

**Democratic Socialist Republic
of Sri Lanka
National Water Supply &
Drainage Board (NWS&DB)**

**DATA COLLECTION SURVEY
ON SEWERAGE SECTOR
IN
DEMOCRATIC SOCIALIST REPUBLIC
OF SRI LANKA**

FINAL REPORT

SEPTEMBER 2012

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(JICA)**

**NIHON SUIDO CONSULTANTS CO., LTD.
YACHIYO ENGINEERING CO., LTD.
YOKOHAMA WATER CO., LTD.**

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FINAL REPORT

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ABBREVIATIONS AND TERMINOLOGY

ADB	Asian Development Bank
Addl.GM	Additional General Manager
AGM	Assistant General Manager
BAPPENAS	National Development Planning Board (Indonesia)
BOD	Biochemical Oxygen Demand
BOT	Build-Operate-Transfer
B.Sc	Bachelor of Science
CCD	Coast Conservation Department
CEA	Central Environmental Authority
CEB	Ceylon Electricity Board
CMC	Colombo Municipal Council
COD	Chemical Oxygen Demand
DGM	Deputy General Manager
DI	Ductile Cast Iron
dia.	Diameter
DIP	Ductile Cast Iron Pipe
DO	Dissolved Oxygen
DS	Divisional Secretariats
E&M	Electrical and Mechanical
EC	Electric Conductivity
EIA	Environmental Impact Assessment
EPL	Environmental Protection License
GDP	Gross Domestic Product
GOSL	Government of Sri Lanka
GPOBA	Global Partnership on Output-Based Aid
HSDC	Hanoi Sewerage Drainage Company
IWK	Indah Water Konsortium
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
KCWMP	Kandy City Wastewater Management Project
KMC	Kandy Municipal Council
LKR, Rs.,SLRs	Sri Lanka Rupee
MBBR	Moving Bed Biofilm Reactor
MC	Municipal Council
M/D	Minutes of Discussion
MHWL	Mean High Water Line
MLWL	Mean Low Water Line

MSL	Mean Sea Level
MOLG	Ministry of Local Government and Provincial Councils
MOWSD	Ministry of Water Supply and Drainage
NH ₃	Ammonia
NO ₃	Nitrate
NRW	Non-revenue Water
NWS&DB (NWSDB)	Notional Water Supply & Drainage Board
NWRA	National Water Resources Authority
O&M	Operation and Maintenance
OD	Oxidation Ditch
PD PAL JAYA	Regional Wastewater Management Company (Jakarta, Indonesia)
PPP	Public Private Partnership
PPWSA	Pnom Phen Water and Sewerage Authority
PS	Predeshiya Sabha (Local Council)
RSC	Regional Support Center
SIDA	Swedish International Development Cooperation Agency
SLTDA	Sri Lanka Tourism Development Authority
SPAN	National Water Services Commission (Malaysia)
SS	Suspended Solids
SSD	Sewerage Service Department (Malaysia)
T-N	Total Nitrogen
T-P	Total Phosphorus
TOR	Terms of Reference
TSS	Total Suspended Solids
UC	Urban Council
UDA	Urban Development Authority
USD	U.S. dollar
USAID	U.S. Agency for International Development
VAT	Value Added Tax
WB	World Bank
WSIA	Water Services Industry Act (Malaysia)
WSP	Water and Sanitation Program
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

UNITS

°C	Celsius
cm	Centimetre
d	Day
h, hr	Hour
ha	Hectare
kg	Kilogram
km	kilometre
L, l	Litre
m, M	Metre, Million
m ²	Square Metre
m ³	Cubic Metre
mg	Milligram
MPN	Most Probable Number
min	Minutes
mm	Millimetre
pH	Potential of Hydrogen
ppm	Parts per Million
s, sec	Second

EXECUTIVE SUMMARY

1 Background

In 2011, the rate of economic development of the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as Sri Lanka) reached 8.3%. The government of Sri Lanka (GOSL) aims to maintain this high rate of growth to achieve an average per capita income of USD 4,000 by 2016, thus joining the rank of semi-developed countries.

The government is trying to achieve sustainable development to improve the standard of living without compromising the needs of future generations by conserving the environment, including preventing water pollution. Nevertheless by 2010 the sewerage coverage ratio is still only 2.5%. The rapid rise in population and water consumption is increasing significantly the quantity of untreated wastewater being discharged into rivers and the sea. The impacts to public health and the environment present serious social and environmental repercussions.

The national development plan, Mahinda Chintana 2010, recognizes sewerage development and safe water supply as important elements of integrated social, economic and environmental objectives of society and proposes to increase the sewerage coverage ratio to 7.0% by 2020. The National Water Supply & Drainage Board (NWSDB) has invested in sewerage development in urban areas including Colombo, Dehiwala, Mt. Lavinia and Kotte, where population, social and commercial activities are on the rise, accompanied by the potential risks of public health degradation. JICA is involved with one of these projects in Kandy city.

In addition to the new projects in these cities, NWSDB is also considering expansion and rehabilitation of existing sewerage facilities. Several projects are now under investigation by different donors.

2 Objectives of the Survey

The survey will contribute to the goal of raising the sewerage coverage in Sri Lanka to 7% by 2020, by carrying out the following activities:

- Confirm current conditions in the sewerage sector at the national level and in 14 selected cities, identify outstanding issues, propose mitigating measures and appropriate assistance programme of donors;
- Evaluate construction, operation and maintenance costs as well as required skills, and introduce at workshops appropriate technologies and equipment to be applied;
- Share Japanese knowledge, experiences, and technologies at a workshop to be conducted in Sri Lanka and during visits to Japanese facilities by host country officials.

The survey was implemented in national sewerage sector and 14 cities as shown in **Table S.1**.

Table S.1 Target Cities for the Survey

Area		City
1	Colombo	1.Colombo MC
2	Western and Southern Area	2. Dehiwala/Mt. Lavinia MC, 3. Kaduwela MC, 4. Kolonnawa UC, 5. Kelaniya PS, 6. Peliyagoda UC, 7. Kalutara UC, 8. Matara MC
3	Central and Eastern Area	9. Matale MC, 10. Nuwara Eliya MC, 11.Badulla MC, 12. Batticaloa MC, 13. Klmunai MC, 14. Trincomalee UC

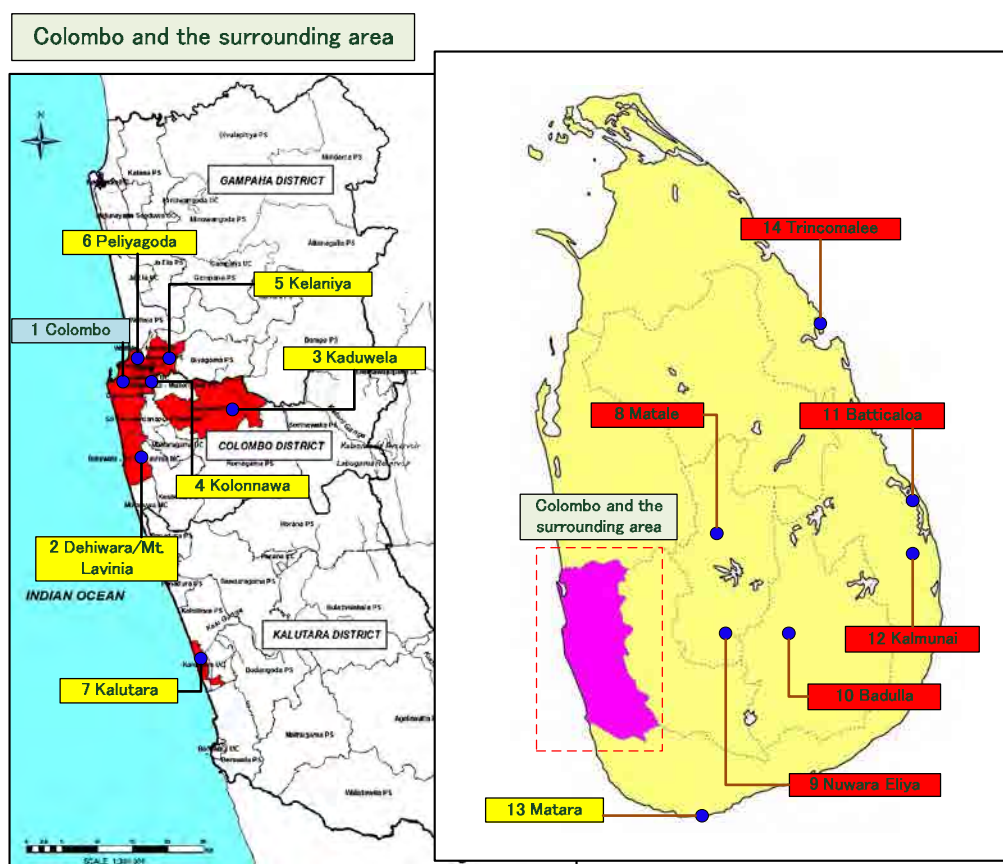


Figure S.1 Location of Target Cities for the Survey

3 National Policy and Standards

3.1 Laws, Acts, Regulations and Standards

The principal laws related to sewerage systems, sewage treatment, and on-site treatment in Sri Lanka are as follows:

- Municipal Councils and Urban Councils Act, No. 42 of 1942,
- Municipal Councils Ordinance No 29 of 1947
- National Water Supply and Drainage Board Law, No. 02 of 1974 as amended by the National Water Supply and Drainage Board (Amendment) Act, No. 13 of 1992. (NWSDB Law) established the NWSDB as a public authority.
- The National Environmental Act, No: 47 of 1980 as amended by Act No: 56 of 1988 and the National Environmental (Protection & Quality) Regulations, No. 1 of 1990, established

discharge standards and made it an offence to discharge, deposit or emit waste into the environment which will cause pollution, except a) under the authority of a license; and b) subject to such standards and criteria prescribed.

- The Urban Development Authority Law, No. 41 of 1978 and The Urban Development Authority Planning and Building Regulations, 1986 related amongst other things, to the approval of building plans, establishes the necessary standards and criteria for such approval.
- Town and Country Planning (Amendment) Act., No. 49 of 2000,
The National Physical Planning Policy and Key projects, prepared under the section of 5 (a) and (b) of the Town and Country Planning (Amendment) Act, No. 49 of 2000, and approved by the National Physical Planning Council as per Section 4B of the Act are to be published.
- National Environmental Act No 47 of 1980
- Coast Conservation Act No 57 of 1981
- Water Resources Act 1994
- Fisheries and Aquatic Resource Act 1996
- Archaeological Impact Assessment Act 2000
- Marine Pollution Prevention Act No 35 of 2008
- SLS 745 Part 2: 2009 – Code of Practice for Design and Construction of Septic Tanks and Associated Effluent Disposal Systems

In addition to the above, there are Regulations and Ordinances relating to the construction of, and connection to, sewers as well as their maintenance.

In order to implement sewerage and on-site sanitation operations, it is necessary to comply with various laws, acts, regulations and standards for mandatory house connection, tariff, solid waste, noise and air pollution and water quality such as acceptable wastewater quality and effluent quality from wastewater treatment plant (WWTP).

3.2 Organizations

National Government Ministries and Regulators with an involvement within the sewerage sector are listed below;

- National Government Ministries
 - Ministry of Urban Development & Sacred Area Development
 - Ministry of Water Supply and Drainage
 - Ministry of Local Government and Provincial Councils
 - Ministry of Environment and Natural Resources
 - Ministry of Health

➤ Regulators

- Central Environmental Authority
- Coast Conservation Dept. (CCD) for the Coastal Zone

3.3 National Policy

According to the Mahinda Chintana Vision for the Future 2010, coverage of water supply and piped sewerage was considered to rise as shown in **Table S.2**.

Table S.2 Target of Sewerage Coverage in Mahinda Chintana

Policy	Parameter	2015	2020
Mahinda Chintana	Piped water connected coverage	44 %	60 %
	Safe water supply coverage	94 %	100 %
	Piped borne sewerage coverage	3 %	7 %

On the other hand, according to the Draft CORPORATE PLAN 2012-2016, pipe borne sewerage coverage will vary as shown in **Table S.3**.

Table S.3 Target of Sewerage Coverage in Draft Corporate Plan 2012-2016

Year	2011	2012	2013	2014	2015	2016
Pipe Borne Sewerage Coverage	479,804	505,672	532,009	558,822	586,118	613,905
Pipe Borne Sewerage Coverage (%)	2.3%	2.4%	2.5%	2.6%	2.7%	2.8%

4 Present Status of Sewerage Sector

4.1 Sewerage Development

Three (3) municipal and ten (10) housing scheme sewerage systems are now under service in Sri Lanka as shown in **Table S.4** and **Table S.5**.

Table S.4 Population Coverage by Pipe Borne Sewerage in 2008 (Five Major Cities)

Sewerage System	City	Total Population	Estimated Covered Population	Population Covered Ratio	WWTP Process
Greater Colombo Sewerage System	Colombo	700,000	430,500	61.5%	2 Ocean Outfalls
	Dehiwala/Mt. Lavinia	223,000	10,160	4.6%	
	Kolonnawa	60,000	5,045	8.4%	
Katragama	Katragama	20,000	4,500	22.5%	Natural Ponds
Hikkaduwa	Hikkaduwa	30,000	3,000	10.0%	Natural Ponds
Total		1,033,000	453,205	43.9%	

Source: NWSDB

Table S.5 Population Coverage by Pipe Borne Sewerage in 2008 (Housing Scheme)

Housing Scheme	No. of Connections	Covered Population
Soysapura	2,368	11,840
Matthegoda	1,240	6,200
Jayawadanagama	850	4,250
Maddumagewatta	192	960
Raddolugama	2,100	10,500
Maligawatta	1,510	7,550
Crow Island	294	1,270
Stace Doad	240	1,200
Hantana	385	1,950
Diganavillage	250	1,250
Total	9,429	46,970

Source: NWSDB

On-going sewerage and sanitation projects are as summarized below;

- Wastewater Disposal Systems for Ratmalana /Moratuwa & Ja- Ela /Ekala Areas (SIDA)
- Greater Colombo Wastewater Management Project (ADB)
- Kandy City Wastewater Management Project (JICA)
- Increase of number of sewerage connections and access to safe sanitation in Colombo Area (GPOBA,WB)
- Jaffna Peninsula & Kilinochchi WaterSupply & Sanitation (ADB - 6th Project)

And the sewerage projects in preparatory stage are listed below;

- Greater Kurunegala Water Supply and Wastewater Disposal Project
- Negombo Wastewater Treatment & Disposal System
- Kataragama Sacred City Waste Water Disposal
- Hambantota Wastewater Treatment Disposal
- Sri Jayawardhanapura Waste Water Collection & Disposal
- Kattankudy Wastewater Disposal System
- Galle Wastewater Treatment & Disposal System
- The Remaining Unserved Areas in Dehiwala and Mt. Lavinia Areas
- Wastewater Disposal System for Maharagama – Boralessgamuwa Area
- Wastewater Disposal Infrastructure for Chilaw Town

New sewerage projects are generally identified and prioritized by the NWSDB taking into account the request of the public and public representatives. The Ministry of Water Supply and Drainage (MOWS&D) reviews, evaluates, and approves the sewerage projects identified by the NWSDB with consultation of Ministry of Local Governments and Provincial Councils and

sends the proposal to the Department of National Planning (DNP). When the DNP decides to implement the project, the Department of External Resources (ERD) identifies a donor agency in consultation with all relevant authorities and sends the details of the loan to the Department of Budget to be included in the annual budget. The Department of Budget makes provisions in the annual budget giving due respect to the limits allocated to the sector.

The priority of sewerage development is determined mainly by the preparatory status and population densities of the UC/MC/PS in 2008, and NWSDB is revising the priority of local governments taking into account population density, future industrial development, risks to public health, social priority, environmental factors, consumer affordability, and potential demand for connections.

Currently, almost all investment projects of the NWSDB in the water supply and sewerage sector are donor funded and the funds from donors are provided to the NWSDB as a grant or as a loan by the Central Government. The donor usually does not cover the entire project cost and, therefore, the Central Government adds its own funds to cover the balance of the cost. The proportion of loan and grant to be provided for each investment project by the Central Government follows the formula shown in **Table S.6**.

Table S.6 Proportion of the Central Government's Funding

Type of the Project	Grant	On-lending
Urban Drinking Water Supply Project	50%	50%
Rural Drinking Water Supply Project	85%	15%
Sewerage Project	100%	-

Source; NWSDB Corporate Plan2012-2016, page 9

As far as this formula in practice is applied for sewerage investment, NWSDB is not required to pay back the loans to the Central Government. NWSDB, however, needs to finance the operation and maintenance cost of the sewerage facilities by its sewerage tariff revenue or its own fund.

According to NWSDB, Treasury is seeking for the opportunity to apply the formula same as that for Rural Drinking Water Supply Project (Grant 85% On-lending 15%) for Sewerage Project in future.

The financial arrangement for the Kandy City Wastewater Management Project (KCWMP) at the construction stage is the same as those of other NWSDB sewerage projects. All required funds for the construction of the sewerage system, including the proceeds of JICA loan, will be provided by the Central Government to NWSDB as a grant.

The difference is in the operation and maintenance stage. According to the 'Memorandum of Understanding between NWSDB & Kandy Municipal Council (KMC), Kandy City Wastewater

Management Project, May 2010', the NWSDB will be the owner of all the facilities constructed under the project. The operation and maintenance of the sewer system of KCWMP, including billing and collection of sewerage tariff, will be conducted by KMC.

Financial arrangement for the sewerage system in the CMC area of the Greater Colombo sewerage system is completely different. While 82.5% of the total project cost of the Greater Colombo Wastewater Management Project Phase I will be provided by the GOSL to the CMC as a grant, the remaining 17.5% will be provided as on-lending. Currently, the CMC is recovering the operation and maintenance cost of the existing sewerage system by including this cost in the municipality rates.

4.2 On-site Treatment Facilities

Installation of septic tanks is the responsibility of individuals and the collection and disposal is the responsibility of local governments who are conducting this as a day to day business in Sri Lanka. The Urban Development Authority Law, No. 41 of 1978 and The Urban Development Authority Planning and Building Regulations, 1986 relate amongst other things, to the approval of building plans and establish the necessary standards and criteria for such approval. The said regulations make it clear that the primary means of sewerage and wastewater disposal is by connection to an existing public sewerage system. Where such public sewerage system does not exist or where the outlet cannot be connected to the public system, sewage is to be disposed through a septic tank and wastewater through a soakage pit. Every building is also to be provided with adequate drainage facilities to drain off and convey the rain water from the roof to a street drain or other approved outlet. The said law also refers to the submission of Building Plans and issuing of Certificates of Conformity.

Local governments are running de-sludge service for the residents without any subsidies. The running costs are covered by service charge and a part of property tax.

4.3 Present Condition of Institutional Arrangement

The central government (MOWSD and the Ministry of Urban Development and Sacred Areas) is responsible for policy making, regulation and development of the sewerage sector, while provincial councils and local governments are responsible for ensuring equitable resource allocation, quality, and standards of service under the National Policy on Rural Water Supply and Sanitation Sector.

Private sector participation in the water and sanitation sector is limited and is mostly in the form of (i) small-scale providers supplying drinking water to households, and (ii) civil work providers where selected functions have been outsourced.

The capital cost for installation of on-site facilities is generally borne by the developer or owner of the property. There are several programs for providing financial support to the poor to install the facilities. Every facility has to be approved by the local government prior to installation.

The operational function of on-site facilities is de-sludging and disposal of the sludge (septage) upon request of the owners of the facilities. The local governments generally provide de-sludge and disposal services, with private sector providing the services in some locations, such as CMC and the Kalmunai MC.

The Urban Development Authority (UDA) is responsible for regulation and guidelines for on-site sanitation.

5 Present Status of Sewerage Sector in 14 Cities

5.1 Present Status of Water and Environment Sectors

Population and population density, water supply, solid waste management, on-site treatment, sewerage facilities, treatment system for hospitals, treatment plants of industrial complex were investigated in the survey.

All of the cities except CMC where solid waste service is provided by private firms on contract basis provide the service by themselves. All cities surveyed suffer from shortage of dumping site, complaints from inhabitants and shortage of collection vehicles.

All cities surveyed provide de-sludge service by own staff except Kalmunai MC where private companies implement de-sludge from septic tanks. The cities send gully sucker to the septic tanks on request of residents and dump the collected sludge to septage (septic tank sludge) treatment plant, garbage dump site, disposal pit or Colombo sewerage system.

There is no sewerage facility in the cities surveyed besides Greater Colombo area covering CMC and a part of Dehiwara/Mt. Lavinia MC and Kolonnawa UC. However, only 1,650 premises out of 5,000 connect to the sewer system in Dehiwara/Mt. Lavinia MC.

General Hospitals in the 6 cities surveyed in southern and eastern coastal and central areas, i.e. Matara MC, Matale MC, Nuwara Eliya MC, Badulla MC, Batticaloa MC and Trincomalee UC have sewage treatment facility most of which employs conventional biological processes like activated sludge, oxidation ditch and trickling filter. Some of them are operated and maintained well and others are not due to inappropriate treatment process, treatment capacity and lack of knowledge. General Hospitals in CMC and Greater Colombo area have no treatment facility and sewage is discharged to sewer pipes without treatment.

