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Report of the
East Bay Municipal Utility District, Oakland, California
Metropolitan Waterworks Authority, Bangkok, Thailand
City Twinning Project
for Urban Environmental Infrastructure

Bangkok, Thailand
November 29 - December 3, 1993

A Program of:
The Office of Regional and Urban Housing and Development of
The United States Agency for International Development (USAID) / Thailand

With Logistical and Technical Support from:



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Disclaimer

This project is supported by the U.S. Agency for International Development and the World Environment Center. The opinions expressed herein are the professional opinions of the authors and do not represent the official position of the Government of the United States of America or the World Environment Center.

I. Executive Summary

In an effort to help local utility and city officials in Thailand choose appropriate methods to provide environmental services to their communities, the Thailand Mission of the United States Agency for International Development (USAID) created the City Twinning Project for Environmental Infrastructure. Under this project, Thai municipal governments and utilities are matched with similar organizations in the United States that service areas of comparable size, climate and geographic features and have found successful solutions to their waste problems. The World Environment Center (WEC) is coordinating this program in the United States.

The purpose of this trip was to allow environmental experts from East Bay Municipal Utility District (EBMUD) to provide short term technical assistance to and to identify and respond to environmental and operational issues facing the Metropolitan Waterworks Authority of Bangkok (MWA).

Michael Wallis, Director of Wastewater, John Lampe, Director of Water Planning and Thomas Paulson, Supervising Wastewater Control Representative, spent 5 working days in Bangkok from November 29 - December 3, 1994. Mr. Robert Parent of Montgomery Watson, an engineering consulting company that works closely with EBMUD also travelled to Bangkok and participated in the project. During that time the experts visited MWA and other government facilities, and discussed issues with MWA and staff from other governmental agencies. This visit served as an opportunity to follow-up on issues discussed during the visit of officials from MWA to EBMUD in October, 1993.

In this report, EBMUD experts recommend appropriate short and long term technological and administrative solutions to issues facing MWA. Recommendations are supported with detailed information developed by EBMUD and are included in the attached appendices.

II. Introduction

The Regional Housing and Urban Development Office (RHUDO) of the United States Agency for International Development in Bangkok, Thailand conceived of the "twinning" model as a way to bring U.S. expertise to bear on development problems at a local level. In Thailand's urban areas, problems related to environmental quality are among the most pressing issues facing the providers of infrastructure and services. This approach takes into account technical, political, social and economic aspects of providing services and infrastructure at the local level and allows the twins to compare and contrast the many issues concerning water treatment, wastewater treatment and utility operation. USAID worked with MWA officials to identify the Authority's priority environmental issues concerning MWA and chose EBMUD as the appropriate "twin".

During October through December 1993, delegations of volunteer experts from both EBMUD and MWA travelled to each others locale to observe operations and discuss issues related to urban environmental infrastructure and services.

III. Summary of Conditions in MWA and Bangkok

The 5-day itinerary emphasized exploration of MWA facilities and operations in Bangkok and included a field trip to Bhumibol Dam, in Tak Province operated by Electricity Generating Authority of Thailand (EGAT).

General conditions observed in MWA's service area (Bangkok) can be characterized as densely populated, free of crime, choked with traffic, friendly, decentralized, and, by Western standards, lacking adequate infrastructure. Conditions at MWA were similar to those at EBMUD with great similarities in operations, exploitation of current technology, and customer service. Conditions with the greatest degree of contrast are water rights, financing and pricing, conservation, rate setting and cost recovery strategies, and interagency coordination.

The pace of growth at MWA is indicative of the rate of population growth in Bangkok. The MWA 1992 Annual Report shows the following trends since 1983:

- Population in the responsible area (approximately 2 times larger than the current service area) increased 1.2 million from 6.1 million to 7.3 million.
- Total Water Production increased 549 million Cubic Meters (Cu.M.) [449,000 acre-feet (AF)] from 626.5 million Cu.M. [512,700 AF] to 1,175.5 million Cu.M. [962,000 AF].
- Total Water Sales increased 453.7 million Cubic Meters (Cu.M.) from 369.7 million Cu.M. to 823.4 million Cu.M.
- Total Connections increased 623,320 from 467,675 to 1,090,995.
- Service area increased 390 square kilometers (sq. km.) from 350 sq. km. to 740 sq. km.
- Average monthly water consumption per customer (connection) **decreased** 4.01 Cu.M. [1.43 Ccf] from 68.28 Cu.M. [24.34 hundred cubic feet (Ccf)] to 64.27 Cu.M. [22.88 Ccf].

(million m³)(1000 l/m³)(1 gallon/3.75 l)(1 acre-foot/325,851 gallon) = 818.4 acre-feet

Photographs taken by the EBMUD delegation are included in Appendix 1. News articles pertaining to water quality issues that appeared in the *Bangkok Post* during the EBMUD visit are included in Appendix 2.

IV. Summary of Activities

1. DESCRIPTION OF FACILITIES VISITED

The location, ownership, and operational activities are described for each of the facilities listed below. A copy of the itinerary followed by the delegation is included in Appendix 3.

On Monday, November 29, the delegation also visited the main office of MWA and the adjacent Bangkhen Treatment Plant. The office is the site of administrative, customer services, training and meeting activities. The Bangkhen Treatment Plant is the largest of MWA water treatment facilities and produces 69.6 % of the water for distribution. The delegation also attended a briefing at the USAID Mission in Bangkok with Curtis Borden, Office of Regional Housing and Development, and Eugene Morris, Deputy Mission Director.

