

**CHAPTER 16 INSTITUTIONAL ARRANGEMENT AND
CAPACITY BUILDING STRATEGY**

THE UNIVERSITY OF CHICAGO PRESS
5 EAST COLUMBIA STREET
CHICAGO, ILLINOIS 60607
TEL: 773-707-3000 FAX: 773-707-3001
WWW.CHICAGO.PRESS.EDU

CHAPTER 16 INSTITUTIONAL ARRANGEMENTS & CAPACITY BUILDING STRATEGY

To ensure the successful implementation and subsequent operation and maintenance of the improved water and new wastewater facilities envisaged in this Plan, several institutional development initiatives will be needed at various levels. The institutional design to implement this project needs serious attention since the areas to be covered are very diverse in terms of economic activity and income levels and the current arrangements require some clarification and strengthening. Expansion into wastewater services and improvement in water services requires serious consideration of strategies that go beyond mere changes in the organizational structure.

This chapter consists of a discussion of institutional policy options and recommendations; the proposed project implementation structure; the facilities operation and maintenance arrangements; the institutional capacity building strategy; and the social marketing and public information strategy. *Private sector participation options* are explored. If GSL is prepared to take policy decisions and action to mobilize private sector involvement in service provision, several key initiating actions are recommended. Table 16.9, at the end of this chapter, summarizes the budget requirements to support this institutional package.

16.1 General Institutional Policy Recommendations

In this section, several institutional policy recommendations are made which will affect the sustainability and efficiency of water and sewerage service provision in the future. Appropriate authorities should consider the following principles, policies and options to guide future operations.

- (1) **Financing Mechanism.** Following the existing capital subsidy policy of Government, 50 percent of the capital requirements will be transferred as grant, while the balance is extended as a 10 percent, 24-year loan with 2-year grace period. The NWSDB shall receive the grants and shall be the borrower of the loan (i.e., take the debt service obligation and risks). The NWSDB then constructs the facilities and participates in the operation of the treatment plants and sewerage pumping stations. The KMC will charge consumers the fees and tariffs required; and will pay the NWSDB an agreed fee sufficient to cover the debt service requirements and the O&M services provided. Upon completion of debt service payments, the ownership of the facilities (including those financed by grant) will be transferred to the KMC. NWSDB's O&M services can be discontinued when the KMC

has developed sufficient capacity to takeover and run the facilities by themselves; however, the debt service obligations will continue as planned. In addition, if all parties agree, the facilities, including any outstanding debt service obligation may be transferred earlier than planned, to the KMC (or possibly, private operators).

Financing of Environment Alleviation Projects. A broader issue which the NWSDB, the Ministry of Finance and other economic planning agencies should consider is the financing of projects with direct environment alleviation impact. Projects, like sewerage, often have a difficult time passing the financial affordability criteria. At the very least, externally financed projects with direct environmental alleviation objectives, like sewerage projects, should be passed on at the same (or better) terms as the funding source.

(2) *Role of NWSDB in Bulk Service Provision.* The NWSDB could further develop its role as bulk distributor of treated water and bulk provider of wastewater treatment and disposal services – but this should only be considered as part of a larger strategy. As a general policy, water and sewerage operations and maintenance should progressively be transferred to capable, reasonably sized utilities that shall bear full responsibility to its customers for all aspects of operations for a defined service area. This utility may be a public (municipal or NWSDB) or private concern, or a joint venture.

- 1) While splitting up the institutional responsibilities (in this case, production and treatment by NWSDB; and water distribution, billing and collection, by PS/UC) may be a viable strategy today, it may prove to be a future hindrance when integration becomes advantageous to achieve economies of scale and efficient resource management. Smaller utilities tend to be more expensive in the long term. The policy advice, at this time, is for NWSDB to retain some flexibility and keep the legal options and means open for possible re-integration of the sub-systems in the future.
- 2) It would also be useful for NWSDB to clearly define its water allocation policy among the bulk dealers, in view of the often-limited supplies, and not promise the PS/UC water that it cannot deliver. The PS/UC should also be protected from non-delivery of water by the NWSDB. In the immediate term, there should be full review and possibly, re-negotiation of current bulk water contracts. More rigorous criteria and preconditions for granting “bulk water distributorships” and widening the options in the selection of “distributors” beyond PS/UC’s, possibly including consumer groups, NGO’s or the private sector, should be considered. Specific areas for review and strengthening are suggested in succeeding sections.

(3) ***Building Up the Sector Regulatory Function.*** As previously indicated, this regulatory functions has to be vested in a third party. As a direct service provider, the NWSDB would be severely hampered by conflict of interest from effectively pursuing this role. The fundamental role of the "regulator" is to ensure that both service providers and the consumers are fairly treated. This "regulatory office" should be able to exercise quasi-judicial powers to review tariffs of all service providers (NWSDB, MC's/PS's/UC's, or private sector). It would have the regulatory powers and tools to enforce service standards and institutional performance standards. With sufficient coordination with other agencies, this regulatory office would also be poised to enforce environmental and water resource conservation measures.

In the immediate term, the KMC should establish an independent interim ***Board of Regulators*** composed of representatives of private, commercial or business interests, public authorities, consumer groups, socio-civic organizations, etc. to function as a regulatory body. The local water and sewerage office should be allowed to operate as independently as possible within the bounds set by the Board. The essential regulatory functions and powers include: tariff review and approval; setting of service standards and objectives and annual performance and financial audits. This Board of Regulators will **not** be involved in day-to-day operations and decisions. These shall continue to reside within the municipal administration.

(4) ***Cost Recovery Policy and Sewerage Tariff Setting Procedures.*** Cost recovery policies should lead to setting the process and procedures for computing, reviewing and approving the required tariff for sewerage and water services.

1) Operation and maintenance costs. As a general policy, water and wastewater operation and maintenance costs, including septic tank cleaning services, should be recovered from the users. Since the benefits of improved water and environmental conditions also accrue to the neighborhood and the city, some level of direct contribution to O&M costs by the city or neighborhoods may be justified.

2) Capital costs. If capital costs are to be recovered partially or fully, the approach should be most easily done through the property/land taxation system. This assumes a reasonable rate of tax compliance on property taxes and the cooperation of the municipal councils in enacting an ordinance and collecting the surcharge or in pre-

allocating a percentage of the local land tax revenues to a "water and sewerage fund" which will be used to service the debt.

In service areas where both water supply and sewerage services are available, the responsibilities, particularly for billing and collection, should be vested on a single institution. There should only be one tariff structure to cover **both** water and wastewater services. This is the only way to recover direct sewerage costs. Tariff for wastewater collection, treatment and disposal will be based on metered water consumption.

(5) ***Tariff and Revenue Raising Strategies.*** Even with best efforts to minimize operating costs, there will invariably be an initial shock with the new tariffs required to support the new services. Because of the low revenue base (the current rates), the tariffs to support the improved water service and the new wastewater services will be substantially higher ***if revenues will be raised exclusively from user tariff*** (i.e., based on consumption volumes). A practical revenue strategy will have to be formulated following these recommended principles:

- 1) Those who will have an immediate and/or direct economic or commercial benefit or saving due to the improved environment and service should bear the initial shock.
 - i. Land values tend to rise with the availability of improved water and sewerage services regardless of whether a landowner is actually connected to the system or not. Similarly, property developers will be able to construct multi-story, high-density buildings without the need for expensive wastewater treatment packages.
 - ii. Business and commercial establishments will directly benefit – hotels, restaurants, tourism-oriented service industries.
 - iii. New homeowners and builders in the service area will not have to construct septic tanks.
- 2) As the impact of the accompanying social marketing program takes effect (over 3-4 years), the sharing of the financial costs can gradually be made more equitable (i.e., based on consumption, use of service and economic value of the service to the users).

(6) ***Demand, Willingness-to-pay and Social Marketing.*** A key challenge for urban policy 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 stakeholders, particularly the householders, are willing and capable of paying for. Demand occurs at different levels, i.e., the central

level, the municipal level and most importantly, the user level. Technical, financial and institutional options are closely linked and its selection should respond to a clearly expressed demand and willingness-to-pay (*or willingness-to-subsidize*).

- 1) *Consumer Demand.* To gain full advantage of the benefits of any project, the demand (and willingness-to-pay) of householders for these household-level benefits should be ascertained. After all, to achieve the environmental sanitation objectives of this project, 1) improvements to the in-house water and toilet facilities may be required; 2) householders have to agree to connect to the system or improve their on-site facility; and, 3) the system will have to be properly operated and maintained. Householders will have to pay for these costs.

- 2) *Municipal and Central-Level Demand.* At municipal and central levels, the demand for the improvements has been initially expressed during the Study stages. This has been a relatively painless process since the costs of development assistance have, thus far, been in the form of grants. The issue of municipal and central-level demand for improvements will have to be assessed with a clear understanding of the impact of the O&M costs and the risks. Given the current tariff revenue base, it is likely that the operation of the new facilities may initially require an even higher level of subsidy from municipal or other sources to augment the revenues which can be raised from tariff. The importance of improved water supply and environment in the Study area to the regional and national economy will be the principal basis for this central and municipal demand.

There are two policy areas that need to be addressed. The first is related to the concept of demand as the basis for planning and implementation approaches; the second, to strengthening public awareness and interest among residents about environmental alleviation options to increase demand and willingness to pay for improvements.

- (7) *Policies to Improve Access of Low-Income Groups to Improved Water and Sanitation Services.* Sri Lanka has been a pioneer in testing innovative community-based development approaches and strategies. The institutional structures for planning and operation of services targeting low-income groups tend to be more complicated, sensitive and politically charged. Low-income groups are the first to feel the impact of deteriorating environmental conditions because of their inability to provide for alleviation measures. Clearly, issues stem, among others, from the inadequate participation of beneficiaries in decision-making and from a lack of clarity on criteria and ground rules. For example, the

criteria for installing public standposts and/or communal sanitation facilities is often not explicit and discretionary - neither are the ground rules for sustainability. The essential concerns that have to be met are;

- that the beneficiaries participate in making the major decisions, including operations and financial responsibilities, 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.

While this Study will now focus on developing a project in the identified priority areas, the need for improved services, particularly in low income areas, will still have to be addressed by the local authorities. The KMC has the prime mandate for promoting access to these services.

(8) ***Sewerage Operations Policies.*** Unlike water supply (which is a basic need), the user demand for wastewater collection, treatment and disposal service is generally lower in the users' priority scale. It has to be more actively marketed and promoted. For the local agencies involved, this will be the first attempt at full-scale wastewater management operation. It is therefore crucial that the initial set of operating policies adopted be sound. The KMC should consider several key policies to ensure the sustainability of sewerage operations.

1) ***Promoting Sewer Service Connections.*** Current experiences, local and elsewhere, with sewerage projects indicate that the high initial connection costs have tended to discourage potential customers from availing of the service. The slow build-up of the customer base has been a major obstacle to system functioning. Low flows contribute to the frequent fouling of the system.

Sewer service connections consist of a pipe extending from the sewer line up to a fixed length to the house for which service applicants are charged a connection fee that includes labor, materials and surface restoration. The full expense to the homeowner, however, goes beyond the connection fee. Often, relocation of in-house piping and other adjustments inside the homes become necessary. In densely populated areas, installing the sewer connection may require breaking up and restoring existing concrete or permanent structures. Taken together, the amount required can be a sizeable expense to the customer. Policies that would alleviate the situation for the existing and potential customers are needed. These policies have an implication on the utility's cash flow that should be assessed.

- Financing through “home improvement loans” and “revolving fund for sewer service connections”. The KMC should also consider encouraging the banks to offer low-interest loans for toilet construction and pipe works to potential customers. Alternatively, the KMC should be able to establish a revolving fund which domestic customers can avail of for financing the service connection, including piping works inside the homes. The fund can be repaid possibly over five years together with the monthly service bills.
 - Special Offers. A “limited promotions” policy that may be considered is to have special time periods (or areas) when an additional service pipe length (or some other discount or benefit) is offered. Such “special” arrangements may be offered to specific neighborhoods during a fixed specific period corresponding, for example to the period when the sewer line is being laid along specific streets - after which the “special promotion” is discontinued and offered to the next neighborhood.
- 2) ***Influent standards policy for acceptance of wastewater into the sewerage system.*** The wastewater treatment plants are designed to handle only domestic wastewater. The introduction of industrial and/or hazardous wastewater reduces treatment efficiency and increases treatment costs. Removal of heavy metals or toxic substances is most economically done in pre-treatment facilities owned by the “polluting source”. Through regular monitoring of raw wastewater quality, the plant should be able to monitor compliance with influent standards and, at the same time, ensure the efficacy of its treatment operations. Influent standards have been adopted in other major cities abroad. Similar steps should be taken to establish and enforce standards in the Study Area.
- 3) ***Service extension policy.*** Where the institutional and technical arrangements are appropriate and the internal water distribution and/or wastewater collection systems are customer-financed, services may be extended for customer groups under agreed terms and fees. This may be applicable to existing or future land development or housing projects areas. Such self-provided systems should conform to specifications.
- 4) ***Mandatory sewer connection policy for customers with high consumption.*** To help ensure the financial viability and raise the utilization rate of the new sewerage system, a policy and ordinance requiring commercial and high residential water consumers to connect will be needed to make the sewerage system viable.

- 5) *Incentive policy for sewerage field staff.* The higher health risks and unpleasant working conditions associated with working on sewerage are sufficient reasons for offering additional incentives for field staff. The preference of most O&M field staff tends to be for water supply assignments that are perceived as “cleaner” and “of higher status”.

- 6) *Managing Septage Collection, Treatment and Disposal.* Outside the sewerage service areas, residents will continue to rely on septic tanks and soakaways to treat and dispose of wastewater. In these areas, the KMC will implement a program to ensure that the existing septic tanks are functioning properly through regular desludging and cleaning at least once every five years. Costs for such services will be borne by the users through surcharges on their monthly bill and will depend on the size of their septic tank; cost of the service will be spread over five years. In renewing their business licenses, commercial establishments (outside the sewered area) must present a certification from the waterworks office (at least once every five years) that their septic tank has been desludged. In effect, residences and establishments outside the sewerage service area will be billed for water and septage collection (instead of the sewerage) services.

16.2 Organizing for Facilities Operation & Maintenance

Based on the functional distribution below, the organization structures to support the immediate improvement are described in this section. The structures have been modified to respond to the new and/or expanded scale of activities and some perceived current weaknesses. The distribution of functional responsibilities for project implementation and facilities O&M is proposed in Table 16.1.

Table 16.1 Distribution of Responsibilities for Project Implementation and O&M

| Functional Responsibilities & Roles | | NWSDB | CPC | KMC | PS/UC |
|--|---------------------------------------|-------|-----|-----|-------|
| Project Implementation and Management | Capital Funds Sourcing | • | | | |
| | Planning and Design | • | | | |
| | Construction Supervision | • | | • | |
| | Project Coordination | • | • | | |
| Water Supply Operation and Maintenance | Water Production | • | | • | |
| | Water Treatment | • | | • | |
| | Bulk Supply | • | | | |
| | Network Distribution | • | | • | • |
| Sewerage Operation and Maintenance | Wastewater Collection | | | • | |
| | Treatment & Disposal | • | | | |
| | Septage Collection | | | • | |
| | Septage Treatment & Disposal | • | | | |
| Customer Service | Billing and Collection | • | | • | • |
| | Social Marketing & Public Information | • | • | • | • |

In the course of preparing this study, the Central Provincial Council, through the Office of the Chief Secretary, has provided enthusiastic support in facilitating various tasks and has provided invaluable advice. It is envisaged that during project implementation, closer coordination among the national and local authorities and the residents and community-based organizations, will be essential and will have to be continued through the Provincial Coordinating Committee headed by the Chief Secretary. The PCC is envisaged to have a principal role in monitoring and reviewing the progress of the work to ensure that the project is proceeding according to schedule and budget. Many project implementation problems, such as permits and right-of-way issues, can be judiciously resolved and expedited if addressed at this level. Political liaison, consultation and dialogue will be another important role, which the PCC can lead. Other inputs which can be provided through the PCC would include: coordination of training and social marketing activities, tree-planting in the sewerage treatment plant "green" buffer zone. The planting of trees and seedlings in the green zone is envisaged to be among the principal obligations (a contractual work item) of the treatment plant contractor.

All actions and commitments to be entered into by the Municipal Council, the Pradeshiya Sabhas and the Urban Councils will need prior clearance and approval of the Provincial Council, through the Chief Secretary.

Financial accountabilities including institutional responsibilities for loan repayment and counterpart funding for this project will be the subject of internal agreements among the central and local authorities and subsequent bilateral negotiations with potential external support agencies.

The basic responsibilities for project implementation will be vested in a Project Management Office headed by a full-time Project Director, with staff coming from the various agencies involved. Details about the PMO are found in Section 16.3.

