



Bangkok Metropolitan Immediate Water Improvement Program

CHAKRIT NORANITIPADUNGKARN

**EAST-WEST CENTER
EAST-WEST TECHNOLOGY AND DEVELOPMENT INSTITUTE
HONOLULU, HAWAII**

BANGKOK METROPOLITAN IMMEDIATE WATER
IMPROVEMENT PROGRAM

by

CHAKRIT NORANITIPADUNGKARN

National Institute of
Development Administration

Bangkok, Thailand

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ABSTRACT

Bangkok's water supply system in the 1960's suffered from chronic shortages and service failures owing to rapid urban growth, limited resources, deficient technology, and faulty administration. Remedial action by the Government established the Bangkok Metropolitan Water Works Authority (MWWA) and brought in a consultant engineering firm to conduct surveys and draw up plans both for immediate water improvement and for long-term modification of management and physical infrastructure toward ensuring a more satisfactory MWWA operation. This case study describes planning and implementation of the immediate improvement program from 1969 to 1972.

This was an interim undertaking during a crisis situation to gain time for planning a more permanent program for the entire metropolitan area. It consisted of four independent projects to increase water resources, to repair the pipeline system for greater water conservation, and to overhaul the metering system for better monitoring of water consumption and collection of consumer service charges. Outside consultant and construction firms were called in to offset MWWA's lack of expertise and resources. The changes introduced by the program were more technological than behavioral or attitudinal, although MWWA was reorganized in critical areas of its regular operation. The program was well supported morally and financially by the National Government.

The public water system did improve as a result, but it took longer to accomplish than was expected. Planning consultants counted too much on the organizational capacity of MWWA, and certain physical problems cropped up during field operations that were not anticipated in preliminary surveys. The whole experience demonstrated that flexibility is the key to resolving the differences which inevitably arise between planning and implementation.

THE AUTHOR

Dr. Chakrit Noranitipadungkarn is Professor of Development Administration and former Director of the Research Centre, National Institute of Development Administration (NIDA) in Bangkok, Thailand. He finished his LL. B. and M. P. A. degrees at Thammasat University, and his Ph. D. in Public and International Affairs at the University of Pittsburgh. He was formerly editor of the Thai Journal of Development Administration, and was appointed in 1973 as a member of the Committee on Local Government Development of the Prime Minister's Advisory Council. He has published a number of articles, reports, and monographs on public administration and urban development in Thailand. He served as a Professional Associate in the Technology and Development Institute, East-West Center, in July 1976.

THE SERIES EDITOR

Dr. Leonard Mason, Professor Emeritus in Anthropology at the University of Hawaii, was Senior Fellow at the East-West Technology and Development Institute in 1976-1977.

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TABLE OF CONTENTS

Title Page	i
Abstract	ii
Table of Contents	v
List of Figures	vii
List of Tables	viii
Series Preface	ix
Introduction	1
Growth of Metropolitan Bangkok	2
Bangkok Water Supply Administration	4
Chapter I. Identification and Definition of Program Goals	7
<u>Ad Hoc</u> Committee on Bangkok Water Works Improvement	8
Consultant Survey and Preliminary Report and Recommendations	10
Chapter II. Preparation and Design of Project Activities	17
Increased Production of Groundwater	18
Increased Production of Surface Water	19

Detection and Repair of Pipeline Damage	21
Repair or Replacement of Defective Meters	21
Chapter III. Project Approval and Activation	27
Project Review and Approval	27
Project Activation and Organization	29
Chapter IV. Implementation and Control Procedures	35
Organizational Changes Within the Metropolitan Water Works Authority	35
Monitoring of Work Performance	38
Chapter V. Project Completion and Evaluation	41
Transition to Normal Operations	44
Chapter VI. Summary and Conclusions	47
An Interim Program to Gain Time	47
A Program of Separate Projects	47
A Test of Management Capacity	48
Recourse to Outside Assistance	49
Benefits of Strong Government Support	49
Emphasis on Physical, not Social, Development	50
Organizational Changes to Aid Implementation	50
Good Planning Means Flexibility	51

LIST OF FIGURES

FIGURE 1.	Organization of the Metropolitan Water Works Authority, 1967-1969	22
FIGURE 2.	Reorganization of the Metropolitan Water Works Authority, 1969	23
FIGURE 3.	Lines of Authority and Transmittal for Project Review and Approval, 1969	28
FIGURE 4.	<u>Ad Hoc</u> Organization for Water Meter Repair or Replacement	33

LIST OF TABLES

TABLE I.	Project Activities and Production Targets, Immediate Water Improvement Program, 1969-1970	14
TABLE II.	Estimated Investment Costs, Immediate Water Improvement Program, 1969-1970	15
TABLE III.	Estimated and Actually Completed Work Schedules, Immediate Water Improvement Program, 1969-1972	42

SERIES PREFACE

The need for more effective project planning and management is emerging as a critical function in both public and private sectors in all countries. Vast resources are channeled into development projects, but the lack of viable policies coupled with poor management results in a waste of valuable resources--human, financial, and natural--in both highly industrialized and rural societies. Experience indicates that attempts to accelerate economic and social growth have often floundered due to serious problems with project planning and implementation. Experience further demonstrates that traditional (Western) project management training programs are too narrow and segmented, are not meeting needs, and often result in costly mistakes in the United States as well as in other countries. A review of educational and training programs of a number of universities in the United States and Asia as well as of international funding agencies demonstrates the fragmented nature of existing project management educational programs. There is pressing need to develop a new program which considers the entire project cycle as an integrated process.

Given this challenge, the Technology and Development Institute (TDI), with its unique East-West partnership relationships, has formulated plans for cooperative research to develop an innovative and comprehensive approach to project management education and training. The project focuses on serious (and costly) management difficulties in the United States and the nations of Asia and the Pacific in view of their common problems rooted in mutual concerns and resulting in similar consequences. The basic approach is to develop a new prototype curriculum for educating and training project managers to understand the entire project cycle as a basis for expediting the necessary decision-making to successfully implement development projects for any sector of the economy or society. It will also attempt to broaden the perspectives of international assistance policy-makers, national policy-makers, local planners, and project implementers in understanding the relationships between national goals and local project requirements. The curriculum will be founded on a balanced

combination of lectures, group discussions, seminars, management game exercises, and case study analyses, with sufficient flexibility to be adapted to the needs of training institutions in different national and cultural settings in Asia, the Pacific and the United States.

Basic to the curriculum is this series of case studies, covering agricultural, industrial, public works, and social sectors. These case studies were initiated early in the calendar year 1976. Participants from Korea, New Zealand, Philippines, Thailand, Taiwan, Malaysia, Indonesia, Iran, and the United States conducted the necessary field research as a basis for writing case study analyses of development projects in the context of an integrated project cycle. Each of the participants then came to the Institute to spend approximately one month to finalize the draft of his particular report. It is anticipated that between ten and fifteen case studies will be completed in this prototype series. The initial group includes such case studies as:

- (1) Korean National Family Planning Program,
- (2) Bangkok Metropolitan Immediate Water Improvement Program,
- (3) Laguna Rural Social Development Project (Philippines),
- (4) Pacific Islands Livestock Development, and
- (5) Community Development Project (Hawaii).

The case studies will be used extensively as a learning tool to provide relevance, practicability, and reality to both classroom discussions and the follow-up field practicum.

Case study research has been in widespread use throughout the world for many years in medical and law schools. This method of instruction has become increasingly popular in recent years in schools of business and public administration, followed more recently by schools of engineering. However, the Institute's case study approach is innovative in that it represents the first attempt to write a series of case studies based on a shared conceptualization of the project cycle as an integrated process. Carefully documented and readable case studies comprehending the entire project cycle will

prove to be extremely useful learning devices in both training and formal education programs. Each case study in this series has been developed in accordance with guidelines prepared by Dr. Dennis A. Rondinelli, (Director, Urban and Regional Planning Program, Maxwell School, Syracuse University) during his tenure as Senior Fellow at the East-West Center in 1975-76. Dr. Rondinelli's paper, "Preparing and Analyzing Case Studies in Development Project Management," is included in the series for this reason. It is necessary to note that all projects do not necessarily evolve through an identical sequence of stages in the project cycle. Rondinelli stressed this important point, and each author has been allowed flexibility in his overview of a project's history within the scope of the idealized project cycle.

This case study series is an appropriate example of the Institute's attempt to achieve the Center's goals of better relations and understanding on economic and social development problems of mutual concern to all countries, East and West, through cooperative research, study, and training activities. In this context, special thanks are conveyed to the authors of the case studies, and to their respective institutions for the splendid cooperation received. Particular acknowledgement is due to former Senior Fellow Dennis Rondinelli for his contribution in formulating the guidelines for the case writers. Acknowledgement is also due Senior Fellow Leonard Mason for his untiring efforts in final editing.

Louis J. Goodman
Acting Director,
East-West Technology
and Development
Institute

INTRODUCTION¹

Water is a necessity of life. Not only do humans rely on it regularly for drinking, but also they use it for washing, cleaning, bathing, and other essential purposes. In the more populated areas, any natural source of available water is usually insufficient, and it becomes the responsibility of the governing authority by one means or another to meet additional water requirements through planned development. Perhaps the most satisfactory solution is by way of a pipeline system which transfers sanitized water from a treatment plant to each customer located in the area.