Two industrial complexes, i.e. Biyagama and Seethawakapula in Greater Colombo area along the Kelani River which is one of water resources for Colombo City were investigated in the survey. In order to conserve the water quality of the river, each complex has individual wastewater treatment facility which is being managed by NWSDB. Because both complexes accept wastewater from dyeing, tanning and chemical factories, influent into the facility contains hard-biodegradable and color substances, and the effluent of the facilities also is colored.

5.2 Present Status of Sewerage Development

Two (2) sewerage projects and a house connection program are now on-going in Greater Colombo area as shown below.

- Greater Colombo Wastewater Management Project funded by ADB
- Wastewater Disposal Systems for Ratmalana /Moratuwa & Ja- Ela /Ekala Areas funded by SIDA
- GPOBA Project (Global Partnership for Output Based Aid)

The GPOBA project focuses on two major outputs, one is the new sewer connections and the other is the improvement of on-site sanitation services.

There are 4 sewerage development frameworks and plans available for the objective fourteen (14) cities.

- Greater Colombo wastewater and Sanitation Master Plan, 1993 (World Bank)
- Pre-Feasibility Report for providing wastewater disposal systems to Batticaloa Municipality and Kattankudy DS Division, 2008 (NWSDB)
- Project proposal for extension of piped sewer coverage for Dehiwala-Mt. Lavinia municipal council Area, 2010 (NWSDB)
- The Study on Greater Kandy and Nuwara Eliya Water Supply and Environmental Improvement Plan in the Democratic Socialist Republic of Srilanka, February 1999 (JICA)

6 Financial Status of Sewerage Sector

6.1 Required Financial Resources to Achieve the Sewerage Coverage Target

To increase the current coverage of sewerage, i.e.2.5% to 7% in 8 years (2012-2020), about 100,000 populations need to be newly connected to the sewerage system annually, which corresponds to 0.5% of total population. The required investment amount to connect annually 100,000 populations to sewerage system is calculated as 22.5 billion LKR. per annum, whereas the current capital expenditure budget allocation for NWSDB's sewerage scheme in 2012 is 4.65 billion LKR.

6.2 Central Government's Financial Condition

NWSDB's annual capital expenditure budget in 2012 is 32 billion LKR. Following the National Policy, NWSDB is prioritizing the piped drinking water supply and 85% of its capital expenditure is allocated to the piped drinking water supply. Only 15% is allocated to sewerage investment.

Under the current financial arrangement for sewerage projects in Sri Lanka, all the sewerage investment will be funded by the Central Government's capital expenditure budget. Therefore, the size of the capital budget of GOSL and its sectarian allocation determines the size of the possible investment for sewerage.

Due to the budget deficit and the heavy public debt burden of GOSL, the size limit of GOSL's annual capital expenditure budget is considered to be about 500 billion LKR. Whether the budget allocation to sewerage sector can be increased or not within this budget limit depends on the competition with other large users of the GOSL capital expenditure budget such as Road Authority, Port Authority and CEB.

6.3 NWSDB's Financial Condition

Since the major portion of NWSDB revenue comes from water supply operation, the key performance indicators of NWSDB's water supply operations are reviewed. The increase of connection and the reduction of NRW contributed to the increase of the water sales volume as well as the sales revenue of water in 2011. On the other hand, the decrease of staff/1,000 connection contributed to the containment of the direct operating expenses and overhead cost.

The financial performance of NWSDB was improved in 2011. Since the water tariff has not been raised since March 2009, this improvement was achieved by the increase of water sales and the stringent control of costs.

In comparison to the best performing water utilities in Asia such as Pnom Phen Water and Sewerage Authority (PPWSA) in Cambodia and Manila Water Company in the Philippines, NWSDB's performance as a water utility, especially the NRW reduction, should be described 'mediocre' at best. To be the best performer, the managerial independence from the government, the decentralization of decision making to the field office and the introduction of the incentive and penalty system would be a 'must'.

In recent years, NWSDB failed to repay the large part of its loan repayment obligation (about LKR. 2,500 million per year) to GOSL.

The cash flow also reveals that almost all capital investment is financed by either the grant or the loan from GOSL and NWSDB hardly manage to cover a part of the investment by its own cash generation.

Although NWSDB recorded profit in 2011, NWSDB's financial condition in the past years has not allowed NWSDB to fulfill its debt service (interest + principal) obligation to GOSL. The tariff revisions of both water tariff and sewerage tariff are imminent.

The sewerage tariff of NWSDB was introduced in March 2008 and revised in December 2011, which has become effective on January 2012. It is applied for the all NWSDB operated sewerage systems. By the revision, the bill value of the average users is expected to increase by 10 times for domestic users, 3.3 times for commercial users and 5.1 times for industrial users.

The capital expenditure of all the sewerage project of NWSDB is financed by the grant from the Central Government and NWSDB does not need to pay the financial cost (amortization and interest payment). Therefore, if the tariff is at the level enough to cover the direct O&M cost of NWSDB, the cost recovery would be achieved, although, ideally, the depreciation cost had better also been recovered in order to secure the fund for the future replacement cost. Ministry of Finance, however, intends to make proportion of capital investment as 85% of grant and 15 % of on-lending for sewerage project. If such occurs, NWSDB needs to recover not only the O&M cost but also 15% of capital cost by its tariff revenue.

6.4 Local Government's Financial Condition

Only 15.4% of the total of national tax revenue and the local tax revenue was usable for the local governments in 2011. Therefore, the available financial resource for the local governments in Sri Lanka is very limited. Under such condition, it is apparent that the local governments can not conduct any enterprise as water works (drinking water supply and sewerage) which require large financial resources.

Annual total amount of income of cities surveyed were not enough to cover its total expenditure in the year 2006 to 2011, and the Central Government reimburses 70~90 % of their salary expense as a grant.

Funding arrangement from the outside is needed for any capital nature improvement proposal in all cities. The decision to take such funding arrangement for capital improvement as well as the amount involved will be dependent whether the council can bear the O &M cost and the financial cost.

6.5 Financing of the House Connection Cost

House connection cost for sewerage is more expensive than the house connection cost for water supply. In Sri Lanka, it costs US\$300-500/connection. It is sometimes beyond the affordable limit of households, especially for poor households. So, the issue of high house connection cost would be the most important issues to be tackled in order to achieve the sewerage coverage target in Mahinda Chintana.

7 Findings and Recommendation for Sanitation Sector

7.1 Central Government Issues

Three aspects are pointed out as issues in policy, law and standard.

- Although National Environmental (Protection and Quality) Regulations, No. 1 (2008, CEA) prescribes tolerant wastewater discharge quality for various factories, hospital and WWTP into surface water and into sewer system. However there is no penal clause in it.
- The Sewerage Act is not yet established in Sri Lanka. Establishment of Sewerage Law is inevitable to regulate sewerage works in national levels in the future, and preparation of standard ordinance for the sewerage works is at least required to democratic promotion of the sewerage development at the moment.
- Technical Guidelines on Solid Waste Management (Pollution Control Division CEA) does not contain sludge generated from WWTP. Whether sludge generated in WWTP can be legally dumped or disposed in solid waste dumping site or not is still pending matter.

Three aspects are pointed out as issues in financial arrangement.

- Budget allocation of sewerage investment is only 0.7% of the total capital investment of GOSL in 2011. In order to increase the share of sewerage investment in the national budget, the comprehensive review of the GOSL's public investment program providing strong priority to sewerage investment or new budget source has to be created, for instance introduction of environmental tax as earmarked budget for sewerage development, which requires the nation-wide debate on the necessity of protecting water quality of public water bodies which is vital for the future economic and social development of Sri Lanka.
- The attempt to separate sewerage account from water supply in NWSDB has been arranged and it is reported that independent account of sewerage activities is started from this year, 2012. It is recommended to strengthen further independency by separating sewerage administration from water supply works in central government level so that sewerage budget would be discussed apart from water supply budget.
- Under the current practice, the capital expenditure of all sewerage projects of NWSDB is financed by the grant from the Central Government irrespective of sources of fund, and NWSDB does not need to pay the financial cost (amortization and interest

payment). Therefore, NWSDB is trying to recover direct operation and maintenance (O&M) costs of sewerage system by collection sewerage users charge. As a movement of the Central Government, it is informed that Ministry of Finance intends to make proportion of capital investment as 85% of grant and 15 % of on-lending for sewerage project. If it occurs, NWSDB is required to recover not only O&M cost but also 15% of capital cost by its sewerage service charge revenue. The NWSDB's current sewerage service charge, effective on January 2012, is close to the direct cost recovery level in the area where the proportion of commercial/industrial connections is 20% or higher. Further increase of the sewerage service charge would be required if on-lending is introduced and/or NWSDB's sewerage service is to be expanded to the area with the less proportion of industrial/commercial connections.

Two aspects are pointed out in institutional arrangement of central government.

The public should understand necessity, benefits of sewerage project and the extent of their responsibility for proper solution of their wastewater issues for preservation of sustainable environment. The public involvement with proper knowledge and sense of responsibility are the essential factors for financial improvement of sewerage development, and thus public awareness campaign is also inevitable for successful promotion in sewerage and sanitary sector. From financial and technical points of view, there is no alternative of executive agency for sewerage works other than national level such as NWSDB at the moment though it should be local government according to the policy of the country. Possible strategy for decentralization will be the NWSDB to implement sufficient number of projects to have good connection number to run the section autonomously. Once it is established, the NWSDB can train and provide assistance for gradual taking over of schemes to local governments and NWSDB would be play an important role as technical and training center for sewerage works, as a central government entity should involve the field of high specialty nature like sewerage works.

7.2 Technical Issues

Three aspects are pointed out in the technical issues.

- The water quality of the majority of rivers, lakes and sea are out of the monitoring sites of CEA and no data is accumulated. When a sewerage works project is planned, environmental water quality is crucial background data to select treatment process and discharging point of treated effluent etc. Therefore, the monitoring has to be carried out at least main rivers, lakes and sea.
- Ocean outfall with preliminary treatment is one of the disposal ways for collected wastewater. However, the cost may almost equivalent to the construction cost of secondary treatment plant. Moreover, secondary treatment plant may have to be constructed in the future.
- The fourteen (14) local governments can be categorized into 4 types as shown **Table**

S.7 in respect of wastewater treatment options by natural and physical characteristics.

Table S.7 Categorization and Wastewater Treatment Option

Area	City	Solutions
Greater Colombo Sewerage Master Plan area	CMC, Dehiwara/Mt. Lavinia MC, Kaduwela MC, Kolonnawa UC, Kelaniya PS, Peliyagoda UC	Wastewater collection system and disposal way will be identified by reviewing the existing M/P in 1993.
Central high land area located upstream of rivers	Matale MC, Nuwara Eliya MC, Badulla MC	Minimization of adverse effects to the downstream intakes of water supply has to be considered. Advanced OD process will be a possible selection, when nitrogen removal is needed.
Thunami affected coastal area	Batticaloa MC	The most practical and economical process will be the natural pond system. Septic tank sludge (septage) can be accommodated in it.
Other coastal area	Kalutara UC, Matara MC, Kalmunai MC, Trincomalee UC	The natural pond system and ocean outfall are also alternative solutions.

7.3 Issues in Sewerage Implementation Sites

Four aspects are pointed out for the issues in sewerage implementation sites.

- Even in sewer covered area, individual connection to sewerage system is low due mainly to high connection cost. Use of small PVC sewer pit can be one of the technical solutions. Not only GPOBA project for poor households but also introduction of revolving fund project for house connection is one of the financial solutions.
- Although Greater Colombo Wastewater and Sanitation Master Plan (World Bank) was prepared in 1993 and the contents are already outdated, framework of some current sewerage projects is based on it. The update of the master plan is desirable to facilitate sewerage development for the remaining areas of Greater Colombo in effective and efficient manner.
- Many damages occurred to the properties along the roads, where deep sewers were installed by digging trench in narrow space. Public complains also concentrated to the road closing for sewer construction trench works. Technical solution will be provided by employing Jacking and tunneling method for which various technologies are developed for every soil conditions and every diameter of sewer in Japan.
- Two (2) of the industrial parks and almost all large scale public hospitals surveyed install individual WWTP based on National Environmental (protection and quality) Regulation (EPL). Most of them are operated and maintained poorly due to inappropriate treatment process, treatment capacity, and lack of knowledge of staff in the facilities, while a few of them are managed well. Effluent of both industrial parks is discharged upper stream of the intake of the Ambathale water purification plant facing to the Kelani River, therefore effluent quality has to be controlled carefully.

Two aspects are pointed out for the issues in community and local government

- All the cities surveyed have ordered to use septic tank system for night soil treatment and a large portion of houses adopt it. However, when the ground water level rises in rainy season treated night soil hardly soaks into the ground. On the contrary the ground water soaks into the soakage tank and septic tank overflows. All the cities surveyed suffered from such situation.
- Many surveyed cities insist shortage and deteriorated or aged conditions of gully sucker for de-sludging from septic tank and lorry for solid west transportation. As cities budget is generally limited, donor's supports are expected. Appropriate land for septage treatment and sanitary land fill site for solid waste is difficult to find.

8 Recommended Road Map to Promote Sewerage Development and Possible Assistance of Donors

The following three steps are proposed for the extensive undertakings of the sewerage developments.

- Step 1: Increase the sewerage coverage and prepare for broad implementation of sewerage projects as well as improvement of on-site treatment
- Step 2: Create ideal environmental model cities and further awareness raising
- Step 3: Institutional arrangement for nationwide water environmental conservation activities

The possible assistance programs shown in the following table are proposed.

Table S.8 Proposed Candidates for Donor Assisted Program

No.	Name	Purpose and Contents	Scheme
(1)	Revolving Fund Project for house connections in the existing sewer covered area	- Increase house connections in the area covered by the existing sewer system - Identify unconnected households - Design and construct rider pipe and house connection plumbing	LP or GA
(2)	Preparatory study and awareness raising program for sewerage project for creating best practice model cities	- Select cities according to categories described in Chapter 6, to be developed as model cities for best practice of sanitation; the choices may depend on complementary circumstances, such as the present conditions of sanitation and availability of required land Conduct preparatory study for sewerage project or project combining sewerage system development, on-site sanitation and solid waste disposal. - Awareness raising program is carried out in the selected cities in advance	Ps and LP
(3)	Preparatory study for the formulated sewerage project	- Accelerate the progress of the formulated project - Prepare proposal for loan project	PS
(4)	Greater Colombo Wastewater Management Master Plan Update	- Bring the Greater Colombo Wastewater Management Master plan up to date with more current information and data	TC, PS, or LP

No.	Name	Purpose and Contents	Scheme
(5)	Water Quality Monitoring Project	- Monitor water quality on an island wide basis and compile long term data on major water bodies, and drains, streams, and ponds in selected cities.	TC
(6)	Procurement of gully sucker sand solid waste lorries	- Procure gully suckers and solid waste lorries for the cities requested	GA

Note; GA: Grant Aid, TC: Technical Cooperation, PS: Preparatory Study, LP: Loan Project

9 Possible Application of Japanese Technologies

Japan made major advances in sewerage technologies when the country had to rapidly increase the sewerage service ratio in the 1980's. These technologies had been adopted in many sewer systems and wastewater treatment plants in Japan and other countries. The characteristics of Japanese sewerage technologies, i.e. saving space and energy are not only for Japan but also for the world now; therefore, those technologies are adoptable in other countries. Among them, four technologies are introduced.

- Rehabilitation technology of aged sewer pipe
- Non-digging pipe construction method
- Oxidation ditch process with advanced treatment
- Screw press sludge dewatering process

CHAPTER 1 INTRODUCTION

1.1 Background

In 2011, the rate of economic development of the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as Sri Lanka) reached 8.3%. The government of Sri Lanka (GOSL) aims to maintain this high rate of growth to achieve an average per capita income of USD 4,000 by 2016, thus joining the rank of semi-developed countries.

The government is trying to achieve sustainable development to improve the standard of living without compromising the needs of future generations by conserving the environment, including preventing water pollution. Nevertheless by 2010 the sewerage coverage ratio is still only 2.5%. The rapid rise in population and water consumption is increasing significantly the quantity of untreated wastewater being discharged into rivers and the sea. The impacts to public health and the environment present serious social and environmental repercussions.

The national development plan, Mahinda Chinta 2010, recognizes sewerage development and safe water supply as important elements of integrated social, economic and environmental objectives of society and proposes to increase the sewerage coverage ratio to 7.0% by 2020. The National Water Supply & Drainage Board (NWSDB) has invested in sewerage development in urban areas including Colombo, Dehiwala, Mt. Lavinia and Kotte, where population, social and commercial activities are on the rise, accompanied by the potential risks of public health degradation. JICA is involved with one of these projects in Kandy city.

In addition to the new projects in these cities, NWSDB is also considering expansion and rehabilitation of existing sewerage facilities. Several projects are now under investigation by different donors.

1.2 Objectives of the Survey

The survey will contribute to the goal of raising the sewerage coverage in Sri Lanka to 7% by 2020, by carrying out the following activities:

- Confirm current conditions in the sewerage sector at the national level and in 14 selected cities, identify outstanding issues, propose mitigating measures, and appropriate assistant programme of donors;
- Evaluate construction, operation and maintenance costs as well as required skills, and introduce at workshops appropriate technologies and equipment to be applied;
- Share Japanese knowledge, experiences, and technologies at a workshop to be conducted in Sri Lanka and during visits to Japanese facilities by host country officials.

1.3 Terms of Reference of the Survey

1.3.1 Survey Areas

The survey was implemented in the areas shown in **Table 1.3.1** and **Figure 1.3.1**. The target areas are divided into 3 zones, i.e. Area-1, Area-2 and Area-3 according to the scope of work of the survey team members and the topography.

Table 1.3.1 Target Cities for the Survey

Area		City
1	Colombo	1.CMC
2	Western and Southern Area	2. Dehiwala/Mt. Lavinia MC, 3. Kaduwela MC, 4. Kolonnawa UC, 5. Kelaniya PS, 6. Peliyagoda UC, 7. Kalutara UC, 8. Matara MC
3	Central and Eastern Area	9. Matale MC, 10. Nuwara Eliya MC, 11. Badulla MC, 12. Batticaloa MC, 13. Klmunai MC, 14. Trincomalee UC

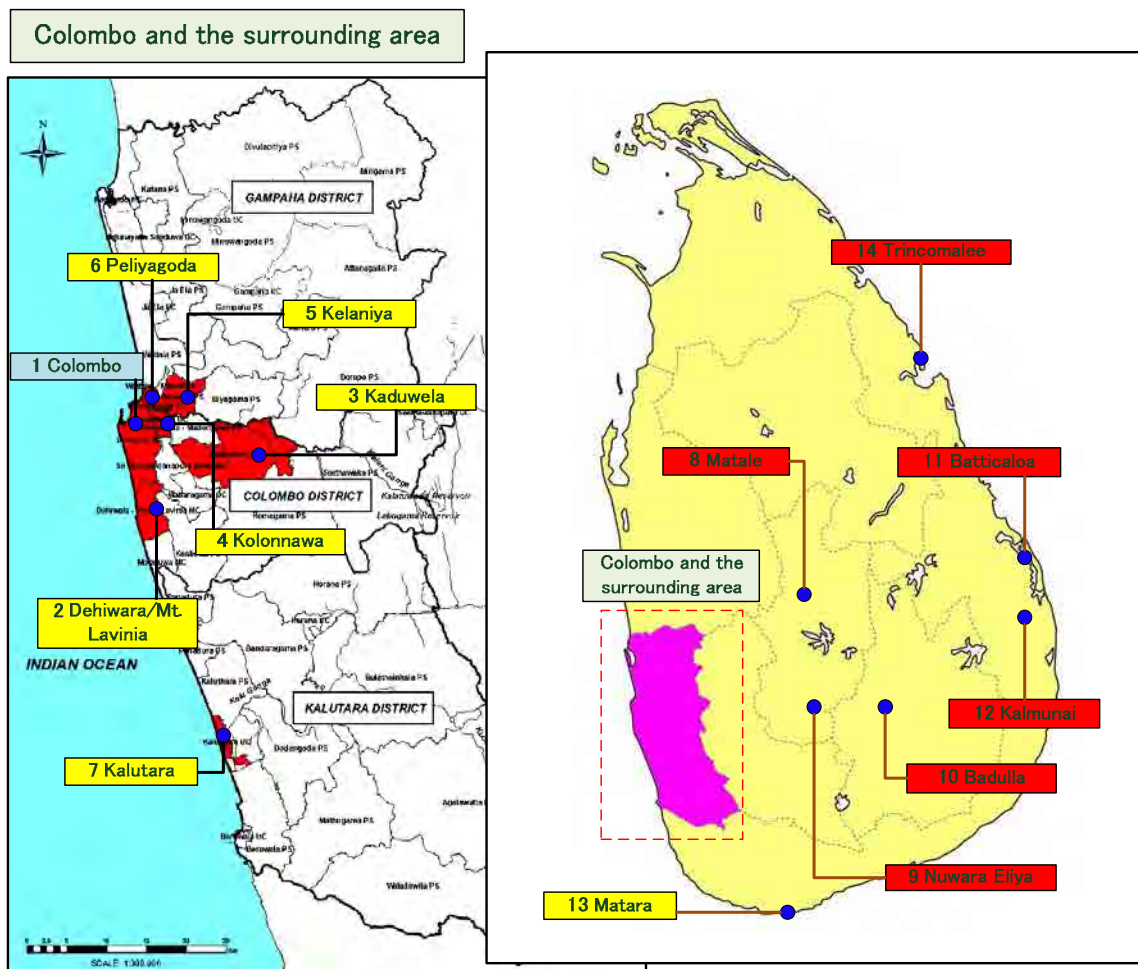


Figure 1.3.1 Location of Target Cities for the Survey

1.3.2 Terms of Reference

The survey was implemented in accordance with the Aide-Memoire on Data Collection Surveys in Sri Lanka, consented between GOSL and Japan International Cooperation Agency (JICA) on February 29th, 2012. The Terms of Reference (TOR) of the survey are as follows.