On Tuesday, November 30, the delegation visited the National Waterworks Technology Training Institute (NWTTI) Central Training Center in Bangkok. NWTTI is a technical cooperative project between the Thai and Japanese governments. Both MWA and the Provincial Waterworks Authority participate in the project. Project activities at the NWTTI Central Training Center include training in water supply planning and management, water purification and quality, pipeline maintenance, and mechanical and electrical installations.

On Wednesday, December 1, the delegation visited the Bangkhen Branch Office of MWA in Bangkok. The Bangkhen office is the site of administrative services, customer bill payment services, and maintenance equipment staging and storage.

On Thursday, December 2, the delegation was flown to the site of Bhumibol Dam in the Tak Province of Thailand. The dam is located approximately 480 kilometers [300 miles] north of Bangkok.

On Friday, December 3, the delegation visited the Computer Department of MWA and met with Bangkok Metropolitan Authority staff. Computer hardware is clustered at the MWA office.

2. DESCRIPTION OF ENVIRONMENTAL ISSUES

Eleven issues are identified and discussed below.

a. Large Meter Testing

Water Sales, expressed as a percentage of Water Production, at MWA increased from 30% in 1967 to a rate of 70.1% in 1992. In 1993, MWA plans to limit water losses to 28.5% (71.5% water sales). Elements of the plan include tunnel rehabilitation projects, leak detection and repair projects, meter replacement, and elimination of illegal connections. Decreasing water losses lowers water production requirements, raises revenues (price being constant), and results in a more equitable distribution of costs and benefits.

A viable supplement to the MWA water loss reduction plan would be large meter testing. In 1983, EBMUD identified inaccurate measurement of water delivered through large meters (≥ 3 inches [76.2 millimeters]) as a potential source of significant water losses. Justification for a large meter testing program, initial results of program implementation, and a current bid document specification for water meters is attached in Appendix 5a.

b. Water Treatment Plant Solids Production and Disposal

MWA, EBMUD, and the water treatment industry in general, are confronted with similar challenges in the disposal of water treatment plant solids. Operational reliability, cost, and environmental impact are all factors effecting selection of the best disposal method.

Current disposal methods at MWA consists of solar drying beds and landfill of sludge. EBMUD is currently conducting extensive studies to develop a plan for future disposal needs and options. Appendix 5b includes a detailed presentation of EBMUD draft studies.

c. Polybutylene Lateral Failures

EBMUD installed approximately 50-70,000 polybutylene (PB) laterals between 1971 and 1987. Several years ago, water utilities in various parts of the country experienced a pattern of premature PB lateral failures and EBMUD crews have likewise reported an increase in the number of PB failures. The rate of failure is 1,000 per year presently and appears to still be increasing in the District. At least one utility (North Marin Water District in California) has reached a settlement with PB pipe manufacturers, and several other utilities have lawsuits pending.

MWA reports use of 1,747,518 meters [1,085 miles] of ½ - 3 inch PB service pipe and 46 meters [151 feet] of 4 inch PB distribution pipe. MWA should consider an aggressive program to identify the extent of any PB failures in their water system. Information assembled by EBMUD summarizing its actions in response to PB failures is attached in Appendix 5c.

d. Enabling Statutes/Water Rights

Thailand law has no provisions for water rights comparable to those in the California law under which EBMUD operates. A system of water rights helps to ensure a balance between competing priorities. Without reformation of laws and regulations concerning water rights, MWA's long term water supply planning will be difficult.

Comprehensive information describing water rights in California, the water right process, and water right appropriations is included in Appendix 5d.

e. Pricing Structures

MWA is currently faced with a water supply crisis and is reviewing plans for water rationing. MWA experience with rationing through intermittent service has proven to be dangerous, expensive, inequitable, and ineffective. MWA is already considering economic incentives to promote wa.er conservation.

EBMUD has faced water shortage emergencies in the years 1976, 1977, 1988 and 1991. When developing emergency plans, EBMUD reviews the following drought related issues:

- Water supply availability
- Water supply alternatives
- Surplus water sales
- Annexations

- Water rationing programs for all customers
- Revenue implications
- Water use restrictions and practices
- Budget for Drought Management Program

Information compiled by EBMUD during review of these issues is attached in Appendix 5e.

f. Hydraulic Modeling

MWA is not equipped with hydraulic modeling capability. Hydraulic modeling can be used to simulate the design and operational characteristics of piping and facilities which form a treated water distribution system. EBMUD is currently developing a computer model for hydraulic pipe network analysis to meet 4 objectives - 1) allow efficient development of long-range distribution system capital improvement plans; 2) maximize pipeline rehabilitation efficiencies; 3) provide ability to quickly simulate water supply capabilities; and, 4) allow significant increases in efficiencies related to operating strategies and system troubleshooting. The EBMUD Strategic Plan for Water Operations Information Systems (WOIS) Project Hydraulic Model Applications Plan is included in Appendix 4f.

The benefits of hydraulic modeling are reduced costs for planning, design, construction, and operation; increased emergency response preparedness; optimization of pipeline replacement priorities and strategies; increased level of service; and ability to model water quality.

g. Utilization of Bhumibol Dam Dead Storage Capacity

MWA continues to confront a water shortage crisis that has nearly depleted its historical water supply at Bhumibol Dam. MWA does not control its water supply and must rely primarily on conservation and resumed groundwater pumping as a short-term plan to deal with diminishing supplies. EGAT currently operates Bhumibol Dam which has a dead storage capacity of 3.8 billion Cu.M. with no means of access. The dead storage compares favorably with MWA's annual need of 1.176 billion Cu.M., and could serve as an emergency supply.