The provision of water to any highly urbanized area needs careful planning and effective administration, because it involves construction and maintenance of extensive water works, integration of several technical systems, accommodation to different categories of users, and distribution over a vast expanse of territory. To insure an acceptable,

¹This case study has been adapted by the author, with the publisher's permission, from his "Bangkok's Metropolitan Immediate Water Improvement Program," which appears as Chapter 8 (pp. 201-230) in Gabriel U. Iglesias (editor), Implementation: The Problem of Achieving Results (Manila: Eastern Regional Organization for Public Administration [EROPA], 1976).

The author wishes to thank both the former and the present managing directors of the Bangkok Metropolitan Water Works Authority, Mr. Chamras Chaya-pong and Mr. Kachok Suppakit-Lekhakarn respectively, for kindly allowing the author to search the Authority's records for factual documentation. Appreciation is also due to the heads of the Engineering Department's Research, Planning, and Water Meter Divisions who provided relevant information and ideas.

sufficient, and timely output, which consumers can hardly do without, requires considerable engineering and public health skills and complex organizational and procedural arrangements. Should the water delivery system fail, it will cause immediate hardship to countless metropolitan residents who then will usually blame the administration for being incapable and inefficient.

The case of Bangkok's water supply from 1960 to 1970 presents a dramatic example of the difficulties noted above. The city's inhabitants suffered from chronic shortages and service inadequacies, which were due to faulty administration and to delays in enlarging the water supply capacity sufficiently to cope with rapid urban growth and constantly rising demands. Eventually, in 1966, a continuing effort to establish some order began with the conception of several remedial measures.

This case study will explore how the interim water improvement program² of 1969-1970, which was but one aspect of the total effort, was planned and implemented to fill the immediately critical vacuum until a more satisfactory long-term scheme could be prepared and carried out.

Growth of Metropolitan Bangkok

The city of Bangkok is the capital of Thailand. Its growth in the past, especially after the Second World War, has been tremendous both in absolute rate of expansion and by comparison with the rest of the country. In 1945, the population of Bangkok was approximately 0.7 million. This increased to 1.4 million in 1960, to 1.9 million in 1965, and to 2.3

²A program is here considered as comprising several inter-related projects. Each project may further consist of one or several activities.

million in 1970.³ The municipal area expanded from some 50 square kilometers in 1945 to about 240 square kilometers in 1970.⁴ Still there could be found clusters of housing projects growing farther out on the city's fringes which in the near future would be linked with the already congested urban center. The average annual rate of population growth during 1960-1969 for the whole Thai Kingdom was 3.1 percent, compared with 5.2 percent for Bangkok itself and 6.2 percent for the entire Bangkok metropolitan area.⁵

Such growth in numbers had resulted in large part from expanding employment, educational opportunity, and an increasingly active tourist industry. The rise in population was due both to new births in Bangkok and to immigration from the countryside and from small towns. Foreigners also contributed notably to the urban spread though on a much smaller scale. For a time, in 1965-1972, certain parts of the city constituted a rest and recreation destination for countless American G.I.'s.

Physical expansion was both vertical and horizontal. New high-rise commercial, office, and hotel buildings and shopping center complexes were more generally located in the city's inner circle. Public and private housing units, or packaged developments, and associated small shops were concentrated off the main roads and in outlying areas. On the other hand, some blighted areas could be found in both the inner

³Official files, Division of Registration and Statistics, Bureau of the Under-Secretary of State for Bangkok Metropolis, Bangkok Metropolitan Administration.

⁴Idem.

⁵Jeff Romm, Urbanization in Thailand, (New York: Ford Foundation, 1972), p. 10.

city and the suburbs on land developed insufficiently or not at all by the owners.

Owing to ineffective and unsatisfactory city planning, it was not only that zoning guidelines were lacking but road systems were also inadequate. Many roads and highways were substandard and poorly designed. Streets were often very narrow and without sidewalks. Surfaces of the main arterials were paved with reinforced concrete, but this made it difficult to install new service facilities. Utility poles and lines along main and secondary roads had already multiplied both above and below ground so that added facilities had to be compressed into the limited space normally reserved for walkways.

Major problems of the Bangkok metropolitan area had similar physical, economic, and social aspects as are usually suffered by other large cities. These included traffic congestion, overcrowded and unsanitary slums, pollution, flooding, robbery and other misdeeds, as well as inadequate public utilities, among the most critical of which was water supply.

Bangkok was governed as a municipality, but several other government organizations and public enterprises shared responsibility for providing local services to the people. Electric, telephone, and water services were maintained by public enterprises. Law and order, fire protection, local bus transportation, health services, and higher education were administered by central government agencies. Each operated quite independently of the others. Coordination, whenever it did occur, could be expected to be difficult. There never was any master plan for Bangkok that might reasonably have been accepted by all of these varied organizations.

Bangkok Water Supply Administration

The introduction of a public water supply administration in Bangkok took place in 1914. The government, upon advice from the foreign adviser, first entered this field by constructing a small water

treatment plant in Bangkok and a transmission canal from a tributary of the main river Chao Phraya, some twenty-six kilometers north of the city. New treatment plants were added as the city grew. After the Second World War, the Bangkok Water Works Authority shifted its attention to construction of deep water wells in various parts of the city. A single deep well had only a limited output, but wells had the advantage of being located closer to the client-users. However, the lack of any long-term or comprehensive planning for a full decade made it difficult, even impossible, for the administration to keep up with consumer demands.

A major development was attempted in 1960 when, under the government of Thai military strongman Field Marshall Sarit Thanarat, the Bangkok Water Works Authority was granted support to improve the water canal and to construct additional treatment plants and major service lines to serve both old and newer populated areas. A French construction firm was awarded a turn-key type of project to construct all that was necessary as determined by the firm's survey. Although more water did become available, this still did not meet popular expectations. Accusations of corruption were made against high officials in the government because the contract had not been reviewed by the Ministry of Finance. The construction costs were too high. It took the contracting firm too long to finish the job. Such considerations as these provoked mounting dissatisfaction among Bangkok residents. They also raised doubts about the Water Works Authority's control over the contractors that would allow the latter to work in such a leisurely manner.

Historically, there have been several changes in the organizational placement of the Bangkok water supply administration. It was first set up as a Water Works Unit in the Sanitation Department of the Ministry of Metropolitan Administration. When that Ministry was abolished four decades ago, Bangkok Water Works became a division in the Public and Municipal Works Department (PMWD) of the Ministry of Interior. Later

the Bangkok Municipality, when it was established in 1939, assumed supervision of that division. In 1952, the Ministry of the Interior, considering the administration of water supply at that time to be unsatisfactory, requested return of the division to PMWD. And there it remained for the next fifteen years until it was transformed into a public enterprise. In 1967 the four waterworks systems then serving the four contiguous cities of the Greater Bangkok area--Bangkok, Thonburi, Nonthaburi, and Samutprakarn, were consolidated in order to reduce cost and to increase efficient operation. The reorganized agency was named the Bangkok Metropolitan Water Works Authority (MWWA) and continued to be attached to the Ministry of the Interior.⁶

⁶Metropolitan Water Works Authority Act B. E. 2510, Royal Gazette, Vol. LXXXIV, Section 75, August 15, 1967.

CHAPTER I

IDENTIFICATION AND DEFINITION OF PROGRAM GOALS

At the height of the water crisis in 1967, it was estimated that the Metropolitan Water Works Authority (MWWA) was producing about 897,000 cubic meters of water per day in Bangkok-Thonburi. This was scarcely enough for the 205,700 metered clients, figured on a minimum daily requirement of 4.38 cubic meters per client per day (1,600 cubic meters per client per year). Thus, it was quite natural that consumers felt compelled to scramble for whatever water was available. Because only few drops of water ordinarily reached the end of service lines in the daytime owing to heavier use, many residents would rouse themselves during the night to draw off enough water for next day's use. At commercial places and some residences, it was not uncommon for owners to install water pumps illegally in their bid for a greater and more regular supply of water. Although MWWA continued to approve the installation of water pipes to new buildings, some new housing areas were left without service because development investment funds were not sufficient to complete the job.

Complaints from users and non-users alike were voiced constantly in the city's daily and weekly newspapers, demanding either new services or a cleaner, more dependable, and sufficient water supply. Many of these protests were forwarded to politicians and to the Ministry of the Interior, as well as to MWWA itself. The public was not generally aware that MWWA was just then constructing more water wells intended to augment the supply. However, such an increase would still fail to meet the mounting demand. Clients expressed their frustration and disappointment in whatever ways they thought might compel more serious attention by the authorities. The language they used in these communications ranged from gently phrased

petitions and suggestions to emotional outbursts couched in harsh and mean language. They even resorted to prayers for help in the distressing situation.

There were three principal reasons for the delay in a decision for an effective course of remedial action. Firstly, officials were not confident about obtaining funds to support any new projects of major scale. The Bangkok Water Works Authority had only recently been discredited by its association with a much-criticized water development project in which corrupt practices and inefficiency had been charged. Secondly, MWWA authorities were worried that the public would promptly suspect anyone who proposed a new plan as being motivated by self-interest to try once more to make some personal gain from it. Thirdly, decisive action on any proposal would depend on the Minister of the Interior who, a strong man of the country, would have to be convinced of the fitness of the project. But, most important of all, there was an urgent need to devise a more suitable organization and better management practices to overcome the many problems associated with supplying water in the Greater Bangkok area. Those who could no longer tolerate delay included other officials, businessmen, and the people of Bangkok generally. But all of these were seemingly left with no recourse but to rely upon the government service that was charged with responsibility for handling the water crisis.