(1) Sewerage sector at the national level

- To confirm laws and regulation, standards for discharge of effluents, and subsidy policy and system
- To confirm national policy, planning and investment plan on the sewerage sector
- To confirm actual budget allocation for the sewerage sector (including subsidy budget)
- To confirm organization structures (including differentiation of roles between NWSDB and local authorities)
- To confirm existing situation of sewerage sector (present sewerage status, coverage ratio)
- To confirm detailed prioritized list of sewerage projects (Master Plan and Feasibility Study)
- To confirm donor assistance (international donors such as WB and ADB, and bilateral donors)
- To analyse outstanding issues on sewerage sector and assess needs of sewerage systems

(2) Sewerage sector in the survey areas

- General conditions of the survey areas
- Existing sanitation facilities (on-site treatment)
- Existing sewerage system
- Analysis on outstanding issues on the sewerage sector

(3) To propose measures to resolve the outstanding issues

(4) To hold a workshop in Sri Lanka to introduce Japanese experiences and technologies in sewerage construction and arrange a tour to visit sewerage facilities in Japan

1.4 Structure of the Report

The survey started in June 2012 and concluded in September of the same year, as stated in the TOR. The study team conducted the field work in Sri Lanka from June to August. The survey report covers the present status of the sewerage sector and financial arrangements at the national level, present sanitary conditions of 14 cities, and recommendation for sewerage development, and introduction of suitable Japanese technologies. The report consists of 8 Chapters and Annexes for 14 cities as follows:

- Background information including national policies related to the sewerage and sanitation sector are presented in Chapters 1 and 2.
- Chapter 3 presents the current status of the sewerage sector at the national level and Chapter 4 those in the 14 cities.
- Financial status and evaluation is presented in Chapter 5.
- Chapter 6 summarizes the findings of the present conditions of sewerage and sanitation sector and presents recommendations to promote sewerage development in the country.
- Chapter 7 proposes the appropriate direction for sewerage promotion and candidate assistance programs and schemes.
- Japanese advanced technologies suited to the local conditions are introduced in Chapter 8.
- Details of the present status in the 14 cities are contained in the Annexes.

CHAPTER 2 NATIONAL POLICY AND STANDARDS

2.1 Laws, Acts, Regulations and Standards Related to the Sewerage Sector

The principal laws related to sewerage systems, sewage treatment, and on-site treatment in Sri Lanka are as follows:

- Municipal Councils and Urban Councils Act, No. 42 of 1942,
- Municipal Councils Ordinance No 29 of 1947

The provision of Section 272 of Part XIII of the Municipal Councils Ordinance as amended from the Municipal Councils and Urban Councils Act, No. 42 of 1942, Municipal council can decide their by-laws on 32 aspects. The following matters related to Water and Sanitation are listed below for reference

Article - 3.0 Drainage

Article - 4.0 Waterworks

Article - 5.0 Sanitation

Article - 9.0 Slaughter Houses

Article - 21.0 Laundries & washing

Article - 28.0 The establishment, maintenance, working and supply and the recovery charges in connection there with public services, such as water supply, public baths, bathing places, laundries and places for washing animals.

- National Water Supply and Drainage Board Law, No. 02 of 1974 as amended by the National Water Supply and Drainage Board (Amendment) Act, No. 13 of 1992. (NWSDB Law) established the NWSDB as a public authority.
- The National Environmental Act, No: 47 of 1980 as amended by Act No: 56 of 1988 and the National Environmental (Protection & Quality) Regulations, No. 1 of 1990, established discharge standards and made it an offence to discharge, deposit or emit waste into the environment which will cause pollution, except a) under the authority of a license; and b) subject to such standards and criteria prescribed.
- The Urban Development Authority Law, No. 41 of 1978 and The Urban Development Authority Planning and Building Regulations, 1986 related amongst other things, to the approval of building plans, establishes the necessary standards and criteria for such approval.
- Town and Country Planning (Amendment) Act., No. 49 of 2000,
The National Physical Planning Policy and Key projects, prepared under the section of 5 (a) and (b) of the Town and Country Planning (Amendment) Act, No. 49 of 2000, and approved by the National Physical Planning Council as per Section 4B of the Act are to be published.
- National Environmental Act No 47 of 1980

- Coast Conservation Act No 57 of 1981
- Water Resources Act 1994
- Fisheries and Aquatic Resource Act 1996
- Archaeological Impact Assessment Act 2000
- Marine Pollution Prevention Act No 35 of 2008
- SLS 745 Part 2: 2009 – Code of Practice for Design and Construction of Septic Tanks and Associated Effluent Disposal Systems

In addition to the above, there are Regulations and Ordinances relating to the construction of, and connection to, sewers as well as their maintenance.

In order to implement sewerage and on-site sanitation operations, it is necessary to comply with various laws, acts, regulations and standards for mandatory house connection, tariff, solid waste, noise and air pollution and water quality such as acceptable wastewater quality and effluent quality from wastewater treatment plant (WWTP).

(1) Acts and regulations

1) Sewerage Act

The Sewerage Act is not yet established in Sri Lanka. The “National Water Supply & Drainage Board (Amendment) Act, No. 13 of 1992” is the prevailing legal framework for water related operations, including sewerage works. The “National Policy in Sanitation (Ministry of Water Supply and Drainage: MOWSD 2011)” approved by the Minister on 16th February 2012 prescribes connection to the sewerage system and payment of service charges which are commonly described in the sewerage law in other countries. However, connection and payment is not obligatory and no penal clause is prescribed.

2) Registration of WWTP

According to the list of “The prescribed activities for which a license is required” (National Environmental Act No. 47, 1980 Section 23A amended by Act No. 1533/16 2008, CEA), WWTPs as well as hospitals and factories using hazardous substances as listed under part-A activities are required to register on an annual basis.

3) Water quality

National Environmental (protection and quality) Regulation (EPL) -1990. Gazette Notification Number 595/16 dated 8th January 1990 and its amendment of Gazette Notification Number 1534/18 dated 01-02-2008 provide the “General Standards for discharge effluents into inland surface waters”.

National Environmental (Protection and Quality) Regulations, No.1 (2008, CEA) prescribe

acceptable wastewater discharge quality for:

- (i) Effluents discharged into inland surface waters (1990)
- (ii) Industrial waste discharged into inland surface waters (2008)
- (iii) Industrial waste discharged on land for irrigation purposes (2008)
- (iv) Industrial and domestic waste discharged into marine coastal areas (2008)
- (v) Waste from rubber factories discharged into inland surface waters (2008)
- (vi) Waste from textile industry discharged into inland surface waters (2008)
- (vii) Waste from tanning industries (2008)
- (viii) Effluent discharged into public sewers with central treatment plants (2008)

Among them, (i) is relevant to the discharge of WWTP effluent into inland waters, and (iv) to discharge into marine coastal areas, while quality of influent into WWTP is regulated by (vii). Although the acceptable wastewater qualities are set, there is no penal clause for non-compliance and legal action is always necessary against the violation of the regulations.

4) Solid waste

Sludge is generated in the wastewater treatment process and its disposal is somewhat onerous in sewerage operations. Although the “Technical Guidelines on Solid Waste Management in Sri Lanka (Pollution Control Division CEA)” regulates the management of various solid wastes, sewage and hazardous wastes are not included in the targets. The CEA “Guidelines for the Implementation of Hazardous Waste Management Regulations” has not been issued due to the lack of treatment and disposal facilities. Hence, disposal of sludge generated in WWTP is still a pending matter.

5) Noise

Noise generated in WWTPs and pumping stations is regulated by the “National Environmental (Noise Control) Regulation No.1 1996 (CEA)”. Acceptable noise levels for day and night times are provided.

6) Air pollution

Concentration of particle matter, NO₃, SO₃, O₃ and CO in the air is regulated under the “National Environmental (Ambient Air Quality) Regulation 2008 (CEA)”. No substance causing bad odor may be generated in WWTPs and pumping stations.

(2) Standards

1) Effluent standards

As described in section (1) 3), standards for effluents from WWTPs into inland water and marine coastal areas, and into public sewers with central treatment plants, are stated in the

National Environmental (Protection and Quality) Regulations.

2) Design standard for sewerage facilities

“Design Manual D7, Wastewater Treatment, March 1989, NWSDB” prepared by USAID Sri Lanka Project, 383-0088 was updated in February 2012, providing the following guidelines for planning and design.

- Wastewater discharge control requirements
- Wastewater characteristics and type of wastewater systems
- Wastewater flow estimation and flow variation for design
- Collection network design and design criteria for pumping stations
- Wastewater treatment systems including tertiary treatment processes
- Sludge treatment
- Wastewater disposal and reuse including ocean outfall

3) On-site sanitation facilities

The Sri Lanka Standard (SLS) 745 PART 1 2004 on septic tank design incorporates an anaerobic process which includes solid separation, reduction of solids volume and BOD through anaerobic reaction, and ground soakage of relatively solid free effluent.

The code limits the maximum waste water discharges of septic tank to 5 m³/day. Treated water is discharged to the soakage pits, seepage trenches and/or seepage beds. These require low ground water table, which is at least 1.5 meters deep and a properly functioning ground percolation rate of between 25 mm/hr to 250 mm/hr.

2.2 Organizations Relevant to the Sewerage Sector

National government ministries and regulators relevant to the sanitation sector, are listed with their departments and key responsibilities in **Table 2.2.1** and **Table 2.2.2**

Table 2.2.1 National Government Ministries

Ministry	Department and Statutory Organizations (relevant to sanitation sector)	Key Responsibilities (relevant to sanitation sector)
Ministry of Urban Development & Sacred Area Development	(i) Urban Development Authority (UDA) (ii) Urban Development and Low Income Housing Project (iii) Colombo Environment Improvement Project (CEIP) (iv) Sustainable Cities and Township Development Project (v) Community Water Supply and Sanitation Project (CWSSP)	(i) Formulation of policies, programs and projects with respect to Physical Planning and Urban Development and assistance in implementation of such programs and projects; (ii) Urban Planning and Development; (iii) Assistance to Urban Local Authorities to improve urban Infrastructure facilities and housing; (iv) Provision of public utility services to under served settlements; (v) Environmental Improvement in the Colombo Metropolitan Area; (vi) Provision of water supply and hygiene education services in rural areas;

Ministry	Department and Statutory Organizations (relevant to sanitation sector)	Key Responsibilities (relevant to sanitation sector)
Ministry of Water Supply and Drainage	NWSDB	(i) Formulation of policies, programs, projects based on National Policy with respect to water supply & public utility services and assistance in implementation of such programs and projects; (ii) Investigation, planning, design, construction, operation and maintenance of water supply services
Ministry of Local Government and Provincial Councils		(i) Implementation of policies, plans and programs with respect to provincial council and Local Government jurisdictions; (ii) All matters relating to provincial councils; (iii) Government functions relating to local authorities; (iv) Granting of loans to local authorities for public utility projects.
Ministry of Environment and Natural Resources	(i) Central Environmental Authority (ii) Marine Pollution Prevention Authority	(i) Implementation of policies, plans and programs pertaining to the environment and natural resources; (ii) Prevention of marine pollution; (iii) Environmental protection and management; (iv) Conservation of river catchments and major reservoirs; (v) Conservation and sustainable development of natural resources;

Source: GOSL

Table 2.2.2 Regulators

Regulator	Roles and Responsibilities
Central Environmental Authority	(i) The Central Environmental Authority (CEA) was established in August 1981 under the provision of the National Environmental Act No: 47 of 1980. The CEA was given wider regulatory powers under the National Environment (Amendment) Acts No: 56 of 1988 and No: 53 of 2000. Its objectives are: a) Protection, management and enhancement of the environment; b) Regulation, maintenance and control of the quality of the environment; c) Prevention, abatement and control of pollution. (ii) The CEA is the key agency with powers to enact regulations for wastewater pollution control. (iii) For all BOI registered industries, the CEA has delegated its powers to enforce the regulations to the BOI. The pre-treatment standards currently applied to the industries within the BOI owned processing zones are not national standards but BOI's own requirements. (iv) The implementation of the CEA regulations for certain industrial sectors can be delegated to the Local Authorities. However, due to the lack of institutional capacity this function has not been effectively transferred to the LAs at present. Hence, the CEA continues to fully monitor the implementation of the regulations.
Coast Conservation Dept. (CCD) for the Coastal Zone	The mandate of the CCD is for conservation and management of the coastal environment in areas within the Coastal Zone, defined in the CCA of 1981 as the area lying within a limit of 300 m landward of the Mean High Water Line (MHWL) and a limit of 2 km seaward of the Mean Low Water Line (MLWL); in the case of rivers, streams, lagoons, or any other bodies of water connected to the sea either permanently or periodically, the landward boundary extends to a limit of 2 km measured perpendicular to the straight base line drawn between the natural entrance points thereof and includes the waters of such rivers, streams and lagoons or any other bodies of water so connected to the sea. All beaches in Sri Lanka are public property in accordance with the Coast Conservation Act.

Source: GOSL

(1) **NWSDB**

NWSDB which operates under the Ministry of Water Supply and Drainage (MOWSD) is the most important organization providing drinking water and facilitating the provision of sanitation in Sri Lanka.

1) History

The organization had its beginning as a sub department under the public works department, for water supply and drainage. In 1965, it became a division under the Ministry of Local Governments. Since 1970, this division functioned as a separate department under the Ministry of Irrigation, Power and Highways and remained so until the present board was established in January 1975 by an act of Parliament.

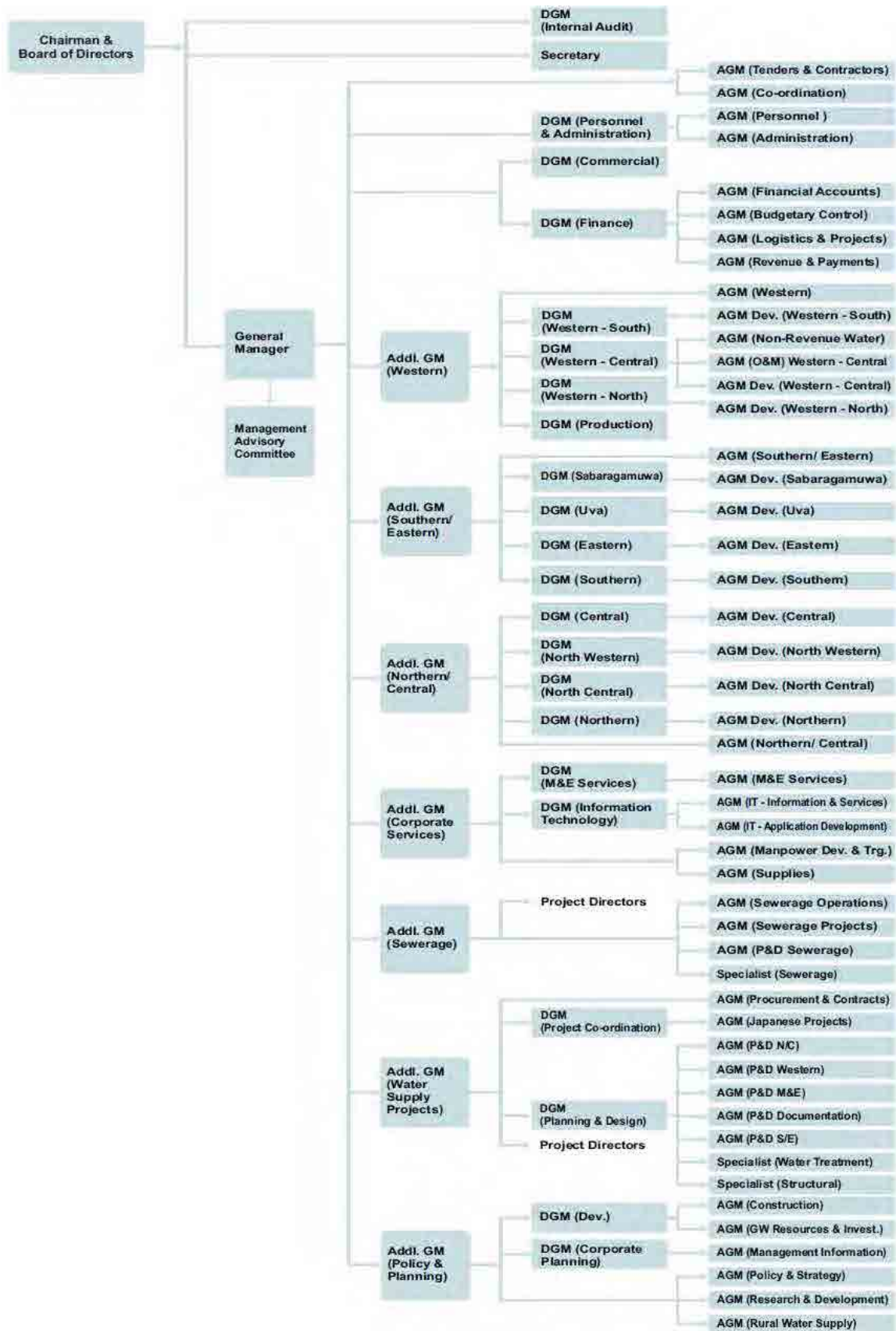
2) Functions

The functions of the NWSDB are:

- Investigation, planning, design and construction supervision of water supply and sewerage projects using local funds and donor assistance. Carrying out feasibility studies, cost estimation & Environmental Impact Assessments for such projects;
- Operation and maintenance of water supply and sewerage schemes to provide satisfactory service to customers;
- Billing and collection through setting affordable tariffs.

3) Organization

Seven (7) Additional General Managers are assigned under the Chairman Board of Directors and the General Manager and one of them is the Additional General Manager (sewerage) who heads up the sewerage section as shown in **Fig.2.2.1**. Three Assistant General Managers are assigned under the Additional General Manager (sewerage). The total regular staff in the sewerage section is 255, as shown in **Figure 2.2.2**. Among the regular staff, 212 deal with administration and O&M of the existing sewerage systems. Other than the regular staff, there are three (3) Project Directors and their staffs presently assigned to the Greater Colombo Wastewater Management Project, Ratmala/Moratuwa & Ja-Ela / Ekala Areas Wastewater Disposal System Project, and Kandy City Wastewater Management Project.



Source: NWSDB

Figure 2.2.1 Organization Chart of NWSDB

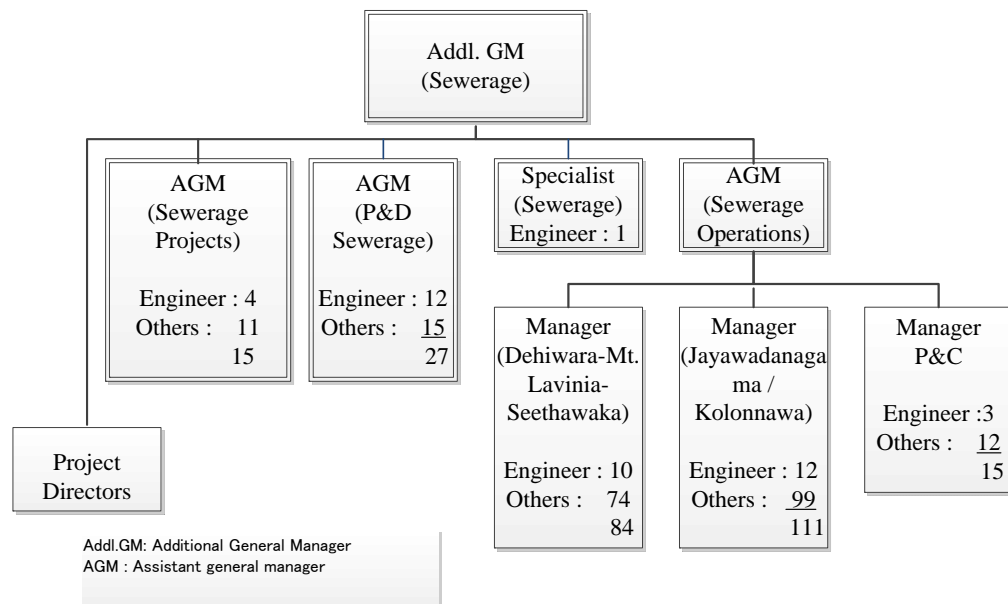


Figure 2.2.2 Organization Chart of the Sewerage Section in NWSDB

(2) Provincial Councils

The thirteenth amendment to the Constitution came into effect in November 1987 along with the Provincial Councils Act No. 42 of 1987. Thus nine Provincial Councils were established in Sri Lanka, devolving the power from the central government to the provinces.

