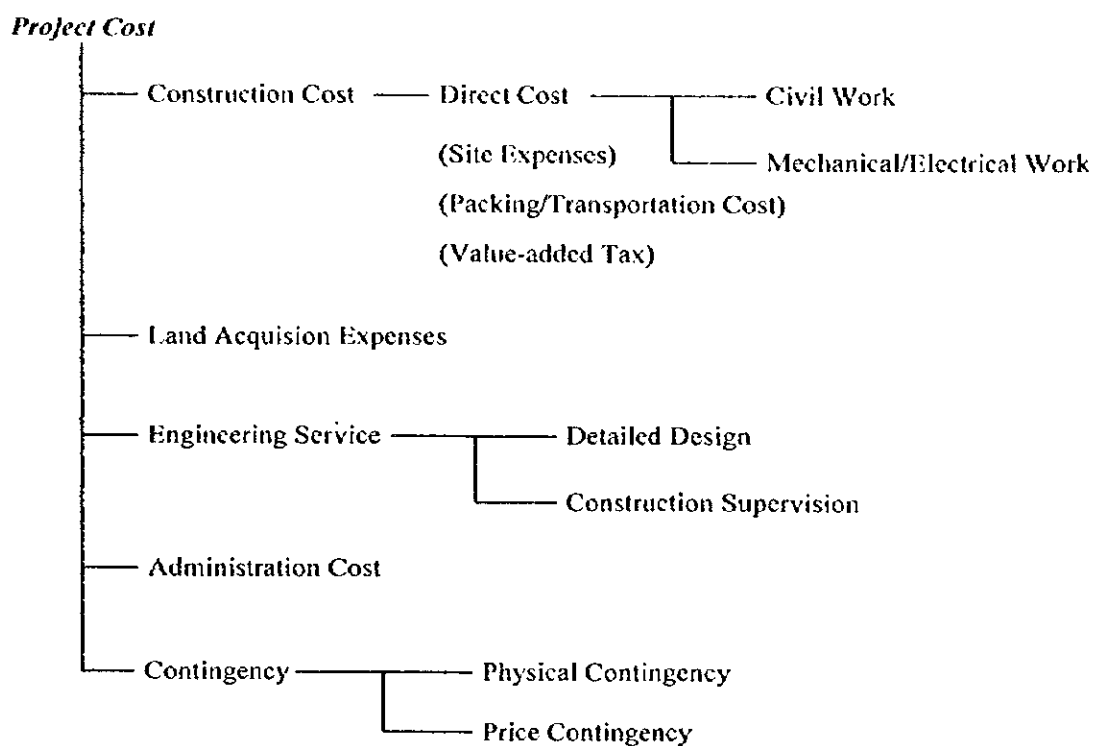


CHAPTER 9
PROJECT COST AND
IMPLEMENTATION PLAN

CHAPTER 9 PROJECT COST AND IMPLEMENTATION PLAN

9.1 General

The project cost will be estimated based on the current unit cost of major construction materials and several cost estimate formula for the alternative plans of sewerage systems. The composition of project cost will be as shown below.



It shall be noted that the accuracy and purpose of the project cost estimate at this master planning stage will be limited to grasp the magnitude of the capital investment requirements and to determine the most optimum system from alternative plans for provision of the sewerage system in North Dhaka.

9.2 Availability of Materials and Equipment

The unit cost of construction materials and equipment was obtained from local suppliers. This information included the availability of materials/equipment in the local market as well as the countries of origin for commonly imported materials/equipment.

Imported materials, which are not available as indigenous materials, such as structural steel and mechanical/electrical equipment were verified. The type of materials, their availability from neighboring countries together with unit cost and ocean freight was also investigated.

The results of the market survey on the required construction materials/equipment are shown in Table 9.2.1.

Table 9.2.1 Procurement Plan for Construction Materials/Equipment

Items	Procured in Bangladesh	Procured to be Imported from Third Country	Name of Third Country
Construction Materials	Crushed Stone, Gravel, Sand, Cement, Reinforcing Bar, Form-board, Scaffolding, Soil for Banking, Reinforced Concrete Pipe, Polyvinyl Chloride Pipe	Sheet Pile, Steel Pipe	India (Calcutta)
Construction Machinery	None	Bulldozer, Back-hoe, Clamshell, Hydraulic Pile Driver, Wheel-crane	Japan
Sewage Treatment Equipment	None	Gate, Screen, Sewage Pump, Sludge Collector, Sludge Pump, Chlorine Injection Facilities	Japan

9.3 Unit Cost

A cost estimate for the sewerage system will be prepared for the sewer, pumping station and sewage treatment plant categories, respectively.

9.3.1 Sewer

The sewer installation cost estimation was divided into, (1) trunk sewer with diameter above

500 mm, (2) lateral sewer with diameter below 500 mm. The unit construction cost was prepared by diameter, earth coverage and pipe materials, based on the quantity calculation on standard pipe installation diagram. The unit construction cost is shown in Table 9.3.1. The basic estimation conditions are shown in Appendix 9.3.1 and detailed calculation results are displayed in Appendix 9.3.2.

Table 9.3.1 Unit Construction Cost of Sanitary Sewer

Unit: Taka/m

Type Covering(m) Dia.(mm)	Steel Pipe	Reinforced Concrete Pipe							
	1.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
250	4,667	3,594	5,031	6,626	31,022	36,136	41,541	48,154	53,448
300	6,242	4,016	5,486	7,100	31,651	36,778	42,216	48,845	54,159
350	6,274	4,288	5,612	7,081	31,802	36,609	46,757	48,105	53,218
400	6,443	4,678	6,021	7,509	32,406	37,225	47,406	48,771	53,904
450	6,604	5,079	6,440	7,949	33,081	37,915	48,127	49,513	54,682
500	8,487	6,432	7,815	9,342	34,763	39,612	49,868	51,272	56,466
600	9,331	7,588	9,019	10,598	40,197	42,520	51,615	54,280	62,091
700	10,301	8,716	10,110	11,654	41,488	46,951	52,742	55,250	62,987
800	11,318	9,916	11,351	12,932	43,984	49,532	55,361	57,930	65,705
900	12,183	11,409	12,894	14,527	45,842	51,456	57,322	62,923	67,755
1000	15,421	13,986	15,511	17,183	50,025	55,725	61,631	67,288	72,159
1100	18,397	16,495	17,978	19,612	52,741	63,218	64,189	69,685	74,478
1200	21,865	18,801	20,325	21,999	55,785	66,342	67,350	72,898	77,727
1300	26,624	21,742	23,317	25,039	61,829	71,123	73,524	81,571	82,648
1400	31,794	24,691	26,313	28,085	68,694	74,773	77,246	85,327	86,422
1500	36,964	27,435	29,094	30,902	73,514	79,635	82,145	90,264	91,414
1600	39,701	30,929	32,638	34,495	77,742	83,899	89,441	94,617	95,803
1700	43,050	34,043	35,788	37,682	81,951	88,144	93,739	98,950	100,173
1800	46,398	37,998	39,800	41,752	86,516	92,746	98,392	103,639	104,898
1900	50,203	41,982	43,834	45,836	96,291	97,680	103,388	108,673	109,973
2000	59,268	46,158	48,061	50,113	102,628	104,063	113,613	115,146	116,481
2100	64,572	48,733	50,713	52,815	106,168	108,397	117,248	118,818	120,192
2200	69,876	51,307	53,365	55,516	109,708	112,731	120,882	122,490	123,902
2400	75,180	56,835	58,892	61,248	117,192	120,330	128,553	130,238	131,725

9.3.2 Pumping Station and Sewage Treatment Plant

For the cost estimate of sewage pumping station and sewage treatment plant, cost estimate formulas were prepared based on the construction cost, required construction site area and O&M cost, including electricity, for each facility with capacity of 20,000, 50,000 and 100,000 cu.m/day. These cost estimate formulas are shown in Table 9.3.2 and Figure 9.3.1 to 9.3.6. The basic estimation conditions are shown in Appendix 9.3.1 and Appendix 9.3.3 and 9.3.4 describe the estimation base data for the sewage pumping station and sewage treatment plant.

Table 9.3.2 Cost estimation Formula for Sewage Pumping Station and Sewage Treatment Plant

Unit Cost	Unit	Pumping Station	Sewage Treatment Plant
Area Requirement	-	$y = 6.7699X^{0.3444}(\text{m}^2)$	$y = 0.0126X^{0.7856}(\text{ha})$
Construction Cost	TK'000	$y = 239.32X^{0.6164}$	$y = 238.18X^{0.7659}$
O & M Cost	TK'000/year	$y = 0.2733X^{0.8515}$	$y = 1.1034X^{0.5269}$

Note: 1) Pumping station: X = Design Maximum Hourly Flow Rate (m³/day)
2) Sewage treatment plant: X = Design Daily Average Flow Rate (m³/day)

