

PN-AAT-877



WATER AND SANITATION
FOR HEALTH PROJECT

Operated by
CDM and Associates

Sponsored by the U.S. Agency
for International Development

1611 N. Kent Street, Room 1002
Arlington, Virginia 22209 USA

Telephone: (703) 243-8200
Telex No. WUI 64552
Cable Address WASHAID

PROPOSED WATER SUPPLY AND SANITATION STRATEGIES FOR THE MINISTRY OF PUBLIC HEALTH IN THE THAILAND SIXTH FIVE - YEAR PLAN, 1987 - 1991

WASH FIELD REPORT NO. 153

NOVEMBER 1985

The WASH Project is managed
by Camp Dresser & McKee
International. The Principal
cooperating institutions and
subcontractors are: Associates
in Rural Development, Inc.
International Science and
Technology Institute, Inc.
Research Triangle Institute
Training Resources Group
University of North Carolina
at Chapel Hill

Prepared for
USAID Mission to Thailand
Activity No. 160

WASH FIELD REPORT NO. 153

**PROPOSED WATER SUPPLY AND SANITATION STRATEGIES
FOR THE MINISTRY OF PUBLIC HEALTH
IN THE THAILAND SIXTH FIVE-YEAR PLAN, 1987-1991**

Prepared for the USAID Mission to Thailand
under WASH Activity No. 160

by

Dennis B. Warner, Ph.D., P.E.
and
Barry Karlin, Dr.P.H.

November 1985

Water and Sanitation for Health Project
Contract No. 5942-C-00-4085-00, Project No. 936-5942
Is sponsored by the Office of Health, Bureau for Science and Technology
U.S. Agency for International Development
Washington, DC 20523

Table of Contents

Chapter	Page
LIST OF ACRONYMS.....	v
EXECUTIVE SUMMARY.....	vii
1. INTRODUCTION.....	1
2. BACKGROUND.....	3
3. SCOPE OF WORK.....	5
4. METHODOLOGY.....	7
5. STATUS OF WATER AND SANITATION PROGRAMS OF THE MINISTRY OF PUBLIC HEALTH.....	9
5.1 Policies and Strategies.....	9
5.1.1 Health for All by the Year 2000	
5.1.2 Water and Sanitation Decade Plan	
5.1.3 Basic Minimum Needs	
5.1.4 Fifth Five-Year Plan, 1982-1986	
5.2 Coverage Programs.....	10
5.2.1 Organizational Responsibilities	
5.2.2 Water Supply	
5.2.3 Sanitation	
5.3 Support Programs.....	13
5.3.1 Operations and Maintenance	
5.3.2 Behavioral Issues	
5.3.3 Health and Hygiene Education	
5.3.4 Training	
5.3.5 Management and Supervision	
5.3.6 Financing	
5.3.7 Water Quality Monitoring	
6. STATUS OF WATER AND SANITATION PROGRAMS OF OTHER AGENCIES.....	19
6.1 General.....	19
6.2 Provincial Waterworks Authority.....	19
6.3 Public Works Department.....	20
6.4 Accelerated Rural Development.....	20
6.5 Department of Local Administration.....	20
6.6 Department of Community Development.....	21
6.7 Department of Mineral Resources.....	21
6.8 Population and Community Development Association.....	21
7. REVIEW OF PROPOSED RURAL WATER SUPPLY AND SANITATION MASTER PLAN, 1985-1991.....	23
7.1 Goals and Objectives of Proposed Master Plan.....	23
7.1.1 Coverage Targets	
7.1.2 Support Programs	

Chapter	Page
7.2 Implications of Proposed Master Plan.....	30
7.2.1 Choice of WSS Technology	
7.2.2 Operations and Maintenance	
7.2.3 Water Quality Monitoring	
7.2.4 Hygiene Education	
7.2.5 Total Costs and Funding Mechanisms	
8. STRATEGY CONSIDERATIONS FOR THE SIXTH FIVE-YEAR PLAN OF THE MINISTRY OF PUBLIC HEALTH, 1987-1991.....	35
8.1 Coverage Issues.....	35
8.1.1 General	
8.1.2 Levels of Service	
8.1.3 Coverage Targets	
8.1.4 Choice of Technology	
8.1.5 Ministry of Public Health Targets	
8.2 Support Issues.....	41
8.2.1 Operations and Maintenance	
8.2.2 Hygiene Education and Promotion	
8.2.3 Financing the Master Plan	
8.2.4 Information Needs	
8.2.5 Research and Development	
8.2.6 Coordination Needs	
8.2.7 Water Quality Standards	
8.3 Ministry of Public Health Leadership Issues.....	47
8.3.1 Dual Water Supply Systems	
8.3.2 Promoting Health Objectives	
8.3.3 Decentralization of Water and Sanitation Planning	
8.3.4 Standardization of WSS Financing	
9. RECOMMENDATIONS.....	51
10. POTENTIAL USAID/WASH ASSISTANCE.....	55
REFERENCES.....	57
APPENDICES	
A. Primary Contacts.....	61
B. Memorandum to Dr. Pirote Ningsanonda.....	69
FIGURE	
1. Dual Water Supply Systems.....	48

TABLES

Page

1. Summary of Investment Requirements for Various Activities of the Rural Water Supply Program (1985-1991).....	25
2. Summary of Investment Requirements for Various Activities of the Rural Sanitation Program (1985-1991).....	28
3. Average Costs of Rural Water Supply.....	40

ACRONYMS

AIT	Asian Institute of Technology
ARD	Office of Accelerated Rural Development
BMN	Basic Minimum Needs
DCD	Department of Community Development
DMR	Department of Mineral Resources
DOLA	Department of Local Administration
DPW	Department of Public Welfare
EHD	Environmental Health Division
lcd	Liters per capita per day
MOPH	Ministry of Public Health
NESDB	National Economic and Social Development Board
NGO	Nongovernmental organization
O&M	Operations and Maintenance
PDA	Population and Community Development Association
PWA	Provincial Waterworks Authority
PWD	Public Works Department
RTG	Royal Thai Government
RWSD	Rural Water Supply Division
SD	Sanitation Division
SDP	Social Development Program
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WASH	Water and Sanitation for Health Project

EXECUTIVE SUMMARY

At the request of the Ministry of Public Health within the Royal Thai Government, USAID arranged for the WASH Project to have a team of two consultants study requirements for water and sanitation in the Sixth Five-Year Plan. Dr. Dennis Warner, a sanitary engineer, and Dr. Barry Karlin, health educator and environmental sanitarian, spent July 1985 in Bangkok, northern, and northeast provinces meeting with key government and nongovernment officials and observing field conditions. Their visit coincided with the submission of a Master Plan for Rural Water and Sanitation by the Asian Institute of Technology in Bangkok to the National Economic and Social Development Board of the Government of Thailand. The major findings, conclusions, and recommendations of the team follows.

Protecting and promoting public health through improved water supplies and sanitary practices are major goals of the Ministry of Public Health (MOPH) but not of the many key agencies responsible for water supplies in rural and semiurban areas. The MOPH can increase its effectiveness in attaining health goals by:

1. Encouraging adoption of dual water service levels with separate and appropriate standards for drinking water and for domestic water;
2. Accepting a minimum of 5 liters per capita per day of drinking water in 95 percent of Thai households by the end of the Sixth Five-Year Plan period;
3. Linking drinking water, household sanitation, and hygiene education to all water and sanitation activities in Thailand;
4. Establishing clear policies giving drinking water the highest priority, followed by domestic water for communities without adequate and dependable year-round sources;
5. Promoting greater coordination within the MOPH and among other agencies through joint planning, sponsoring workshops on technical and behavioral issues, and through joint planning of technical and operational research;
6. Drawing upon rural health workers to carry out annual water, sanitation, and hygiene inventories;
7. Strengthening hygiene education through a variety of means, including holding national hygiene education workshops, administrative changes needed to secure responsible and well-trained health educators in water and sanitation programs, and through reexamining budgetary requirements for attaining Plan goals;
8. Reviewing funding methods and sources to both strengthen the revolving fund mechanism and to obtain new sources of capital from government and commercial banks;

9. Seeking funds currently available from USAID and from other bilateral and multilateral agencies in support of water supply and sanitation in Thailand.

Chapter 1

INTRODUCTION

Thailand is in the final years of its Fifth Five-Year Economic Development Plan (1982-1986) and is in the process of developing the Sixth Plan (1987-1991). At present, the Ministry of Public Health (MOPH) within the Royal Thai Government (RTG) is formulating the health component of the Sixth Plan. In October 1984, discussions between the MOPH and USAID/Thailand led to a request for WASH Project assistance in preparing the water supply and sanitation program of the MOPH. Of particular concern in this program was the future role of the MOPH in water and sanitation during the Sixth Plan, as well as the related issues of population coverage, financing strategies, and interagency coordination.

A two-person WASH team consisting of a sanitary engineer (Dr. Dennis B. Warner, Deputy Director of the WASH Project) and a health educator/sanitarian (Dr. Barry Karlin, consultant) spent the month of July 1985 in Thailand working with the MOPH. The team reviewed available documents, met with officials of the various RTG water and sanitation agencies, and travelled to several rural areas in the North and Northeast Regions. Working closely with RTG officials, the team identified a number of key issues regarding rural water supply and sanitation in the Sixth Plan and formulated corresponding strategies for the MOPH.

This report presents the findings and recommendations of the WASH team. Chapter 2 contains the historical background to rural water and sanitation development in Thailand. The scope of work of the team, as defined by USAID, is presented in Chapter 3. Chapter 4 explains the methods used by the WASH team to carry out their assignment.

Chapter 5 is a description of the current policies and water and sanitation programs of the MOPH. In Chapter 6, a brief review of the water supply programs of the other main agencies is given. A more detailed analysis of the proposed rural water and sanitation master plan for the Water and Sanitation Decade is presented in Chapter 7.

General strategies and related program activities of the MOPH in the water and sanitation sector during the Sixth Plan are discussed in Chapter 8. Where appropriate, recommendations are made for consideration and possible adoption by the MOPH. A summary of the key recommendations is given in Chapter 9. The report concludes with a discussion of possible follow-up assistance from USAID and the WASH Project in Chapter 10.

Chapter 2

BACKGROUND

The Royal Thai Government (RTG) has had policies and programs designed to improve and promote rural environmental sanitation since the early 1950s. It has received assistance from WHO, UNICEF, USAID, and other donors over the years, including major financial and technical support from USAID beginning in 1957 leading to the development of the Village Health and Sanitation Project. This project gave emphasis to improved village water and sanitation through active community participation, training large numbers of field sanitation workers, technical research, and commodity support, transportation, and field supervision from central and regional offices. Environmental sanitation support from USAID has been provided by USAID at varying levels since then.

A number of studies of water and sanitation have been supported by USAID in recent years. In 1979, a team from the American Public Health Association prepared "Strategy and Guidelines for Improvements in Sanitation and Water Supply in Selected Areas of Thailand." The following year, USAID sent two members of its Washington staff, D.M. Dworkin and B.L. Pillsbury, who reported on "The Potable Water Project in Rural Thailand." The WASH team of J. Arbuthnot and R.H. Thomas prepared a report on "Village Water Supply and Sanitation in Northeast Thailand" in July, 1981. Most recently, a "Thailand: Health Sector Assessment" was prepared in 1983 by Management Sciences for Health.

In October 1984, discussions were held between USAID and the Office of the Director General of Health, resulting in a request for assistance from the Water and Sanitation Project for Health (WASH). Two consultants were selected and charged with assisting the Department of Health in the Ministry of Public Health in formulating strategies for rural water supplies and sanitation in the sixth five-year health plan of the MOPH covering the period of 1987-1991. Their assignment, which was to last a total of seven person-weeks, included providing advice on how the RTG could best coordinate its water and sanitation efforts, suggesting methods of assessing program coverage, establishing action priorities, and identifying areas of potential USAID and WASH support commitments for such support were not part of this assignment.

Thailand not only has a long history of improving rural water and sanitation, it currently has highly trained and competent officials posted throughout its responsible agencies. Furthermore, a two-year study resulting in a master plan for rural water and sanitation development was ready for submission from the Asian Institute of Technology to the National Economic and Social Development Board (NESDB) under the Office of the Prime Minister. The WASH team, therefore, sought to identify and study only selected issues of special importance to the MOPH. These were:

- Feasibility of a dual water quality system with separate standards and priorities for drinking and domestic water;
- Appropriateness of various sources of drinking water;

- Selection of suitable coverage targets for drinking water, domestic water, and sanitary latrines;
- Interaction of water supplies, sanitation, and hygiene education to obtain maximum health benefits;
- Leadership roles for the MOPH in promoting water and sanitation for health;
- Compatability of centralized planning with a "bottoms up" developmental philosophy;
- Comparison of technical costs and likely funds; and
- Capitalization and local participation in financing.

Each of these issues is addressed in this report, including discussions of how they are covered in the master plan.

Chapter 3

SCOPE OF WORK

The scope of work for this assignment was initially defined in a cable sent to AID/Washington by the USAID Mission in Bangkok. The cable (BANGKOK 12199) requested WASH assistance in the formulation of the rural water supply and sanitation program of the MOPH in the Sixth Five-Year Plan, 1987-1991, as follows:

- a. Review and assess the current status of water supply and sanitation programs being carried out by the MOPH, including population coverage (percentage of rural population having access to year-round safe drinking water and using sanitary latrines), MOPH strategies in utilizing community funds for program expansion, and rate of program expansion.
- b. Review rural water supply programs carried out by other agencies, such as the Provincial Waterworks Authority, and the Departments of Local Administration, Mineral Resources, and Public Works.
- c. Assist the MOPH in formulating and reviewing its next five-year water supply and sanitation program.
- d. Advise the RTG (1) how the efforts of different departments should be coordinated and (2) how the program coverage will be properly assessed.
- e. Advise the RTG and USAID which aspects of the program need to be strengthened and which ones WASH would be able to assist.

In May, an exchange of cables between AID/Washington and USAID/Thailand led to an addition to the scope of work whereby the WASH team was "to advise on a future course of action for the Ministry of Public Health in coordination with other agencies" (STATE cable 134875).

Chapter 4

METHODOLOGY

Because of its broad scope regarding water supply and sanitation programs in the Sixth Five-Year Plan, this assignment required the collection of information from a wide variety of sources. Initial briefings of the consultants were held in Washington, D.C. with officials of the Asia Bureau (ASIA/HPN) and the Office of Health of the Bureau for Science and Technology (S&T/H). These briefings covered the background leading up to the assignment and included a review of related field reports prepared by other USAID teams.

In the field, the consultants visited most of the agencies active in rural water supply and sanitation. Dr. Karlin arrived in Thailand on 1 July 1985 and began a series of preliminary meetings with USAID, MOPH, and the Asian Institute of Technology. Dr. Warner arrived on 6 July, and the consultants then began the formal part of the investigation. Following an initial briefing with MOPH officials in the Department of Health, the consultants met with representatives of the following agencies:

USAID

MOPH

- Sanitation Division
- Rural Water Supply Division
- Environmental Health Division
- Health Education Division
- Food Hygiene Division
- Health Planning Division
- Training Division
- School Health Division

Ministry of Interior

- Provincial Waterworks Authority
- Public Works Department
- Office of Accelerated Rural Development
- Department of Local Administration
- Department of Community Development

UNICEF

Ministry of Industry

- Department of Mineral Resources

Secretariat to the Prime Minister

Mahidol University

- Faculty of Social Science and Humanities
- Faculty of Public Health

Asian Institute of Technology

National Economic and Social Development Board

Technical Development Research Institute

Population and Community Development Association

Thai Savings Bank

Two field trips were taken to meet with provincial and local officials and to inspect village water and sanitation facilities. The first trip was 10-14 July to Lampang, Lamphun, and Chiang Mai in the north; the second was 17-18 July to Khon Kaen in the northeast.

Throughout the investigation, the WASH consultants worked closely with MOPH officials and sought frequent discussion and guidance. On 19 July, the consultants presented their preliminary findings and conclusions to the MOPH for review and discussion. A preliminary review of the results was also held with USAID on 24 July. The official presentation of the consultants' findings and recommendations was held in separate meetings with the MOPH and USAID on 26 July. In addition, a special debriefing was held on 28 July with Sanitation Division officials.