EBMUD faced conditions similar to current water shortage conditions at MWA in the droughts of 1976-77 and 1987-92. One option EBMUD utilized was accessing essentially dead storage in reservoirs with a floating pump station. Appendix 5g contains EBMUD's suggestions for MWA.

h. Conjunctive Use of Groundwater

In the past MWA supplemented its surface water supplies with groundwater supplies in the Bangkok area. Since 1983, the percent of total water production from groundwater fell from 21.8% (136.8 million Cu.M.) to 1.9% (22.4 million Cu.M.). MWA reduced groundwater production due to land subsidence as a result of overdrafted groundwater conditions.

Groundwater storage could supply MWA with water in dry years at relatively low cost and with low environmental impact and could improve overdrafted groundwater conditions. EBMUD is currently soliciting proposals for Phase 1 of its Mokelumne Aquifer Recharge and Storage Project. Relevant attachments from the request are included in Appendix 5h.

Water Reclamation

EBMUD plans to supply approximately eight million gallons per day (MGD) [3,802 Cu.M.] of reclaimed water within EBMUD's Service Area, more than doubling the amount currently reclaimed. This non-potable water would be provided to large irrigators and selected industries within approximately five miles of existing reclaimed water sources. Users of the reclaimed water would include golf courses, cemeteries, and a limited number of commercial, institutional, and industrial users for cooling or process water.

Additional facilities required to support EBMUD's water reclamation project include pressure pipeline, seven pumping plants, and up to six storage tanks with a combined capacity of eight MGD. An outline for establishing a water reclamation program is included in Appendix 5i.

j. Spatial Information Management

MWA is considering the benefits of spatial information usage and the geographic information technology that supports its management and use. The major concern among MWA staff is coordination, organization, and funding among geospatial data users and producers. Justification of MWA as a sole user and producer of geospatial data may not be possible. Joint venture partnerships with industry, government, or research and educational institutions could be a viable way to defray costs and facilitate regional access.

MWA has a well equipped Computer Department that supports inventory control, mapping network, personnel, financial, management and customer information functions. MWA staff are considering the purchase and operation of an automated mapping/facilities management/Geographic Information System (AM/FM/GIS).

Visiting delegates recommend that MWA invest in AM/FM/GIS software and hardware that can fully map water distribution systems and link them to a database defining each element, including reservoirs, pipe segments, services, and system appurtenances. This system would support planning, design, operations and maintenance.

EBMUD's Scope of Work - User Needs Study for the Mokelumne Aquifer Recharge/Storage Project and Wastewater Capital Assets Management Plan (in memorandum form) are included in Appendix 5j.

k. Water Conservation

During their visit at EBMUD, the MWA delegation received all EBMUD Water Conservation literature and information currently available. The applicability and usefulness of EBMUD water conservation measures to MWA may be limited due to water use patterns, distribution system water pressure, current levels of water consumption, and socioeconomic factors in Bangkok that are significantly different than in the United States.

V. Conclusions and Recommendations

EBMUD recommends that MWA revise its short term and long term water supply plans. Section IV and the accompanying appendices cover in detail a broad range of activities that target more water supplies in the short term and a long term plan that places more control of available water supply sources with MWA.

Short Term Issues

In the short term, the most vital activities for MWA are:

- Access 3.8 billion Cu.M. of water in dead storage at Bhumibol Dam
- Institute price structures and programs which promote water conservation
- Initiate feasibility studies for long term plans

Long Term Issues

Critical long term MWA plans should include:

- Dam water supply forecasting and modeling
- Groundwater storage and conjunctive use of water supplies
- Reclamation of local surface water runoff and reuse of treated wastewater
- Development of water rights agreements that allow management control and flexibility in procurement of water supplies
- investment in AM/FM/GIS software and hardware