Based on the technical studies, the new facilities to be constructed for which the institutional arrangements have to be designed consists may be outlined as follows:

Table 16.2 Summary of Proposed New Facilities to be Operated and Maintained

| New Facilities | Phase 1 - 2005 | Phase 2 - 2010 | Phase 3 - 2015 |
|---|------------------------------|------------------------------|------------------------------|
| <i>Water treatment plant (Conventional)</i> | 36,700 m ³ /d cap | 36,700 m ³ /d cap | 36,700 m ³ /d cap |
| <i>Water transmission</i> | 42 kms | 40 kms | 100 kms |
| <i>Booster pumps</i> | 9 | 8 | 15 |
| <i>Kandy STP (Oxidation Ditch)*</i> | 8,500 m ³ /d cap | - | 8,500 m ³ /d cap |
| <i>Katugastota STP (Aerated Lagoon)*</i> | - | - | 1700 m ³ /d cap |
| <i>Sewage Pumping Stations*</i> | 3 | - | 1 |
| <i>Sewer lines</i> | 22 kms | - | 7 kms |

*To be initially operated and maintained by the NWSDB and ultimately transferred to the KMC.

16.2.1 Organizational Structure

For Kandy Municipal Council, it will be possible to retain the current organization concept for water provision that divides service responsibility in the city into three (3) zones, possibly increasing to five zones in the succeeding phases. Scope of responsibilities of the office would however expand to include sewer connections and sewer line maintenance. A new Technical Officer to supervise septage collection will be needed. The interim NWSDB team will be part of the Operations Section. The new office will be named the KMC Water and Sanitation Office (KMC-WSO).

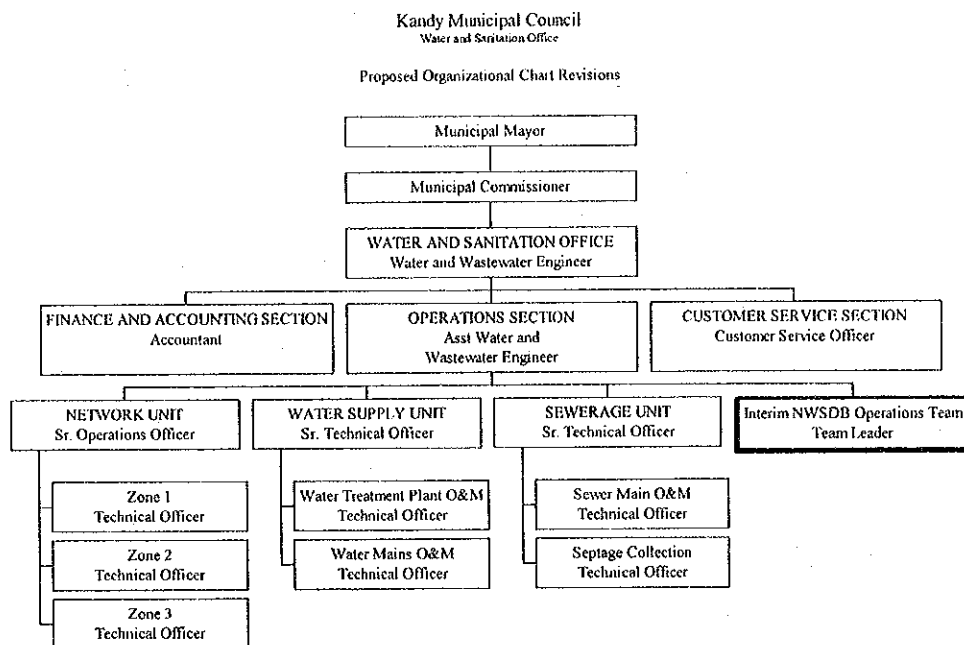


Figure 16.1 Proposed Organization for KMC Water and Sanitation Office

16.2.2 Inter-Agency Agreements and Contracts

As independent bodies, the KMC, NWSDB and PS's/UC's will have to enter separately into legally binding contracts or agreements prior to project implementation. The negotiating parties may enter into alternative arrangements. It should, however, achieve the same objective and/or clearly define institutional responsibility. These agreements may have to be conditionally entered into immediately to secure external financing support. As required, approval from the Central Provincial Council should be sought. The provisions of the agreements should include the following suggested aspects.

- (1) **Proposed KMC-NWSDB Agreement.** The Consultants recommend that the NWSDB start-up, operate and maintain the treatment plants and sewage pumping stations, on behalf of the KMC, and gradually turnover the responsibilities over a 6 to 8-year period. This should allow the KMC to develop sufficient capacity to operate and maintain the new facilities. Costs for such operations will have to be negotiated and agreed upon by both parties. Some employees of KMC would be detailed to the treatment plants for on-job training and actual operations.

Based on this concept, a contract or memorandum of agreement will have to be entered into between KMC and NWSDB whereby, NWSDB will operate the water treatment and wastewater treatment plants, receive, treat and dispose of the effluents and sludge from the KMC system in a sanitary manner. For this service, KMC will pay a monthly service

fee to the NWSDB. The service fee should be sufficient to cover all the associated operating costs of the NWSDB and cover any debt service obligations of the NWSDB for acquiring the facility. The fee may be re-negotiated periodically. It should also be stressed that this is intended to be an *interim* arrangement only. Ultimately, the facility will be turned over to the KMC.

The proposed WTP in Katugastota is intended to produce water for consumers within the KMC service area and outside. The recommended option is for the NWSDB to retain ownership, operation & maintenance of the facility and enter into a bulk supply agreement with KMC.

Only domestic wastewater is covered by the Agreement; industrial wastewater and storm water are not included.

The installation of sewer connections and maintenance, cleaning of sewer mains and collection of septage within the city will be done by the KMC. Only water treatment, wastewater treatment and disposal functions are temporarily transferred to the NWSDB. Billing and collection will continue to be done by the KMC.

- (2) **Bulk Supply Contracts of NWSDB with PS/UC's.** Similarly, there will be a need to review the current contractual arrangements for bulk supply between the dealers (PS's/UC's) and the NWSDB to make it more formal and business-like. NWSDB needs to be adequately protected in case of defaults. The review should also protect the dealers from non-delivery of water by the NWSDB. Issues which have to be settled include;
- Rationalizing the criteria for selecting "bulk dealerships";
 - Protecting NWSDB from financial defaults through payment guarantees, bank guarantees, conditional takeovers and pre-contract capacity audits;
 - Protecting "bulk dealers" from non-delivery by NWSDB. If the NWSDB is unable to supply an agreed minimum volume of water during the month, the dealers should be entitled to claim for damages or discounts on the bulk price;
 - NWSDB bulk pricing issues;
 - Basis for allocation of water supply among bulk dealers when supply is short;
 - Regulatory control over "retailers";
 - Service standards for "retailers";
 - Delivery standards for NWSDB (minimum quality and quantity of water) with "take or pay" provisions;

- Provision of regular training, technical assistance and management advisory services to the “retailers”
- Extension of wastewater services, where applicable.

(3) **Contracting for other services.** The overall responsibility for septage collection is lodged with municipal councils. However, private sector involvement, through service contracts, for septage collection should be considered. Provisions should be made for regular cleaning of septic tanks in the service area every five year. The practice of contracting out sewer cleaning may also be introduced, as required. However, the municipal council should ensure proper pre-qualification of the capability of the contractors and rationalize the use of contractors versus the use of in-company services for cost effectiveness.

As the new facilities are brought on-line there will be increased demand for in-house plumbing services by homeowners. Increased water pressure may also cause leaks and wastage after the meter. It will therefore be useful for the KMC to establish a plumber referral system.

16.2.3 Private Sector Participation as an Option

The Ministry of Housing and Urban Development requested the Study Team to look into institutional options involving the private sector. Private sector participation at the NWSDB, at this time, is limited to service contracting for specific activities. Current activities enlarging its role as the producer and “wholesale” provider of water could open up possibilities for the private sector coming in as the water distributors, instead of UC’s.

(1) *Options Assessed.*

Central to any discussion on private sector participation should be an understanding of the various options that the government and the private sector can enter into. The options generally vary in terms of ownership of the facilities, responsibility for capital investments and responsibility for operation and maintenance. Basic features of the various options assessed are briefly described below.

- 1) Under **concession** schemes, a private firm is awarded a long-term (possibly 25 years) contract during which it is mandated to provide a specified level of service to a well-defined area (the concession area). The concessionaire is given access to operate the existing assets of the water utility (ownership of the asset is retained by the govern-

ment). To achieve the required level of service, the concessionaire may be required to provide additional investments that are usually turned over to the government at the conclusion of the concession contract. For the "privilege" of providing the service, the private firm pays the government an agreed upon concession fee. Concession bids are usually evaluated based on the initial tariff that the concessionaire proposes to charge. Performance monitoring of the concessionaire in delivering the mandated level of service is usually the critical element in concessions.

- 2) In *build-operate-transfer (BOT)* schemes, a private firm proposes to invest and operate a water system (or parts thereof) for a fixed period (usually 25 years) after which it transfers ownership of the facility to the government. For example, in a BOT for water source and treatment, the public water utility agrees to buy the water produced by the private sector BOT proponent at agreed rates with "take or pay" guarantees.
- 3) *Joint ventures* are another form of private sector participation when the public water utility and the private firm organizes a joint company which takes responsibility for operating the water and sewerage operation and investment. Each partner has a clear set of roles and responsibility. The private sector representative usually takes the lead management role.
- 4) Minor forms of private sector participation would include leasing, management contracts, etc. Under the *lease* arrangement, the private firm agrees to "rent" the existing facilities of the water utility, operate the facilities, bill and collect customers and pay a fixed "rental fee" to the water utility. In *management contracts* (or service contracts), the private company provides a specific service for which it is paid an agreed fee.

(2) *Assessment and Conclusions.*

- 1) In the context of this study, there are so many related sector policy issues on private sector participation that have to be addressed which are beyond the scope of this study. This makes an unequivocal recommendation for private sector involvement difficult. However, the institutional structures recommended in this study will make it possible for smooth transition should the PSP decision be taken in the future. Overall, options in the form of concessions or joint ventures can be workable and should be explored further. The NWSDB may be described, at this time, as interested.
- 2) To prepare a serious proposal for privatization, potential investors and operators spend huge amounts up-front to develop their strategies. A clear decision and timetable by the political leaders at the highest levels to privatize is needed to invite serious local and foreign companies. At the sector level, it would be useful for the following decisions and actions, among others, are established.

- a. clear ground rules, timetables and procedures;
 - b. who are the contracting parties representing the owners of the assets;
 - c. the regulatory arrangements and tariff adjustment process;
 - d. policies to protect the tenure of employees; and
 - e. incentives and government guarantees, if any.
- 3) At the micro level,
- a. Define the scope; get agreements in principle from the KMC and PS/UC's;
 - b. Prepare the standard technical description of the proposed area;
 - c. Prescribe the mode of privatization and the terms (a draft of the contract itself would be useful to merit serious discussions);
 - d. Establish the bidding procedures, evaluation criteria and award procedures.
- 4) For this project in Greater Kandy, the additional specific issues that need to be addressed include the following.
- a. No doubt, Colombo will be a more attractive alternative because of its size and potential. However, the attractiveness of Greater Kandy as a PSP project potential can be enhanced with proper incentives and a clear and transparent process.
 - b. A corollary issue is the "fairness" of opening up the Greater Kandy area for privatization ahead of Colombo. The capital city has been the major recipient in the past of cheaper, government-subsidized financing for capital investment. The issue raised is why Colombo should continue to receive cheaper financing while the lesser cities would have to make do with private financing which is generally perceived as more expensive.
- 5) Policy advice regarding private sector participation:
- a. Establish clear objectives for selecting the private sector approach and a clear strategy and timetable.
 - b. Get the basic ground rules and incentives officially approved at the highest levels. Preparing a proposal is an expensive undertaking for potential investors for which the opportunity must be clear. PSP is as much a private sector decision as it is a Government decision. Government can only open up to the PSP approach and put in incentives. In the end, it is the private sector that decides whether it will take the business risk.
 - c. Whatever option is selected, it is important for operational efficiency that both water supply and sewerage service provisions should be included;
 - d. Ensure there are ample provisions and consultations to address staff employment security issues;

- e. It would be useful to have a private sector participation advisor to help guide the process. Most proponents have wide experience in negotiating and structuring these water and sewerage privatization contracts.
- 6) There is a need for wider understanding of the concepts and options among consumers and most specially the staff who will be affected. However, in the final analysis, it will be the trust and confidence of the potential private sector investors that the privatization process is fair and transparent will be the key factor which will determine the success of the transition process.

16.3 Organizing for Project Implementation and Management

- (1) A *Project Management Office (PMO) for Phase I*, headed by a full-time Project Director (PD), will be organized to coordinate **all** the activities related to this Project. The PD will report to the Deputy General Manager – RSC/C directly on matters related to the Project. To guide the implementation of this Master Plan, ensure proper external coordination, continuity and consistency with current policies, the National Steering Committee (NSC) and Provincial Coordination Committee (PCC), established during this study stage, will be continued with the same composition. The NSC is presided over by the Secretary, Ministry of Housing and Urban Development; while the Chief Secretary shall preside over the Provincial Coordination Committee. The appointment of the PD shall be made by the NWSDB and confirmed by the NSC. The PD shall coordinate with the DGM for Special Projects (and the AGM for Japanese Projects Unit, in particular) who oversees foreign assistance. He is expected to co-ordinate closely with the concerned Chief Engineers within the RSC/C and officials of the municipal councils, PS's and UC's.
- (2) *Terms of Reference*. The PMO shall bear planning and design, construction management, capacity building and social marketing responsibilities for this Project. Specifically, the PMO should:
 - 1) Supervise the detailed *design and construction* activities of the new facilities; Prepare the tender documents and guide the selection of contractors;
 - 2) Supervise the planning and implementation of *training programs* planned under this project;
 - 3) Supervise the implementation of the *NRW reduction program* to be implemented under this project;

- 4) Promote, advocate and monitor the adoption of needed *policy reforms* raised in this Master Plan, including the needed *inter-agency agreements* for O&M and the *bulk supply arrangements* with PS/UC affected by this project.
- 5) Plan and coordinate a large-scale *social marketing and public information program* in coordination with the respective municipal councils;
- 6) Monitor compliance of the contractor with the *environmental mitigation plan*;
- 7) Act as the Secretariat of the National Steering Committee (NSC) and Provincial Co-ordination Committee (PCC).

Project management consultants will assist the PMO in the above functions and transfer technology on project management and construction inspection skills.

- (3) **Staffing.** The PMO will be located within the premises of the RSC/C and staffed by full-time consultants and counterparts. Staff from the RSC/C Planning and Design Office and the Construction Office will be the counterpart for facilities design and construction. Staff from the KMC will also be needed particularly to monitor construction progress, to implement social marketing activities and to organize training activities. Administrative services and office support facilities (vehicles, drafting, communications, etc) will be provided by the RSC/C. During Phase 1, it is envisaged that the PMO will consist of the following staff.

Table 16.3 Staffing of the Project Management Office

| Post | Contributing Office |
|------------------------------------|----------------------------|
| Project Director | NWSDB |
| Water Supply Engineers (P&D) | RSC/C |
| Sewerage Engineers (P&D) | RSC/C |
| Utility Management Specialists (2) | NWSDB |
| Construction Inspectors | RSC/C, KMC |
| NRW Engineers & Technicians | RSC/C, KMC |
| Technical Training Specialists (3) | RSC/C, KMC |
| Social Marketing Specialists (2) | KMC |

Modified Organization Chart of NWSDB (Partial)
(showing only project-related elements)

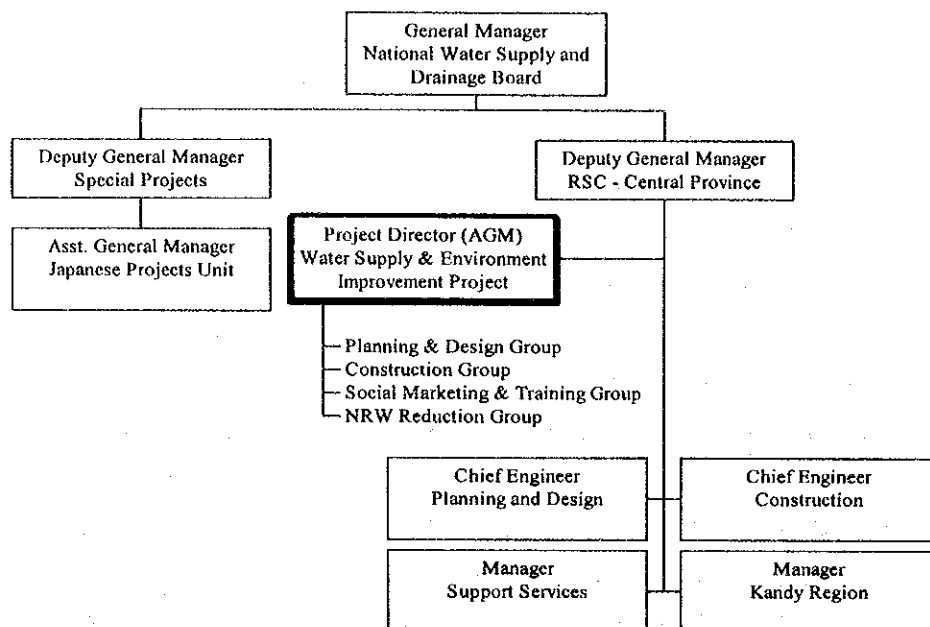


Figure 16.2 Proposed Location of the PMO

After the completion of Phase 1 of project implementation, the staff of the PMO will be retained intact to form the core of a new Institutional Development Services Office (IDSO) to be created under the DGM of RSC/C. The capacity developed at the PMO during Phase 1 should not be dissipated. The proposed regular line function of the new IDSO is discussed in detail in Section 16.8.