With the assistance of USAID, a draft preliminary report was typed and distributed to USAID and the MOPH on 29 July. The consultants left Thailand later that evening.

Chapter 5

STATUS OF WATER AND SANITATION PROGRAMS OF THE MINISTRY OF PUBLIC HEALTH

5.1 Policies and Strategies

5.1.1 Health for All by the Year 2000

Shortly after the World Health Organization's major conference on primary health care held in Alma Ata, USSR, Thailand's Ministry of Public Health adopted the conference theme of Health for All by the year 2000 through primary health care. Water and sanitation has since been incorporated into all primary health care services, including the work of the Divisions of Sanitation, Rural Water Supply, Environmental Health, School Health, Primary Health Care, Rural Health, Training, and others. In fact, water supply and sanitation activities, including strong community participation, led the way for more comprehensive primary health care services and methodologies in Thailand.

5.1.2 Water and Sanitation Decade Plan

The RTG has been late in developing a national plan for the International Drinking Water Supply and Sanitation Decade, 1981-1990. In 1983, the NESDB contracted with the Asian Institute of Technology to formulate a rural water supply and sanitation master plan for the period 1985-1991. This plan has recently been completed and is now being reviewed by RTG ministries (see Chapter 7). In the absence of an official plan, the Sanitation Division of the MOPH in 1985 established several coverage targets for the Decade. The target for water supply was set at 2 liters per capita per day (lcd) of drinking water for 90 percent of the rural population. It was expected that this target could be met with a combination of rainwater collection, shallow wells, and deep wells with handpumps. No figures were established for the remainder of domestic water needs. For sanitation, the target was set at 90 percent of all rural households having a sanitary water seal (pour-flush) latrine.

5.1.3 Basic Minimum Needs

The goal of "Health for All by the Year 2000" led the RTG to establish the Social Development Project (SDP) under the direction of the NESDB in 1980. This project evolved into a rural health and socioeconomic development strategy involving the direct participation of villagers in the planning and development process. One of the key aspects of the SDP is the application of Basic Minimum Needs (BMN) in identifying local development activities and motivating the people to participate in them. Introduced in 1982, the concept of Basic Minimum Needs is based upon a set of characteristics intended to be exhibited by Thai society in the year 2000. There are nine Basic Minimum Needs, including good nutrition, appropriate shelter, access to employment, basic human services, security of life and property, access to production factors, family planning, participation in community development, and spiritual development.

The application of Basic Minimum Needs involves the measurement of 52 indicators in a village in order to identify current projects and activities and to assess performance gaps. The results are used by the various committees of the village to determine the priority of problems and to formulate potential solutions. After one or two years of implementation, it is intended that BMN surveys should be conducted again to assess progress and to determine new activities for the village. By the end of 1984, villages in 14 of 72 provinces had accepted BMN indicators in the promotion of sound development. It is expected that by the year 2001, which will be the end of the Eighth Five-Year Plan, the basic minimum needs of the entire country will have been achieved through the efforts of the four key ministries in the rural sector: the Ministries of public health, agriculture and cooperatives, education, and interior.

5.1.4 Fifth Five-Year Plan, 1982-1986

Primary health care is the key strategy for national health development in the Fifth Plan. The MOPH targets for the plan period are 2 lcd of safe drinking water for 70 percent of the rural population and sanitary (i.e., pour-flush) latrines for 70 percent of the rural population. In the area of water supplies, MOPH strategy is based upon the provision of safe water through the promotion of household rainwater tanks, the use of village health volunteers and technicians, the subsidization of rainwater tanks, and participation of the private sector. In the area of environmental sanitation, the MOPH intends to promote the construction of pour-flush latrines, community participation through the training of village technicians, the transfer of appropriate technology, and local production and marketing. Water supply and sanitation systems are seen by the MOPH as key interventions to reduce the incidence of diarrhea and the prevalence of parasitic diseases, especially in children. The ultimate target for the country is that every household has safe water supply, a sanitary latrine, proper refuse disposal, vector control, proper housing conditions, and an appropriate environment.

Health education is seen by the MOPH as part of primary health care and as a means of controlling endemic diseases. Health education strategies include dissemination of health information by health volunteers, use of mass communications, and assistance to village health volunteers in terms of training, provision of data, and information. MOPH training targets for water and sanitation activities in the Fifth Plan comprise 43,250 village council members, 17,000 village craftsmen, and 1,697 tambol (subdistrict) health officers.

5.2 Coverage Programs

5.2.1 Organizational Responsibilities

Water and sanitation responsibilities within the MOPH are divided among a number of different offices. Within the Department of Health are found the Rural Water Supply Division (RWSD), the Sanitation Division, and the Environmental Health Division. The RWSD is responsible for the development of surface and groundwater supplies, including well drilling, the installation of handpumps and electrically driven deep well pumps, and the construction of small piped water supply systems. The RWSD has five regional centers from

which it provides technical services to village committees. The Sanitation Division is responsible for rainwater containers, small piped water systems, and the training of village craftsmen and is the sole RTG agency charged with the promotion of latrine construction. There are nine regional centers from which the Sanitation Division provides technical services to the field. The Environmental Health Division is responsible for water quality monitoring of all rural water supplies. It has no regional centers and, therefore, carries out most laboratory work at the MOPH headquarters in Bangkok. All three divisions report to the Director General of the Department of Health. The Department also has a small but active Food Hygiene Division which stresses hygiene education for village housewives.

The Health Education Division is located in the Office of the Permanent Secretary for Public Health. Although it is responsible for the motivation of villagers regarding environmental sanitation practices, it has no direct link to the water and sanitation divisions in the Department of Health. Similarly, the provincial health administration, which includes all sanitation field staff under the direction of a Provincial Chief Medical Officer in each province, reports directly to the Permanent Secretary, as well as to provincial governors under the Ministry of Interior.

5.2.2 Water Supply

a. National Coverage

In 1983, Mahidol University carried out a national census of rural drinking water sources and latrines. It found that 85 percent of the rural population had access to "adequate" (year-round) water sources, which included shallow wells, deep wells, piped water supplies, and surface water. However, only 15 percent of the rural population were served by "sanitary" sources, defined as protected sources with good quality water, although not necessarily meeting WHO drinking water standards. (Some MOPH officials dispute this figure and believe that 60 percent or more of the rural population is currently served by protected water sources. It is not clear to the writers which figure is more valid, since the various definitions used for drinking water are imprecise and not directly comparable). No information was collected on per capita water consumption from either "adequate" or "sanitary" water sources. The census also showed that there were 111,753 shallow wells, 15,276 deep wells, 3,119 piped water systems, and 13,993 surface water sources, of which 75 percent were considered to be adequate and only 27 percent to be sanitary. In addition, the census indicated that there were 2.2 million water jars, each with a storage capacity of 1.0 to 2.0 cubic meters. Approximately 11 percent of all rural households were using the jars for rainwater collection and storage. These data are approximations in that significant methodological and analytic problems were present in this census.

b. Rural Water Supply Division (RWSD)

The Rural Water Supply Division of the MOPH supervises the digging of shallow wells, drills deep wells, installs handpumps, and constructs piped water systems for villages up to 2000 in population. Annually, the RWSD digs approximately 200 shallow wells, drills 1,000 deep wells (with the aid of 44 drilling rigs), and improves 200 to 300 existing shallow wells.

Locally-manufactured handpumps are installed on all shallow wells. Most deep wells are also provided with handpumps, but a few have electric submersible pumps which are used as part of a complete piped water supply system. Piped projects have an elevated storage tank and metered house connections. In many cases, the systems are provided with simple aeration and filtration equipment to reduce the high iron content of the groundwater. Since 1982, the RWSO has built about 50 piped water systems.

c. Sanitation Division

The Sanitation Division of the Department of Health heavily promotes rainwater collection systems, but it also installs small piped water systems in schools and temples and oversees the digging of shallow wells. The water supply activities of the Sanitation Division are described in the following section.

5.2.3 Sanitation

a. Sanitation Division

Established in 1974, the Sanitation Division has been strongly influenced by the Village Health and Development Project, which began in 1957, and by subsequent projects supported by a number of donor agencies, including USAID, UNICEF, and the World Bank. It currently has a staff of 600, including 258 trained sanitarians, 206 of whom work in nine regional sanitation centers. The primary responsibility of the division has been to promote construction of sanitary latrines. It also actively supports rainwater jar and tank construction, design and promotion of household water filters, and numerous training activities. The accomplishments of the Sanitation Division are impressive. Drawing upon a total budget of approximately 60 to 70 million baht for the Fifth Plan period, 81 percent of which is used in impoverished areas, the Sanitation Division has supported the construction of many of the 2,865,000 water-seal latrines which now serve over 45 percent of rural families.

Over 2,234,000 rainwater jars provide 2 lcd of safe drinking water for 11 percent of the population, while 12,000 families benefit from larger concrete rainwater tanks. Over 23,000 families, mainly in Northern Thailand, now have simple household water filters costing about 200 baht each (U.S. \$7.40). Improved wells, many with sanitary pumps, are also widespread, but it is impossible to know how many are functioning, and how many families regularly drink safe water from them. Mahidol University and the Asian Institute of Technology have undertaken research studies on these issues.

The Sanitation Division, through its field staff and regional centers, provides technical advice and, in some cases, revolving funds for the construction of latrines, rainwater jars and tanks, and biogas generators. Individual households pay for materials and provide labor.

By the end of the Fifth Plan, the Sanitation Division expects that drinking water (2 lcd) and sanitary latrines will have been provided in 12,555 villages located in 38 provinces officially designated as impoverished. In addition, water and sanitation will be available in another 6,444 villages in other provinces. Although water supply is being developed by several agencies, sanitary latrines are the sole responsibility of the Sanitation Division.

b. Food Hygiene Division

This Division was established in 1983 with assistance from UNICEF to promote improved hygienic food handling preparation and storage of foods in both rural and urban areas, excluding Bangkok. Of its 40-person staff, 12 are located in Bangkok and the remainder are assigned to nine regional sanitation centers. The Food Hygiene Division was organized in 1977 with responsibilities for providing public education regarding food hygiene and for promoting the upgrading of hygienic practices at food handling establishments. Since then, it has trained over 42,000 persons, established 120 demonstration restaurants, and produced well over a million audiovisual aids. Special emphasis is now being given to training housewives in rural villages in 17 provinces.

5.3 Support Programs

5.3.1 Operations and Maintenance

It is generally agreed that operating and maintaining wells, pumps, and water treatment and distribution systems in rural Thailand present complex problems that have not been fully solved. The extent of these problems is not clear. In 1972, a USAID audit found that efforts to sustain drinking water systems were unsatisfactory as a result of shortages of mechanics, insufficient operating funds, and inadequate support from villagers. A large proportion of water treatment plans were found to be inoperative or only partially operative. However, the USAID evaluation team of Dworkin and Pillsbury reported in 1980 that "Most of the systems built under the project continue to function more than ten years after the first systems were installed." (Dworkin, D. and B. Pillsbury, May 1980, p. ii of Summary). Breakdowns were found to be more often due to poor management in maintaining and financing systems than to technical failures or inadequate training of operators. Indeed, the evaluation team was favorably impressed with the technical abilities of local operators and the extent to which they continued to serve. They found that more complex pumped and piped systems were less likely to be broken than simple handpumps, which were viewed by villagers as not much better than the old bucket system. Perhaps the more serious problem observed by Dworkin and Pillsbury was the frequent failure of villagers to drink protected water, a problem which was clearly reflected by the limited attention being paid to hygiene education. The operating plan inspection form contained 25 technical items and only one question about whether villagers were drinking plant water.

In the short time in which the WASH team had to prepare its report, no systematic study of operations and maintenance was possible. An attempt was made to review findings on this issue from a recent water and sanitation census conducted by Mahidol University, but the data were only partially analyzed and not considered to be sufficiently accurate. There was widespread agreement that household meters were far more satisfactory than other fund-raising methods, and that metered systems tended to be well maintained. The team did find a tendency in piped systems to disconnect chlorinators to avoid complaints about taste.

5.3.2 Behavioral Issues

The MOPH has promoted community participation in water and sanitation programs for decades and has used community committees as a means of educating villagers about the relationships between hygiene and health. However, the numbers of health workers who are trained and have time to devote to this process are limited. As a result, many rural people continue to drink water from highly polluted sources, even though safer but less tasty sources are or could be made available. Pumps needed to protect well water often are not properly maintained or promptly repaired. Fewer than half of the people have sanitary latrines, which are not consistently used by children or for the disposal of infant wastes. Food hygiene has only recently been addressed. As a result, morbidity and mortality from diseases associated with poor sanitation remain high. There is a lack of emphasis within the MOPH on the importance of sanitation and hygiene for attaining the full health benefits of improved water supplies.

5.3.3 Health and Hygiene Education

Health education is a process of systematically bringing about changes in health beliefs, attitudes, and practices in order to increase people's value for health, to promote healthful practices, and to reduce illness and premature death. The health education process depends upon voluntary individual and community cooperation and participation, using person-to-person contacts and group educational techniques, often supported by a variety of audiovisual aids, including mass communications. This process can take place in homes, community meeting areas, clinical sites, schools, or elsewhere. For maximum impact, health education programs employ a variety of techniques and staff in a carefully planned and coordinated manner. The term "social preparation" is sometimes used to describe community health education.

Professionally-trained health educators have been contributing to water supply and sanitation programs in Thailand for many years. At the present time, human and material resources to promote health education for improved environmental sanitation, i.e., hygiene education, are likely to be insufficient to meet the health goals implied in the Water Decade. Only a handful of trained health educators are assigned to duties outside of Bangkok at regional or provincial levels, and almost none below the district level. Studies that describe the effectiveness of public health workers as hygiene educators are lacking. Weaknesses in hygiene education are even greater outside of the MOPH where programmatic goals only vaguely include improved health.

5.3.4 Training

While responsibilities for improved water supply and sanitation are spread throughout the MOPH, most of this work is done by junior or senior sanitarians. Junior sanitarians are recruited from MOPH training institutions which provide two years of training to men and some women with a 12th grade education. Between 700 and 800 junior sanitarians graduate each year, a number close to the 800 to 900 called for in the Fifth Plan. There is also a new continuing education program for upgrading their education to the B.S. level. Senior sanitarians at the B.S. and M.P.H. levels are also trained in Thailand

in sufficient numbers. Sanitation services are being spread more widely through vigorous programs of training village craftsmen and women in basic sanitation skills, such as working with concrete, casting well and privy-casing rings and water-seal latrine slabs, and making one-to-two-cubic meter concrete jars. A total of 18,556 craftsmen are to be given a two-week training program by 1986. Junior and senior sanitarians generally serve as district health officers and are expected to offer a great variety of health services, including administration, recordkeeping and minor medical treatment. To maintain their interests and skills in water and sanitation, the Sanitation Division operates nine regional centers manned by highly experienced and motivated sanitation workers who remain in constant contact with provincial and district workers. Despite these contacts, field workers receive relatively little by way of water and sanitation reports, newsletters, journals, or other current information other than that prepared by the Sanitation Division in Bangkok. This informational lack is also true for training institutions where trainers need to be kept abreast of development in Thailand and elsewhere. Management and supervision services are also provided from regional engineers attached to the Rural Water Supply Division but it is not clear to what extent workers with health education responsibilities are given such backstopping.

5.3.5 Management and Supervision

Many factors have combined to make effective management and supervision of water and sanitation programs difficult in Thailand. At the central level, Thailand has a tradition of strong central leadership that has historical roots in its earliest kingdoms. Problems associated with strong centralization were clearly recognized in the Fifth Five-Year Plan, which noted that, "Rural development has still been carried out mostly by government agencies on the basis of top-down and hand-out approaches. This is very much inconsistent with the principle of rural development...." (Source: p. 589, Chapter 4 of English translation). The plan goes on to observe that "...there is no unity of command among government agencies in the province, which creates coordination problems and duplication..." The plan sees a need to reorganize development management at the provincial level, in particular, as well as through strengthening subdistrict councils. The need for strong local management will be especially great in water supply and sanitation programs that must reach to the most remote of villages, that are supported by large numbers of agencies, each with its own objectives and methodologies, and that must count on ongoing local understanding and cooperation to succeed.