Ad Hoc Committee on Bangkok Water Works Improvement

Earlier, in 1966, the Cabinet under Marshall Thanom Kittikachorn had decided to take steps toward certain reforms in the capital city. The initiative to do something about the water supply came from the National Economic Development Board (NEDB),⁷ a

⁷The name was later changed to National Economic and Social Development Board (NESDB).

central planning agency of the government. Members of NEDB were convinced that no more time should be lost in expanding and improving the several water systems in the metropolitan area. An ad hoc Committee on Bangkok Water Works Improvement was proposed, and this action was endorsed by the Cabinet, the highest decision-making group in the nation. The Committee was composed of the Deputy Secretary-General of NEDB, as chairman, and representatives from the Bangkok Water Works Authority, the Public and Municipal Works Department, the Ministry of the Interior, the Budget Bureau, and NEDB. Its terms of reference were to suggest improvement measures and to plan for the future.

The Committee's first recommendation was to reorganize the agencies that were then providing water to the metropolitan area. These were the four water-works systems that served the four neighboring cities of Greater Bangkok, i.e., Bangkok, Thonburi, Nonthaburi, and Samutprakarn. The Cabinet agreed to the Committee's proposal and, as noted above in the Introduction, the Bangkok Metropolitan Water Works Authority (MWWA) came into being under the direction of the Ministry of the Interior.

Another assignment the Committee had accepted was to determine the type of studies necessary to formulate specific recommendations for improving the water supply itself. The Committee intended to approach the entire matter quite scientifically. Its members, lacking the requisite knowledge and expertise themselves, agreed to recruit an engineering firm judged to be most suitable for conducting a thorough survey and preparing a master plan for both management and technical improvements in the MWWA operation. It was the Committee's firm conviction that only by this strategy could supplies of water to the metropolitan area in the future be made sufficient and uninterrupted.

With the Cabinet's approval, the Committee circulated worldwide an announcement relative to its search for a firm of consulting engineers. A lengthy series of screening sessions were undertaken by the Committee in 1967-1968 to select the most able of some fifty-two firms from twelve countries which had applied

for the job. Camp, Dresser and McKee, of the United States, was finally chosen on the grounds that its time and cost estimates were the most reasonable and that it offered the most favorable conditions regarding experience and past performance, availability of skilled company personnel and co-partner specialist firms, and a convincing tentative plan of operations. After the necessary negotiations, the Committee signed a contract with the American company to carry out its mandate.

However, this process of evaluation and approval took several months, and many more months would be needed to get the new action moving. Under the circumstances, local consumer demand continued to exceed available water supplies, and the critical gap became even greater. The problem was obviously felt much more keenly than it had been, judging by the intensification of telephoned complaints to the authorities concerned. This greatly aggravated situation almost automatically forced the Committee members to the realization that some intermediate plan was needed to provide the maximum amount of water in the shortest time possible. Such an intermediate proposal must be consistent with the more fundamental long-range plan. In the Committee's view, the two together could best be designed by one well-equipped and intensely involved consultant firm of engineers. Even though additional expense would have to be borne in developing the intermediate plan, the emergency situation fully justified it.

Consultant Survey and Preliminary Report and Recommendations

Camp, Dresser and McKee accepted the job and began work in June 1968. After seven months spent in an extensive study of various possibilities, the consulting firm presented the Committee with a preliminary report⁸ which included a package of

⁸Camp, Dresser and McKee, "Preliminary Report on Water Supply and Distribution," February 1969.

recommendations as emergency measures to meet the minimum water requirements for the metropolitan area projected to the year 1975. This was a proposal for a so-called Immediate Water Improvement Program (which is the principal focus of this case study) for work activities to be completed within the two fiscal years of 1969-1970. The governing criteria used in formulating these recommendations were that a maximum increase in water supply must be developed in the shortest possible time, with the least investment cost, and with minimum disruption of existing operations.

The Committee appraised the report and indicated its satisfaction with the recommendations. The report was forwarded with Committee endorsement to the Governing Board of the Metropolitan Water Works Authority. It was expected that the Board would accept the recommendations, not only because these were based on a detailed feasibility study by experts, but also because the Cabinet-endorsed Committee had indicated its full support in obtaining the necessary government subsidy to implement the program.

The Board, which had full authority to initiate new programs, agreed to go ahead with the proposal. The Immediate Water Improvement Program, as recommended, consisted of four major projects, or activities, designed to meet the stated goal. For each project, specific targets were identified, costs were estimated, time schedules were set, and details of needed improvements were set forth. The MWWA administration would bear responsibility for working out further details and procedures as the projects were implemented. The four major projects are outlined below.

Project 1: improvement of the surface water transmission canal and water treatment plants. Both banks of the main canal would be raised one meter. In each of the ten existing treatment plants in Bangkok, a new water tank, larger in size, would be constructed, and pipelines, valves, and other accessories would be replaced as needed.

Project 2: increase of groundwater production by additional deep wells and shallow aquifers. The latter would cost less than the deep wells but the

quality of water would not be as good although it should meet standards for treatment at the Thonburi plant then operating at only half capacity. The shallow aquifer alternative would require further testing.

Project 3: repair of leaking pipelines for water conservation. New work units would have to be organized to survey the full extent and nature of leakage. Necessary equipment would be purchased and personnel would be recruited and trained to carry out this work for the entire metropolitan area. This activity would be critical for remedying the existing situation, but it would also have to be continued on a permanent basis as part of the long-range master plan.

Project 4: repair, or replacement, of the large number of non-functioning water meters discovered in the firm's preliminary survey. A problem-oriented task unit would need to be created to complete this work within the two-year duration of the improvement program. The existing Water Meter Division would bear responsibility only for the installation of new meters.

In 1968, two-thirds of the water produced in Bangkok-Thonburi (598,000 cubic meters per day) was surface water, mainly river water transmitted by canal from north of the city. This was treated at ten plants in Bangkok and one in Thonburi. The consulting firm suggested that more raw water could be treated in Bangkok if all ten plants, or at least nine of them, were modified. However, any such increase would still fail to meet the ever-rising demand. It would be necessary to continue to rely on supplemental groundwater sources. The latter were the only potentially available water that could be tapped in the short period of two years called for in the improvement program. Groundwater sources already accounted for one-third of the supply provided in Bangkok and Thonburi and for all of the municipal water used in Nonthaburi and Sumatprakarn. The problems faced in the last two areas, which were geographically separate from Bangkok-Thonburi, would be approached by another program.

According to the consulting firm's survey, 65 percent of the water consumed in Bangkok and 80 percent in Thonburi could not be accounted for. As already noted, a large number of water meters were defective. Many of these had been rendered inoperative intentionally by building occupants. Consequently, customers were often tempted to use more water than needed when they did not have to pay for all of the water they consumed. The consulting firm during its survey could find no meters at many clients' places, and illegal connections were detected in many other locations. Furthermore, the system for collecting water fees was recognized as obsolete and inefficient. The Metropolitan Water Works Authority admittedly lacked enough staff to check out illegal situations or to file court suits against consumers for non-payment of bills. Chronic leakage from the poorly maintained distribution system reduced still further the volume of water available to metropolitan users.

The consulting firm calculated that implementation of its recommendations would produce an additional 362,000 cubic meters of water per day, an increase of about 40 percent. A further increase, though more difficult to calculate, would benefit clients through the planned reduction of waste in the main distribution system. According to the firm's estimates, the total program for immediate water improvement could be achieved at a minimum cost of 92,600,000 baht, and the work could be completed within two years. Details of the recommended targets and required fiscal allocations are presented in Tables I and II respectively.

TABLE I

Project Activities and Production Targets,
Immediate Water Improvement Program, 1969-1970

Project No.	Project Activity	Targeted Production Increase	Existing Production Capacity
1	Increased production of raw surface water (transmission canal and treatment plants)	145,000 cmd*	598,000 cmd
2	Increased production of ground-water from (a) deep wells (b) shallow aquifers (water to be treated at Thonburi plant)	131,000 cmd 86,000 cmd	} 299,000 cmd
		(362,000 cmd)	
3	Detection of leaks and repair of distribution pipelines	99.7 percent (of entire system)	0.3 percent** (pilot tested)
4	Repair or replacement of defective water meters	120,000 units	165,000 units (considered in good condition)

*Cmd = cubic meters of water per day. This figure was for improving nine water treatment plants, but MWWA later decided to improve all ten plants, and raised the new water target to 168,000 cmd.

**Pitometer Associates surveyed 0.3 percent of the entire system as a pilot test.

TABLE II

Estimated Investment Costs,
Immediate Water Improvement Program, 1969-1970

Project No.	Total Estimated Cost (in <u>baht</u>)*	Fiscal Year** 1969	Fiscal Year 1970
1 (surface water)	31,000,000	8,500,000	22,500,000
2 (groundwater)	19,500,000	4,500,000	15,000,000
3 (leakage repair)	8,900,000	8,900,000***	---
4 (meter repair)	33,200,000	18,100,000	15,100,000
Total	92,600,000	40,000,000	52,600,000

* Twenty baht = approximately US\$1.00

** The Fiscal Year is from October through September of the following year.

*** Establishing detection and repair work units and acquiring essential equipment would be completed in Fiscal Year 1969. Thereafter, maintenance would have to be provided for in the regular budget.