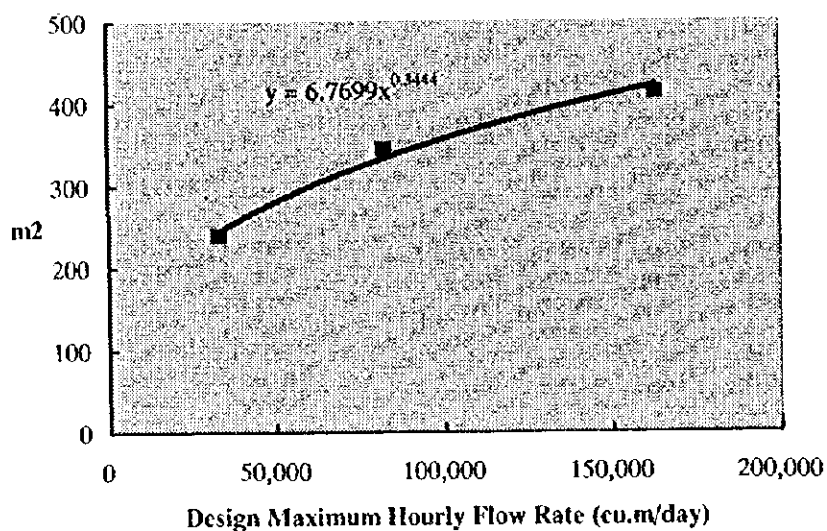


Figure 9.3.1 Flow Rate Area Formula of Pumping Station

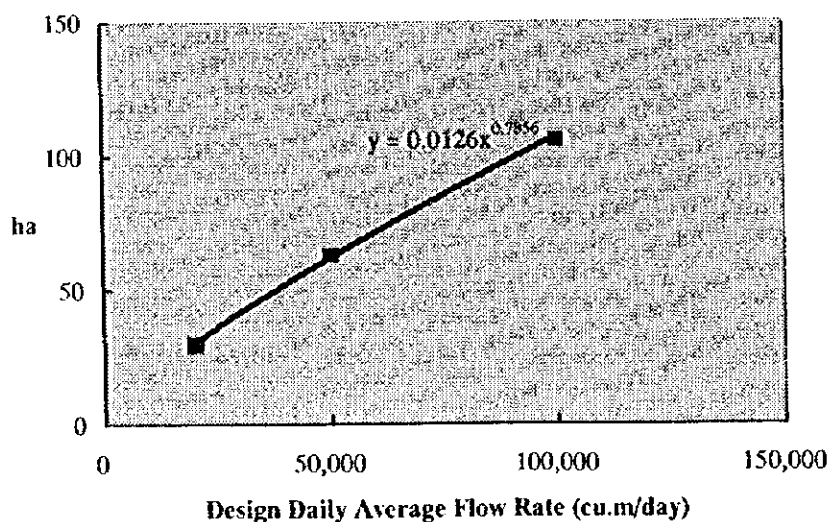


Figure 9.3.2 Flow Rate Area Formula of Sewage Treatment Plant

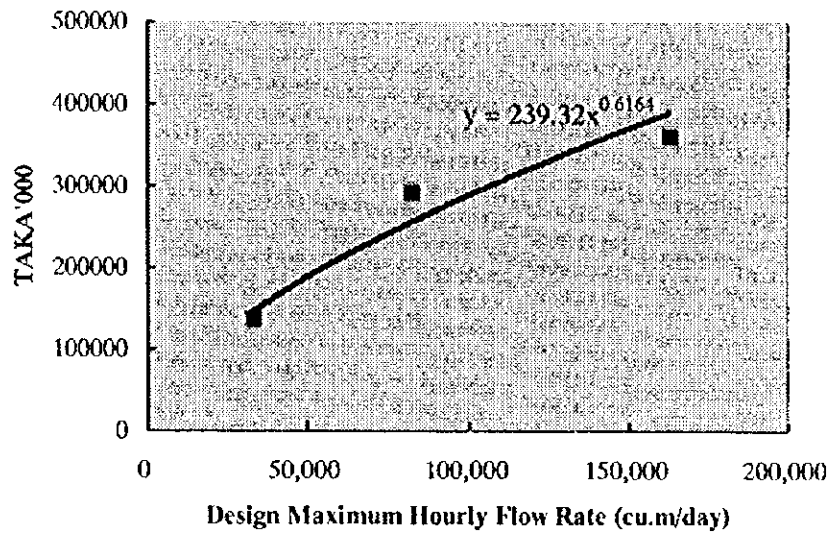


Figure 9.3.3 Flow Rate-Construction Cost Formula of Pumping Station

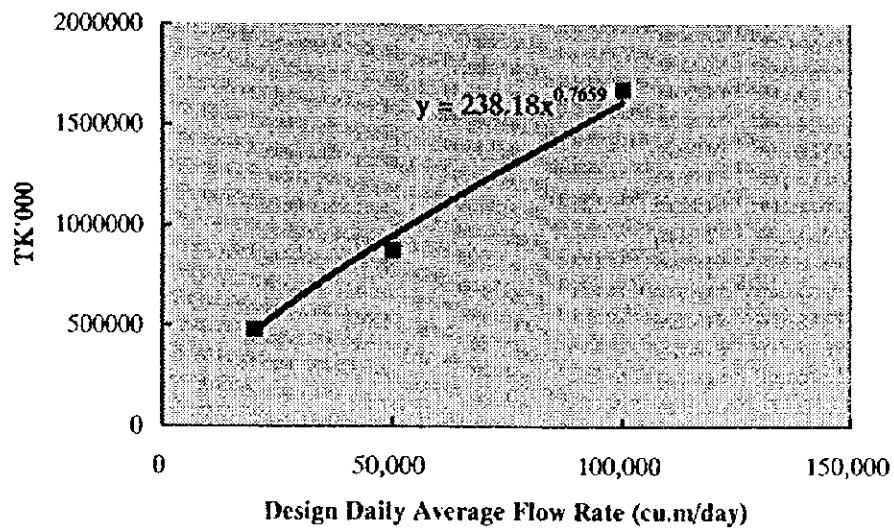


Figure 9.3.4 Flow Rate-Construction Cost Formula of Sewage Treatment Plant

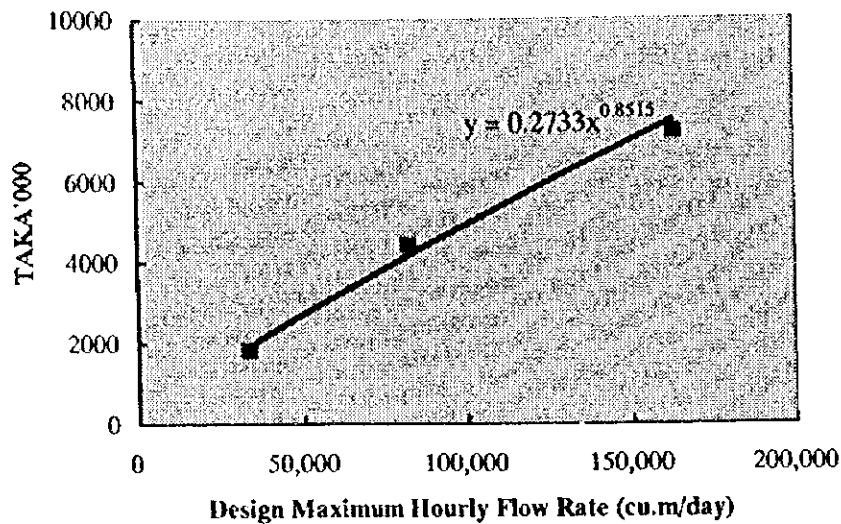


Figure 9.3.5 Flow Rate-O&M Cost Formula of Pumping Station

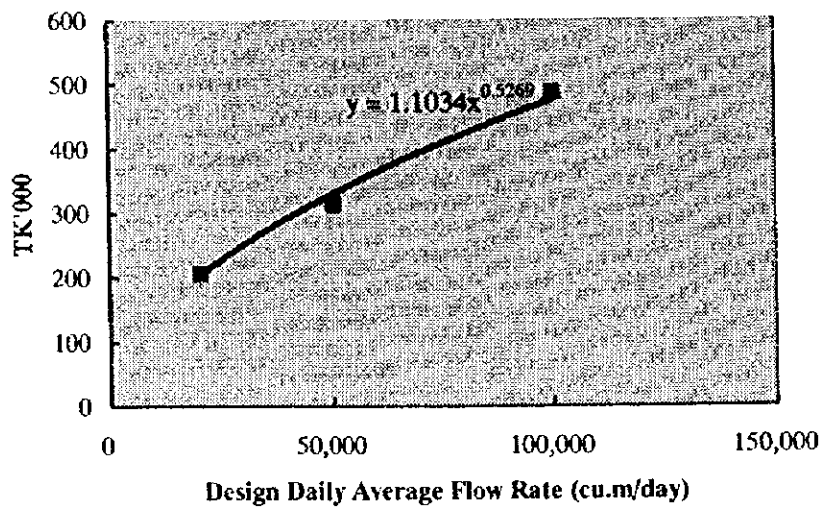


Figure 9.3.6 Flow Rate-O&M Cost Formula of Sewage Treatment Plant

9.4 Project Cost

The project cost for Alternative 4, which was selected as the optimum sewerage plan, will be estimated by construction cost and O&M cost. The construction cost calculated in Chapter 8.4.3 will be adopted for the cost estimation, while O&M cost will be assumed by adding the required personal expenses to the electricity for the sewerage facilities. The conditions for construction/O&M cost estimation are as follows:

- An estimation was performed for each sewerage facility and sewerage zone.
- The target sewerage facilities are: branch sewer, trunk main, pumping station and sewage

treatment plant.

- Sewers with diameters above 500 mm were regarded as trunk mains and a cost estimation was carried out by unit cost per diameter and earth cover.
- Sewers with diameters below 500 mm were regarded as branch sewers and the costs were calculated by the following formula:

$$\text{Construction cost} = \text{Area of sewerage zone (ha)} \times \text{road density (m/ha)} \times \text{unit cost (Taka/m)}$$

The unit cost of sewers with diameters of 250mm and with 2.0m earth cover was adopted for this formula.

Road densities by sewerage zone are shown in Appendix 9.4.1.

- A cost estimation for the branch sewer in the existing sewerage service area, namely Gulshan and Mirpur, was conducted in the following manner:

Gulshan: Sewer construction cost will not be summed up.

Mirpur: As to the small bore sewerage system service area, 50% of the construction cost was summed up as that of gray water sewer regarding night soil sewer was already completed.

- Construction cost, required site area and O&M cost were calculated by a cost estimation formula. Please refer to Chapter 9.3.2.
- Personal expenses were summed up according to the personnel allocation plan described in Chapter 10.2.3 and the results are shown in Table 9.4.1.
- Each project cost items were set as follows:
 - Overhead and Indirect Cost etc.(a): 20% of direct construction cost
 - Engineering Service(b): 3% of (direct construction cost + (a))
 - Administration Cost(c): 5% of (direct construction cost + (a) + (b))
 - Physical Contingency: 10% of (direct construction cost + (a) + (b) + (c) + land acquisition cost)

The project cost and O&M cost for the sewerage system in the target year of 2020 are shown in Table 9.4.2 and 9.4.3 respectively.

Table 9.4.1 Personal Expense for O&M of Sewerage System

Unit: Tk/year

Sewerage Zone	Tongi		Uttara		North Dhaka East		North Dhaka West		Total
Sewerage Facility	PS	STP	PS	STP	PS	STP	PS	STP	
Number of Facility	2	1	1	0	4	1	4	1	14
Number of Person	4	21	4	0	4	30	4	42	109
Unit Cost	2,650	2,650	2,650	2,650	2,650	2,650	2,650	2,650	
Personnel Expense	254,400	667,800	127,200	0	508,800	954,000	508,800	1,335,600	
Total	922,200		127,200		1,462,800		1,844,400		4,356,600

Table 9.4.2 Project Cost of Sewerage System

Unit: Tk'000 and US\$'000

Facilities	Tongi	Uttara	North Dhaka East	North Dhaka West	Total
1. Construction Cost					
Branch Sewer	426,764	415,716	843,306	949,520	2,635,306
Trunk Main	141,357	149,553	539,120	519,893	1,349,923
Pumping Station	294,520	81,493	898,318	1,171,420	2,445,751
Sewage Treatment Plan	646,157	0	1,663,590	2,340,602	4,650,349
Sub-total	1,508,798	646,762	3,944,334	4,981,435	11,081,329
Sub-total (including overhead)	1,810,558	776,114	4,733,201	5,977,722	13,297,595
2. Land Acquisition					
Land Cost for PS	3,030	1,320	30,325	6,905	41,580
Land Cost for STP	733,740	0	1,440,780	2,391,110	4,565,630
Sub-total	736,770	1,320	1,471,105	2,398,015	4,607,210
3. Engineering Service	54,317	23,283	141,996	179,332	398,928
4. Administration Cost	93,244	39,970	243,760	307,853	684,827
Total(1+2+3+4)	2,694,889	840,687	6,590,062	8,862,922	18,988,560
5. Physical Contingency	269,489	84,069	659,006	886,292	1,898,856
Grand Total	2,964,378 (US\$67,785)	924,756 (US\$21,145)	7,249,068 (US\$165,761)	9,749,214 (US\$222,930)	20,887,416 (US\$477,623)

Note: Exchange Rate: US\$1.00 = 43.732Taka (as of July 1997)

This project cost is not include the price contingency.

