

CHAPTER 4

ORGANIZATION AND INSTITUTIONAL ARRANGEMENT

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4.1 INTRODUCTION

The presentation of the feasibility of implementation of institutional and organizational arrangements stated in the Master Plan (M/P) is the subject of this Chapter. These arrangements are proposed after a careful study of the existing structure and the arrangements within followed by an analysis of the improvements that should be in place.

The main principle pursued in the development of proposed arrangements as stated in the M/P is the introduction of the most critical needs causing a minimum level of disturbance to the structure of the department. In other words only those arrangements absolutely necessary were proposed.

The institutional and organizational arrangements are meant to include any one or a combination of changes listed below:

- Re-organization of existing divisions/sections
- Re-arrangement of divisions/sections
- Creation of new divisions/sections
- Introduction of effective methods of co-ordination

It should be highlighted that the institutional and organizational arrangements proposed in this Chapter are implemented in an integrated manner. This suggests that implementation of bits and pieces without considering the totality of proposed changes will not produce the desired benefits.

The Chapter includes definition of terms used, detailed proposals followed by suggested implementation schedule. The estimated costs for institutional and organizational development are included in the last section.

4.2 DEFINITION OF TERMS

Found in this section are definitions of some common terms as discussed in the current Chapter. The meaning of these terms is important in understanding the report well.

Institution: The word “institution” (“s” for plural) as analyzed and described is meant to include any systematic and formal procedure of endurance to accomplish specified tasks. An institution has a unique organizational structure, specified roles and functions, and clear procedures within. The main purpose of an institution is to get certain tasks accomplished. Examples of institutions are the YCDC, water supply and sanitation department, divisions within the department, the legal system in the country, etc.

Organizations are those structures which are not (yet) formal. They may or may not have a proper structure, unclear (or evolving procedures) and unspecified roles. When an organization has developed a formal (and endurance) structure and clear procedures with specified roles and functions, we call the organization has transformed itself to an institution.

This Chapter does not use the above two words interchangeably as found in many current literature on the subject of institutions and organizations.

Organizational development refers to structure of the organization, arrangement of units, their relationship to each other, the role and functions of the organization and other similar issues.

Structure (in the context of an institution or organization) refers to its skeleton. Especially, what are the different posts and what level are they within this skeleton are explained by the structure.

Role and functions – Role (in an organizational development sense) refers to the main purpose of either a position or any segment within the structure. In other words, the role refers to the main duty of person/unit within the organizational structure. The word “function” on the other hand refers to sets of duties similar to each other. As an example, a particular role may have some sets of duties which can be named as “planning functions” while other sets of duties assigned to the same role could be “administrative functions”.

Tasks are the specific activities to be performed within a function. Examples of some tasks relating to planning function of a planner (role) are: identify individuals to be involved in preparation of a plan, source and collect materials required, assign specific work to different people in the unit, etc.

4.3 PURPOSE OF THE REPORT

The main purpose of this Chapter is to present the results of Pre-Feasibility Study (pre-F/S) for strengthening the Water Supply and Sanitation (engineering) (WSS) department in the management of City water supply system. The pre-F/S components are drawn from the proposals contained in the Master Plan (M/P).

For this purpose, the proposals as presented in the M/P are further reviewed, analyzed, consolidated, refined, modified, and the feasibility of implementation assessed. In this context, it is quite obvious that some strategies (as proposed in M/P) further developed, altered, modified or even deleted altogether. This is mainly because of the fact that the strategies in the pre-F/S are based on more accurate data than what was utilized in the formulation of M/P. The pre-F/S report presented in this Chapter also shows specific data than what the M/P has produced.

The specific purposes of this Chapter are fourfold:

- To present the desirable galaxy of institutions and organizations together with their linkages for water supply improvement in the City, with a specific focus on YCDC operations
- To identify the priorities from within the institutional landscape for immediate action
- To propose a realistic (and implementable) plan of institutional development covering the period from 2003 to 2010
- To prepare and present a tentative estimate of financial resources needed in order to achieve the plan.

4.4 RE-ORGANIZATION OF INSTITUTIONS: MAIN ISSUES AND ACTION PROPOSED

The four main institutional issues pertaining to YCDC discussed in the Chapter are as follows:

- Organizational development
- Human Resource Development (HRD) including training
- Institutional arrangements for operation & maintenance (O&M), system construction and/or rehabilitation and other tasks
- Other institutions and organizations supporting YCDC operations.

The first three items are specifically related to institutions within YCDC (to be more realistic within WSS) while the last item focuses on outside institutions and organizations that may strength the capacity of WSS to deliver the desired output.

4.4.1 Inter-Relationships of Institutions

Like in any other sector, the galaxy of institutions and organizations associated with water supply in the City are inter-related. This suggests that no single institution (or organization) by itself is capable of delivering the task. On the other hand, the collective performance of all the institutions and organizations is sine-quo-non in order to achieve the desired goal. For all practical purposes, the performance of one institution (or organization) is related to the performance of several other related institutions as depicted in the Figure below:

The main implication of this model is that an integrated approach for institutional and organizational strengthening is most appropriate.

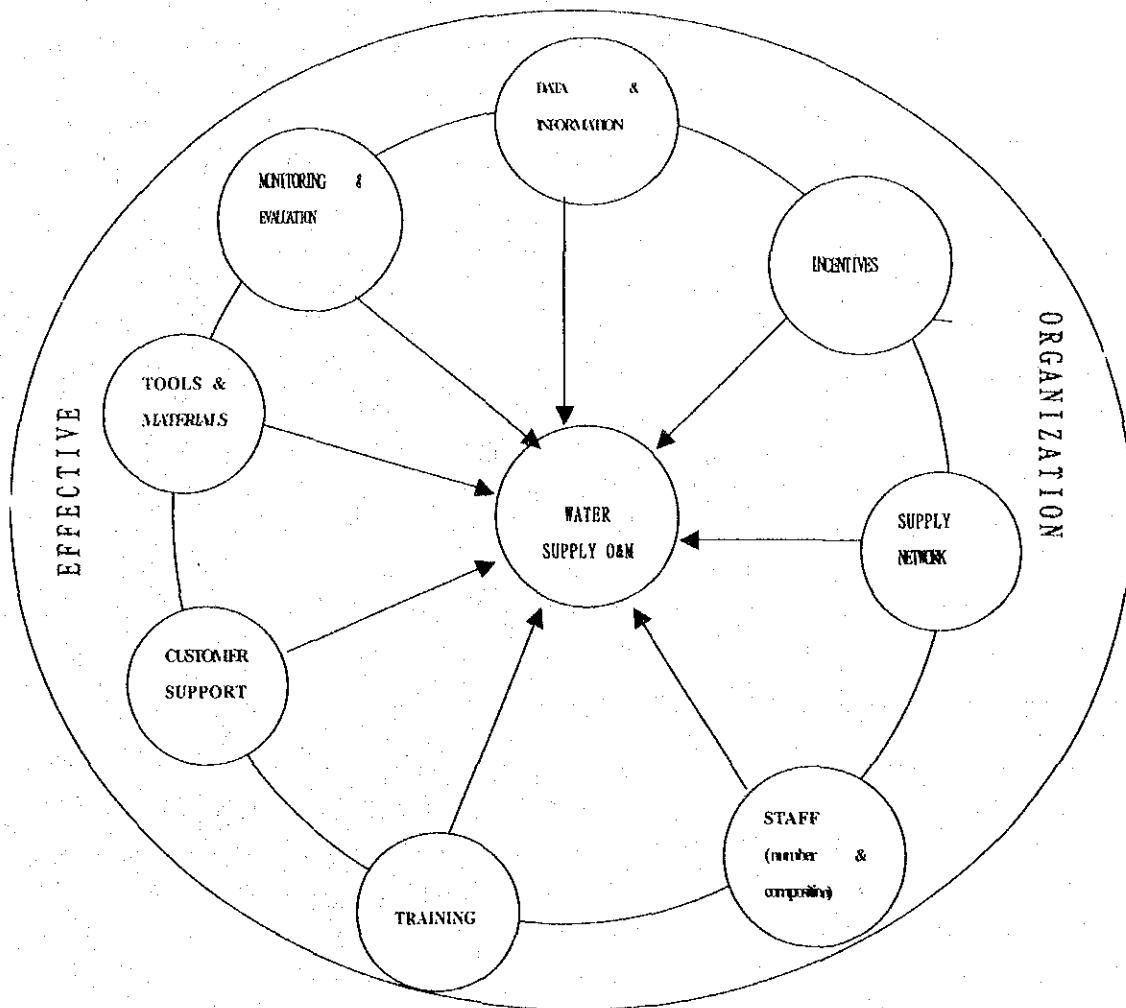


Figure 4.1 Interrelationships of Institutions, Organizations and Tasks

The above model indicates that effective O&M, is not only a result of hardware institution (e.g. Water distribution division) but also the combined action of several other institutions (e.g. Finance & Administration division, training division, store section, field organizations which can educate customers on network protection, etc.). The individual divisions (institutions) and organizations should be closely knit and their efforts integrated in order to facilitate them all to perform satisfactorily. The latter role of “binding” of both hardware and software institutions is a significant function of institutions. This role is performed either by a co-ordination department/division or putting in place co-ordination arrangements.

For this reasons, the model explains that effective O&M only results from the optimum combination of several institutions and organizations.

4.4.2 Organizational Developments In Water Supply and Sanitation (Engineering) Department

This Pre-Feasibility Study (Pre-F/S) proposes a “learning process” approach to organizational development in the water Supply and Sanitation (Engineering) department (WSS). This means planning for and implementation of only those organizational changes that are absolutely necessary. Any future changes within the department are to be effected only after the evaluation of the outcome of changes proposed in the pre-F/S. Such an approach is needed because of two main reasons. Firstly, institutions and organizations being relatively new subjects within this predominantly “engineering” oriented establishment, a cautious approach is necessary in their modification. Secondly, building human resource need investments over a long period. If the investment decisions are not made properly, it is likely that the optimum results would not be expected. This is a source of confusion for the policy maker who might keep away from investments on human resources.

The specific organizational changes proposed in the pre-F/S are briefly described in the proceeding sections.

(1) Overall department

The Pre-F/S recommends that the overall structure of the department shall be retained but minor modifications within are undertaken. The Figure 4.2 provides the proposed organizational structure of the department, which in principle is similar to the existing structure. Although the basic structure of the department is retained, three main changes are proposed. Firstly, the department should gain autonomy in five key operations as listed below:

Financial authority

Financial authority to utilize at least part of its revenue and the authority to re-invest on a rational basis within the water sector itself

Authority to co-ordinate

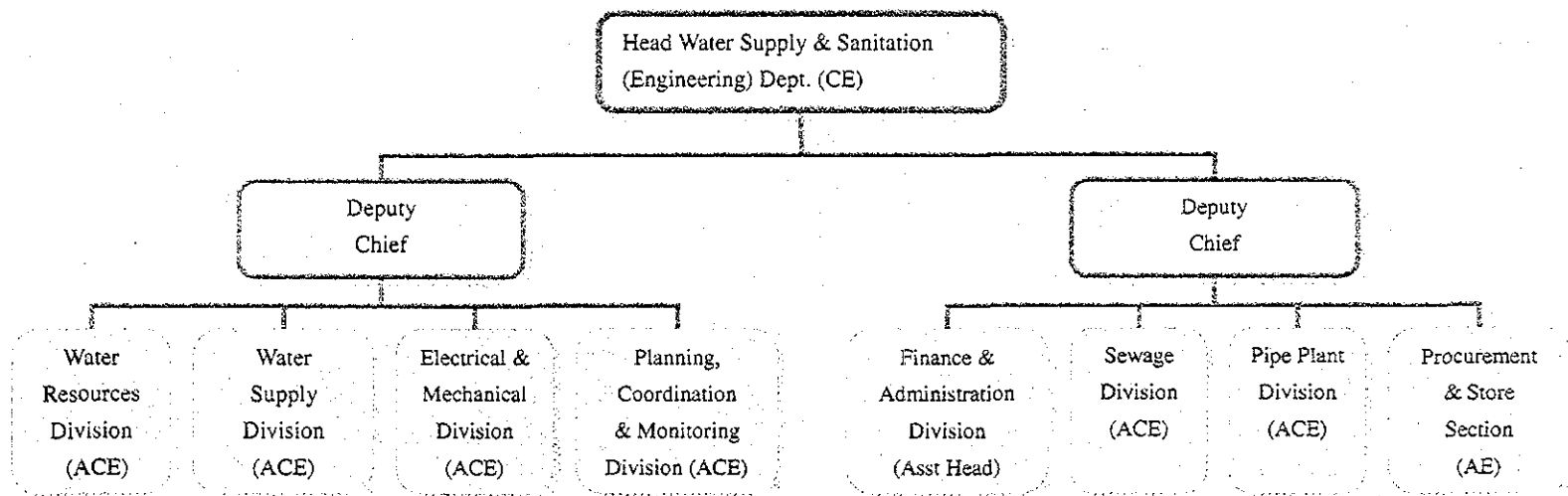
The authority to discuss with and co-ordinate actions of other institutions (ministries and departments) involved in the City water sector

Authority to procure supplies

The authority to discuss with and co-ordinate actions of other institutions (ministries and departments) involved in the City water sector

Authority to build human resources

Authority for recruitment, appointment, promotion and filling vacancies



CE: Chief Engineer

ACE: Assistant Chief Engineer, AE: Assistant Engineer

Figure 4.2 Organizational Structure of Water Supply & Sanitation (Engineering) Department (Proposed)

Budgetary independence

Authority to request an increased budget and the development of a separate budget for priority items such as staff training.