CHAPTER II

PREPARATION AND DESIGN OF PROJECT ACTIVITIES

The Metropolitan Water Works Authority (MWWA) was a single organization unit in charge of administering and providing water supply to well over two million inhabitants of the Greater Bangkok area. It operated as a semi-autonomous and state-owned public enterprise whose Board of Directors bore the responsibility for all major decisions and development projects. It also came under the general supervision of the Ministry of the Interior.

As noted in Chapter I, MWWA was the product of a merger in 1967 of the four waterworks authorities which had served the four cities of Bangkok, Thonburi, Samutprakarn, and Nonthaburi, making up the metropolitan area. Each of these authorities had suffered continuous losses and were constantly blamed for mismanagement. The new single integrated unit, operating on an economy-of-scale concept, was seen as more economical in overhead expense, more uniform in the services offered, and more amenable to changes introduced to achieve greater efficiency. MWWA managed ten water treatment plants in Bangkok and one in Thonburi as well as a number of deep wells in all four cities.

The reorganization of MWWA had not yet been completed when the intermediate program for immediate water improvement was launched. Rather, new management procedures were being devised and installed by Booz, Allen and Hamilton, International, an expert management consultant firm brought in by the engineering consultant group of Camp, Dresser and McKee. These new measures included such activities as computerized billing system, work reassignments, redistribution and expansion of work units, and recruitment of additional personnel. The organizational structure existing at the time the new program was being considered is

presented in Figure 1. This system was further reorganized in 1969, as shown in Figure 2, in order to implement more effectively the various projects and new tasks assigned to MWWA.

As the responsible organization, MWWA had the initial task of translating the proposed program for immediate water improvement into several specific projects. Some of the proposals, when subjected to review in February 1969, could be carried out by utilizing the existing machinery of MWWA, but other parts called for management and technical procedures that were new and sophisticated, requiring further assistance from the consulting firms. For example, the improvement of treatment plants and the deep-well system were construction projects of a type in which MWWA possessed prior experience. Construction techniques and procedures as well as cost estimating had been fairly well standardized. However, the proposal to enlarge the capacity of existing plants necessitated technical and administrative studies and particulars beyond MWWA's in-house capabilities. In this context, the four major activities in the recommended improvement program were approached as separate tasks, each to be considered and planned for independently. Work assignments were made on a project-by-project basis and handed out to different organizations and work divisions.

Increased Production of Groundwater

The managing director of MWWA forwarded the recommendation on groundwater deep wells to the Engineering Department. This department originally consisted of Divisions pertaining to Administration, Surveying and Supervision of Construction, and Design (see Figure 1). Later, with reorganization and enlargement, it was strengthened with new Divisions of Planning, Research, and Water Analysis (see Figure 2). Department engineers were sent out to inspect and select locations for the new wells. Subsequently another team of technicians was assigned

to make tests of water suitability. The necessary project documents were then prepared, with blueprints and specifications for each of the designated wells. Contracts were awarded through competitive bidding to individual companies to carry out the required construction.

The shallow aquifers that were recommended to increase groundwater production presented a relatively new kind of problem to the Engineering Department. The aquifer sources had to be checked out at specific locations with specialized testing equipment. Engineers from the Department, with cooperation from the consulting firm and from the Public and Municipal Works Department (in the Ministry of the Interior), selected the sites according to specifications and conducted the necessary tests. Unfortunately, the water content of the shallow aquifers proved to be too salty for processing at the treatment plants, and the whole idea had to be scrapped.

Increased Production of Surface Water

As a consequence of the need to abandon the shallow aquifer project, the Engineering Department assisted by the consulting firm undertook a preliminary survey of an alternative solution suggested to increase water production. This was to lay a pipeline from the Bangkok transmission canal to the Thonburi treatment plant, some thirteen kilometers distant. When this option proved feasible, a proposal drafted with help from the consulting engineer was transmitted to the governing board of MWWA. Although the estimated cost of the new undertaking would be higher than for the shallow aquifer project, it remained the only choice agreed to by the Board, which approved it in principle. The Engineering Department proceeded with a detailed formulation and design of the project. Its Planning Division completed an intensive survey for use in drawing up the plan. Then the Design Division took over the preparation of project documents, blueprints, and specifications. Construction on this project was also

to be contracted out to private companies, because MWWA did not have enough workforce to carry out the job itself.

It was MWWA policy to streamline its workforce. By awarding contracts for major development and construction work, there was no need to retain a large number of engineers and workers on the regular payroll. Nor was there need to acquire and maintain a large inventory of specialized equipment and materials that would not be used after a particular job had been completed. MWWA always tried to maintain adequate staff and facilities to handle routine jobs and emergency calls. At this time, MWWA was in the process of expanding and improving its regular workforce by recruiting better qualified people and upgrading employee skills through training programs.

In the project described here, the acquisition of the necessary pipeline materials was achieved through outside purchasing. It is interesting to note that prices quoted in bids by commercial suppliers were considerably below the cost estimates prepared by MWWA. The reason was that an oversupply of pipeline stock existed in Thailand at the time.

As regards the proposed modification of treatment plants in Bangkok, MWWA did accept the consulting firm's recommendation, but felt that formulation of the more detailed specifications and engineering designs had best be worked out by qualified experts rather than within MWWA. The Board, therefore, appointed a team to represent it in meetings with the engineering consultants (Camp, Dresser and McKee) to negotiate costs and other terms for providing such technical service and also for supervising the construction work required. Finally, after several meetings and some bargaining between the two parties, agreement was reached and the results were referred to the MWWA Board for final approval.

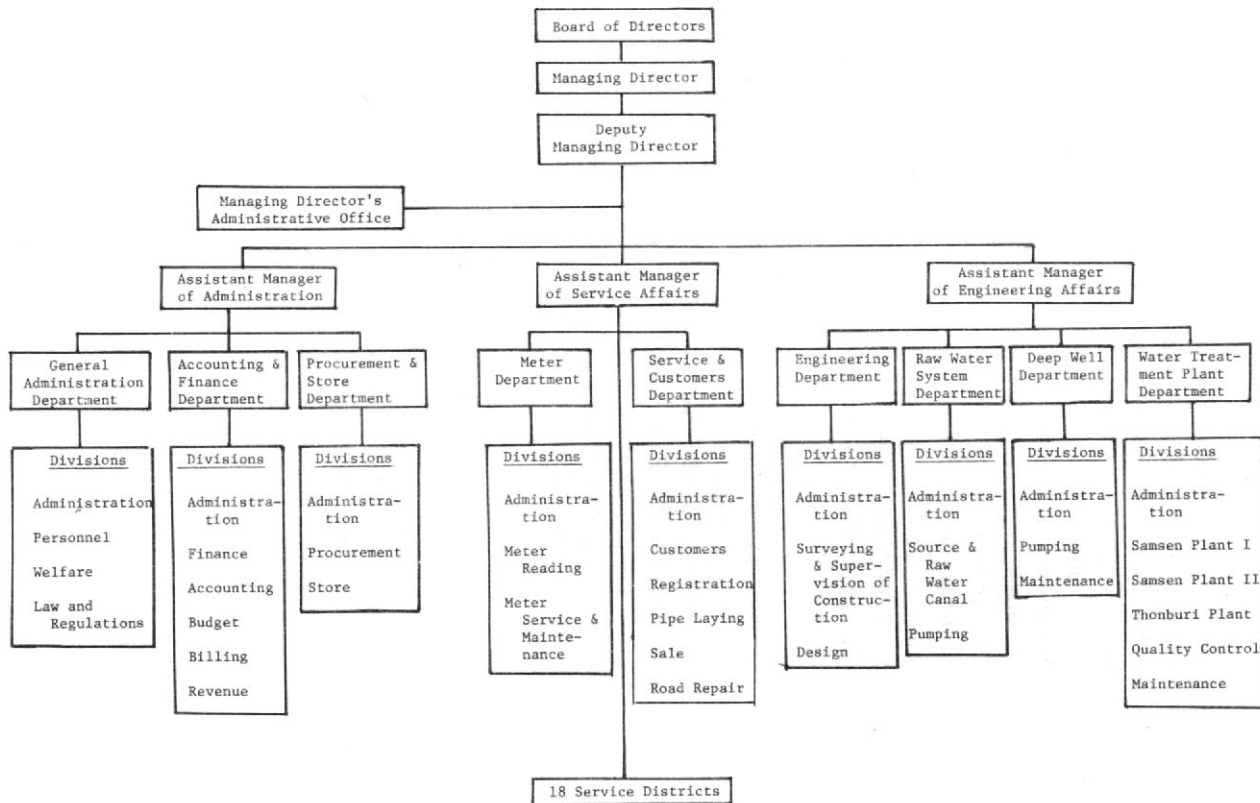
The proposals for surveillance of damage to the main pipelines and for their immediate repair were also approved by the MWWA Board and referred to the Engineering Department. Officials of the Department's Research Division met with representatives of Camp, Dresser and McKee to discuss the best approach to the problem and to work out the details of project implementation. The consulting firm's affiliate, Pitometer Associates, undertook an initial check on the condition of the pipelines. It was agreed that two new detection units would be set up within MWWA's Engineering Department with appropriate staff additions and budgetary support for a permanent detection operation. Pitometer Associates offered, at no extra cost to MWWA, to train new workers on the job. Repair work recommended by the damage survey would be carried out separately by regular staff in the eighteen service districts (see Figure 1). Subsequent reorganization of MWWA assigned these district offices to four separate Water Supply Service Divisions within the Service Department (see Figure 2).