Table 9.4.3 Operation and Maintenance Cost of Sewerage System

Unit: Tk'000/year and US\$'000/year

Sewerage Facility	Tongi	Uttara	North Dhaka East	North Dhaka West	Total
Power Consumption					
Pumping Station	3,965	861	14,645	21,770	41,241
Sewage Treatment Plant	254	0	487	616	1,357
Personnel Expense	922	127	1,462	1,844	4,355
Total	5,141 (US\$117)	988 (US\$22)	16,594 (US\$379)	24,230 (US\$554)	46,953 (US\$1,073)

Note: Exchange rate: US\$1.00 = 43.73Taka (as of July 1997)

The financial viability of the optimum sewerage system master plan is studied based on the project cost and incorporated in Chapter 12 "Financial Aspects".

9.5 Implementation Plan

The principles of the preparation of a sewerage master plan with target year of 2020 are as follows:

- Project implementation will begin in the year of 2000 and will be completed in 2020, the target year of the master plan. The first year (2000) will be allocated the project preparation, survey and design. The construction will start in 2001.
- Sewerage development shall be implemented in the priority order of North Dhaka East, North Dhaka West and the Tongi service areas.
- Sewerage development in the sewerage zone will also be implemented in the priority order, from the Core Area followed by the Transitional Area.
- Project cost will be estimated based on the prices of July, 1997, when the sewerage master plan was prepared.
- Project implementation plans in each sewerage zone were established based on the required construction period. Their annual costs were calculated by dividing the total project cost for the collection system (6,430,980,000 Tk) comprised of trunk main, branch sewer and pumping station, by the project implementation period (20 years):

$$6,430,980,000 \text{ Tk} \div 20 \text{ years} = 321,549,000 \text{ Tk/year}$$

The project cost for each sewerage zone has already been calculated, so the required construction period can be estimated by the said project cost and the annual cost. Appendix 9.5.1 shows the project cost per sewerage zone.

- The construction period for sewage treatment plant was assumed as two years for both North Dhaka East and West, while the time anticipated for Tongi, which is smaller than the other two, was one year.
- The price contingency was calculated assuming that price escalation ratio will be equivalent to the present ratio, 5% (Please refer to Chapter 2.2.5 Economic Conditions).

The project implementation and disbursement schedule is shown in Appendix 9.5.2.

CHAPTER 10
OPERATION AND MAINTENANCE PLAN

CHAPTER 10 OPERATION AND MAINTENANCE PLAN

10.1 General

At present, some parts of North Dhaka, namely Gulshan, Badda, Baridhara, are served by a sewerage system and Mirpur is equipped with a small bore system (although some sections are not yet operated since the discharge pumping stations are not yet completed).

The appropriate O&M of sewerage facilities is indispensable, not only to retain the function of the public sewerage service, but also to prolong the service life of the overall sewerage system. Based on the findings on present the O&M status of the existing sewerage facilities in South Dhaka and the MODS Zone Offices, the proposed maintenance activities are described below.

10.2 Procedure of Operation and Maintenance

10.2.1 Sewers

There are three procedures for the O&M for sewers; namely, site investigation, pipe cleaning and the rehabilitation of damaged sewers. The work items for the three O&M procedures are shown in Table 10.2.1

Table 10.2.1 Work Items by Type of O&M of Sewers

O&M Type	Work Item
Site Investigation	<ul style="list-style-type: none">- Location, diameter, material of investigated sewers- Identification of location/cause of damaged/blocked sewers- Identification of location/cause of groundwater intrusion- Investigation of manhole overflow point and its cause- Measurement of the volume of sediments at the sewer bottom
Pipe Cleaning	<ul style="list-style-type: none">- Removal of sediments
Rehabilitation	<ul style="list-style-type: none">- Replacement/repair of damaged sewer

The O&M work for sewers shall be conducted by the working programs as shown below.

(1) Site investigation

A yearly investigation plan shall be prepared, covering the entire sewer in the service area, and the site investigation itself shall be conducted along with the above-mentioned work items based on the said plan. During the site investigation, all staff must be careful of the possibility of anoxic conditions in manholes and of the traffic around the working area.

This investigation shall be performed repeatedly and periodically. Further, the daily O&M activities shall be recorded in a log book.

(2) Pipe cleaning program

An annual pipe cleaning program shall also be prepared and be carried out based on the priority spots identified in the site investigation.

Generally, there are four types of pipe cleaning methods: hydraulic jetting machine, sludge suction machine, bucket machine and manual cleaning. At present, the following equipment is available in the MODS Zone Offices, however, most sewers are cleaned manually, using bamboo sticks and buckets.

Table 10.2.2 Existing Pipe Cleaning Equipment in MODS Zone Offices

Item	Sludge Dewater Pump	Sludge Suction Pump	Hydraulic Jetting Machine
Zone Office	Zone Office I x 2 Nos. Zone Office VI x 2 Nos.	Zone Office III x 1No.	Zone Office I x 1No. Zone Office III x 1No.
Total	4 Nos.	1 No.	2 Nos.

The pipe cleaning shall be conducted repeatedly and periodically and the daily O&M activity shall be recorded in a log book.

(3) Rehabilitation plan

Aside from the existing sewerage system, a large part of the planning area for sewerage service in North Dhaka is left unsewered at present. However, rehabilitation work is indispensable to maintain the proper capacity and to extend the life of both the existing and any newly installed sewers. The following work shall be conducted:

The annual pipe rehabilitation plan shall be prepared and be carried out at the priority spots in accordance with the results of site investigation, considering their priority status.

Generally, there are two types of pipe rehabilitation: the replacement of sewer pipe and repair of damaged pipe portions. The damage caused by natural or external factors, such as ground subsidence, adjacent construction work, overweight vehicles and hydrogen sulfide corrosion etc.

The rehabilitation work shall be, in principle, covered by the O&M teams of the MODS Zone Offices but the tasks will be done according to the scale of work. Some work can be contracted out to local contractors.

(4) Monthly audit report

Monthly audit reports must be prepared. O&M costs should include all the required costs, such as labor, material, transportation costs, etc. The proposed auditing indicators are: O&M cost (Tk)/1,000 m of sewer

10.2.2 Lift Stations

In total, 14 lift stations are proposed in the proposed project as shown in Chapter 8. The O&M for lift stations can be classified into two items, namely daily and periodical work. The work items by O&M type are shown in Table 10.2.3.

Table 10.2.3 Work Items of Lift Station by O&M Types

O&M Type	Work Item
Daily Work	<ul style="list-style-type: none"> - Manual operation of pump facility - Removal of screenings - Record the daily O&M activities and relevant data (pump operation time, receiving voltage, ampere, major breakdown, etc.) on Log Book - Report to MODS Zone Office in case of breakdown
Periodical Work	<ul style="list-style-type: none"> - Removal/cleaning of scum, sediments in pump pit in every 6 months - Overhaul of pump facility every 5 to 10 years

(1) Daily work program

Most I/Ss in South Dhaka are operated manually. Thus, the I/S s in North Dhaka shall be basically operated manually since it is the most reliable method. Pump shall be operated in a close relationship to the sewage level in the wet well and the high water level (pump starting level) shall be set at the lowest level that won't interfere the pump operation. In most I/Ss in South Dhaka, the sewage level in the wet well was high. This is because of the breakdown of the water level indicator. Due to the breakdown of the indicator, the resident pump operators operate pumps only using their eye measurement of sewage level in wet well and pump starting level of sewage is usually high. This might hinder the smooth flow of sewer and cause the clogging/flooding of the sewer. Thus, durable water level indicators are indispensable to maintain the sewage level.

The removal of screenings is also important for the proper operation of L/S. The removed screenings shall be hauled away by O&M team of the Zone Offices immediately to avoid any nuisance to the public.

Further, the pump operator must report to the Zone Office in a case of breakdown. Zone Office will call the exclusive O&M team and the team will be dispatched to the site.

Basically the L/Ss shall be operated in 24 hours a day; thus the existing three shift system adopted in South Dhaka, shall be employed as follows:

Shift 1: 6:00 - 14:00

Shift 2: 14:00 - 22:00

Shift 3: 22:00 - 6:00

One (1) resident pump operator shall be assigned for each shift and one (1) stand-by operator shall be employed in emergency cases. Thus four (4) pump operators/L/S will be needed in total.

(2) Periodical work program

The pump pit needs periodical cleaning every 6 months by the resident pump operator. During this operation, any scum and sediment will be removed. The overhaul of the pump facility shall be done every 5 to 10 years to extend their service life and continuous proper operation.

(3) Monthly audit report

Monthly audit report must be prepared. O&M cost shall include all the required cost such as, labor, material, transportation cost, etc. The proposed auditing indicators are as follows:

O&M cost (Tk)/cu.m/day per pumped sewage

10.2.3 Sewage Treatment Plant

The treatment method for the STP is the stabilization pond method, which requires simple technology and has small manpower requirements; however, proper O&M is indispensable in extending the service life of the facilities and to ensure continued performance.

In the plant, there are two substances to be treated: sewage and sludge. Sewage will be treated by a stabilization pond and then discharged to the receiving water bodies, while sludge will be treated using sludge drying beds and will be removed manually. The treated sludge will then be disposed of at a disposal site.

The O&M work for the STP can be categorized into two items: daily and periodical work. The work items by the said category are shown in Table 10.2.4.

Table 10.2.4 Work Items of Sewage Treatment Plant by O&M Type

O&M Type	Work Item
Daily Work	<ul style="list-style-type: none">- Measurement of inflow sewage volume- Removal of screenings- Inspection of mechanical/electrical facilities- Water quality analysis- Record of daily O&M activities
Periodical Work	<ul style="list-style-type: none">- Removal of grit and sediments at grit chamber (monthly)- Removal of sludge at stabilization pond and sludge drying bed (annually)- Inspection/repair of mechanical/electrical facilities (annually)- Overhaul of mechanical/electrical facilities (every 5 to 10 years)

(1) Daily work program

The measurement of the sewage inflow rate is a significant item for the proper future operation of the treatment facilities. The screenings collected at the screen and grit chamber shall be removed everyday to allow for the smooth inflow of sewage into the treatment facility. The collected screenings will be conveyed to a waste disposal site. The mechanical/electrical facilities must be inspected during their daily operation in order to notice any defects and to quickly conduct any needed maintenance work. It is very important to extend their service life and to maintain their future proper operation.

These daily O&M activities shall be recorded in a log book on a daily basis. Major breakdowns, repairs, any required manpower, time, an cost shall be described in the log book as well. This information will be important data for O&M in the future.