In some provinces with strong leadership by governors, such as in Korat and Srisaket, officials of various ministries and departments carry out their activities only when specifically authorized to do so as a part of a provincial development plan. Vehicles from one department might be detailed to support construction or transportation projects of other ministries. But elsewhere, well drillers from various agencies can decide for themselves where and when wells are to be drilled, and the extent to which villagers will participate in or will have some control over their community development activities. There is often no one at the provincial level with either the status or technical background needed to effectively coordinate water development. Even when provincial planners have advanced management training, as do 60 out of 74 provincial planning officers, they often lack needed support to plan or coordinate complex multiagency activities.

At the community level, a number of key managerial problems will have to be solved during the period of the Sixth Five-Year Plan, including local management of fees, revolving funds, bank loans, and a variety of other developmental tasks which must be undertaken simultaneously. Past evaluations of potable water supply projects in Thailand suggest that management issues rather than technical designs or operations are primarily responsible for systems failures, as noted in Section 5.3.1 earlier.

Skilled and ongoing supervision offers an effective means for promoting improved management and overall program implementation. An important factor in the success of sanitary latrine efforts in Thailand has been supportive supervision from skilled and dedicated sanitarians working out of a network of nine regional centers. In addition, key MOPH officials at both central and provincial levels have taken a personal interest in field supervision. However, the regional centers of the Sanitation Division do not necessarily correspond to the regional centers operated by other divisions of the MOPH or, for that matter, with those of other ministries. Any major expansion in water and sanitation efforts, as envisioned in the master plan, will therefore require greater human, material and fiscal resources to permit adequate levels of supervision, including managerial support.

5.3.6 Financing

Financing of water supply and sanitation (WSS) activities under the MOPH includes a variety of mechanisms. Budgets are allocated to three key divisions: Sanitation, Rural Water Supply, and Environmental Health. The first two have networks of staff at regional centers throughout the Kingdom. Under the Sanitation Division is a specially-funded Mobile Health Project supported by the Government of West Germany, which emphasizes WSS in seven provinces along the Cambodian border. Support for WSS activities also comes from the many health workers stationed in the field who serve under chief provincial medical officers. It has long been MOPH policy to expect villagers to contribute land, labor, and materials when available. The proportions will vary according to system designs and local economics. For example, the Rural Water Supply Division expects villagers to contribute at least 20 percent of capital costs, of which 5 percent must be in cash and the remainder can be in labor and materials. All piped water systems now being installed have individual household meters that allow for ready generation of operation and maintenance funds. Public (free) taps are no longer being installed. Neighbors or the village council are responsible for addressing the special needs of villagers who cannot afford to pay for their water requirements and who would otherwise be forced to use more dangerous or inconvenient sources. A number of systems of revolving funds have been established, permitting villagers to borrow funds for household rainwater containers, sanitary latrine slabs, or similar uses. Interest is charged in some cases while in others it is not. Villagers are expected to pay for their own latrines but are provided with molds which permit low-cost local casting. A recent development in the northeast has been large-scale manufacture of slabs by village development committees and by elementary school teachers to generate profits for local use. The private sector is becoming increasingly important as a source of low-cost but high-quality slabs, often with a porcelain finish.

Nevertheless, even with relatively large budgets and local contributions, funds are insufficient for MOPH officials to achieve their Fifth Five-Year targets. The Sanitation Division, for example, had established the goal of organizing sanitation programs in half of all villages by 1986, i.e., 25,000 villages. However, staff and budget shortages will mean that only 18,550 will be entered, one-fourth fewer than planned.

On the other hand, emphasis had been given to the 38 most economically needy provinces, and all villages in these provinces are expected to be organized by October 1986. But there are many disadvantaged communities badly in need of help in the remaining 34 provinces, and many of these will have to remain unserved by the MOPH. While it is true that some water development services can also be obtained from other ministries, these agencies lack a strong health commitment and often fail to include provisions for safeguarding water against contamination, assistance with sanitary latrines, or any hygiene education to increase proper use of improved supplies.

5.3.7 Water Quality Monitoring

In general, drinking water quality throughout the country is poor, especially in rural areas. Moreover, water quality monitoring efforts currently being carried out by water authorities are inadequate and lack any effective means of follow-up enforcement of higher standards. For example, in Khon Kaen and Mara Sarakham provinces, the Thai-Australia Project found that unprotected water sources, such as ponds and open shallow wells, almost invariably have high bacteriological contamination, but even protected water sources such as deep wells, shallow wells with handpumps, and rainwater containers tend to provide unsafe drinking water because of either chemical (dissolved salts, iron) or bacteriological (fecal coliforms) contamination. Recent laboratory tests carried out by the Environmental Health Division of the MOPH suggest that the majority of all water sources and systems in Thailand contain bacteriologically unacceptable drinking water and that almost all fail to meet existing physical and chemical standards. The RTG and the MOPH follow the WHO International Drinking Water Standards, which basically prohibit the presence of any coliforms in drinking water and have equally restrictive limits on physical and chemical contaminants.

Since 1983, the Environmental Health Division (EHD) has been carrying out drinking water quality surveillance programs in the provinces. With support from UNICEF and CIDA (Canada), the EHD works with provincial health officers to develop sampling, laboratory testing, and local training programs in 15 provinces per year. At present, fewer than half of the provincial hospitals have the capability of testing for fecal coliforms in drinking water. By 1987, it is expected that all 72 provinces will have developed individual monitoring programs and the capability to carry out routine bacteriological and chemical analyses. The overall national program is partly research in nature and is intended to set up a basic monitoring infrastructure, but it is not expected to meet the full water quality monitoring needs of the country.

Chapter 6

STATUS OF WATER AND SANITATION PROGRAMS OF OTHER AGENCIES

6.1 General

Overall, there are 17 separate RTG agencies within six ministries responsible for the development of small-scale rural water supply projects. Nine of these agencies are involved in providing drinking and domestic water supplies in all areas of Thailand.

Ministry of Public Health

1. Rural Water Supply Division (RWSD; MOPH)
2. Sanitation Division (SD/MOPH)

Ministry of Interior

3. Provincial Waterworks Authority (PWA)
4. Public Works Department (PWD)
5. Office of Accelerated Rural Development (ARD)
6. Department of Local Administration (DOLA)
7. Department of Community Development (DCD)
8. Department of Public Welfare (DPW)

Ministry of Industry

9. Department of Mineral Resources (DMR)

In addition, the Population and Community Development Association (PDA), a private organization, provides rural water and sanitation services in a number of provinces. External assistance is also provided to the rural water supply and sanitation sector by UNICEF, UNDP, the Australian Development Assistance Bureau, and USAID. Most of this assistance is channeled through one or more of the above agencies.

Many of the above agencies promote similar types of water supply projects, although the objectives and methods of implementation usually vary between agencies. A brief description of key agencies follows:

6.2 Provincial Waterworks Authority (PWA)

The Provincial Waterworks Authority (PWA) was formed in 1979 to be responsible for design, construction, operation, and maintenance of water supply systems in urban areas, which are towns with a population of 5,000 or more. PWA also provides some support to towns above 2,500 population in official sanitary districts. Most water systems under PWA control were originally constructed by the Public Works Department of the Ministry of the Interior or by the RWSD of the MOPH. To date, PWA is responsible for 181 urban and 675 rural water supply systems. All systems have water treatment and, in general, all systems deliver water only to metered connections. Public taps are no longer built, although some older systems still have some metered public taps. Since PWA was

established to be a self-supporting agency, all water systems under its control must be financially solvent.

6.3 Public Works Department (PWD)

The Public Works Department (PWD) was established more than 50 years ago to be responsible for water supply systems in urban areas. In 1979, urban water supplies were shifted to the newly-formed PWA. Since then, PWD has concentrated on providing piped water supplies to small rural communities within sanitary districts. PWD activities include deep well drilling and the construction of small piped water systems consisting of a pump, storage tank, and piping. Treatment facilities are not normally included in PWD systems. The cost to PWD for such systems is about 250,000 baht, exclusive of the cost of the well. The local community is expected to contribute about 20 to 30 percent of the cost of the system. System operators are trained by PWD, but maintenance is the responsibility of the village. PWD will provide special repair services as long as the village pays for parts and materials. PWD controls 41 drilling rigs and has the capacity to drill 2,000 deep wells annually. In 1985, PWD will drill about 1,250 wells and build 50 piped water systems. PWD systems serve communities of 300 to 2,000 persons and are designed to provide 40 lcd.

6.4 Accelerated Rural Development, Ministry of Interior (ARD)

The ARD Project was initiated during the early 1960s in response to the needs of rural Thais living in politically sensitive or endangered areas, particularly in the Northeast and on the southern border. Since improved water supply was a high local priority, drilling rigs and other equipment were procured and drilling programs initiated. During the Fifth Five-year plan, ARD will construct almost 1,600 shallow drilled wells up to 10 meters in depth and 5,258 deep wells. Hand pumps are installed on each developed well. Pond improvement or digging is to be completed at 371 sites, and local initiative is encouraged for constructing rainwater jars and tanks. Over 30,000 two-cubic-meter jars will be completed with ARD participation.

For the Sixth Five-year plan period, ARD anticipates that drilling will proceed at the same rate but will be more highly concentrated in the Northeast, where three-fourths of the wells are to be drilled. About 90 percent of new jar construction will be in the Northeast, i.e., about 27,000 jars over five years. ARD has approximately 30 multipurpose engineers at each of its 6 regional offices and has offices in 57 provinces. Environmental sanitation and health education are not currently ARD activities.

6.5 Department of Local Administration (DOLA)

The Department of Local Administration (DOLA) constructs small water supply facilities in sanitary districts and rural areas. All capital costs are paid by the Department, but responsibility for operation and maintenance is turned over to either the sanitary districts or the provincial administration in the rural areas. At present, most DOLA water supply activities are carried out in the rural areas. The current annual output of the DOLA includes 1,000 shallow

wells, 100 ponds, 40 large concrete tanks, 1,000 small metal tanks, and 4,000 rainwater jars of two-cubic-meter capacity.

6.6 Department of Community Development (DCD)

The DCD has been working in the rural areas for many years and claims to have organized community development committees in every Thai village. Some 5,000 community development workers work as developmental generalists, serving as facilitators or catalysts in bringing RTG services to communities that are ready to receive them. DCD does not attempt to plan exactly which services or facilities are to be delivered each year. Rather, it responds to community priorities. It has, however, supported rainwater storage activities in both the Fourth and Fifth Plans. Sanitation and hygiene education have not received similar emphasis. If people want an open well for convenience, DCD will support its construction even though safe drinking water remains unavailable. DCD funds are used primarily for training and demonstration purposes. Well drilling rigs are made available if villagers pay for casings and other supplies. In past years, the reverse was true, with DCD paying for supplies and villagers providing labor. DCD gives special emphasis to working with village women, but additional technical backstopping would be needed for these groups to receive hygiene education directly from DCD staff.

6.7 Department of Mineral Resources (DMR)

The Groundwater Division in the Department of Mineral Resources (DMR) is the largest water supply drilling agency in Thailand, constructing about 2,150 deep wells annually, or 40 percent of the total RTG output. Most wells are drilled for local communities, although a small number are drilled for other RTG agencies. The DMR has 45 drilling rigs, mainly the direct rotary type. Completed wells cost from 60,000 baht (with handpumps) to 75,000 baht (with electric submersible pumps). Approximately 90 percent of the wells have handpumps, with the remainder fitted with electric pumps. Each handpump serves between 250 and 300 people. All capital costs of wells and pumps are borne by the DMR, but the local village must assume responsibility for operation and maintenance as well as the capital costs of any treatment, storage, and distribution piping that may be derived. The DMR does not build piped systems, but it does provide simple technical designs for implementation by village personnel. The 1985 rural water supply budget of the DMR is 280 million baht. There are a total of 1,100 persons working in the Groundwater Division.

6.8 Population and Community Development Association (PDA)

PDA, the largest private voluntary organization in Thailand, was founded in 1974 to provide community-based family planning services. Its success led to expansion in broader primary health care and development areas. Presently, some 12,000 volunteers are working in 16,000 villages throughout the Kingdom. Community participation and self-reliance are an integral part of all of PDA's activities. This approach resulted in a highly successful rainwater tank ("Tungnam") Project, which assisted in the building of 8,500 tanks of 11.1 cubic meters at a cost of 6,200 baht each, including technical support and

administrative costs. Assistance is provided to villages only when 12 families request help and are able to provide the needed labor. A revolving fund is used, which requires down payments of 500 baht plus 200 baht per month until the materials cost of 4,400 baht is repaid. No interest is charged for money loaned to households. Using revolving funds, PDA hopes to assist in the construction of rainwater tanks throughout the country during the Water Decade. At present, PDA is assisting in the construction of about 2,700 tanks per year. A standard of 6.7 lcd has been adopted, which assumes that each tank will supply a family of seven persons for eight months. (Note: this standard exceeds that of the MOPH which is 2 lcd, assuming six persons per family; or that of the Asian Institute of Technology (AIT) which is 5 lcd, assuming that there are five persons per family). PDA also actively promotes village sanitation activities, including installation of water-seal latrines purchased from commercial sources and the construction of rainwater jars. To date, PDA has assisted in the construction of 6,000 latrines and 5,000 jars.

Chapter 7

REVIEW OF PROPOSED RURAL WATER SUPPLY AND SANITATION MASTER PLAN, 1985-1991

7.1 Goals and Objectives of Proposed Master Plan

7.1.1 Coverage Targets

The master plan contains appendices that present details of existing water and sanitation facilities by population served and by geographic region. It then presents the numbers of people to be served by the end of 1991 in order to achieve 95 percent coverage for adequate water and 75 percent coverage with sanitary latrines. Summary figures are:

A. Populations with adequate sanitary and nonsanitary water supplies from nonpublic (private) and public sources:

		Percent of rural pop. (N=35,660,000)
<u>Nonpublic</u>	Population	
Sanitary	1,494,685	4.2
Nonsanitary	4,678,687	13.1
<u>Public</u>		
Sanitary	4,907,194	13.8
Nonsanitary	20,382,057	57.3
<u>Total with adequate water</u>		
Sanitary	6,401,873	18.0
Nonsanitary	25,060,744	70.4
<u>Total without adequate water</u>	4,138,000	11.6

By the end of 1991, the master plan projects that there will be a total of over 40 million rural Thais, of whom 38 million (95 percent) will be served with safe water. After subtracting the 6.4 million already adequately served, the plan calls for serving 12.8 million people by upgrading existing public facilities, and another 14.5 million by new construction of rainwater jars and tanks, wells and piped systems. Almost 1 million systems will be rehabilitated, and nearly 4 million people would be expected to use private water sources.

It should be noted once again that definitions of "safe" and "adequate" are not uniform, and that the major statistical source for the Asian Institute of Technology estimates, i.e., the Mahidol University census, needs additional verification of accuracy.

B. Sanitary Latrines

By the end of 1984, it was estimated that over 2.9 million rural households (44 percent) had sanitary latrines, almost all of them being water-seal (pour-flush). After taking into consideration population growth and numbers of new

households, it is estimated that an additional 2.5 million units will be needed to achieve 75 percent coverage of the nearly 7.2 million expected households. The 75 percent target is lower than that of the MOPH, which seeks 90 percent coverage by the end of the Decade of Water and Sanitation. That would require about one million more units than called for in the master plan.

7.1.2 Support Programs

To achieve the targets described above, the master plan proposed by AIT identifies and quantifies a number of important support programs. These are:

a. Technology

1. Rehabilitation of 7,546 deep wells and 406 piped water systems, representing about half of all existing systems;
2. Upgrading of 11,531 shallow wells and 2,051 piped water systems;
3. Construction of 4 million rainwater jars, each two cubic meters, plus 376,000 one cubic meter jars;
4. Construction of 63 spring catchments;
5. Drilling of 21,805 deep wells and 25,053 shallow wells;
6. Construction of 98 piped water systems with filtration;
7. Construction of 1,316 piped systems without filtration;
8. Construction of 6,650 rainwater collection systems at schools, temples, and other public facilities;
9. Assistance in constructing 2.5 million water-seal (pour-flush) latrines.