Repair or Replacement of Defective Meters

The recommendation to repair or replace the large number of defective meters uncovered in the consultants' preliminary survey was referred by the MWWA Board to the Meter Service and Maintenance Division (see Figure 1), and subsequently was passed on to the Water Meter Division in the Service Department (see Figure 2) for the drafting of an implementation proposal. With help from the consulting engineers, it was decided that the unusually large volume of work required to resolve the current crisis could not be handled adequately within MWWA either by the regular workforce or with the conventional equipment and accessories on hand. As indication of the size of the problem, in 1969 alone, the estimated loss of revenue resulting from defective meters was approximately US\$3 million. About the same level of revenue loss had prevailed during the previous ten years. In order to cope

FIGURE 1

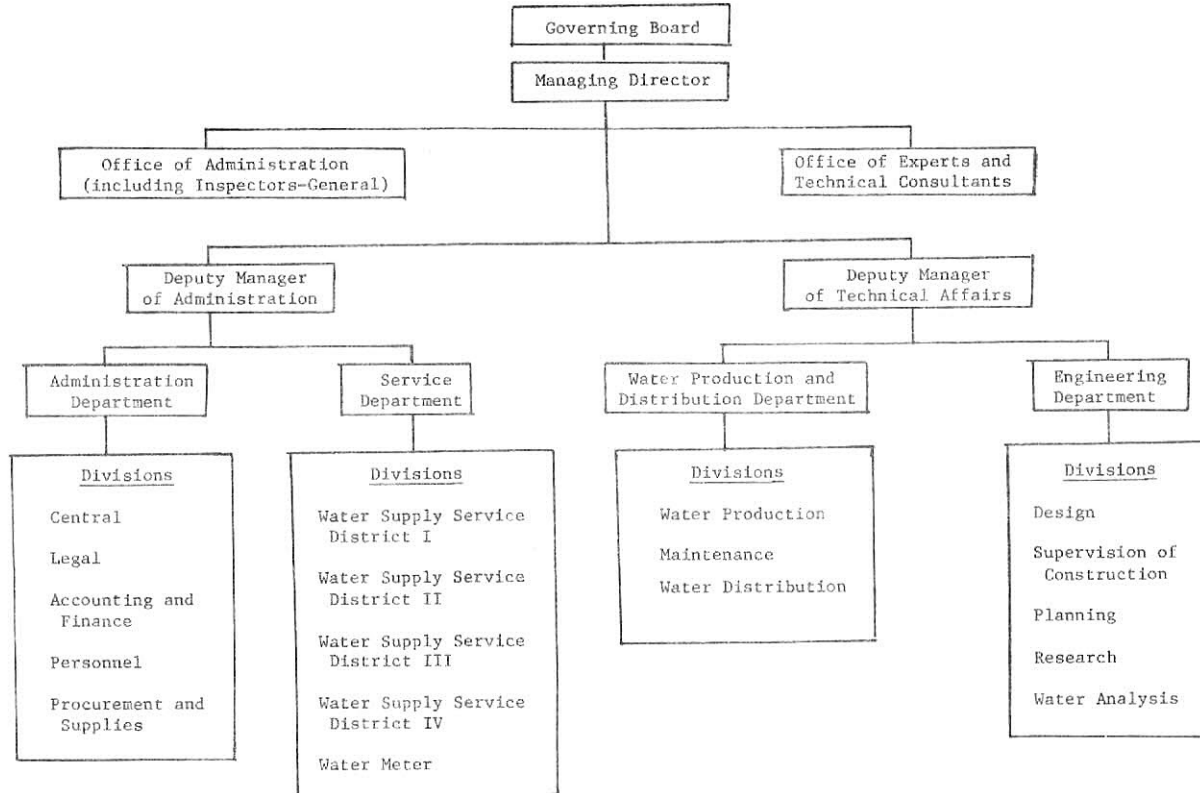
Organization of the Metropolitan Water Works Authority, 1967-1969*



*Metropolitan Water Works Authority, An Interim Report on the Organization and Administration of Metropolitan Water Works Authority, (Bangkok: Camp, Dresser and McKee, and Booz, Allen and Hamilton, International, Inc., 1969), Exhibit II (insert between pp. 5-6).

FIGURE 2

Reorganization of the Metropolitan Water Works Authority, 1969*



* Metropolitan Water Works Authority, *ibid.*

immediately with the rapidly deteriorating situation, a temporary problem-oriented organization was suggested that could easily be dissolved once the targeted mission had been completed.

The envisioned temporary organization would not only carry out the repair and replacement of defective water meters, but would also survey the entire situation, locating existing meters whether defective or not and drafting a plan for future administration of the meter system. Following agreement on the essential goals to be achieved, an appropriate proposal was drafted in the Water Meter Division, detailing the organizational structure and the requirements for staffing, funding, and purchase of repair equipment and meter replacements. Four years were judged to be necessary to complete the project. Consequently, as the proposal represented a multi-year investment, it had to comply with the submittal format directed by the National Economic Development Board (NEDB), i.e., (1) objective, (2) rationale, (3) operational methods and targets for each activity, (4) financial requirements for purchasing and for new staff, and (5) expected benefits of the project. When the MWWA Board finally approved the project proposal, the managing director transmitted it to NEDB to ensure that the operation would be consistent with established policy of the middle-term national plan. With NEDB approval, the request for annual funding was forwarded to the Budget Bureau, and the new organization was finally set in operation.

However, the length of time taken to submit the meter project proposal for review by NEDB, to obtain funding approval, to draw up specifications for purchasing the new meters, and to await delivery from commercial suppliers, had the effect of putting the whole operation far behind schedule. Furthermore, it was then discovered from the newly completed survey and workman's experience in the field that the volume of defective meters throughout the metropolitan area was far greater than had originally been estimated, amounting to 200,000 non-functioning units instead of 150,000. This made it necessary to rewrite the project, taking

this distortion into account and requesting a correspondingly larger support subsidy to accomplish the increased volume of work over a five-year period instead of four. After a while, when the new version had been approved by the MWWA Board, it was resubmitted as a long-term development project for review by NEDB and for final approval by the Cabinet.

CHAPTER III

PROJECT APPROVAL AND ACTIVATION

Project Review and Approval

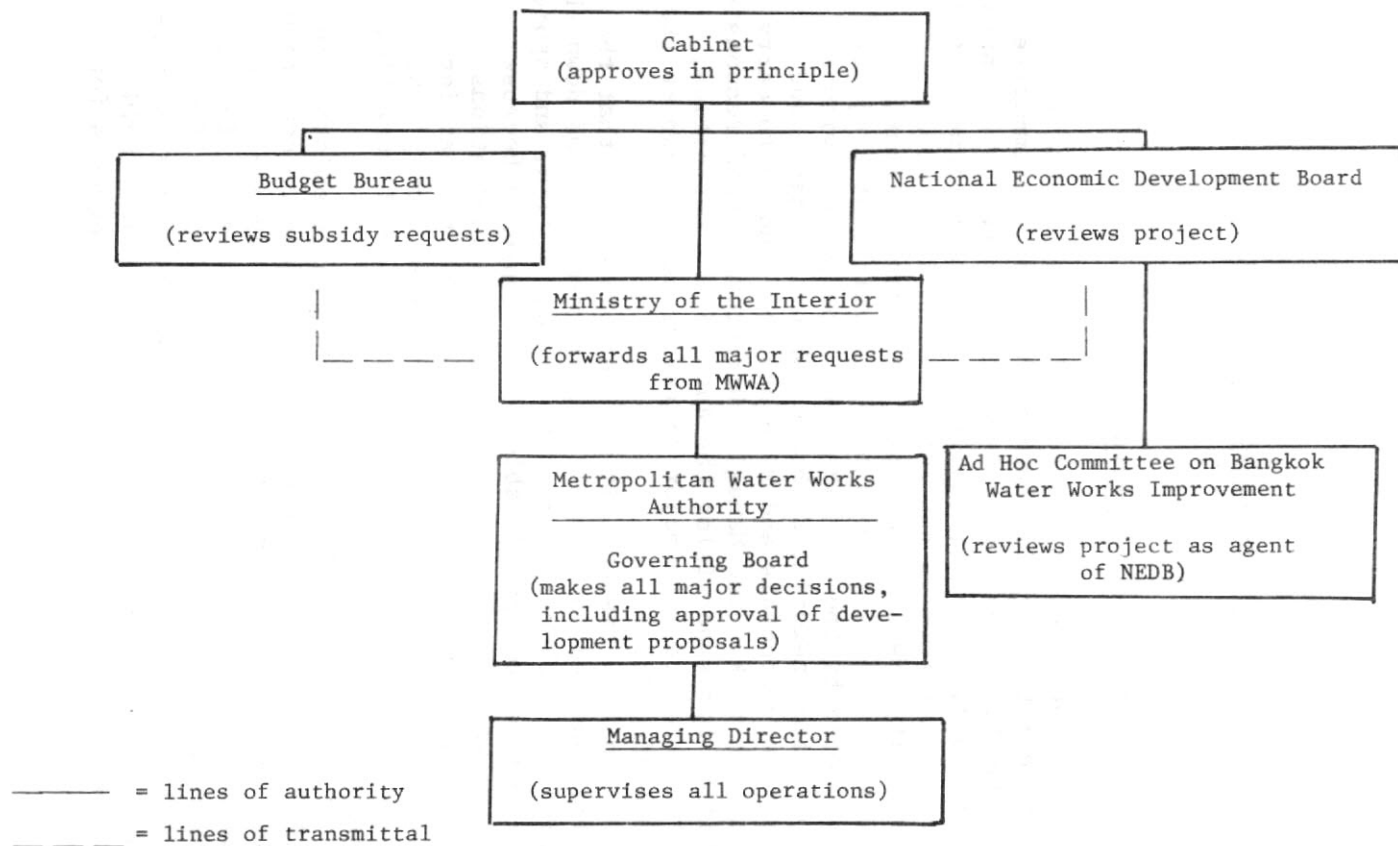
As observed in the foregoing discussion, the National Economic Development Board's Sub-Committee on Bangkok Water Supply Improvement acted as an appraisal board, before transmitting recommendations of the consultant firm to the Metropolitan Water Works Authority (MWWA). However, the Governing Board of MWWA had the final word on all development projects conducted by the organization. The Board reviewed, appraised, negotiated changes when necessary, and approved proposals and requests for funding to carry out the work. The Managing Director carried responsibility for supervising the Authority's activities, in accordance with major decisions handed down by the Governing Board.