Basically the STP will be operated 24 hours a day; thus the existing three shift system adopted in South Dhaka shall be employed as follows:

Shift 1: 6:00 - 14:00

Shift 2: 14:00 - 22:00

Shift 3: 22:00 - 6:00

According to the proposed project, three (3) STPs will be operated in the Study Area. For each STP, one (1) foreman and two (2) operators shall be assigned to each shift. The number of workers in each shift will vary according to the design capacity of the STP as follows:

<u>Name of STP</u>	<u>Design Capacity (m³/day)</u>	<u>Number of workers</u>
Tongi	30,400	3
North Dhaka East	104,500	6
North Dhaka West	163,200	10

Aside from the said O&M staff, one (1) executive engineer and one (1) subdivision engineer will be needed for the management of the plant and one (1) microbiologist shall be employed in the laboratory. Thus, in total, the following staff will be needed per each STP.

Table 10.2.5 Required Staff for Sewage Treatment Plant

Position	No.	Position	No.
Executive Engineer	1	Operator	6
Subdivision Engineer	1	Worker	T:9, DE:18, DW:30
Foreman	3	Microbiologist	1
		Total	T:21, DE:21, DW:42

Note : T ; Tongi STP, DE ; North Dhaka East STP, DW ; North Dhaka West STP

(2) Periodical work program

Two types of maintenance staff are required for a periodical work program. The first group is comprised of ordinary workers to remove the sediment/sludge in the grit chamber, stabilization pond and sludge drying beds. The removed sludge will be conveyed to a disposal site. The second group is made up of technicians for the maintenance of the mechanical/electrical facilities.

(3) Laboratory

Since a STP will discharge treated water into public water bodies, the treated water must comply with the effluent regulations established by the DOE, which are shown in Table 3.4.8. Thus, a laboratory shall be constructed within the STP to check the effluent quality on a daily basis. Complicated water analyses can be conducted by contracting out. The examination items and their frequency are as follows:

Table 10.2.6 Proposed items and Frequency for Water Quality Analysis

Items	Regulations	O&M
(Sewage)		
Air temperature		●
Water temperature	◎	●
Color		●
Odor		●
Transparency by cylinder test		●
pH		●
DO		●
BOD	◎	○
COD		●

**Table 10.2.6 Proposed Items and Frequency for Water Quality
Analysis (Cont'd)**

Items	Regulations	O&M
SS	⊙	●
Settable solids		●
Chloride		◇
Total solids		◇
Fixed solids		◇
Volatile solids		◇
Dissolved solids		◇
Total nitrogen		◇
Ammonia (Free)		◇
Ammonia nitrogen		◇
Nitrate	⊙	◇
Nitrite		◇
Organic nitrogen		◇
Phosphorus (total as P)	⊙	◇
Coliform count	⊙	●
Total colonies		●
(Sludge)		
Temperature		●
pH		⊙
Moisture content		●
Hazardous substances		◇

Note: Examination frequency

● : More than once a day ○ : More than once a week
 ⊙ : More than twice a week ◇ : As required

(4) Monthly audit report

A monthly audit report must be prepared. The O&M cost shall include all the required costs, such as labor, materials, transportation costs, etc. The proposed auditing indicators are as: O&M cost (Tk)/cu.m/day per treated sewage

10.3 Organization for O&M and Others

(1) Organization and budget of MODS Zone Office

For efficient O&M activities, the organization of the MODS Zone Office shall be separated in terms of the water supply and sewerage systems together with their budgets.

(2) Exclusive O&M team and O&M budget for STP and I/S

Exclusive O&M teams are indispensable for the proper operation of the sewerage system. They will be dispatched by the request from the MODS Zone Offices. A budget, vehicles and tools exclusively for O&M work shall be prepared also.

(3) New work shop

Although there is an existing work shop in Mirpur, they mainly repair vehicles. Thus, new a work shop shall be built for water supply and sewerage equipment such as pumps, motors, generators etc. The periodical rewiring of electric motors is an effective preventive maintenance procedure that will be facilitated by the new workshop. A new spare parts shop shall also be constructed to ensure efficient repair work. In related to these activities, a monthly audit report covering O&M shall be prepared.

(4) Waste collection system

In some parts of South Dhaka, waste is piled along the road and some is dumped into sewers from open manholes, causing pipe clogging. A waste collection system shall be set up in close cooperation with the DCC. Sanitation education for the end-users shall also be conducted.

(5) Collection and treatment of accumulated sludge of septic tank

Some parts of Study Area will be covered by on-site treatment facilities such as septic tanks. For efficient treatment, the settled sludge in the off-site facilities should be extracted and treated. Although collected sludge is dumped at a sludge dumping site at present, considering its impact to the surrounding environment, the sludge shall be treated properly. A sludge treatment facility can be planned within the site for a new STP. The collection work will be covered by the O&M teams for sewer reticulation in the MODS Zone Office. Thus, the team should be equipped with the necessary collecting vehicles and tools.

(6) Data Base on sewerage system

A computerized sewerage Data Base System shall be established. The data base shall include the following basic information:

1) Information on consumers

Address, phone number, name of the owner, number of family members, and diameter of connected sewer.

2) Information on sewer reticulation

Pipe ID number, diameter, length, material of sewer, year of completion, capacity, existing flow rate, and repair record.

3) Information on pumping stations and sewage treatment plant

Address, list of facilities and equipment, completion year, design criteria, incoming and effluent sewage rate; repair record.

4) O&M activity record

Date, work contents, and cost.

CHAPTER 11
LEGISLATION, INSTITUTION
AND ORGANIZATION



CHAPTER 11 LEGISLATION, INSTITUTION AND ORGANIZATION

This section presents and assesses the institutional and legal framework affecting the provision of sewerage, sanitation and related services (Subsections 11.1 through 11.3) in Dhaka. Strategic recommendations are made regarding the institutional options and arrangements to promote and guide the successful completion of this master plan (Subsections 11.4 through 11.5).

11.1 Sector Institutions Involved in Sanitation/Sewerage Provision

11.1.1 Central-Level Institutions

- (1) The *Planning Commission* of the **Ministry of Planning (MP)** is responsible for coordinating the formulation and monitoring of *Five-Year Development Plans*. It ensures that all proposed improvements are consistent with current policies and priorities. Since the 1st Five-Year Plan for 1973-78 was issued, the resource allocation for water supply and sanitation has been diminishing.

This trend reversed by the 4th Five-Year Plan, 1990-95; sector investment level now stands at 1.41% of total development expenditure. In addition, the *Three-Year Rolling Investment Plan (TYRIP)* was introduced in 1991 to reflect short-term public sector development programs and projects, including technical assistance. The Plan reflects, in broad terms, the development perspectives, objectives, policies and strategies of the GOB. *Annual Development Plans (ADP)* are based on the TYRIP.

- (2) The *External Relations Department* of the **Ministry of Finance (MOF)** assesses the foreign exchange requirements; coordinates with external support agencies and negotiates for grant and loan financing facilities for priority projects of the various ministries. It also reviews the utilization of external assistance funds. Principal sources of loans for water supply and sanitation in Dhaka are IDA/World Bank and ADB.

The French and the Japanese Governments have provided significant grant funds for capital improvements and rehabilitation. The Dutch and Danish Governments, UNDP and UNICEF have principally supported sector work in the rural areas.

- (3) **Ministry for Local Government, Rural Development and Cooperatives (MLGRDC)** exercises overall responsibility for provision of water supply and sanitation services in the country. Its *Department of Public Health Engineering (DPHE)* bears the responsibility for planning, implementation and operation of water and sanitation in rural areas and small towns. However, in Dhaka and Chittagong, *Water Supply and Sewerage Authorities (WASAs)* have been organized to develop and manage water and wastewater systems. Although they are still under the Ministry, the WASAs enjoy some autonomy as public utilities.

Municipal corporations, such as the *Dhaka City Corporation (DCC)*, are responsible for, among others, all other forms of sanitation activities except for waterborne sewerage. In smaller towns and rural areas, the *Local Government Engineering Department (LGED)* assists local government units in providing basic municipal services, including water and sanitation. In many instances, the DPHE and the LGED functions have tended to overlap.

- (4) **The Ministry of Housing and Public Works**, through the *Rajdhani Unnayan Kartripakkha (RAJUK)*, reviews major urban development and building plans and issues permits to ensure compliance with existing design and construction standards. RAJUK coordinated the formulation of the new Dhaka Metropolitan Development Plan for 1995-2015.

The DMDP presents the planned development for a wider area of about 1528 sq.km. (including the Study area). While the previous 1959 Master Plan was essentially a land use plan, the new DMDP focuses on and integrates the needed services and presents a general structure plan. It is envisaged that detailed planning will be done later in consultation with residents.

The DMDP divides Dhaka into twenty-six (26) strategic planning zones (SPZs) and offers future scenarios based on area potentials and current problems. The Plan was completed in 1997 under the supervision of a multi-agency Technical Management Committee headed by the RAJUK Chairperson.

The Committee included representatives from the DCC, DWASA and other public utilities, state-owned enterprises, officials from affected pourashavas and other agencies and programs. The UNDP and UNCHS provided technical and financial support for the plan preparation.

- (5) Several ministries exercise key development and/or regulatory responsibilities related to sanitation and sewerage service provision. The **Ministry of Land** deals with resettlement policies and issues, including entitlements and procedures. WASAs requiring right-of-way for new facilities have to coordinate with this institution. The actual implementation of resettlement, however, is undertaken by the Deputy Commissioner for Dhaka of the **Ministry of the Establishment**.

The **Ministry of Water Resources** is responsible for overall water resources management and water quality monitoring of rivers, lakes and other natural bodies. The **Ministry of Health and Family Welfare** is responsible for ensuring access to environmental sanitation and public health services. The **Ministry of Environment and Forests** is responsible for setting and enforcement of effluent standards. The *Department of the Environment (DOE)* was established in 1989.

11.1.2 City-Level Institutions

Bangladesh is divided into five (5) Administrative Divisions: Dhaka, Barisal, Chittagong, Sylhet, Khulna and Rajshahi. Dhaka City is part of the Dhaka Administrative Division. It is divided into administrative wards, each of which is headed by an elected ward commissioner.

- (1) **Dhaka City Corporation (DCC)** was created to undertake the planning and general administration of urban services within the city. Headed by the mayor, the DCC

takes responsibility for, among others, non-sewered (on-site) sanitation and disposal services and solid waste management. DCC has been implementing a public toilet construction program. The public toilets are operated through lease contracts with private individuals or groups residing in the community. There are about 68 toilet facilities functioning at present; thirty (30) more are under construction. The lessee pays a nominal annual fee of about Taka 10,000 for the rights to operate the facility and pays for the water and electricity charges. DCC continues to be responsible only for major repairs. Current problems encountered are pilferage of parts and availability of land for new sites. Wastes are treated in septic tanks; effluents are discharged to storm drains. Current user charge is Taka 0.50 per use.

For the general repair and maintenance of public service infrastructure, including major repairs of public toilets, the DCC Engineering Department has divided the city into ten (10) zones each headed by an Executive Engineer. Tendering, for private sector lease of public toilets, is done by the DCC State Department. The DCC Health Department provides for sanitary inspection services.

- (2) The Dhaka Water Supply and Sewerage Authority (DWASA) bears responsibility for piped water supply and sewerage services for the city. As a state-owned enterprise, DWASA is expected to function in a financially viable manner. Technology used for wastewater collection, treatment and disposal is mainly of the conventional type. Almost 90% of water supply is taken from groundwater sources; although several water supply treatment plants are in operation. DWASA is also tasked to deal with storm water drainage issues. A detailed description of the DWASA is found in Subsection 11.3.