In order to implement above changes, it may be necessary for the department to work closely with YCDC policy makers.

Secondly, it is recommended that the vacant post of deputy chief engineer is filled and two functions posts are created. Each deputy chief engineer will be made responsible for a set of divisions and sections (see Figure 4.2).

Thirdly, to develop and institutionalize several organizational arrangements (many of which do not exist at present) are proposed. Such organizational arrangements are discussed in section 4.4.4 (a).

The division/section specific changes are described in the next two sections to follow.

(2) Re-organization of existing divisions/sections

It is proposed that the structure of some existing divisions and/or sections is changed while others are made redundant. These changes are shown in Table 4.1.

Table 4.1 Changes Proposed to Existing Divisions and Sections

Current Name	Status (proposed)	Description
Reservoir (Division)	Division name changed to "Water Resources"	Scope of Division expanded and 3 sections created
Gyobyu Reservoir (Section)	3 sections to cease.	The 3 reservoirs together with Ngamoyeik to come under a new section of "Reservoir"
Phugyi Reservoir (Section)		
Hlawga Reservoir (Section)		
Electrical & Mechanical (Division)	No change of structure	Organizational arrangements to change with new functions added
Electrical Repair (Section)	No change of structure	Organizational arrangements to change with new functions added
Mechanical Repair (Section)	No change of structure	Organizational arrangements to change with new functions added
Tube wells (Section)	No change structure	Organizational arrangements to change with new functions added
Water Distribution (Division)	Division re-named as "Water Supply"	Role and functions to expand
House Connections (Section)	Name changed to "Connections" section and functions expanded	Will be charge of all connections ie. Domestic, industry/commerce, government & foreign. Also responsible for metering
Distribution (Section)	Cease to operate	Part of functions to be absorbed by O&M section others by UfW unit
Operation & Maintenance (Section)	No structural change	Scope expanded and organizational arrangements to change
District East (Section)	All 4 sections to merge and form District section.	Will be responsible for co-ordination and planning work for 4 districts
District West (Section)		
District North (Section)		
District South (Section)		
Administration (Section)	No change of structure	Staff increased
Supporting Branch	Cease to operate	Staff and functions to be absorbed by other sections
Computer (Section)	Cease to operate.	Relevant functions to be absorbed by divisions
Research (Section)	Cease to operate.	Relevant functions to be absorbed by divisions
Water Quality Administration & Monitoring (Section)	Name of section changed to "Water Quality Monitoring"	New organizational arrangements to put in place
Stores (Section)	Name of section changed to "Procurement & Store"	Scope expanded and new functions added
Sewage (Division)	No change	
Pipeplant (Division)	No change	
Finance & Administration (Division)	No change	Staff numbers will increase
Finance (Section)	No change	
Administration (Section)	No change	

(3) Creation of new divisions and sections

Creation of two new divisions, six new sections and one new unit is proposed. The organizational arrangements of the new/re-organized divisions/sections together with their main roles are found in Figures 4.3 to 4.5 while the details of the Unaccounted for Water (UFW) unit are described in Chapter 3. It is proposed that the UFW unit will merge with the O&M section once its assigned tasks have been accomplished.

The proposed Planning, Co-ordination & Monitoring (PCM) division though under one deputy CE will be under the direct supervision of the CE himself. This organizational arrangement it is hoped will assist the CE to devote a considerable amount of his time for corporate planning tasks. It will also convey all other staff of the department the importance of this division.

(4) Role and functions

The roles and functions of the department as well as of the divisions and sections are briefly described under this heading.

At a broader level, roles and functions of the department are twofold. Firstly, the department will have to continue with its own programmes of water supply and sanitation within the City. This is the long-term role of this macro water institution. It is expected that this role will be strengthened, and the actual work performance enhanced by the proposed rehabilitation project. Secondly, from 2003 through to 2020, the rehabilitation project functions will be dominant in the department. It is hoped that at the end of rehabilitation the "project" roles/functions will have been absorbed by the department. In other words it is expected that project functions will transform themselves to a regular departmental programme by the year 2020 and beyond.

The principle role/function that may be assigned to each division is presented in Table 4.2 while the same for each section is depicted in Table 4.3.

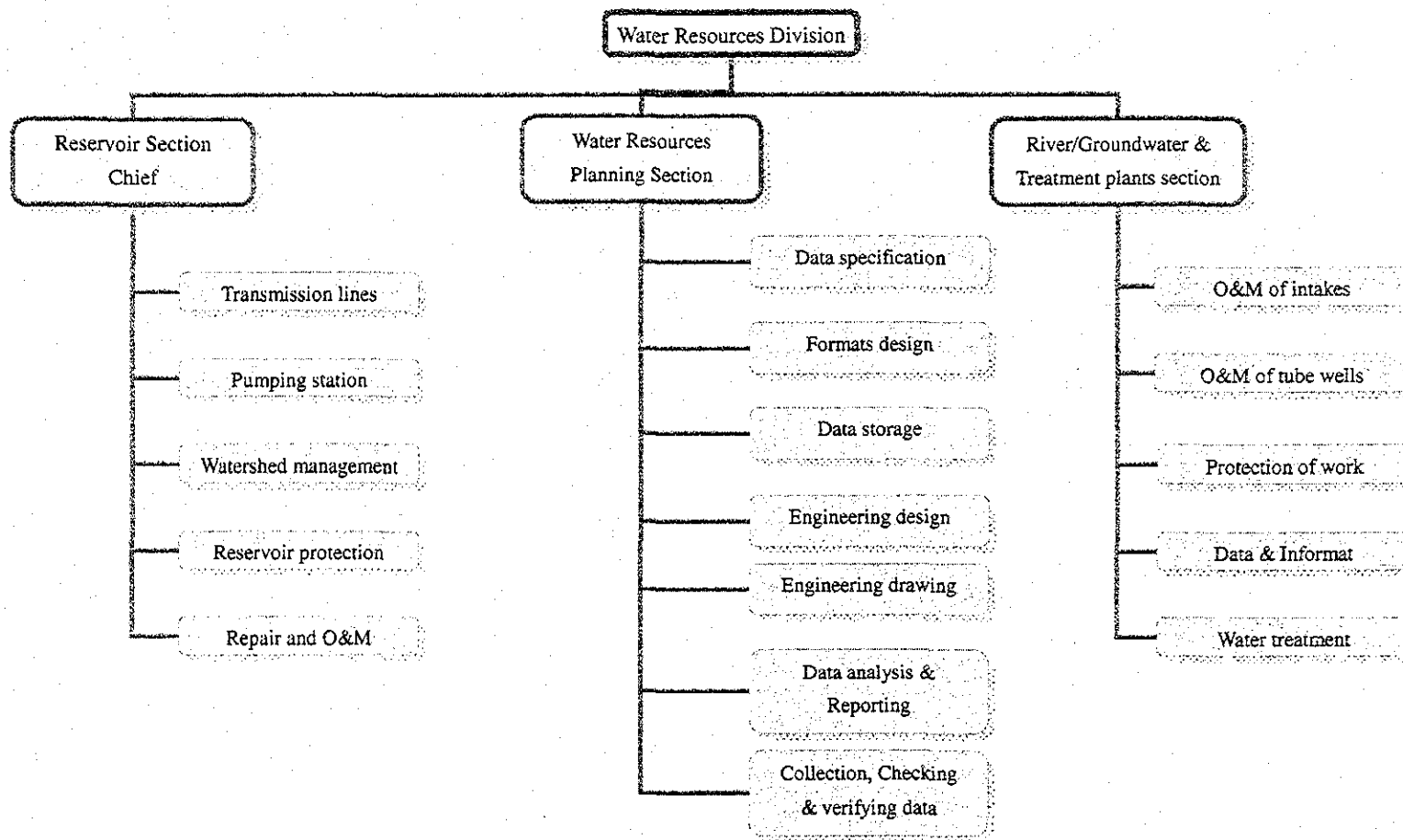
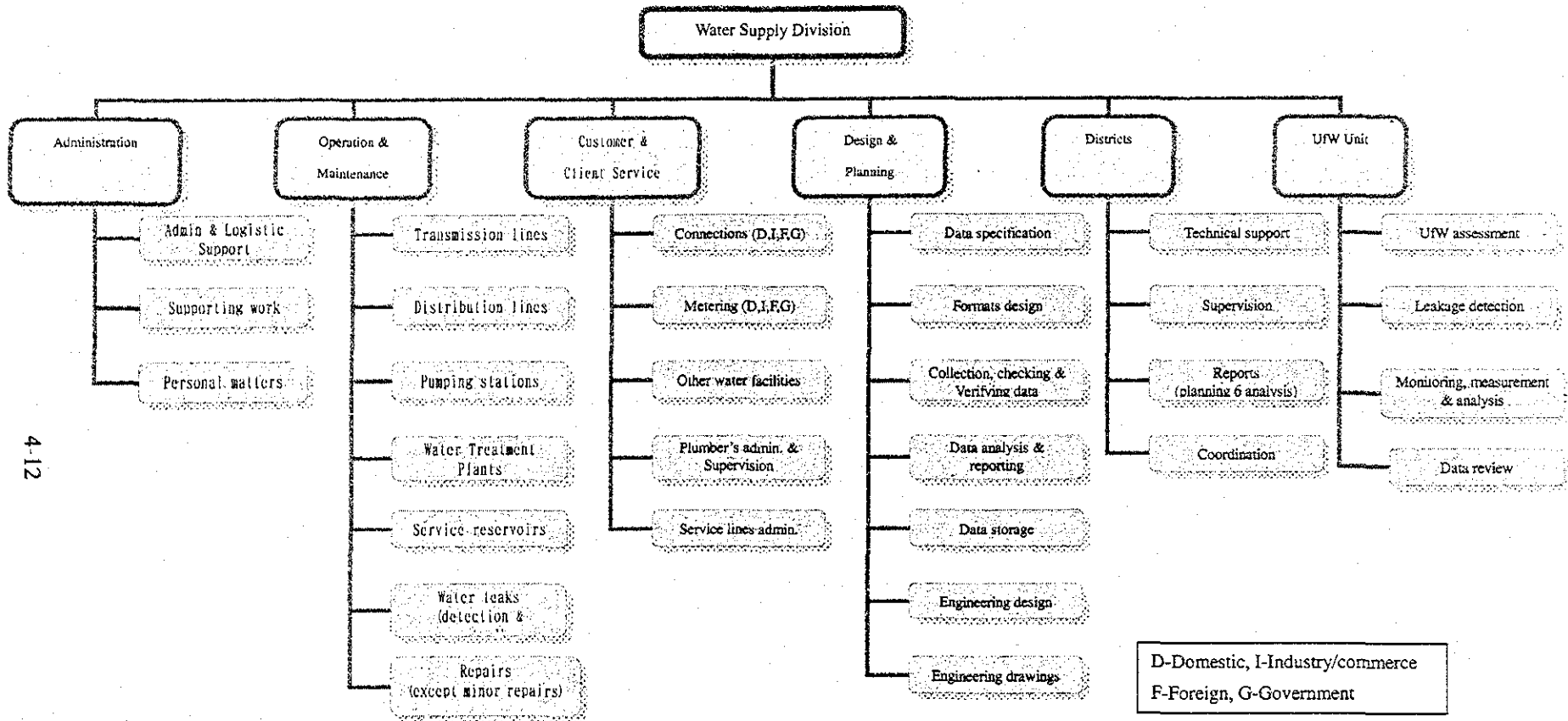