In this respect, it may be pointed out that the time consumed in transmitting proposals up and down the lines of authority for review, modification, and approval was quite considerable. This happened because there was no scheduling to govern the limitations of time that might be observed by each of the parties involved. As MWWA had been in existence only since 1967, no detailed study of this problem of work flow had yet been made.

Figure 3 outlines the relationships existing in 1969 between the major offices and agencies concerned in the process of project review and approval. In addition to the Cabinet, at the very highest level, there were the National Economic Development Board (NEDB) and its Sub-Committee on Water Supply Improvement, and also the Budget Bureau. The last held authority to appraise and approve all requests for government funding.

FIGURE 3

Lines of Authority and Transmittal for Project Review and Approval, 1969



MWWA was not a self-supporting enterprise. Its income from water consumption fees paid for only one-third of its annual expenditures. The remainder was subsidized by annual grants from the government. It was expected that some time would pass before MWWA could rely entirely on its own resources.

In order to obtain the subsidies it needed, MWWA had to submit its requests to the Budget Bureau, whose decisions to allocate government funds among various government agencies were guided by priorities set forth in the national policies within the limits of available resources. Actually, in the case of any major development project, the initial request for financing would be forwarded to the Cabinet for approval in principle only. The Cabinet's action then became a guideline for the Budget Bureau to follow. NEDB was, for its part, responsible for evaluating the economic and social contributions of any project, especially one programmed for more than a year, toward meeting the goals of national development. It followed that an endorsement from NEDB would strengthen the likelihood of an agency receiving official funding for its activities.

The MWWA case for immediate water improvement in Bangkok had elicited strong support from the NEDB Sub-Committee. The latter kept the Cabinet well informed of each step taken in the process of project development, in view of MWWA's urgent need to obtain a government subsidy for the emergency work required. Otherwise, it was argued, the government might well be blamed for not supporting a project most critically needed to relieve the suffering of the capital city's inhabitants. The government, well aware of the time that would be necessary for MWWA to prepare the project proposals in detail, had already in prior years allotted lump-sum subsidies for assistance even though the project documents were not completed for transmittal to the relevant offices for approval.

Project Activation and Organization

Of the four separate projects identified as segments of the Immediate Water Improvement Program,

the two having to do with increased production of surface and ground water were to be carried out by private contractors. The other two, directed at detection and repair of leaking pipelines and repair or replacement of defective water meters, would be implemented by either existing or specially created work units within the Metropolitan Water Works Authority.

In dividing the program between private and public workforces, MWWA relieved itself of much of the burden and complexities of management, in favor of private companies that had won contracts through competitive bidding. The private firms, of course, would strive to manage those activities assigned to them, such as completing the job within prescribed time and cost limits, in such a way that they would be certain to clear a profit for themselves. They would have to calculate operational costs, recruit personnel and make job assignments, arrange for necessary equipment and instrumentation, and schedule their project operations economically. They would also have to be prepared to meet and overcome unanticipated problems arising during the course of the project. The agreed upon duration of each contract commonly carried an enforcement clause which had to be observed strictly by the contractors if they were to avoid penalty fines and lowered profits.

It should be mentioned here that most of the contractors involved did have satisfactory prior experience in deep-well construction, though they could offer less in pipeline construction, and least in modifying treatment plants. In regard to their management capability, most of them still depended on rule-of-thumb to plan and implement their projects, though one or two had already advanced beyond that level. In general, however, the contractors' experience had produced fairly reliable results.

At stated intervals, MWWA supervisors would inspect completed segments of the work under contract. If all was satisfactory, payment of appropriate installments to the contractors would be endorsed. Supervision of construction work during modification of the treatment plants was assumed jointly by technicians from MWWA's

Engineering Department and from Camp, Dresser and McKee, the consultant engineering firm.

When inviting bids for contracts, MWWA stated only a few simple conditions, that the contractor should be in good standing (i.e., a good record of past performance) and be financially sound, well equipped to do the job, and capable of completing the work within the specified time. The lowest bidder was usually declared the winner, provided the tender he had submitted was in accordance with or close to the specifications set forth by MWWA.

Responsibility for inviting and reviewing bids and awarding contracts was divided among three groups: (1) receipt-of-tender committee, (2) opening-and-deliberation committee, and (3) contract-making committee. Officials from different but relevant Divisions within MWWA were appointed to each group by the Managing Director. All final decisions were made by the Governing Board. The multi-committee approach had been adopted in order to avoid control by a single committee over the whole process of bidding and awarding.

Implementation of the two remaining projects was assigned directly to managers of various MWWA units. In each project, two different approaches were utilized. The first was to create special units for designated tasks demanded by the emergency situation. The second was to involve existing units within the MWWA organization for such work as could more easily be phased into regular service operations.

In the pipeline leakage project, the detection survey was to be conducted by two newly created units under the supervision of the Engineering Department's new Research Division (see Figure 2). However, responsibility for pipeline repair was given to the existing Service District offices of which there were eighteen (see Figure 1); later, this function was reassigned by the Managing Director to the four Water Supply Service Districts within the Service Department (see Figure 2).

In the water meter project, authority for all repair work and replacement of defective units was handed to a problem-oriented unit, while new meter

installation continued to be performed by the Meter Service and Maintenance Division (see Figure 1) and, later, by the Water Meter Division (see Figure 2). The new repair-and-replacement unit was conceived as an ad hoc organization the various functions of which are indicated in Figure 4. As already mentioned, this special unit, like the pipeline detection units described above, would be phased out when the critical missions had been accomplished.

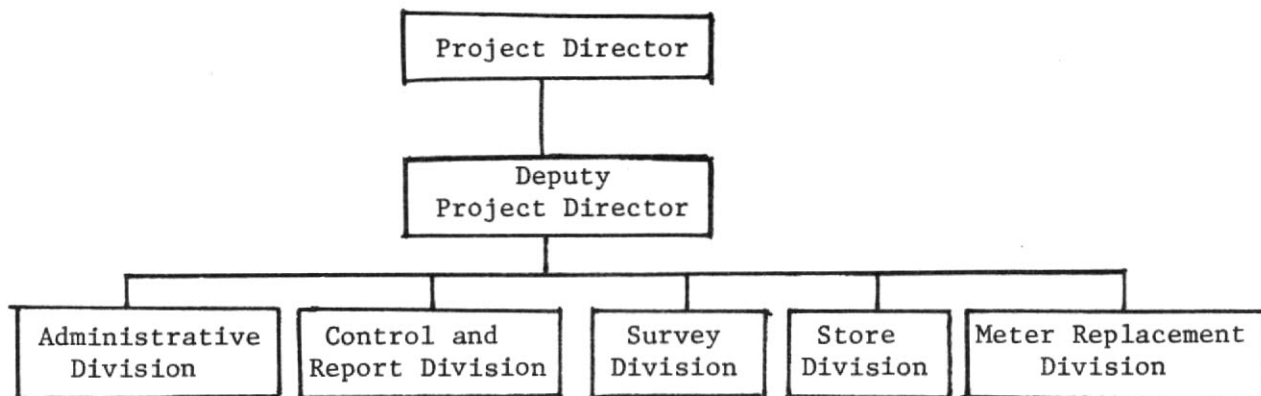
Consulting engineers played a role in advising MWWA on the organization of work units both old and new, as well as in aiding with preparation of special equipment and instruments and with other technical aspects of the extraordinary operations which had to be carried out. For example, consultants suggested a double-check system whereby one MWWA unit would evaluate the performance of another. In the pipeline project, the leakage detection team worked independently of the repair team, but once a repair was made by the latter, the detection unit would check it out.

Similarly, in the meter project, the repair team and the meter-reading groups operated separately, though the latter would report malfunctions in the course of routine reading. Also, each meter repair unit assigned to a given area would be rotated after a certain period of time. In the beginning, eight three-man repair teams were organized to do the job. Later, when the magnitude of the problem inflated unexpectedly and when additional workers could be trained, this number was increased to twenty-four teams of the same size. Each of these had its own construction equipment and was charged with excavating earth for installations as well as removing and replacing all defective meters.

Leakage detection and repair of the pipeline systems were facilitated by experiments directed by Pitometer Associates, a firm with expert knowledge and experience in this field. Pitometer also helped to train new personnel on the job in Bangkok, and arranged for other workers to train in Japan when a greater capability was called for in sophisticated aspects of the project. MWWA technicians were able to train their own employees in meter repair and replacement, because this work was less difficult and did not demand as much skill on the part of the workers.