11.2 Key Legislation and Sector Policy Statements

There are several major legislation and policy statements that have a significant impact on the Master Plan.

- (1) The **Town Planning Act, 1953**, was enacted to promote the development, improvement and expansion of selected areas, initially Dhaka City and Narayanganj.

It provided for the extension of the development area beyond the stated bounds, as needed, and created the "Dacca Improvement Trust" and the institutional arrangements to undertake area planning and development. This is the forerunner of what is now called RAJUK. It was on this basis that the first master plan was formulated in 1959.

- (2) **The Building Construction Act, 1952**, and the **Building Construction Rules, 1984**, seeks to prevent the haphazard construction of buildings and other developments which may interfere with planning in other areas.
- (3) **The Dhaka City Corporation Act, 1983**, created the city corporation and vested it with the authority to administer the day-to-day management of public services in Dhaka.
- (4) **The Water Supply and Sewerage Authority Ordinance, 1963**, (subsequently amended) authorized the establishment of Water and Sewerage Authorities (WASAs) by local governments to provide adequate and safe drinking water and sewerage services in urban areas. The Dhaka Water Supply and Sewerage Authority was created pursuant to this ordinance. It is tasked to construct, improve, and operate water supply and sewerage works and other facilities. In 1966, the DWASA Rules on sewer connections and levy of sewer rates were issued. In 1989, storm water drainage responsibilities were added to DWASA's mandate.
- (5) Numerous ordinances, policies and action plans have been enacted to address environmental management and pollution control. The **National Environmental Management Action Plan (NEMAP)** has been adopted to strengthen compliance with ordinances. The **Environmental Conservation Act, 1995**, empowered the DOE to take urgent measures against polluting industries and laid the basis for the **National Conservation Strategy, 1995**.

The **Environmental Protection Act, 1995** established the Department of Environment (DOE); authorized the declaration of environmentally critical areas, the regulation of polluting industries through environmental impact assessments and standards. The **Environmental Pollution Control Act, 1977**, was also passed.

Earlier, the **Factory Act, 1965**, and **Factory Rules, 1979**, required industries to install appropriate systems for disposing of their solid and liquid wastes. The **Fish Act, 1950**, amended by an ordinance in 1982, seeks to check the poisoning of fish and marine life in the rivers.

11.3 The Dhaka Water and Sewerage Authority (DWASA)

Public water and sanitation service provision in Dhaka started during the British occupation when a simple water supply facility was constructed in 1873. The first wastewater facility was installed in 1923 in what is now called the old city. In 1992, the GOB, with JICA assistance, rehabilitated several wastewater pumping stations and upgraded the sewage treatment plant capacity to 120,000 cu.m/day to serve up to 30% of the city population.

11.3.1 Organizational Structure

A seven-man Board governs DWASA; the Chairman is appointed by the MLGRDC. The Board exercises policymaking functions. A Managing Director handles the day-to-day operations of the utility assisted by three (3) Deputy Managing Directors (for Planning and Development Services; for Technical Services; and for Financial and Administration Services). The *Planning and Development Services* is responsible for all facilities improvement projects and organization development programs.

The *Technical Services* is responsible for day-to-day operations, maintenance and repair of the water and wastewater system. The service area is divided into six (6) Maintenance, Operations and Distribution Service (MODS) zones each headed by an Executive Engineer and reporting to the Assistant Managing Director for Technical Services. The North Dhaka Study Area is within MODS zones 3 to 5. The *Financial and Administration Services* is responsible for general support services, including human resources development; and for the billing, collection and customer relations operations.

The partially implemented organization chart of DWASA is shown in Figure 3.1.1. The approval and staffing of the posts of Managing Directors and Deputy Managing Directors has been completed; confirmation of other posts and staffing is expected to follow shortly. The timetable for the completion of the reorganization is unclear. The situation is complicated by current discussions towards increased private sector participation.

11.3.2 Staffing and Human Resources Development

- (1) Staffing ratio is 24 employees per 1,000 service connections which is considered high. The annual cost for salaries and wages is in the order of Taka 130.0 M. DWASA employed a total of 3,264 persons as of December, 1996, deployed as follows:

Technical Service	1,943
Administrative Service	55
Financial Service	698
Planning and Development Service	568
Total	3,264

- (2) Internal Training Capacity for Wastewater and Sewerage

The promotion and organization of staff training is the responsibility of the *DWASA Training Institute* which was established in 1980 and is headed by the Chief Training Officer under the Administrative Service.

- 1) **Current training courses** emphasize water supply operations. There are no wastewater-related courses being implemented and it would be fair to state that there is no capacity to launch one in the near future. Current course list is outlined below.
 - a. Operation of Chlorinators, Use of Gas Masks and Safety Measures (6 days; for Pump Operators and Apprentice Pump Operators)
 - b. Training Course for Newly-Recruited Filter Operators (6 days; for Sub-Assistant Engineers)
 - c. Pump Operation and Maintenance (6 days; for Pump Operators and Apprentice Pump Operators)

- d. Sewer Laying and Maintenance (6 days; for Sub-Divisional Engineers, Assistant Engineers) not active
- e. Sinking of Deep Tubewells (6 days; for Sub-Assistant Engineers)
- f. Orientation Course for Sub-Assistant Engineers (5 days; for Sub-Assistant Engineers)
- g. Accounting and its Application; Budget Preparation and Control (8 days; for Junior Office Assistants, Senior Office Assistants, Cashiers)
- h. Existing Rules and Regulations of DWASA (7 days; for Sub-Divisional Engineers, Assistant Engineers, Assistant Secretary, Accounts Officers, Assistant Microbiologists, Research Officers)
- i. Billing and Revenue Collection (6 days; for Revenue Inspectors)
- j. Computer Operations: WordPerfect 5.1 Package (15 days; for Lower Division Assistant cum Typists, Assistant Engineers, Assistant Secretaries)
- k. Computer Operations: Lotus 1-2-3 Package (15 days; for Lower Division Assistants cum Cashiers, Revenue Inspectors, Store Keepers, Assistant Engineers)

2) **Trainers and Training Methods.** There are not enough trainers and facilitators to launch the needed training activities to support sewerage operation. There are only 2 professionals, including the Chief Training Officer, at the Institute. Most trainers (lecturers) have come part-time from within DWASA or other institutions, such as the Bangladesh Management Development Center. Honoraria paid to resource persons range from Taka 175/hour for in-house staff to Taka 250 for experts invited from outside. Methodology generally consists of lectures, with very few opportunities for practical training and discussion. Typical class size would range from 78 persons.

3) **Areas of Training.** Generally, the Institute has not been able to keep pace with new ideas about approaches and technology options for sewerage and sanitation. There are no training and information materials available on these subjects. Many lessons could have been learned from the current sewerage operations in South Dhaka and the facilities in Pagla Treatment Plant and the Narinda Lift Station; however, there have not been any moves to tap this rich source of case studies and experience.

- 4) **Training Resources.** The current annual budget allocation for the Institute is about Tk 400,000. This is intended to cover direct local training expenses only, i.e., training staff salaries are not included. The training center in Lalmatia has classroom facilities and some audiovisual equipment.
- 5) **Training Administration.** Annual Plans are put together by the Institute based on available resources and other opportunities. Very little input is provided by managers and supervisors in determining the training priorities.

11.3.3 Current Institutional Development Initiatives in DWASA

There have been recent institutional assessments of DWASA in connection with planned capital improvements in water supply. Although much of the reforms underway have been formulated and recommended based on a review of the water supply operations, some of the reforms will invariably improve the sewerage operations also. The World Bank 4th Dhaka Water Supply Project, for example, puts an emphasis on institutional strengthening. Its Management and Operational Support Program (twinning program) seeks to strengthen the "management, planning, operational and maintenance capabilities of DWASA". The diagnostic phase has just been completed. This Master Plan considers the recommendations and focuses on improvements on wastewater management and operations based on current practices in the South Dhaka sewerage operations.

11.4 Analysis and Assessment of Institutional Issues

11.4.1 Institutional Situation in the Study Area

The target areas covered by this North Dhaka study is included, wholly or in part, in six (6) of the 26 Strategic Planning Zones (SPZs) identified under the DMDP. A brief description of the institutional situation, by the relevant SPZ, follows.

- (1) *SPZ4 Western Suburbs* includes *Mohammadpur*, a part of which is included in the Study. Mohammadpur has been characterized as a planned residential area; although spontaneous residential houses have cropped up in the Agargaon area. The urban

environment, even in the planned areas, is poor. Previous NGO activities in the area have reported difficulties in introducing improvements. Provision of organized urban services will be challenging because of dire poverty, desperation and the emergence of complicated social structures and norms common in most slum areas.

- (2) *SPZ5 Mirpur (Partial)* consists of low to middle income population who are gainfully employed. Large slum settlements are found in the low-lying areas. Many sites are potential crowd and tourist drawers. A pilot small bore sewer system assisted by ADB is nearing completion and will be operated by DWASA.
- (3) *SPZ6 Banani, Gulshan and Baridhara* areas are the prime, fully-built-up residential districts of Dhaka. *Badda* is more predominantly spontaneous housing with low-income and poor households.
- (4) *SPZ13.1 The Cantonment* is the location of the government's military installations, including housing for military personnel and the two airports. Land use is strictly controlled by the Cantonment Board. It is significant however that the new DMDP Master plan for Dhaka suggests that the current installations be moved to other sites and that the area be redeveloped for other land uses.
- (5) *SPZ13.2 Uttara*. The Uttara Model Town has been developed by RAJUK. At present, land plots have been delineated, and power lines have been installed. The water and wastewater systems are the responsibility of DWASA. These have been programmed under the World Bank-financed project. Sale of the plots however seems to be slow and residences are still to be constructed. High-density housing and high rise construction is not expected because of restrictions imposed by the nearby airport and a geologic fault-line in the area.
- (6) *SPZ14 Tongi* is the northernmost part of the study area. It still has underdeveloped flood-free areas. Water supply is provided by the pourashava with assistance from the DPHE. A new water system, in fact, has been constructed with ADB financing and will be commissioned shortly. It is envisaged that the operation will initially be managed jointly by the pourashava and the DPHE with a view towards eventual take

over by the pourashava. A local Water and Sanitation Committee is in place to oversee the startup.

The following shows the various sewerage zones with the corresponding SPZ and MODS responsibility.

<u>Proposed Sewerage Zones</u>	<u>Location</u>	<u>DWASA Coverage</u>
Dhaka North East (<i>Badda, Baridhara, Gulshan, Bannani</i>)	SPZ 6,12,13.1 & 13.2	MODS 5
Dhaka North West (<i>Mohammadpur & Mirpur</i>)	SPZ 4 & 5	MODS 3 & 4
<i>Uttara</i>	SPZ 13.2	MODS 4 & 5
<i>Tongi</i>	SPZ 14	Water supply by DPHE/pourashava

11.4.2 Assessment of Central and City-Level Issues

(1) **Urban Development Planning and Leadership.** The DMDP raises serious concerns about the “uncoordinated and fragmented” institutional arrangements and leadership for urban development in Dhaka. Clearly, RAJUK has this strategic urban planning mandate. However, because of difficulties in securing the support and cooperation of other agencies, its role has shifted to upper-income land development and planning and some elements of regulation of area development. RAJUK thus seems to have ceded its mandated urban planning superbody status by competing with the operating agencies.