Figure 4.3 Organization Chart of Functions of Water Resources Division



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Figure 4.4 Organization Chart of Functions of Water Supply Division

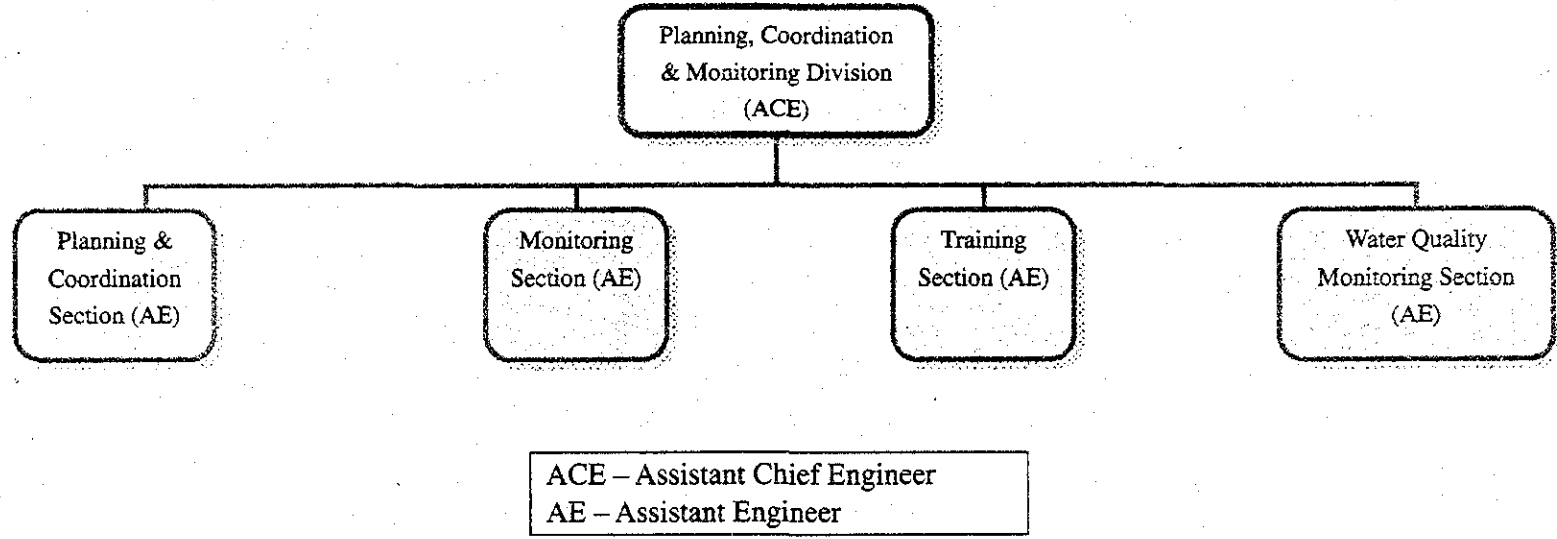


Figure 4.5 Organization Structure of Planning, Coordination & Monitoring Division

Table 4.2 Principle Role/s and Functions by Divisions

Title	Division/ Status	Roles	Functions
Planning, Co-ordination & Monitoring	Division (new)	Macro planning and co-ordination of City the water supply including formulation of department work plan Initiate, facilitate and co-ordinate vision for the department Assist inter-ministerial co-ordination committee to monitor/evaluate the water sector at large Carry out monitoring & evaluation of City water supply independently of operational units Co-ordinate training and water quality analysis for the water sector Provide leadership in the development of a reliable and accurate database on City water sector	<ul style="list-style-type: none"> • Planning functions • Co-ordination functions (within and without department) • Reporting functions • Data management functions • Administrative functions
Water Resources	Division (new)	Plan & manage water resource production and utilization by YCDC Develop and implement monitoring & evaluation system for City water supply sector Operation & maintenance of all facilities from production to pumping stations Plan, develop and manage a database for its operations	<ul style="list-style-type: none"> • Planning & monitoring • Database development • Research & communication • O&M of facilities
Water Supply	Division (new)	Improve performance of division's activities by making realistic planning, targets, achievement strategies and carrying out evaluations Plan, develop and manage an effective and a reliable database to guide own operations Develop, monitor and manage customer and client base Operation & maintenance of all facilities below pump stations down to end of second distributaries Billing & revenue collection	<ul style="list-style-type: none"> • Planning & monitoring • Database development functions • Co-ordination • O&M functions • Training & education functions of customers/clients • IEC materials management • Service functions • Administration
Electrical & Mechanical	Division	Develop & monitor a plan to service/repair all water facilities and relevant workshops Develop and manage an accurate and a reliable database on all repairs including	<ul style="list-style-type: none"> • Planning, monitoring & evaluation • Database management

		costs/materials	<ul style="list-style-type: none"> • Co-ordination • Administration
Finance & Administration	Division	Financial and administrative planning Revenue management Recruitment & staffing, and other personnel matters Develop & manage a database on personnel, revenue and expenditure	<ul style="list-style-type: none"> • Administration including personnel • Financial functions • Reporting • Co-ordination • Database development & management

Table 4.3 The Role and Functions assigned to Sections

Title	Section / Status	Roles	Functions
Planning & Co-ordination	Section (new)	Planning, project/programme and co-ordination Monitoring and evaluation Training Water quality analysis and reporting	<ul style="list-style-type: none"> • Planning functions • Co-ordination functions • Water quality analysis functions • Monitoring & evaluation functions • Training functions • Reporting functions • Administrative functions
Monitoring	Section (new)	Monitoring of departmental work including the proposed rehabilitation project	<ul style="list-style-type: none"> • Monitoring • Database development functions
Training	Section (new)	Planning, implementation, monitoring and evaluation of all departmental training work	<ul style="list-style-type: none"> • Training & development • Training database management • Monitoring & evaluation of training
Water Quality Monitoring	Section (relocated)	Planning for water quality assessment and reporting	<ul style="list-style-type: none"> • Quality assessment • Reporting

Reservoir	Section (relocated)	O&M and repair of reservoirs	<ul style="list-style-type: none"> • Database management • Reporting • Administration
Water Resources Planning	Section (new)	Overall planning of water resources utilization	<ul style="list-style-type: none"> • Database management • Planning • Reporting • Co-ordination
River & groundwater & Treatment Plants	Section (new)	Overall planning of groundwater and river sources; O&M of sources; watershed management	<ul style="list-style-type: none"> • Planning • O&M • Database management
Electrical	Section	Repair and maintenance of all electrical gadgets	<ul style="list-style-type: none"> • Repair • Database management
Mechanical	Section	Repair and maintenance of all mechanical instruments	<ul style="list-style-type: none"> • Same as above
Tube wells	Section	Repair and maintenance of tube wells and water pumps	<ul style="list-style-type: none"> • Same as above
Connections	Section	Providing and managing water connections	<ul style="list-style-type: none"> • Regulatory • Administrative • Supervisory • Service

The Water Supply division will be responsible for the management of all staff attached to facilities from below pumping stations down to the service lines while it is the responsibility of Water Resources division to manage its staff located above the pumping stations. Staff of the water treatment plants will report to the Head of Water Quality Monitoring section although they will be administratively under the Water resources division.

It is recommended that the exact role/s and functions of each division/section are analyzed, reviewed and agreed upon. It is suggested that this revision has to be treated as a matter of top priority before implementation of the proposed structure takes place. This would be one of the first tasks to be performed by the Planning, Co-ordination & Monitoring division assisted by a specialist.

4.4.3 Organizational Arrangements for Water Supply: The Hardware

Discussed in this section are the guiding principles, proposed organizational arrangements, resources needed and important recommendations relating to hardware aspects of water sector management.

(1) Operation and Maintenance (O&M)

O&M as discussed in this section relates to all facilities built and operated by the department. They are basically headwork (river intakes, water treatment plants, transmission mains, reservoirs, pump stations, tube wells, water pumps, distributory mains and service reservoirs), secondary distributaries, bulk meters and repair facilities. (i.e. Workshops).

Summary of present status of O&M

As described in details in the Interim report, effective organizational arrangements together with reliable repair facilities are not in place currently. Combined with the dearth of staff, in particular the almost absence of proper training, the use of inappropriate parts and procedures have seriously plagued the O&M activities. Lack of reliable data, records management and inadequate reporting are the other constraints to developing a responsible O&M culture within the department.

Proposed arrangements

It is to be recognized that O&M consists of core activities and supporting operations.

The primary responsibility for the O&M of facilities is entrusted in two divisions namely, Water Resources and Water Supply. The two divisions will make use of plans and work co-ordination to achieve the desired O&M. For the O&M of distribution mains and the service reservoirs, it is proposed to set up three O&M mobile teams from among the staff of Water Supply division. Each team will have an O&M engineer, 2-3 technicians and about 10 supporting staff. The three teams will be equipped with basic tools, materials and other supplies together with the cash advance facility. The latter is not availed at present. Their

work will be to patrol the designated parts of the network on a daily basis, clearing of debris, fixing defects and generation of records (see Table below).

The four main sections supporting the operations of the two divisions are the Electric section (for repair of all electric gadgets), Mechanical section (repair/service of mechanical items), Tube wells (repair/service tube wells and pumps) and Procurement section (supply of quality materials, parts, tools chemicals and other supplies). Therefore, strengthening of the former 2 divisions together with the 4 supporting sections is the primary feature of these proposals. The strengthening of 2 divisions centre on several new organizational arrangements described below. This is followed by proposals to strengthen the Electric, Mechanical and Tube Wells, and Store sections.

The proposals for organizational strengthening are basically sixfold namely, staffing and training, work planning, staff deployment in equipped teams, generation of records, continuous monitoring and workshops.

The key features of proposed O&M plan are summarized in the Table 4.4.

The arrangements for training are discussed in section 4.4.6.

Strengthening of Electric & Mechanical division

This division is responsible for the repair and servicing of all main facilities including all electric and mechanical gadgets as well as water pumps. It is therefore of paramount importance to equip its own facilities, enhance the skills of staff by training, provide tools and materials together with cash advance facility to facilitate emergency repair work. As much as possible, the materials needed for repairs are obtained from the department's store that is proposed to be strengthened.

It is recommended that Technical Assistance (TA) inputs is sought to determine the facilities and equipment needed to up-skill this division (see Appendix Table 1.1).

Table 4.4 Key-Organizational Arrangements to deliver O&M Service

Activity/Item	Description	Frequency	Responsibility	Action
O&M action Plan	Two divisions to prepare a broad plan to accomplish O&M	Annual	Water Resources & Water Supply division	O&M plan prepared, agreed and resources identified
Daily record of operational team	Each team responsible for facility O&M will record inputs used, hours operated and main problems/defects	Daily	Operational team	Record to go into divisional database
Repair report	For each item repaired, a report will be generated which will include the nature of repair, what was done, materials used, limitations together with date and location.	Every repair item	Main system O&M teams, and repair teams of Electric, Mechanical and Tube wells sections	Report to database. Planning section in Water Supply division and Electric & Mechanical division to prepare report formats
O&M workshops	The relevant divisions to organize O&M workshop to discuss about annual plan implementation, main problems and review the plan	Every quarter	Water Supply, Water Resources and Electric & Mechanical divisions	Workshop to be backed by data extracted from the database. Planning sections in divisions to identify main constraints/issues from records for presentation. A workshop report generated detailing future action needed. Recommendations to be submitted by divisional head to department co-ordination committee

Procurement and Stores

It is recommended that the store section is expanded, scope widened, staff trained and proper database developed. The aim of reorganizing the store section is to improve its capacity to procure and store all the materials needed to run the water supply operations of the department. It is strongly recommended to order required materials in bulk.

It is suggested that the specialist advice is sought in strengthening of the procurement and store functions (see Appendix Table 1.1).

O&M manual

In view of the absence of proper procedures aimed at developing an appropriate O&M culture among all those concerned, it is strongly recommended that an O&M manual is prepared. It is suggested that its preparation is to be financed under Technical Assistance (TA). The proposed scope of work for this TA is found in Appendix Table 1.1.