Table 1 indicates how water funds are to be spent. Rehabilitation plus upgrading would utilize 10 percent of the budget; rainwater jars take 19 percent; drilling and other construction uses 34 percent, with 21 percent set aside for operations and maintenance. Monitoring, operational costs, and training combined take up 15 percent, leaving 0.8 percent for research and development. No funds are set aside for hygiene education in the water budget, but a relatively small amount is allocated under the sanitation budget, as shown in Table 2. The sanitation portion of the budget is 17 percent of the total water supply and sanitation master plan budget.

b. Operations and Maintenance

Although the master plan urges high levels of community participation in operations and maintenance, it suggests that private firms be used for operating and maintaining wells with government funding. Agencies responsible for installing piped systems should also be responsible for their operations

Table 1

Summary of Investment Requirements for Various Activities of
the Rural Water Supply Program (1985-1991), in million Baht
(U.S. \$ = Approximately 27 Baht in July 1985)

Activities	1985	1986	1987	1988	1989	1990	1991	Total
1. NEW CONSTRUCTION								
Rainwater jars	502.91	502.91	336.98	336.98	-	-	-	1,679.78
Spring catchment system	0.81	0.81	0.81	0.81	0.81	0.81	0.81	5.67
Sanitary well	57.26	57.26	57.26	57.26	57.26	57.26	57.26	400.82
Deep well	221.48	221.48	221.48	221.48	221.48	221.48	221.48	1,550.36
Small-scale piped water supply system	37.79	37.79	37.79	37.79	37.79	37.79	37.79	264.53
Slow sand filter	38.24	38.24	38.24	38.24	38.24	38.24	38.24	267.68
Rapid sand filter	9.99	9.99	9.99	9.99	9.99	9.99	9.99	69.93
Small-scale rainwater supply system	45.68	45.68	45.68	45.68	45.68	45.68	45.68	319.76
Subtotal	914.16	914.16	748.23	748.23	411.25	411.25	411.25	4,558.53
2. UPGRADING								
Shallow well	80.42	80.42	80.42	80.42	80.42	80.42	80.42	562.94
Deep well	21.75	21.75	21.75	21.75	21.75	21.75	21.75	152.25
Small-scale piped water supply system	1.20	1.20	1.20	1.20	1.20	1.20	1.20	8.40
Subtotal	103.37	103.37	103.37	103.37	103.37	103.37	103.37	723.59

Table 1, page 2

Activities	1985	1986	1987	1988	1989	1990	1991	Total
3. REHABILITATION								
Deep well	21.78	21.78	21.78	21.78	21.78	21.78	21.78	152.46
Small-scale piped water supply system	1.16	1.16	1.16	1.16	1.16	1.16	1.16	8.12
Subtotal	22.94	22.94	22.94	22.94	22.94	22.94	22.94	160.58
4. OPERATIONS AND MAINTENANCE (O&M)								
Sanitary well	10.70	22.50	34.29	46.10	57.89	69.69	81.49	322.66
Deep well	107.93	141.17	174.41	207.66	240.90	274.14	307.39	1,453.60
Training of village operators	0.91	0.91	0.91	0.91	0.91	0.91	0.91	6.37
Subtotal	119.54	164.58	209.61	254.67	299.70	344.74	389.79	1,782.63
5. MONITORING OF WATER QUALITY								
Investment cost	90.78	93.91	-	-	-	-	-	183.99
Operational cost	81.38	170.23	170.23	170.23	170.23	170.23	170.23	1,102.76
Training	2.52	3.03	0.27	0.27	0.27	0.27	0.27	6.90
Subtotal	174.68	267.17	170.50	170.50	170.50	170.50	170.50	1,294.35

Table 1, page 3

Activities	1985	1986	1987	1988	1989	1990	1991	Total
6. RESEARCH AND DEVELOPMENT (R&D)								
Subtotal	10.00	10.00	10.00	10.00	10.00	10.00	10.00	70.00
GRAND TOTAL	1,344.69	1,482.22	1,264.65	1,309.71	1,017.76	1,062.80	1,107.85	8,589.68

Note: Training Cost from 1987 - 1991 is for any replacement to be made.

Source: NESDB, Masterplan for Rural Water Supply and Sanitation in Thailand, 1985, p. III-12.

Table 2

Summary of Investment Requirements for Various Activities of
the Rural Sanitation Program (1985-1991), in million Baht

Activities	1985	1986	1987	1988	1989	1990	1991	Total
A. Toilet construction								
- Material subsidy	88.0	110.0	132.0	154.0	184.8	206.8	220.0	1,095.6
- Revolving fund	170.0	180.0	(Use initial fund to revolve)					350.0
B. Training								
- VHC, VHV*	26.3	26.3	23.8	23.8	23.8	23.8	23.8	171.6
- TCC, VSC, THW*	15.9	16.1	17.4	17.4	18.0	18.8	18.8	122.3
- Seminar/workshop/ coordination, etc.	1.8	1.9	1.9	2.0	2.0	2.1	2.1	13.8
C. Health education								
- Incentive for VHCs and VHVs	(To be studied, with option to offer a substantial one)							
- Latrine in school	1.6	1.6	1.6	1.6	1.6	1.6	1.6	11.2
- Posters, leaflets, radio programs, etc.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.0
- Mobile units	2.0	2.0	2.0	2.0	2.0	2.0	2.0	14.0
D. Research and Develop- ment	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.0
TOTAL	307.6	339.9	180.7	202.8	234.2	257.0	270.3	1,792.5

Source: NESB, Masterplan for Rural Water Supply and Sanitation in Thailand, 1985, p. III-21.

*Various village and subdistrict workers

and maintenance with funds coming from users. Owners are expected to maintain their own latrines with guidance from local sanitation workers as needed.

c. Water Quality Monitoring and Training for Quality Control

The master plan gives detailed plans for water quality control. Standards for piped water, rainwater, and domestic water all appear to be those set by WHO. Supplies that fall below these standards would be chlorinated. Funds are provided for fecal coliform testing and other physical and chemical testing, as well as for needed training, with emphasis placed at the tambol (subdistrict) level.

d. Hygiene Education

Hygiene education, including communications and information, is to include curricula development, particularly for school children, mass media support under the leadership of the Sanitation Division of the MOPH, plus person-to-person educational contacts by primary health care workers. Research and development funds are specified for technical and administrative aspects of the sanitation program as well as for social science research related to attitudinal and behavioral change. The total budget for hygiene education is 21 million baht, or 0.2 percent of the master plan budget. It is suggested that mobile educational units receive two-thirds of these funds.

e. Research & Development (R & D)

Research and development is advocated to improve cost-effectiveness, to assist in technical improvements, and to enhance community participation. Both the Sanitation Division and reputable contracting institutions may be utilized. All implementing RTG agencies are urged to contribute to such studies.

f. Total Costs & Funding Mechanisms

Tables 1 and 2 present total master plan budgets for water and sanitation. The plan contains great detail on how each technical improvement is to be funded, including subsidies for some items such as latrine slabs and water jars, and the use of revolving funds to foster more rapid and affordable water improvements. No mention is made of funding larger concrete household rainwater tanks, which are rapidly increasing in popularity, but it can be assumed that rainwater jar funds would be substituted. Approximately 1.6 thousand million baht (1.6 billion) is proposed for construction of rainwater jars having a total storage capacity of 3.4 million cubic meters. This would be sufficient to serve the needs of 7 million persons, based on an average of 5 lcd with 240 days of storage capacity, or 1.2 cubic meters per person. This number is an average and will vary according to the sizes of containers built. Seven million people represents 21 percent of the 33 million rural people to be served.

7.2 Implications of Proposed Master Plan

7.2.1 Choice of WSS Technology

The proposed master plan was not designed to review the appropriateness of technology currently associated with WSS activities. It makes note of the importance of appropriate technology and suggests resources for research and development. Assumptions are made that improved technology can be applied in simplifying construction of WSS systems, in upgrading existing systems through addition of covers and pumps to wells, and in aerating to improve water quality. The plan also suggests technical solutions for correcting broken-down systems that are clogged, have damaged parts, or lack needed components such as aerators.

A variety of technical issues remain unaddressed in the master plan, including:

- a. What rainwater catchment techniques other than use of rooftops are needed and appropriate for Thailand?
- b. Is there a need for policies to standardize equipment such as handpumps or to encourage equipment made in Thailand?
- c. What sizes, shapes, building materials and techniques are most suitable for constructing safe rainwater storage jars and tanks in rural Thailand?
- d. How appropriate are standpipes for public use in rural Thailand?
- e. Under what circumstances are biogas generators cost-effective?
- f. Can small household filters be safely used by villagers?
- g. Under what circumstances are large slow- or rapid-sand filters advisable?
- h. What are the relative advantages and disadvantages of routine or periodic chlorination of wells, tanks, and other facilities?
- i. What technology is appropriate for testing water quality?
- j. How can modern technology, including computer-assisted data handling, be used to improve information exchanges among WSS specialists?
- k. To what extent are WSS systems broken down or improperly used as a result of technical limitations versus attitudinal or local perceptual factors?
- l. What are the ideal and maximum numbers of users of various technical items, such as a handpump, or systems, such as a community storage tank?

The master plan includes a complex series of committees and other organizations that could serve to identify technical problems and opportunities, to foster information-sharing and discussion, and to bring about more rational decision-making. It is assumed that these mechanisms will be utilized in the future both at central and regional levels.

7.2.2 Operations and Maintenance (O&M)

The master plan for the Decade has three primary O&M elements:

1. Training of village caretakers or operators who would be chosen by village development committees to oversee each facility;
2. Shifting of O&M responsibilities for shallow and deep wells to private contracting firms under "carefully stipulated conditions", and;
3. Training and ongoing support for piped water systems coming from relevant RTG agencies, with costs being borne by villagers.

Operations and maintenance of sanitary latrines are not viewed as presenting significant problems and would therefore be the responsibility of homeowners with modest educational support from health workers. In fact, water-seal (pour-flush) latrines have proved to be highly satisfactory in rural Thailand with relatively few maintenance demands.

The master plan suggests allocating 1.782 billion baht for O&M, or 21 percent of the entire water budget (see Table 1). This is a very large amount of money and may be more than is actually required. A much smaller amount of money, 6,730,000. baht (0.07 percent) is cited for training in O&M. It may be that there will be a need to shift contracting funds for training support at the community level. It is not yet clear whether villagers will indeed be able to support O&M for piped water systems as envisioned in the master plan. There are considerable variations in economic conditions from area to area and from season to season.

7.2.3 Water Quality Monitoring

The master plan proposes that surveillance and assessment programs be set up for water quality monitoring. The surveillance program is to include annual sanitary inspections and basic water quality tests of fecal coliforms and residual chlorine, where appropriate, for all types of water sources. These activities are to be the responsibility of the tambol (subdistrict) health officer. The assessment program is to include complete chemical, physical, and bacteriological examinations of water sources under the responsibility of district, regional, and central officials. It is envisaged that all villages in the 3,445 tambol will be covered by these activities within two years of initiating the Decade Plan. Almost 700 training courses in sampling and water disinfection for local officials are projected over the life of the plan.

There is some question regarding the extent of sampling and testing proposed by the master plan. Each tambol is expected to take 720 samples per year for basic testing for fecal coliforms (or a theoretical annual total of almost 2.5 million samples nationwide), while each region is expected to provide 6,400 samples per year for detailed chemical, physical, and bacteriological tests (or 57,600 tests nationwide). At present, MOPH central laboratories carry out primarily physical and chemical tests on about 4,000 samples annually. Another 200 per year are examined for bacteriological and partial chemical content in each of 54 provincial hospitals; however, most of these laboratories are capable of testing only for total coliforms rather than the more critical fecal coliforms. The master plan is unclear as to how the necessary laboratory facilities, associated personnel, and training programs are to be established to support the proposed levels of water quality monitoring. Moreover, the requisite enforcement of water quality standards and improvements in water systems was found to be substandard and needs further consideration.

7.2.4 Hygiene Education

A number of important issues are raised in the proposed master plan regarding hygiene education. Hygiene education appears to be almost the sole responsibility of the Sanitation Division in the Department of Health. This division has placed most of its past emphasis on human waste disposal and small water supplies and treatment systems. It is not clear that it has sufficient resources to support the major increase in hygiene education that would be needed to bring about significant changes in villagers' attitudes and hygienic practices. With a proposed budget of 21 million baht over the life of the plan, or 0.2 percent of the total budget, the Sanitation Division is unlikely to have sufficient resources to support needed social science and marketing studies, professional media development, including pretesting of protocol materials, or promoting a coordinated MOPH hygiene and social preparation effort.

The master plan calls for the creation of mobile health education units costing 14 million baht, or two-thirds of all hygiene education funds. Such an approach, however, tends to treat education as a passive activity, i.e., villagers are given information and are expected to respond. It may be that more active approaches, including ongoing women's and men's study groups and local participation in educational planning and services, would be more successful.

Little attention is given to hygiene education in terms of who would have specific responsibilities for providing these services, who would backstop and supervise these efforts, and how much time and resources would be required for each community scheduled to have improved water and sanitation. Nor are the roles of other workers, such as community development specialists, discussed. Most importantly, it is not specified that hygiene education and other social preparations are to be included in all village water and sanitation efforts as part of a basic strategy for achieving health goals.

7.2.5 Total Costs and Funding Mechanisms

Costs and funding issues take up a large proportion of the proposed master plan. Only a few of the more salient issues will therefore be addressed: A key issue is whether villagers will actually be able to afford to repay borrowed funds for jars, tanks, or more sophisticated systems within the one year repayment period. If general poverty, poor crops, low prices for their products, or other factors limit repayments, there can be a significant slowdown in programs based upon the concept of revolving funds.

Rainwater costs are based upon locally-made jars of 1.0 to 2.0 cubic meter capacity. Larger concrete tanks are proving to be very popular in that they have a larger capacity, take up much less yard space, are more modern, are easy to keep clean, and are likely to last for ten or more years. However, these tanks are more expensive and will use up revolving funds at a much faster rate. Coverage rates, therefore, would be reduced accordingly.

A great deal of money is to be spent on rainwater storage, drilling, and rehabilitating water supplies. Yet there is considerable evidence that villagers feel little motivation to drink only "safe" water, as defined by health workers, and will continue to drink whatever water is acceptable and convenient. More information is needed about villager preferences and how to succeed in modifying their behavior. Cost-effectiveness studies for various drinking water options are also needed. Furthermore, the proposed budget makes no provisions for any special emphasis on drinking water during the early years of the plan to reduce morbidity and mortality.

The proposed plan has a total allocation of over 10 thousand million baht of which 17 percent (1,792 million) is for sanitation and hygiene education. A goal of only 75 percent latrine coverage is proposed, in contrast to the 90 percent target advocated by the MOPH for the Water Decade. Adopting a higher level of latrine coverage would be consistent with MOPH policy to link water to sanitation and hygiene but it would cost more. Instead of 2.5 million latrines, 3.5 million would be needed. An additional technical issue is that of funding screens and covers for water jars to avoid the real danger of mosquito-borne diseases.

There are a number of other important funding issues. Although private nongovernmental organizations are suggested as being most suitable for carrying out operations and maintenance services under contract, no details are provided about how such contracts will be awarded and controlled. No provisions are made for contributions by foreign donors in water and sanitation planning, research, implementation, monitoring, training, information exchange, evaluation, or other components. Such donors have traditionally supported a variety of water and sanitation activities in Thailand and it would be realistic to indicate those areas in the plan in which foreign donors would be expected to participate. Clarification regarding the role of external assistance in the plan may be needed.

Chapter 8

STRATEGY CONSIDERATIONS FOR THE SIXTH FIVE-YEAR PLAN OF THE MINISTRY OF PUBLIC HEALTH, 1987-1991

8.1 Coverage Issues

8.1.1 General

Coverage issues are concerned with the nature and extent of water supply and sanitation services in the Sixth Plan, while support issues deal with the programs necessary to achieve coverage targets. This chapter will discuss some of the key issues in the Sixth Plan and will explore possible strategies that might be adopted by the MOPH. The concepts discussed here are based upon a review of relevant documents, including the proposed master plan for rural water supply and sanitation by AIT, as well as discussions with water and sanitation officials, and field visits to project sites. These concepts have been influenced by the writers' experience with water supply and sanitation programs in Thailand and other countries and by their estimate of the potential for water supply and sanitation development in Thailand.