The DMDP can reestablish RAJUK’s urban development leadership. However, it is crucial to develop a constituency for the DMDP at this time from among and within government agencies, local authorities, people’s organizations and the donor community and to cultivate strategic partnerships with the Planning Commission and ERD to influence the flow and direction of capital investments as early as the project identification stage. While disagreements and comments continue to confront the DMDP, it still represents the most comprehensive guide to urban development for Dhaka at this time.

(2) **Environmental Management.** A recent report cites the numerous pollution control legislation, policy statements, and institutional arrangements which have been enacted or adopted with very little enforcement and implementation because of, among others, serious resource and capacity constraints. So far, public awareness campaigns have yielded unclear results. Warnings and court suits against polluting industries seems to have had little impact. There have also been serious overlaps and conflicts *vis a vis* enforcement between central and local government agencies.

(3) **Demand and Willingness-to-Pay.** The selection of technical, financial and institutional options are closely linked and should respond to a clearly expressed demand and willingness-to-pay. The demand occurs at different levels: the national level, the city (or pourashava) level and most importantly, the user level. The Master Plan thus envisages that the different areas will be served by different technical options ranging from onsite systems to conventional sewerage. Each technical option is associated with different financing and institutional arrangements.

An essential challenge for urban planners is in sustaining an ability to respond to demand; i.e., demand that is based, not on what the planners and engineers think, but on what the users (or the ones who will have to pay for the facilities and service) are willing and able to pay for. The issue of demand has been at the forefront of many of the new ideas in water supply and sanitation and it would be useful for local officials to be updated on these ideas as a basis for capacity building.

To illustrate the point about demand, consider the inland lakes within the city which have become highly polluted. Everyone wants it cleaned and rehabilitated, but, there is no demand for this. No one is willing to reorder their spending priorities (or give up something else) to have the lakes cleaned. The willingness to reorder one's spending priority, whether one represents the national, city or household level, depends on one's perception of the benefits and perception of the institutional capacity to meet the demand.

1) **Demand.** In order to gain full advantage of the benefits of this project, the demand (which includes willingness-to-pay) of householders for these household-level benefits should be ascertained. After all, to achieve the impact

of improved wastewater facilities, 1) improvements of in-house water and toilet facilities may be required; 2) householders have to agree to connect to the system or to improve their onsite facility and 3) the system will have to be properly operated and maintained. Householders are expected to pay for these costs.

On the government side, the need for the improvements has been expressed during the preparatory stages. This has been a relatively painless process since the costs for preparatory studies and possibly, the capital improvements, are covered by grants. The issue of government's demand for this project will, however, have to be revisited when the O&M costs and the economic and social benefits are clearer. It is very likely that the operation of the new sewerage facilities will, in spite of the increased revenue projected, require an even higher level of subsidy from official sources to meet the increased operating costs.

- 2) *Benefits.* Environmental pollution from various sources remains unchecked due to poor enforcement of regulations. Consequently, it would not be realistic to expect dramatic water quality improvements in the rivers and lakes at this time because of pollution from other sources. Rather, the key benefit to residents of this sewerage and sanitation project in North Dhaka will be: improved household health; general convenience and the removal of stagnant wastewater from canals and drains. Landowners can expect land values to rise with the availability of wastewater collection facilities in their area. Demand for sanitation improvements from land occupants with uncertain tenure is questionable and should be continuously monitored.

- (4) *Responsibility Gaps.* The institutional responsibility for policies and regulation to ensure that all residents of Dhaka have reasonable access to hygienic wastewater management services will have to be identified and agreed upon. At the operational level, these functions are under the DCC and DWASA, for non-sewered and sewerage sanitation systems, respectively. Tongi Pourashava is responsible for both in its area of jurisdiction. Similarly, the regulatory functions will have to be exercised at the central level through mechanisms which ensure adequacy and fairness of tariffs, compliance with environmental standards, adequacy of service delivery, etc. The key idea is that the service provider should be distinct and separate from the regulator.

(5) **Private Sector Participation** is one of the key elements in the GOB's development strategy. DWASA has been prominently mentioned as a prime candidate for such action. Concrete steps, have, in fact, been taken towards this end. At present, further dialogue with employees is underway. There are various options and modalities for unbundling the system for private sector involvement which should be fully explored, including: management contracts, service contracts, joint ventures, concessions and build-operate-transfer schemes. It is however crucial that water supply provision **not** be separated from sewerage operations.

The proposal to "sectoralize" (i.e., privatize only some areas of the system) will not likely lead to the expected improvements since the system, technically, cannot be horizontally unbundled and secondly, the likelihood that the "unprivatized" part of DWASA will work to ensure its failure seems high. More importantly, the general attractiveness of DWASA as an investment opportunity for the private sector seems doubtful at this time unless there are major institutional reforms undertaken and, possibly, incentives and concessions to prospective private operators are granted by the GOB.

The Study supports increased the private sector involvement in water supply and sewerage of Dhaka. However, further studies will be needed to formulate a reasonable and acceptable strategy and approach.

A more promising opportunity for private sector initiative in wastewater may be found in Tongi where numerous textile and jute mills are located in the "mixed land use" area. At present, the wastewater effluents are discharged without treatment upstream of the water supply sources. The opportunity to amalgamate the resources of these private mills to organize, finance, construct and operate a common industrial WWTP can be further studied.

(6) **Land Use Conflict Resolution.** Conflicts may arise between land use zoning plans and the proposed WWTP sites. While the Study will endeavor to locate the WWTPs in sites compatible with current land use and future long-term zoning plans, a limited range of technically feasible options (or financial constraints) may bring this issue to

a head. The system for resolving possible conflicts in land use is unclear. This issue will have to be reassessed during the feasibility study when the proposed WWTP sites are confirmed.

11.4.3 Assessment of DWASA Institutional Issues

- (1) **Decision Making.** At present, many key decisions affecting its overall financial and institutional condition still do not lie in DWASA's own hands. Decisions on matters such as investments, tariff rates, staff salaries and benefits and higher-level staffing, are made at levels beyond the Board. Policy decisions requiring higher level clearances will be clarified. Reforms on tariff setting policy and procedures and appointments to senior positions are redefined in a new policy. A clearer delineation of the policymaking functions from management functions will improve and streamline board-management relationship, will give more autonomy to DWASA management, and will strengthen its commercial orientation

Operationally, a management policy to decentralize towards the MODS has been accepted; however, much of the day-to-day decisions still require central approvals. Major reforms are needed to strengthen management at the MODS level. The obvious linkage between operating costs, efficiencies and the tariff structure, however, does not seem to be readily appreciated.

- (2) **Sewer Tariff Setting.** Although the Board is empowered to adjust tariffs, the current practice is to have informal consultations up to the Cabinet level prior to formal Board approval of tariff adjustments. Based on precedence, adjustments due to fuel/power increases and inflation are done. The most recent adjustment approved was a two-step increase of 2.5% in March 1997, and another 2.5% in June 1997. The first step was implemented in July 1997. Sewer rates are based on a 100% surcharge on the water bill. A premium is charged to customers who are within 30 meters of a sewer line but who opt not to connect.
- (3) **Coordination and Communication Issues.** Many situations depict the low degree of interaction and internal coordination within the present DWASA structure. A pilot

small bore sewer system is nearing completion and the institution does not seem to be ready to operate and maintain it. No preparations are evident to advise the consumers that the system is ready. No one at MODS seems to have a clue as to how it will operate.

(4) Human Resources Management and Planning

- 1) One of the shortcomings of current human resources approaches is the inadequate economic analysis of human resources and disregard for new ways of "doing business." DWASA has been characterized by plans that generally included ambitious projections of targets and resource requirements. These plans pay casual regard to their actual ability to recruit (i.e., the attractiveness of a DWASA career to prospective employees) and commonly assume that it should exclusively be the recruiter, trainer and employer of skilled manpower. The human resources projections quickly fall out of date because of administrative and budgetary constraints; and ignore substitution possibilities brought on by technical and institutional innovations (e.g., telemetry, computerization, private sector participation, new technologies and approaches, etc.).
- 2) **Incentives and Performance.** Part of the inadequacy of human resources management at DWASA is the non-recognition of an incentive structure for professional and skilled workers. Water, sanitation, sewerage and solid waste management provision have historically been regarded as public sector activities and the incentives for skilled manpower to stay within the sector have largely been assumed and not considered in a consistent manner. Its impact is now evident from the considerable disparity between public and private sector remuneration in the engineering profession and the prevalent practice of staff taking on second jobs. The likely future scenario will feature stiffer competition for available skilled staff among the sectors; between the public and the private sector. Labor export and foreign migration has already come into play. *DWASA should position itself to compete for the "brightest and the best" coming out of the manpower market.*

The discussions consistently indicated that salary ranges, as in other sectors, are perceived by employees as low. Salary-related issues are national in scope and

cannot be sufficiently addressed in this Study. Fostering the proper incentives environment will require creative approaches to increase revenues by, *inter-alia*, cost recovery policies, tariff enforcement, cross-subsidies from industrial (commercial) to domestic (residential) users; to reduce operating costs or generate budget savings; and to reform the institutional arrangements under which the service is provided through merging of related services, increased private sector and user participation or clear job performance standards. *Increased staff salaries and benefits will have to be earned through productivity increases. Promotions (with salary raises) must be commensurate with performance and productivity. Across-the-board (i.e., for everybody) salary increases do not have any performance incentive value.*

- (5) **Human Resources Development (HRD).** Evidence of the effectiveness of training as a contributor to organization improvement is still scant. The absence of measurement indicators, limited follow-up of training, lack of investigation of outcomes and poorly-understood interrelationships between skill development and institutional strengthening limit appreciation of the potential impact of training. The expectations, thus, of managers and policy makers on the impact of effective training is low and superficial, at best. It is seldom a controversial topic and is generally viewed favorably by many officials.

The HRD promise that impact will happen but may not be visible has tended to reduce real expectations. There is an immediate need to convince trainers to stress and articulate immediate training results to raise the desire, awareness and expectations of management to be more involved in determining HRD directions.

- (6) **Capacity of the DWASA Training Institute for Wastewater Management and Technical Training.** One of the hallmarks of successful public utilities in Asia is the existence of a visible and credible training department with direct access to the chief executive. Such training departments have a strong influence over the overall corporate directions and plans marketing and public information, production, treatment, operation and maintenance, research and all other aspects of the "business".