It is also recommended that the contract documents include clauses as appropriate to:

- Request the contractor to provide staff with manuals and other (written) procedures and guidelines
- Provide on-the-job training for the relevant staff before handing over the completed items

Resources needed

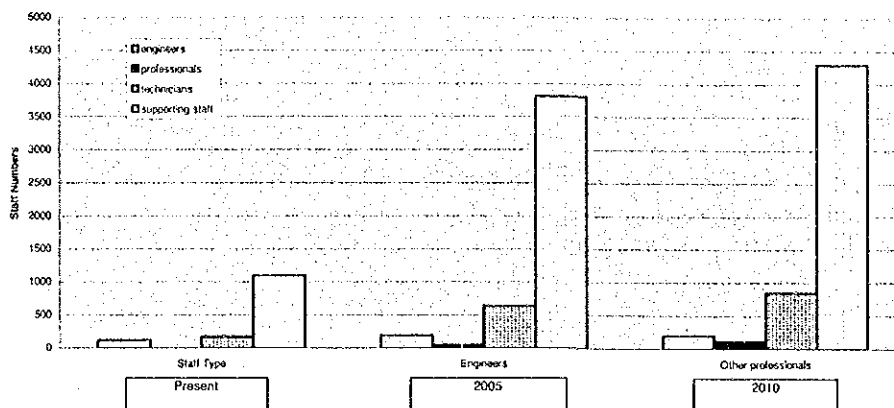
The resources needed to strengthen O&M activities are basically staff, facilities for training (discussed in section 4.4.6), appropriate organizational arrangements (already discussed above), and equipment, materials and supplies.

The estimated staff numbers for O&M together with the current staffing for comparison are given in the Figure 4.6 while estimated data are found in Appendix Table R.5.

As seen in the bar chart, the staff numbers needed for a continuous programme of O&M is several fold higher than the number in 2002. The largest increase is for supporting staff followed by technicians. The number of engineers double and the other professionals increased by 100% during present and the estimated number in 2010. As the above reflects a substantial increase, new strategies, arrangements and an overall O&M culture will have to be created. It is to be noted that the dearth of skilled (and qualified) technicians is a huge barrier to meeting quality targets.

In order to effectively use the staff resources, it is vital that the organizing arrangements described earlier together with the strengthening of supplies and staff training are well looked into. It is to be highlighted that all the four components are managed satisfactorily in order to plan and accomplish O&M activities on a sustainable basis.

Figure 4.6 : Estimated Staff Requirement for O&M, 2002 to 2010



(2) Unaccounted for Water

The control of unaccounted for water is an obvious and integral part of O&M system. This subject of UfW however, is treated in a separate Chapter (Chapter 3) as the Terms of Reference (TOR) for this study asked for a detailed account of this subject.

(3) Water Quality

It is proposed to develop and implement a continuous programme of assessing and monitoring quality of water pertaining to important sources. The sources will include reservoir, river and groundwater. Samples will also be collected from the supply network. At present, there is no quality assessment programme in place.

The proposed activity includes setting up and staffing the section, training staff, building and equipping the laboratory, development of the details of the assessment programme in that order. Many of these tasks can only be completed only after recruiting the required staff. It is recommended that an advisor is sought for initial setting up the sections and to train staff.

Other organizational arrangements for water quality assessment and monitoring include:

- Prepare a report on water quality analysis at suitable intervals
- Develop and monitor a database on water quality
- Supply data and information to the department co-ordination committee as well as the inter-ministerial co-ordination committee on water sector for action
- Develop links with other agencies involved in water quality assessment

(4) Headworks Construction

One of the main tasks of the department from 2004 to 2020 would be to monitor the progress of construction of headwork. The Planning, Co-ordination & Monitoring (PCM)

division would be the key with regard to monitoring and to provide planning assistance in this regard.

As an important measure in strengthening the department's capacity and capability, it is suggested that staff of all relevant divisions and sections of the department are actually involved in construction work. This will provide an appropriate opportunity for the relevant staff to gain knowledge about facilities being constructed and thereby to understand O&M needs thoroughly. In an extreme case, although the construction, laying out and connection of transmission and distribution lines will be the responsibility of the contractors, it is expected that the Pipe plant division will get involved in planning and implementation of relevant activities.

The department staff needed to work with the contractor to gain an understanding of the proposed new facilities is given in Appendix R.6.

The main organizational arrangements, among others, for monitoring rehabilitation project are listed below:

- Establish a progress monitoring and co-ordination committee within the PCM division
- Prepare a system of progress reporting and seek agreement of the stakeholders
- Collect all relevant data and feed into a database
- Establish a system of co-ordination meetings with the relevant stakeholders.

It is suggested that the co-ordination requirements together with other details are planned out and agreed by the parties before the project is begun.

(5) Service Lines

The service lines for customers will not be established by the rehabilitation project. This area will therefore become the responsibility of YCDC. The work expected to generate in service lines construction is substantial. This is also one of the few areas where there will be a lot of disturbance to the public, which therefore needs to be properly coordinated.

The magnitude of the work involved in putting the service lines would be clear from the following estimates (Table 4.5).

The above work will obviously place a heavy demand on YCDC manpower. If this is to be accomplished by YCDC, it is necessary to make sufficient provision for resources and manpower.

It is necessary to plan out a comprehensive organizational strategy for the construction of service lines. As the workload is substantial, it would be necessary to contract some of the construction work out to other organizations.

Table 4.5 Estimated Manpower Requirements for Service Lines

Item	2003	2005	2010
Service population	1,898,280	2,201,500	2,973,000
Number of connections	316,380	366,917	495,500
Number of installation teams (5 men team)	100	150	195
YCDC teams (permanent)	20	40	65
Total supervision staff	13	15	30
Support staff	40	60	78

(6) Water Connections and Metering

The estimates of connections and meters installation are presented elsewhere in the report (see Chapter 3). This section addresses to some organizational issues that need to be considered.

The policy proposed in the M/P is to adopt universal metering. This includes all free water users including those obtain water from communal tanks.

Some organizational arrangements that would be needed for service lines establishment are as follows:

- Discontinue the current practice of two engineers of the department having to supervise providing water connection by a plumber
- Supervision is to be exercised through proper data, records and inspection of actual connections made by plumbers, rather than in-person (as above)
- A report to be generated from each connection and the relevant data to be added to the database
- The process of connection approval be delegated to district engineers.
- The private plumbers are requested to provide a detailed report on the connection provided. Standard of materials used, specifications and limitations of the connections should be noted in the report
- Data extracted from plumbers report are added to the database
- The relevant township engineers should have ready access to connection information
- Metering is to follow through the programme of supply of actual water connections

As a prelude to the connection programme, it is necessary to agree on the type of materials to be used together with their specifications.

(7) Communal Water Supply Facilities

As proposed in the M/P, it is necessary to upgrade the current facilities and construction of new facilities to meet the demand of especially for the low-income customers. The customers need education and training and communal arrangements for the O&M of these facilities are proposed.

It is recommended that the work involved is assessed, quantified and a separate proposal is prepared.

(8) Ponds and Ponds Management

In keeping with the recommendation in the M/P, the pre-F/S proposes that up grading of facilities and institutionalization of community-based management should be put in place for ponds. It is proposed this the requirements in this area are assessed, evaluated and proposals as appropriate are formulated (see Appendix R.4).

4.4.4 Organizational Arrangements for Other Tasks

(1) Work Planning and Co-ordination

For higher performance, planning itself (such as preparation of work plans) and co-ordination are obviously necessary tools. The preparation of work plan will start with the section concerned, followed by divisional work plans and finally the departmental work plan. The suggested process of work plan preparation is to begin with a workshop involving relevant stakeholders. This workshop has to be backed by data and reports pertaining to the activity for which the plan is prepared. In particular, the plan should address to constraints and limitations surfaced by O&M staff in their monthly reports (see Table 4.4).

The departmental work plan, it is proposed be agreed by the co-ordination committee and the necessary resources obtained. Based on the annual work plan, each division and section will prepare its own plan and then activity plan by the relevant team.

The work plan should subject to continuous monitoring and all data generated through the process of its implementation are recorded and transmitted to the database in the relevant division.

Work is to be undertaken at four main levels namely, within any unit (either division or section), within the department, within YCDC and with outside agencies (other ministries, departments, organizations etc.).

A brief description of co-ordination arrangements proposed is found below (Table 4.6).

Table 4.6 Examples of Proposed Co-ordination Arrangements

With Whom?	Proposed Arrangement/s	Remarks
Involving outside agencies	Inter-ministerial committee on water sector convened at agreed intervals	Meeting to be chaired by a senior representative from Ministry of Construction
Within department	All heads of departments are members. Once a month	Chaired by CE. Meeting to be supported by data and reports generated by PCM division
Within unit (division/section/township)	Head of the unit and the relevant members. At fortnightly intervals	Chaired by Head of division

It is suggested that co-ordination arrangements with YCDC as appropriate are detailed out and organized.

It is necessary that the co-ordination arrangements in details are worked out and agreed by all stakeholders as early as possible. One of the main responsibilities of the newly created PCM division is to initiate thinking and dialogue on co-ordination arrangements. Once agreed upon, the arrangements would have to be written and informed to all relevant parties for appropriate action.

(2) Monitoring

Monitoring simply means “keeping tract of progress”. It is one of the most important tools in managing a multi-disciplinary team involving a wide range of activities such as water supply management is.

Suggested levels of monitoring

It is proposed that continuous monitoring is planned and undertaken at four main levels. They are:

- Unit/ work activity level
- Division/section level
- Departmental level
- Water sector

The parties involved in monitoring are different at above four levels. The first three levels incorporate only the departmental staff as appropriate. The last level namely, water sector monitoring however will involve other ministries and even from the private sector organizations.

Monitoring process

The process of monitoring involves 6 steps namely:

- Identify indicators for monitoring
- Design tool (form, meeting etc.)
- Collect data
- Data analysis
- Report
- Action

All workshops and co-ordination meetings discussed earlier should be backed by appropriate data and reports generated through monitoring process.

It is vital that a monitoring specialist is employed to define the proposed system, develop tools to identify indicators, monitoring itself, data analysis and reporting (see Appendix Table R.4).

(3) Procurement of materials, tools and chemicals

Many of the repair and O&M problems at present are relating to the use of inappropriate (or substandard) materials, the use of improper tools and poor workmanship. The former two it is proposed to overcome by organizing a proper store for parts, materials, tools, chemicals and other supplies. The last item is discussed in section (5) below.

The pre-F/S recommends that the re-organization of procurement and store section as a necessary condition for effective management of supplies.

The re-organization will include, but not limited to, the following issues:

- Re-organize the store section as discussed earlier
- Develop an appropriate procurement system
- Select and train staff on store management, inventory control and procurement
- Assess the requirement of tools, instruments and materials and develop standards
- Build and equip sub-stores in critical township offices
- Develop reporting system as appropriate
- Develop and manage a reliable database

It is suggested that an advisor is placed in order to assess the materials and tools needed by townships, workplaces and workshops (See Appendix Table R.4).

(4) Byelaws and regulations

The M/P recognized the need for development of Byelaws and regulations concerning City water supply and use. The pre-F/S recommends that:

- Byelaws are formulated and agreed
- Staff workshops are organized to build awareness

- Extracts of important parts of byelaws and regulations are printed for wider circulation

An advisor is recruited and placed to assist in the formulation of byelaws and regulations (see Appendix Table R.4).

(5) Plumbing

As discussed in Chapter 3 and earlier in this Chapter, the services of private plumbers would be critical for the supply of connections as well as the new metering policy as planned. As much as plumber's role will expand so is the role of supervisor's to check and monitor standards of plumbing and thereby to improve the quality of supply network. In the meantime, poor workmanship of plumbers is likely to be a main limitation in improving the standard of plumbing.

The pre-F/S recommends following organizational arrangements aimed at improving plumbing work:

- Plumbing work is to be supervised by checking reports, spot checks and using other records rather than supervision by staff on case by case basis
- Plumbing standards are to be prepared and all concerned should be made aware of such standards. The customer and clients section will have to play a pivotal role on this matter
- Plumbers will be monitored closely. It is to be made mandatory for plumbers to send returns of their completed work on specified formats at agreed intervals
- After assessment of plumbing work, the relevant plumbers should be informed of quality of plumbing in writing noting improvements if any, needed
- The skills of plumbers are to be up graded by conducting workshops for them at suitable intervals
- Preparation of a reliable and an accurate database of plumbers and plumbing work

(6) Meter reading, billing and revenue collection

One of the main drawbacks in the present arrangements for meter reading, billing and revenue collection is the absence of meter reading staff. The present staff has O&M work of service lines and other work in addition to meter reading, billing and revenue collection. Another problem is low access rate of customers affecting progress in revenue collection. The limited opportunities for the payment of bills are a problem for the customer.