16.4 Specific Policy Recommendations for NWSDB – Kandy Region

16.4.1 General

The Study has also taken into consideration current initiatives within the NWSDB to restructure and upgrade its overall operations. It is not the intention of this Study to conduct still another institutional study. The institutional problems of the NWSDB are complex and have to be addressed in a unified manner starting with the policy issues highlighted in earlier chapters and proceeding to examine internal institutional performance issues and future opportunities.

In the long term, NWSDB should consider strengthening its capacity to deliver wastewater technical assistance to other major cities. This would be best lodged at the Planning and Design Department of the RSC/C, in close coordination with the head office.

16.4.2 Organizational Structure

There are two (2) major organization structure adjustment proposed:

- (1) Establish an *Institutional Development Services Office (IDSO)* under the Deputy General Manager of RSC/C. The principal responsibility and function of IDSO is to promote bulk dealerships; conduct capacity audits of potential bulk distributors; training and development; technical assistance and advise to PS's/UC's and social marketing program implementation. The core staff of the PMO during Phase 1 will constitute this new office. *It is intended as a means of retaining and enhancing institutional capacity developed during the first phase.* This office may also manage subsequent phases of this project.

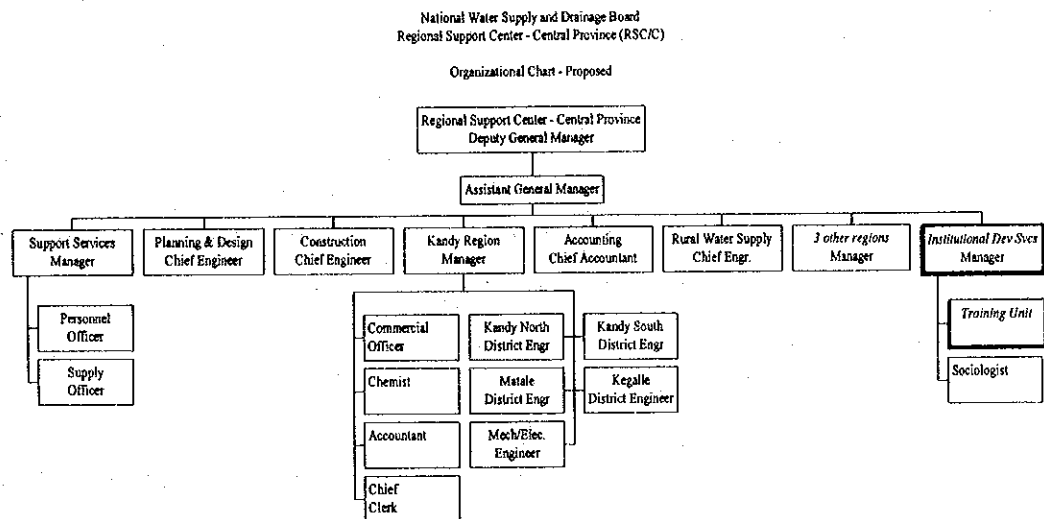


Figure 16.3 Proposed Changes in the NWSDB-RSC/C Organization

- (2) Of immediate concern to this Project is the need to establish **NWSDB Interim Operations Teams** (for either water treatment or sewerage treatment plants) to bear the main responsibility for ensuring that the new facilities are properly operated and maintained. Training of KMC staff will also be a prime function of this Team. It will be *interim* since these functions will ultimately be turned over to the KMC. Since many of the O&M problems can be traced to design and construction decisions, the involvement of the Operations Team, even during the initial stages, will be critical.

**National Water Supply and Drainage Board
Interim Operations Team - Sewerage**

Typical Team Structure (Proposed)

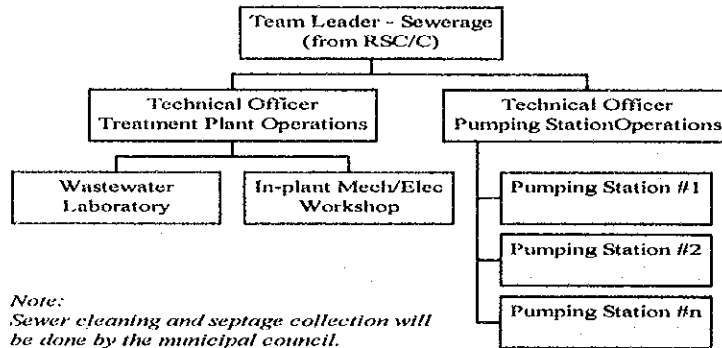


Figure 16.4 Proposed Typical Structure of the NWSDB Interim Operations Team

The Teams will be organized and appointed by the Kandy Regional Manager at the recommendation of the PMO Project Director. The Team Leader will be administratively under the Regional Manager; but will work in close coordination and guidance of the local KMC officials.

16.5 Capacity Building Strategy Guidelines

In this section, strategic guidelines, principally consisting of *human resources development* and *introduction of management systems*, are described.

16.5.1 Human Resources Development

Staffing. The current staffing level stands at 15.52 staff per 1,000 connections. This will have to be reduced to about 7. Based on the projected increase in service connections, this implies that the present level of 267 staff will have to be reduced to 210 through 2015. The following table shows how the staffing level for KMC-WSO can be transformed with minimal disruption, as well as the ideal profile. This profile will have to be adjusted and revised as the service develops.

Table 16.4 Projected Staffing for KMC-WSO

| KMC | Present | 2000 | 2005 | 2010 | 2015 | Remarks |
|-------------------------------|---------|---------|---------|---------|---------|---------|
| <i>Projections</i> | | | | | | |
| Projected Served Population | 135,000 | 144,000 | 153,000 | 162,000 | 171,000 | |
| Total No of Connections | 17,203 | 25,263 | 26,842 | 28,421 | 30,000 | |
| <i>Targets</i> | | | | | | |
| Staffing Ratio | 16.0 | 15.0 | 9.5 | 8.0 | 7.0 | |
| Total No of Staff | 276 | 258 | 240 | 227 | 210 | |
| <i>Management/Supervisory</i> | | 21 | 19 | 18 | 17 | 8% |
| <i>Professional</i> | | 21 | 19 | 18 | 17 | 8% |
| <i>Technicians/Operators</i> | | 186 | 173 | 164 | 151 | 72% |
| <i>Office Support</i> | | 31 | 29 | 27 | 25 | 12% |

Training. Based on the assessments, the emerging HRD strategy for this Project will focus on three (3) main elements.

- (1) ***Direct Provision of Training on Project Management & Construction, on Water Supply O&M (including Reduction of Non-Revenue Water), on Sewerage Facilities O&M and on Improved Financial Management Control Systems***

- 1) The **objective** of this component strategy is to ensure that there will be adequately skilled staff to supervise the planning and construction activities of the Project and to operate, maintain and manage the new water production, treatment and distribution and the wastewater collection, treatment and disposal facilities. The primary target of the training will be staff and officers directly involved in project implementation and field staff performing daily operation and maintenance activities. To the extent possible, access to NWSDB training resources should also be extended to the private sector.
- 2) The courses outlined in Table 16.5 are modular and participants are expected to complete all the individual subject areas listed in the series. Each module is envisaged to be a five-day course. Detailed training designs will be prepared and reviewed prior to implementation. Further coordination with the ongoing O&M Improvement Program (ADB-assisted) should be undertaken to ensure consistency with current policies and guidelines. It is envisaged that the basic training materials to be used will consist of the O&M Guidelines and manuals. Overseas training also may be organized as described in Table 16.5.

- 3) Implementation Responsibility and Monitoring. The PMO will collaborate with the Engineer Training Unit of RSC/C and the MPTD in organizing and implementing project-related staff training. It is envisaged that the training programs will be held in both Kandy and Nuwara Eliya.
- 4) Guidelines will be formulated as part of the capacity building to monitor the following:
- *impact of training interventions*, based on key performance parameters;
 - the *effectiveness of training designs and methods* through a year-round assessment of training methods and techniques; and
 - *Individual progress* in acquiring new skills and knowledge through tests and exercises to be conducted during the training programs.
- 5) **Resource requirements for Phase 1.**
- *Direct Costs for Phase 1.* There will be an estimated 226 trainees required to undergo various programs listed in Table 16.5. Assuming an average of five days per course, budget estimates for direct training are as shown in Table 16.6.

Table 16.6 Budget Estimates for Direct Training (in Rs.)

| Series | KMC | NEMC | NWSDB | Total |
|---|---------|---------|---------|----------------|
| <i>Project Mgmt & Construction Series</i> | 37,000 | 37,000 | 39,000 | 113,000 |
| <i>Water Supply Facilities O&M Series</i> | 32,000 | 32,000 | 57,000 | 121,000 |
| <i>Sewerage Facilities O&M Series</i> | 94,500 | 94,500 | 109,500 | 298,500 |
| <i>Financial Mgmt & Control Series</i> | 44,500 | 44,500 | 82,000 | 171,000 |
| Total | 208,000 | 208,000 | 287,500 | 703,500 |
| <i>Less: Local Counterpart</i> | | | | 56,500 |
| Required Budget for Workshops | | | | 647,000 |
| Say | | | | 650,000 |

The unit cost for the above budget is Rs. 518 per trainee per day. There is a stronger bias towards sewerage training (compared to water supply training). The budget includes the following provisions:

Resource person honoraria @ Rs. 250/hour;

Training materials @ Rs. 500 per day

Meals and lodging @ Rs. 1,000 per day

Table 16.5 Recommended Training Programs (Phase 1) and Estimated Number of Trainees

| Series | Modules | Recommended Training Coverage | | | | Total |
|---|---|-------------------------------|------|------------------------|----|-------|
| | | KMC | NEMC | NWSDB | | |
| <i>Project Management and Construction Series</i> | Procurement of Goods and Services | 3 | 3 | 3 | 9 | |
| | Construction Management, Inspection, Supervision and Monitoring | 8 | 8 | 10 | 26 | |
| <i>Water Supply Facilities Operation & Maintenance Series</i> | Reduction of Non-Revenue Water | 5 | 5 | 10, with PS & UC staff | 20 | |
| | Sewer Cleaning, Rehabilitation and Maintenance | 10 | 10 | 5 | 25 | |
| | O&M of Sewerage Pumping Stations | 5 | 5 | 10 | 20 | |
| | O&M of Sewerage Treatment Plants | 5 | 5 | 10 | 20 | |
| <i>Sewerage Facilities Operation & Maintenance Series</i> | Septage Collection, Treatment & Disposal | 12 | 12 | 6 | 30 | |
| | Engineering & Management of Sewerage Systems | 3 | 3 | 10 | 16 | |
| | Commercial Practices Systems | 5 | 5 | 10, with PS & UC staff | 20 | |
| | Analysis of Financial Statements | 5 | 5 | 10, with PS & UC staff | 20 | |
| <i>Financial Management and Control Series</i> | Financial Planning, Budgeting and Controls | 5 | 5 | 10, with PS & UC staff | 20 | |

- *Cost sharing arrangements for training expenses.* The nominating agency is expected to provide for the daily allowance, travel to and from the training site as well as the salary of the staff during the training. In addition, a minimal contribution (or “fee”) towards the direct costs equivalent to Rs. 50 per training day will be shouldered by the nominating agency. This reduces the budget requirement by Rs. 56,500.
- *Local Workshops.* In addition, an annual provision of Rs. 50,000 is made for participation of staff in other in-country training programs on subjects related to the training plan. Total four-year allocation: Rs. 200,000.
- *Overseas Program.* The Project budget will include provision for overseas training for six (6) staff directly involved in operation and maintenance of the system. Those who will undergo overseas training are expected to act as trainers for the local training programs. Provisions will be made for 30-day observation visits and training, estimated as follows:

| | | |
|---|-----------------|----------------------|
| Airfares: 6 persons @ US\$ 1200 | | 7,200 |
| Per Diems: 6 persons @ US\$ 120/day for 30 days | | 21,600 |
| Training Costs: 6 persons @ US\$ 2,000 | | 12,000 |
| Miscellaneous: 10% of above estimates | | 4,000 |
| Total | | 44,800 |
| | @ Rs. 65 / US\$ | Rs. 2,912,000 |
| | Say | <u>Rs. 3,000,000</u> |

(2) ***Strengthening Capacity of the Manpower Training Division of NWSDB and the RSC/C Training Unit for Sewerage Facilities O&M Training***

The NWSDB Manpower and Training Division (MPTD) and the Engineer Training Unit at RSC/C will be strengthened to deliver more effective training services, particularly for sewerage operation, maintenance and management. Training services for septage management and sewer maintenance will also be opened to the PS's/UC's and private sector contractors. Steps towards organizing, training and professionalizing private contractors who provide water- and wastewater-related services should be promoted by NWSDB.

- 1) The **objective** of this component is to equip the MPTD and the RSC/C Training Unit to provide training services to the concerned agencies for more effective water supply and sewerage O&M training programs. Specifically, the following strategy is envisaged:
 - *Developing the RSC/C as a specialized training resource with a focus on sewerage and wastewater facilities operation, maintenance and management.*

- *Improving trainer skills.* Trainers and “coaches” should develop expertise in adult learning principles and approaches and use of participatory methods.
 - *Developing strong training designs and improving training methods and techniques.* 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 competency.
 - *Use of new facilities as field-training sites* should help make the training activities practical and “hands-on”.
 - *Identifying and developing appropriate training materials.* For operator-level, the need for locally produced materials is indispensable. A library of reference materials, including training materials, should be further developed. Where appropriate, existing and new O&M Guidelines will be adapted and used as the basic training materials.
 - *Cooperation with CMC and other possible training-support systems.* Cooperation with universities and colleges, vocational training institutes, and continuing education programs of professional organizations will help bolster the available resources. The CMC has developed various sewer maintenance training materials; permission to review, adapt and use these materials should be sought.
- 2) **Intensive technical assistance** will be needed to improve institutional capacity to operate and maintain the new water and sewerage facilities, particularly the sewer network, pumping stations and treatment plants. The PMO should try to arrange for the posting of a “*system start-up and training adviser*”, either local or expatriate, who will oversee the developing of local training capacity and at the same time bear responsibility for starting up the system and bring it to designed capacities. Other subject-expert expatriates would be brought in, as needed.
- 3) **Resource requirements.**
- **Training equipment.** Various audio-visual equipment, including a van, will be procured for the conduct of the training programs (and the social marketing and public information program). Estimated cost: Rs. 2.0 M.
 - **Library support.** Various training and information materials, documents and reference materials will be procured which will build up the reference library of the Training Unit. Estimated cost: 200,000.

Provisions for the posting of a system start-up and training adviser will be included in the engineering consulting services budget.

- (3) *Organizing formal and on-the-job training on treatment plant and pumping stations operations (both water and wastewater) for operators from the KMC.*

The Terms of Reference for the NWSDB Operations Team includes a clear plan for training of the staff detailed by the KMC. Training will be done through a planned series of formal classroom and on-the-job training. Skill tests should be conducted to ascertain the acquisition of new skills and knowledge. The PMO will be responsible for ensuring that this skill transfer to KMC staff takes place.