Twinning Project Continuation

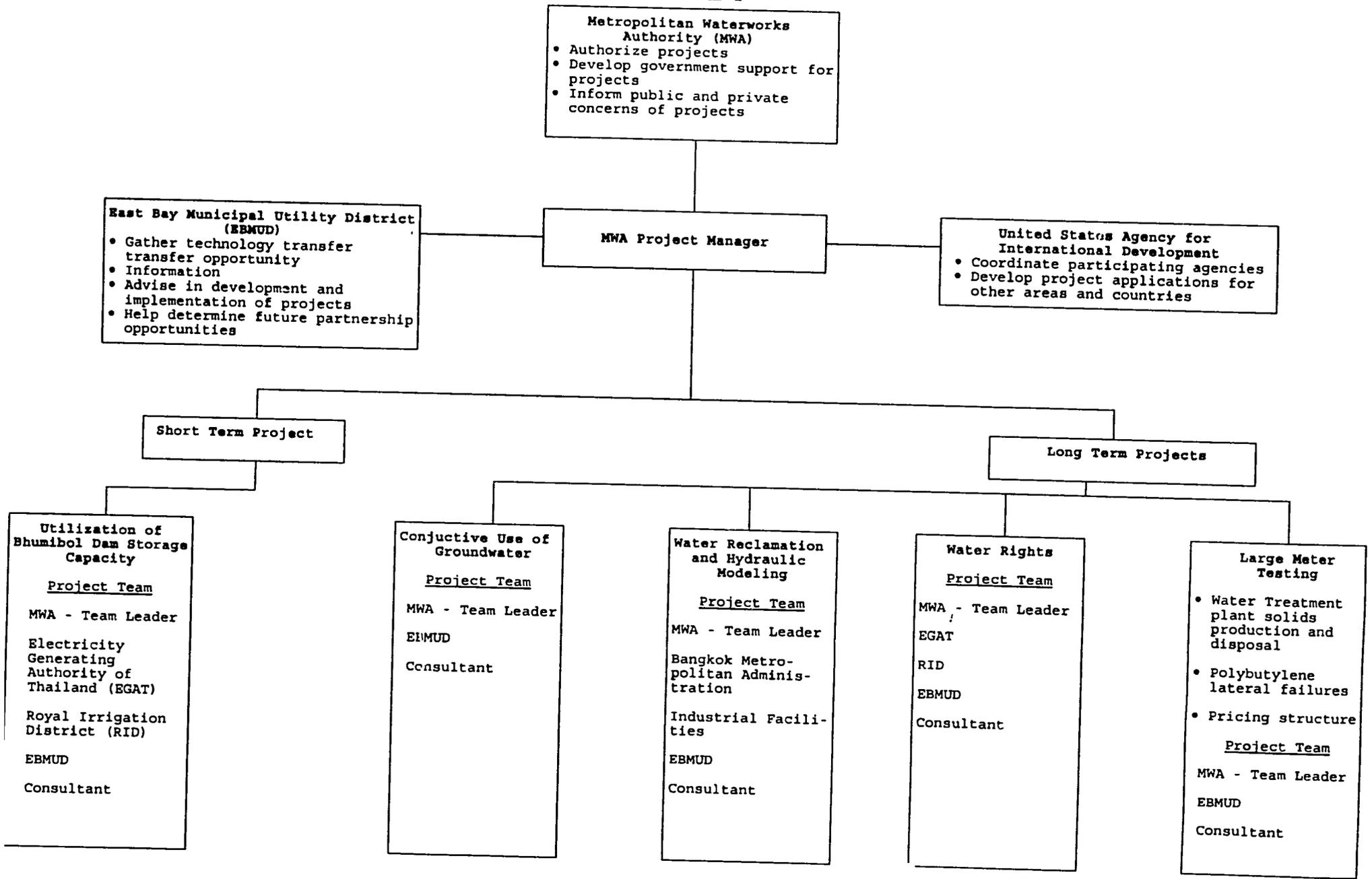
The Twinning Project was a success due to the complementary environmental priorities confronting both EBMUD and MWA. The visiting delegates from EBMUD helped MWA identify high priority issues and suggests possible actions. Most of these issues can be addressed by transfer or adaption of methodology and technology used by EBMUD. EBMUD also recommends continued USAID support of the Twinning Project between EBMUD and MWA.

EBMUD's role in a continued Twinning Project would be:

- Share information in which EBMUD has strong experience and capability
- Provide advisory services in program implementation and project management
- Provide technical review of programs and projects at key milestones
- Assist in the development of long term plans and feasibility studies
- Help determine parameters for future USAID programs
- Develop a trans-Pacific environmental network

Continuation of the Twinning Project could be implemented through USAID support of internship/training opportunities at EBMUD, short-term technical assistance projects for EBMUD staff with MWA, and continued exchanges. Specific elements of a continuing project are developed from the environmental issues identified by EBMUD volunteer experts in Section IV of this report and are listed below. Figure 1 depicts a model of project continuation functions and elements.

FIGURE 1



Metropolitan Waterworks Authority (MWA)

- Authorize projects
- Develop government support for projects
- Inform public and private concerns of projects

East Bay Municipal Utility District (EBMUD)

- Gather technology transfer transfer opportunity
- Information
- Advise in development and implementation of projects
- Help determine future partnership opportunities

MWA Project Manager

United States Agency for International Development

- Coordinate participating agencies
- Develop project applications for other areas and countries

Short Term Project

Long Term Projects

Utilization of Bhumibol Dam Storage Capacity

Project Team

MWA - Team Leader

Electricity Generating Authority of Thailand (EGAT)

Royal Irrigation District (RID)

EBMUD

Consultant

Conjective Use of Groundwater

Project Team

MWA - Team Leader

EBMUD

Consultant

Water Reclamation and Hydraulic Modeling

Project Team

MWA - Team Leader

Bangkok Metropolitan Administration

Industrial Facilities

EBMUD

Consultant

Water Rights

Project Team

MWA - Team Leader

EGAT

RID

EBMUD

Consultant

Large Meter Testing

- Water Treatment plant solids production and disposal
- Polybutylene lateral failures
- Pricing structure

Project Team

MWA - Team Leader

EBMUD

Consultant

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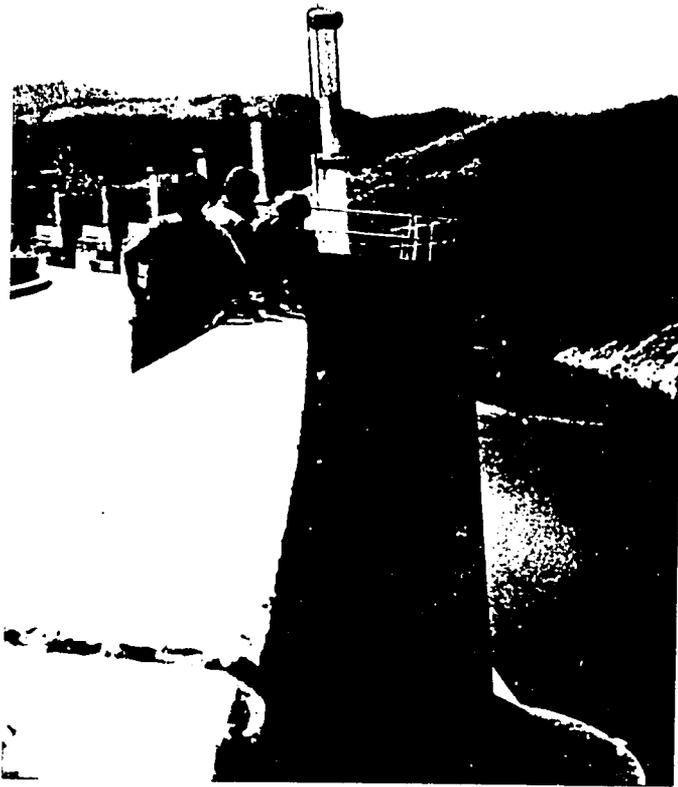