One main policy of the M/P is universal metering. This means the number of meters installed will be substantially increased in future (see Chapter 3 for the numbers to be installed by year). For example, there is likely to be in place as many as 100,000 new meters by 2005 and a massive number of 490,000 by 2010. This is to be compared with about 23,000 meters read at present.

In view of expansion of meter installations, new and more effective strategies for meter reading, billing and revenue collections should be in place. The proposed arrangements to this end are as follows:

- A dedicated cadre of meter readers to be created, trained and deployed in the townships. This is included in the new staff list
- Meter reading staff to be separated from revenue collection staff
- Quicker and cost-effective methods of revenue collection should be investigated, trial led and adopted first on a pilot scale. In this regard, the programme of sub-contracting revenue collection for local organizations has several merits. The current experiences are to be evaluated and adapted as appropriate
- Customers should be given several options for payment of bills such as by post office, Bank, mailed check, appointed agents, among others rather than only cash payment at township office or to the collection staff
- Incentives for early bill payment are another method adopted elsewhere. This is worth study
- Develop a reliable and an accurate database on meter reading, billing and payment
- Examine methods to cut down revenue collection costs
- Each domestic meter is to be read at 3 monthly intervals whereas the large meters to be read monthly
- Bills are to be printed in the Administration and Finance division for distribution by township staff

(7) Information, education and communication (IEC) materials

The M/P recommends to write and produce IEC materials in public, client and even staff education activities. The pre-F/S supports this recommendation.

It is suggested that some key subject areas are identified for the development of IEC materials. For this purpose, the pre-F/S proposes the recruitment of a consultant to assist identify materials as well as to prepare them. The proposed scope of work for the consultant is given in Appendix R.4.

(8) Customer education and awareness

The level of customer education and awareness provided at present is grossly inadequate in seeking any useful contribution from customer contribution to reduce water waste. In view of the future role expected from the growing customer base, it is strongly suggested to develop and implement educational programmes as appropriate.

Three areas where the participation of the customers is to be secured during Phase 1 (2003 to 2010) are:

- Provide education (e.g. reduction of the volume of leakage)

- Information (e.g. New practices such as use of prescribed materials in plumbing, procedures such as universal metering including free connections, revised tariffs)
- Data collection and field level monitoring (e.g. Frequent data on water use and sanitation standards)

The arrangements proposed to initiate and strengthen the participation of customers in three above areas during the Phase 1 are listed below:

- Recruit a consultant to advise on setting up customer liaison task
- Customer service section will be the focal point
- Dedicated and trained staff at township offices to handle customer complaints and information
- Customer handling functions to be transferred to townships
- Develop a subcontract with selected local non-governmental organization (NGO) to conduct customer education, awareness building and training programmes and field monitoring including data gathering on key indicators in designated townships
- Develop an effective customer database within the customer and client service section
- The selected NGO to plan and conduct meetings and discussions in designated areas of the City in order to explain and educate customers on emerging water and sanitation trends

(9) Marking Ward Boundaries

The M/P suggests the necessity to re-organize the method of marking ward boundaries. It is recommended that the department staff takes this matter up with the appropriate department of YCDC and/or the Ministry of Construction and agree on a strategy to conform boundaries. This is one of the tasks that can be discussed at the inter-ministerial co-ordination committee.

4.4.5 Human Resources Management

The management of human resources within the department is an integral part of the management of the water supply network. It is the performance of people who are in-charge of different levels of the system, which ultimately reflects in the performance of the network itself. It is therefore of paramount importance to manage work teams comprising of staff.

Staff training, which is one of the main elements of Human Resources Management (HRM), is treated in a separate section as the number of issues involved is many that it deserves independent treatment.

The department does not have an appropriate division to take responsibility for HR management. The Finance & Administration division takes care of financial and personnel functions. This leaves other HR issues such as incentives, motivation, staff development, etc. unattended. This

state is unsuitable for the proper management of human resources. Ideally, the department should develop a HR division and training should be a part of the new division, in the long run. Many of the HRM issues offer a number of challenges to the department. It is strongly suggested that the services of a HR advisor would be of immense benefits to the department in setting up HRM system. The proposed scope of work for the HR specialist is found in Appendix Table R.4.

The important HRM issues that need to be actioned upon are briefly described in this section.

(1) Job analysis

The Interim Report described that the department has not developed job and role descriptions. Only a very few people have been served with a list of duties which again is not specific to their job but duties in general. The earlier sections have given descriptions of the type of work that need to be accomplished within specific time intervals in order to improve City water supply. In addition, in future there likely to be several non-engineering professionals within the department. Moreover, as suggested in section 4.4.2, there is likely to be several new divisions and sections added to the department in future.

All these means the role of each division and section should be clear to its staff and the staff themselves should be very clear of their own jobs. Job analysis refers to the procedure in determining the duties and skill requirements of a job and the kind of person who should be recruited for the job. The job analysis has a very important application within the proposed organizational structure.

The development of job descriptions and job specifications are vital for the performance of staff, which is the first step in the job analysis.

It is recommended that a suitable HR specialist be recruited to conduct job analysis. The scope of work for the proposed position is found in Appendix Table R.4.

(2) Staffing

The estimated number of staff in the department is proposed to be increased from the current 1,362 to 2,200 in 2005 and further to 2,800 in 2010. This increase results from new organizational arrangements proposed, new procedures established as well as the additional work resulting from the rehabilitation project.

The increase in staff numbers is reflected in the increased number of engineering positions, other professionals, technicians and the supporting staff. The relevant data are given in Table 4.7 while details are found in Appendix Table R.6.

It is to be noted that the increase in staff numbers places additional demands such as personnel matters apart from the obvious higher pay roll. This has forced the office staff, which attends to personnel functions an increase.

One of the main barriers for an increase in departmental staff is in the staff balance in other YCDC departments. It is recommended that the department seek YCDC approval on this matter to increase the number of jobs.

Table 4.7 Increase in Staff Numbers from 2003 to 2010

Staff Category	YEAR		
	2003	2005	2010
Engineers	122	370	436
Other Professionals	0	100	141
Technicians	174	1,417	1,739
Supporting Staff	1,099	8,310	9,812
Total Staff	1,395	10,197	12,128

Note: Staff number include O&M and construction staff of the department

Does not include the staff of Pipeplant and Sewage divisions

New service lines and meter installation lead to substantial increase in staff

Present staff number is considered to remain unchanged in 2003

All staff numbers based on estimations

(3) Recruitment and placement

The department has not seen in its history an increase in staff numbers of a scale as proposed currently. In the meantime, the department currently has no authority to recruit staff, which continues to be the duty of Administration department of YCDC.

It is recommended that the department:

- a) Seek YCDC's approval to recruit its own staff
- b) Develop an appropriate strategy for staff recruitment
- c) Develop a plan to house new staff

Placement of staff is within the delegated responsibility of the department. However, it is necessary to draw up a placement plan in consultation with the HR advisor.

(4) Salaries and incentives

The staff salaries and incentives within YCDC are below what their counterpart staff gets in the private sector. Salaries, however, is a national issue which is unlikely to be altered in one public department as opposed to others. The pre-F/S recommends that salary and

incentives are increased to departmental staff in considering the normal practices established in this area.

On a separate note, it is also to be noted that the staff security in the public sector such as the department is high. This might be an incentive for a trained member to join the department. Hence, it is suggested that job security be maintained which would thereby help retain the qualified staff within the department.

(5) Performance assessment

The department does not employ a performance assessment technique currently. Such a system is recommended mainly to identify training needs of staff. As a result of the performance assessment, the areas of the staff member that needs improvement can systematically be assessed. It is suggested that the HR advisor work on this subject.

(6) Motivation

Motivation for work is an important determinant of performance. In view of the time-bound tasks expected to be performed by engineers, other professionals and technicians, it is recommended that the staff motivation is enhanced by way of more (and frequent) professional training opportunities, certificates of recognition, encouragement of professional development, study tours and other similar instruments. The HR advisor is expected to provide more advice in this area.

4.4.6 Staff Training

The Interim Report has clearly established that the department does not offer any systematic training to its employees. It does not possess the facilities needed nor has trainers. Almost all of the professional engineers have not had the opportunity to follow any professional training in their work areas. Almost absence of (and not lack of) training appears as a main hindrance to effective O&M and many other tasks assigned to employees.

It is to be noted that the department has accepted the need for development of staff training facility within the department. There is evidence for department's commitment in this area that is encouraging, which should be supported.

(1) The two-stage training

The pre-F/S proposes two main plans for training. Firstly, considering the immediate need for staff training throughout the department, it recommends the development of crash programmes of training including the development of facility within the department. The proposed training section will be the focal point in this connection and the short-term advisor would be the key person. Initially, the training facility will include basic training aids, important tools and instruments, supplies and an operational budget.

The short-term training specialist's role would start with setting up the new section, develop some quick training courses, organize their delivery, identify 1-2 trainers and begin development of a training database. These are priority needs of the department.

Secondly, in the long-term, it is recommended that a thorough assessment of training needs is undertaken leading to building the proper "training and development process". The long-term training should include staff in designated divisions. It is proposed that the long-term training is analyzed in the needs assessment for implementation of such training beginning from 2005.

(2) The demand for training

The staff of the department is likely to be doubled by 2010. It is likely that many of the new employees will not have prior training on water supply before joining the department. In addition, the existing staff the majority of which has not received any effective training in the past would place additional demands on training.

The type of staff and the subjects that they need be trained on a priority basis are given in Table 4.8.

Working on the principle that each professional worker and technician should be trained at least on any single topic, it would amount to training of employees every day.

Most of the early training needed for physical rehabilitation work can effectively be provided while still on-the-job. In the case of other areas such as planning, monitoring, co-ordination, form design, etc. it may be necessary to organize some class-room type training in addition to on-the-job training.

(3) Types of training

Training conducted during the Phase 1 of the project will be of two types as outlined below.

Training during initial 1-2 years

During the initial 1-2 years in Phase 1 of the rehabilitation project, almost all training will be on orientation and on-the-job. In other words, training on water supply knowledge up-liftment in general will not be planned during the above-mentioned period.

Table 4.8 Example of Formal Staff Training Needs by Work Area

Subject area	Examples of Training Activity	Trainees	
		Rank	Number
Reservoir management	Prevention of contamination, monitoring of water level and water quality	All professional and supervisory staff of 4 reservoirs	39
Water Treatment Plant	Prevention of contamination, monitoring of raw and treated water quality, determining correct combination/amount of water treatment chemicals, adding and mixing chemicals, keeping records	Engineers and supervisors of 2 Water treatment Plants	6
Groundwater	Prevention of contamination, monitoring of water level and water quality	Township engineer & engineering assistants	22
Sector planning	Assess water use by sector; planning for better allocation among sectors	Planners in Water Resources Planning and Planning & Design section	5
Ponds management	Prevention of contamination, cleaning, on-site water treatment	Township engineer & assistants	25
Pumps	Operation and maintenance of mechanical and electrical equipment, keeping records, minor repairs	Engineers and supervisors of pumping stations	12
Water transmission line	Daily inspection of leakage or damaged portion	Leakage prevention team engineers and supervisors	18
Water quality analysis	Determine sampling sites, sample collection, determine types of analyses, analyse data, frequency of sampling, reaching conclusions	Quality control supervisors and assistants in Water Quality Monitoring section	10
Service reservoirs	Water level monitoring and control, keeping and analysis of records	Engineers, assistant engineers and supervisors of O&M section	39
Distribution lines	Daily inspection of leakage or damaged portion, repair of defects, collecting and recording data	Engineers, assistant engineers and supervisors of O&M section	99
Service lines	ditto	Engineers, assistant engineers and supervisors of O&M section	33
Water leaks and unaccounted for water	Training on water leakage detection using modern equipment, preparation of annual leakage deduction plan, gathering, recording and analysis of data	Relevant engineers and supervisors of O&M section	33
Repairs of mechanical / electrical gadgets	Up grade repairing skill, basic records and data analysis	Engineers, assistant engineers and supervisors of Electrical & Mechanical division	10
Meter repair	Detecting problems and repairing meters using modern techniques	Workshop staff in-charge of meter repairs	33
Data collection, checking and editing, summarizing	Identify data types, develop databases, preparation of formats, data checking	Township engineer & planning assistants, planning assistants in divisions, district engineer, planning assistants in PCM	70
Corporate planning & strategy	Organization vision, organization strategy, long-term and short-term plan	Corporate staff	12
Targets & work programming	Setting targets, programme preparation to achieve targets, monitoring, programme review, evaluation	Planning assistants in PCM, divisions & townships	40
Information & communication materials	Determine subjects, types of materials for different situations, using IE materials	Representative staff from townships, districts and NGO	70
Store management & inventory control	Store management principles, inventory control, creation and operation of computer-aided inventory system	Operational staff of store, township store assistants	35
Customer & client management	Preparation of customer databases, identify data types, customer/client feedback, complaints management and recording	Staff of customer & client service section, relevant staff of townships	65
Data analysis & reporting	Data analysis, preparation of tables, reporting	Planning assistants in PCM, divisions & townships	40