The Provincial Councils are provided with various financial grants to facilitate achieving the objectives of the devolution of power and decentralization of administration in an efficient and effective manner. Block grants are provided for regular on-going expenditures while criteria based grants, matching grants, provincial specific development grants and development assistance through donor funded projects, are provided for capital expenditures and investment support. The Ministry of Local Governments and Provincial Councils (MOLG) has given priority to ensuring that the Provincial Councils have sufficient funding to operate financially.

(3) Local Governments

The local government institutions are responsible for providing services which the law specifically allows them to do. They are required to provide services for the comfort, convenience and well-being of the community in their respective areas. The local governments have the following functions:

- Regulatory and administrative
- Promote public health and sanitation (mainly means management of solid waste and sludge from septic tanks)
- Environmental sanitation
- Public thoroughfares and public utility services

2.3 National Policy, Sector Program, and Financial Arrangement

2.3.1 National Policy

The Mahinda Chinthana Vision for the Future 2010 clearly specifies the province wide development targets with respect to safe water supply and sewerage. The overall target is 44% piped water coverage by 2015 and 60% by 2020. The safe water supply coverage target specified therein is 94% by 2015 and 100% by 2020. The targets specified for piped sewerage coverage are 3% by 2015 and 7% by 2020.

According to the Millennium Development Goals, 85% safe water supply coverage is to be achieved by 2015 and 100% by 2025. With respect to adequate sanitation, the Millennium Development Goal specifies 87% by 2015 and 100% by 2025.

It is noted that the NWSDB does not cover the entire drinking water sector in the country. Local governments and other organisations share some of the responsibilities.

2.3.2 NWSDB's Program

The Mahinda Chinthana Vision for the Future 2010 clearly specifies the targets for piped sewerage coverage of 3% by 2015 and 7% by 2020. The NWSDB targets sewerage coverage of 2.8% by 2016 as stated in the Draft Corporate Plan 2012-2016 and shown in **Table 2.3.1**.

Table 2.3.1 Target of Sewerage Coverage in Draft Corporate Plan 2012-2016

Year	2011	2012	2013	2014	2015	2016
Pipe Borne Sewerage Coverage	479,804	505,672	532,009	558,822	586,118	613,905
Pipe Borne Sewerage Coverage (%)	2.3%	2.4%	2.5%	2.6%	2.7%	2.8%

Source: Draft Corporate Plan 2012-2016

To achieve the targets of sewerage coverage, the NWSDB sets out to accomplish the following:

- Implement identified priority water supply & sewerage projects
- Continue to identify new growth centres
- Ensure additional coverage during rehabilitation & expansion schemes
- Carry out campaigns to provide connections to completed water supply and sewerage projects
- Identify and implement rain water harvesting and ground recharge programmes
- Adopt a mechanism to get public commitment and buy in prior to providing water supply and sewerage facilities
- Introduce household purification

2.3.3 Financial Arrangement

Although there is no written rule, financing for the offsite sanitation (sewerage) schemes are currently provided by the central government through the NWSDB (except Colombo Municipality Council (CMC)) or through the MOLG (in case of CMC). Most of the financing for sewerage schemes is in the form of grants. The GOSL takes out loans from foreign financial institutions such as JICA, and provide grants to the NWSDB or CMC. In the case of the Greater Colombo Wastewater Management Project financed by ADB, 82.5% of the loan amount was granted to CMC but 17.5% was loaned to CMC. The Treasury appears to have the intention to increase the on-lending portion from 0% to 15% for the sewerage schemes similar to the current practice for the rural drinking water supply schemes.

CHAPTER 3 PRESENT STATUS OF SEWERAGE SECTOR

3.1 Sewerage Development

3.1.1 Existing Sewerage Systems

There are 3 municipal and 10 housing scheme sewerage systems in Sri Lanka as shown in Table 3.1.1 and Table 3.1.2.

Table 3.1.1 Population Coverage by Pipe Borne Sewerage in 2008 (Five Major Cities)

Sewerage System	City	Total Population	Estimated Covered Population	Population Coverage Ratio	WWTP Process
Greater Colombo Sewerage System	Colombo	700,000	430,500	61.5%	2 Ocean Outfalls
	Dehiwala/Mt. Lavinia	223,000	10,160	4.6%	
	Kolonnawa	60,000	5,045	8.4%	
Katragama	Katragama	20,000	4,500	22.5%	Natural Ponds
Hikkaduwa	Hikkaduwa	30,000	3,000	10.0%	Natural Ponds
Total		1,033,000	453,205	43.9%	

Source: NWSDB

Table 3.1.2 Population Coverage by Pipe Borne Sewerage in 2008 (Housing Schemes)

Housing Scheme	No. of Connections	Covered Population
Soysapura	2,368	11,840
Matthegoda	1,240	6,200
Jayawadanagama	850	4,250
Maddumagewatta	192	960
Raddolugama	2,100	10,500
Maligawatta	1,510	7,550
Crow Island	294	1,270
Stace Doad	240	1,200
Hantana	385	1,950
Diganavillage	250	1,250
Total	9,429	46,970

Source: NWSDB

The construction of the Greater Colombo Sewerage System started in 1906 and the majority of the work was completed by 1925 under a loan from the Government to CMC. The system is separate from rainwater drainage and has two main sewerage catchments. Since 1983, expansion, rehabilitation, and reconstruction have taken place at various times and the system now consists of about 320 km of sewers, 18 pumping stations, and two sea outfalls.

The WWTP in Hikkaduwa was constructed as a part of the Hikkaduwa Coastal Zone Waste Management Project. It was a joint effort between the NWSDB, Hikkaduwa Urban Council and the Australian Government. The Kataragama sewerage system was constructed by Austrian investment.

The total population covered by sewerage systems was estimated to be 500,175 in 2008. The Greater Colombo Sewerage System covers approximately 80% of CMC, 60% of Kolonnawa UC and 6% of Dehiwala/Mt. Lavinia MC in terms of geographic area, but only 61.5%, 8.4%, and 4.6% respectively in terms of population.

3.1.2 On-going Sewerage Projects

With reference to the Greater Colombo Sewerage System, four projects listed in **Table 3.1.3** are being conducted.

Table 3.1.3 On-going Projects for the Greater Colombo Sewerage System

Project	District	Components	Project Period	Financing Agency	Estimated Cost (LKR. Million)
Rehabilitation & Upgrading of Southern Catchments of GC Sewerage	Colombo	To construct the main sewerage pumping station Wellawatta & rehabilitate two main sewer lines approximately 7.3km long leading to the Wellawatta pumping station	2007- 2012 (completed)	Austrian	2,222
Wastewater Disposal Systems for Ratmalana /Moratuwa & Ja-Ela /Ekala Areas	Colombo Gampaha Ratmala Moratua	To construct wastewater collection system of 14.4 km, treatment plant of 7,250 m ³ /day, 3 pumping stations, and connections in the Ja- Ela /Ekala areas, To construct wastewater collection system of 50.4 km, treatment plant of 17,000 m ³ /day, 4 pumping stations, and connections in the Ratmalana /Moratuwa areas	2008- 2013	SIDA	16,155
Greater Colombo Wastewater Management Project	Colombo	To upgrade the sewerage infrastructure To strengthen institutional and operational capacity To provide project management and institutional support	2010- 2014	ADB	15,158
Increase in sewerage connections and access to safe sanitation in the Colombo Area (GPOBA)	Colombo	To increase the household access to safe sanitation in Dehiwala / Mount Lavinia and Moratuwa MCs and Kolonnawa and Ja-Ela PS areas for poor households	2011- 2014	World Bank	1,095

Source: NWSDB

ADB is preparing the next project for the water supply and sewerage system of Greater Colombo and the loan agreement is scheduled for December, 2012. The project cost will be

USD 400 million with ADB loan of USD 300 million for the year 2012 to 2016, in which USD 182 million will be allocated to the sewerage system. The scope of the project will be:

- Rehabilitation of water supply networks and reduction of NRW in Colombo City
- Improvement of wastewater services in Greater Colombo; including sewer rehabilitation, expansion of the collection system by 475 km, provision of sewer connections, and construction of two wastewater treatment plants with a total capacity of 174,000 m³/day to secondary treatment standards.
- Institutional reforms, capacity building, and implementation support

In addition to the above, **Table 3.1.4** lists the 6 on-going projects in sanitation and sewerage across the country and **Table 3.1.5** shows the projects which are at the preparatory stage. The NWSDB prepares Request for Proposals (RFP) for open bidding of turn-key projects with private financing for new projects. Locations of the projects are indicated in **Figure 3.1.1**.

Table 3.1.4 On-going Projects in the Sanitation and Sewerage Sector – Island Wide

No.	Project	District	Components in Sanitation and Sewerage Sector	Project Period	Financing Agency	Estimated Cost (LKR. Million)
1	Kandy City Wastewater Management Project	Kandy	To establish wastewater disposal system	2011-2017	JICA	22,585
2	Dry zone Water Supply & Sanitation Project	Puttalam Vavuniya Mannar	To provide 25,000 house hold latrine units To provide 534 latrine units at schools and health centers	2009-2014	ADB	13,030 including water supply components
3	Jaffna Peninsula & Kilinochchi Water Supply & Sanitation (ADB - 6th Project)	Jaffna Kilinochchi	Sanitation facilities to approximately 50,000 people and Institutional Support	2011-2014	ADB	20,000 including water supply components
4	Secondary Towns Rural Community Based WS & Sanitation (ADB 4th project)	Batticaloa, Muttur, Anuradhapura, Polonnaruwa Hambantota, Trincomalee	To provide sanitation facilities to Batticaloa, Muttur, Anuradhapura, Polonnaruwa, Hambantota, Trincomalee, Ampara areas	2004-2013	ADB	29,680 including water supply components
5	Local Government Infrastructure Improvement Project	Welimada	To collect wastewater generated by the residents, and treat to acceptable standards	2008 - 2012	ADB	N/A

Source: NWSDB

Table 3.1.5 Sewerage Projects at the Preparatory Stage

No.	Project	District	Present Status	Possible Financing Agency	Estimated Cost (LKR. Million)
6	Greater Kurunegala Water Supply and Wastewater Disposal Project	Kurunegala	Tendering	China	8,283
7	Negombo Wastewater Treatment & Disposal System	Gampaha (Negombo)	Ministry signed MOU with China	China	3,790

No.	Project	District	Present Status	Possible Financing Agency	Estimated Cost (LKR. Million)
8	Kataragama Sacred City Waste Water Disposal	Monaragala (Kataragama)	Tender evaluation	Austria concessional loan financing	615
9	Hambantota Wastewater Treatment Disposal System	Hambantota	Financial evaluation	China Australia	2,543
10	Sri Jayawardhanapura Waste Water Collection & Disposal	Colombo (Kotte)	Financial evaluation	China	12,650
11	Kattankudy Wastewater Disposal System	Batticaloa (Kattankudy)	Tender evaluation	France China	4,215
12	Galle Wastewater Treatment & Disposal System	Galle	RFP preparation	-	2,248
13	The Remaining Unserved Areas in Dehiwala and Mt. Lavinia Areas	Dehiwala and Mt. Lavinia	RFP preparation	-	7,446
14	Wastewater Disposal System for Maharagama – Boralesgamuwa Area	Colombo	RFP preparation	-	-
15	Wastewater Disposal Infrastructure for Chilaw Town	Puttalam	RFP preparation	-	-

Source: JICA Study Team based on the information provided by NWSDB

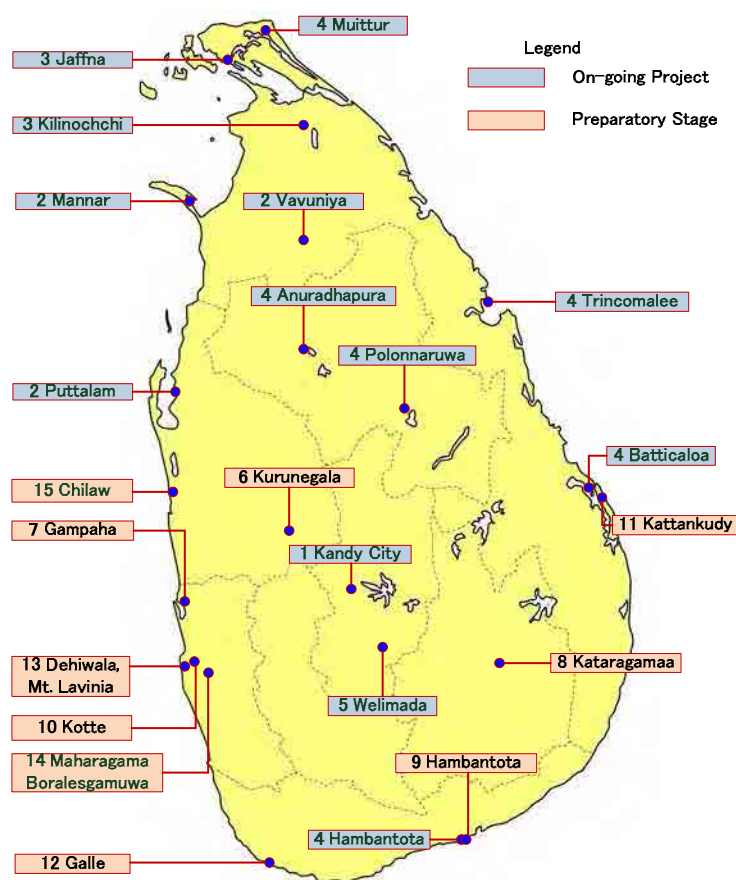


Figure 3.1.1 Location of Sanitation and Sewerage Projects (On-going and Preparatory)

3.1.3 Sewerage Project Formulation

New sewerage projects are generally identified and prioritized by the NWSDB taking into account the request of the public and public representatives. The Ministry of Water Supply and Drainage (MOWSD) reviews, evaluates, and approves the sewerage projects identified by the NWSDB with consultation of Ministry of Local Governments and Provincial Councils and sends the proposal to the Department of National Planning (DNP). When the DNP decides to implement the project, the Department of External Resources (ERD) identifies a donor agency in consultation with all relevant authorities and sends the details of the loan to the Department of Budget to be included in the annual budget. The Department of Budget makes provisions in the annual budget giving due respect to the limits allocated to the sector.

According to the Government's decentralization policy supported by the thirteenth amendment to the Constitution in 1987, wastewater management is the responsibility of local governments. However, local governments have limited technical and financial capacity at the moment. The NWSDB as a principle organization under Law No. 2 of 1974 is providing water supply and sanitation services across the nation, except for the Kandy MC and CMC.

The capacity development of local governments is being conducted under the ADB financed Greater Colombo Wastewater Management Project and the JICA financed Kandy Wastewater Management Project.

Sewage treatment for hospital is identified by the Ministry of Health and approved by the Central Environmental Authority (CEA). The procedure for financing is the same as for new sewerage projects identified above.

Involvement of the public and public representatives is essential for sewerage development. The MOWSD informs the public on the importance of sewerage for the protection of the environment. Nevertheless, sewerage projects are still perceived as NWSDB projects, and the MOWSD concentrates more on water supply, and the public give a higher priority to safe water supply than sewerage development.

The most urgent issue is the people's reluctance to connect to the sewerage system. Ordinary people have septic tank in their houses and consider it is enough for sanitation purposes. Hotels and industries have their own wastewater treatment facilities and are also reluctant to connect to the sewerage system.

3.1.4 Sewerage Development Priority

Other than the sewerage projects listed in Section 3.1.2, the NWSDB has prioritized and categorized local governments for sewerage development as shown in **Table 3.1.6**. The priority is determined mainly by the preparatory status and population densities of the UC/MC in 2008.

The priority of local governments is being revised by the NWSDB taking into account population density, future industrial development, risks to public health, social priority, environmental factors, consumer affordability, and potential demand for connections.

Table 3.1.6 Priority Category of Municipalities for Sewerage Development by NWSDB

Name of UC/MC	Land Area of UC/MC (km ²)	Population in 2008	Population density in 2008 (Pers/km ²)	Status	Category
Maharagama	38.0	195,797	5,153	2	A
Jaffna	20.2	128,520	6,362	3	A
Kolonnawa	16.3	60,866	3,734	1	A
Baticaloa town	16.6	91,623	5,519	2	B
Matara Four Gravets	8.3	80,628	9,714	4	B
Peliyagode	3.6	35,786	9,940	4	B
Kalmunai	22.0	109,383	4,972	4	B
Chilaw	5.6	23,578	4,210	2	B
Kaduwela	30.0	76,574	2,552	4	B
Hikkaduwa	4.0	11,694	2,923	1	B
Gampaha	2.2	6,622	3,010	2	B
Puttalam	25.6	47,316	1,848	2	B
Seeduwa-Katunayake	21.8	59,416	2,726	4	C
Akkarapattu	9.0	32,162	3,754	2	C
Katharagama	8.0	18,553	2,319	1	C
Badulla	10.4	43,963	4,227	4	C
Trincomalee town and Gravets	7.8	28,252	3,622	4	C
Wattala	4.4	42,879	9,745	4	C
Gampola	3.3	31,319	9,491	4	C
Bandarawela	2.3	21,986	9,559	4	C
Beruwala	4.4	35,931	8,166	4	C
Panadura	7.0	41,665	5,952	4	C

Status; 1: Part of the area already covered, 2: Already proposed project, 3: Already committed projects, 4: Other than the above

Category; A: Projects to be implemented initially, B: Project to be implemented less priority than A, C: Project to be implemented less priority than C

Source: JICA Study Team based on the information of NWSDB

The priority shall be discussed based on population density, health and sanitation, social, and environmental aspects, and NWSDB also takes the above aspects into account in preparing concrete plans such as Pre-Feasibility and Feasibility Studies.

(1) Population Density

High population density generates high pollution load causing high contamination potential to nearby water courses and downstream reaches. According to the Urban Development Authority

Law, No. 41 of 1978 and the Urban Development Authority Planning and Building Regulations, 1986, septic tank and soak away pit shall be constructed with the designated distance of 100 feet (30.48 m) from the existing well. It becomes difficult to construct a new septic tank and soak away pit in high population density areas especially in the area other than Greater Colombo where most of the houses are single or two stories.

(2) Health and Sanitation Aspects

A prevalence of water borne and water related diseases such as cholera, infectious hepatitis, typhoid, dysentery, gastroenteritis, ascariasis, conjunctivitis, diarrhoeal diseases, scabies, tinea infections, and skin, emphasizes the need for improved wastewater development.

(3) Social Aspects

Social conditions such as administration and/or commercial centers, national resorts, tourism hot spots, existence of natural resources, up-stream locations etc. of the identified area are also taken into account. Another significant aspect is low income settlements where many families receive Samurdhi Benefits. Ability to pay the sewerage bill has to be evaluated.

Ground water usage and covering ration of pipe borne water supply are also significant factors to be considered.

(4) Environment Aspects

Pollution situation of public water body, such as streams, canals and rivers is the most important indicator for developing sewerage project, as it causes ground water contamination, spreading of water borne diseases and loss of natural resources like flora and fauna. Flooding and high groundwater table are main reasons to spread seepage from domestic septic tanks and soakage pits in the vicinity area resulting in faecal contamination of the ground water.

Other than the above physical, social and environmental aspects, public awareness and desire for improved sanitation is essential. Residents' complaints to local governments on health and environmental matters pressure the authorities to seek solutions to sanitation problems, such as the development of sewerage system.

3.1.5 Present Financial Arrangement for Sewerage Works

(1) Financial Arrangement for sewerage project implemented by NWSDB other than Kandy City Wastewater Management Project (KCWMP)

Currently, almost all investment projects of the NWSDB in the water supply and sewerage sector are donor funded and the funds from donors are provided to the NWSDB as a grant or as a loan by the Central Government. The donor usually does not cover the entire project cost and, therefore, the Central Government adds its own funds to cover the balance of the cost. The

proportion of loan and grant to be provided for each investment project by the Central Government follows the formula shown in Table 3.1.7.

Table 3.1.7 Proportion of Grant and On-lending of the Central Government's Funding of NWSDB Investment Projects

Type of the Project	Grant	On-lending
Urban Drinking Water Supply Project	50%	50%
Rural Drinking Water Supply Project	85%	15%
Sewerage Project	100%	

Source: NWSDB Corporate Plan 2012-2016, page 9

As far as the formula for sewerage investment, the NWSDB is not required to pay back the loans to the Central Government. The NWSDB, however, needs to finance the operation and maintenance cost of the sewerage facilities by its sewerage tariff revenue or its own funds.

According to the NWSDB, the Treasury is seeking to apply the Rural Drinking Water Supply Project formula (Grant 85% On-lending 15%) for Sewerage Projects in the future. If this happens, the NWSDB needs to finance not only the operation and maintenance cost of the sewerage facilities but also the repayment of the principle and interest for the 15% of the investment cost by its sewerage tariff revenue or its own funds.