8.1.2 Levels of Service

At present, there are many levels of water supply service found in rural areas. Some systems deliver large quantities of treated and piped water to individual houses while other systems provide only small quantities of untreated and unpiped water at a single public location. RTG agencies are developing a wide range of water supply services, but little official guidance exists regarding the types that should be promoted either now or during the Sixth Plan. To understand the concept of level of service, it is necessary to consider the variables of quality, quantity, reliability, accessibility, and acceptability. Water quality refers to the bacteriological and chemical quality of the water. Water used for drinking has a greater effect upon health than water used for other domestic purposes, and therefore must meet higher quality standards. Water supply development in Thailand produces both potable drinking water, which is relatively free of contaminants affecting health, and nonpotable domestic water, which is suitable for bathing, clothes washing, and other nonpotable uses. Water quantity refers to the average amounts of water used by the consumers. Drinking water needs may be as low as 2 lcd while domestic water needs may range from 20 to 60 lcd.

The variable of reliability is basically whether a source or system is capable of providing an adequate quantity of water throughout the year. Accessibility is generally defined as the distance from the house to the water source. Since it is generally desirable to use water at the house rather than at the source, distances between house and source should be made as small as possible. And finally, acceptability refers to the willingness of the people to use the water supply for its intended purpose. In Thailand, community acceptance of drinking water supplies is very much determined by taste, with bacteriological and chemical quality having only minor importance in source selection.

There are good precedents for classifying rural water supplies into drinking and nondrinking (domestic) sources. Multiple water sources are common in most rural villages, and local residents are well aware which are considered to be potable and which are not. As described in Section 5.1.2, the MOPH set a Water Decade target of 2 lcd of drinking water for 90 percent of the population, while in Section 7.1.1 the proposed decade master plan recommended targets of 5 lcd of drinking water for 95 percent of the rural population and 45 lcd of domestic water for 75 percent of the population. The master plan, however, seems to have gone too far by proposing that both drinking and domestic water meet WHO Drinking Water Standards. Given the general availability of some type of water in most parts of the country, therefore, it is reasonable to focus Sixth Plan resources on meeting the drinking water needs of rural people with less emphasis on domestic water quality. Drinking water must be of sufficient quality to avoid excessive hazards to health without necessarily requiring expensive treatment processes or complicated laboratory procedures for routine monitoring. Source protection and simple treatment, where necessary, should be adequate for most drinking water needs. If a small quantity of reasonably good quality of drinking water can be provided to rural communities, the remainder of domestic water needs could be provided from readily available, but lower quality, water sources at presumably lower capital and recurrent costs. By adopting two distinct levels of water service, the MOPH could establish higher coverage targets for the Sixth Plan than would otherwise be practical.

In terms of the variables described earlier, the two levels of service could be defined as follows:

Level of service variable	Drinking water	Domestic (Nondrinking) water
Quality	Protected source; no fecal coliforms or or excessive chemical contaminants	No fixed standard
Quantity	5 lcd	45 lcd
Reliability	Provides drinking water throughout the year	Alternative sources assure year round reliability
Accessibility	No alternative source is closer	Within 0.5 km
Acceptability	Willingness to use for drinking and cooking	Willingness to use for domestic purposes

In the area of rural sanitation, only one level of service, the sanitary latrine, is needed.

8.1.3 Coverage Target

By reducing the need to provide potable water from the normal project design level of 40 or 50 lcd to the drinking water requirement of only 5 lcd, it becomes much easier in terms of costs, available resources, and administration to serve all of the rural population with drinking water during the Sixth Plan. It should be possible by 1991 to assist around 95 percent of the rural population to have adequate drinking water as defined in the previous section. Note that this water will not necessarily meet WHO Drinking Water Standards, which are overly restrictive and, in any event, unenforceable in the context of most rural drinking water supplies. The above coverage rate compares reasonably well with the MOPH Fifth Plan target of 70 percent (2 lcd), the MOPH Decade target of 90 percent (2 lcd), and the proposed master plan target of 95 percent (5 lcd).

For the remainder of domestic water needs, it is likely that 70 to 80 percent of the rural population could be assured of 45 lcd if all water sources, both unprotected (open wells, streams, ponds) and protected (handpumps, piped systems) are considered. If only protected sources are included, then the domestic coverage target would probably drop to 50 to 75 percent. It is much harder to estimate the potential coverage of domestic water supplies because of uncertainties over costs, available budget, and the rate of achievement of the drinking water targets.

The MOPH strategy for assisting villages that desire water supply improvements should be based on a set of priorities regarding water supply coverage in these communities, as follows:

Priority 1: Villages without adequate drinking water.

Any water supply activities in a village should address drinking water needs prior to improving any nonpotable sources for domestic water supplies. A minimum drinking water requirement of 5 lcd can usually be met through one of several available water sources and possible technologies. In many cases, rainwater will be the most effective solution, but it is also possible that shallow wells with handpumps or deep wells with piped systems may be more appropriate. Open shallow wells in combination with small household sand filters may be a safe and cost-effective option. The main point is that domestic water facilities should not be improved unless drinking water criteria, as given in Section 8.1.2, have been satisfied.

Priority 2: Villages with adequate drinking water but insufficient quantities of domestic water.

Once drinking water needs have been met, efforts to increase the supply of available domestic water to 45 lcd can be undertaken. Any water source or technology should be considered acceptable as long as the criteria for reliability, distance, and social acceptability, shown in Section 8.1.2, are satisfied. However, by temporarily deferring increases in domestic water in villages already served with adequate drinking water supplies (priority 2), additional government resources can be devoted to expanding drinking water coverage in villages without adequate drinking supplies (priority 1).

Priority 3: Villages with adequate quantities of both drinking and domestic water but inadequate quality of domestic water.

Eventually the upgrading of water quality in domestic supplies will be necessary. This may require sophisticated water treatment or even the development of new sources. Because the costs of water quality improvements are likely to be very high, these activities should be given very low priority until such time as priority 1 and 2 villages throughout the country have been served. Local communities should be allowed to make any improvements in their water systems for which they are willing to pay, but scarce government resources should not be spent on these villages.

For sanitation, which is limited here to sanitary latrines, a coverage target of 90 percent of all rural households should be established. The national census of rural drinking water sources and latrines reported that 44 percent of all rural households in 1983 had a sanitary latrine. MOPH strategies for the Fifth Plan called for 70 percent rural coverage with sanitary latrines, while the current Water Decade target of the MOPH is 90 percent coverage. At the present rate of construction of sanitary latrines, MOPH officials are confident that a 90 percent coverage can be achieved by the end of the Sixth Plan.

In promoting expanded coverage of water supply and sanitation programs, the MOPH would do well to join these two programs in order to reinforce and enhance the health benefits each provides to the community. The linking factor, of course, is hygiene education, which can help to mobilize the community, sensitize it to the relevant health issues, and influence behavioral changes in the villagers. Experience has shown, however, that hygiene education and, occasionally, sanitation improvements are not automatically accepted by rural communities. Incentives are sometimes needed to make them attractive. It would be worthwhile to put water, sanitation, and hygiene education together in a single package and promote them as a unit. One way of doing this is to require the preparation of a village sanitation plan, addressing jointly the needs for drinking water supplies, sanitary latrines, and hygiene education, whenever any MOPH assistance is given for the improvement of water supplies or the construction of latrines.

8.1.4 Choice of Technology

Technology is a tool for providing water supply and sanitation services to the people. It is not the end purpose of water and sanitation programs but merely the means for improving the drinking and domestic water supplies used in rural communities. The choice of technology, therefore, should be based on the specific needs of the communities rather than arbitrary standards or the particular technical specialties of the implementing agencies.

The MOPH has a wide variety of technologies for water and sanitation development, ranging from individual household rainwater collection to village piped water systems. Widespread success and growing popularity of rainwater collection systems are of particular importance to achieving coverage targets because they shift most of the financing, construction, and maintenance burdens from government to individual households.

The key to providing effective services is to remain flexible regarding the types of technology that may be used. Depending on cost, source availability, community preferences, and the degree of treatment required, drinking water may be obtained from rainwater containers, shallow wells with handpumps, or deep wells fitted with either handpumps or electric pumps connected to a complete system consisting of basic treatment, storage, and distribution piping. Where needed, water treatment might consist of simple aeration and direct filtration for iron removal and, perhaps, chlorination for disinfection. An alternative to system-wide water treatment is to use individual water filters in the homes. These units operate as slow sand filters. They offer great promise for the utilization of otherwise nonpotable water sources for drinking purposes, but their effectiveness as an alternative to system-wide water treatment remains to be proven.

Costs are always a factor in the choice of technology. Rainwater jars and shallow wells with handpumps have capital costs as low as 100 baht per person served, while piped village systems may exceed 1,500 baht per person. Table 3 lists the cost ranges of a number of common water supply and sanitation technologies. For domestic water supplies, a wider range of technologies is possible. Drinking water sources can be used when adequate, as well as open wells, ponds, and streams. No attempt should be made to ensure that domestic water is potable. Domestic water may be high in total dissolved solids, fluorides, nitrates, or iron, which could make the water unacceptable for drinking because of taste or because of significant hazards to health if ingested. Nevertheless, potability is not an issue in clothes washing, bathing, latrine flushing, and other household activities for which domestic water may be used.

There is little variety necessary in sanitation. Sanitary latrines, i.e., pour-flush (or water-seal) toilets, have proven themselves in almost three million Thai households. These latrines do require water, however, and an average household of five persons will need at least 10 liters per day for flushing purposes. Because of the general availability of water, pour-flush latrines are suitable in almost all areas of the country. Where water is extremely limited because of a lack of nearby sources, the VIP latrine (or ventilated improved pit latrine) should be considered as a sanitary alternative that does not require water for flushing.

8.1.5 Ministry of Public Health Targets

It is very difficult to set specific water supply and sanitation targets for the MOPH for the Sixth Plan because of the problems of interpreting available data on coverage and annual rates of expansion. This is especially true in the rural water supply sector because the national census of drinking water and latrines conducted by Mahidol University in 1983 did not clearly define the key categories of "safe" water and "adequate" water. Moreover, the census results are questionable because of weaknesses in survey design and problems in data processing. The problems of the Mahidol census are especially regrettable because it is the only comprehensive attempt to date to assess water and sanitation patterns throughout the Kingdom. No other single source of data exists on the number of facilities, levels of source, and population served.

Table 3

Average Costs of Rural Water Supply
and Sanitation Facilities in Baht
(U.S. \$ = approximately 27 Baht in July 1985)

<u>Facility</u>	<u>Size</u>	<u>No. of persons served</u>	<u>Per capita cost (baht)</u>	<u>Total cost (baht)</u>
Rainwater jars	1-2 m ³	5	50-100	250-500 for materials
Rainwater tanks	3-11 m ³	5	700-1,000	3,500-5,000 for materials
Shallow well with handpump	6-8 m. deep	approx. 125	100-200	10,000-20,000 for materials
Deep well with handpump	50-100 m. deep	100	500-800	50,000-80,000
Piped village water supply system including deep well pump, iron removal, storage, and distribution piping	10 m ³ /hr.	500-2,000	1,000-2,000	500,000-2,000,000
Ponds	-	100	1,250	125,000
Household water filter	-	5	40-60	200-300
Sanitary latrine	-	5	100-200	500-1,000 for materials

Some review of gross statistics can be made to indicate the magnitude of the problem of setting water and sanitation targets for the MOPH. As mentioned above, the field of rural water supplies is particularly difficult to assess. In 1983, Thailand had a rural population of 35 million, of which it can be assumed from the Mahidol data that at least 15 percent, or 5.3 million people, had "safe" (i.e., potable) water supplies. By the end of the Sixth Plan in 1991, there will be 40 million rural people. If 95 percent are to have potable drinking water supplies, then an additional 33 million rural inhabitants must develop potable supplies over the plan period. It is not possible at this point to know how much of this coverage the MOPH could or should accept. With at least seven other agencies developing drinking water supplies and with most of the capital costs of the primary form of drinking water technology, rainwater collection, being borne by the individual households, one cannot easily define the amount of future drinking water coverage to be allocated to the MOPH. The problem of setting a drinking water supply target for the MOPH emphasizes the need for close coordination of water supply agencies at both the national and local levels.

In sanitation, the task of setting targets is simplified by the fact that the MOPH is the only RTG agency promoting sanitary latrines. In 1983, there were 2.8 million sanitary latrines among 6.3 million rural households, a coverage rate of 44 percent. By the start of the Sixth Plan (1986), it is assumed that the coverage rate will rise to 46 percent and that there will be 3.1 million sanitary latrines among 6.7 million rural households. To achieve a 90 percent coverage rate for the 7.2 million rural households projected for 1991, an additional 3.3 million sanitary latrines will have to be built. This will require approximately 650,000 new latrines each year, which is several times the estimated current rate of construction.

To reduce the direct burden of promoting and guiding the development of sanitary latrines, the MOPH should encourage other organizations, such as the Department of Community Development and the Department of Local Authority, as well as NGOs, to sponsor latrine programs. The MOPH, through the training of village craftsmen and the provision of technical advice, could assist these organizations in technical areas, leaving to them responsibility for latrine promotion and village mobilization.

8.2 Support Issues

8.2.1 Operations and Maintenance

Similar to coverage investments, support programs should be designed on the basis of priorities. Where resources are limited, costly operations and maintenance requirements will restrict the expansion of coverage programs. The likelihood of achieving drinking water and sanitary latrine coverage targets, therefore, will be increased if completed facilities stay operational and do not require inordinate maintenance and repair services.

The MOPH should encourage the development of facilities requiring low levels of maintenance in order to rapidly expand the development of drinking water sources and sanitary latrines. Rainwater jars and tanks are a good example of low maintenance facilities, and they have the additional advantage that almost

all repairs can be done within the village itself. Drilled wells and pumps, on the other hand, often require specialized maintenance services.

The proposed Decade master plan recommended that all operations and maintenance of sanitary wells and deep wells be handled by private firms. To effectively utilize the private sector for operations and maintenance, it will be necessary to encourage private firms to provide services on a routine basis to villages. The MOPH should work with other RTG water supply agencies to identify such firms and, where possible, assist villages in setting up appropriate maintenance contracts. Because private firms have not provided maintenance services in the past, their performance should be closely monitored during the first few years.

In addition, the MOPH could encourage standardization of handpump selection among RTG agencies and expand training of village craftsmen to include basic handpump maintenance and repair.

For larger systems, including piped water supplies, current RTG policy requires the agency which built the water system to be responsible for any major repairs. Since there are at least six agencies building systems costing 100,000 baht or more, the requirement for all to maintain repair capabilities may lead to a poor allocation of scarce resources, such as the needless duplication of repair facilities or the failure of some agencies to develop sufficient repair capabilities to carry out their responsibilities. It might be more efficient for the RTG to consider assigning responsibilities for major repairs to a small number of agencies, perhaps one in the rural areas, another in the sanitary districts, and a third in the urban areas.

Rehabilitation of inoperative and poorly performing systems is often one of the most cost-effective means of meeting coverage targets. Facilities most likely to need rehabilitation are deep wells, shallow wells, handpumps, electric submersible pumps, and piped water systems. In the Sixth Plan, the MOPH should generally direct its rehabilitation efforts to meeting drinking water needs first, leaving the rehabilitation of domestic water systems until later. Rehabilitation investments should be made only after all major social issues leading to system breakdowns have been addressed.

8.2.2 Hygiene Education and Promotion

Issues raised in Section 7.2.4 concerning the future of hygiene education as a part of the Sixth Plan have also been raised by many MOPH officials. These officials are concerned that there will be an excessive amount of attention given to hardware and technology, that there will not be adequate leadership and resources to assure that such technology is appropriate, and that adequate social preparations will not be made. Furthermore, the MOPH has a major responsibility in educating other RTG officials about the importance of health considerations in water programs. To address such important questions, it is recommended that steps be taken toward more effective national hygiene education planning for the Sixth Plan. This would include:

- a. Initiate a review of hygiene education and health education experiences in Thailand in the past, including a review of literature, interviews with knowledgeable people from both official

and nongovernmental agencies, and, if needed, field data collection. Summarize these findings for use in planning activities.