Some guidelines for orientation training are listed below:

- Every skilled worker, technician, engineer and other professional will receive orientation training
- Orientation training will be organized for each “identifiable” work area in phases
- The focus of orientation training will be “getting used” to designated work norms/practices
- Training for skilled workers will be half-day long while technicians will receive it for 1-2 days. The engineers will receive an expanded version of this training for 2-3 days per work area
- Orientation training for engineers and technicians is to be conducted by the contractor and project advisors. The skilled worker will receive the same training from the technicians / engineer who have previously undergone the same training.
- The orientation training will begin at least several days before actual execution of work in the field
- Two staff categories (i.e. Engineers and skilled workers) should not be included in the same session
- The specific items to include in orientation will include, among others, planning for the job, worker deployment and supervision, mandatory checklist of items, critical issues to look for, basic repair of equipment, etc.

On the other hand, on-the-job training in so far as the purpose and duration are concerned will be different from orientation type. The purpose here is to gain actual experience in operation and maintenance of the work such as the appropriate method to handle/use a machine, the use of leakage detection instruments etc. On-the-job training will be approximately a few days to a weeklong, which would be conducted, in the actual work place. The use of manuals, training one-on-one basis and actual handling of the instrument or equipment itself are dominant in the case of on-the-job training.

Some guidelines for on-the-job training are as follows:

- It will be conducted by the contractor and advisors
- In the case of facilities such as water treatment plant, all members of the designated O&M team will work at least for one week together with the contractor. This should become a mandatory requirement for the contractor before the completed facility is handed over to departmental staff
- The contractor should ensure that the staff has developed the capacity to operate and maintain the facility before handing over
- The contractor will provide detailed instructions, copies of manuals etc to the O&M team
- On-the-job training will cover all the relevant aspects of O&M including collection and keeping records
- The participants per one training session not to exceed 10

- Two staff categories (i.e. Engineers and skilled workers) should not be included in the same session
- In each work area, the relevant advisor will identify 1-2 staff members (preferably engineers and other professionals) who will receive further mentoring and coaching. Such staff would become future trainers
- On the job training should also cover software issues such as monitoring, (data collection & analyses), work planning, target setting and goal achievement for each divisional/sectional as well as relevant township staff

Training beyond 2005 up to 2010

Once the initial training is completed, the training landscape will transform itself to more formal and long-term training. The approach to formal training will consist of several steps as shown in Figure 4.7.

The design of formal training will become the responsibility of the long-term training advisor who it is recommended should be available in early 2005. The long-term training

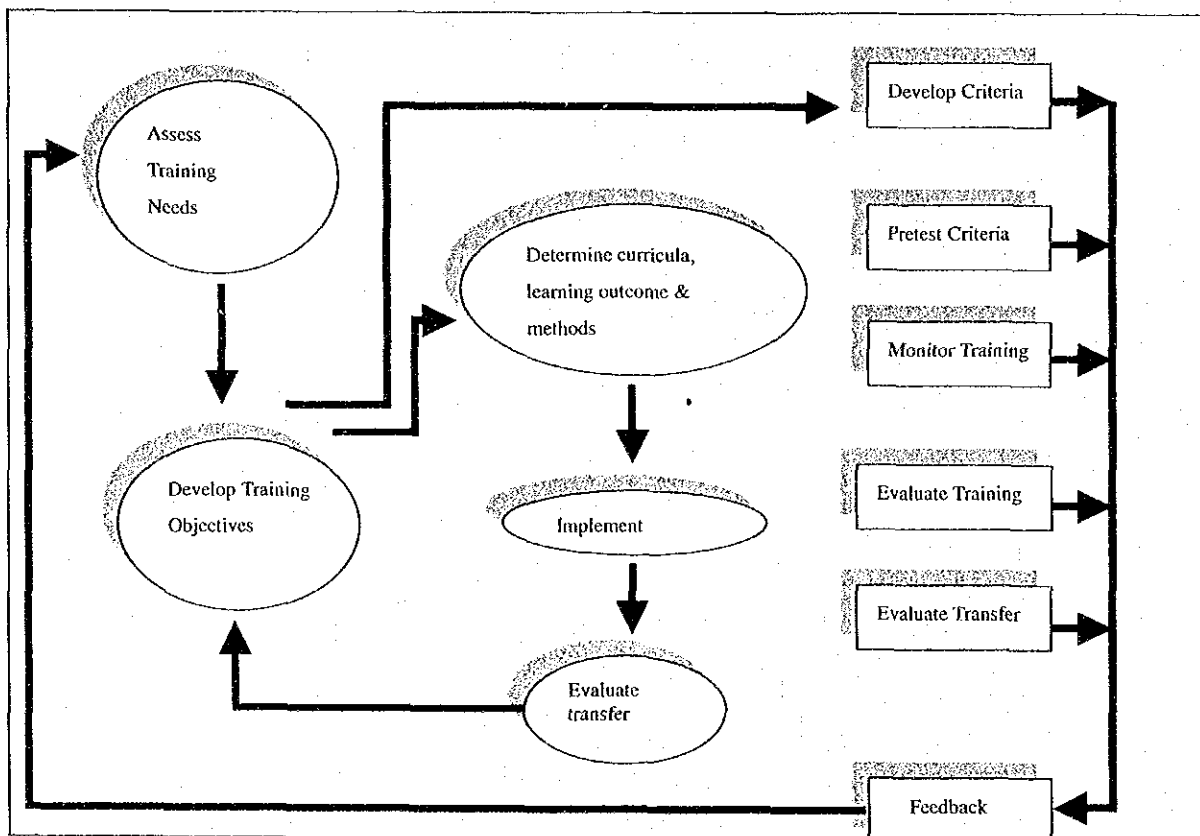


Figure 4.7 Training Need Assessment Model

advisor will begin to formulate a training M/P to cover the period from 2005 to 2020. Some specific long-term training it is proposed be included in this plan.

The training in Phase I should include opportunities for long-term training for selected staff. The M/P should specifically indicate the numbers to be trained, the subjects and providers of such training.

(4) Training Resources

The resources needed for training as outlined above depend on the phase of the project. During the initial 1-2 years of Phase 1, the resources basically are the contractor and project advisors. Funding for translation of manuals to Myanmar, printing cost and for some basic training equipment such as white board, flip chart and other supplies are recommended.

In the latter years of Phase 1 will need adequate funds to plan, implement and evaluate training.

-
- As a matter of top priority, seek resources to fund training in Phase 1
- Include necessary clauses in contractor documents specifying contractor's obligations in on-the-job training, provision of manuals, etc.
- The department to allocate a suitable building and furniture to house training
- Seek approval from YCDC for a training budget. This is particularly important beyond 2005
- Select and appoint short-term training specialist and the long-term training advisor
- To appoint 2-3 senior and dedicated staff to training section to function as future trainers

4.5 INSTITUTION DEVELOPMENT ACTION PLAN AND COST

The aim of this section is to outline an institutional (and organizational) development action plan for the period 2003 to 2010. An approximate cost for such a plan is also given. It is important that working plans incorporating what can in fact be achieved during the stipulated time period is formulated before implementation begins.

4.5.1 The Principles

The action plan is built upon three main principles namely,

- Interrelationships of water supply institutions and organizations. This aspect of inter-relationship among institutions and organizations was clearly highlighted in section 4.4.1.
- Integrated approach is suggested for strengthening whereby all the relevant issues are identified and strengthened. Strengthening of only a few selected institutions at the expense of the integrated approach will not deliver the desired benefits. The necessary components were discussed in sections 4.4.2 to 4.4.6.
- For practical reasons and funding limitations, it is however, suggested that the actual strengthening process is undertaken in phases. This leads to identification of priorities within 2003 to 2020.
- It is strongly recommended that all identified institutions and organizations will have strengthened to a varying degree during the above-mentioned period.

4.5.2 Commitments and Constraints

Firstly, it is necessary that a strong commitment should be in place in order to improve the supply system. It has to come from the government, YCDC and the department. It is a healthy sign to note that the commitment of the government on water supply improvement is very clear. It strives to provide quality drinking water throughout the country and is in the process of building and rehabilitation works. Moreover, improvement of water supply is one of the main tasks of the long-term national economic plan from 1989/2030.

At the departmental level too, the commitment to improve water supply in the City is evident in several areas. This includes department's own initiatives in strengthening some of the work areas proposed in the action plan. For instance, the department has attempted to plan and implement training for its staff by creation of a "training centre" within and arrangements being planned to improve collection of accurate data. Both these developments were initiated after the commencement of the M/P.

Such commitments need to be fostered, supported and facilitated. The organizational and institutional procedures, arrangements and the resources indicated in this Chapter are tailored towards elimination of constraints on the one hand and supporting the departmental own initiatives on the other hand.

Two main constraints should be addressed to before actual improvement work can be begun. They are as follows:

- The lack of “authority” to plan, control, co-ordinate and effectively support a programme of water sector rehabilitation. These issues were discussed in section 4.4.2.
- Resources limitation is a serious issue that needs to be addressed. In this regard, it is to be highlighted for the need of some advisors who will play the role of initiation and providing the leadership through the reorganization process.

It is to be highlighted that the above constraints are critical for planning and implementation. In the above context, there is every reason to believe that the institutional and organizational strengthening as proposed in this Chapter are built upon the needs of the department and the plan itself is implement able, provided the resources are made available.

4.5.3 Implementation Schedule for Priority Items

The implementation schedule for priority issues is outlined in this section. The approach is to determine priority at two levels. Firstly, the schedule for main activities is prepared at the broader level. At this level the beginning of and the end year for each broad institutional and organizational issue is plotted (Figures 4.8 (1) and 4.8 (2)).

The continuous line indicates the start of the activity while the dotted line indicates continuous implementation work.

At the second level the specific activities within the broader institutions and organizations are to be specified. This will be one of the tasks to be undertaken in late 2003.