Photo 3: EBMUD officials observe operations at the Bhumibol Dam

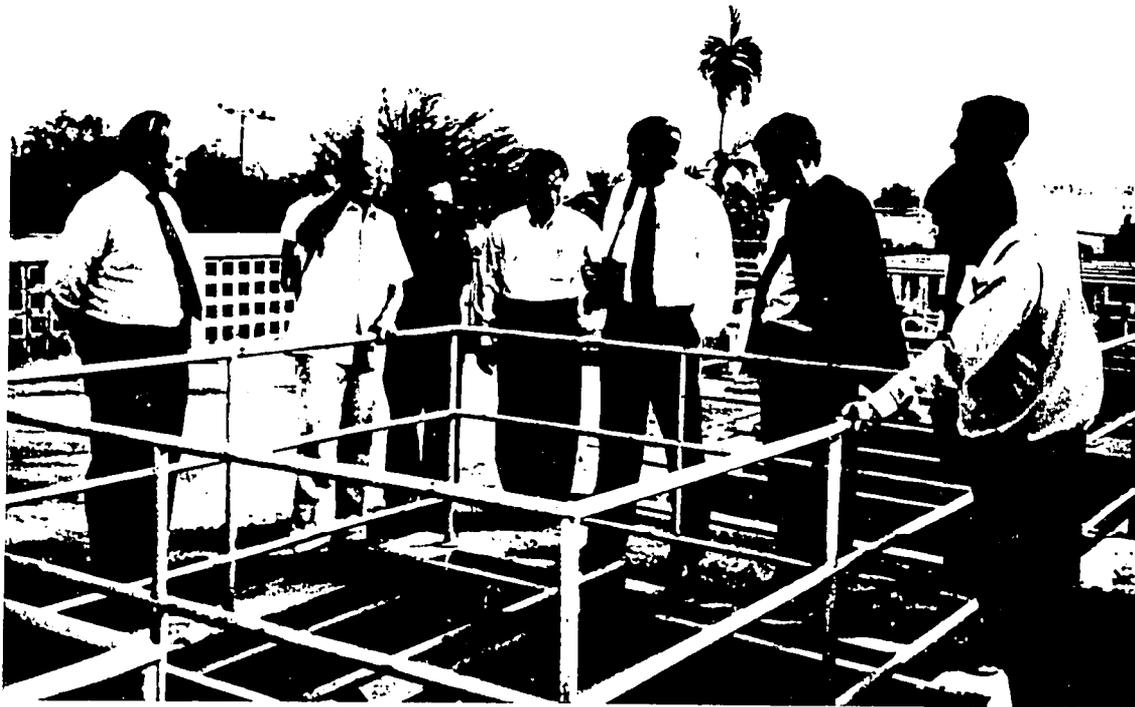


Photo 4: Officials from the National Waterworks Technology Training Institute (NWTTI) explain their operations to Robert Parent, John Lampe, Michael Wallis and Thomas Paulson



Photo 1: Mr. Watana Yuckpan, MWA (right front) explains operations to John Lampe, Michael Wallis and Thomas Paulson, EBMUD and Curtis Borden, USAID/Thailand



Photo 2: Mr. Suvich Futrakul, Governor, MWA and other MWA officials discuss operations with Thomas Paulson, John Lampe and Michael Wallis of EBMUD

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APPENDIX 2
NEWS ARTICLES

Business Post

Vol. XLVIII No. 337

BANGKOK FRIDAY DECEMBER 3, 1993

SECTION TWO

Govt to spend heavily on environment

THE Government is expected to spend more than 22,000 million baht over the next five years solving environmental problems.

In a speech to open the "Merging Business & the Environment" forum at the Regent Hotel yesterday, Prime Minister Chuan Leekpai said his Government was serious about tackling environmental problems, which would only worsen as the country became more industrialised.

The conference, co-sponsored by the *International Herald Tribune*, Mazda Motor and Thai Airways International in association with the

Phaichitr's address page 23

Thailand Environment Institute, was designed to promote dialogue between government ministers, business leaders and environmentalists, with a view to harmonising economic growth and development with environmental responsibilities.

He outlined four major government policies to manage natural resources and the environment:

- Decentralising natural resource and environment management to a regional and local level through increasing the participation of the provincial and local communities;
- Promoting the role of the private sector in implementing and sharing



CHUAN AT MEETING: Prime Minister Chuan (centre) is seen arriving at the conference yesterday. On hand to welcome him are conference chairman Rolf Dranepuhl (left) and chairman of Thailand Environment Institute Dr Phaichitr Uathavikul.

responsibilities with the Government, including joint investments between the two sectors in the construction of central waste water treatment systems;

- Supporting the participation of the people through creating aware-

ness among young children, youths and the adult population on the importance of conserving natural resources and the environment, combined with providing government support to the private sector; and

- Increasing the country's role in

the global community in contributing towards environmental conservation in order to achieve sustainable and balanced development.