- 1) *Organizational Location.* The responsibility for the promotion and organization of staff training is lodged with the DWASA Training Institute under the Administrative Services. Under this setup, however, the training arrangements have not flourished. Very few similarly-situated training departments elsewhere have really flourished under such a setup since the orientation tends more towards the administrative requirements of the training rather than the application of correct adult learning principles, training objectives and methods and impact assessments. The most useful location of the training is in the mainstream of planning and operations.
- 2) *Core Trainer Skills.* DWASA trainers should develop expertise in adult learning principles and approaches. This is the main challenge of the Institute. Many can deal with the administrative requirements of organizing a workshop. Having the technical expertise would be useful; but knowing how people can learn effectively should be the critical contribution of the training professionals. There is difficulty in attracting and transforming operating staff into trainers with good teaching and technical skills.

There is a need for more trainers who are skilled at using participative methods. The technical staff generally view a training responsibility as a career deviation with an unclear path. There is need to enrich and promote careers in training and organization development in DWASA. While the approach of recruiting outside subject competent lecturers is useful; it is equally important that DWASA: i) builds its in-house core staff of trainers and ii) improves the skills of current trainers on better methodologies.

- 3) *Leadership for developing the internal HRD.* Beyond the training of trainers, the development of materials and facilities and acquisition of resources which are the perceived "standard" ways of strengthening capacity, there is need for responsive leadership for the HRD system. The key is in making the training job attractive enough to interest talented individual(s) in the organization, with strong communication and management skills, confidence and enthusiasm for the task; a training "champion".

- 4) *Training and information materials.* There are minimal training materials and facilities now available. These are of varying degrees of quality and applicability. More operation and maintenance training materials are needed. Setting up a library of audiovisual training and information materials can greatly help build training capacity.
- 5) *Training Information Systems.* In preparing this Study, it is prudent to point out the general difficulty in accessing accurate information on HRD because of the absence of an organized central data system. Most HRD information are, at best, anecdotal. Detailed information would likely be more organized as development progresses. One of the key activities of the training department is to set up an effective reporting, monitoring and information system.
- 6) *Overseas Training.* Overseas training have been effective means of familiarizing with developments and new ideas in similar countries; it is also a means of rewarding staff who are productive and who work effectively. Opportunities should be disseminated widely to broaden the pool from which candidates are selected in a transparent manner.
- 7) *Linkages with other HRD support systems.* Cooperation with universities and colleges, vocational training institutes, and continuing education programs of professional organizations will help bolster the capacity of the Training Institute. There is need to develop wider and stronger partnerships among existing local and international institutions to widen base of expertise and experience.

(7) Effectiveness of Training Programs

- 1) *Individual Competence vs. Corporate Competence.* Generally, many of the corporate performance problems can be traced to several factors, aside from staff competence. These would include: effectiveness of unit managers or supervisors, quality of design and construction workmanship, etc. It would be sufficient to state that in all operating units, a small corps of competent supervisors and technicians has taken root and it is important to keep the momentum going by provision of adequate incentives for further development and application of new knowledge and skills within DWASA.

- 2) *Management's Key Role.* Training impact happens when managers and supervisors recognize that training is their role; not the Training Institute's. It is a non-delegatable function. One of management's main output is to ensure that their staff is competent and qualified to accomplish their tasks. Management's understanding of learning principles (how people learn) is critical. It is also important that management promote an environment which will allow a **critical self-assessment of internal operations** in order that current problems are tackled and further training needs identified.
- 3) *Post-Training Placement.* More attention has to be put on placement of trained staff in order to make full use of their new competencies. There is increasing anecdotal information about, for example, the highly-trained individual who immediately leaves the institution for which his training was provided; the doctoral student who never comes back; the engineer trained in techniques which have little application in his work, etc.
- 4) *Training Designs.* Training designs, not just a list of topics with a time schedule, are needed. These training designs would clearly describe learning objectives, the relevance to corporate objectives and the process to be used in gaining the competency.

(8) Management Development

- 1) Management training is a complex set of issues and is assessed separately. Progress occurs at a faster pace when key decision-makers and staff have been exposed to the wide range of development concepts and strategies and have experienced the planning, implementation, operations and evaluation processes involved. Generally, managers have become what they are because they are highly self-directed (they know what is best for them and have taken the right steps towards becoming managers).

They have developed certain habits and behaviors, whether positive or negative, which have served them well. That there is a need for new managerial skills and concepts is generally accepted. Focusing on planning, incentives and

performance monitoring, does more for management development, than organizing "management training workshops". Sharing strategic information and current events (e.g., what are the trends in water utility operations in Asia, what are the future urban development plans in Dhaka, what are the implications of new national policies on water utility operations, etc.) or where they can get more information is more powerful as a motivator for competency development. They will solve daily issues themselves and in their own way. Methods of management training are vastly different. One never lectures to managers, one exchanges or shares information. An external adviser's role here is crucial in helping the managers respond to their information needs (or at least point to other information sources) or sort out the data deluge brought on by the ready access to information. It is fair to say that the desire to learn new ideas and skills pervades the institution.

- 2) Management at DWASA is characterized by very little delegation of responsibilities and authority. The MODS concept is fundamentally sound. However, the managerial capacities of the executive engineers in charge of the various MODS have, at best, not been tested since key decisions are still made at the central office. Unless improved soon, the MODS will continue to deteriorate. Recommendations have been made to improve the situation and strengthen the role of the MODS. Actual delegation of authority and implementation of a strong performance audit system based on MODS as cost centers should be vigorously pursued.
- 3) The fundamental strategy for management competency development should be founded on an open, consultative process. "Toolbox" approaches to management training can only flourish if the demand for the tools is strong.

11.5 Recommendations: Future Institutional Requirements and Capacity Building Strategies

This Master Plan for North Dhaka envisages the use of the strategic sanitation approach. Implementation of the Master Plan may therefore consist of a mix of sanitation

technology options, ranging from onsite systems to conventional sewerage. Each technical option will likely require a different institutional arrangement. To the extent possible, such arrangements will be largely determined in consultation with the residents. This implies the need to establish institutional mechanisms and capacity which can function under a broad range of scenarios at the pre-construction and the post-construction phases. Similarly, the DCC and the Tongi pourashava will also be involved if a decision to meet O&M shortfalls through holding tax (or surcharges) is agreed upon.

11.5.1 Implementing this Master Plan: Project Development and Construction

(1) **Overall responsibility** for provision of adequate wastewater management in the city is divided between DWASA (for sewered areas) and the DCC (for non-sewered areas). Tongi pourashava functions like the DCC for its respective jurisdiction. Master plan follow-up and implementation will have to be arranged in cooperation with the local officials. The Study will now start to focus on sewerage feasibility study in the next stage which will mainly involve DWASA. However, the master plan's onsite solution strategies should continue to be seriously addressed by the GOB. **The MLGRDC is well-positioned to take up this function as its oversight functions covers DWASA, DCC and Tongi Pourashava.**

(2) **Institutional Options to Address Financial Viability Issues.** Because of DWASA's low tariff base and collection performance, it is expected that there will be increased financial deficits when the new sewerage systems are put online. There is the possibility of implementing new institutional arrangements so that this shortfall could be addressed.

1) *Sewer service connections and household improvements*, specifically for toilet construction or in-house plumbing are major costs borne by householders. However, it would be useful to look into the viability of extending a lending facility through other banks or NGOs for toilet improvement and plumbing.

2) To reduce possible financial deficits and raise the utilization rate of the new (and proposed) sewerage system, *a regulation requiring commercial and high*

residential water consumers to connect will be needed to make the sewerage system viable. This can be achieved by a policy decision of the DWASA Board.

- 3) *Financing the anticipated O&M shortfall.* One option is for DWASA to ask the DCC to adopt new tax revenue measures. Since land and holdings values are expected to rise with the availability of wastewater collection facilities, there will be increased city revenues from tax collection. A part of this increase may be preallocated to DWASA for sewerage O&M. This implies that a premium is levied on holdings with access to sewerage, regardless of whether they are connected or not. Another option might be to levy *an annual environmental surcharge* on top of the holdings tax. Either of the above options assume a reasonable level of tax compliance and enforcement. These revenue potentials involve new institutional arrangements and legislation, since holdings taxes are within the responsibility of the city government. Significantly, incentive mechanisms can be built in by the DCC for DWASA to achieve higher collection performance by indexing actual fund transfers to DWASA based on its actual general collection performance.

Agreements will have to be reached in the course of the feasibility study on how this shortfall can be addressed and the various tradeoffs and options (institutional, technical and financial) considered.

- (3) **Regulatory Powers and Authority.** Conventional wisdom suggests that regulators should be distinct from the service providers. Current regulatory arrangements, are unclear and confusing. DWASA considers itself as a self-contained institution with regulatory powers vested in its Board. No one seems to be responsible for independent monitoring to ensure that public utilities for water and sewerage are operating within acceptable standards and that the people are being served.

In Tongi, it is unclear who, between local authorities and the DPHE, has the approving authority to ensure that tariff can fully recover operating costs and are fair. In addition, the local pourashava and the DOE have overlapping regulatory powers on the matter of regulating industrial effluents. The initial areas of regulation which will have a vital impact on service delivery include:

- Financial and Tariff Review
- Environmental Regulations
- Urban Development Regulations

11.5.2 Sewerage Operations in the Core Areas

- (1) The development of and the operation and maintenance functions for sewerage for Dhaka City is clearly within the current mandate of DWASA. The Study strongly supports the general shift towards decentralizing and focusing O&M responsibility to the various MODS. There will however be major reforms needed to strengthen the operations and to improve accountability of MODS officials. Some of these measures are identified in the diagnostic report of the "twinning project".

This Study proposes that a stepwise scheme to devolve powers and authority to the MODS, contingent on attainment of specific MODS-level institutional development and performance parameters, should be set up. MODS staff and officials who are able to meet the specific performance requirements, such as collection efficiency, will have more specific powers devolved to them. Regular operations audits should be conducted and each MODS and key point installation would receive an efficiency rating. Those who are unable to meet the performance requirements should be reassigned to positions where they are better suited.

- (2) Operation and maintenance of public toilets in schools and public areas, such as bus terminals, parks, and public markets, will continue to be developed by the DCC even within the sewered areas.
- (3) Responsibility for ensuring effective and well-organized septage collection, treatment and disposal should also be taken up by DWASA. The Master Plan envisages that the STP will have the capacity to also treat septage and it is thus more sensible to have this responsibility lodged with DWASA. Private sector involvement in septage collection is recommended. Appropriate cost recovery policies, procedures and incentive schemes should be devised to ensure that septage is actually collected

effectively; that the sludge is disposed of in the treatment plants and that the fees collected for septage removal and treatment are adequate.

- (4) Health and hygiene promotion (social marketing) will be done through the respective wards and relevant local sector departments, with technical and financial support from both DWASA and the DCC. A public awareness and social marketing program will help in realizing the health benefits associated with improved sanitation and household practices, including proper disposal of solid wastes. Such activities should be devolved to the MODS level.
- (5) Onsite facilities up to the service connection will be primarily the responsibility of each household; house clusters or neighborhoods will ensure that wastes, whether solid or liquid, do not become a nuisance to the community.
- (6) Following official policy, the operations functions will, to the extent possible, be done with private sector participation. The initial areas that may be considered for private sector involvement include: septic tank desludging and the operation and maintenance of public toilets. If the current discussions for increased private sector participation in DWASA flourishes, the sewerage operations should be included in the functions to be transferred to the private sector. It should not be separated from its water supply operations.
- (7) There are no ongoing organized training programs on wastewater management (sewered and non-sewered) available at present. Neither is there a capacity to launch one in the near future. The DWASA Training Institute is lacking in trainers and facilities for wastewater training. The possibility of fielding long-term experts (and facilities) to support both classroom and on-the-job training in wastewater management should be further explored. This will be useful to both North and South Dhaka as well as other cities in the future.
- (8) To implement the sewerage facilities in the study area, it is envisaged that a fulltime Project Management Office for North Dhaka Sewerage will be established and staffed to coordinate all aspects of project design and execution. This PMO will be reporting to the Deputy Managing Director for Planning and Development.