- b. During the course of the above study, identify individuals who should be invited to participate in a national hygiene education workshop to be charged with preparing a national program and budgetary guidelines.
- c. Form an interagency hygiene education planning committee to guide the above study and offer leadership in planning the national workshop. Seek to include representatives of leading water supply and sanitation agencies, as well as academic and social science research organizations such as Mahidol University and the Thai Australia Project in Khon Kaen.
- d. Plan a detailed workshop agenda that would include but not be limited to the following issues:
 - 1. What are the major components of hygiene education?
 - 2. What are the phases of social preparation and how much time and resources are likely to be required, including social science findings, educational assessments, communication strategies, and so forth?
 - 3. What staffing patterns and supportive services are essential or desirable, including field support at each administrative level? What existing resources should be used or strengthened and how?
 - 4. How can the radio be used more effectively to reinforce community hygiene education?
 - 5. Under what circumstances would mobile hygiene education services be cost-effective?
 - 6. What types of supervision, monitoring, logistical support and evaluation systems are needed for successful hygiene education?
 - 7. Identify future research and information-sharing needs.
- e. Make all needed preparations for the workshop, including advanced distributions of the hygiene education review described in point (a), plus specific workshop report plans.
- f. Provide resources for utilizing the workshop report for detailed hygiene education planning during the Sixth Plan.

8.2.3 Financing the Master Plan

Many of the issues raised in Section 7.2.5 on costs and financing mechanisms deserve careful study. The most crucial issue, however, is the adequacy of

funds likely to be made available for meeting Decade and plan goals. If funds are inadequate, as is likely to be the case, alternative funding techniques must be immediately explored. One such technique is to arrange for RTG banks and commercial banks to be major sources of village water supply loans, with RTG agencies serving to guarantee commercial loans as required. The testing of such financing schemes in pilot areas as soon as possible is urged. (See Appendix B for the memo dated 7/25/85, which describes in some detail how Thai Savings Bank funds can be secured).

Thailand has had a long and generally successful experience in utilizing revolving funds for various public health activities. Recent studies indicate that attention should be paid to certain weaknesses in this system (see Myers, C., et al., April 1985). For example, the most influential villagers at times have access to funds at the expense of those in greater need. Such funds are seriously undercapitalized, resulting in unnecessarily slow progress in terms of people's readiness to borrow funds for health improvements. In addition, there is too much variation in revolving fund policies that either require no repayment of capital costs, or require partial or full payment with varying interest rates. A uniform policy, including some payments for capital costs, is recommended. A review of MOPH revolving fund policies based upon current information is suggested.

The Sixth Five-Year Plan offers numerous opportunities for foreign donors to contribute to water and sanitation efforts in Thailand, including direct contributions to revolving funds, to research and information exchanges, to training, and to other components. A systematic search for such sources of support is urged. Some donor funds may also be available immediately and be used to prepare for Sixth Plan activities. For example, USAID is able to reprogram some six million baht upon request of the Department of Health. Other USAID funds are available for supporting research and other special activities (see Chapter 10).

Nongovernmental organizations such as the Population and Community Development Association, the Provincial Water Authority, private engineering firms, the Girl Guides, and so forth, need to be brought more fully into water and sanitation development and promotion. The MOPH is in the best position to exert its leadership toward this end.

8.2.4 Information Needs

NESDB has requested that AIT prepare detailed recommendations for meeting water and sanitation information needs during the Decade. Some preliminary recommendations are in the proposed master plan and additional details are to follow. Regardless of what system is finally approved, the MOPH will need to be prepared to contribute accurate and timely information about its water and sanitation activities. Such information is now scattered among a number of divisions and appears in different forms. An effort will be needed to modify these systems to meet MOPH needs as well as to satisfy NESDB requirements.

Another type of information need has to do with obtaining and making available current information from journals, newsletters, books, reports, and other technical sources to water and sanitation workers at all appropriate levels.

This need also exists in other agencies involved in water and sanitation development and, therefore, might be addressed in a coordinated manner.

Accurate data on the current status of water supply and sanitation facilities is needed for annual planning and budgeting purposes during the Sixth Plan. This information is crucial in assessing progress toward coverage targets, deciding institutional responsibilities, and determining annual budgets. Data should include an annual inventory of all water and sanitation facilities, especially drinking water sources and sanitary latrines, plus information on their current operating condition. Such information does not now exist in sufficient detail for annual planning, although the national drinking water and latrine census carried out by Mahidol University in 1983 provides some baseline data. It is recommended that MOPH field personnel, with the assistance of field staff from the Department of Community Development and the Department of Local Administration, carry out such an inventory annually.

8.2.5 Research and Development

The MOPH has had a long and beneficial experience with WSS research. It supported technical research during the early 1950s in Chiang Mai, Korat, and elsewhere, resulting in innovative and successful water-seal latrine casting techniques, handpumps suitable for rural Thailand, slow sand filters, hand earth augers for locating shallow water, etc. It has also supported administrative and operational research in Lampang and elsewhere. And finally, it pioneered in the application of social science research, such as that conducted by Anthropologist Robert Textor, to village water and sanitation programs. Technical, administrative, operational, and social science research will continue to be important to the success of Thailand's WSS efforts.

The master plan proposes a total of 77 million baht for WSS research and development and cites the importance of technical issues, cost-effectiveness, appropriate technology, community participation, social science studies, and improved administration. It encourages each participating agency to note its research needs and to turn toward the private sector, including the university community, when appropriate.

The WASH team would like to reinforce the importance of these areas of research and encourages the MOPH to consider with care how its resources and those of such donor agencies as USAID, WHO, UNICEF, the Governments of West Germany and Australia, universities, and other nongovernmental institutions can assist in meeting these research needs. The team urges that the MOPH focus on research directly related to improved health through WSS, leaving more technical concerns to other appropriate ministries. The MOPH needs to provide for needed research into how to best modify hygienic practices, promote the sanitary environments, and obtain the greatest impact on health through various WSS interventions. Some of the technical issues raised in Section 7.2.1, such as items f., h., j., and k., would be of interest to the MOPH. It also needs to cooperate closely with other research agencies to make sure that health concerns are built into their research and development effort. The MOPH has pioneered using private firms to assist in social marketing, such as its recent and successful vasectomy campaign. Such firms could also be useful in testing social marketing strategies and materials in support of WSS. The team

views the recent WHO/SEARO grant of \$42,000 for Environmental Health Research Workshops as an important step in meeting MOPH WSS research goals.

8.2.6 Coordination Needs

In reviewing support efforts of current MOPH WSS programs under Section 5.3, as well as support issues discussed in Chapters 7 and 8 earlier, repeated emphasis was given to activities that will require careful coordination in order to assure health priorities, avoid duplication, and minimize confusion among villagers, local officials, and others. Effective operations, maintenance, management, supervision, quality control, technology decisions, and research, require such coordination.

The proposed master plan addresses coordination issues primarily at the central level, and the team feels that the RTG will give full consideration to such needs and will do its utmost to meet this challenge. However, coordination needs at the provincial level are equally complex and important. At that level, the MOPH with its extensive network of district, subdistrict and community workers can provide needed leadership and support for greater local coordination. Two central issues are to find ways of assisting village councils to increase their priorities for health through improved WSS and to obtain support from other developmental ministries in respecting and responding to locally felt needs. MOPH field staff were the first workers in Thailand to organize village development committees and can play important roles in transforming "top-down" planning toward greater local participation and self-reliance. This is a most suitable topic for operational research, seminars, and revised training curricula. One possible avenue to explore would be the holding of regular intraministerial seminars for key officials of regional centers with overlapping geographic responsibilities.

8.2.7 Water Quality Standards

The key issue in water quality is the standards that should apply to drinking water and domestic water. The adoption of dual water service levels requires that appropriate standards reflecting current realities in rural Thailand be adopted. A growing number of health officials believe that the WHO Drinking Water Standards are too restrictive to provide meaningful guidance to water supply development in rural Thai communities. The current WHO standards (1983) call for the absence of all coliforms in piped supplies and less than 10 coliforms in unpiped supplies. As discussed in section 5.3.7, these standards are rarely attained at present; even most piped systems with treatment facilities deliver water that fails to meet WHO standards.

There is great need to establish water quality criteria for drinking water, including water drawn from rainwater containers. Such criteria should recognize the types of drinking water currently being used, allow for levels of pollutants not overtly harmful to health, and establish standards that encourage people to progressively improve their supplies. Similarly, water quality criteria for domestic water supplies are needed, but these standards need not be equal to potable water standards. Domestic supplies are used for washing clothes, bathing, and general household purposes. Therefore, the main health consideration is whether they are harmful on contact with skin. Since

there are few waterborne parasites posing such hazards in Thailand, health-related criteria for nonpotable domestic waters probably would become less important than those dealing with aesthetics (smell, stained clothing, etc.) or utility (soap usage in clothes washing, etc.).

Over time, water quality standards can be raised as the level of rural development and the ability to enforce specific criteria improves. Eventually, standards could equal those set by WHO. For the present, however, Thailand would be better served with new standards that recognize dual water service levels and are designed to encourage the provision of acceptable drinking water supplies to nearly all the Thai population by the end of the Sixth Plan.

8.3 Ministry of Public Health Leadership Issues

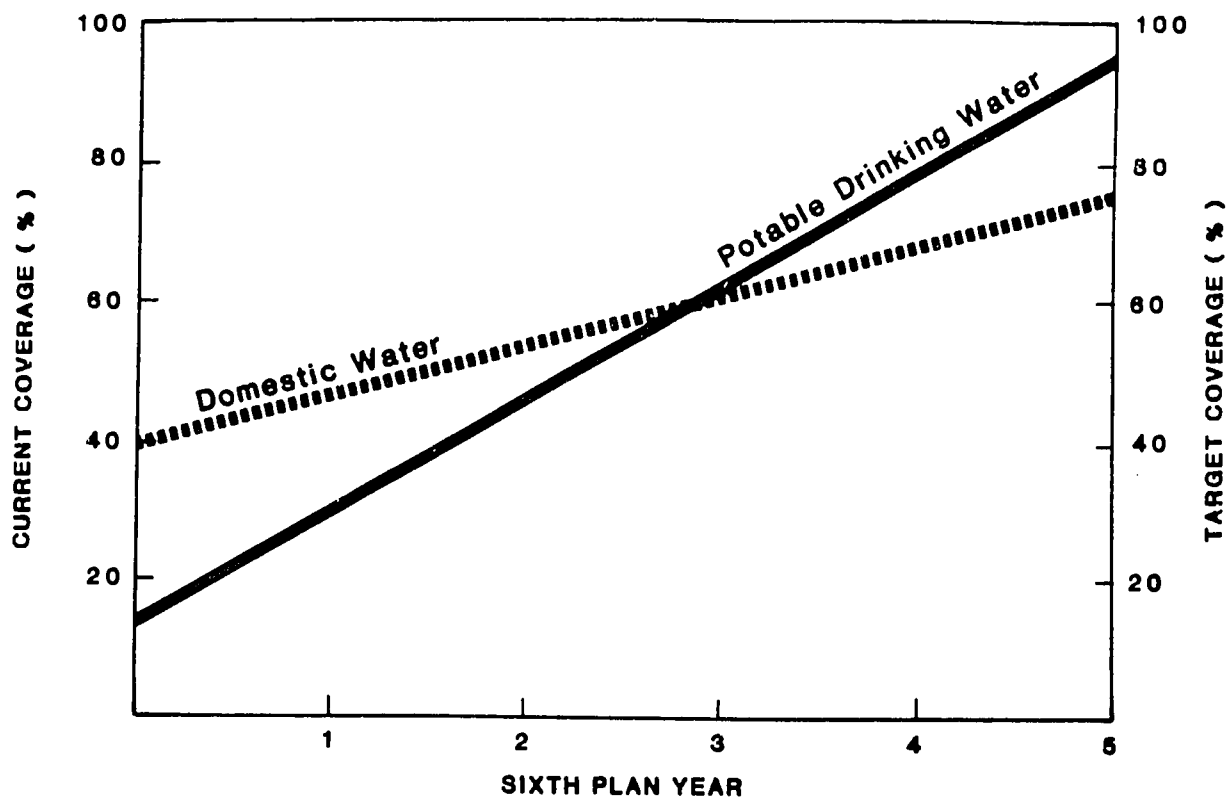
8.3.1 Dual Water Supply Systems

In most of the more highly developed nations, single standards for household water apply. Bacteriological, chemical, and physical requirements for cleaning or bath water are equal to those of drinking water. In Thailand and in many other developing nations, rural people have adopted multiple sources of water for their various uses. Rainwater and water from shallow wells are collected for drinking when available, while other sources, such as from deep wells, might be used for bathing or clothes washing. It is rare, however, for government agencies to formally recognize dual water systems or to promote them. Nevertheless, such a dual system seems to be desirable for Thailand during the period of the Sixth Five-Year Plan.

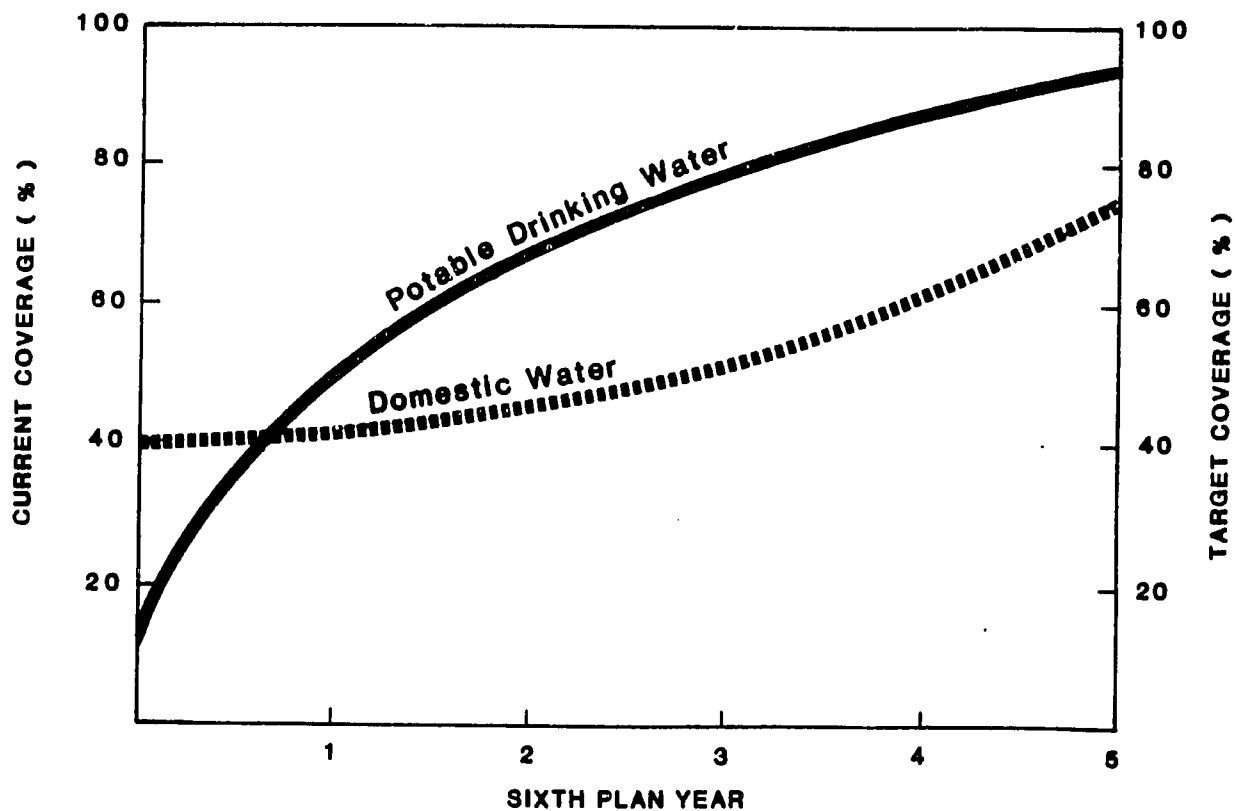
There is a definite need to adopt such a system. It will not be economically feasible for Thailand to achieve 90-95 percent safe drinking water by 1991 if all sources of domestic water must meet rigid quality tests. Dual water standards are only possible in nations like Thailand, which can be described as "water-rich", where water is generally abundant but special provisions are needed for safe drinking water. Furthermore, Thai people do not suffer from high levels of diseases associated with casual contact with water, such as schistosomiasis, which would argue against encouraging continued use of pond or stream water for bathing or other domestic uses.