Mr Chuan said the Government

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Measures ready to counter big drought

MEASURES to ensure economical use of water during an expected dry season drought crisis were drawn up by a government committee yesterday.

They include banning use of water from canals under the jurisdiction of the Irrigation Department for golf courses, Government spokesman Abhisit Vejjajiva said.

The water level in reservoirs of the Bhumibol and Sirikit dams is at its lowest for more than 30 years.

● B318m budget for new wells
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The total amount of water behind the two dams at the latest reading on November 14 was only 2,659 million cubic metres which must be reserved for use during the first six months of next year. It is needed for tap water production and agriculture along the Chao Phraya and connected rivers.

A task force centre to coordinate ef-



forts to solve the problem will be set up at Government House. The centre will

be chaired by Pramote Mai-klad, an irrigation specialist.

The Interior Ministry would set up similar units at provincial and district level for the same purpose, Mr Abhisit said.

Savit Bhotivihok of the Prime Minister's Office will chair a public relations sub-committee to campaign for the public to use water economically.

Prime Minister Chuan Leekpai chaired yesterday's meeting attended by representatives of the Agriculture and Cooperatives, Finance, Science, Technology and Environment, Commerce, Industry and Interior ministries, the National Economic and Social Development Board and other agencies.

The Irrigation Department issued two orders under a Royal Irrigation Decree to prohibit use of water from irrigation canals and connected klongs for golf courses.

Violators are subject to a fine of up to 20,000 baht or up to five years' jail or both.

Directors of all irrigation offices and

chiefs of all units for controlling water distribution and maintenance are required to enforce the ban.

The Science, Technology and Environment Ministry is responsible for ensuring factories do not discharge waste water into water resources.

The Agriculture and Cooperatives Ministry will readjust irrigation zones and plan for farmers to grow suitable crops. It will work with the Commerce Ministry.

The Labour and Social Welfare Ministry will work out ways to prevent a migration to Bangkok by farmers and their families who will not be able to work five million rai of unirrigated land spread over 65 provinces.

It will work with the Agriculture and Finance ministries and Budget Bureau to create jobs for farmers in their areas.

Farmers will be allowed to delay loan repayments to the Bank for Agriculture and Agricultural Cooperatives.

Mr Abhisit said the meeting dis-

Continued on page 3

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Action on environment will not occur until it hits 'political agenda'

IN Thailand today, the environmental issue is not yet on the political agenda, and until it is, no action can take place, according to Phaichitr Uathavikul, chairman of the Thailand Environment Institute.

Mr Phaichitr was speaking yesterday at the "Conference on Asia and the Pacific: Merging Business and the Environment" at the Regent Hotel.

Prime Minister Chuan Leekpai, who also addressed the conference, acknowledged the importance of merging business and environmental issues to achieve sustainable development in Asia and the Pacific.

Topics discussed at the conference covered a range of issues about how business, especially in developing countries in the Asia-Pacific region, can best tackle environmental issues.

In his speech entitled "Thailand: Energy and the Environmental Challenge," Mr Phaichitr said a solution must be found in the next 15-20 years that greatly reduces the burning of fossil fuels.

Energy obtained for use in industry through the burning of fossil fuels gives out fumes such as carbon monoxide, which are hazardous to both the environment and health. Industries have become notorious for their

dumping of wastes into rivers and oceans.

In Thailand, fossil fuels constitute 81% of energy consumption and it is predicted that if things continue without any changes, the amount of sulphur dioxide produced here will be over three million tons per year. The amount of other poisonous gases released into the atmosphere will quadruple.

Mr Phaichitr pointed out that the largest users of energy in the country are the transport sector, which relies completely on fossil fuels and was responsible for 31% of the energy used in Thailand last year, and the power and industrial sectors, which also rely heavily on fossil fuels.

In developed countries, there have already been great reductions in energy intensity by industry, but the less-developed countries have by and large failed to make such reductions, Mr Phaichitr said.

In view of the potential threat not only to the lives of Thais today but also to the well-being of future citizens of the country, the time has come for action to ensure a cleaner environment.

Thailand today is not lacking in awareness about environmental issues, nor is it lacking in environment-

friendly policies, although many more are needed. What Thailand does need is the will and the means to implement such policies, he said.

On the matter of creating new policies, there are conflicting social objectives, he noted.

On the one hand, there are those who want cheap energy at any cost; on the other, there are environmental groups and a large percentage of the public who want to conserve the environment. A compromise must be found.

In a country like Thailand, where bureaucratic corruption still exists and the political will on the part of the Government to enforce such measures may be lacking, environmental protection policies will have to be carried out through the implementation of market-based incentive measures such as emission and fuel taxes.

At the end of the day, it is the public which should decide what policies and measures are taken to ensure a cleaner environment, he said.

As yet, the political system in Thailand does not provide a means by which people can voice their opinions directly to politicians, although this should not deter people from making their opinions known to those in power, Mr Phaichitr concluded.

New agency to eye sources for water

THE Government is to form a special organisation to look after water sources and watershed areas, according to Science, Technology and Environment Minister Phisan Moolasartathorn yesterday.

Water is a major concern of the Government and a special organisation is needed to look after problems connected with the conservation and use of water sources, said Mr Phisan after a meeting of economic ministers at Government

House.

He said future reserved watershed areas would be announced in provinces such as Chaiyaphum, Phetchabun, Khon Kaen, Chiang Mai and Surat Thani. Provincial authorities will also have to help look after water sources.

The pollution of the Chao Phraya, the country's main river, will be considered in detail at a later meeting but it is possible a Chao Phraya River Authority may be formed to tackle this task.