16.5.2 Improving Financial Management and Control Systems

- (1) NWSDB. There are several initiatives underway to improve internal planning and control systems within the NWSDB. A computerized Central Data Management system is currently being installed which will, among others, improve monitoring of budgets and expenditures at the regional and central level. Within the limited scope of this Study, it will not be practical to consider a broad range of management systems that need to be improved or developed. The PMO will however have to keep track of the progress of and contribute to the development of the institutional and management systems development programs and to ensure that the concerns, particularly for wastewater operations, are adequately addressed.
- (2) The financial management and control systems of the KMC as they relate to the water (and wastewater) operations will be further reviewed. Substantial improvements can be achieved by installing Commercial Practices Standards for the utility operations. The CPS would include a comprehensive system for billing collection, customer service, inventory control, cost accounting and financial reporting (balance sheets, income statements and sources and uses of funds). The key challenge would be in designing the system to be as compatible as possible with the current municipal system.
- (3) Clearly, the introduction of wastewater management functions will additionally require an expansion of existing planning and monitoring systems that the KMC should prepare for. These would include:
 - Establishing the service and performance standards, including unit operation costs, and clear performance accountabilities;
 - Operation and maintenance guidelines and standards.
 - Performance monitoring and auditing systems.

- Cost accounting procedures and controls will be needed to differentiate water supply from sewerage expenses, and also from septage collection and treatment costs and revenues.
- (4) Costs for this management systems improvement will basically be included in the consulting services budget.

16.6 Strategic Guidelines for Social Marketing and Public Information

In this section, guidelines are proposed for launching a social marketing and public information program. A thorough understanding of the benefits and costs by the residents and community leaders is important to ensure the sustainability of the service. The social marketing and public information program is envisaged to increase demand for improved water supply, sanitation and wastewater management services. Two approaches are recommended.

(1) *Social Marketing Approach.*

The important point is that the authorities should engage the consumers in continuing dialogue, consultation and feedback to gain their confidence that their concerns are being addressed. There are several community-based organizations and non-government organization which are active within the study area. These organizations have a creditable track record and enjoy the general trust and confidence of the residents. The support and involvement of these groups is crucial in this social marketing program. It is envisaged that, through existing communication, consultation and decision-making structures and processes, a plan to enable communities to make informed decisions about their communal environmental problems will be supported through this project.

(2) *Public Information Approach.*

- 1) *Audiences and Messages.* Different audiences have different information needs; and some dissemination methods are more effective than others depending on the audience one is trying to reach. It is therefore useful to first identify who the various audiences are, define their information needs and draw up a strategy to address these needs. Based on the assessments and the initial household survey, there are several key messages targeting specific audiences which have to be addressed.

Table 16.7 Suggested Messages to be Disseminated

| Sample Messages | Target Audience | | | | | |
|--|-------------------------|--------|-----|----------|-------|-------|
| | Domestic (income level) | | | Business | | Gov't |
| | High | Middle | Low | Major | Minor | |
| Uncollected wastewater is a serious health risk. | • | • | • | | | |
| Lakes and rivers are polluted due to uncontrolled wastewater. | • | • | • | • | • | • |
| Shallow tube well supplies can be polluted by wastewater. | • | • | • | | | |
| Household benefits of improved sanitation and sewerage. | • | • | • | • | • | • |
| Options for on-site disposal. | | • | • | • | • | |
| Industrial wastewater is not acceptable in a domestic sewerage system. | | | | • | • | • |
| Septic tanks have to be cleaned regularly to be effective. | • | • | • | • | • | |
| New sewer connection policies, including revolving fund. | • | • | • | • | • | |
| How to apply for sewer connection. | • | • | • | • | • | |
| How and where to pay for service. | • | • | • | • | • | |
| How and where to report problems and complaints. | • | • | • | • | • | |
| Annual financial and operating highlights of the utility. | • | • | • | • | • | • |

The direct benefits of the availability of sewerage to consumers will be improved household health and hygiene, general convenience, removal of stagnant wastewater from canals and low-laying areas and improved business prospects. For landowners, the land values should also rise with the availability of good water and wastewater collection facilities.

- 2) **Media and Methods.** There are various ways of disseminating the information with varying degrees of appropriateness and impact.

Table 16.8 Various Media to be used for Public Information

| Dissemination Media | Target Audience | | | | | |
|----------------------------|-------------------------|--------|-----|----------|-------|-------|
| | Domestic (income level) | | | Business | | Gov't |
| | High | Middle | Low | Major | Minor | |
| Radio and Television | • | • | | • | • | • |
| Newspapers | • | • | | • | • | • |
| Handbills and Fliers | | • | • | | | |
| Public Meetings | | • | • | | | |
| Posters & Billboards | • | • | • | • | • | |
| Consumer Newsletters | • | • | | | | |
| School System Activities | • | • | • | | | |
| Sponsored Facilities Tours | | • | • | | | |
| Special Events | • | • | • | • | • | • |

- (3) **Internal staff awareness program.** The NWSDB and the KMC should not underestimate the importance of an internal staff awareness program, particularly for field workers who are in direct contact daily with customers. All staff should be able to effectively respond to questions and represent the best interests of the company.
- (4) **Civic and business organizations.** In the Greater Kandy area, business and other special interest groups, such as the Sinhala Traders Association, the Muslim Traders Association, the Women's Chamber of Commerce and Small Industries, the Chamber of Commerce, the Katugastota General Traders Association, the Kandy Hoteliers' Association and the Contractors Association, can play a key role in enhancing the sustainability of the project. There should be other organizations, including schools and religious organizations, not included in the list above which should be tapped.
- (5) **Responsibility.** A Social Marketing and Public Information Program will be formulated even prior to the start of the project and made reviewed annually. Inasmuch as there is no current unit in the RSC/C responsible for social marketing and public information, it is envisaged that the PMO will coordinate closely with the public information offices in the KMC. The KMC seem to be better organized to launch this strategy; however, some capacity strengthening will also be needed.
- (6) **Budgets.** Generally, the implementation of this Program is a continuing normal business operating expense borne by the local agencies. A limited budget can be set aside for the preparation of materials, including in-depth community based research on effective communication approaches, preferably through NGO's who have gained the respect and confidence of the communities. Estimated cost: Rs. 250,000.

16.7 Budget Requirements

The institutional package to support Phase 1 of this project is summarized in the following table. Costs for local and expatriate capacity building consultants and advisers will be included in the engineering services budget component.

Table 16.9 Summary of Institutional Development Budget (Phase 1)

| Activities | Water Supply Component | Sewerage Component | Total Budget Rs. |
|--|-------------------------------|---------------------------|--|
| Implementation of Training Programs | 250,000 | 400,000 | 60,000 |
| Overseas Training Program | 1,000,000 | 2,000,000 | 3,000,000 |
| Other Training Program | 100,000 | 100,000 | 200,000 |
| Acquisition of Audio-Visual and other Training Equipment | 1,000,000 | 1,000,000 | 2,000,000 |
| Build-up of Library | 100,000 | 100,000 | 200,000 |
| Social Marketing and Public Information Program | | 250,000 | 250,000 |
| <i>Total</i> | <i>2,450,000</i> | <i>3,850,000</i> | <i>Rs. 6,300,000</i> <i>US\$ 96,920</i> |

CHAPTER 17

FINANCIAL ANALYSIS

CONFIDENTIAL

CONFIDENTIAL

CHAPTER 17 FINANCIAL ANALYSIS

17.1 Introduction

The annual report of the NWSDB for the year of 1997 had not been published as of 8th of September 1998 when the study team was trying to finalize their field survey. As such, the financial analyses of this chapter are mainly based on data up to and including the 1996 annual report and various field data and direct findings. However, although the financial result of the year of 1997 has not been officially disclosed, the study team had access to the latest information on various aspects of the financial state of the NWSDB. It may therefore be considered that the conclusions and suggestions of this financial analysis have been based on the latest available information.

The target year for the Master Plan is 2015, while for the Feasibility Study is 2005. Along with our study, the NWSDB is trying to develop a new business plan with a target year of 2010, which may change the characteristics of the NWSDB to substantial degree from the current picture which was formulated in 1974 when the NWSDB was established.

The economy of Sri Lanka has developed smoothly throughout this decade without economic turbulence and will soon be entering a new century. The NWSDB has the responsibility of supplying safe water to the people of Sri Lanka while maintaining its own financial stability and management efficiency. Maintaining the compatibility of these two aspects is a hard but necessary task. Henceforth, the increase in demand for water supply will be substantial, as will be the financial demand on the NWSDB to invest future capacity expansions. Consequently, it will be more difficult for the NWSDB to maintain its financial stability, and it will therefore have to seek new way of financing in addition to the existing conventional method of public infrastructure financing. According to our project, the national demand of water supply by 2015 will be close to twice the demand at 1997. In addition to the water supply, the development of sewerage systems will increase financial demand on the NWSDB further.

17.2 Financial Condition of the whole NWSDB

The study area of this report is Greater Kandy and Nuwara Eliya, with this volume dealing with the Greater Kandy Area and the other volume dealing with Nuwara Eliya. But as the scale of the fund requirement presented in the Master Plan is very large we have to examine

not only the financial issues covering the study area but also the whole financial situation and the financial capability of the NWSDB to challenge this Master Plan.

The capital investment by the NWSDB, which is currently being examined at their head quarters, is Rs. 86 billion for the period 1999 to 2010. The Master Plan represents a substantial portion of this comprehensive plan. The conventional method of financing the NWSDB's new capital investment is 50 percent grant and 50 percent loan with the conditions of ten-percent interest, 24 years for repayment and two years grace period in case of urban water supply projects. The definition of "urban" is a population of over 6,000 and this condition is applicable to both Greater Kandy and Nuwara Eliya. For rural projects, the 50 percent grant portion will increase to 85 percent while the loan portion decreases to 15 percent.

The loan conditions on foreign funds from case to case. But the borrower from foreign financing agencies is the Treasury. Regardless of the financing conditions between the foreign agency and the Treasury, the Treasury gives the loan to the NWSDB on the above stated conditions.

The Balance Sheet and the Income Statement of the NWSDB for the year of 1996 and 1995 are shown on Tables A.17.1 through A.17.4 in Appendix 17.1. In addition eight years of financial trend are shown on Tables A.17.5 and A.17.6 in Appendix 17.1. These tables should not be considered as simple copies from the corresponding annual reports. For financial statements, format is very critical. The original annual reports were reclassified based on the tables employing a clearer format.

The owners' equity portion of the Balance Sheet has increased through grants from the Government and foreign donors. In addition to the owners' equity, the long-term liabilities, especially from foreign financing agencies, amount to a substantial figure.

When we compare the income statement for the year of 1996 with the one for 1995, the year of 1996 was "bad year" due to a delay in the tariff increase. But several informal figures on the financial result for the year of 1997, including net profit, have improved. Therefore 1996 can be considered an exceptional year while the income statement for 1995 is more typical of the revenue and expense structure of recent NWSDB operations.

As the water supply business requires substantial fixed assets, the ROA (return on total assets) is low. But, income before depreciation and interest (EBDI) in 1995 for the NWSDB

was 38.5 percent, and for net income in 1995 was 9.6 percent. Based on the trend of the last eight years, net income has averaged in the range of seven to eight percent. From this, we can conclude that the cost of water production and distribution has been controlled at least with respect to the direct and indirect operations costs.

The largest problem with the financial structure of the NWSDB is debt service. The debt service coverage ratio (the profit before interest and depreciation (EBID)) / (debt service), has to be watched carefully and continuously. As the turnover of assets is low in the water supply business and the revenue on total assets is also low, large-scale capital investment financed through borrowing will easily deteriorate the financial structure of the NWSDB. The debt service ratio for 1995 was more than 200 percent. The debt service ratio should be maintained at between 120 percent to 150 percent from now on.

But the debt service figure of 120 to 150 percent means that the remaining net income after payment of debt service is only 20 percent to 50 percent. This implies how fragile the financial structure of water supply business is. Continuous efforts are needed to keep direct operating costs down and to realize a tariff rate sufficient to effectively cover the costs required.

The establishment of a sound and effective accounting system is necessary for the NWSDB to be a financially independent and stable organization. Among the three fundamental financial statements, the most fundamental are the balance sheet and income statements. That is, an understanding of accounting with an accrual basis (not cash basis) is a fundamental requirement for the financial soundness of the NWSDB.

Although, the NWSDB prepares annually both the balance sheet and the income statement, the cash basis accounting seems to have deep roots in every aspect of the NWSDB. This is a common phenomenon in public organizations that are controlled and supported financially by Governments everywhere around the world.

In order to see the long-term effect of large-scale capital investment on financial structure, it is necessary to see the pro-forma income statement and balance sheet. We have to see pro forma income statement and balance sheet. However, only the pro-forma statement for cash requirement was available for review. The information on depreciation and debt service in the long run is not sufficiently disclosed.

In general, the financial statements of the NWSDB are not easy for outsiders to understand. The NWSDB must try to observe international accounting practices and express the financial results more clearly and in a similar manner to private firms. Not only the net figure, but also gross figures, has to be disclosed in the area of revenue, depreciation and debt management, etc.

17.3 Financial Projection for the NWSDB

The financial projection until 2002 that was recently been prepared by the NWSDB also concentrates on cash requirement analysis and cash inflow analysis. Therefore, the study team employed the same approach and extended the projection period from 2002 to 2015, the period the Master Plan is to cover. (See Tables A.17.7 and A.17.8 in Appendix 17.1)

For the long-term estimation of expenditure, similar assumptions used in recent NWSDB projections were also used. Some of the crucial assumptions made by the NWSDB are: NRW 35 percent, inflation rate 10 percent (1998-1999) and 8 percent (2000 – 2002), average domestic demand 25 m³ at 2002 respectively. The trend will continue until 2015 in general, but due to uncertainty in the financial world, it was assumed that the current 10 percent level of inflation would continue. All input costs are assumed to increase in proportional to the general inflation rate. The NWSDB has to maintain operational costs within the projected level and to increase revenue by pursuing various opportunities.

As for tariff increases, the NWSDB's forecast assumes less than the forecast inflation rate. We have suggested an increase in tariffs in order to perform the NWSDB's mission without weakening its financial formulation. We have therefore made up a revenue projection (see Table A.17.8 in Appendix 17.1) which corresponds to 1% annual average tariff increase in real terms.

However, if the Sri Lanka economy grows at a moderate pace most of the tariff increase will be absorbed by the economic growth. With higher tariffs also comes the increased possibility of new project being initiated due to an increase in retained income, which at present is negative.

Regarding debt service, the available data from the NWSDB only covers the period from 1997 to 2002. Based on project actual numbers, the debt service schedule until 2000 is provided (see Table A.17.9 in Appendix 17.1). We believe that the provided projection until

2002 is the most feasible estimate and also the upper limit within which the financial structure of NWSDB can be well controlled. Using this philosophy the projection has been extended until 2015, being the most feasible upper limit of annual debt service burden as shown in Table A.17.7 in Appendix 17.1.

Table 17.1 shows the data on debt service. We have added the former JICA study team estimates that were produced during the study of the Kalu Ganga Project as an additional reference. If the debt service is controlled within this level and other things go along with our estimates, the cumulative deficit that now amounts to almost annual volume of sales of water will disappear by the year of 2006.

It is a critical requirement for the NWSDB to keep expenditure within the mid-ninety percent level of revenue in order to be a financially healthy organization. But the compatibility of the Master Plan with the above debt service limit is a completely different issue. The feasible way of financing the master plan should be seek.

Table A.17.1 shows that the allowance for additional new projects with respect to debt service is severely limited, especially during the early stage of the study period. But as our study revealed, the inception of new projects is necessary in order to satisfy future service demand. The NWSDB is trying to develop a new business plan, targeting the year of 2010 (twelve years from now). In the new plan, PSP (private sector participation) will be a major breakthrough in solving the issue between fund requirement and debt service limitation.

Private sector participation (PSP) will occupy 27 percent of new capital investment, as presented in Table 17.2. If this 27 percent is applied to the total scale of capital investment (Rs. 86 billion, until 2010), the investment from the private sector will be Rs. 23.3 billion until 2010.

The feasibility of our Master Plan must be fortified by incorporating at an appropriate PSP scheme within the project development. While the NWSDB has a firm orientation toward PSP as the future direction, the actual strategy of how to invite the private sector is still very vague. Whether the projects developed in this Master Plan are suitable for PSP is as yet not clear.