In order for a dual system to work, that is, to provide needed drinking and domestic water without endangering health, vigorous and effective educational programs in all communities with such systems will be essential. There are good reasons to believe that this can be accomplished in Thailand with its rapidly expanding system of community organizations, active community participation, and a network of dedicated public health workers who, with proper training and supervision, could provide needed hygiene education. This work is simplified when people are encouraged to drink water that they already prefer, i.e., rainwater or water from shallow wells that has been filtered.

By adopting a dual standard, the RTG can readily establish clear action priorities that stress adequate and safe drinking water over domestic water, as discussed in detail in Section 8.1.3. Such priorities could easily lead to decisions to emphasize drinking water early in the Sixth Plan period in order to achieve a more rapid decline in morbidity and mortality. Domestic water could then receive increasing attention during the second half of the Plan period.



**OPTION A: CUMULATIVE COVERAGE BASED ON
FIXED RATE OF ANNUAL INVESTMENT
IN POTABLE WATER SYSTEMS**



**OPTION B: CUMULATIVE COVERAGE BASED ON HIGH
INITIAL INVESTMENT IN POTABLE WATER SYSTEMS**

FIGURE 1 - EFFECT OF INVESTMENT RATES ON COVERAGE

The two graphs in Figure 1 illustrate this point. In Option A, no special priority is given to drinking water over domestic water, and two straight lines are used to show the percent of people served over five years. Option B illustrates early emphasis on drinking water, hopefully with more rapid declines in morbidity and mortality, assuming well balanced water, sanitation, and hygiene education efforts.

The master plan proposed by AIT suggests adopting dual water standards but does not clearly differentiate water quality levels for each standard. Leadership from the MOPH will be required to resolve this issue.

8.3.2 Promoting Health Objectives

The MOPH has the unique responsibility for safeguarding the health of all Thai citizens by promoting an increased concern for health at every opportunity. The master plan for water and sanitation offers numerous excellent opportunities for doing so. First, it can promote actions likely to have a significant impact on health over other activities having little or no health consequences. Second, it can help to establish RTG criteria for carrying out water improvements that incorporate sanitation and hygiene education as essential program components. Third, it can encourage activities linked to health during the early years of the plan, stressing less critical domestic water development to the second half of the plan. Most importantly, it can increase the understanding and abilities of developmental workers both within and outside of the MOPH and encourage them to take more active roles in supporting water and sanitation for health as an essential aspect of primary health care and meeting basic minimum needs.

One way of promoting health objectives within other agencies is to hold an interagency workshop on the planning of rural water supply systems. This workshop could address the technical planning and design of systems in terms of national goals and objectives. Since improved health is the primary objective of drinking water investments, such a workshop would give the MOPH an opportunity to provide strong leadership in the planning and coordination of rural water supplies.

8.3.3 Decentralization of Water and Sanitation Planning

The MOPH and the RTG have promoted decentralized planning and program implementation through extensive regional, provincial, district, and subdistrict systems. Such decentralization has involved increasingly important roles for provincial governors, chief provincial health officers, and, more recently, village, "tambol", and "amphur" committees. With so many major water development agencies in the field, it is increasingly important for there to be strong leadership at the provincial level in order to respond to requests for water and sanitation services in a coordinated, efficient manner. MOPH workers may need to provide leadership in establishing and cooperating with coordinated provincial programs for development.

Because there are at least eight agencies working on water supply development in the rural sector, coordination of activities at the provincial level is especially important. No other sector has so many active agencies and,

therefore, the need for coordination at this level is probably unique within the RTG. This need for enhanced coordination could, in theory, be handled by the provincial development committee, but past experience shows that this is not being done. Perhaps a water supply advisor could be attached to the office of the provincial governor. Alternatively, the MOPH could provide technical advisory services directly to the provincial administration. Either option would give the MOPH another opportunity to exercise leadership among the several agencies and in time bring about greater overall coordination in the rural water supply sector.

8.3.4 Standardization of WSS Financing

With so many agencies involved in rural WSS, it is to be expected that considerable variation would exist in the manner in which WSS programs are funded. Even brief field visits turn up such variations in terms of the percent of capital costs, if any, to be paid for by villagers, the percent of operations and maintenance costs paid, inclusion of long-term capital costs for system replacements, household or village revolving fund levels, eligibility standards, interest charges, repayment periods, collection methods, auditing standards, equity, and provisions for highly impoverished families.

Such variations cause confusion at the community level, misunderstanding among officials, and higher costs to the RTG when less cost-effective policies are followed. Financing standards that determine household or community eligibility for loans also offer opportunities for assuring balanced development, including sanitation and hygiene education in conjunction with water improvements. This situation is likely to get worse as additional donor agencies, private firms, and governmental and commercial banks, each with their own requirements, enter the scene.

The team therefore recommends that local financing of WSS be a topic for a series of intra-agency workshops, perhaps under NESDB sponsorship, with a goal of increasing uniformity and adoption of cost-effective financing policies. Such policies would have to take into consideration the desirability of requiring local financial contributions, as well as significant fiscal constraints at the village level. The April 1985, study of Myers et al. cited in Section 8.2.3 and Appendix B would offer a useful background document for workshop participants.

Chapter 9

RECOMMENDATIONS

MOPH Policies

1. Give first priority to the provision of 5 liters per capita per day (lcd) of drinking water to rural communities.

Adopt a policy of dual water service levels to the rural areas. The first priority for MOPH efforts should be to ensure that drinking water (5 lcd) from protected sources (rainwater jars, sanitary wells, piped systems) is available at the house. Water quality need not fully comply with WHO Drinking Water Standards, but it should come from a protected source and not contain any hazardous levels of chemical or physical contaminants.

2. Give second priority to assuring 45 lcd of domestic water to rural communities.

After drinking water needs have been satisfied, provide a larger quantity (45 lcd) of water for domestic, but nonpotable, uses. These include bathing, clothes washing, latrine flushing, and general household cleaning. Such water may come from either protected or unprotected sources (open wells, ponds, streams) as long as it is acceptable for domestic use by the villagers. This water may have lower bacteriological, chemical, and physical standards than drinking water.

3. Adopt the following coverage targets for the Sixth Plan:
 - a. 95 percent of the rural population to have 5 lcd of drinking water;
 - b. 70-80 percent of the rural population to have 45 lcd of domestic water;
 - c. 90 percent of rural households to have sanitary latrines.

Coverage targets for the Sixth Plan should be goals the MOPH works toward. Close monitoring of actual performance in the first year or two of the Plan will be necessary to determine whether these targets can be achieved (see program recommendation no. 7 below). In order to provide realistic guidance to the programming and budgeting process, the coverage targets should be reviewed and revised annually.

4. Prepare a village sanitation plan, consisting of drinking water supplies, sanitary latrines, and hygiene education, whenever programs for water supplies or latrines are being promoted in rural communities.

Develop clear guidelines for incorporating safe drinking water, village sanitation and hygiene education as integral and essential elements of all community water development efforts. Effective hygiene education will be critical if dual standards for drinking water and domestic water are to be adopted. Clarify how such programs are to be related to basic minimum needs, to primary health care, and to the priorities of local populations through their organizations.

5. Encourage the other RTG agencies with domestic water supply programs to adopt the above coverage policies (recommendations 1-4).

Establish a MOPH goal of securing adoption of health priorities, as recommended in points 1-4 above, among all RTG agencies and nongovernmental organizations with domestic water supply programs.

MOPH Programs

1. Hold a workshop for the planning and promotion of hygiene education in water and sanitation programs.

This workshop should stress the role of hygiene education and social preparation in water and sanitation programs. To accomplish this, organize an interagency workshop planning committee, including university and social science research representations; authorize a careful study of past and present experiences with hygiene education and related behavioral change efforts; and structure the workshop in such a way that reports and recommendations will be pertinent to planning, staffing, implementing, and evaluating hygiene education.

2. Assign a permanent liaison from the Health Education Division to the Department of Health to strengthen the role of hygiene education in water and sanitation programs.

Explore ways of further strengthening hygiene education and social preparation leadership in the Department of Health. This could include establishing a hygiene education unit within the Health Education Division and assigning additional trained health educators at appropriate levels in the Department of Health who would interact with the Health Education Division and with other divisions and field workers. It could also include adding trained health education staff at regional and provincial levels.

3. Provide additional technical support at the provincial level to help coordinate the water supply activities of the various RTG agencies.

There is great need for the coordination of field activities of water supply agencies at the provincial level. At present, there is no effective way of keeping track of all water programs in a province and no single individual or agency is responsible for allocating priorities and project requests among the RTG water supply agencies. The MOPH should support establishment of some type of coordinating mechanism at the provincial level. This could take the form of the assignment of a water supply expert to the office of the provincial governor or the provision of technical advisory services to the provincial development committee.

4. Hold a workshop on the technical planning aspects of rural water supply development for all RTG water supply agencies.

This workshop should bring together all RTG agencies responsible for rural water supply development to discuss how the technical aspects of projects

lead to health benefits. The purpose of the workshop is to make health objectives the primary focus of all drinking water supply projects.

5. Carry out research investigations in the following areas:

- a. Effectiveness of the household water filter;
- b. Social acceptability of different types of water sources;
- c. Advantages and disadvantages of routine or periodic chlorination of wells, tanks, and other facilities in terms of user acceptability;
- d. Appropriate technology for testing drinking water in the field;
- e. Technical vs. attitudinal factors leading to WSS equipment breakdown and disuse.

Further research on both water quality and social preparation is needed if the drinking water goals of the Sixth Plan are to be met. For immediate programming purposes, research is needed into the bacteriological effectiveness of the small household sand filters and into the willingness of people to drink water from the water sources and systems (jars, tanks, handpumps, piped distribution networks) commonly found in villages.

6. Establish water quality criteria that are appropriate for the dual water supply service levels proposed above (recommendations 1 and 2 of MOPH policies).

There is need to develop new water quality standards that reflect the actual needs and available resources of rural Thailand. The WHO Drinking Water Standards are too restrictive for small village water supplies because it is not normally practical to provide disinfection and other forms of water treatment or to carry out the requisite degree of monitoring such treatment would require. There should be one standard for rural drinking water supplies and another for rural domestic water supplies. The degree of source protection, and possibly the absence of fecal coliforms, may be sufficient for a drinking water standard. For domestic water, the quality could be considerably lower without directly endangering community health.

7. Assist in preparing an annual inventory of all water supply and sanitation facilities in the rural areas.

An annual count of the number of wells, handpumps, piped systems, jars, tanks, etc., along with some indication of their operational status, is necessary for determining progress towards coverage targets and for budgeting for the next fiscal year. This inventory should be made relatively simple so that field staff of the Departments of Health, Community Development, and Local Administration can rapidly count them on an annual basis. The MOPH should act as the coordinating agency for this annual inventory.

8. Encourage the use of revolving funds to help finance the capital costs of all water supply and sanitation facilities in the rural areas.

Adopt a uniform use of revolving funds for financing capital costs of water supply systems, in contrast to the present mixed policies of full local payments, partial payments, or no payments. Encourage wider use of

nongovernmental agencies through careful monitoring and information sharing.

9. Investigate the potential for villages to borrow funds from the Thai Savings Bank to finance water supply and sanitation improvements.

Investigate the potential for both RTG banks and commercial banks to serve as major sources of money for financing village water supply and sanitation improvements, as described in detail in Appendix B.

10. Request USAID to reprogram approximately 6,000,000 baht of surplus funds for new water supply and sanitation activities.

USAID has some 6,000,000 baht of surplus funds in the Rural Primary Health Care Expansion Project. These funds are available for new water and sanitation activities of the MOPH. They could be used for training, purchase of materials, research investigations, or other relevant work of the MOPH. Because these funds will expire at the end of the project in October 1986, there is need for the MOPH to request that USAID reprogram the funds as soon as possible.

Chapter 10

POTENTIAL USAID/WASH ASSISTANCE

There are a number of ways in which USAID may be able to provide assistance to the rural water and sanitation program of the MOPH in the Sixth Plan, although the following list does not imply prior USAID approval. In all cases, a request for assistance must be made by the MOPH to the USAID Mission in Bangkok. The most likely sources of financial or technical assistance are the following:

1. Reprogramming of 6,000,000 baht surplus funds in the Rural Primary Health Care Expansion Project.

This project currently has surplus funds amounting to approximately 4,000,000 baht resulting from the recent devaluation of the baht and 2,000,000 baht of unexpended project funds. It is available for additional water supply and sanitation activities within the MOPH. A proposal for the use of these funds is required in order to reprogram them. All funds must be expended before the anticipated completion date of the project (October 1986) or they will be withdrawn.

2. Grant funds from the Emerging Problems in Development II Project.

This project has funds available for studies as well as for training in primary health care and management at the tambol level and for health-related fellowships. Further information regarding requests for these funds is available at the Office of Health, Population and Nutrition in the USAID Mission.

3. Technical assistance from the WASH Project.

WASH Project assistance is available for short-term, technical advisory services in water supply and sanitation. The costs of WASH Project assistance are borne by the USAID Mission or by AID/Washington. With regard to the Sixth Plan, WASH assistance could be provided in the following areas:

- a. Planning and design of the workshop on hygiene education and promotion (Program recommendation No. 1).
- b. Planning and design of the workshop on the technical planning of water supplies (Program recommendation No. 4).
- c. Design of research investigations, such as:
 - water quality effectiveness of the household water filter
 - studies of the social acceptability of different types of water facilities.
- d. Design of the annual inventory of all water supply and sanitation facilities (Program recommendation No. 7).

- e. Design of field surveys of household water usage, behavioral practices, system maintenance.
- f. Assessment of training needs and the design of training programs.
- g. Design of information exchange programs, including the establishment of technical libraries and the development of linkages with international information centers.

REFERENCES

1. Agency for International Development, Thailand - Rural Primary Health Care Expansion, Project Paper: Proposal and Recommendations for the Review of the Development Loan Committee (AID-DLC/P-2285), Washington, D.C.
2. American Public Health Association, Strategy and Guidelines for Improvements in Sanitation and Water Supply in Selected Areas of Thailand, Washington, D.C., 1979.
3. Australian Development Assistance Bureau, Northeast Village Water Supply Project, Thailand: Project Document, February 1984.
4. Benjamin, Robert, M.D., M.P.H., et al., Thailand Health Sector Assessment, Period September 5 to October 5, 1983, USAID.
5. Dorsch Consult and Asian Engineering Consultants Corp. Ltd., Mobile Health Services 81-65-177, Progress Report No. 6, (March - May 1985), Thailand Department of Technical and Economic Cooperation.
6. _____, Mobile Health Services 81-65-177, Addendum 1, Interim Report: Mobile Sanitary Services (February 1985), Thailand Department of Technical and Economic Cooperation.
7. Dworkin, Daniel M., and Barbara L. Pillsbury, The Potable Water Project in Rural Thailand, AID Project Impact Evaluation Report No. 3, AID, May 1980.
8. Elmendorf, Mary, and Patricia Buckles, Sociocultural Aspects of Water Supply and Excreta Disposal, Appropriate Technology for Water Supply and Sanitation, World Bank, December 1980.
9. Health Care and MCH/FP Development for Thai Minority Groups Project, Final Project Progress Report, Project Field Office, Chiang Mai, Thailand, April 1985.
10. Hovichitr, Patcharee, et al., Cost Recovery Mechanisms for Public Standposts in Thailand, prepared for IRC and presented to the First International Meeting on Public Standpost Water Supplies, Thailand, November 11-17, 1984, Khon Kaen University, Faculty of Engineering, Khon Kaen, Thailand.
11. Khon Kaen University, Thailand, Faculty of Engineering, Collection and Storage of Roof Runoff for Drinking Purposes, Vol. 1, Hydrologic Studies, International Development Research Centre, Canada.
12. _____, Vol. 2, Studies of Rainwater Quality, International Development Research Centre, Canada.