Dept bans passage through watergates

THE Irrigation Department has suspended boat traffic through various watergates on the Chao Phraya, Tha Chin and Noy rivers from yesterday owing to the low water level in the rivers.

The announcement, signed by department Deputy Director-General Kijja Polpasi, said the boat traffic suspension

would apply until the water level returned to normal.

The suspension of boat traffic resulted from the extremely low level of water behind the Bhumibol and Sirikit dams.

No water would be released from the dams for boat traffic, the department said.

1,150 reservoirs planned to help counter drought

A TOTAL of 1,150 reservoirs each capable of holding between 3,000 and 5,000 cubic metres of water and costing in all about 600 million baht will be built for farmers this fiscal year to ease drought problems, according to Sithilarp Vasu-it, chief of the Land Development Department.

He said Agriculture Minister Nipon Promphan had assigned the department to join other agencies to help improve soil and water quality to increase farm productivity.

As the drought becomes more severe, the department will focus on constructing small reservoirs to meet immediate water needs.

The department originally planned to build only 150 reservoirs costing in all 450 million baht. Mr Nipon increased the budget to 600 million baht to increase the number.

Nine provinces in the lower North are stepping up measures to cope with drought and its consequences, especially those stemming from drought, Interior Permanent Secretary Aree Wong-araya said yesterday.

During a meeting of the governors of lower northern provinces, Mr Aree discussed the impact

of drought expected to occur in summer because the water level behind dams is lower than usual.

A short-term plan emphasising control of water use suggests farmers in the nine provinces avoid planting a second rice crop. They should turn instead to fast-growing crops such as soybean and corn, which need little water but yield high profits.

To save water for domestic use, Mr Aree told the nine governors to work out plans to dredge waterways, dig more wells and make trucks ready to carry water to areas short of water.

State agencies in the provinces are also required to prepare work for local people to prevent them from migrating to Bangkok to find work.

The governors were told to work out plans to counter crimes that might result from hardship caused by drought.

Paed Rew district in Chachoengsao province is geared up to counter a serious water shortage.

Chachoengsao Governor Thirawat Kullawan-ich said yesterday that measures to conserve water were needed because less water could be taken from the Chao Phya River for irrigation.

Inflow of sea water threatens crops

ABOUT 300 million cubic metres of fresh water is needed to push back sea water flowing into the Chao Phraya River to prevent damage to crops, Secretary-General to the Prime Minister Tawat Wichaidit said yesterday.

Mr Tawat, without saying how the water would be procured, said the sea water problem was worrisome as the water has a salt content of about seven grammes per litre.

Crops cannot survive if the salt level is more than two grammes per litre, he said.

Sea water has reportedly reached the Memorial Bridge and Mr Tawat said it was necessary to prevent it flowing further up the river.

Mr Tawat also said another 1,200 million cubic metres of water was needed for agriculture.

The water level in Bhumibol Dam has dropped to about 1,209 million cubic metres while the level behind the Sirikit Dam has been recorded at 980 million cubic metres, said to be the lowest in decades.

Mr Tawat said the Government had prepared measures to solve water shortages including the procurement of 500 million cubic metres of water for tap water production, the launch of water-saving campaigns, the pumping of water for dry areas and the generation of jobs in rural areas.

The Government has allocated 500 million baht for the digging of ponds in drought-stricken areas and has ordered the Commerce and Agriculture and Cooperatives ministries to help guarantee crop prices for farmers.

Mr Tawat said an ad hoc centre to solve drought problems had also been set up at Government House. The centre is chaired by Pramote Maiklad, the Royal Irrigation Department's senior operations and maintenance expert.

He denied rumours water rates would be increased in the wake of water shortages.

Plants warned over pollution

THE Industrial Works Department says it will get tough with factories located near public waterways if they pollute the water when levels start to drop.

Officials have been ordered to keep a close watch on factories located close to rivers or canals. If they violate regulations they will be ordered shut immediately, said Director General Manas Suksamarn.

There is also concern that water levels may be so low that even treated waste water discharged by some factories may not be safely absorbed.

In those cases case, Mr Manas said the department would seek cooperation from factories to suspend production temporarily, as Phoenix Pulp and Paper Co. did because of low levels in the Pong River.

The Harbour Department has sued 39 factories for polluting the Chao Phraya River.

The case stems from a different standard for waste water discharged into public waterways. The Industrial Works, Harbour and Environment Protection departments plan to work on a uniform standard.

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King wants two dams

day "but probably an average of 20 litres of water per person per day."

"Some may be able to make it. Some are already using 20 litres of water a day, but they are special people," said His Majesty.

The King further told the audience that he might again make the same complaint on the same occasion six years from now if the dam projects were still not yet a reality.

"But I might not be able to complain too much because we are suffering as there is no water," said His Majesty, adding that he would feel happy as well as the Thai people if his wish became a reality.

Construction of the two dams, said His Majesty, could be completed in four years, if work was speeded up.

The reservoir to be created behind the dam in Nakhon Nayok would be able to store up to 250 million cubic metres of water. The dam itself would stand 70 metres tall and the water in the reservoir would flood the existing weir at Ban Tha Dan.

His Majesty said he believed the water catchment area would store enough water up to its capacity because there is more rain in this area than in the North. He noted also that artificial rain-making there was more convenient than in the North.

His Majesty dismissed the notion that royally-sponsored projects were untouchable. "This is a wrong perception," he said, adding that if his projects were untouchable, then the country would go backward.