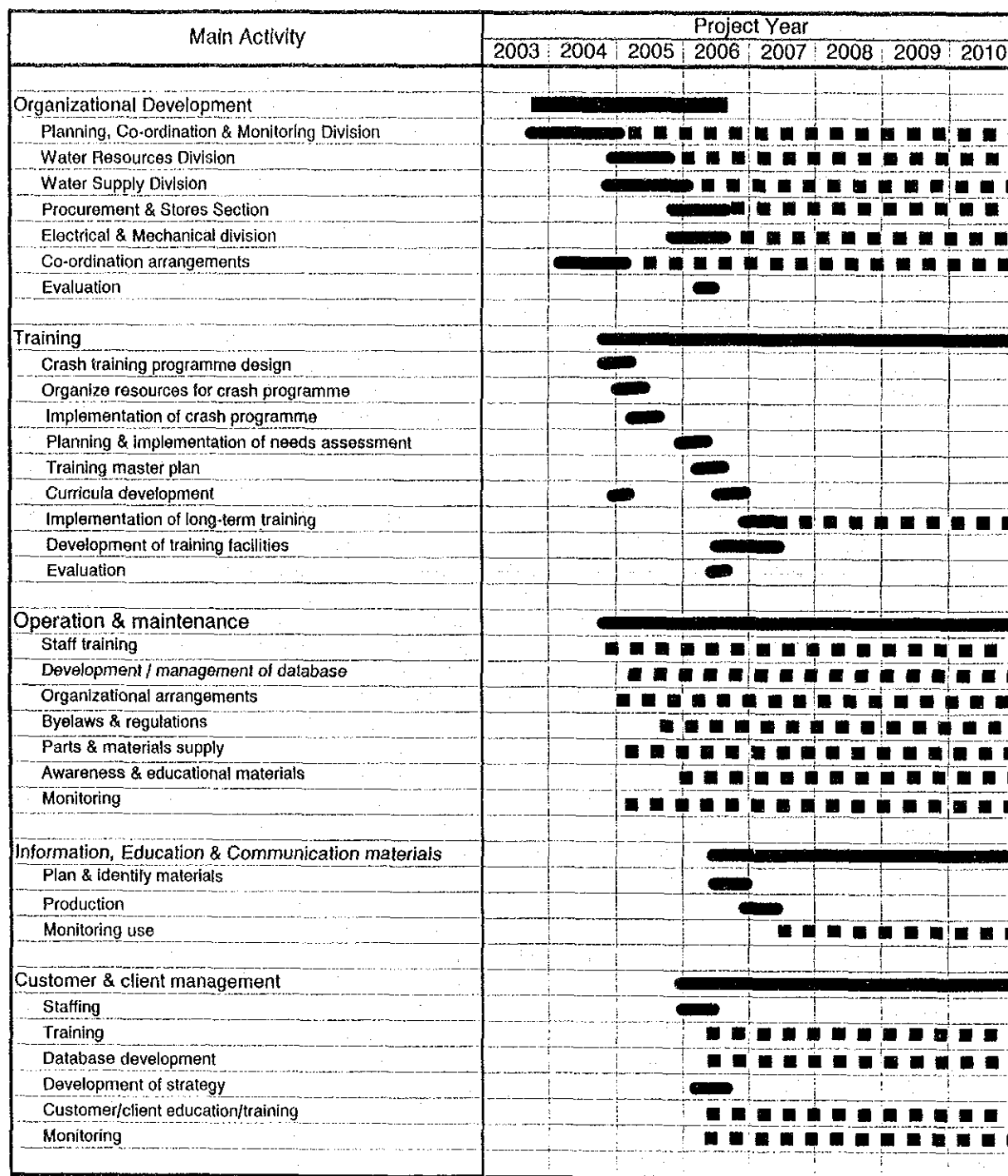


Figure 4.8 Implementation Schedule for Priority Action (1)

4.5.4 Approximate Costs (By Item and Year)

The cost for institutional and organizational strengthening has been estimated. It basically consists of human resources costs and material costs. The human resource cost has been calculated, considering both the current staff as well as the staff needed to perform O&M of the rehabilitated facilities. The materials cost does not include several items such as fuel, electricity, chemicals etc. that need to be estimated. Also, not estimated at this stage are the cost of repair workshops, equipment, instruments tools and other supplies.

The total cost for institutional development including the TA from 2003 to 2010 is US Dollars 6,686,000.

The above costs estimated for each project year are given in Table 4.9.

Table 4.9 Operation & Maintenance Cost by Category and Year (US\$)

ITEM	PROJECT YEAR								Total
	2003	2004	2005	2006	2007	2008	2009	2010	
Staff salaries (O&M)	12,000	47,000	96,000	144,000	205,000	248,000	317,000	383,000	1,452,000
Salaries (existing)	197,000	197,000	197,000	197,000	197,000	197,000	197,000	197,000	1,576,000
Material cost	0	404,000	165,000	14,000	2,000	1,000	3,000	9,000	598,000
Sub-Total	209,000	648,000	458,000	355,000	404,000	446,000	517,000	589,000	3,626,000
Technical assistance	282,000	860,000	1,037,000	559,000	198,000	84,000	0	40,000	3,060,000
Grand Total	491,000	1,508,000	1,495,000	914,000	602,000	530,000	517,000	629,000	6,686,000

The detailed calculations are found in Appendix Table R.7.

The dividends for investment on institutional and organizational development will be substantially high which is therefore to be vigorously pursued.

4.5.5 Technical Assistance

As discussed in the preceding sections of this Chapter, the recruitment of several specialists and advisors is a significant step forward in building sustained institutions and organizations, and their strengthening. Considering the “newness” in many subject areas within the department on the one hand, the neglect of O&M work for years on the other, it is strongly recommended to appoint advisors / specialists in the areas proposed in this Chapter. Without this specialist inputs, it would be near impossible to build, strengthen, monitor, evaluate and manage the water supply system in the City.

The cost of advisory inputs as estimated by task is found in Table 4.10. The Appendix Table R.8 provides further details of TA costs.

Table 4.10 Cost of Technical Assistance

Work Area	Cost (\$)
LONG-TERM TECHNICAL ASSISTANCE	2,420,000
Senior Planning advisor	792,000
Monitoring advisor	572,000
Training advisor	572,000
Human Resources Management advisor	484,000
SHORT-TERM EXPERTS	640,000
O&M	100,000
O&M advisor	40,000
Tools, instruments & parts specialist	40,000
Procurement & Inventory specialist	10,000
Customer relations specialist	10,000
Training	280,000
Training specialist	240,000
Curriculum development (local specialist)	25,000
IEC advisor (local specialist)	15,000
Revenue Collection	40,000
Meter reading, billing & collection specialist	40,000
Evaluation	120,000
Evaluation specialist (training)	60,000
Evaluation specialist (human resources)	40,000
Evaluation specialist (planning & monitoring)	20,000
Communal Facilities & Ponds	100,000
Study team	100,000
Grand Total	3,060,000

CHAPTER 5

COST ESTIMATE AND IMPLEMENTATION PLAN

CHAPTER 5 IMPLEMENTATION PLAN AND COST ESTIMATE

5.1 IMPLEMENTATION PLAN

5.1.1 Implementation Plan

The project is planned to implement in two stages aiming the target year of 2010. Stage 1 works will be conducted from 2004 to 2006, while stage 2 works will be carried out from 2007 up to 2010. In 2003, the detailed design, Pre-qualification and tendering is anticipated.

Implementation plan was formulated based on the following major work items;

Table 5.1 Major Work Items

No.	Work Items	Work Contents
1	Rehabilitation	Replacement of the existing aged pipeline
		1.1 Pipelines with average age over 80 years
		1.2 Pipelines with average age from 50 to 80 years
2	Development of Reservoir System	2.1 Ngamoeyeik Reservoir System (Installation of transmission pipeline and pumping station)
		2.2 Strengthening of Existing Reservoir System (Replacement of Gyobu pumps, 1 additional pump to Phugyi P/S)
3	Hlaing River System	3.1 Intake Facility
		3.2 Hlaing River System (Raw water mains, P/S, WTP, transmission main)
4	Terminal Reservoir	4.1 Connection pipelines
		4.2 Terminal Reservoir
		4.3 Transmission P/S
5	Transmission and Distribution System	Transmission Pipeline, Service Reservoir and Distribution Network
		5.1 CB Downtown (Zone 1)
		5.2 CB Downtown East (Zone 2)
		5.3 CB West (Zone 3)
		5.4 CB Hlawga (Zone 4)
		5.5 CB North (Zone 5)
		5.6 EB South (Zone 6)
		5.7 EB Central (Zone 7)
		5.8 EB North (Zone 8)
5.11 WB North (Zone 11) (including groundwater development)		
6	Connections	Other connection pipeline installation works
7	Groundwater Management in Main System	Groundwater management in the left bank of Hlaing River

Table 5.2 Project Implementation Schedule

No	Facility	Dimension	Phase 1							
			2003	Stage 1			2006		Stage 2	
			2004	2005	2006	2007	2008	2009	2010	
1	Rehabilitation									
1.1	Replacement of aged distribution pipe < 80 years old	Dia. 75 to 450 mm, L = 318,000 m								
1.1.1	Bukitany, Kyaukse, Lammalew, Latha, Pabedan, Pazandaw									
1.1.2	Tonaw									
1.1.3	Aldan, Kyaukse, Latha									
1.2	Replacement of aged distribution pipe < 80 and > 50 years old									
1.2.1	Sanchang									
1.2.2	Mangalazunmyar									
1.2.3	Dagon, Bala, Yuda									
2	Development of Reservoir System									
2.1	Ngamoyek reservoir system									
2.1.1	Transmission line	Dia. 1800 x 30.75 km								
2.1.2	Pumping station	498,000 m ³ /d								
2.1.3	Duplication of dia. 1100 mm line	Dia. 1100 x 13.28 km								
2.2	Strengthen of existing reservoir system									
2.2.1	Gyobu pump rehabilitation (3 pumps)	9,930 m ³ /d								
2.2.2	Plant rehabilitation 1 pump	5,160 m ³ /d								
3	Hlaing River System									
3.1	Intake facility									
3.1.1	Intake facilities									
3.2	Hlaing river system (1/2)									
3.2.1	Raw water intake	Dia. 2500 x 7 km								
3.2.2	Pumping station	491,000 m ³ /d								
3.2.3	Water treatment plant	470,000 m ³ /d								
3.2.4	Transmission pumping station	470,000 m ³ /d								
3.2.5	Transmission main	Dia. 2000 x 33.3 km								
4	Terminal System									
4.1	Connections									
4.1.1	Intake facilities and raw water main									
4.1.2	Gyobu connection pipe	Dia. 1400 x 4.2 km								
4.1.3	Connection to existing transmissions	Dia. 1630 x 1.0 km, Dia. 1100 x 1.3 km								
4.2	Terminal reservoir (TR)									
4.2.1	TR (2/4)	40,000 m ³								
4.2.2	TR (1/4)	20,000 m ³								
4.2.3	TR (1/4)	20,000 m ³								
4.3	Transmission pumping station									
4.3.1	PS for Downtown	400 m ³ /min								
4.3.2	PS for Central West, DT East, East South	480 m ³ /min								
4.3.3	PS for Central North, Hwaga and East North and Central	840 m ³ /min								
5	Transmission and Distribution System									
5.1	Downtown (Zone 1)									
5.1.1	Strengthening of transmission line	Dia. 1400 x 1.35 km								
5.1.2	Rehabilitation of central reservoir	45,450 m ³ (10 MG)								
5.1.3	Distribution network									
5.2	Downtown East (Zone 2)									
5.2.1	Transmission line (From Central West ST)	Dia. 1800 x 12.2 km								
5.2.2	Service reservoir	50,000 m ³								
5.2.3	Distribution pumping station	474 m ³ /min								
5.2.4	Distribution network									
5.3	Central West (Zone 3)									
5.3.1	Transmission line (From TR)	Dia. 2700 x 7.5 km								
5.3.2	Service reservoir	50,000 m ³								
5.3.3	Distribution network									
5.4	Hwaga zone (Zone 4)									
5.4.1	Transmission line (From TR)	Dia. 2200 x 3.9 km								
5.4.2	Service reservoir	50,000 m ³								
5.4.3	Distribution network									
5.5	Central North (Zone 5)									
5.5.1	Transmission line (From TR)									
5.5.2	Service reservoir									
5.5.3	Distribution network									
5.6	East South (Zone 6)									
5.6.1	Transmission line (From DT East)	Dia. 1200 x 7.6 km								
5.6.2	Service reservoir	25,000 m ³								
5.6.3	Distribution pumping station	210 m ³ /min								
5.6.4	Distribution network									
5.7	East Central (Zone 7)									
5.7.1	Transmission line (From East North)									
5.7.2	Service reservoir									
5.7.3	Distribution pumping station									
5.7.4	Distribution network									
5.8	East North (Zone 8)									
5.8.1	Transmission line (From TR)									
5.8.2	Service reservoir									
5.8.3	Distribution pumping station									
5.8.4	Distribution network									
5.11	West North (Zone 11) - Hlaingthaya									
5.11.1	Groundwater development									
5.11.2	Transmission line for groundwater									
5.11.3	Transmission line from central system									
5.11.4	Service reservoir	30,000 m ³								
5.11.5	Distribution pumping station	188 m ³ /min								
5.11.6	Distribution network									
6	Connections									
6.1	Connection to Hwaga Hot PS to 36 inch pipe now under construction for Dagon Myothitwa	Dia. 1200 x 2.0 km								
7	Groundwater management in Central Block									
Annual Construction Cost (million US\$)		Total 781 million \$	34	36	134	92	177	138	172	

5.1.2 Implementation Schedule

Implementation schedule was prepared based on the aforementioned major work items and shown in Table 5.2. Implementation period was set by eight years and eight years was divided into two stages, namely stage 1 (four years) and stage 2 (four years). Whole Project were classified into several sub-projects and sub-projects having higher priority and higher project effects were allocated to stage 1 for earlier implementation.