Table 17.1

NWSDB Debt Service Projection (1000 Rs.)

| Year | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Total |
|--|-----------|---------|---------|---------|---------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| 1. Financial Projection (from 1997 to 2002 by NWSDB and from 2003 to 2010 by JICA Study Team) (A) | | | | | | | | | | | | | | | |
| Interest | 528,000 | 496,667 | 469,167 | 545,833 | 657,500 | 739,167 | 790,614 | 845,641 | 904,498 | 967,452 | 1,034,788 | 1,109,810 | 1,183,845 | 1,266,241 | 11,556,222 |
| Loan Repayment | 130,000 | 130,000 | 160,000 | 197,000 | 276,000 | 276,000 | 320,850 | 372,988 | 433,599 | 504,059 | 585,969 | 681,190 | 791,883 | 920,565 | 5,780,104 |
| Total | 658,000 | 626,667 | 629,167 | 742,833 | 933,500 | 1,015,167 | 1,111,464 | 1,218,629 | 1,338,098 | 1,471,511 | 1,620,757 | 1,787,999 | 1,975,728 | 2,186,806 | 17,316,326 |
| 2. Debt Outstanding & Repayment Schedule (by NWSDB) | | | | | | | | | | | | | | | |
| Interest | 436,728 | 588,756 | 580,612 | 562,526 | | | | | | | | | | | |
| Loan Repayment | 87,872 | 67,872 | 150,715 | 150,716 | | | | | | | | | | | |
| Total | 524,600 | 656,628 | 731,327 | 713,242 | | | | | | | | | | | |
| Loan Balance | 4,974,175 | | | | | | | | | | | | | | |
| 3. Foreign Loan Commitment before Kalu Ganga Project (previous JICA Study Report in 1994) (B) | | | | | | | | | | | | | | | |
| Interest | 516,122 | 561,592 | 560,877 | 544,001 | 525,211 | 497,684 | 470,457 | 442,631 | 415,104 | 387,578 | 360,051 | 332,525 | 304,998 | 277,472 | 6,196,303 |
| Loan Repayment | 71,157 | 133,633 | 156,065 | 187,969 | 260,770 | 260,770 | 260,770 | 260,770 | 260,770 | 260,770 | 260,770 | 260,770 | 260,770 | 260,770 | 3,156,524 |
| Total | 587,279 | 695,225 | 716,942 | 731,970 | 785,981 | 758,454 | 731,227 | 703,401 | 675,874 | 648,348 | 620,821 | 593,295 | 565,768 | 538,242 | 9,352,827 |
| 4. Difference (A-B) | | | | | | | | | | | | | | | |
| Cumulative | 70,721 | -68,558 | -87,775 | 10,863 | 147,519 | 256,713 | 380,237 | 515,228 | 662,224 | 823,163 | 999,936 | 1,194,704 | 1,409,960 | 1,648,564 | 7,963,499 |
| | 70,721 | 2,163 | -85,612 | -74,749 | 72,770 | 329,483 | 708,720 | 1,224,948 | 1,887,172 | 2,710,335 | 3,710,271 | 4,904,975 | 6,314,935 | 7,963,499 | 46% |

Table 17.2

Diversification of Financial Source for Future Capital Investment until 2010

| | M Rs. | |
|---|---------------|-------------|
| 1. The First Source | | |
| GOSL/Donor Institution | 60,000 | 70% |
| Generated Fund (500 MRs. Per year) | 15,000 | 17% |
| Cost Recovery (40,000 Rs. Per Connection) | 6,000 | 7% |
| Local Authority (15 %) | 2,000 | 2% |
| Total | 3,000 | 3% |
| | 86,000 | 100% |
| 2. The Second Source | | |
| GOSL | | 25% |
| Donor | | 37% |
| PSP (Private Sector Participation) | | 27% |
| NWSDB | | 11% |
| Total | | 100% |

In general, private capital requires cost recovery, profitability, and the minimization of the risk, which is far from the governmental point of view. Therefore, the conventional capital portion of governmental grant and loan assistance also has to be utilized in the form of supporting and inviting PSP. Current fifty-fifty financing structures might be rearranged in the actual project picture.

The water Supply Project in the Greater Kandy Area may be a candidate for a BOT scheme. Sewerage projects are usually very difficult to get PSP in projects such as BOT. One of the improvements reported by PSP is the collection of monthly fees of which both the KMC and NEMC accumulate substantial arrears.

17.4 Major Assumption of Financial Analysis

Only incremental portion added by this master plan or F/S was dealt in this analysis. That is, an appropriate "hypothetical business entity" was set up in each project, which is associated with new investment.

In the water supply project of the Greater Kandy Area, this "hypothetical business entity" covers whole newly added water supply activities of the NWSDB, the KMC and other local authorities in the Greater Kandy Area.

As discussed later in 17.5 Tariff Issue, Rs. 13.36 per m³ was assumed for water tariff in 1998 the standard tariff for the financial analysis. This is the retail price. As for the water produced by the proposed plan, the part of water is sold directly to customers, while the remaining portion will be sold to final users through the KMC or other local authorities. The sales from the NWSDB to the KMC or the local authorities are considered as "internal transaction" in the hypothetical entity. It is assumed that the retail price of the NWSDB, the KMC and other local authorities are the same, that is Rs. 13.36 per m³.

The retail distributors such as the KMC and other local authorities have to be compensated their distribution costs from the total revenue of the sales amount with the retail price of Rs.13.36. In case of the NWSDB, the total expenditure other than the water production costs is covered under the name of the Overhead, which is assumed as the 10 % of water sales. There is some expansion of the concept of "overhead as accounting term". Therefore, in case of the bulk supply from the NWSDB to retailers, some portion of this "overhead" has to be

given to the retailers as "so-called retail fee". The bulk price is the retail price minus retail fee. This price has to be decided as fair price.

In case of the bulk water supply from the NWSDB to the local authorities and other prospective local retail distributors, "fair value" with consolidated concept shall be established to both parties.

In this "hypothetical business entity" concept, the bulk supply from one portion of the entity to the other portion of the entity is considered as internal transaction and therefore is excluded from financial analysis, although the transfer price is major concern of the respective portion in "hypothetical entity".

The overhead on the new hypothetical business entity is assumed at 10 % in principle after project period (2015), which is a little lower than existing operation in the recent financial statements. But it is very natural that the new projects have to get some internal support or invisible subsidy from the existing division because of huge starting costs.

In every project, early stage of the project period suffers cash deficit. In order to keep operation, in addition to construct cost, the working capital must be supplied.

For reference, the working capital burden is estimated under the assumption of the cash availability with 10 % interest. Interest payment and cumulative figure is shown on the respective table.

The depreciation period is assumed as follows.

- Civil Works including engineering fee etc.: 50-year life and no salvage value.
- Machinery and Electrical equipment: 15-year life and with 20 % salvage value.
- Auto: 15-year life and no salvage value.

The salvage value at the year of 2050 was assumed to be converted to cash at the book value for the estimation of FIRR.

Annual inflation rate was assumed to be constant at the rate of 10% until 2050.

The loan condition by the government is 10 % interest rate and 24 years with two-year grace period, which is same as the current government policy.

While NWSDB's financial forecast uses 94 % as water tariff collection rate, same figure was applied after examining the collection performance of the NWSDB in central province and Kandy MC. Because of the time lag between billing and collection the exact number for collection rate was not available in study period.

In sewerage projects, 100 % subsidy from the government for capital investments was assumed. But as the government's subsidy may not cover whole capital investments, 90 % coverage case was examined for reference. As to operation and maintenance costs, while current government policy assumes free service, O&M cost recovery from the tariff was assumed, especially from various business customers.

17.5 Tariff Issue

Water Tariff

The revenue from water sales depends on the sales volume and the effective tariff level. Therefore, the tariff structure is critical effects on the financial performance of the water supply systems. But as the water tariff has the direct effect on the local residents and businesses, the assumed tariff for new project is carefully examined and must be acceptable to the local residents and businesses.

As the NWSDB applies the unified tariffs for each category of customers in retail water sales in whole Sri Lanka, we computed unified average water tariff at the year of 1998 that is Rs. 14.84 per m³. But as discussed in this section later, because of current low price and limited number of business users of the water supply system in Greater Kandy area compared with Colombo, Rs. 13.36 per m³ was applied as the unified average tariff.

As discussed in Chapter 3, in 1997 the average price for KMC water was Rs. 9.01 per m³. But the cost was Rs. 10.80 per m³. Also as KMC does not maintain cost accounting system, the exact cost of KMC water supply is actually unknown. In Kundasale local water supply scheme, average water price was Rs. 10.94 per m³. The averaged retail water supply price of NWSDB (whole country) is Rs. 14.84 per m³ in 1998. But due to the deference in the composition of consumers, the effective average water price in the project-covered area is as follows.

The effective water price for domestic users (assuming 25 m³/month): Rs.3.0 / m³.

The effective water price for non-domestic users: Rs: 25./ m³ plus fixed fee

The composition of water sales of newly produced water by this Master Plan:

Domestic : Non-Domestic = 71 : 29

Therefore Rs. 3.0*0.71+Rs. 25.0*0.29= Rs. 9.38

In the rural area, due to the scarcity of business connection, the effective average price is far lower than the national average in spite of using unitary tariff table.

However, according to Table 3.15, the effective cost of NWSDB source water in the study area is Rs. 14.16. The difference between Rs.14.16 and Rs. 9.38 is compensated by the internal subsidy from metropolitan area to rural area same as other public service such as postal service, national railways.

Actually, without considering this internal subsidy, the financial feasibility of the projects in rural area is very difficult to attain, but this type of internal subsidy was excluded in the financial analysis.

Incorporating all above-mentioned factors, Rs.13.36 per m³ was applied as the average tariff in 1998. This figure will be the basis of financial analysis in all the water supply cases. This amount is 90 % of the actual national average tariff of NWSDB.

As for the domestic tariff, assuming the current tariff table and the current composition of Domestic/Non-domestic, it will be Rs. 4.27 (for the user with 25 m³/month).

$$\text{Rs. } 3.0 \times 13.36/9.38 = \text{Rs. } 4.27$$

In some reference books, it is shown the affordable water tariff is less than 3 % of monthly household income. Using this standard, the required monthly income is Rs. 3,558.

$$\text{Rs. } 4.27 \times 25/0.03 = \text{Rs. } 3,558$$

According to Household Income Data (1998) in KMC, the household less than monthly income of Rs. 3,000 is 10.5 % and the household from Rs.3,001 to Rs.6,000 is 31.6 % respectively. In the rest of Greater Kandy Area, the household less than Rs. 3,000 is 9 % and the household from Rs. 3,001 to Rs. 6,000 is 35.2 %.

Domestic tariff of Rs. 4.27 per m³ may be considered as affordable level. But if the burden of low-income household less than Rs. 3,500 monthly should be reduced, the progressive tariff structure must be introduced. The current domestic tariff structure already has progressive nature. Whether to strengthen the progressive characteristics is the matter of political decision. Another way is to increase business user tariff.

Also every one has to understand the cost difference between the existing water and the newly produced water from the project. The low price of old system does not guarantee the new cheap water. Even if other authorities try to construct new scheme, the almost same level of the tariff will be required.

As to the annual tariff increase we assumed 1% in real terms is acceptable. If the growth of Sri Lanka economy is moderate, 1% increase will be less than the growth of per capita income of Sri Lanka. In some case we have to accept more than 1% tariff increase while some project is feasible without tariff increase. In addition, by combining the low cost water from the existing water supply facilities with new water will reduce the burden of consumers

(2) Sewage Tariff

As for the sewerage service, the government will supply 100 % of capital investment as the form of capital grant, and also monthly service charge is currently free in existing sewerage service at Colombo area. But in order to maintain the sewerage service viable, at least the direct operation and maintenance cost should be recovered in the form of monthly fee from customers.

In terms of the monthly fee, first affordable monthly fee was examined. In general it was told that the reasonable portion of both water supply and sewerage service is around 5 % of family income where water supply portion is higher than sewerage service. Therefore 2% of household monthly income was tentatively assumed as affordable sewerage tariff for domestic customers.

In KMC, the 9 % household earns less than Rs. 3,000 monthly and in the range from Rs. Rs.3,001 to Rs. 6,000 there are 31.6 % household. In case of Rs. 3,500 household, 2% of income is Rs. 70. Assuming monthly water consumption at 25 m³, the fee of Rs.70 corresponds to Rs. 2.8 / m³. But still there are about ten percent households less than Rs. 3,000 and their

response about willingness to pay are very low. We have decided Rs. 2.0 per m³ as the starting tariff for the domestic customers. It will take time until people become accustomed to pay the sewerage fee, because people do not understand the cost and the benefit of the sewerage service that they have not experienced. Thus, social marketing effort will be required.

The remaining balance of the sewerage service costs being not covered by domestic users has to go to the non-domestic users. The ratio of no-domestic/domestic tariff was computed and it was found that three to five be necessary depending of the individual cases.

Consideration on the additional connection cost

After the facility construction finished, the problem is the costs incurred to the domestic user side, as the form of connecting work costs that has to be paid by users. It is the additional work within the user's premise from the point where the public structure provided by this project.

If the connection cost to individual domestic users is about Rs. 5,000, it will be equivalent to the sewage tariff of 100 month (about eight years) to them.

$$\text{Rs. } 5,000 / (\text{Rs. } 2 \times 25) = 100 \text{ month (assuming } 25 \text{ m}^3 \text{ /month)}$$

For most of the low-income household, it is impossible to pay such amount of additional connection cost. However, if the people would not pay such expenditure, sewerage service coverage ratio will not be increased. Therefore, these cost have to be shouldered by others, such as business users or local authority.

In case of Kandy sewerage system, the number of the domestic household in Phase I is 2,000. Consequently, the total additional connecting cost will be Rs. 10 M. It is only 0.6% of the project cost.

Also it is less than 5 % of total tariff revenue from 2004 to 2015 (Rs. 223 M), of which the most part paid by the non-domestic users (For simplicity, we ignored the inflation and interest). Maybe it will be the burden of a little more than five or six percent added to their monthly bill from 2004 to 2015.

For the whole Master Plan, the same logic will be applicable. By extending the recovery of the cost over the reasonable period, the additional connection cost of domestic users is the additional burden on the non-domestic users at around 5 % level.

17.6 Financial Analysis

Following two sets of outputs are prepared for each project (refer to Appendices 17.2 and 17.3).

- (1) Pro Forma Financial Statements (Fund Flow Table, Income Statement Table and Balance Sheet)
- (2) Financial Internal Rate of Return (FIRR)

In addition to these three typical Financial Statements, the working capital burden of each project is calculated. Either the form of subsidy internal or external or the interest-bearing loan somehow covers the cash deficit of the each year in the early stage. Estimate the interest burden when the available rate is 10 %.

The summary tables for the FIRRs and the sensitivity analysis for the FIRRs are shown in Tables 17.3 to 17.5. The computing process for each FIRR is shown in Appendices 17.2 and 17.3.

Table 17.3 FIRRs by Different Tariff Increase Rate of Water Supply System

| Tariff Increase Rate | 0.5% | 1.0% | 1.5% | 2.0% | 2.5% | 3.0% | 3.5% |
|----------------------|-------|--------------|-------|--------|--------|--------------|-------|
| FIRR for M/P | 1.55% | 5.04% | 8.14% | 11.10% | 14.07% | 17.17% | |
| FIRR for F/S | | | | | 1.66% | 2.71% | 3.69% |

Note: Bold Faces are the recommended Cases.

Table 17.4 Results of Sensitivity Analysis on Water Supply Projects

| Case | Annual Tariff Increase | Variance of Capital Investment and O&M Cost | | | |
|-------------|------------------------|---|--------------|-------|-------|
| | | -5% | 0% | +5% | +10% |
| FIRR of M/P | 1.0% | 6.47% | 5.04% | 3.74% | 2.53% |
| FIRR of F/S | 3.0% | 3.13% | 2.71% | 2.31% | 1.93% |

Table 17.5 FIRRs by Different Grant Coverage for Sewerage Project

| Item | | unit | Case 1 | Case 2 |
|---|--------------|--------------------|--------|--------|
| Grant Coverage for the Investment | | % | 100 | 90 |
| Starting Tariff for Domestic Users | | Rs./m ³ | 2.00 | 2.00 |
| Non-Dom. Tariff Multiplier against Dom. | | Times | 3 | 5 |
| Annual Tariff Increase Rate | | % | 1.00 | 1.00 |
| Case A (Bowela, OD) | FIRR for M/P | % | 4.42 | 2.75 |
| | FIRR for F/S | % | 7.26 | 3.50 |

The following discussions detail the financial analysis for individual cases.

17.6.1 Result of Financial Analysis (1): Greater Kandy Water Supply Project (Master Plan)

(refer to Appendix 17.2)

The Pro Forma Statements are prepared until 2050 in order to see the long-term financial consequence of this project. The assumption for tariff increase is 1%. While it is more than the level of willingness to pay at the current level, it is moderate because GDP growth per capita will absorb most of it. In addition, the cheaper water from the existing scheme will reduce the average level of the water price especially at the early stage of the project period. Eventually the residents will have to shoulder the cost for this water supply development and contribute to the financial basis of the water supply.

As shown in Table 17.3, FIRR of this case is a remarkable 5.04 percent. In long-term range, the project is financially rewarding and attractive. But it is 2024 when the net income becomes positive. The cumulative loss will disappear in the year of 2033. Thus substantial working capital should be prepared in addition to the capital investment.

The final result in 2050 is very attractive and produces the good FIRR in spite of the heavy investment and working capital burden in the early stage.