He said he would grant permission for the dismantling of the weir at Ban Tha Dan, which is a royal project, in order that a dam could be built to store more water and, at the same time, to help prevent floods. The dam, he added, will be able to irrigate up to 100,000 rai of arable land.

His Majesty explained that having sufficient water means enough water for household use, agriculture and industrial use. Without water or with insufficient water, progress will slow down or grind to a stop, he said.

He said that people in general tend to be optimistic. Some Thai people think the country is prospering economically while others feel it is going backward, he added.

He recommended caution and reminded people in authority not to ignore the basic needs of the people. Industrialists are ordinary human beings like the prime minister and other people who sometimes feel happy and sometimes feel pain, he added.

Touching on floods, His Majesty said he had not intended to discuss the problem had it not been for Mother Nature which caused the recent floods in the South. He added that dams would help regulate water flow and alleviate flood problems.

His Majesty told the audience that the water supply in Bangkok did not only come from Bhumibol and Sirikit dams. Water, said the King, also comes from other sources.

He said water in the Chao Phraya River has never dried up even though water was not released from Bhumibol and Sirikit dams because water came from several other sources.

Logging, said His Majesty, is not the only cause of water scarcity. It is just one of several causes, he added.

Referring to the royal artificial rain-making fleet, he said there are only two planes in the fleet and, sometimes, one of them could not fly and had to be repaired. He added that pilots also had to risk their lives if the planes were not in good working condition.

Artificial rain-making could not achieve its target because there are not enough planes, he said, adding that the planes are expensive.

On Bangkok traffic, His Majesty said that the problem seemed to get worse even though more efforts were exerted to tackle it. He noted, however, that this was normal, adding that if the problem was not attended to, more would crop up to the extent that it was insoluble.

He stressed the need to tackle the immediate problems, otherwise long-term problems would never be solved.

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APPENDIX 3
ITINERARY

**TWINNING PROJECT
BETWEEN
METROPOLITAN WATERWORKS AUTHORITY, BANGKOK, THAILAND
AND
EAST BAY MUNICIPAL UTILITIES DISTRICT, OAKLAND, CALIFORNIA**

ITINERARY

Day 1 - November 29

- 8:00 - 9:00 Visit USAID, Bangkok Office
- 9:30 - 10:00 Courtesy call to the Governor of MWA
(Board Meeting Room)
- 10:00 - 12:00 General Overview of Organizations
(Board Meeting Room)
- 12:00 - 1:30 Lunch
- 1:30 - 2:00 Review Itinerary and Key Issues
(Board Room)
- 2:00 - 4:30 Tour Water Treatment Plant
(Bangkhen Treatment Plant)
- 7:00 Dinner at Sukhothai Hotel
(Host by the Governor of MWA)

Day 2 - November 30

- 8:30 - 12:00 Water losses
(Deputy Governor Planning & Development Room)
- 11:45 Recongnition at Board of Directors Meeting
- 12:00 - 1:30 Lunch with Board members
(Board Room)
- 1:30 - 2:30 Organization/Institutional Strategies and Operation
(Seminar Room, 1204, NWTTI)
- 2:30 - 4:30 Training and Technology improvement
(Seminar Room, 1204, NWTTI)
- 6:30 Dinner
(Host by the Deputy Governor of MWA, Services I)

Day 3 - December 1

- 8:30 - 10:00 Customer Services
(Bangkhen Branch Office)
- 10:00 - 12:00 Capital Improvement Planning
(Bangkhen Branch Office)
- 12:00 - 1:30 Lunch
- 1:30 - 4:30 Study tour
(Raw Water Resources for West Bank Project)
- 6:30 Dinner
(Host by the Deputy Governor of MWA, Planning & Development)

Day 4 - December 2

- 8:00 - 7:00 Tour Upcountry
(Bhumipol Dam and Sukhothai Ancient Capital)

Day 5 - December 3

- 8:30 - 10:00 Raw Water Resources
Water conservation, reclamation and Public Relation
(Bangkhen Treatment Plant)
- 10:00 - 12:00 Computer Systems
(Department of Computer)
- 12:00 - 1:30 Lunch
- 1:30 - 4:30 Wrap up
- 7:00 Farewell Party
(Host by the Governor of MWA)

APPENDIX 4
LIST OF DOCUMENTS
RECEIVED

List of Documents Received

Documents received are described by the title of the document or, when no title is present, by description of the contents of the document. Following the description is the agency responsible for publication and the number of pages in the document. Mr. Curtis Borden of U.S. AID received copies of all documents listed below during the Twinning Project meetings in Thailand.

- *Water Treatment Process brochure, MWA, 1 page*
- *Bangkhon Branch Office Organization and Highlights fact sheets, MWA, 4 pages*
- *Human Resources Development Office fact sheets, MWA, 5 pages*
- *Major Development Project List, MWA, 5 pages*
- *Third Program schedule and itemized costs, MWA, 2 pages*
- *Fourth Bangkok Water Supply Project brochure, MWA, 1 page*
- *Fifth Bangkok Water Supply Improvement Project brochure, MWA, 1 page*
- *Water Conservation tips, MWA, 1 page*
- *Water Loss Reduction Program information, MWA, 3 pages*
- *Computer Department organization and functions, MWA, 31 pages*
- *National Waterworks Technology Training Institute brochure (NWTTI), NWTTI, 8 pages*
- *Bhumibol Dam and Hydro Power Plant brochure, Electricity Generating Authority of Thailand (EGAT), 1 page*
- *EGAT 1992-1993 report, EGAT, 20 pages*
- *Bhumibol Hydro Power Plant Renovation Project Units 1 & 2, EGAT, 8 pages*

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