- (2) Financial Arrangement for the Kandy City Wastewater Management Project financed by JICA
- The financial arrangement for KCWMP at the construction stage is the same as those of other NWSDB sewerage projects. All required funds for the construction of the sewerage system, including the proceeds of JICA loan, will be provided by the Central Government to NWSDB as a grant.

The difference is in the operation and maintenance stage. According to the 'Memorandum of Understanding between National Water Supply & Drainage Board & Kandy Municipal Council, Kandy City Wastewater Management Project, May 2010', the NWSDB will be the owner of all the facilities constructed under the project. The operation and maintenance of the sewer system of KCWMP, including billing and collection of sewerage tariff, will be conducted by Kandy Municipal Council (KMC).

According to the By-Laws of KMC notified by the gazette on May 30, 2011, every person who obtains the sewage disposal service through the connection to the system will be charged the sum calculated in accordance with the monthly water consumption or in a manner determined by KMC. The tariff proposal is included in the 'Sri Lanka JBIC Water Sector Development Project Special Assistance for Project Implementation (SAPI) September 2006'. The operation and maintenance of the sewerage treatment plant will be conducted by the NWSDB. The KMC will pay the operation and maintenance fee to the NWSDB, based on the Memorandum of Understanding between the two parties.

(3) Financial Arrangement of the Greater Colombo Wastewater Management Project

Financial arrangement for the sewerage system in the CMC area of the Greater Colombo sewerage system is completely different as described below. The NWSDB is not involved. While 82.5% of the total project cost of the Greater Colombo Wastewater Management Project Phase I will be provided by the GOSL to the CMC as a grant, the remaining 17.5% will be provided as on-lending. Currently, the CMC is recovering the operation and maintenance cost of the existing sewerage system by including this cost in the municipality rates.

The CMC will introduce the separate sewerage tariff in future, which may be different from the NWSDB sewerage tariff.

Financial aspect of the Greater Colombo Wastewater Management Project

- 1) Project component of Greater Colombo Wastewater Management Project Phase I
The Greater Colombo Wastewater Management Project Phase I funded by ADB includes only the partial rehabilitation of the existing sewerage system in the Greater Colombo area. It does not include the sewage treatment plants, or the expansion of existing sewer networks. The ADB wanted, as a first step, to amend the situation that the current sewerage system in Colombo does not meet the environmental regulation of the CEA. The sewage treatment plants and the expansion of the sewer network will be conducted in Phase II.
- 2) Connection coverage of the existing sewerage system
In the CMC area, 80% of the residents are connected to the sewerage system. Even the slum population in the sewered area are connected. 20% of the population who are not connected live in the un-sewered areas. Slums in Colombo are scattered all over the city and people living in slums make up 40% of the total population. The 20% of the population who are not connected to the sewerage system use septic tank or cess-pit.
- 3) ADB loan for the Greater Colombo Wastewater Management Project Phase I
The total project cost of the Greater Colombo Wastewater Management Project Phase I is US\$116million. The ADB provides US\$100 and the GOSL provides US\$16 million. Out of US\$116 million, only US\$5.63million goes to the NWSDB. The majority of the project elements will take place in the CMC area. The ADB loan for Phase I was signed in September 2009.
- 4) Grant and on-lending
Of the US\$100million ADB loan, 82.5% is provided from the GOSL to the CMC as a grant, and 17.25% is provided as on-lending since there are many commercial buildings in the CMC area. This was negotiated between the GOSL (Ministry of Finance and Planning) and the CMC. At the beginning, the GOSL insisted that the on-lending portion be 25%, and the compromise was set at 17.25% on-lending. The division of grant and on-lending portions has nothing to do with the project components. The NSWDB portion is all grants. This matter is entirely a GOSL policy matter and has nothing to do with the ADB. The on-lending conditions between the GOSL and CMC are interest rate of 10% and repayment period of 25 years after 5 years grace period.

- 5) Institutional arrangement of CMC
In the CMC, there are 15 Department, one of which is the Municipal Engineering Department. Under this Department, the Drainage Division will implement the project. A separate project account is created by the Ministry of Local Governments and Provincial Councils, outside of the CMC, in which the ADB loan and the GOSL contribution will be deposited and used for the project.
- 6) Sewerage Tariff
Currently, the CMC is recovering the O&M cost of sewerage by including it in the municipality rates. The rates differ between those who received the sewerage service and those who do not receive the service. The introduction of the separate sewerage tariff will be a condition of ADB financing for the Phase II of the Greater Colombo Wastewater Management Project.
- 7) Separation of Sewerage Account from the CMC's General Account
Now, it is not separated. Under the Phase I Project funded by ADB, a study will be conducted to create a separate cost centre for CMC's sewerage operation.

Source: JICA Survey Team based on a meeting with the Project Director, CMC, conducted on June 29, 2012)

- (4) What is common for the above three (3) arrangements?

All funding for sewerage investment comes from the central government. There is no financial contribution from the local government for the construction of sewerage facilities. This is often explained by the extremely centralized government structure of Sri Lanka and, by extension, the very weak local governments.

The Pros and Cons of this arrangement will be analysed in Chapter 5.

3.2 On-site Treatment Facilities

3.2.1 Legal Framework

Installation of septic tanks is the responsibility of individuals and the collection and disposal is the responsibility of local governments who are conducting this as a day to day business in Sri Lanka. The Urban Development Authority Law, No. 41 of 1978 and The Urban Development Authority Planning and Building Regulations, 1986 relate amongst other things, to the approval of building plans and establish the necessary standards and criteria for such approval. The said regulations make it clear that the primary means of sewerage and wastewater disposal is by connection to an existing public sewerage system. Where such public sewerage system does not exist or where the outlet cannot be connected to the public system, sewage is to be disposed through a septic tank and wastewater through a soakage pit. Every building is also to be provided with adequate drainage facilities to drain off and convey the rain water from the roof to a street drain or other approved outlet. The said law also refers to the submission of Building Plans and issuing of Certificates of Conformity.

The legal provisions relating to on-site sanitation facilities are provided under several Acts, Ordinances and Regulations. They include the Nuisance Ordinance, the Quarantine and

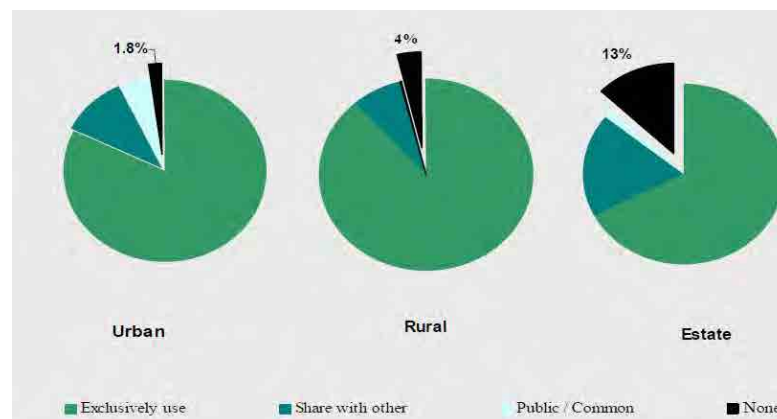
Prevention of Diseases Ordinance, the Town and Country Planning Ordinance (Physical Planning Act), the Housing and Town Improvement Ordinance, the Local Government Regulations, the UDA Act and also the National Environment Act and EPL Regulations.

In addition to the above, there are Regulations and Ordinances in place relating to the construction of, and connection to, sewers as well as their maintenance.

3.2.2 Present Status of On-site Treatment Facilities

According to “MDG Indicators of Sri Lanka, A mid Term Review – 2008 (Department of Census & Statistics)”, the proportion of the population with access to improved sanitation stands at 94 % in 2006/07 and has exceeded the MDG target of 93 %. Since a concerted effort to increase access to sanitation has taken place after the above report, the ratio has increased from the value reported in 2007.

An issue reported in the sanitary sector in the report is that only 86 % of the households enjoy a separate toilet for their exclusive use, and there is a wide variation between provinces and among sectors in this regard. Only 76 % of households in the eastern province and 67 % of households in the estates have private toilets. It is still worse to note that 11 % of the households in the eastern province, and 13 % of the households in the estate sector have no latrine facilities at all. Even in urban areas, about 3.5 % of households use public/common toilets and 1.8 % had no toilets in 2006/2007 as shown in Figure 3.2.1.



Source: MDG Indicators of Sri Lanka, A mid Term Review – 2008 (Department of Census & Statistics)

Figure 3.2.1 Type of Sanitary Facilities Sector (2006/2007)

The public/common toilets normally installed in low income settlements are generally in bad conditions and rehabilitation is required. For instance, all the 66 public/common toilets located in the low lying area in Kolonnawa UC are reported to be deteriorated and are polluting the surrounding water courses.

Households have septic tanks or cesspits to treat discharge from toilets where there is no coverage by a sewerage system. Even in sewer covered area, individual connections to sewerage system are not completely constructed. These unconnected households also rely on septic tanks or cesspits for on-site treatment. The dominant ratios of septic tanks and cesspits are supposed to be 70 % and 30 % according to the public consultation and questionnaire survey results in Nuwara Eliya MC and Matale MC.

3.2.3 Present Financial Arrangement for On-site Treatment Facilities

Except the cases in which the provisions of the improved sanitation facilities (safe and sanitary toilet) are included in the donor funded rural water and sanitation project, financing on-site sanitation is not considered as the responsibility of Central Government.

Local governments are running de-sludge service for the residents without any subsidies. The running costs are covered by service charge and a part of property tax.

Few cities have the appropriate sludge treatment facility and there is no provision in the Central Government Budget for sludge treatment facility.

3.3 Present Conditions of Institutional Arrangement

3.3.1 Institutional Arrangement for Sewerage Development

The main geographical locations with sewerage services are the CMC, a part of Dehiwala/Mt. Lavinia MC and Kolonnawa UC, Raddoluwa (National housing scheme, Katana PS), Hantana (Housing scheme, Kandy MC), Soyasapura (Housing scheme, Moratuwa MC), Hikkaduwa, and Kataragama. Sewerage services within the CMC area are provided by the CMC and the others are by the NWSDB.

The central government (MOWSD and the Ministry of Urban Development and Sacred Areas) is responsible for policy making, regulation and development of the sewerage sector, while provincial councils and local governments are responsible for ensuring equitable resource allocation, quality, and standards of service under the National Policy on Rural Water Supply and Sanitation Sector.

Before 1975, the provision of piped water and public wells was mainly the responsibility of local governments. In 1974, through an act of Parliament, the NWSDB was established as the primary national agency responsible for water supply and sanitation. Subsequently several major urban water supply schemes were transferred from local governments to the NWSDB in order to improve coverage and service. The NWSDB, provincial councils, and local governments have a mandate to provide water and sanitation services. The CMC is the only municipal council in Sri Lanka to provide comprehensive sewerage and sanitation services

within its jurisdiction. It is envisaged that the KMC will offer sewerage services in the near future.

Private sector participation in the water and sanitation sector is limited and is mostly in the form of (i) small-scale providers supplying drinking water to households, and (ii) civil work providers where selected functions have been outsourced.

A draft Water Supply and Sanitation Policy was formulated in 2002 to provide guidance to the NWSDB, provincial councils, local governments, lending institutions, and community based organizations (CBOs), and non-government organizations (NGOs) involved in delivering water supply and sanitation services. It included investment strategies to achieve coverage, service quality and cost recovery objectives. A cabinet paper has been under revision since April 2004, when the NWSDB was asked to bring it in line with new Government investment strategies. Separate water and sanitation policies have since been prepared. NWSDB's Board has approved the draft sanitation policy, but approval by cabinet is still pending.

Regulators are generally responsible for monitoring and enforcing discharge licenses and fees and service quality and for setting affordable and efficient tariffs. In the case of Sri Lanka, two main bodies have been given these responsibilities. The Public Utilities Commission (PUC) was created by Parliament in late 2002 to regulate water, electricity, and ports. Although commissioners were appointed soon after its establishment, it is not carrying out its functions fully, partly because of delays in the formulation and approval of the Water Industry Act. The Government is currently reviewing how NWSDB's operations can be brought in line with the PUC Act to enable the PUC to undertake technical and economic regulation.

The Central Environmental Authority (CEA) has powers to enact laws and regulations associated with wastewater pollution control and discharge standards. For all Board of Investment (BOI) registered industries, the CEA has delegated its powers to enforce the regulations to the BOI. The pre-treatment standards currently applied to the industries within the BOI-owned processing zones are not national standards but BOI's own requirements. The implementation of the CEA regulations for certain industrial sectors can be delegated to the local governments. For industries such as hotels and restaurants in Colombo, discharge compliance, monitoring, and enforcement have been delegated to the CMC and are linked to business license renewals. The Urban Development Authority (UDA) is responsible for regulation and guidelines for on-site sanitation.

3.3.2 Institutional Arrangement for On-site Facilities

The capital cost for installation of on-site facilities is generally borne by the developer or owner of the property. There are several programs for providing financial support to the poor to install the facilities. Every facility has to be approved by the local government prior to installation.

The Public Health Inspector (PHI) grants the approval of the local government. The PHI reports to the Chief Medical Officer (CMO) in municipalities and Medical Officer of Health (MOH) in other local governments.

The operational function of on-site facilities is de-sludging and disposal of the sludge (septage) upon request of the owners of the facilities. The local governments generally provide de-sludge and disposal services, with private sector providing the services in some locations, such as CMC and the Kalmunai MC.

CHAPTER 4 PRESENT STATUS OF SEWERAGE SECTOR IN 14 CITIES

4.1 Present Status of Water and Environment Sectors

4.1.1 Population and Population Density

The 2010 population and population density data by area selected by NWSDB for the 14 cities are shown in **Table 4.1.1**. Colombo has the biggest population of over 720,000, followed by Kelaniya PS and Kalmunai and Dehiwala/Mt. Lavinia with over 100,000. The remaining 10 cities have less than 100,000 and 6 of these are under 50,000. Only Colombo Dehiwala/Mt. Lavinia, and Periyagoda have population densities well above 10,000 persons/km². Matara Four Gravets are around 10,000, while the rest of the cities are well below this number. The higher population density areas are chosen for the planning exercise to ensure that the design meets the maximum required capacity.

Table 4.1.1 Area, Population, and Population Density (2010)

Area	MC/UC/PS	km ²	Population (Persons)	Population Density (Persons/km ²)
CMC	1 Colombo	42.0	720,437	17,153
Greater Colombo Area	2 Dehiwala/Mt. Lavinia	8.0	113,099	14,137
	3 Kaduwela	30.0	78,423	2,614
	4 Kolonnawa	16.3	62,335	3,824
	5 Kelaniya PS*	18.2	117,005	5,850
	6 Periyagoda	3.6	36,650	10,180
Western Coast Area	7 Kalutara	8.5	41,695	7,593
Southern Coast Area	8 Matara Four Gravets	8.3	81,923	9,870
Central Area	9 Matale	5.2	39,485	5,489
	10 Nuwara Eliya	15.0	27,276	1,818
	11 Badulla	10.4	44,847	4,312
Eastern Coast Area	12 Batticaloa Town	16.6	95,138	5,731
	13 Kalumunai	22.0	114,032	5,183
	14 Trincomalee Town and Gravets	7.8	29,049	3,724

Source: NWSDB except Kelaniya PS (Some areas are not coincide with Municipal administrative areas)

*Kelaniya Ps: JICA Study team based on the questionnaire survey results

4.1.2 Water Supply

The 6 cities along the Western Coast (including CMC and Greater Colombo area) are 100% covered by the water supply system, while Kaduwela MC is only 75% covered. Matale, Badulla, and Trincomalee reach over 80%. Eastern Water Supply Development Project funded by JICA will raise coverage ratios of Batticaloa MC and Kalumunai MC significantly to approximately 90%.

Table 4.1.2 Water Supply System Coverage Ratio and Number of House Connection

Area	MC/UC/PS	Water Supply System Coverage (%)	Number of House Connection
CMC	1 Colombo MC	100	127,182
Greater Colombo Area	2 Dehiwala/Mt. Lavinia MC	100	51,107
	3 Kaduwela MC	75	45,299

Area	MC/UC/PS	Water Supply System Coverage (%)	Number of House Connection
	4 Kolonnawa UC	100	16,400
	5 Kelaniya PS	100	24,165
	6 Periyagoda UC	100	6,041
Western Coast Area	7 Kalutara UC	100	8,400
Southern Coast Area	8 Matara MC		
Centre Area	9 Matale MC	95	17,000
	10 Nuwara Eliya MC	17	1,212
	11 Badulla MC	83	2,358
Eastern Coast Area	12 Baticaloa MC	19	3,532
	13 Kalumunai MC	56	11,400
	14 Trincomalee UC	82	10,600

Source: JICA Study team based on the questionnaire survey results

4.1.3 Solid Waste Management

Almost all the cities surveyed provide solid waste collection service by city staff except CMC and Matale. Collected waste is dumped at open sites except for Nuwara Eliya where a sanitary land fill site was constructed with funding from JICA. This site has a well maintained leachate treatment plant which employs an anaerobic process. Almost all the cities surveyed suffers from shortage of dumping sites, complaints from inhabitants, and shortage of collection vehicles as indicated in **Table 4.1.3**.

Table 4.1.3 Solid Waste Management Conditions and Issues

Area	MC/UC/PS	Service Provider	Available Equipment and Conditions	Outstanding Issues
CMC	1 Colombo	Private Firms on contract basis		
Greater Colombo Area	2 Dehiwala / Mt. Lavinia	MC	48 vehicles are engaged.	Some of the vehicles are not satisfactory and need replacements.
	3 Kaduwela	MC	Capacity of the dumping site is not sufficient	No adequate transport facilities.
	4 Kolonnawa	UC	3 compactors, 2 tippers and 6tTractors are available.	Conditions are not satisfactory and need replacements.
	5 Kelaniya	PS	Compost site at Manelagama	Inadequate vehicles and equipment.
	6 Periyagoda	UC	6 tractors and 2 tippers.	Inadequate vehicles and equipment. Conditions of some vehicles not satisfactory.
Western Coast Area	7 Kalutara	UC	Compost site at Phorawatta village	Inadequate vehicles and equipment.
Southern Coast Area	8 Matara	MC	Compost site at kotawila village	Inadequate physical resources, e.g.: tractors, tippers for transporting solid waste.
Centre Area	9 Matale	Consortium (MEC & MMC)	Collection waste is functioning well with PPP operation.	Need for a new vehicle for PPP
	10 Nuwara Eliya	MC	Disposed at sanitary landfill site with leachate treatment plant.	Need for new vehicles
	11 Badulla	MC	New disposal site is being developed.	Need for new vehicle fleet urgently.
Eastern Coast Area	12 Baticaloa	MC	Motorcycle mounted collection is carried out in narrow lanes.	Need for new vehicles
	13 Kalumunai	MC	Small hand tractor mounted collection along narrow lanes.	Need for new vehicles
	14 Trincomalee	UC	4 compactors, 4 wheel tractors and a tipper	Needs for new vehicles

MC: Municipal Council, UC: Urban Council, PS: Pradeshiya Sabha,

Source: JICA Study team based on the questionnaire survey results

4.1.4 On-site Treatment

All the cities use their own staff to provide the de-sludging service, except Kalmunai MC where this is contracted out to private companies. The cities send gully suckers to empty the septic tanks on request of residents and dump the collected sludge to septage (septic tank sludge) treatment plants, garbage dumping sites, and disposal pits. **Table 4.1.4** shows the detailed information on these services for the 14 cities.

Table 4.1.4 De-sludging Collection Service, Disposal Sites, and Related Charges

Area	MC/UC/PS	Service Provider	Disposal Site	Charge
CMC	1 Colombo	MC	CSS	No charge
Greater Colombo Area	2 Dehiwala/Mt. Lavinia	MC	CSS	LKR. 1,350/load, Pay to NWSDB: LKR. 550/load
	3 Kaduwela	MC	CSS	MC charges for de-sludging
	4 Kolonnawa	UC	Pump station (CSS)	LKR. 3750/load, Pay to NWSDB: LKR. 500/load
	5 Kelaniya	PS	CMC pump house	PS charges for de-sludging
	6 Peliyagoda	UC	CMC pump house	UC charges for de-sludging
Western Coast Area	7 Kalutara	UC	Mt. Lavinia Pump House (CSS)	UC charges for de-sludging
Southern Coast Area	8 Matara	MC	Dumping Pit	MC charges for de-sludging
Centre Area	9 Matale	MC	Septage Treatment Plant	LKR. 3,000 for residential, LKR. 5,000 for commercial
	10 Nuwara Eliya	MC	Septage Treatment Plant	LKR. 3,000 to 4,500 depending on the distance
	11 Badulla	MC	Dumping Pit	LKR. 2,500 for residential, LKR. 5,000 for commercial
Eastern Coast Area	12 Batticaloa	MC	Septage Treatment Plant	LKR. 3,000 to 4,000 depending on the distance
	13 Kalmunai	Private Companies	-	-
	14 Trincomalee	UC	Garbage Dump Site	UC charges for de-sludging

MC: Municipal Council, UC: Urban Council, PS: Pradeshiya Sabha, CSS: Colombo Sewerage System

Source: JICA Study Team

Many Municipalities do not have adequate de-sludging service due mainly to lack of properly functioning gully suckers and inadequate disposal sites, except for CMC, Nuwara Eliya, and Matale as indicated in **Table 4.1.5**

According to the survey on-site treatment facilities such as septic tanks and pit latrines in urban area have following problems.