Table 17.3 also shows the sensitivity analysis on the annual tariff increase. Even if the tariff increase rate reduced to 0.5 percent, which seems to be less than per capita income growth level, the FIRR is still 1.55 percent.

Another sensitivity analysis is shown in Table 17.4. It analyses the effect of the variance of the investment costs and O&M costs on the FIRR of the recommended case. Although they have a moderate effect, the financial feasibility will not be affected.

17.6.2 Result of Financial Analysis (2): Greater Kandy Water Supply Project (F/S)

(refer to Appendix 17.2)

The Pro Forma Financial Statements of this case are shown in Appendix 17.2 in the same format as the Master Plan.

The critical difference from the Master Plan is the assumption for the tariff increase. This case assumes a 3 percent annual increase in real terms in order to be financially feasible in terms of FIRR.

This F/S plan, that is Phase 1 in the Master Plan, requires the largest portion of capital investment among the three separate phases while producing only one third of the water. The early stage of this pro forma forecast is very depressive. The cumulative deficit will continue until the year 2025. But in the year 2050, after finishing the repayment of the loan, the final financial results is very positive and will bring a substantial FIRR of 2.71 percent as presented in Table 17.3.

The problems are how to cope with the financial burden in the early stage. The first solution is the same as above. That is, combination with cheaper water from the existing scheme will reduce the averaged water price. The second solution will be the subsidy from urban consumers, especially from Greater Colombo to Greater Kandy. Substantial difference exists between Greater Colombo and Greater Kandy residents in both income level and customer composition, which affects their ability to pay the tariff.

17.6.3 Result of Financial Analysis (3): Kandy Sewerage Project (Master Plan)

(refer to Appendix 17.3)

As for the sewerage service, the Government will supply 100 percent of capital investment in the form of subsidy. The monthly service charge is currently free for the existing sewerage service in the Colombo area

In order to maintain the viability of the project, it was assumed that at least the direct operation and maintenance cost would be recovered in the form of monthly fee from customers.

As for the monthly charge to domestic customers, Rs. 2.0 per m³ of sewerage discharge, which is less than one quarter of the water tariff, was set for the analysis. This level is higher than the willingness to pay level of local residents obtained through the residents' survey. But people do not realize the costs and benefits of the sewerage system. Therefore social marketing effort should be made in the future.

In ordinary sewerage systems, a higher tariff is applied to commercial customers, especially high-grade hotel customers.

One percent annual tariff increase was assumed. It is the same rate as the Master Plan. If the per capita GDP increases moderately, most of the tariff increase will be absorbed by economic growth without placing an additional burden on the residents. The problem is the financial burden in the early stage of the project. Substantial amounts of working capital must be provided although this amount is far smaller than the capital investment requirement. But in long term, until 2050, this project is not only environmentally desirable but also financially rewarding.

Even if ten percent of the capital investment is required to be recovered by monthly fees in addition to the requirement for direct cost recovery, the financial projection will be feasible, as shown in Table 17.5. The sewage tariff will be about one third of water tariff. The annual tariff was assumed to be increased at a rate of 1.0 percent in real terms. With all the efforts mentioned here, the absolute volume of the working capital requirement to cover the negative cash balance until 2022 is substantial. The FIRR is positive at 4.42% as shown in Table 17.5. This project is financially feasible but solving the working capital requirement is needed.

17.6.4 Result of Financial Analysis (4): Kandy Sewerage Project (F/S)

(refer to Appendix 17.3)

In the Kandy Sewerage Project (F/S), the financial performance projection for the feasibility study (Table 17.5) is better than the Master Plan.

As with the Master Plan, this Feasibility Study will also be profitable if substantial working capital is arranged in addition to the capital investment.

In the case of a 10 percent capital cost requirement, the result is the same as the Master Plan, as shown in Table 17.5. Financial return is positive, but the requirement for working capital has to be solved to secure financial feasibility.

CHAPTER 18

**GANNORUWA SEWAGE TREATMENT
PLANT**

CHAPTER 18 GANNORUWA SEWAGE TREATMENT PLANT

18.1 Introduction

Kandy sewage treatment plant was originally designed to be located at Bowala. The design is shown in Chapter 10. As a result of the Steering Committee Meeting, held on November 27th, 1998, the proposed site was changed due to the difficulty of acquiring the land and an alternative site was proposed at Gannoruwa. The proposed land is currently used as a Government Farm of the Central Agricultural Research Institute. The land area is sufficient for the setting of a sewage treatment plant of 17,000 m³/day.

In this chapter, design alternatives for the sewage treatment plant, pumping station and sewage collection system are considered. The project cost, project implementation, and financial analysis are also examined.

18.2 Fundamentals of Alternative Planning

18.2.1 Sewage Treatment Plant Location

The newly proposed site is located at Gannoruwa and is shown in Figure 18.1. Gannoruwa is outside the Kandy MC and the sewage treatment plant site has an approximately elevation of 470m above MSL and is located about 2.0 km west of the originally proposed site. The site is closed to the Mahaweli River and presently used as a government farm.

18.2.2 Design Condition

To accord with change in proposed location of the sewage treatment plant site, the original plan will be changed based on the following conditions;

(1) Population, Area and Sewage Flow

The fundamentals for sewerage system planning (population, area and sewage flow etc) will remain unchanged.

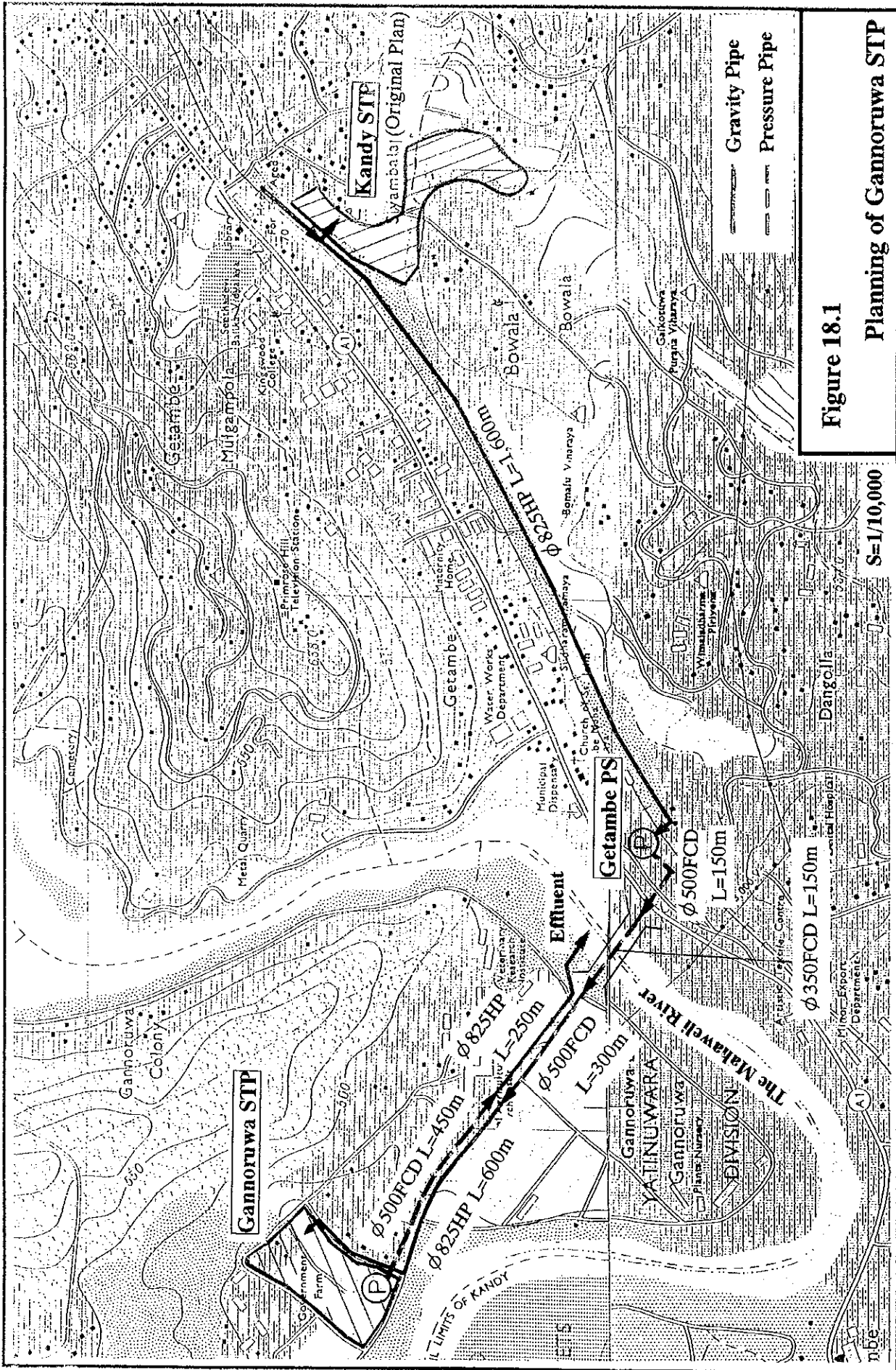


Figure 18.1
Planning of Gannoruwa STP

S=1/10,000

(2) Sewer Route

The sewer length will be extended to the new location to include gravity, pressure, and river crossing pipes. From the original site to a new pumping station at the Mahaweli River, the elevation is on the downgrade, it is, however, on the up grade for half the distance to the newly proposed location.

(3) Pumping Station

The pumping station, originally located at the sewage treatment plant, will now be located near a bridge on the Mahaweli River. An additional pumping station will be needed to discharge treated water near the bridge on the Mahaweli River, which is located downstream of a water intake of the Kandy Municipal Water Treatment Plant. A natural creek is available near the site, however, this flows into the river upstream of the existing water intake.

(4) Discharge

The outfall sewer will need to be extended because receiving waters were close to the sewage treatment plant adjoining the water source. The treated water is discharged downstream of a bridge at Getambe.

18.3 Preliminary Design of Sewerage System

18.3.1 Design Consideration

The proposed site is presently used as a Government Farm being operated by the Central Agricultural Research Institute and is close to the Mahaweli River in Gannoruwa. The shape of the site is rectangular, 150m by 200m, with an area of about 3 ha, and an elevation of approximately 470m above MSL. The surrounding area is also Government Farmland and it is considered that an increase in land is possible. Since this site was proposed on November 27, 1998, the topographic survey has not yet been conducted. It will therefore be necessary to perform the topographic survey at the next stage.

A soil investigation has not been conducted because of the same reason, and will need to be conducted at the next stage.

18.3.2 Sewage Collection System

The sewer system to be added to the initial plan is summarized in the following tables.

Table 18.1 Additional Sewer

| Item | Diameter (mm) | Length (m) | |
|-------------------------|---------------|------------|-------|
| | | 2005 | 2015 |
| Concrete Pipe | 825 | 3,450 | 3,450 |
| DI Pipe (on the Bridge) | 350 | 150 | 150 |
| DI Pipe | 500 | 900 | 900 |

The alternative sewage treatment plant site at Gannoruwa is located on the other side of the Mahaweli River, requiring the sewer to cross river. Therefore in this plan a pressure pipe will be set on the bridge to cross the river, with the pipe diameter reduced for this section.

18.3.3 Pumping Station

Two pumping stations are needed for the operation of this alternative plan. One near the bridge to send sewage to the sewage treatment plant and another at the plant to discharge treated water to the Mahaweli River. The tentative requirements and specifications for the revised site location are summarized in the following table. The detailed data is presented in Appendix 18.3.

Table 18.2 Summary of Pumping Station

| Location | | Specification |
|---------------|------|---|
| Getambe | 2005 | Submersible Pump, 5.47 m ³ /min, 17 m, 30 kW, 3 sets |
| | 2015 | Submersible Pump, 5.47 m ³ /min, 17 m, 30 kW, 4 sets |
| Gannoruwa STP | 2005 | Submersible Pump, 5.47 m ³ /min, 13 m, 22 kW, 3 sets |
| | 2015 | Submersible Pump, 5.47 m ³ /min, 13 m, 22 kW, 4 sets |

18.3.4 Sewage Treatment System

The preliminary design for the sewage treatment plant was conducted with the following capacity. Details of the sewage treatment plant are presented in Appendix 18.4. In this study, the plant design capacity is 8,500 m³/day for phase 1, considering the final capacity of 17,000 m³/day.

Since the alternative site has a large area, both the Oxidation Ditch Method and Aerated Lagoon Method have been designed.

| Location | Treatment Method | 2005 | 2015 |
|-----------|-----------------------------------|---------------------------|----------------------------|
| Gannoruwa | Oxidation Ditch or Aerated Lagoon | 8,500 m ³ /day | 17,000 m ³ /day |

(1) Layout

As the topographic survey has not yet been for conducted for the alternative site of the treatment plant, the layout of the sewage treatment plant will be designed assuming that the necessary area is available. Tentative layouts for the sewage treatment plant based on two methods (Oxidation Ditch and Aerated Lagoon) are shown in Figure 18.2 and 18.3 respectively.

(2) Specifications of Facilities

Specifications for the sewage treatment plant with numbers, dimensions and design parameters for each facility for the two approaches (Oxidation Ditch and Aerated Lagoon) are given in Table 18.3. The detailed data is presented in Appendix 18.4.

(3) Sludge Treatment/ Disposal

1) Oxidation Ditch Method

This site has enough space to dry all waste sludge generated by the sewage treatment plant. The plant does not need to provide aerobic tanks which can reduce the amount of sludge for transporting the sludge to Getambe Pumping Site for drying and disposal. The sludge treatment process will therefore be done as follows;

Thickening → Drying → Disposal

2) Aerated Lagoon Method

The sludge generated using this method will be dried at a Partial Mixing Aerated Lagoon directly, and transported to Getambe Dumping Site for disposal.

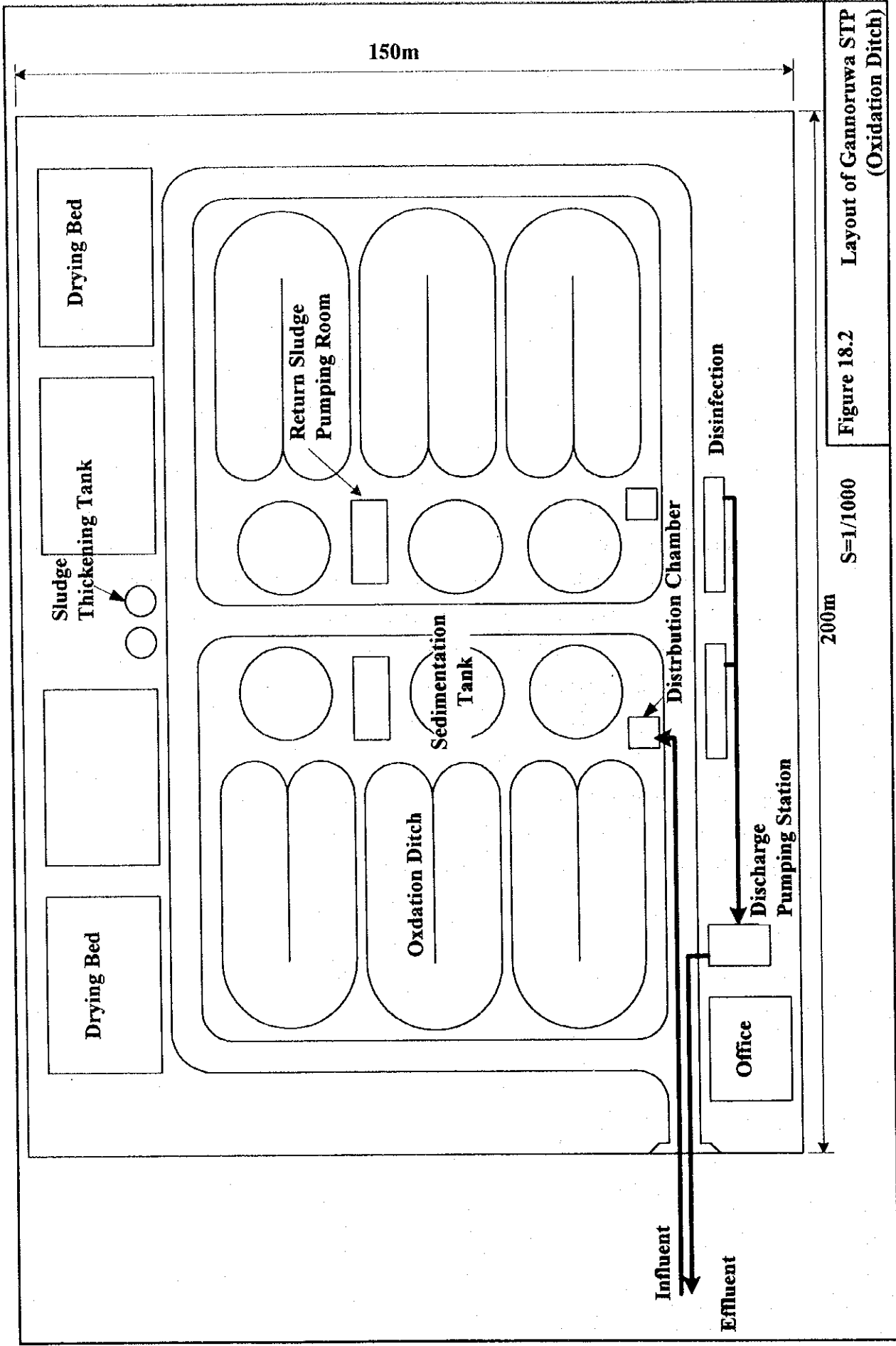


Figure 18.2 Layout of Gannoruwa STP (Oxidation Ditch)