FIGURE 4

Ad Hoc Organization for Water Meter Repair or Replacement



CHAPTER IV

IMPLEMENTATION AND CONTROL PROCEDURES

It has been described in Chapter III how certain work units within the Metropolitan Water Works Authority (MWWA) had to be modified, or created anew, to directly take over various functions in the several projects that were part of the Bangkok Immediate Water Improvement Program. Implementation of these structural innovations as soon as possible and their transition into a long-range master plan required MWWA to streamline its whole organizational structure and management procedures to accommodate the changes. In fact, when awarding the contract to Camp, Dresser and McKee, the National Economic Development Board, through its Sub-Committee on Bangkok Water Supply Improvement, specifically required the engineering consultant firm to devise an effective management system and appropriate procedures for the Water Works Authority.

Organizational Changes Within the Metropolitan Water Works Authority

Modifications in MWWA's organizational structure were the result of detailed work studies and analyses carried out continuously by the management expert firm of Booz, Allen and Hamilton, International, which had been called in by the prime contractor for this very purpose. The workload assumed by MWWA during 1967-1970 grew rather rapidly because of the vigorous attempt to enlarge the Authority in order to more adequately serve the need represented by the metropolitan water shortage. The strategy of expansion was to take things step by step, so that one step became the springboard to the next.

Selection and recruitment of qualified people to manage the various assignments proved to be no easy task. Only when there was sufficient and qualified

staff to deal with the increasing flow of work would the entire operation be processed to everyone's satisfaction. The planned alterations in work management were only partially realized in the period under review. Recommendations by the management consultants did include introduction of the concept of an integrated process of project management, but it would take some time before that concept could be fully implemented according to plan.

Reorganization of the MWWA structure was achieved in two major stages. In 1967, three Assistant Managers were given charge of three major functional areas, that is, administration, service affairs, and engineering affairs. What earlier had been designated as divisions were raised to departmental status, and more specialized divisional responsibilities were distinguished within each of these new Departments. This was done mainly to cope more efficiently with the increasing volume of work in the many different activities. Thus, the functions of General Administration, Accounting and Finance, and Procurement and Store were formalized as separate Departments in the administration group. Similarly, within the functional group of service affairs, the work of the Meter Department was differentiated from that of the Service and Customer Department. And the engineering affairs complex consisted of the Engineering, Raw Water System, Deep Well, and Water Treatment Plant Departments (see Figure 1).

In 1969, additional modifications were made to further divide or realign work responsibilities at divisional levels, regrouping all of these within four new Departments, in place of the three functional groupings. The four Departments were now Administration, Service, Water Production and Distribution, and Engineering (see Figure 2). Two Deputy Managers, each supervising two of the four Departments just named, were placed in overall charge of Administration and Technical Affairs respectively. The Managing Director was further assisted by two staff offices. One of these dealt with Administration matters and included several Inspectors-General; the other was concerned

with Experts and Technical Consultants. New, smaller units were created at the divisional level. Not included in Figure 2 are the two pipeline leakage and repair units and the meter repair and replacement unit, which had been formed temporarily to resolve certain problems in the comprehensive water improvement program, as described in Chapters II and III.

The project manager of the water meter repair and replacement unit, after having secured appropriate budgetary support, managed to recruit the necessary complement of special workers. These employees were trained for the eight three-man teams set up during the project's first year of operation. As reported in Chapter III, these teams were increased to twenty-four in the following year. It was anticipated that this would be sufficient to complete the required work within the two years of the project's duration.

The newly renovated and computerized billing system, according to the plan, would go into operation after completion of the meter repair unit's assignment, so that when all of the repair work had been completed the income from collection of water service fees could be increased accordingly.

The temporary work status of those involved in the water meter project was one disruptive factor in an otherwise smooth operation. Most of the laborers understandably preferred permanent employment. Therefore, they tended to remain with MWWA only until they could locate other, less temporary jobs. Several of the newly recruited workers, after but a short time on the payroll, misbehaved and upon being reported were immediately discharged. Replacements for these vacated positions had to be sought constantly.

One difficulty encountered in building up MWWA to be a more efficient operation was the general lack of incentive and sanction that had prevailed during the previous administration. Salaries were low, and the undifferentiated approach to reward for individual merit had demoralized employees, especially the better ones. When the volume of work increased far out of proportion to the number of new workers hired, some older employees were no longer willing to take their

work as seriously. Under the circumstances, MWWA management found it necessary to revise pay scales more generously and equitably.

Monitoring of Work Performance

Direct responsibility for supervision and monitoring rested with two major organizational units of MWWA. These were the Engineering and Service Departments. In the first named, there were groups of engineers who could be assigned to oversee specific projects. Their criteria for monitoring were derived from the terms of each contract and the specifications detailed therein. Periodically, they checked the work being done at the construction sites, and notified the contractor in charge whenever a problem arose concerning engineering designs. They would endorse contractors' requests for payment of completed work segments only when the work had been performed to their satisfaction.

The detection of pipeline leakage was a responsibility of the Chief of the Research Division in the Engineering Department. For this undertaking, Bangkok was divided into several operational zones, and a schedule was set up to carry out the required job in each zone. This schedule was used by the Research Division head as the basis for monitoring the workers' performance, and he reported periodically to the Engineering Department head. It was anticipated that this project, for the whole of Bangkok, would be completed within one year. After that, the plan was to start over in the first zone, as part of a continuing cycle, in checking on pipeline leakage as a regular maintenance chore.

The responsibility for repairing the pipelines, once leakage had been detected, belonged to the Service Department, more specifically to the several District Service offices whose supervisors would see to it that their field staff made the necessary repairs within a reasonable space of time. If there was any oversight on the part of these service teams, the detection crews from the Research Division, as noted

earlier, would be expected to spot the malfunction during their next round of checks for leaky pipes.

As already pointed out, the repair or replacement of water meters was carried out by an ad hoc organization which became the special charge of the Chief of the Water Meter Division in the Service Department. For purposes of this activity, seventeen operational zones were differentiated for the Bangkok metropolitan area, and priority was given to any area or areas where the water supply problem was considered to be most critical. The special task force assigned to this project was expected, according to the plan, to have completed its work by 1976. Once the defective meters had been repaired or replaced, a foreman from Headquarters would check out the work by resorting to a sampling method. If some repairs had been overlooked, the meter readers from the District Service offices were expected to discover such oversights on their regular check of home meters to record the monthly use of water.

Finally, periodic reports were submitted by Chiefs of the various Departments to their respective superiors, the Deputy Managers, and thence to the Managing Director according to the hierarchical line of authority. Upon completion of an entire project, a comprehensive report would be forwarded to the MWWA Governing Board for review and ratification.

CHAPTER V

PROJECT COMPLETION AND EVALUATION

Not one of the four separate projects in the Immediate Water Improvement Program was experimental or pilot in nature. All were identified at the outset as practical solutions to a crisis situation, and they were to be implemented as rapidly as possible. The Metropolitan Water Works Authority (MWWA) urgently needed to have the projects completed in order to overcome the water supply shortage in the Bangkok metropolitan area. Because the time spent on project preparation was relatively short, some discrepancies did develop between the estimated duration of the projects and the actual time required for their completion. Table III is a detailed statement of these differences.

The project on detection and repair of leaky pipelines was the only one completed on time. All of the others experienced unanticipated difficulties in adhering to the time schedules originally recommended by the consultant engineering firm.

The longest delay occurred in the case of the meter repair and replacement project. From the start, the situation deteriorated to the extent that several additional years had to be programmed. Unlike the other projects, this one required several preparatory stages before the work program itself could be tackled. This preparation included such matters as the organization of an ad hoc problem-oriented unit, a revised request for a long-term financial commitment from the national government, the purchase and delivery of water meter equipment, and the recruitment and training of special workmen. Furthermore, unexpected problems developed in the field when workers began the actual task of repair and reconstruction of meter facilities. The Meter Division itself estimated, while detailed planning was still underway, that about 900 to 1,000 additional water meters became defective every month.

TABLE III

Estimated and Actually Completed Work Schedules,
Immediate Water Improvement Program, 1969-1972

Date of Completion	Project 1 (surface water)	Project 2A (deep well)	Project 2B (shallow aquifer)	Project 3 (pipeline leakage)	Project 4 (meter repair)
Estimates in consultant recommendations	30 Sep '70	30 Sep '70	30 Sep '70	30 Sep '70	30 Sep '70
Planners' revised estimates	29 Sep '71	During '69	30 Sep '71		30 Sep '72
Same	23 Oct '71	Dec '71			
Same	17 Dec '71				30 Sep '76
Actually achieved	June '72	Dec '71	25 Oct '71	30 Sep '70	about 85 percent by early '76

Delays in the project to modify the water treatment plants were due largely to unforeseen construction problems and to the contractors' own shortcomings on the job. Remnants of older facilities were frequently uncovered during excavation, which required more time and additional expense in clearing the land for new construction. Service lines--for telephone, electricity, and drainage--sometimes needed realignment, and this necessitated time-consuming negotiation with relevant authorities. MWWA was sympathetic with the contractors' worries about these developments, but it meant that time estimates for the project's completion had to be revised continually (see Table III, Project 1).

In general, however, most of the projects could not be completed on schedule owing to the short period of time allowed to reorganize MWWA's management procedures and organizational structure. All projects, except the one on meter repair and replacement, were finally brought to an end before midyear in 1972. This accomplishment, although later than originally hoped for, did raise the total capacity of water production and distribution in the Bangkok metropolitan area to a new high of 1,200,000 cubic meters per day.