- In all cities surveyed overflow of soakage from pits is observed in rainy season due to high ground water level and inflow of rain water. Above all in the cities of coastal area this problem is so severe.

- In the area with high population density, where housing lots are often divided into smaller plots, new construction of septic tank with adequate soakage function is getting difficult.
- In some cities ground water, which might be polluted by soakage of septic tank effluent, is utilized even for drinking water.
- In some secluded residences from road the hose of gully sucker cannot reach septic tanks, which causes overflow of seepage to the drainage channel steadily.
- Grey water is discharged to drainage channels, which causes pollution of water environment

Table 4.1.5 Gully Sucker Vehicle Inventory

Area	City	Status	Comment/Analysis
CMC	1 Colombo	There are 14 gully suckers but 8 are often not in operation. 3 to 5 private gully suckers are also providing the service.	The number of gully suckers owned by CMC is not adequate. The present conditions of some of G.S. are not satisfactory and need replacement.
Greater Colombo Area	2 Dehiwara/ Mt.Lavinia	There are only 3 gully bowsers.	Not adequate.
	3 Kaduwela	-	No. of gully suckers is not sufficient.
	4 Kolonnawa	-	Gully suckers are old and need replacement.
	5 Kelaniya	Only one gully bowser is available.	Inadequate gully emptied. Only one gully sucker is available.
	6 Periyagoda	-	Inadequate gully suckers
Western Coast Area	7 Kalutara	Sludge is transported 20 km from Kalutara to Mt Lavina Sewerage Pump House .	No. of gully suckers is not adequate.
Southern Coast Area	8 Matara	3 gully bowsers available	Number is not sufficient.
Centre Area	9 Matale	Sludge is treated at treatment plant. Encouraging Private Public Partnership (PPP)	Need for new vehicle.
	10 Nuwara Eliya	Sludge is treated at treatment plant. Two gully suckers are available	
	11 Badulla	2 15-year old gully bowsers	Need new vehicle urgently.
Eastern Coast Area	12 Baticaloa	BMC has one gully sucker. (None on standby)	Need for new vehicle, NWSDB handed over Vehicle to BMC which was received during Tsunamis 2004.
	13 Kalumunai	Private party has a gully sucker & tractor mounted one. KMC also has a one. (PPP arrangement is having dispute with present KMC management)	Need for new vehicle and another smaller one for the narrow lanes.
	14 Trincomalee	Two gully suckers available. Only one is in operation at a time, as the fleet is old.	Need replacements.

Source: JICA Study Team

4.1.5 Present Financial Arrangement for On-site Treatment Facilities

Except the cases in which the provisions of the improved sanitation facilities (safe and sanitary toilet) are included in the donor funded rural water and sanitation project, financing on-site sanitation is not considered as the responsibility of Central Government.

The financial accounts of 14 cities surveyed do not show any expenses on on-site sanitation. People construct their own septic tanks with the approval of the relevant local authority. The local authority is involved only for the sludge clearing at the request made by the people.

A nominal fee is charged to cover the direct cost involvement by Local authorities for de-sludging. No separate accounts have been maintained for the onsite sanitation income or expenditure. They use gully bowsers and tractor for de-sludging service and the fees charged by some of the local authorities are as follows.

Table 4.1.6 De-sludging Service Fees and Saptage Disposal Site

Local Authority	De-Sludging Rate Per Load	Disposal Site
Kelaniya Pradeshiya Shabha	Within Area Rs: 2500/= Outside area Rs: 4000/=	Madampitiya site - CMC
Kolonnawa U.C	Within Area Rs: 2000/= Outside Area Rs: 3000/-	Kollonanawa Site - NWSDB
Dehiwala Mt.Lavinia M C	Small Gully Load Rs: 1358.71 Large Gully Load Rs: 1525.71	Mt.Lavinia Pump house
Kaduwela MC	Within area Rs: 2500/= Outside Area Rs: 3500/= Small Gully Rs: 1920/=	Kollonanawa Site - NWSDB

Few cities have the appropriate sludge treatment facility and there is no provision in the Central Government Budget for sludge treatment facility.

4.1.6 Sewerage Facilities

The existing sewerage system in Greater Colombo covering CMC and parts of Dehiwara /Mt.Lavinia MC and Kolonnawa UC was constructed by the British before 1925. The system was improved and expanded in the eighties and nineties including that for a housing scheme in Kaduwela MC. The wastewater is conveyed by gravity assisted by 18 pumping stations, to the two ocean outfalls located in Wellewatte and Mutwal and discharged to sea after primary treatment.

The existing sewer system which runs through CMC area serves about 80% of the city area. The total length of sewer lines is about 320 km. The rest of the city depends on septic tanks and pit latrines for disposal of night soil.

In Dehiwela/Mt.Lavinia MC, the existing sewerage system covers only 5 to 6% of the total MC area. There are 5,000 premises within the served area, but only 1,650 are connected to the system. To promote more house connections, a project funded by World Bank, GOSL, NWSDB, and the community is being implemented.

In Kolonnawa UC, the existing sewerage system was constructed using World Bank, Saudi Arabia, GOSL funding and commissioned in 1989. The total length of sewer lines in the UC

area is about 20.6 km covering about 60% of the total city area with 1,550 connections.

In Kaduwela MC, there is a sewerage system in the Jayawadenagama housing scheme operated by NWSDB, which is more than 30 years old. Kaduwela MC needs a sewerage system for the urban area of Battaramulla where central government institutions are located near the new Parliament.

The surveyed cities in the Greater Colombo area, Kelania PS and Periyagoda UC do not have any sewerage system.

None of the cities surveyed in coastal and central areas has a piped sewerage system. Nuwara Eliya MC and Batticaloa MC have construction plans for sewerage system. Many cities suffer from pollution of rivers, lakes, sea or lagoons and seepage from septic tanks in rainy season due to high ground water level and inflow of rain water. In coastal areas the seepage problem is quite severe. According to mayors and responsible officials, sewerage is the first priority to be addressed as indicated in **Table 4.1.7**.

Table 4.1.7 Sewerage Systems and Existing Construction Plans in 14 Cities

Area	MC/UC/PS	Existing Sewerage Systems and Construction Plans
CMC	1 Colombo	The existing sewer system covers about 80% of the city area, with a sewer pipe line of about 320 km. The wastewater is pumped into the ocean with primary treatment at two outlets located in Wellewatte and Mutwal. The Greater Colombo Wastewater Improvement Project is being implemented using ADB loan.
Greater Colombo Area	2 Dehiwala/Mt. Lavinia	Only 5-6% of the city area is served by the existing sewerage system. A project to promote sewer connections to the individual houses funded by World Bank (50%), GOSL(35%), NWSDB(10%), and the community(5%) is being implemented. A sewerage project funded by SIDA is in progress to connect the Industries and houses in the Ratmalana area.
	3 Kaduwela	There is no existing sewerage system except the one at the Jayawadenagama housing scheme operated by NWSDB. A development project is at the planning stage, but its funding is not yet identified.
	4 Kolonnawa	Total length of sewer lines is about 20.6 km covering about 60% of the total city area.
	5 Kelaniya	No sewerage system exists.
	6 Peliyagoda	No sewerage system exists.
Western Coast Area	7 Kalutara	No sewerage system exists.
Southern Coast Area	8 Matara	No sewerage system exists.
Centre Area	9 Matale	No sewerage system exists.
	10 Nuwara Eliya	No sewerage system exists. The Study on Greater Kandy and Nuwara Eliya Water Supply and Environmental Improvement Plan was completed in 1999.
	11 Badulla	No sewerage system exists.
Eastern Coast Area	12 Batticaloa	No sewerage system exists. The Pre-Feasibility Report on providing a wastewater disposal system to Batticaloa Municipality and Kattankudy DS Division was submitted in 2008.
	13 Kalmunai	Tsunami houses have sewerage treatment plants.
	14 Trincomalee	No sewerage system exists.

Source: JICA Study Team

4.1.7 Treatment Systems for Hospitals

Hospital wastewater contains pathogens and other hazardous materials such as colloidal silver used in medical applications. The general hospitals in the 14 cities are surveyed and results are shown in **Table 4.1.8**.

Wastewater from hospitals in the areas of CMC and Dehiwela/Mt.Lavinia MC is discharged to the sewer pipes and subsequently to the sea without pre-treatment.

The general hospitals in the 7 cities in the southern and eastern coastal and central areas (Kalutara UC, Matara MC, Matale MC, Nuwara Eliya MC, Badulla MC, Batticaloa MC, and Trincomalee UC) have sewage treatment plants most of which employ conventional biological processes, such as activated sludge, oxidation ditch, and trickling filter. Some of these are operating well, but others are not due to lack of technical knowledge. The general hospital in Kalumunai MC has septic tank for each building.

Table 4.1.8 Hospital Sewage Treatment Systems

Area	MC/UC/PS	Hospital Sewage Treatment
CMC	1 Colombo	Discharge to sewer pipe without pre-treatment
Greater Colombo Area	2 Dehiwala/Mt. Lavinia	Discharge to sewer pipe without pre-treatment
	3 Kaduwela	No general hospital
	4 Kolonnawa	No general hospital
	5 Kelaniya	No general hospital
	6 Peliyagoda	No general hospital
Western Coast Area	7 Kalutara	OD (aerating rotor is not operating)
Southern Coast Area	8 Matara	OD (aerating rotor is not operating)
Centre Area	9 Matale	Activated sludge (insufficient aeration)
	10 Nuwara Eliya	Anaerobic pond
	11 Badulla	Trickling filter
Eastern Coast Area	12 Batticaloa	Activated sludge
	13 Kalmunai	Septic tanks
	14 Trincomalee	Pressurized filter

Source: JICA Study Team

4.1.8 Treatment Plants at Industrial Complexes

There are two industrial complexes (Biyagama and Seethawakapula) in the Greater Colombo area along the Kelani River which is one of water resources for Colombo City. In order to conserve the water quality of the river, each complex has a common industrial WWTP managed by the NWSDB.

The Biyagama Complex has an aerated lagoon and also uses the oxidation ditch process; both are operating in excess of their designed capacity. The present capacity of this plant will be increased from 9,000 m³/d to 20,000 m³/d. The Seethawakapula WWTP employs the oxidation ditch process which is operating within its capacity. The Biyagama plant uses drying beds to

reduce the amount of generated sludge and the Seethawakapula plant uses the belt-press process. Both WWTPs have to deal with wastewater effluents from dyeing or chemical factories, containing substances that are difficult to biodegrade. The effluent is often coloured and an ozonation process is required.

Table 4.1.9 WWTP at Industrial Complexes

Name of Complex	Type of WWTP	Capacity (m ³ /day)	Existing amount of treatment (m ³ /day)	Upgrade plan
Biyagama	Aerated lagoon	9,000	12,000	20,000
	Oxidation ditch			
Seethawakapula	Oxidation ditch	9,900	9,000	12,900

4.2 Present Status of Sewerage Development

4.2.1 On-going Sewerage Projects

There are two major sewerage projects in progress and one house connection effort just got started in the Greater Colombo area.

(1) Greater Colombo Wastewater Management Project funded by ADB

The objective of the Project is to improve the urban environment and public health for the residents of Greater Colombo through improved wastewater management services. The Project consists of the following components:

- Design, supply of equipment, construction of civil, mechanical and electrical works associated with rehabilitation of 11 existing pumping stations in the CMC service area, laying 4 pumping mains, and installation of pre-treatment prior to discharge to sea outfalls.
- Supply of equipment and construction of gravity sewers, including replacement of 10 km of critical sewers which are under capacity and refurbishment of existing gravity sewers by replacement of non-operational control valves.
- Design, supply of equipment and rehabilitation of 2 marine outfalls in Mutwal and Wellawatte.
- Supply of non-fixed assets and equipment for the CMC.

The project is at the tender document preparation stage as of July, 2012, and the documents for procurement of operational equipment, and rehabilitation of gravity sewers, pumping stations, and ocean outfalls will be ready later this year (2012).

(2) Wastewater Disposal Systems for the Ratmalana /Moratuwa & Ja- Ela /Ekala Areas funded by SIDA

- The objective of the project is to collect wastewater generated from industries and residences in the two industrial areas, treat to the acceptable standards and dispose to water bodies, while maintaining clean and pollution free environment for the inhabitants in Dehiwala/Mt. Lavinia MC, Moratuwa MC, and Ja-Ela PS. The project consists of two areas and the scope of works is as follow:Ja - Ela / Ekala
 - Wastewater collection system of 14.4 km along 8.0 km of road
 - Treatment plant with capacity of 7,250 m³/day
 - 03 pumping stations
 - Connections:
 - Industries: 103
 - Commercial / Institutions: 42
 - Households: 138 + Nivasipura (1,202 connections) + Air Force Camp (1,000 persons)
- Ratmalana / Moratuwa
 - Wastewater collection system of 50.4 km along 32.5 km of road
 - Treatment plant with capacity of 17,000 m³/day
 - 04 pumping stations
 - Connections:
 - Industries: 129
 - Commercial / Institutions: 83
 - Households: 1750 + Soysapura (2,200 connections)

The project was at 75% completion as of March, 2012 and construction will be completed by January, 2013. The NWSDB has already formulated Stage I, Phase II of the Ratmalana/Moratuwa Sewerage Project and obtained the clearance from the National Planning Department. Under Phase II, the domestic sewerage coverage in the Ratmalana DS Division is expected to increase to service a population of approximately 57,000 by 2030.

The following issues were recognized during the course of the implementation of the project:

- Basic design was prepared based on the “Greater Colombo Wastewater and Sanitation Master Plan, April 1993” prepared by Engineering Science, Inc. with World Bank funding. The layout plans in the Master Plan do not meet the present conditions of the area.
- There were many damages to the properties along the roads, when deep trenches were dug in narrow spaces to install the sewer lines.
- Most of the public complaints were directed towards road closures during sewer construction and trenching.
- There were difficulties in locating underground utilities.

(3) GPOBA Project (Global Partnership for Output Based Aid)

The Principal objective of the project is to increase the number of sewer connections to poor households in the Greater Colombo area that would benefit from an improved sanitation system and to ensure that their domestic wastewater is not disposed in urban waterways without proper treatment. The project is currently at the formulation stage.

The proposed GPOBA project focuses on two major outputs which are new sewer connections and improvements to on site sanitation services. The new sewer connections fall into four categories according to distance which is directly related to cost:

- i. Direct connections for household located within 20 m of the existing network,
- ii. Extension and connections for households located between 20 m and 250 m of the existing network made with conventional sewer technology,
- iii. Extension and connections for households located between 20 m and 250 m of the existing network made with simplified sewer technology,
- iv. New stand-alone sewer networks with decentralized wastewater treatment system and connection for households located more than 250 m from the existing sewer network depending on the practicability and success of the pilot project of the same.

4.2.2 Existing Sewerage Frameworks and Plans

There are 4 sewerage development frameworks and plans available for the targeted 14 local governments.

- Greater Colombo Wastewater and Sanitation Master Plan, 1993 (World Bank)
- Pre-Feasibility Report for Providing Wastewater Disposal Systems to Batticaloa Municipality and Kattankudy DS Division, 2008 (NWSDB)
- Project Proposal for Extension of Piped Sewer Coverage for Dehiwala-Mt. Lavinia Municipal Council Area, 2010 (NWSDB)
- The Study on Greater Kandy and Nuwara Eliya Water Supply and Environmental Improvement Plan in the Democratic Socialist Republic of Sri Lanka, February 1999 (JICA)

Greater Colombo Wastewater and Sanitation Master Plan covers 6 of the 14 local governments: CMC, Dehiwala/Mt. Lavinia MC, Kaduwela MC, Kolonnawa UC, Kelaniya PS, and Peliyagoda UC.

(1) Greater Colombo Wastewater and Sanitation Master Plan, 1993 (World Bank)

This master plan was prepared based on the Water Supply Master Plan prepared in 1991, using data from 20 years ago. The document needs to be revised for the following reasons:

- The water supply master plan being revised by the JICA loan project will be finalized by 2013.

- All the information on social and environmental situations has been changed during the last two decades.
- Details of the 2011 Census results will be released soon. The Executive Summary was disclosed on April 20th, 2012, providing the annual population growth ratio by district for a total population of the country at 20,277,597.
- Various changes were made at different times to the existing sewerage system and more will take place with the on-going and future ADB projects taking place upstream.

A new sea outfall structure was designed for the Sri Jayawardanepura Kotte Wastewater Collection and Disposal System Project, though the wastewater from the area was originally planned to be discharged from the existing Wellawatta Outfall through CMC south area as indicated in the Projected Sewerage Area shown in **Figure 4.2.1** of the 1993 Master Plan.

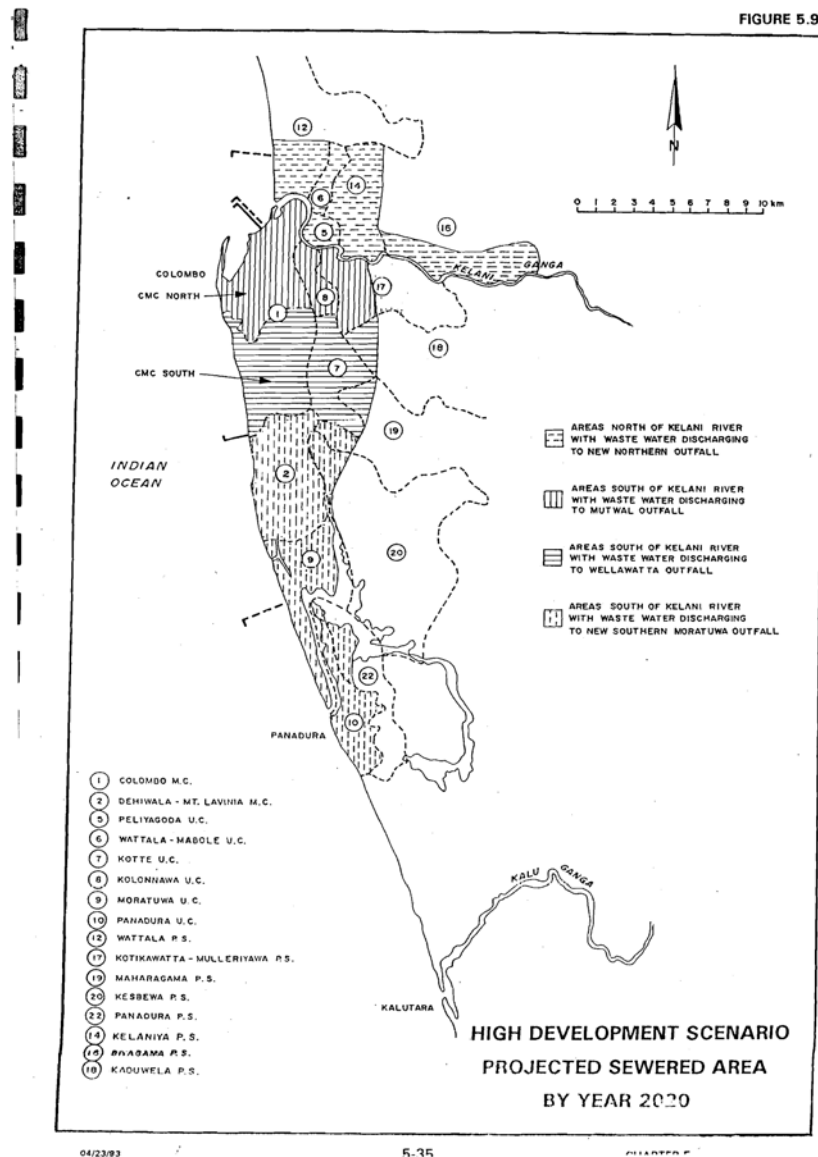


Figure 4.2.1 Projected Sewer Service Area by Year 2020 in Master Plan of 1993

- (2) Pre-Feasibility Report for Providing Wastewater Disposal Systems to Batticaloa Municipality and Kattankudy DS Division, 2008 (NWSDB)

The Pre-Feasibility Report is the revised version of F/S study prepared by ADB in 2001 (ADB 4th project) which includes the sewerage plan for Manumunai North of Batticaloa MC.

The sewerage developments aim to prevent ground water pollution (people use drinking water from shallow aquifers), compensate for insufficient on-site treatment facilities (mostly pit latrine and lack of septic tank), and to conserve the lagoon system.

The plan follows the design criteria of the ADB F/S, except for the design horizon which is changed to 2028 and the proposed conventional activated sludge treatment process is replaced by the 3 options of oxidation ditch, natural pond system, and long sea outfall.

The design data and main figures are provided in **Table 4.2.1** and **Table 4.2.2**, and **Figure 4.2.2** shows expected sewer service area.