5.2 COST ESTIMATE

5.2.1 Cost Estimate Condition

The project cost was estimated based on the preliminary design of water supply facilities. Unit prices and lump sum prices were established considering local construction conditions, availability of construction materials and equipment, suitability of the construction method as well. Assumptions and conditions applied for the cost estimate were as follows;

(1) Price Level

The price level is set by March 2002 corresponding to the period of Pre Feasibility Study.

(2) Foreign Exchange Rates

The exchange rates were set as follows;

$$\text{US\$ 1.0} = \text{Yen 130} = \text{Ks 500}$$

(3) Procurement of Construction Materials and Equipment

Most of mechanical and electrical equipment is assumed to procure from abroad. Likewise, ductile cast iron pipe and steel pipe will be imported. In case of PVC pipe and RC pipe, domestic products are available.

As to construction materials, domestic sand, brick and gravel is available but cement and re-bar is imported from Thailand.

After the completion of this project, chemicals needed for the O&M of facilities will be procured both from domestic and abroad market. The following chemicals are needed;

Solid Alum:	imported from India or Thailand
Liquid Chlorine:	imported from Thailand
Liquid Sodium Hypochlorite:	Domestic or imported from Thailand

(4) Foreign and Local Currency Portions

The project cost estimate was divided into the Foreign Currency portion (F/C) and Local Currency portion (L/C) assuming foreign fund to the F/C portion.

F/C and L/C ratio assumed as follows according to the work categories;

<u>Work Categories</u>	<u>L/C</u>	<u>F/C</u>
Civil Works	20 %	80 %
Pipe Laying Works	5 %	95 %

Electric and Mechanical Works 5 % 95 %

5.2.2 Project Cost

The project cost of Phase-1 work was summarized in Table 5.3 and detailed estimation was tabulated in Table 5.4. Detailed cost estimation on pipeline rehabilitation and installation of distribution pipelines are shown in Appendix S.

Table 5.3 Summary of Project Cost

Unit : US\$

	L/C	F/C	Total
Phase-1	108,096,000	673,120,000	781,215,000

5.2.3 Operation and Maintenance Cost

Operation and maintenance cost for the completed water supply facilities is comprised of the following cost categories;

- Salaries
- Electricity
- Chemicals
- Repair Cost

(1) Salaries

Total salaries of the O&M personnel were calculated based on the annual personnel allotment and their basic monthly salaries. The followings are the basic salaries by job types;

Engineer, Other Professionals, Technicians : 8,000 Ks/month

Supporting Staff : 5,500 Ks/month

(2) Electricity

Electric consumption was calculated according to the pump motor output and operation hours. Since the construction of new facilities was planned as shown in implementation schedule, total motor output was varied year by year. The following electric tariff was adopted;

0.50 Ks/kWH (for Department)

(3) Chemicals

Chemical consumption was estimated based on the treated water amount and chemical dosage rate. The following dosage rate was adopted;

Alum (Water Treatment Plant) : 50 mg/L
Chlorine (Water Treatment Plant) : 1.5 mg/L
Sodium Hypochlorite (Service Reservoir) : 1.0 mg/L

(4) Repair Cost

Repair cost was accounted based on the purchase cost of equipment. 5 % of equipment cost was summed up every 4 years.

Table 5.4 Project Cost Estimation (1/4)

Unit) 1,000 US\$

No.	Facility	Dimension	Phase 1								Cost					
			Stage 1				Stage 2				L/C	F/C	Total			
			2003	2004	2005	2006	2007	2008	2009	2010						
1	Rehabilitation	Dia. 75 to 450 mm														
1.1	Replacement of Aged Distribution Pipe < 80 years old	L = 348,900 m														
1.1.1	Botataung, Kyauktada, Lanmadaw, Latha, Pabedon, Pazundaung			346	346	346		347	347				1732			6166
1.1.2	Tamwe			96	96	96		96	97				481	4434		834
1.1.3	Ahione, Kyeemyindaing			70	70	71		71	71					353		
				150	150	150		150	150				750			1180
				86	86	86		86	86					430		
1.2	Replacement of Aged Distribution Pipe < 80 and > 50 years old															
1.2.1	Sanchaung					104		104	104	105	105		522			954
						86		86	86	87	87			432		
1.2.2	Mingalartaungnyunt					67		68	68	68	68		339			1336
						199		199	199	200	200			997		
1.2.3	Dagon, Bahan, Yankin					277		277	277	278	278		1387			3555
						433		433	434	434	434			2168		
2	Development of Reservoir System															
2.1	Ngamoeyik Reservoir System															
2.1.1	Transmission Pipeline	Dia.1800 x 30.75 km		995	995	995							2985			59702
				18906	18906	18905								56717		
2.1.2	Pumping Station	409,000 m3/d				343							343			6492
						6149								6149		
2.1.3	Duplication of Dia.1100 mm Pipeline	Dia.1100 x 13.28 km						541					541			10822
								10281						10281		
2.2	Strengthen of Existing Reservoir System															
2.2.1	Gyobyu Pump Rehabilitation	9,930 m3/hr		23									23			461
				438										438		
2.2.2	Phugyi Additional 1 Pump	5,160 m3/hr		18									18			369
				351										351		
3	Hialng River System															
3.1	Intake Facility															
3.1.1	Intake Facility									291	292		583			2917
										1167	1167			2334		
3.2	Hialng River System (1/2)															
3.2.1	Raw Water Main	Dia.2500 x 7km									902		902			18055
											17153			17153		
3.2.2	Pumping Station	491,000 m3/d									247		247			4911
											4664			4664		
3.2.3	Water Treatment Plant	470,000 m3/d							10979	10980	10980		32939			117066
									28041	28043	28043			84127		
3.2.4	Transmission Pumping Station	470,000 m3/d									325		325			6500
											6175			6175		
3.2.5	Transmission Main	Dia.2000 x 33.3km							1324	1325	1325		3874			79486
									25170	25171	25171			75512		
4	Terminal System															
4.1	Connections															
4.1.1	Intake Facilities and Raw Water Main					339							339			1637
						1298								1298		
4.1.2	Gyobyu Connection Pipeline	Dia.1400 x 4.2km				261							261			5227
						4966								4966		

Table 5.4 Project Cost Estimation (2/4)

Unit) 1,000 US\$

No.	Facility	Dimension	Phase 1								Cost				
			Stage 1				Stage 2				L/C	F/C	Total		
			2003	2004	2005	2006	2007	2008	2009	2010					
4.1.3	Connection to Existing Transmissions	Dia.1650 x 1.0 km Dia.1100 x 1.3 km				136							136		2727
4.2	Terminal Reservoir (TR)					2591								2591	
4.2.1	TR (2/4)	40,000 m3				1400							1400		7000
4.2.2	TR (1/4)	20,000 m3				5600						700	700		3500
4.2.3	Water Treatment Plant					3309						2800	4963	2800	24813
4.3	Transmission Pumping Station					13233								19850	
4.3.1	PS for Downtown	400 m3/min				325							325		6500
4.3.2	PS for Central West, DT East, East South	480 m3/min				6175							284	6175	5688
4.3.3	PS for Central North, Hlawga and East North and Central	640 m3/min					284						5404	5404	
										125	126		251		5013
										2381	2381			4762	
5	Transmission and Distribution System														
5.1	Downtown (Zone 1)														
5.1.2	Stengthening of Transmission Pipeline	Dia. 1400 x 1.35 km		84									84	1596	1680
5.1.3	Rehabilitation of Central Reservoir	45,450 m ³ (1.0 MG)		1596									0	0	0
5.1.4	Distribution Network				192	205	183	183	183	183	183	183	1129		12391
					1952	2198	1779	1779	1779	1779	1775			11262	
5.2	Downtown East (Zone 2)														
5.2.1	Transmission Pipeline (from CB West SR)	Dia.1800 x 12.2 km					592	592					1184		23687
5.2.2	Service Reservoir	50,000 m ³					11251	11252						22503	
5.2.3	Distribution Pumping Station	474 m3/min						2343	3993				2343	3993	6336
5.2.4	Distribution Network							217					217		4346
								4129						4129	
								366	366	366	351		1449		6012
								1214	1214	1218	917			4563	
5.3	Central West (Zone 3)														
5.3.1	Transmission Pipeline (From TR)	Dia.2700 x 7.5 km				775	776						1551		31020
5.3.2	Service Reservoir	50,000 m ³				14734	14735							29469	
							833						833		4166
5.3.3	Distribution Network						3333							3333	
							278	333	333	333	333		1610		8552
							1178	1441	1441	1441	1441			6942	
5.4	Hlawga Zone (Zone 4)														
5.4.1	Transmission Pipeline (From TR)	Dia.2200 x 3.9 km								411	0		411		8211
5.4.2	Service Reservoir	50,000 m ³								7800	0			7800	
										833	0		833		4166
5.4.3	Distribution Network									3333	0			3333	
										134	348	348	348	1178	6949
										38	1911	1911	1911		5771

Table 5.4 Project Cost Estimation (3/4)

Unit: 1,000 US\$

No.	Facility	Dimension	Phase 1										Cost				
			Stage 1				Stage 2				L/C	F/C	Total				
			2003	2004	2005	2006	2007	2008	2009	2010							
5.5	Central North (Zone 5)																
5.5.1	Transmission Pipeline (From CB Hlawga SR)												0				0
5.5.2	Service Reservoir												0				0
5.5.3	Distribution Network										24	24	48				60
											6	6				12	
5.6	East South (Zone 6)																
5.6.1	Transmission Pipeline (From DT East)	Dia.1200 x 7.6 km								361			361				7219
										6858					6858		
5.6.2	Service Reservoir	25,000 m ³								1213			1213				3377
										2164					2164		
5.6.3	Distribution Pumping Station	210 m3/min								45			45				908
										863					863		
5.6.4	Distribution Network									213	213	213	639				2703
										688	688	688			2064		
5.7	East Central (Zone 7)																
5.7.1	Transmission Pipeline (From East North)												0				0
5.7.2	Service Reservoir												0				0
5.7.3	Distribution Pumping Station												0				0
5.7.4	Distribution Network											130	130	260			1514
												627	627			1254	
5.8	East North (Zone 8)																
5.8.1	Transmission Pipeline (From CB Hlawga SR)												0				0
5.8.2	Service Reservoir												0				0
5.8.3	Distribution Pumping Station												0				0
5.8.4	Distribution Network																
												110	110	110	330		1794
												488	488	488		1464	
5.11	West North (Zone 11) - Hlaingthaya																
5.11.1	Groundwater Development (Including GW transmission Pipeline)						587	587	588				1762				24804
							7681	7681	7680						23042		
5.11.2	Service Reservoir	30,000 m ³							1867				1867				4731
									2864						2864		
5.11.3	Distribution Pumping Station	188 m3/min							40				40				808
									768						768		
5.11.4	Distribution Network						28	111	111	111	111	472					3123
							525	548	548	548	548				2717		
6	Connections																
6.1	Connection to Hlawga No1 PS to 36 inch pipe now under construction for Dagon Myothit area	Dia.1,200 x 2.0 km											166	166			3336
													3170				

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Table 5.4 Project Cost Estimation (4/4)

Unit) 1,000 US\$

No.	Facility	Dimension	Phase 1										Cost		
			Stage 1				Stage 2				L/C	F/C	Total		
			2003	2004	2005	2006	2007	2008	2009	2010					
7	Groundwater Management in Central Block				4	1	1	2		2		2	12		75
					63									63	
		L/C	0	1,712	2,122	9,683	5,783	22,278	16,402	18,807	76,787	0	554,945		
		F/C	0	22,334	23,262	85,697	59,467	103,613	80,492	103,293	0	478,158	0		
		Total	0	24,046	25,384	95,380	65,250	125,891	96,894	122,100	76,787	478,158	554,945		
		Indirect Cost	0	5,531	5,838	21,937	15,008	28,955	22,286	28,083	17,661	109,976	127,637		
		Engineering Service	0	2,662	2,810	10,559	7,223	13,936	10,726	13,516	8,500	52,932	61,432		
		Contingencies	0	1,612	1,702	6,394	4,374	8,439	6,495	8,185	5,147	32,053	37,201		
		Grand Total	0	33,850	35,734	134,270	91,855	177,221	136,401	171,884	108,096	673,120	781,215		