S=1/1000

200m

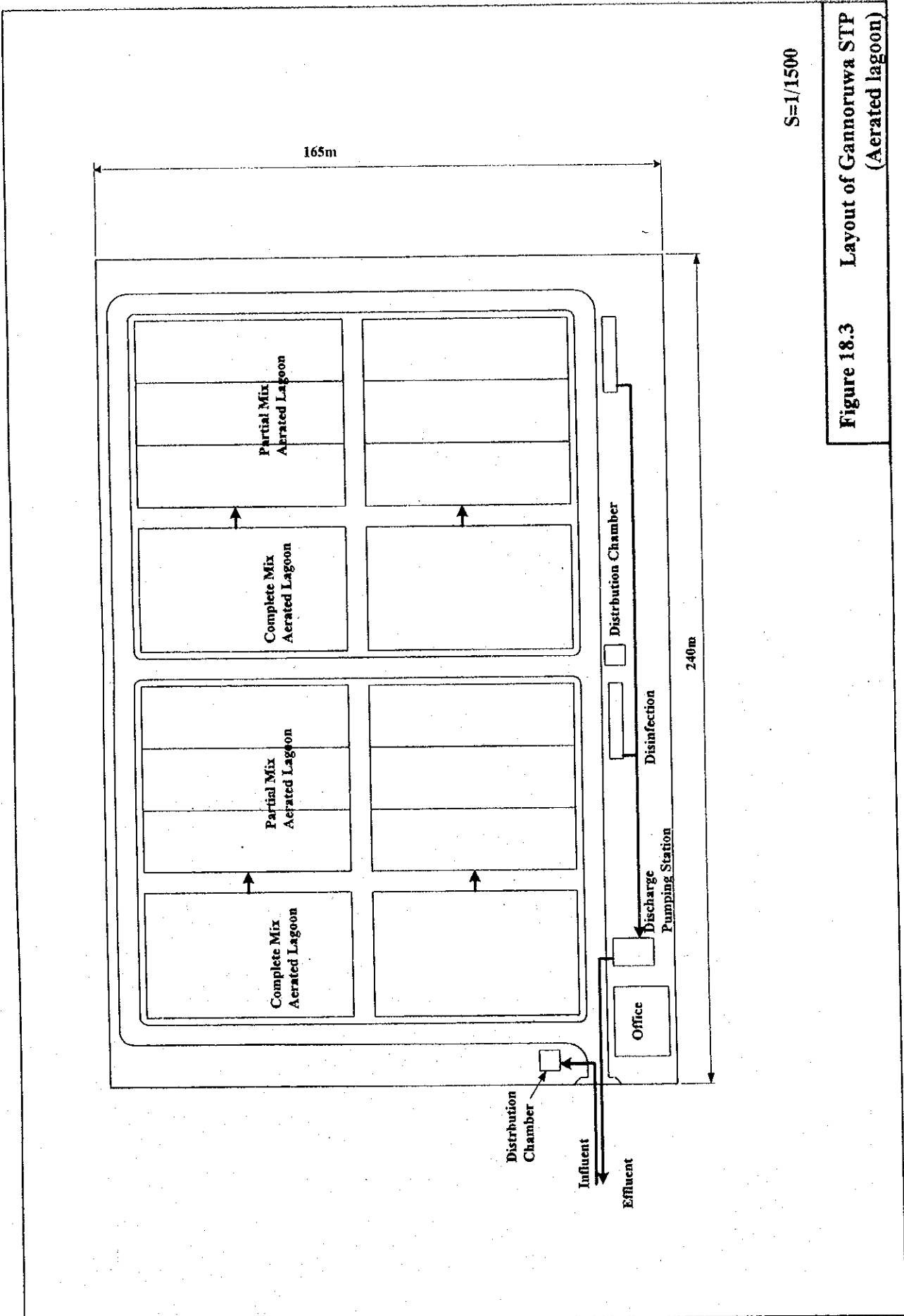


Figure 18.3 Layout of Gannoruwa STP (Aerated lagoon)

Table 18.3 Specifications of Sewage Treatment Plant

1. Oxidation Ditch Method

| Facilities | | Specifications | | | |
|-----------------------------------|--|----------------|------|----------|--|
| 1. Grit Chamber and Screen | | | | | |
| Type | Parallel Flow Type | | | | |
| Dimension | 1.2 m W x 5.5 m L x 0.7 m D | | | | |
| Average Velocity | 0.16 m/sec | | | | |
| Number of Basin | Phase 1 | 1 basin | 2015 | 2 basins | |
| 2. Oxidation Ditch | | | | | |
| Type | Oval-shape Type | | | | |
| Dimension | 6.0 m W x 190 m L x 3.0 m D | | | | |
| Aeration Power Level | 90 kW | | | | |
| Retention Time | 29.0 hours | | | | |
| Number of Basin | Phase 1 | 3 basins | 2015 | 6 basins | |
| 3. Sedimentation Basin | | | | | |
| Type | Circular Type | | | | |
| Dimension | 16.0 m Dia. x 3.0 m D | | | | |
| Water Surface Load | 14.1 m ³ /m ² /day | | | | |
| Retention Time | 3.4 hours | | | | |
| Number of Basin | Phase 1 | 3 basins | 2015 | 6 basins | |
| 4. Disinfection Tank | | | | | |
| Type | Rectangular Type | | | | |
| Dimension | 3.0 m W x 20.0 m L x 1.5 m D | | | | |
| Required Chlorine | 1.42 kg/hour | | | | |
| Retention Time | 15.2 min. | | | | |
| Number of Basin | Phase 1 | 1 basin | 2015 | 2 basins | |
| 5. Sludge Thickening Tank | | | | | |
| Type | Circular Type | | | | |
| Dimension | 5.0 m Dia. x 4.0 m D | | | | |
| Solid Load | 65 kg/m ² /day | | | | |
| Number of Basin | Phase 1 | 2 basins | 2015 | 4 basins | |
| 6. Sludge Drying Bed | | | | | |
| Type | Rectangular Type | | | | |
| Dimension | 6.0 m W x 14.5 m L x 0.3 m D | | | | |
| Solid Load | 10.2 days | | | | |
| Number of Basin | Phase 1 | 1 basin | 2015 | 2 basins | |

2. Aerated Lagoon Method

| Facilities | | Specifications | | | |
|--|-------------------------------|----------------|---------|----------|--|
| 1. Grit Chamber and Screen | | | | | |
| Type | Parallel Flow Type | | | | |
| Dimension | 1.2 m W x 5.5 m L x 0.7 m D | | | | |
| Average Velocity | 0.16 m/sec | | | | |
| Number of Basin | Phase 1 | 1 basin | Phase 2 | 2 basins | |
| 2. Complete Mixing Aerated Lagoon | | | | | |
| Type | Rectangular Type | | | | |
| Dimension | 60.0 m W x 36.0 m L x 3.0 m D | | | | |
| Aeration Power Level | 11 kW x 4 | | | | |
| Retention Time | 1.52 days | | | | |
| Number of Basin | Phase 1 | 2 basins | Phase 2 | 4 basins | |

| 3. Partial Mixing Aerated Lagoon | | | | |
|----------------------------------|-------------------------------|---------------------|---------|---------------------|
| Type | Rectangular Type | | | |
| Dimension (Cell) | 60.0 m W x 18.0 m L x 4.0 m D | | | |
| Aeration Power Level | 1.5kW x 2 | | | |
| Retention Time | 2.04 days | | | |
| Number of Basin | Phase 1 | 3 cells 2 basins | Phase 2 | 3 cells 4 basins |
| 4. Disinfection Tank | | | | |
| Type | Rectangular Type | | | |
| Dimension | 3.0 m W x 20.0 m L x 1.5 m D | | | |
| Required Chlorine | 1.42 kg/hour | | | |
| Retention Time | 15.2 min. | | | |
| Number of Basin | Phase 1 | 1 basin | Phase 2 | 2 basins |

18.4 Project Cost

The total cost of the proposed project at the alternative site location (2 treatment methods for 2005, 2015) is estimated in Sri Lankan Rs. as shown in Table 18.4. Detail Cost is presented in Appendices 18.5 and 18.6.

Table 18.4 Project Cost (Gannoruwa)

1. Oxidation Ditch Method

| Item | Phase 1 | Phase 2 | Total |
|---|------------------|------------------|------------------|
| (1) Construction Cost | | | |
| 1) Collection System | 537,663 | 284,060 | 821,723 |
| Sewer Main, Sewer Lateral | 463,191 | 284,060 | 747,251 |
| Additional Sewer | 74,472 | 0 | 74,472 |
| 2) Pumping Station | 26,618 | 5,894 | 32,512 |
| Civil Works | 11,363 | 1,210 | 12,573 |
| Mechanical/Electrical Works | 15,255 | 4,684 | 19,939 |
| 3) Sewage Treatment Plant | 503,733 | 547,796 | 1,051,529 |
| Civil Works | 185,341 | 194,163 | 379,504 |
| Mechanical/Electrical Works | 318,392 | 353,633 | 672,025 |
| 4) Administration Cost | 52,986 | 42,250 | 95,236 |
| Sub-Total | 1,068,014 | 1,121,000 | 1,905,764 |
| (2) Procurement of Maintenance Equipment | 25,000 | | 25,000 |
| (3) Engineering Cost | | | |
| 1) Detailed Design | 47,000 | 38,000 | 85,000 |
| 2) Construction Supervision | 37,000 | 28,000 | 65,000 |
| Sub-Total | 84,000 | 66,000 | 150,000 |
| (4) Common Expenses | | | |
| 1) General/Administration Expenses | 10,000 | 10,000 | 20,000 |
| 2) Land Acquisition | 60,000 | 20,000 | 80,000 |
| Sub-Total | 70,000 | 30,000 | 100,000 |
| (5) Contingency | 195,000 | 148,000 | 343,000 |
| (6) GST (12.5 %) | 190,000 | 146,000 | 336,000 |
| Total | 1,685,000 | 1,270,000 | 2,955,000 |

2. Aerated Lagoon Method

| Item | Phase 1 | Phase 2 | Total |
|---|------------------|------------------|------------------|
| (1) Construction Cost | | | |
| 1) Collection System | 537,663 | 284,060 | 821,723 |
| Sewer Main, Sewer Lateral | 463,191 | 284,060 | 747,251 |
| Additional Sewer | 74,472 | 0 | 74,472 |
| 2) Pumping Station | 26,618 | 5,894 | 32,512 |
| Civil Works | 11,363 | 1,210 | 12,573 |
| Mechanical/Electrical Works | 15,255 | 4,684 | 19,939 |
| 3) Sewage Treatment Plant | 328,803 | 397,294 | 726,097 |
| Civil Works | 209,420 | 244,349 | 453,769 |
| Mechanical/Electrical Works | 119,383 | 152,945 | 272,328 |
| 4) Administration Cost | 44,916 | 34,752 | 79,668 |
| Sub-Total | 893,084 | 938,000 | 1,580,332 |
| (2) Procurement of Maintenance Equipment | 25,000 | | 25,000 |
| (3) Engineering Cost | | | |
| 1) Detailed Design | 40,000 | 30,000 | 70,000 |
| 2) Construction Supervision | 30,000 | 24,000 | 54,000 |
| Sub-Total | 70,000 | 54,000 | 124,000 |
| (4) Common Expenses | | | |
| 1) General/Administration Expenses | 10,000 | 10,000 | 20,000 |
| 2) Land Acquisition | 80,000 | 20,000 | 100,000 |
| Sub-Total | 90,000 | 30,000 | 120,000 |
| (5) Contingency | 170,000 | 120,000 | 290,000 |
| (6) GST (12.5 %) | 162,000 | 114,000 | 276,000 |
| Total | 1,455,000 | 1,040,000 | 2,495,000 |

Note: Exchange rate: SL Rs. 1.00 = Japanese Yen 1.80 (as of November, 1998)

18.5 Implementation Program

The project implementation and disbursement schedule with estimated annual disbursements of project cost is presented in Table 18.5.

**Table 18.5 Project Implementation and Disbursement Schedule
of Kandy Sewerage Project (Gannoruwa STP)**

| Item | Phase Year | Phase 1 | | | | | Phase 2 | | | | |
|--------------------------------|---------------|---------|------|------|------|------|---------|------|------|------|------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2009 | 2010 | 2011 | 2012 | 2013 |
| Implementation Schedule | | | | | | | | | | | |
| 1. Preparation of Project | | | | | | | | | | | |
| 2. Pre-Construction Stage | | | | | | | | | | | |
| 2.1 Detailed Design | | | | | | | | | | | |
| 2.2 Bidding | | | | | | | | | | | |
| 3. Construction | | | | | | | | | | | |
| 3.1 Collection System | | | | | | | | | | | |
| - Trunk Mains | | | | | | | | | | | |
| - Sewer Laterals | | | | | | | | | | | |
| 3.2 Sewage Treatment Plant | | | | | | | | | | | |
| - Civil Work | | | | | | | | | | | |
| - Mechanical/Electrical Work | | | | | | | | | | | |
| 4. Procurement of Equipment | | | | | | | | | | | |

Case A Original Plan (Kandy STP, Oxidation Ditch)

| Disbursement Schedule | Total Cost (Million SL Rs) | Phase 1 | 1710.0 | | | Phase 2 | 1270.0 | | | |
|-------------------------------------|-------------------------------|---------|--------|--------------|--------------|--------------|--------|-------------|--------------|--------------|
| 1. Land Acquisition | 180.0 | | | 160.0 | | | | 20.0 | | |
| 2. Administration | 20.0 | | | 2.0 | 4.0 | 4.0 | | 2.0 | 4.0 | 4.0 |
| 3. Construction Work | 1,932.0 | | | | 345.0 | 700.0 | | | 287.0 | 600.0 |
| 4. Procurement of Equipment | 25.0 | | | | | 25.0 | | | | |
| 5. Engineering Service | 146.0 | | | 45.0 | 15.0 | 22.0 | | 36.0 | 10.0 | 18.0 |
| 6. Contingency | 346.0 | | | 31.0 | 54.0 | 113.0 | | 9.0 | 45.0 | 94.0 |
| 7. GST (12.5 %) | 331.0 | | | 30.0 | 53.0 | 107.0 | | 9.0 | 38.0 | 94.0 |
| Total of Annual Disbursement | 2,980.0 | | | 268.0 | 471.0 | 971.0 | | 76.0 | 384.0 | 810.0 |

Case B Gannoruwa STP (Oxidation Ditch)

| Disbursement Schedule | Total Cost (Million SL Rs) | Phase 1 | 1685.0 | | | Phase 2 | 1270.0 | | | |
|-------------------------------------|-------------------------------|---------|--------|--------------|--------------|--------------|--------|-------------|--------------|--------------|
| 1. Land Acquisition | 80.0 | | | 60.0 | | | | 20.0 | | |
| 2. Administration | 20.0 | | | 2.0 | 4.0 | 4.0 | | 2.0 | 4.0 | 4.0 |
| 3. Construction Work | 2,001.0 | | | | 421.0 | 700.0 | | | 280.0 | 600.0 |
| 4. Procurement of Equipment | 25.0 | | | | | 25.0 | | | | |
| 5. Engineering Service | 150.0 | | | 47.0 | 15.0 | 22.0 | | 38.0 | 10.0 | 18.0 |
| 6. Contingency | 343.0 | | | 18.0 | 57.0 | 120.0 | | 9.0 | 45.0 | 94.0 |
| 7. GST (12.5 %) | 336.0 | | | 20.0 | 55.0 | 115.0 | | 14.0 | 38.0 | 94.0 |
| Total of Annual Disbursement | 2,955.0 | | | 147.0 | 552.0 | 986.0 | | 83.0 | 377.0 | 810.0 |

Case C Gannoruwa STP (Aerated Lagoon)

| Disbursement Schedule | Total Cost (Million SL Rs) | Phase 1 | 1455.0 | | | Phase 2 | 1040.0 | | | |
|-------------------------------------|-------------------------------|---------|--------|--------------|--------------|--------------|--------|-------------|--------------|--------------|
| 1. Land Acquisition | 100.0 | | | 80.0 | | | | 20.0 | | |
| 2. Administration | 20.0 | | | 2.0 | 4.0 | 4.0 | | 2.0 | 4.0 | 4.0 |
| 3. Construction Work | 1,660.0 | | | | 338.0 | 600.0 | | | 342.0 | 380.0 |
| 4. Procurement of Equipment | 25.0 | | | | | 25.0 | | | | |
| 5. Engineering Service | 124.0 | | | 40.0 | 12.0 | 18.0 | | 30.0 | 10.0 | 14.0 |
| 6. Contingency | 290.0 | | | 16.0 | 51.0 | 103.0 | | 9.0 | 45.0 | 66.0 |
| 7. GST (12.5 %) | 276.0 | | | 15.0 | 50.0 | 97.0 | | 9.0 | 43.0 | 62.0 |
| Total of Annual Disbursement | 2,495.0 | | | 153.0 | 455.0 | 847.0 | | 70.0 | 444.0 | 526.0 |

18.6 Operation and Maintenance Program

18.6.1 Work Program for Operation and Maintenance

(1) Sewage Collection System

There are four major O & M procedures namely, daily inspection, site investigation, pipe cleaning and rehabilitation of damaged sewers. The work items by O & M procedure are the same as Chapter 14.