Table 4.2.1 Design Data for Batticaloa Sewerage

Description	Design Data
Per capita water consumption (residential)	120 lpcd
Average Dry Weather Flow (ADWF)	80% of water consumption
Peak factor	Sub-catchment sewers:6, Trunk sewers:4
Infiltration	15%
Design wet weather flow	1.15xPDWF

Source: Pre-Feasibility Report for providing wastewater disposal systems to Batticaloa Municipality and Kattankudy DS Division

Table 4.2.2 Summary of Main Figures for Batticaloa Sewerage

Equivalent Population in 2028	Service Area	Population Density	WWTP Capacity	Required WWTP Site
64,223 people	2,031 ha	31.6 (peo./ha)	7,200 (m ³ /day)	Oxidation Ditch : 1 ha
				Natural Pond :8 ha
				Sea Outfall :0.25ha*

*: Including discharge from Kattankudy DS

Source: Pre-Feasibility Report for providing wastewater disposal systems to Batticaloa Municipality and Kattankudy DS Division



Source: Pre-Feasibility Report for providing wastewater disposal systems to Batticaloa Municipality and Kattankudy DS Division

Figure 4.2.2 Expected Service Area of Batticaloa Sewerage

- (3) Project Proposal for Extension of Piped Sewer Coverage for Dehiwala-Mt. Lavinia Municipal Council Area, 2010 (NWSDB)

The Dehiwala-Mt. Lavinia area is fully serviced with pipe borne water supply. Piped sewerage facilities have been provided since 1987 for Dehiwala West, Jayatholake and Mt. Lavinia GN Divisions, including the segment of Galle Road from Mt. Lavinia Junction up to the bridge across Dehiwala canal under the Greater Colombo Sewerage Project. Details of the existing system, which is a part of the Greater Colombo Sewerage System with ocean outfall, are shown in **Table 4.2.3**.

Table 4.2.3 Existing Sewerage System in Dehiwala-Mt. Lavinia MC

Description	Data
Length of Sewer Network	25km
No. of House Laterals	2,240
No. of Unit Served	2,178
Estimated Served Population	12,000
MLP 01 Pumping Station-Dehiwala	100 l/s
Present average Peak Flow	50 l/s
N0. Of Pumps	03 (2 Duty, 1 Stand-by)
MLP 02 Pumping Station-Mount Lavinia	170 l/s
Present average Peak Flow	85 l/s
N0. Of Pumps	03 (2 Duty, Stand-by, provisions for 4 pumps)

Source: Project proposal for extension of piped sewer coverage for Dehiwala-Mt. Lavinia municipal council Area

The non-sewered area was not dealt with in the most recent studies due to the complexity of the collection system. Presently there is a severe problem of sewage over flowing from septic tanks due to low soil permeability and the lower elevations are most affected.

The design horizon of the project is year 2040. The population growth rate is taken as 1.2% considering vertical development in the area and also the migrant population due to industrialization. The design data and main figures are shown in **Table 4.2.4** and **Table 4.2.5** respectively, and the proposed catchment area is shown in **Figure 4.2.3**.

Table 4.2.4 Design Data for Non-sewered Area in Dehiwala-Mt. Lavinia MC

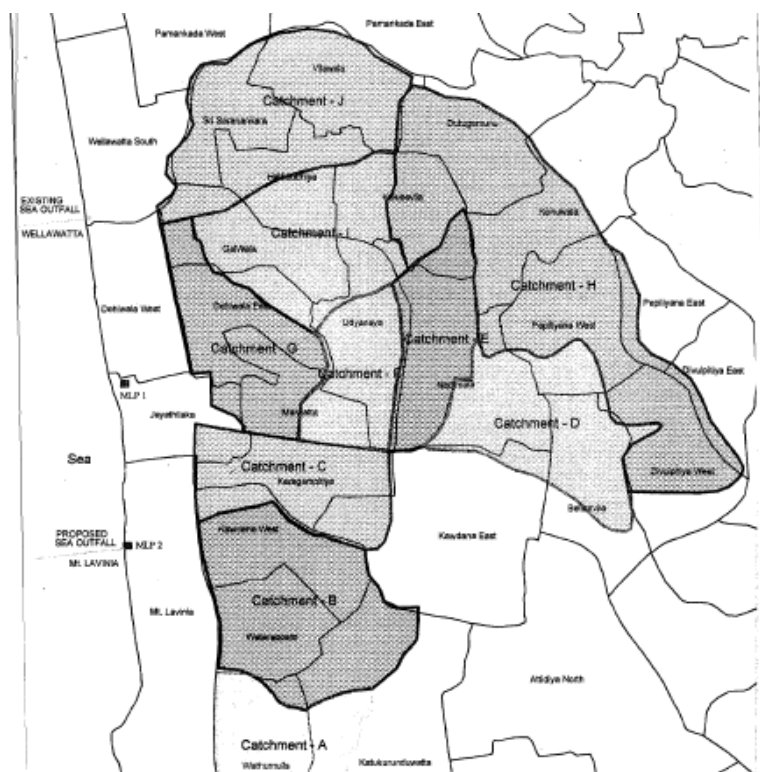
Description	Design Data	
Per capita water consumption (residential)	120 lpcd	
Average Dry Weather Flow (ADWF)	85% of water consumption	
Peak factor	3	
Peak dry weather flow (PDWF)	3xADWF	
Infiltration	15%	
Design wet weather flow	1.15xPDWF	
Minimum velocity (Gravity pipes)	0.7m/s	
Flow velocity (Pumping mains)	1 m/s – 2 m/s	
Depth of Buried Pipes	Min. Depth (m)	Max. Depth (m)
Main Sewer	1.0	3.5
Rider Sewer/Branch sewer	0.9	3.5

Souse: Project proposal for extension of piped sewer coverage for Dehiwala-Mt. Lavinia municipal council Area

Table 4.2.5 Summary of Main Figures for Non-sewered Area in Dehiwala-Mt. Lavinia MC

Equivalent Population in 2040	Service Area	Population Density	Discharge Flow	Remarks
138,230 people	919 ha	150 (peo./ha)	20,434 (m ³ /day)	Sea Outfall by Wellawatta Outfall and proposed Mount Lavinia long Outfall

Source: Project proposal for extension of piped sewer coverage for Dehiwala-Mt. Lavinia municipal council Area



Source: Project proposal for extension of piped sewer coverage for Dehiwala-Mt. Lavinia municipal council Area

Figure 4.2.3 Service Area Expansion in Dehiwala-Mt. Lavinia MC

It is noted that the costs of sewer construction using no-dig technology is quoted as LKR. 314 million for 868 m of pipes of 225 mm and 315 mm diameters. This translates to LKR. 362,000 /m, which is extremely high and some arrangement shall be made to reduce the costs.

Some of the wastewater from the area is designed to discharge through a new sea outfall structure to be constructed under the Sri Jayawardanepura Kotte Wastewater Collection and Disposal System Project. The construction costs of the new sea outfall are estimated as LKR. 2,934 million. It is also noted that this estimate is quite high and possible alternatives will be pursued.

- (4) The Study on Greater Kandy and Nuwara Eliya Water Supply and Environmental Improvement Plan in the Democratic Socialist Republic of Sri Lanka, February 1999 (JICA)

The study includes the Sewerage Master Plan for an area of 314 ha and the Feasibility Study for the first phase development of 84 ha in Nuwara Eliya MC. The Master Plan was prepared

with projections to 2005 and the Feasibility Study to 2015. The WWTP site was proposed to be located on private agricultural land in Kelegala. The land, however, could not be acquired because of opposition of the workers on the private agricultural land and the residents. The project was subsequently suspended.

Design details and main figures of the Sewerage Master Plan and F/S of Nuwara Eliya MC prepared in 1999 are summarised in **Table 4.2.6** and **Table 4.2.7**, and **Figure 4.2.4** provides the layout plan of the Master Plan.

Table 4.2.6 Design Data for Nuwara Eliya MC Sewerage

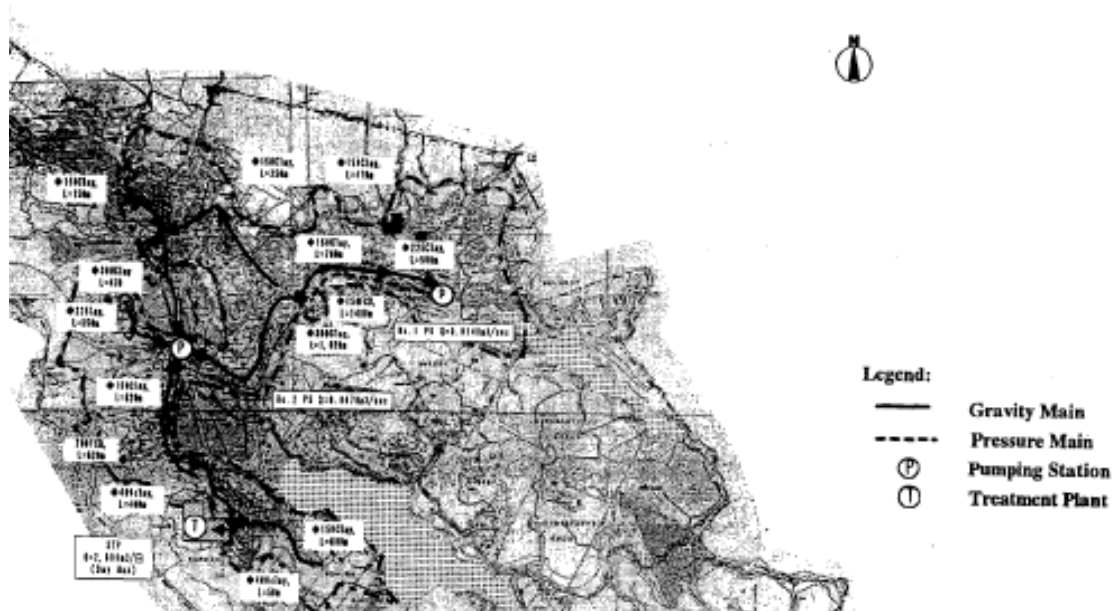
Description	Design Data	
	M/P (2015)	F/S (2005)
Per capita water consumption (residential)	148 lpcd including I/I	133 lpcd including I/I
Average Dry Weather Flow (ADWF)	80% of water consumption	
Peak factor	2.0 and 1.8 depending on the population served	
Peak dry weather flow (PDWF)	1.2xADWF	
Infiltration	15%	

Source: The Study on Greater Kandy and Nuwara Eliya Water Supply and Environmental Improvement Plan in the Democratic Socialist Republic of Sri Lanka

Table 4.2.7 Summary of Main Figures for Nuwara Eliya MC Sewerage

	Population	Service Area	Population Density	WWTP Capacity
M/P (2015)	8,680 people	314 ha	36 peo./ha	2,800 m ³ /day
F/S (2005)	1,830 people	84 ha	22 peo./ha	1,400 m ³ /day

Source: The Study on Greater Kandy and Nuwara Eliya Water Supply and Environmental Improvement Plan in the Democratic Socialist Republic of Sri Lanka



Source: The Study on Greater Kandy and Nuwara Eliya Water Supply and Environmental Improvement Plan in the Democratic Socialist Republic of Sri Lanka

Figure 4.2.4 Layout of Sewerage System in Nuwara Eliya MC

4.3 Consideration on Project Preparation

4.3.1 Selection of Treatment Process

Sewage treatment process selection depends on the discharge standard, water environments at the discharge point and downstream, land availability, economic evaluation, and O&M requirement. According to the discharge standard into inland surface waters and present practices in Sri Lanka, following four methods would be the candidates as alternative treatment processes.

- Aerated lagoon (AL),
- Trickling filter (TF)
- Oxidation ditch (OD), and
- Conventional activated sludge (CAS)

In addition to the above 4 methods, following two processes are included as alternatives for coastal region according to the discharge standard for marine coastal areas.

- Natural pond system (NP), and
- Long ocean outfall with preliminary treatment process (LO)

As far ocean outfall, NWSDB is designated in “Design Manual D7” as quote “The discharge of wastewater to the ocean is an accepted means of disposal provided that the assimilative capacity of the ocean at the discharge location is not exceeded and provided that the discharge dose not give raise to unacceptable pollution levels in recreation areas or in shellfish harvesting area.”

When land for treatment site is available, following priority order will be generally given to the processes according to the construction and maintenance costs and less O&M requirement.

For inland region : AL, TF, OD, CA

For coastal region: NP, AL, TF, OD, CA, LO

It is noted that TF is sometimes not selected by some environmental reasons and that LO needs further study and several concurrences from CEA, Coastal Conservation, and UDA etc. before implementing the project. It also noted that nitrogen removal process may be required to minimize adverse effects to the downstream intakes of water supply and other water uses.

4.3.2 Construction and Maintenance Costs

Trial estimates for sewerage projects at sample cities are attempted assuming unit rates for construction and O&M costs. The unit costs are assumed based on the estimation made by NWSDB in “Pre-Feasibility Report for providing wastewater disposal systems to Batticaloa Municipality and Kattankudy DS Division”.

(1) Unit Costs for Construction and Maintenance

The construction and O&M costs estimated by NWSDB for wastewater disposal systems for Batticaloa and Kattankudy in 2008 are summarized in **Table 4.3.1**. The costs is called the project cost including all required expenses, such as general items, engineering services, administration costs, contingencies, escalation, VAT etc. In collection system, pipe installation, pumping station, road reinstatement, force main were included. In treatment and disposal, outfall structure, sludge treatment, and administration buildings were also included.

There were three treatment options for Batticaloa and Kattankudy systems, which was Oxidation Ditch process, Natural Pond system, and long Ocean Outfall with preliminary treatment process. The provision would be made in kattankudy ocean outfall pumping station and outfall structure to cater for the wastewater from Batticaloa Municipality. The combined cost is presented in **Table 4.3.2**.

Table 4.3.1 Estimated Project Costs for Batticaloa and Kattankudy Systems

Batticaloa System

Item	Amount	Unit	LKR. Million	LKR. Million	LKR. Million
Collection system	53	Km	2,037	2,037	2,037
Treatment & disposal					
Oxidation Ditch	7,200	m ³ /d	541		
Natural Pond	7,200	m ³ /d		314	
Ocean Outfall					
Land Acquisition			8	64	
Total			2,586	2,415	
Annual O&M Cost at 2020			23	21	21

Kattankudy System

Item	Amount	Unit	LKR. Million	LKR. Million	LKR. Million
Collection system	50	Km	1814	1814	1814
Treatment & disposal					
Oxidation Ditch	8,800	m ³ /d	1,167		
Natural Pond	8,800	m ³ /d		885	
Ocean Outfall	16,000	m ³ /d			2,399
Land Acquisition			8	91	2
Total			2,989	2,790	4,215
Annual O&M Cost at 2020			27	20	22

Source: Pre-Feasibility Report for providing wastewater disposal systems to Batticaloa Municipality and Kattankudy DS Division

Table 4.3.2 Estimated Total Costs for Batticaloa and Kattankudy Systems

Item	Amount	Unit	LKR. Million	LKR. Million	LKR. Million
Collection system	103	Km	3,851	3,851	3,851
Treatment & disposal					
Oxidation Ditch	16,000	m ³ /d	1,708		
Natural Pond	16,000	m ³ /d		1,199	
Ocean Outfall	16,000	m ³ /d			2,399
Land Acquisition			8	91	2
Total			5,575	5,205	4,215
Annual O&M Cost at 2020			50	41	43

Source: JICA Study Team

Unit rates for construction are calculated from **Table 4.3.2** as follow.

Construction Cost

Collection System	:	LKR. 37,388/Gravity sewer length (m)
Oxidation Ditch Process	:	LKR. 106,750/Treatment Capacity (m ³ /d)
Natural Pond Process	:	LKR. 74,938/Treatment Capacity (m ³ /d)
Ocean outfall	:	LKR. 149,938/Treatment Capacity (m ³ /d)

O&M costs for collection, treatment, and disposal systems

Oxidation Ditch Process	:	LKR. 3,125/m ³
Natural Pond Process	:	LKR. 2,563/m ³
Ocean outfall	:	LKR. 2,500/m ³

Taking into consideration of cost escalation about 30% from 2008 to 2012, and relatively low costs estimated for Oxidation Ditch process, following unit rates are set for trial estimate for calculation of construction and O&M costs for sample cities.

Construction Cost for trial estimation as of 2012

Collection System	:	LKR. 50,000/Gravity sewer length (m)
Oxidation Ditch Process	:	LKR. 400,000/Treatment Capacity (m ³ /d)
Natural Pond Process	:	LKR. 100,000/Treatment Capacity (m ³ /d)
Ocean outfall	:	LKR. 200,000/Treatment Capacity (m ³ /d)

Annual O&M Cost for trial estimate as of 2012

Oxidation Ditch Process	:	LKR. 6,000/Daily wastewater Treated (m ³)
Natural Pond Process	:	LKR. 3,000/ Daily wastewater Treated (m ³)
Ocean outfall	:	LKR. 3,300/ Daily wastewater Treated (m ³)

(2) Trial Estimation for Construction and O&M costs

Trial cost estimate is made for Peliyagoda with ocean outfall, Baticaloa with natural pond process, and Nuwara Eliya with oxidation ditch process as shown in **Table 4.3.3**.

Table 4.3.3 Trial Estimate for Sewerage Systems

Peliyagoda (LKR. Milliom)

Item	Amount	Unit	Unit Rate	Amount
Collection system	54	Km	50/km	2,700
Treatment & disposal				
Ocean Outfall	4,000	m ³ /d	0.2/m ³	800
Land Acquisition	0.25	ha	15/ha	4
Total				3,504
Annual O&M Cost at 2020	4,000	m ³ /d	0.0033/m ³	13

Batticaloa (LKR. Million)

Item	Amount	Unit	Unit Rate	Amount
Collection system	53	Km	50/km	2,650
Treatment & disposal				
Natural Pond	7,200	m ³ /d	0.1/m ³	720
Land Acquisition	8	ha	15/ha	120
Total				3,490
Annual O&M Cost at 2020	7,200	m ³ /d	0.003/m ³	22

Nuwara Eliya (LKR. Million)

Item	Amount	Unit	Unit Rate	Amount
Collection system	20	Km	50/km	1,000
Treatment & disposal				
Oxidation Ditch	2,800	m ³ /d	0.4/m ³	1,120
Land Acquisition	1	ha	15/ha	15
Total				2,135
Annual O&M Cost at 2020	2,800	m ³ /d	0.006/m ³	17

Source: JICA Study Team

Under the current practice, the capital expenditure of all the sewerage project of NWSDB is financed by the grant from the Central Government. Therefore, NWSDB does not need to pay the financial cost (amortization and interest payment). Therefore, if the tariff is at the level enough to cover the direct O&M cost of NWSDB, the cost recovery would be achieved, although, ideally, the depreciation cost had better also been recovered in order to secure the fund for the future replacement cost.

O&M costs derived from Table 4.3.3 is calculated for each city as shown in **Table 4.3.4**.

Table 4.3.4 O&M Costs in Trial Estimate

City	Annual O&M Cost (LKR.)	Annual wastewater Treated (m ³)	Unit O&M Cost (LKR./m ³)
Peliyagoda	13,000,000	1,460,000	8.9
Batticaloa	22,000,000	2,628,000	8.3
Nuwara Eliya	17,000,000	1,022,000	16.6

Source: JICA Study Team

The cost recovery of future NWSDB's sewerage operation depends on the proportion of domestic users versus commercial/industrial users in the sewerage project area, and under the revised tariff structure possible revenue is assumed from LKR.23/m³ to LKR.30/m³ in **Table 5.3.15** and **Table 5.3.16**. Unit O&M costs for the sample 3cities are all below the assumed revenue level, and it can be evaluated that the sewerage development of the above three cities would not affect NWSDB's financial situation adversely under the above various assumptions.

CHAPTER 5 FINANCIAL STATUS OF SEWERAGE SECTOR

5.1 Required Financial Resources to Achieve the Sewerage Coverage Target

The current coverage of sewerage in Sri Lanka is 2.5%. To increase this coverage to 7% in 8 years (2012-2020), about 100,000 population needs to be newly connected to the sewerage system annually, which corresponds to 0.5% of total population. This is not a great target. If this pace of increase of sewerage coverage continues, it will take more than 100 years to increase the sewerage coverage to 50%. Japan achieved the sewerage coverage increase from 12% (1970) to 72% (2008) in 40 years, 1.5-2% increase per annum.

How much capital cost is needed to connect one person to the sewerage system?

According to National Planning Department, unit cost of sewerage is LKR. 500,000 per connection. It is about US\$950 (LKR. 125,750) per capita assuming 4.2 family members in a household. US\$1,000 per capita is a reasonable figure for the unit sewerage investment cost for such a densely populated mega cities like Jakarta, Indonesia, but is not applicable for the local municipalities which are the targets of this survey where the population density is less and the unit cost of sewerage investment will be higher.

The most well progressed modern sewerage projects in Sri Lanka are Ratmalana Moratuwa and Ja/Ekela Wastewater Management Project funded by SIDA which costs LKR. 16,155million and connects 6,290 households and the Kandy City Wastewater Management Project (KCWMP) funded by JICA which costs LKR. 22,591 million) and connects 11,989 households plus 150,000 tourists (equivalent to 50,000 sewerage population) to the newly built sewerage systems. Assuming 4.2 family members in a household, the unit construction costs of both Ratmalana Moratuwa and Ja/Ekela Wastewater Management Project and Kandy City Wastewater Management Project are calculated as LKR. 610,000 per capita and LKR. 225,000 per capita respectively. In this analysis, the unit construction cost of KCWMP, LKR. 225,000, is used.