13. _____, Vol. 3, Construction Materials, Techniques and Operational Studies, International Development Research Centre, Canada.
14. _____, Vol. 4, Socio-Economic Studies, International Development Research Centre, Canada.
15. _____, Office of Water Resources Development, Integrated Village Development via Water Supply System: Recommendations and Proposals, paper submitted to IRC as a follow-up of the First International Meeting on Public Standpost Water Supplies, Khon Kaen, Thailand.
16. Menaruchi, Anant, et al., Research Report on Methodology for Community-based Sanitation Development Program Including Financial Management, Khon Kaen University.
17. Myers, C.N., et al, Financing Health and Medical Care in Thailand, prepared for USAID/Thailand, April 1985.
18. National Economic and Social Development Board, Planned Community Financing of PHC in Thailand, presented to U.S. International Development Cooperation Agency, Bangkok Office, February 25, 1985.
19. National Institute of Development Administration, Evaluation of Rural Water Supply Projects in Thailand: Final Report, Rural Watersupply Planning Subcommittee, National Economic and Social Development Board in cooperation of United Nation's Children's Fund, September 1978.
20. Panvisavas, Subarn, et al., Census of Rural Drinking Water Sources and Latrines in Thailand, Mahidol University at Salaya, Faculty of Social Sciences and Humanities, Office of the Drinking Water Sources and Latrines Census Project, Salaya Nakornpathom, Thailand.
21. Population and Community Development Association, Rainwater Collection for Safe Drinking in Rural Thai Villages, Khon Kaen University, Faculty of Engineering, Civil Engineering.
22. Stewart, Michael M., M.D., M.P.H., et al., Midterm Evaluation of the Thailand Rural Primary Health Care Expansion Project, American Public Health Association supported by USAID (AID/DSPE-C-0053), February 24 to March 15, 1980.
23. Telier, Charles H., Community Involvement in Primary Health Care Nutrition Program: Assessing Social Mechanisms in the Growth Monitoring Process, International Nutrition Unit Technical Report Series, U.S. Department of Health and Human Services, Office of International Health, Rockville, Maryland, April 23 to May 4, 1985.
24. Thai Australia Village Water Supply Project, Maximizing the Health Impact of Improved Drinking and Domestic Water Sources on Rural Communities in Northeast Thailand, Technical Report No. 2, Melbourne, Australia, Ministry of Public Works.

25. Thai Australia Village Water Supply Project, A Methodology for Selecting Village Water Supply Facilities, Technical Report No. 1, Melbourne, Australia, Ministry of Public Works, September 1984.
26. _____, Mid-Term Report, Melbourne, Australia, Ministry of Public Works, February 1985.
27. Thailand Ministry of Public Health, Health Development Policy and Programs, 1984.
28. Thailand Ministry of Public Health, Department of Health, Sanitation Division, Introducing Sanitation Programs Implemented by the Sanitation Regional Center Region 5, Lampang.
29. Thailand Ministry of Public Health and USAID/Thailand, Rural Primary Health Care Expansion Project, Add-On Project Proposal for Control of Diarrheal Diseases and Safe Drinking Water and Sanitation Activities, July 1984 - October 1985 - October 1986, USAID, May 1984.
30. Tuchinda, Dr. Prakorb, et al., Thailand Health Profile 1976, Bangkok, Thailand, January 23, 1977.
31. Tunyavanich, Nongluk, et al., Research Report on the Provision of Safe Drinking Water Supply in Rural Poverty Area Program: A Case Study in Yasothon Province, Project: UNDP/WHO ICP CWS 003, Mahidol University, Faculty of Social Sciences and Humanities, Thailand.
32. WASH Field Report No. 19, Village Water Supply and Sanitation in North-eastern Thailand, prepared for USAID/Thailand by James Arbuthnot and Robert H. Thomas, Washington, July 1981.

APPENDIX A
Primary Contacts

A. ROYAL THAI GOVERNMENT

Ministry of Public Health

Dr. Pirote Ningsanonda
Director General
DOH, MOPH
Bangkok

Mr. Chetpan Karnkaew, Director
Rural Water Supply Division
DOH, MOPH
Bangkok, 282-9491
(Ms. Tevarasa, Asst.)

Mr. Paisal Prigsang, Director
Sanitation Division
DOH, MOPH
Bangkok 281-9461

Mr. Phaopong Jaroensurasatol
Sanitation Division
DOH, MOPH
Bangkok 281-9461

Dr. Damrong Boonyoen
Director, Health Planning Division
MOPH
Bangkok 281-3925

Dr. Ulit Leeyavanija
Dep. Director General
DOH, MOPH
Bangkok 281-9023

Mr. Sukhum Sema, Manager
Thai-German Mobile Health Project
DOH, MOPH
Bangkok

Dr. Prasert Suvannus
Health Specialist
DOH, MOPH
Bangkok 281-5977

Mr. Thira Thatsanatheb
Planning Officer
Sanitation Division
Department of Health
MOPH, Bangkok 282-8117

Mr. Suang Liamrangsi
Director
Food Hygiene Division
Department of Health
MOPH, Bangkok

Dr. Pricha Desawasdi
Chief Medical Officer
Office of the Permanent Secretary
MOPH, Bangkok

Mr. Praporn Charuchand
Director
Environmental Health Division
MOPH, Bangkok

Dr. Prakaht Chaowanapricha
Chief Provincial Medical Officer
Khon Kaen
221-750

Mr. Songsak Sritoonma, Director
Sanitation Div. Regional Sub-HQ
Lampang
(Staff: Pisanu, Chalong & Sanan)

Dr. Chamroon Meekhanon
Chief Prov. Medical Officer
Lampang

Dr. Nuansri Tieuthong
Director, Health Education Division
MOPH, Bangkok
(Staff: Mr. Thiraphol)

Dr. Sunthara Pongspipat
Training Division
Department of Health, MOPH

Mr. Ong-Art Sithicharoenchai
Primary Health Care Office
Office of the Permanent Secretary
MOPH, Bangkok

Ministry of Interior

Mr. Niyom Niyamunusorn
Provincial Water Supply Division
Public Works Department
Ministry of Interior
Bangkok 282-4879

Mr. Prajaya Sutabutre, Chief
Technical Section
Provincial Water Supply Div.
Public Works Department
Ministry of Interior
Bangkok 282-4879

Mr. Hukharn Tomornsak
Director, Local Affairs Division
Ministry of Interior
Bangkok 222-5824
(staff: Mr. Danai Tomornsak)

Mr. Cheewin
Dep. Director General
Department of Community Development
Ministry of Interior
Bangkok
(Staff: Mr. Yuranat)

Mr. Wichit
Accelerated Rural Development
Ministry of Interior
Bangkok

Provincial Waterworks Authority

Dr. Thawat Wichaidi, Governor
Provincial Waterworks Authority
Bangkaen, Bangkok
(Deputy Gov.: Mr. Lertz, Chainarong
521-3062

NESDB

Dr. Boonyarat Ningsanonda
Economist
NESDB, Bangkok

Mr. Anek Chandarawongse
Center for Integrated Plan of
Operation (CIPO)
NESDB, Bangkok
282-3437

Ms. Pannaria Kantaghit
Center for Integrated Plan of
Operation (CIPO)
NESDB, Bangkok
282-3437

Dr. Direk Reikrai
(Prof. at Kasetsart U)
Social Development Project
NESDB

Dr. Robert Muscat
Consultant
NESDB, Bangkok

Department of Mineral Resources

Mr. Suwit Watthanachan
Director, Ground Water Division
Dept. Mineral Res.
Ministry of Industry
Bangkok 245-6213

Government Savings Bank

Mr. Dusdee Svasti-Xuto
Director General
Government Savings Bank
Bangkok 279-8389, 279-9555

Committee for Coordination and
Acceleration of Water Resource Dev.

Dr. Apichart Anukularmphai
Secretariat of the Prime Minister
Committee for Coordination and
Acceleration of Water Resource Dev.
Bangkok 282-4950

Bangkok Metro Politan Administration

Dr. Chek Dhanasiri
Dep. Under Secretary of State
Bangkok Metro Administration
221-4866

B. BI-LATERAL AND MULTI-LATERAL
AGENCIES

USAID

Mr. Lee Twentyman, Acting Director
Office of Health, Population &
Nutrition
USAID, Bangkok 252-8191

Mr. Terrence P. Tiffany, Director
Office of Health, Population &
Nutrition
USAID, Bangkok 252-8191

Mr. Narintr Tima
Program Specialist (Health)
Office of Health, Population &
Nutrition
USAID, Bangkok 252-8191

Mr. Mintara Silawatshananai
Office of Engineering
USAID, Bangkok 252-8191

Mr. John Neave
Office of Engineering
USAID, Bangkok 252-8191

Mr. Willy Baum
Office of Engineering
USAID, Bangkok 252-8191

UNICEF

Dr. Jane Bunnag, Communications
Regional Project Support/Officer
UNICEF, Bangkok 282-3121

Mr. Pricha Chulavachana
Programme Officer
UNICEF
Bangkok 282-3121

Thai Australia Village Water Supply

Mr. David J. King, Senior Consultant
Thai Australia Village Water Supply
Project
Khon Kaen (043) 239-322

Mr. Cecil Showman
Sanitation Specialist
Thai Australia Village Water Supply
Project
Khon Kaen (043) 239-322

Mr. Peter Cox, Sociologist
Thai Australia Village Water Supply
Project
Khon Kaen (043) 239-322

Dr. Michael J. Toole
Medical Consultant
Thai Australia Village Water Supply
Project
Khon Kaen (043) 239-322

Peace Corps

Mr. Nikorn Saengchantr
Michael Zwack
James Hanson
Peace Corps Staff
Bangkok

C. NON-GOVERNMENTAL AGENCIES

Mahidol University

Dr. Subarn Panvisavas, Dean
Faculty of Social Sciences and
Humanities
Mahidol U at Salaya
Nakorn Pathom, 413-4068

Dr. Nongluk Tunyavanich
Faculty of Social Sciences and
Humanities
Mahidol U at Salaya
Nakorn Pathom, 413-4068

Dr. Somchit Supannatas
Head, Department of Health Education
Faculty of Public Health
Mahidol U.
Bangkok

Ms. Julie Muscat
Asia-Pacific Consortium Project
School of Public Health
Mahidol U.
Bangkok

Khon Kaen University

Dr. Prakob Wirojanagud
Office of Water Resource Development
Faculty of Engineering
Khon Kaen U. 237-604, 238-755

Dr. Prinya Chindaprasirt, Dean
Office of Water Resource Development
Faculty of Engineering
Khon Kaen U. 237-604, 238-755

Population & Community Development
Association (PDA)

Mr. Meechai Viravaidya
Director
Population & Community Development
Assoc.
Bangkok 252-3960

Mr. Pairojana Sornjitti
Director
Community-Based Appropriate
Technology Bureau
Population & Community Development
Assoc.
Bangkok 252-3960

Mr. Wilas Lohitkul
Manager, Community Development
& Technology Division
Population & Community Development
Association
Bangkok 251-0402

Mr. Ardis Yenprasitti
Water Resources Development
Population & Community Development
Association
Bangkok 251-0402

Technical Research & Development
Institute

Dr. Anat Arbhabhirama
Secretary General
Thailand Development Research
Institute (TDRI)
Bangkok

Asian Institute of Technology

Mr. H.P. "Larry" Ricarte, Jr.
Sr. Research Assoc.
Environmental Engineering Div.
Asian Institute of Technology
Bangkok 529-0041

Mrs. Samorn Muttara
Assoc. Prof.
Environmental Engineering Div.
Asian Institute of Technology
Bangkok 529-0041

Dr. Eddie K.S. Hum
Deputy Head
South East Asia Program Office
Asian Institute of Technology
Bangkok 529-0041

ASEAN Training Center for Primary
Health Care Development

Dr. Mali Thaineua
Consultant
ASEAN Training Institute
Salaya, Nakorn Pathom

APPENDIX B

Memorandum to Dr. Pirote Ningsanonda



WATER AND SANITATION
FOR HEALTH PROJECT

Operated by CDM Associates

Financed by the U.S. Agency
for International Development

WASH Operations Center
1611 N. Kent St., Room 1002
Arlington, Virginia 22209 USA

Telephone (703) 243-8200
Telex No. WUI 64552
Cable Address: WASHAID

DATE: July 25, 1985

TO: Dr. Pirote Ningsanonda, Director-General, Department of Health

FROM: Barry Karlin, WASH/AID Consultant *B. Karlin*

SUBJECT: Funding of Rural Water Supplies

Funding of rural water supplies represents a major obstacle to rapid success in providing badly needed improved water supplies to rural villages. The costs of piped water systems or rainwater tanks which can hold 5 cubic meters or more is approximately 4-6000 baht per household. Rainwater jars of up to 2 cubic meters are less expensive, but are more subject to contamination and mosquito breeding but do offer a viable alternative. In addition, piped water systems require constant operations and maintenance with charges of 3 baht or more per cubic meter of water delivered. Limited amounts of revolving funds have made it necessary to require that borrowers repay loans in from 10-18 months, even though the systems themselves are designed to last for 10 years or longer. Even with these short repayment periods, it is very doubtful if there will be sufficient funds from developmental ministries to achieve Water Decade goals. For example, if only one-third of rural villages or 20,000 villages received piped water or rainwater tanks, the cost would be 10-20 thousand million baht (at 4-5,000 baht per household). This is up to two times the entire water budget in AIT's Master Plan. A related problem is that developmental ministry officials are not bankers. They are not trained to work with loans or to assist villagers to do so.

A possible solution to these problems is to secure large amounts of money in the form of interest-bearing loans from Thai Government or commercial banks, assuming that a Government agency would provide loan guarantees. It would be best to begin with loans from a Government bank to be able to demonstrate adequately high repayment to convince commercial banks of the soundness of loans to villagers without collateral. Dr. Warner and I took the opportunity of discussing these ideas with Dr. Anat Arbhabhirama, Director of the Thailand Development Research Institute, and with Dr. Chok Dhanasiri, Deputy Permanent Secretary for the Bangkok Metropolitan Administration (BMA). Dr. Anat urged that we pursue this idea further and was particularly pleased that we are

considering using the services of bankers rather than other officials. Dr. Chek encouraged us to meet his friend, Mr. Dusdee Svasti-xuto, Director-General of the Thai Government Savings Bank, and arranged an appointment on the morning of July 24th.

I met with Director-General Dusdee and described the importance of improved water supplies for Thai villagers, reviewing some of the problems associated with funding. He was extremely happy to have me bring this issue to him. Over a year ago, then-PWA Governor Mechai requested loan funds for water tanks and Mr. Dusdee requested and received Ministry of Finance approval of 100 million baht which could be loaned for 18 months at 16% interest. However, the repayment period can be lengthened. Thus far, only 700,000 baht (0.7%) has been drawn from this fund. Mr. Dusdee is anxious to have all of these funds used on behalf of the rural people, and he believes that even more could be obtained if villager repayments records are good. He would like to proceed immediately with such loans without waiting for the 6th 5-Year Plan. Mr. Dusdee plans to retire in September and sees this as a priority issue. He would like to discuss it with the new PWA Governor, Thawat Wichaidit and with you soon.

We then discussed methodology issues. I suggested that loans go to village committees, not to individuals, and that only a portion of villagers receive funds for rainwater. Remaining households would be eligible for their funds only when the first recipients showed that they were willing and able to make monthly payments. This would put needed social pressure on families. Such pressures would be built into piped systems which would be metered in any case. Only villages which were well organized and were working with appropriate Government officials, including MOPH, would be eligible for loans, thereby helping to assure that health goals would be met. A high proportion of households would be expected to have signed up in advance. Finally, we discussed the desirability of having the Bank train rural loan officers who could serve as a liaison between villagers and the bank. Beginning in pilot areas, such as Khon Kaen and Chiangmai, would be consistent with the Saving Bank's initial proposal to the Ministry of Finance.

Action Required: It is important that the MOPH be able to influence the release and expenditure of these funds before Director-General Dusdee retires and in a way which assures achieving health goals. For example, a reasonable standard would be to link eligibility to village plans for sanitation improvements and to the availability of adequate add safe drinking water if the piped system is primarily for domestic uses. A discussion between you and Mr. Dusdee (Tel. 279-8389 or 279-9555) is suggested, perhaps followed with a meeting. His office is in Saphan Kwai. The meeting might logically include PWA's Governor with whom Dr. Warner and I had a very cordial meeting last week.

Please let Dr. Warner and me know if we can be of further assistance

cc: Dr. Warner
Mr. Narintra Iima