The Governing Board, basing its collective judgment on reports from the supervising engineers and other MWWA officials, including the Managing Director's own recommendations, finally took action to accept the construction work completed by outside contractors, and properly credited the performance of MWWA work units involved in the emergency program. MWWA achievements were acknowledged in two principal ways--in the annual reports of the Departments concerned, and in the final report on each project following its completion.

As already noted, the project on repair and replacement of defective meters was far from finished in 1972. Planners realized that it would not be possible to finish this project within the time limits of the Immediate Water Improvement Program. Considering the phenomenal increase in non-functioning meters reported monthly, it was likely that a new project to carry out this much needed rehabilitation would have to be formulated as a five-year plan and incorporated in the National Economic and Social Development Plan (1972-1976).

Transition to Normal Operations

There were two categories of activity that had to be transferred upon completion of projects in the Immediate Water Improvement Program. The first was concerned with the detection and repair of leakage in the main pipelines, where the specially trained personnel of the newly created detection and repair units had to adapt their labors to the continuing task of routine maintenance of the pipeline system. The second type of activity involved work assignments on the other three projects. For example, with the end of new construction, there was need to rehearse employees in the operation of the modified treatment plants, the new canal system for transmitting raw water to the Thonburi plant, and the new deep wells. These tasks, however, did not present undue difficulty or call for unusual effort on the part of MWWA. Personnel for the sections responsible for managing and maintaining the new facilities were available because they had been recruited and trained for the job during the process of MWWA reorganization.

In the case of meter repair and replacement, as explained previously, the ad hoc organization was to be phased out upon completion of the special project in favor of MWWA sections that regularly maintained the metering system. Executives of the ad hoc group already held posts of authority in permanent MWWA units, and the technical staff would simply be transferred to district offices of the Service Department where regular positions were being reserved for them.

MWWA did not face the problem of returning to the government those funds that had been invested in support of the Immediate Water Improvement Program. The government earlier had decided in principle that during the period of critical water shortage, it should exercise responsibility for the special projects as a necessary public utility service for the people of the Bangkok metropolitan area. However, MWWA still had the responsibility for running an efficient waterworks organization and for further improving its water supply capability in the years ahead.

MWWA continued to accept customers' applications for new water service installations so as to avoid new waves of citizen criticism and complaint. The need for water continued to be immediately and absolutely essential for the majority of Bangkok's inhabitants, although some residential projects and commercial plants relied on construction of their own deep wells and could wait a little longer before having to depend on the public Water Works Authority.

CHAPTER VI

SUMMARY AND CONCLUSIONS

It is readily conceded that projects undertaken as programmed action to achieve certain goals within a given time and cost expenditure will vary from one to another in terms of objective, rationale, magnitude, complexity, and constraints. Nevertheless, the following observations drawn from the experience of the Bangkok Metropolitan Immediate Water Improvement Program should help to highlight certain critical factors in project planning and management that may occur elsewhere in the conduct of similar programs of planned change.

An Interim Program to Gain Time

The Immediate Water Improvement Program consisted of four projects or activities devised for implementation by the Bangkok Metropolitan Water Works Authority (MWWA) to alleviate as quickly as possible the very serious water shortage in the Greater Bangkok area. Under the circumstances, it was neither intended to, nor could it indeed, solve the whole problem of water supply faced by the people and their government. Rather, quite frankly, it was designed to be an interim effort for the purpose of gaining time while the large-scale and long-term development program was being prepared.

A Program of Separate Projects

Instead of a professional authority forecasting a critical situation to occur some time in the future and recommending measures to cope with it, the concept of the Immediate Water Improvement Program emerged and was identified only in response to extraordinary public pressure issuing from the constant complaints of

customers. As the organization responsible, MWWA was in fact not at all well prepared to take up the challenge. The severe limits of time available to prepare and activate a remedial program understandably contributed to a program implementation in which the four proposed projects were carried out independently instead of being coordinated within a single time schedule.

Actually the lack of such coordination did not entail any disruption of one project by another, because they were not functionally interrelated and the completion of one project was not a prerequisite for beginning another. Any one or all of the four projects made a positive contribution in serving the common objective, that is, to increase the production and distribution of the public water supply. For any project to fall behind schedule, although certainly not desirable in itself, was not a critical factor in the program's overall success. Delays did occur and they did result in some increase in investment costs. And, of course, they also prolonged the inconveniences felt by the client consumers of water in their daily living condition.

A Test of Management Capacity

Originally the consulting firm attempted to devise its recommendations for solving the water supply problem in the form of a single program, that is, to integrate several activities or projects that would serve the single overriding objective and that could, or should, be carried out simultaneously. This strategy was based on the firm's feasibility study of the water service system, taking into account factors of demand and supply judged to be crucial for determining the scope of the remedial program and the engineering capacity to cope with the problem. At the same time, of course, potential sources of additional water supply were extensively explored. But the planning consultants sorely underestimated the time required to complete all of the projects.

Perhaps most important of all, they failed to gauge correctly the organizational capacity of the

Metropolitan Water Works Authority to implement the whole program. In this connection, the consulting firm quite naturally had recommended specific courses of action on the assumption of accepted project management principles and practices. But MWWA administrators were not then totally familiar with or experienced in these concepts and their ramifications. Therefore, when the Water Improvement Program was finally launched, MWWA was still in the midst of reorganization aimed at modernizing its management structure and procedures. The result was that an unexpectedly long time was needed for total implementation of the program and its affiliate projects.

Recourse to Outside Assistance

While MWWA as an organization was not fully prepared to undertake a job of this magnitude entirely on its own, it was quite ready to call upon the services of outside consultants who assisted in laying out a basic approach to the emergency situation and in suggesting administrative and engineering solutions to various aspects of the problem. MWWA also proceeded promptly in putting out to bid much of the construction work, thereby relegating some of the task of implementation to outside contractors. If MWWA had attempted to do this work with its existing inadequate resources, there might well have been a great waste of labor and materials, and even more confusion and delay than eventually did come about.

Benefits of Strong Government Support

The Water Works Authority was unable to operate solely on the basis of its own financial resources. It was fortunate, therefore, in being beneficiary to strong moral and fiscal backing from the government. The support manifested within the National Economic Development Board, as well as the powerful personality of the Board Chairman who was at the same time Deputy Prime Minister, contributed most significantly to

receipt of the necessary funding from government sources. With such direct support in the present emergency, MWWA was not compelled to seek loan funds, either internal or external. To have had to resort to that option would have meant many months of negotiation and execution of loan agreements, forcing undue postponement of the desired accomplishments of the Water Improvement Program.

Emphasis on Physical, Not Social, Development

The kinds of work effort called for in the Bangkok program posed fewer problems than might be expected in other types of development projects. The principal reason for this was that the program involved almost entirely new construction or repair work, both of which were primarily physical in nature. No far-reaching changes in either attitudes or behavior of the city's population were contemplated, except for certain limited reorganization of personnel relationships and responsibilities in relevant MWWA work units. To have attempted any major alteration of Bangkok society or culture would have been very difficult to introduce or to maintain. Innovative elements in the water improvement projects, both physical and organizational, were to a large extent simply added on to what MWWA already had or was accustomed to, and this made the task somewhat easier. It may be noted, however, that in the meter repair and replacement project, at least some client-users of water were delinquent in breaking meters and otherwise circumventing the system by illegal means, and would have to be educated to a more cooperative behavior in the future.

Organizational Changes to Aid Implementation

This case study has demonstrated how organizational arrangements may be modified or created anew to cope with problems arising in project implementation. Within MWWA there were some permanent structural units that were able to serve project demands with only minor adaptation. But, in other instances, ad hoc temporary

units had to be established to accomplish a given mission. Another lesson learned was that organizational change proceeded more smoothly when it was carried out but one step at a time, moving ahead at a pace calculated to be not unduly disruptive, and building on what was familiar and well established. A third innovation which promised positive gains for MWWA both then and in the future was a double-check system whereby one work unit regularly reviewed the work of another, toward the goal of achieving greater efficiency and integrity in services offered to the public.

Good Planning Means Flexibility

To program work segments in a project is a highly technical operation if the various elements are to be meshed accurately and consistently with each other. Even so, changes during the process of implementation must be expected, no matter how well the project is planned and estimated. Of course, the costs of a project depend upon close adherence to a time schedule. But, should the need arise to alter a planned course of action while the project is underway, the process must be flexible enough to accommodate change even though this may add significantly to the cost. Planning is never achieved once and for all. To anticipate perfect management performance is only an illusion. However, the most desirable rule is still to hold any discrepancies between planning and action to the minimum, without endangering the ultimate success of the project.



THE EAST-WEST CENTER is a national educational institution established in Hawaii by the United States Congress in 1960. Its purpose is to promote better relations and understanding between the United States and the nations of Asia and the Pacific area through cooperative study, training, and research. Since 1975, the Center has been administered by a public, nonprofit educational corporation, officially known as the "Center for Cultural and Technical Interchange Between East and West, Inc." An international Board of Governors consisting of distinguished scholars, business leaders, and public servants guides Center policies.

Each year more than 1,500 men and women from more than 60 nations and dependencies in the region participate in Center programs that seek cooperative solutions to problems of mutual consequence to East and West. Working in research and development projects with the Center's multidisciplinary and multicultural staff, participants include visiting scholars and researchers; leaders, policy-makers, and other professionals; and graduate degree students, most of whom are also enrolled at the University of Hawaii. For each Center participant from the United States, two participants are sought from the Asian-Pacific area.

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