11.5.3 Operations in On-site, Non-sewered Areas and Community Participation

This subsection will mainly deal with the provision of communal facilities for areas which cannot be served by the sewerage system. Provision of individual, in-house facilities is clearly the responsibility of each household. In low-income and slum areas, the key issues will be affordability and willingness to pay under conditions of landlessness, uncertain tenure and poverty.

Based on lessons learned from past experience, the advantages of community management of facilities have become very evident. However, the institutional structures for planning and operations tend to be more complicated and sensitive. With the broad range of technology, financing and institutional arrangements available, some flexibility is needed to be more responsive to user demand and to take advantage of opportunities.

In Dhaka, the DCC has the mandate for promoting onsite wastewater systems. The DCC has been experiencing difficulties in operation and maintenance and have opted for lease arrangements with private groups from within the user communities to operate the facilities, with much success. The DCC has already adopted a strategy of leasing its public toilets to private groups for operation. The next possible upgrade to this is to use concession models i.e., a private group is given a concession to provide public sanitation facilities, which includes the responsibility to finance, operate and maintain such facilities.

For Master Plan implementation, a "pilot project" approach is recommended to test the various policies and methodologies for determining actual user demand and for involving users in the planning and implementation. It is envisaged that various user consultations will have to be conducted and appropriate counterparting schemes will be organized to provide incentives for communities to take the needed decisions to address their waste management demands.

- (1) **Technology Options.** Properly designed and constructed, operated and maintained, low and intermediate-cost technologies can provide a sanitary and hygienic means of waste disposal. Much of the current failed experience with non-sewerage solutions can be traced to inadequate planning and design, poor workmanship, improper and

inadequate operation and maintenance and low demand. The current technologies available, such as pour-flush toilets with single or double pits or septic tanks with soak-away, properly sited, constructed and maintained, in and of themselves, are valid technologies.

(2) Financing Options. Government and external donors need not only be the source of capital financing for onsite systems. Most of the financing mechanisms in place are in the form of grants. This study recommends that as a general policy, a revolving fund be set up from which concessionary loans may be granted for the construction of communal facilities. A reasonable level of counterpart should also be required to avail of the loan. Such revolving fund can be administered by a bank or non-government agencies. In addition, a clear and consistent criteria may be established for making grants, if warranted by extreme situations. The immediate concern of government agencies (i.e., MLGRDC, DWASA, DCC and Tongi pourashava) should be in finding a source to seed the revolving fund.

(3) Institutional Options. The options for operating communal facilities can range from cooperatives to private sector provision to ward provision. Any of these arrangements can have an even chance of succeeding. It is thus best to maintain flexibility in institutional design, i.e., not have too many detailed rules which have to be complied with.

The key concerns which have to be met are: that the beneficiaries participate in making the major decisions, including operations responsibilities and cost recovery, and agree with the steps to be taken; that the beneficiaries have a stake in the success of the project and that they have a hand in monitoring the quality of construction, operation and maintenance. Government agencies take on the role of promoters (social marketing) and technical advisors to enable communities to solve their communal problems; not the direct providers of the service. Many of the successful community-based strategies in the world today have evolved and been adapted from pilot demonstration projects in Bangladesh.

11.5.4 Training and Human Resources Development

(1) **Priority Competency Needs.** The institutional reforms envisaged under this Master Plan require a viable HRD system for sustainability. The current resource constraints pose serious challenges in terms of service provision and require innovative and creative solutions to longstanding problems. These problems include the provision of services to urban poor; participation of beneficiaries in planning, implementation and O&M; low capacity and willingness to pay; integration of awareness-building, health and hygiene education programs; and demand-oriented planning approaches using strategic sanitation concepts. Based on the proposed Master Plan, the initial priorities for training interventions include:

- 1) *Policy and Management.* Impact of A Market Economy on Provision of Basic Services; Policy Formulation and Review Processes; National Sector Master Planning; Water Resources Management; Investment Programming; Legislation (affecting the Sector); Technical Standards; Environmental Protection; Institutional Development, Training and Human Resources Development; Urban Development; Research and Development; Effective Regulations and Enforcement; and Performance Monitoring.
- 2) *Project Development and Management.* Project Identification and Selection; Project Objectives; Project Indicators and Measurements for Monitoring and Evaluation; Feasibility Study (including Economic and Financial Analysis); Environmental Impact Assessments; Financing Mechanisms; Cost Recovery; Willingness to Pay; Technology Selection, Strategic Sanitation Approaches; Engineering Design, Environmental Protection; Construction Planning, Supervision and Inspection; and Procurement of Goods and Services.
- 3) *Utility-based Operations, Management and Maintenance.* Utility Management; Commercial Practices; Tariff Setting; Financial Management and Controls; Technical Aspects (Operations & Maintenance); and Customer Relations.

- 4) *Community-based Systems.* Community Mobilization and Organization; Social Marketing and Community-based Approaches; and Managing of Public Sanitation Facilities.

(2) **Summary of the Capacity Building and Training Plan.** Improving the long-term sanitation situation in North Dhaka is the focus of this Master Plan. It is envisaged that through the series of interventions and technical assistance, the DWASA will be able to take steps towards more efficient sewerage operations and, more importantly, prove its ability to implement major capital investment projects. It is estimated that the total capital investments needed in the coming years for sewerage in Dhaka will be in the order of US\$4,000,000 annually. An inordinate amount of institutional preparation to attract this size of investment of capital resources and capacity building to assume such a major financial responsibility will be needed at DWASA and at the DCC.

Types Of Training Program	
Urban Policy Series (6 modules)	<ul style="list-style-type: none"> • Economics • Municipal Finance and Financing Options • Institutional Arrangements • Technology Options Overview • Urban Regulatory Policies and Enforcement • Environmental Management
Master Planning Series (3 modules)	<ul style="list-style-type: none"> • Review of Urban Development Plans • Development Concepts and Techniques • Data Collection, System Mapping and Assessment Methods
Project Management & Development Series (6 modules)	<ul style="list-style-type: none"> • Prefeasibility/Feasibility Studies • Detailed Design and Costing • Technical Specifications • Preparation of Bidding and Tendering Documents • Procurement Guidelines • Construction Supervision and Monitoring
Social Marketing Series (3 modules)	<ul style="list-style-type: none"> • Research Methods • Health and Hygiene Education Planning • Willingness-to-Pay Surveys
Special Skills Development Series	<ul style="list-style-type: none"> • Computer Training (Word Processing, Data Base, Spreadsheets, Modeling, Project Management, Financial Management)
Utility Management Series (7 modules)	<ul style="list-style-type: none"> • Financial Management and Control • Corporate Planning • Customer Relations • Management Information Systems • Human Resources Development • Sewerage Tariff Setting • Billing and Collection Strategies
Sewerage Operations Series (11 modules)	<ul style="list-style-type: none"> • Sewer Maintenance • Maintenance of Equipment and Appurtenances • Sewage Pumping Stations • Sludge Management • Wastewater Quality Monitoring & Wastewater Effluent Standards • Laboratory Methods • Wastewater Treatment Technology (Biological Treatment) • Industrial Wastewater Management • Sewer/Drains Cleaning and Rehabilitation

- (3) **Monitoring Training Results and Impact.** Monitoring training impact has been one of the more complicated aspects of human resources development. Guidelines will be formulated as part of the capacity building to check the impact of training interventions on the performance of DWASA based on key indicators (improved revenues, reduced expenses, increased productivity). An Annual Training Plan will be formulated prior to the start of the year and made the basis for the yearend reviews.

This training plan will be closely linked with the planned establishment of a corporate planning system and management information system. A second area to be monitored is the effectiveness of training designs and methods for local application. This will be done through a deliberate and year-round assessment of training methods and techniques. The third area is the monitoring of individual progress in acquiring new skills and knowledge. This will be done through tests and exercises to be conducted during the training events.

- (3) **Financing Training and HRD.** The adoption of the following initial finance and operating policies and guidelines to promote the establishment of and sustain a viable and relevant HRD system is recommended:

- 1) *DWASA will allocate an amount initially equivalent to about 3% of annual staff salary budget for training activities.* This fund will continue to be controlled by the respective managers. Similarly, each department will formulate a departmental training plan and control the use of this fund. The role of the Training Institute will be to assist and advise each department to utilize this training budget effectively. The Institute may compete for this budget by charging for training services. Admittedly, this is initially a supply-driven approach. However, this guideline should be revised to make it demand-based as the budget requirement rises beyond 3%.
- 2) *External loan and grant funds will be utilized for training and social marketing.* The use of loans shall not be limited to hardware financing.
- 3) *All DWASA investment projects should have a training and technology transfer component.* The benefits from this provision should have an impact beyond the

direct impact on the investment project but on the HRD delivery system. All future externally-assisted projects will be evaluated, among others, on effective technology transfer.

- (5) **Raising Management's Willingness-to-pay for Training.** While indeed, much of the impact of successful training will be felt after some time, trainers should stress realistic and immediate training results. Incorporating action planning and actual decision-making during the programs tend to raise the interest of managers in getting involved in setting training objectives. To the extent possible, training proposals or plans should declare realistic corporate performance results possibly in terms of increased revenues or savings generated.
- (6) **External Cooperation and Support for HRD.** The feasibility of establishing management and technical training support to develop the competency requirements above through JICA Technical Cooperation (including, possibly, provision of long-term training experts; audiovisual equipment; refurbishing of the DWASA Training Institute; and study visits) will be assessed. The possibility of improving and expanding existing training arrangements of the DWASA Training Institute with other WASAs will be examined.
- (7) **Local Scholarships.** DWASA is encouraged to strengthen its local scholarship programs for deserving staff at all levels, as a part of staff benefits. Participation shall be on a competitive and transparent basis. Special programs may be organized with universities to have the programs done in the office premises. Appropriate service contracts will apply.

11.5.5 Institutional Performance Monitoring System

The recent Performance Contract between DWASA and the MLGRDC provides an excellent basis for assessing the results from the implementation of this study. A critical review of the information gathering system, specifically financial information, is needed to enable sound conclusions. The system should enable the **comparison of performance** among the different MODS and among the various "key point installations". The

relationship between costs and outputs should be more readily apparent. Specifically, the following key indicators may be used to assess the overall contribution of the project:

(1) Operational indicators, including:

- % households connected
- Volume of wastewater treated
- % wastewater treated.

(2) Efficiency Indicators, including:

- Treatment cost per cum
- Capacity utilization
- Staff/1,000 connections.