(2) Sewage Treatment Plant

The proposed method of sewage treatment to be used at the sewage treatment plant is almost the same as Chapter 14.

18.6.2 Organization for Operation and Maintenance

The proposed staffing for operation and maintenance personnel by the Oxidation Ditch Method is 12 persons for Phase 1 and 21 persons for Phase 2, and by the Aerated Lagoon Method is 10 persons for Phase 1 and 19 persons for Phase 2, as shown in Table 18.6.

Table 18.6 Required Number of Staff for O&M of Sewage System

(unit: persons)

| Field & Position | | Oxidation Ditch Method | | Aerated Lagoon Method | |
|---------------------------|------------|------------------------|---------|-----------------------|---------|
| | | Phase 1 | Phase 2 | Phase 1 | Phase 2 |
| Manager | | 1 | 1 | 1 | 1 |
| Sewer and Pumping Station | | | | | |
| Sewer | Engineer | - | 1 | - | 1 |
| | Foreman | 1 | 1 | 1 | 1 |
| | Worker | 1 | 2 | 1 | 2 |
| | Driver | 1 | 2 | 1 | 2 |
| Vehicle Maintenance* | Mechanic | - | - | - | - |
| Sewage Treatment Plant | | | | | |
| Operation | Engineer | 1 | 1 | 1 | 1 |
| | Foreman | 1 | 3 | - | 2 |
| | Operator | 3 | 6 | 3 | 6 |
| Maintenance | Technician | 1 | 1 | 1 | 1 |
| | Worker | 1 | 2 | - | 1 |
| Water Analysis | Chemist | 1 | 1 | 1 | 1 |
| Total | | 12 | 21 | 10 | 19 |

* Vehicle maintenance shall be done by the Municipality workshop.

18.6.3 Operation and Maintenance Cost

The operation and maintenance program, as stipulated in the preceding sections, requires the following items and annual funds for proper operation of the sewage collection system and the sewage treatment plant. The detailed cost estimate is presented in Appendix 18.8.

Table 18.7 Operation and Maintenance Cost

(Unit: Thousand Rs/year)

| Item | Oxidation Ditch Method | | Aerated Lagoon Method | |
|----------------------|------------------------|---------|-----------------------|---------|
| | Phase 1 | Phase 2 | Phase 1 | Phase 2 |
| - Personnel Expenses | 1,176 | 1,980 | 1,032 | 1,836 |
| - Electricity Cost | 8,496 | 16,800 | 6,787 | 15,171 |
| - Chemical Cost | 161 | 334 | 161 | 334 |
| - Repair Cost | 3,307 | 6,920 | 1,317 | 2,883 |
| Total | 13,140 | 26,034 | 9,297 | 20,224 |

Table 18.8 Outline of Kandy Sewerage Project (Gannoruwa, Oxidation Ditch)

| Phase | | Unit | Phase 1 | Phase 2 | Remarks | | |
|----------------------------|--|--------------------------------------|---|--|---|---|--------|
| Frame Values | Service Area | | City center commercial area, Kandy Lake, surrounding hotels, hospital, Hantana housing scheme, housing area along the two principal transportation routes and Katugastota.. | | The values in phase 2 column shows these for the whole project. | | |
| | Target Year | | 2005 | 2015 | | | |
| | Service Area | ha | 271 | 724 | | | |
| | Population | Pop | 153,000 | 171,000 | | | |
| | Service Population | Pop | 19,300 | 55,000 | | | |
| | Percentage of Service Population | % | 13% | 32% | | | |
| Sewage Flow | Per Capita Sewage Flow | Domestic | lpcd | 86 | 97 | The values in phase 2 column shows these for the whole project. | |
| | | Non-Domestic | lpcd | 92 | 138 | | |
| | | Infiltration | lpcd | 32 | 42 | | |
| | Total | lpcd | 210 | 277 | | | |
| | Design Sewage Flow | Daily Average Sewage Flow | m ³ /d | 7,300 | 15,200 | | |
| | | Daily Maximum Sewage Flow | m ³ /d | 8,500 | 17,800 | | |
| Hourly Maximum Sewage Flow | | m ³ /d | 12,200 | 25,500 | | | |
| Phase | | Unit | Phase 1 | Phase 2 | Total | | |
| Facility | Planning Area | | Kandy-city center commercial area, the area around the Kandy Lake, hospital, Hantana housing scheme. | Excluding Phase 1 column in Service area. | — | | |
| | Sewage Treatment Plant (Gannoruwa) 3.0ha | Treatment Method | | Oxidation Ditch | | | |
| | | Capacity | m ³ /d | 8,500 | 8,500 | 17,000 | |
| | Sewage Treatment Plant (Katugastota) | Facilities | | Grit Chamber, Oxidation Ditch, Sedimentation Basin, Disinfection Tank, Sludge Thickening Tank, Sludge Drying Bed | | | |
| | | Treatment Method | | Aerated Lagoon | | | |
| | Pumping Station | Capacity | m ³ /d | — | 1,700 | 1,700 | |
| | | Facilities | | Grit Chamber, Complete Mixing Aerated Lagoon, Partial Mixing Aerated Lagoon, Disinfection Tank | | | |
| | Sewer Pipe | Submersible Pump | Nr | 3 | 1 | 4 | |
| | | | Lateral Sewer Clay ϕ 150mm | m | 4,500 | 4,800 | 9,300 |
| | | | Trunk Sewer Clay ϕ 150~600mm | m | 13,940 | 2,600 | 16,540 |
| | | | Concrete ϕ 675~825mm | m | 6,320 | 0 | 6,320 |
| | | | Puressure Pipe DI ϕ 100mm | m | 650 | 0 | 650 |
| | | | DI ϕ 350mm | m | 150 | 0 | 150 |
| DI ϕ 500mm | | | m | 900 | 0 | 900 | |
| Project Cost | Construction Cost | Service Connection | Nr | 5,800 | 6,600 | 12,400 | |
| | | Direct Construction Cost | Milli. Rs. | 1,121 | 880 | 2,001 | |
| | | Procurement of Maintenance Equipment | Milli. Rs. | 25 | 0 | 25 | |
| | | Engineering Cost | Milli. Rs. | 84 | 66 | 150 | |
| | | Administration and Land Acquisition | Milli. Rs. | 70 | 30 | 100 | |
| | | Contingency | Milli. Rs. | 195 | 148 | 343 | |
| | | GST 12.5% | Milli. Rs. | 190 | 146 | 336 | |
| | Total | Milli. Rs. | 1,685 | 1,270 | 2,955 | | |
| | Annual Operation and Maintenance | Personnel Expense | Thou. Rs. | 1,176 | 1,980 | — | |
| | | Electricity Cost | Thou. Rs. | 8,496 | 16,800 | — | |
| Chemical Cost | | Thou. Rs. | 161 | 334 | — | | |
| Repair Cost | | Thou. Rs. | 3,307 | 6,920 | — | | |
| Total | Thou. Rs. | 13,140 | 26,034 | — | | | |

Table 18.9 Outline of Kandy Sewerage Project (Gannoruwa, Aerated Lagoon)

| Phase | | Unit | Phase 1 | Phase 2 | Remarks | | |
|----------------------------|--|--------------------------------------|---|--|---|---|-------|
| Frame Values | Service Area | | City center commercial area, Kandy Lake, surrounding hotels, hospital, Hantana housing scheme, housing area along the two principal transportation routes and Katugastota.. | | The values in phase 2 column shows these for the whole project. | | |
| | Target Year | | 2005 | 2015 | | | |
| | Service Area | ha | 271 | 724 | | | |
| | Population | Pop | 153,000 | 171,000 | | | |
| | Service Population | Pop | 19,300 | 55,000 | | | |
| | Percentage of Service Population | % | 13% | 32% | | | |
| Sewage Flow | Per Capita Sewage Flow | Domestic | lpcd | 86 | 97 | The values in phase 2 column shows these for the whole project. | |
| | | Non-Domestic | lpcd | 92 | 138 | | |
| | | Infiltration | lpcd | 32 | 42 | | |
| | Total | lpcd | 210 | 277 | | | |
| | Design Sewage Flow | Daily Average Sewage Flow | m ³ /d | 7,300 | 15,200 | | |
| | | Daily Maximum Sewage Flow | m ³ /d | 8,500 | 17,800 | | |
| Hourly Maximum Sewage Flow | | m ³ /d | 12,200 | 25,500 | | | |
| Phase | | Unit | Phase 1 | Phase 2 | Total | | |
| Facility | Planning Area | | Kandy-city center commercial area, the area around the Kandy Lake, hospital, Hantana housing scheme. | Excluding Phase 1 column in Service area. | - | | |
| | Sewage Treatment Plant (Gannoruwa) 3.0ha | Treatment Method | | Aerated Lagoon | | | |
| | | Capacity | m ³ /d | 8,500 | 8,500 | 17,000 | |
| | | Facilities | | Grit Chamber, Complete Mixing Aerated Lagoon, Partial Mixing Aerated Lagoon, Disinfection Tank | | | |
| | Sewage Treatment Plant (Katugastota) | Treatment Method | | Aerated Lagoon | | | |
| | | Capacity | m ³ /d | - | 1,700 | 1,700 | |
| | | Facilities | | Grit Chamber, Complete Mixing Aerated Lagoon, Partial Mixing Aerated Lagoon, Disinfection Tank | | | |
| | Pumping Station | Submersible Pump | Nr | 3 | 1 | 4 | |
| | Sewer Pipe | Lateral Sewer Clay φ 150mm | m | 4,500 | 4,800 | 9,300 | |
| | | Trunk Sewer Clay φ 150~600mm | m | 13,940 | 2,600 | 16,540 | |
| | | | Concrete φ 675~825mm | m | 6,320 | 0 | 6,320 |
| | | Pressure Pipe DI φ 100mm | m | 650 | 0 | 650 | |
| | | | DI φ 350mm | m | 150 | 0 | 150 |
| | | | DI φ 500mm | m | 900 | 0 | 900 |
| Service Connection | Nr | 5,800 | 6,600 | 12,400 | | | |
| Project Cost | Construction | Direct Construction Cost | Milli. Rs. | 938 | 722 | 1,660 | |
| | | Procurement of Maintenance Equipment | Milli. Rs. | 25 | 0 | 25 | |
| | | Engineering Cost | Milli. Rs. | 70 | 54 | 124 | |
| | | Administration and Land Acquisition | Milli. Rs. | 90 | 30 | 120 | |
| | | Contingency | Milli. Rs. | 170 | 120 | 290 | |
| | | GST 12.5% | Milli. Rs. | 162 | 114 | 276 | |
| | Total | Milli. Rs. | 1,455 | 1,040 | 2,495 | | |
| | Operation and Maintenance | Personnel Expense | Thou. Rs. | 1,032 | 1,836 | - | |
| | | Electricity Cost | Thou. Rs. | 6,787 | 15,171 | - | |
| | | Chemical Cost | Thou. Rs. | 161 | 334 | - | |
| Repair Cost | | Thou. Rs. | 1,317 | 2,883 | - | | |
| Total | Thou. Rs. | 9,297 | 20,224 | - | | | |

18.7 Financial Analysis

18.7.1 Calculation

In addition to Case A (original Plan at Bowela, Oxidation Ditch method), financial viability of Case B (Alternative plan at Gannoruwa, Oxidation Ditch method) and Case C (Alternative plan at Gannoruwa. Aerated Lagoon method) were examined. Assumptions adopted for the computation were set up as same as for the analysis for Case A.

18.7.2 Financial Evaluation

All the assumption in the financial analysis for Case B and Case C is the same as those for Case A that is discussed in the Chapter 17. In Case 1, 100 % governmental subsidy for the capital investment was assumed, while 90 % subsidy and 10% recovery by tariff in Case 2.

Table 18.10 presents the summary of financial evaluation for the project.

Table 18.10 FIRRs by Different Grant Coverage for Sewerage Project

| Item | unit | Case 1 | Case 2 |
|---|--------------------|--------|--------|
| Grant Coverage for the Investment | % | 100 | 90 |
| Starting Tariff for Domestic Users | Rs./m ³ | 2.00 | 2.00 |
| Non-Dom. Tariff Multiplier against Dom. | Times | 3 | 5 |
| Annual Tariff Increase Rate | % | 1.00 | 1.00 |
| Case A* (Bowela, OD) | FIRR for M/P | 4.42 | 2.75 |
| | FIRR for F/S | 7.26 | 3.50 |
| Case B (Gannoruwa, OD) | FIRR for M/P | 3.67 | 2.68 |
| | FIRR for F/S | 5.76 | 4.60 |
| Case C (Gannoruwa, AL) | FIRR for M/P | 47.45 | 5.88 |
| | FIRR for F/S | 49.04 | 7.61 |

*: Refer to Chapter 17.

(1) Case B

a. Kandy Sewerage Project (M/P)

In case of 100 % subsidy, FIRR is 3.67%. Net cash inflow becomes positive in the year of 2023 and cumulative cash deficit will disappear in 2031. Even the all capital investment cost is subsidized, the working capital in the early stage of the project has to be provided in addition to the investment costs. It must be understand that the

FIRR in the case of 100 % subsidy tells only that the O&M costs and some overhead can be recovered from expected sewerage tariff in project life.

In case that 10% of capital investment costs shall recover from sewerage tariff, FIRR goes down to 2.68% and the cash flow becomes worse further even though non-domestic customers will pay five times of unit rate for domestic customer. Even the 90 % of capital investment cost are supplied as grant, the working capital in the early stage of the project has to be provided in addition to the investment costs. Net cash inflow becomes positive in the year of 2020 and cumulative cash deficit will disappear in 2025.

b. Kandy Sewerage Project (F/S)

In case of 100 % subsidy, FIRR is 5.76%. Net cash inflow becomes positive at the year of 2014 and the cumulative cash deficit will disappear at 2022. The financial situation becomes better than the case of M/P because the work of the F/S covers CBD (Central Business District) where the business users are concentrated. Even all the capital investment cost is supplied as subsidy, the working capital in the early stage of the project has to be provided in addition to the investment costs.

In case 2, FIRR goes down to 4.60 %. Net cash inflow becomes positive in the year of 2011 and cumulative cash deficit will disappear in 2017.

(2) Case C

a. Kandy Sewerage Project (M/P)

In case of 100 % subsidy, FIRR is 47.45%. Net cash inflow becomes positive in the year of 2006 and cumulative cash deficit will disappear in 2008. Even the all capital investment cost is subsidized, the working capital in the early stage of the project has to be provided in addition to the investment costs.

In case that 10% of capital investment costs shall recover from sewerage tariff, FIRR goes down to 5.88% and the cash flow becomes worse further even though non-domestic customers will pay five times of unit rate for domestic customer. Even the 90 % of capital investment cost are supplied as grant, the working capital in the early

stage of the project has to be provided in addition to the investment costs. Net cash inflow becomes positive in the year of 2009 and cumulative cash deficit will disappear in 2018.

b. Kandy Sewerage Project (F/S)

In case of 100 % subsidy, FIRR is 49.04%. Net cash inflow becomes positive at the year of 2006 and the cumulative cash deficit will disappear at 2008.

In case 2, FIRR goes down to 7.61 %. Net cash inflow becomes positive in the year of 2014 and cumulative cash deficit will disappear in 2023. Comparing with Case B, better results were obtained.