The required investment amount to connect annually 100,000 populations to sewerage system is calculated as LKR. 22.5 billion per annum, whereas the current capital expenditure budget allocation for NWSDB's sewerage scheme in 2012 is LKR. 4.9 billion. Without the substantial increase of the budget allocation, it would be very difficult to achieve the sewerage coverage target in Mahinda Chintana (7% by 2020). If the budget allocation for NWSDB's sewerage scheme is to increase to LKR. 22.5 billion, the NWSDB annual capital expenditure budget (for both water supply and sewerage) is to increase to LKR. 51 billion compared to the budget allocation in 2012 (LKR. 33 billion).

5.2 Central Government's Financial Condition

5.2.1 National Budget for Sewerage Scheme Implemented by NWSDB

(1) NWSDB's Capital Expenditure Budget

NWSDB's annual capital expenditure budget in 2012 is LKR. 32 billion (¥19 billion). Following the National Policy, NWSDB is prioritizing the piped drinking water supply and 85% of its capital expenditure is allocated to the piped drinking water supply. Only 15% is allocated to sewerage investment.

Table 5.2.1 Capital Expenditure Budget of NWSDB 2010-2012 (LKR. 1,000)

Schemes	2010	2011	2012
	Result	Revised Budget	Estimate
Emergent Small Townships Water Supply Schemes	1,299,980	1,800,000	3,203,200
Large Scale Water Supply & Sanitation Schemes	18,310,076	22,402,900	23,125,000
Tsunami Affected Area Water Supply & Sanitation	2,289,955	1,596,000	1,385,000
Sewerage Schemes	3,191,128	3,350,000	4,930,000
Total	25,091,139	29,148,900	32,643,200

Source: Budget Estimates (Approved by Parliament) 2012 Volume II page 461-467

(2) NWSDB's Sewerage Schemes on the National Budget

Among NWSDB's sewerage schemes on the national budget, two (2) relatively large schemes in Kandy (funded by JICA) and Moratuwa, Ratmalana & Jaela Ekala (Funded by SIDA) occupies the largest share (67% of total capital expenditure for sewerage during 2011-2014). The ADB funded Greater Colombo Sewerage Rehabilitation Project is mainly executed by Colombo Municipality Council (CMC) but there are areas which are outside of CMC area but are connected to the Greater Colombo Sewerage System and operated by NWSDB, where NWSDB is also the executing agency of the ADB funded Project.

Another interesting project is Global Partnership for Output Based Aid (GPOBA) funded Increasing Household Access to Sewerage Services Project. GPOBA is a partnership of donors and international organizations working together to support the delivery of basic services in developing countries using results-based financing approaches. Output Based Aid (OBA) is a results-based mechanism to increase access to basic services—such as infrastructure, healthcare, and education—for the poor in developing countries. OBA is used in cases where poor people are being excluded from basic services because they cannot afford to pay the full cost of user fees such as connection fees. In this project, the poor residents in the existing and the new sewerage service areas of NWSDB will be provided the grant assistance for their cost of house connection to the sewers which normally costs US\$300-500 per connection.

Other sewerage projects on the national budget are, Rehabilitation & Upgrading of Southern Catchments of Greater Colombo funded by Austria (completed) and three (3) China funded projects (Galle Sewerage Project, Maharagama-Boralesgamuwa Sewerage Project, Hospital Sewerage System Improvement Project) (under negotiation).

Table 5.2.2 Sewerage Schemes on the Budget Estimate of NWSDB 2012 (LKR. 1,000)

Sewerage Schemes	2010	2011	2012	2013	2014	2011-2014
	Result	Revised Budget	Estimate	Projections		Total
Disposal System for Kandy Municipal Area (GOSL-JICA)	112,014	627,000	1,750,000	1,500,000	1,850,000	5,727,000
Greater Colombo Sewerage Rehabilitation (GOSL-ADB)	15,000	3,000	130,000	481,000	228,000	842,000
Waste Water Disposal System to Moratuwa, Ratmalana & Jaala Ekala (GOSL-SIDA)	2,828,190	2,650,000	2,600,000	2,528,000	1,550,000	9,328,000
Rehabilitation & Upgrading of Southern Catchments of Greater Colombo (GOSL-Austria)	235,925	30,000				30,000
GPOBA funded project for Increasing Household Access to Sewerage Services (GOSL-World Bank)		40,000	150,000	285,000	230,000	705,000
Galle Sewerage Project(China)			100,000	1,000,000	1,500,000	2,600,000
Maharagama -Boralesgamuwa Sewerage Project (China)			100,000	150,000	300,000	550,000
Hospital Sewerage System Improvement (China)			100,000	1,000,000	1,500,000	2,600,000
Total Expenditure	3,191,128	3,350,000	4,930,000	6,944,000	7,158,000	22,382,000

Source: Budget Estimates (Approved by Parliament) 2012 Volume II page 467

5.2.2 National Budget for Sewerage Scheme Other than Those of NWSDB (CMC Portion of the Greater Colombo Wastewater Management Project)

The major part of the Greater Colombo Wastewater Management Project funded by ADB is being implemented and operated by Colombo Municipality Council, not by NWSDB. The budget for this project is included in the budget of Ministry of Local Government and Provincial Council as follows.

Table 5.2.3 Sewerage Scheme on the Budget Estimate of MOLG 2012 (LKR. 1,000)

Sewerage Scheme	2010	2011	2012	2013	2014	2011-2014
	Result	Revised Budget	Estimate	Projections		Total
Greater Colombo Sewerage Rehabilitation (GOSL-ADB)	11,758	685,000	950,000	1,665,000	2,225,000	5,525,000

Source: Budget Estimates (Approved by Parliament) 2012 Volume I page 256

5.2.3 Limitation of GOSL's Available Financial Resources for Sewerage Investment

Under the current financial arrangement for sewerage projects in Sri Lanka, all the sewerage investment will be funded by the grant from the Central Government's capital expenditure budget. Therefore, the size of the capital budget of GOSL and its sectorial allocation determines the size of the possible investment for sewerage.

The size of GOSL's capital expenditure budget is determined by the fiscal balance of GOSL. Since GOSL's revenue is just good enough to cover the current expenditure, the capital expenditure of GOSL is almost entirely financed by borrowing from domestic or foreign

sources which is almost equivalent to the budget deficit. The budget deficit needs to be contained within the reasonable percentage of GDP, otherwise the management of public debt would become uncontrollable. Currently, the target of the budget deficit of GOSL in 2012 is set as 6.25% of GDP which is about LKR. 470 billion. Accordingly, the size limit of GOSL's capital expenditure budget is considered to be about LKR.500billion (¥297 billion).

Table 5.2.4 Fiscal Balance of Government of Sri Lanka (2010-2012)

Items	2010	2011		2012
	Result	Approved Estimates	Provisional	Approved Estimates
LKR. million				
Total revenue and grants	834,188	985,920	949,917	1,126,081
Total revenue	817,279	963,320	934,776	1,106,081
Tax revenue	724,747	861,943	812,611	1,000,559
Non tax revenue	92,532	101,377	122,166	105,522
Grants	16,909	22,600	115,141	20,000
Expenditure and lending minus repayments	1,280,205	1,419,664	1,400,097	1,594,946
Current	937,094	1,017,155	1,006,633	1,107,902
Capital and net lending	343,111	402,509	393,465	487,044
o/w Public investment	356,519	413,546	407,488	497,465
Overall fiscal surplus (+)/deficit (-)	-446,017	-433,744	-450,180	-468,865
Financing	446,017	433,744	450,180	468,865
Foreign financing	243,788	143,750	218,956	197,264
Domestic financing	202,229	289,994	231,224	271,602

Source: Central Bank of Sri Lanka Annual Report-2011 P.128 Table 6.1

All capital expenditure requirements of 54ministries of GOSL should be accommodated within this limit. Out of LKR. 541 billion capital expenditure budget of GOSL 2012, LKR. 434 billion (80%) is allocated for eight (8) ministries. Ministry of Water Supply and Drainage, under which NWSDB budget is included, is one of these large spending ministries.

Table 5.2.5 Capital Expenditure of GOSL by Ministries (National Budget 2012)

Ministry	2010	2011	2012	2013	2014
		Revised	Estimate	Projections	
LKR. million					
Ports and Highways	111,831	131,688	144,367	153,916	86,002
Economic Development	45,055	65,357	86,023	91,727	92,895
Transport	14,407	30,211	40,000	68,291	32,857
Local Government and Provincial Councils	28,601	32,340	34,714	43,281	51,112
Water Supply and Drainage	26,302	29,512	33,000	47,065	53,731
Irrigation And Water Resources Management	8,540	21,018	32,500	54,492	55,447
Power and Energy	25,284	32,720	32,500	47,195	34,112
Finance and Planning	10,528	19,036	30,724	9,004	7,020
Other 46 ministries	71,932	106,915	107,172	132,955	137,919
Total	342,480	468,797	541,000	647,928	551,095

Source: 4.4GOVERNMENT EXPENDITURE BY MINISTRY/INSTITUTION, BUDGET ESTIMATES (Approved by Parliament 2012 VOLUME 1 Page XXXI-XXXV)

Can NWSDB increase its share in the GOSL's capital expenditure budget and increase their allocation to sewerage scheme so that the sewerage coverage target in Mahinda Chintana (7% by 2020) can be achieved?

It depends on the competition with other large users like Road Authority, Port Authority and CEB. **Table 5.2.6** is the list of large projects (projects for which more than LKR. 10 billion is allocated during 2011-2014), which is completing and starting during 2012-2014. Some large projects are completing but some are starting. In order to increase the share of sewerage investment in the national budget in this competitive situation, the comprehensive review of the GOSL's public investment program and strong prioritization of sewerage investment above others is needed. In other words, it would be difficult to achieve the sewerage coverage target in Mahinda Chintana by 'business as usually' approach.

Table 5.2.6 Large Projects Completed and Started (2012-2014)

Sector	Large Projects completing in 2012-2014	Large Projects starting in 2012-2014
Port	-Colombo Port Expansion Project-South Break Water (15,805) -Development of Service Port Hambantota (18,453)	-Development of Service Port Hambantota Phase II (33,500)
Highway	-Southern Transport Development Project (35,636) -Colombo-Katunayake Expressway (26,050) -National Highway Sector Project(ADB) (11,220) -Improvement of National Road Network in Northern Provinces (China) (50,842) -Northern Road Connectivity Project (ADB) (11,665)	-Rehabilitation & Improvement of Priority Roads Project II (China) (28,500)
Economic Development	-Development of Infrastructure (Conflict Affected Region Emergency Project) (ADB) (18,502)	-Divineguma Programme (22,215) - Sabaragamuwa Arunalokaya(11,000) - Rajarata Nawodaya (10,768) - Kandurata Udanaya(10,675) - Wayamba Pubuduwa(10,094) - Pubudamu Wellassa(10,049) - Batahira Ran Aruna(11,308) - Ruhunu Udanaya(11,070)
Transport	-	-Matara-Beliatta-Kataragama-New Rail Line (35,110)
Water Supply and Drainage	-	-Jaffna Kilinochchi Water Supply and sanitation (ADB)(11,785)
Power and Energy	-Upper Kotomale Hydropower Project (10,490)	-Clean Energy Access Improvement Part 4 (ADB) (14,967)

Source: JICA Study Team picked up data from the relevant chapters in Budget Estimates 2012

5.3 NWSDB's Financial Condition

The next question would be whether NWSDB's drinking water supply operation is yielding enough surpluses to cross-subsidize its sewerage operation, to supplement the limited Central Government's budget for sewerage schemes.

5.3.1 Recent Performance of NWSDB as a Water Utility

Since the major portion of NWSDB revenue comes from water supply operation, the key performance indicators of NWSDB's water supply operations are reviewed. **Table 5.3.1** shows that the increase of connection and the reduction of NRW contributed to the increase of the water sales volume as well as the sales revenue of water in 2011. On the other hand, the decrease of staff/1,000 connection contributed to the containment of the direct operating expenses and overhead cost.

Table 5.3.1 Performance Indicators of NWSDB's Water Supply Operation

	2008	2009	2010	2011	Variation 2010-2011
Number of connections	1,186,931	1,266,328	1,353,573	1,455,677	7.1%
Piped water production (million cu.m.)	440	449	469	490	4.5%
Piped water sales volume (million cu.m.)			321	342	6.5%
NRW (%)	32.13	31.07	31.56	30.20	-3.8%
Total Staff/1,000 connections	7.59	7.16	6.66	6.35	-4.7%
Sales revenue of water (LKR. million)	6,743	9,670	10,744	11,616	8.1%
Direct Operating Expenses + Overhead cost (LKR. million)	7,984	8,384	9,626	9,917	3.0%

Source: JICA Study Team from NWSDB Annual Report 2009 (published), 2010(not yet published), 2011(not yet published), NWSDB Financial Statements for the year ended 31.12.2011 (Not yet published)

NWSDB is a nation-wide water utility which is very unique existence in Asia. In most of Asian countries, each urban municipality has each water utility and the nation-wide water utility such as NWSDB does not exist. It is, therefore, not easy to compare the performance of NWSDB to the performances of other water utilities. **Table 5.3.2** and **Table 5.3.3** are performance indicators of Pnom Phen Water and Sewerage Authority (PPWSA) which is a public utility which operates water supply service in the capital city of Cambodia and Manila Water Company which is a private utility which operates water supply and sewerage service in the East Zone of the capital city of the Philippines. Those two water utilities are considered as the most well performing water utilities in the developing Asia. The most notable difference exists in the reduction of NRW. Both PPWSA and Manila Water Company succeeded to reduce NRW from 60-70% to 8-16% in 10 years. That makes them as the best performing water utilities in the developing Asia.

Compared to those two best performing utilities, the achievement of NWSDB's NRW reduction should be described as 'mediocre' at best. Especially, in the central Colombo area, which is comparable to the service area of PPWSA and Manila Water Company, the NRW remains as high as 50%. By this comparison, we can conclude that the highest propriety should be given to the reduction of NRW in the NWSDB's strategy for improvement.

It should be noted that in both cases of PPWSB and Manila Water Company, the reduction of NRW was achieved by the independent management from the government (more concretely, the management of the utility can hire and fire its employees and can decide their salaries by himself), the decentralization of the decision making to the field offices and the introduction of incentive and penalty system. In case of Manila Water Company, the service area is divided into 8 business zones and each zone manager is given the authority to conduct necessary investment for NRW reduction, depending on its amount, without obtaining the approval of the head office. The staffs and workers of the zone office which achieved the NRW reduction target was paid more salary than those who failed to achieve the target.

Table 5.3.2 Performance Indicators of Pnom Phen Water and Sewerage Authority

Items	1993	2006
Employee/1,000 connections	22	4
Supply capacity (m ³ /day)	65,000	235,000
Service coverage	25%	90%
Water supply hours/day	10	24
Water supply pressure (Av.)	0.2kg/cm ²	2.5kg/cm ²
NRW ratio	72%	8%
Rate of water tariff collected	48%	99.9%

Source: JICA Study Team

Table 5.3.3 Performance Indicators of Manila Water Company

Items	1997	2010
Served population	3Million	6.1 Million
Percentage of population with 24 hour supply	26%	99%
NRW ratio	63%	16%
Employee/1,000 connections	9.8	1.4

Source: JICA Study Team

5.3.2 NWSDB Corporate Plan 2012-2016

NWSDB's Corporate Plan 2012-2016 was created based on the Five Year Business Plan 2011-2015 which was developed by Merchant Bank of Sri Lanka PLC under the JICA's technical assistance.

Corporate Plan 2012-2016 sets targets as the following two (2) tables. Please note that the sewerage coverage target is strangely low.

Emphasis is put rightly on the reduction of NRW in Colombo city (9.4% reduction in five (5) years.

Table 5.3.4 Planned Water Supply & Sewerage Coverage 2012-2016

Item	2011	2012	2013	2014	2015	2016
Overall Pipe borne water supply connected coverage (%)	43.5%	45.2%	47.0%	48.8%	50.6%	52.4%
NWSDB pipe borne water supply connected coverage (%)	33.0%	34.5%	36.0%	37.4%	38.9%	40.4%
Pipe borne sewerage coverage (1000 population)	480	506	532	559	586	614
Pipe borne sewerage coverage (%)	2.3%	2.4%	2.5%	2.6%	2.7%	2.8%

Source: NWSDB Corporate Plan 2012-2016 p.7

Table 5.3.5 Expected % of NRW to be Achieved 2012-2016

Item	2012	2013	2014	2015	2016
Colombo Municipality (CMC)	47.4%	43.0%	41.0%	40.0%	38.0%
Western Central (incl. CMC)	34.9%	32.1%	30.7%	30.0%	28.6%
Island wide	29.5%	29.0%	28.5%	27.2%	26.0%

Source: NWSDB Corporate Plan 2012-2016 p.11

5.3.3 Financial Condition of NWSDB

The financial performance of NWSDB was improved in 2011. Since the water tariff has not been raised since March 2009, this improvement was achieved by the increase of water sales and the stringent control of costs.

If you look at the Balance Sheet and the Cash Flow of NWSDB, however, you may find that the amounts of 'Loan Capital Payable' in 'Short Term Liabilities' in the Balance Sheet for year 2009, 2010 and 2011 are LKR. 2,256, 2,363 and 2,688 million respectively. On the other hand, the amounts of 'Loan Repayment' in the Cash Flow for year 2009, 2010 and 2011 are only LKR. 17, 850 and 665 million respectively. This implies that, in recent years, NWSDB failed to repay the large part of its loan repayment obligation (about LKR. 2,500 million per year) to GOSL.

The cash flow also reveals that almost all capital investment is financed by either the grant or the loan from GOSL and NWSDB hardly manage to cover a part of the investment by its own cash generation.

Table 5.3.6 NWSDB Profit and Loss 2008-2011 (LKR. million)

Item	2008	2009	2010	2011
Sale of Water	6,743	9,670	10,744	11,616
▲ Direct Operating Expenses	▲ 6,089	▲ 6,322	▲ 7,062	▲ 7,470
Operating Profit on Sale of Water	654	3,348	3,682	4,156
Other Operating Income	1,391	1,397	1,566	2,082
▲ Administration Overhead	▲ 1,895	▲ 2,062	▲ 2,564	▲ 2,447
▲ Depreciation	▲ 1,398	▲ 1,410	▲ 3,258	▲ 1,769
▲ Other Operating Expenses	▲ 468	▲ 1,089	▲ 269	▲ 250
Profit and Loss from Operating Activities	▲ 1,715	184	▲ 842	1,761
Revaluation Deficit			▲ 3,684	▲ 474
▲ Finance Cost	▲ 1,192	▲ 1,569	▲ 1,419	▲ 943
Non-operating Income	60	49	98	131
Profit and Loss from Ordinary Activities before Tax	▲ 2,848	▲ 1,336	▲ 5,849	474
▲ Taxation-Economic Service Charge	▲ 67	▲ 89	▲ 105	▲ 53
Net Profit and Loss for the year	▲ 2,914	▲ 1,425	▲ 5,955	421

Source: NWSDB Annual Report 2009 (published) NWSDB Financial Statements for the year ended 31.12.2011 (not yet published)

Table 5.3.7 Balance Sheet of NWSDB 2008-2011

	2008	2009	2010	2011
Current Asset	15,190	13,461	14,985	14,479
Fixed Asset	115,632	135,978	149,210	178,291
Property, Plant & Equipment. Net - At cost	55,197	63,086	73,666	84,271
Capital Work in Progress	60,344	72,815	75,479	93,973
Total Asset	130,822	149,439	164,195	192,770
Short Term Liabilities	5,315	7,379	9,337	10,586
Loan Capital Payable	1,411	2,256	2,363	2,688
Loan Interest Payable	1,457	1,896	3,157	2,465
Long Term Liabilities	20,280	23,325	26,476	31,474
Long-term loan	18,113	20,137	23,071	27,839
Capital and Reserves	105,227	118,735	128,380	150,711
Equity Capital / government Grant	54,560	58,446	62,618	69,440
Capital Grants	56,142	67,190	78,620	94,203
Accumulated Profit/(Loss)	-7,804	-9,560	-15,588	-16,172
Total Equity and Liabilities	130,822	149,439	164,193	192,771

Source: NWSDB Annual Report 2009 (published) NWSDB Financial Statements for the year ended 31.12.2011 (not yet published)

Table 5.3.8 Cash Flow of NWSDB 2008-2011

	2008	2009	2010	2011
Net Profit/ (Loss) before Tax	▲ 2,848	▲ 1,336	▲ 5,850	474
Depreciation	1,398	1,410	3,259	1,769
Revaluation Loss	-	-	3,684	474
retiring Gratuity Provision	391	1,013	220	217
Interest Expense	1,193	1,569	1,419	943
Other adjustment before working capital change	▲ 60	▲ 62	▲ 101	▲ 626
Change of Inventories, etc.	▲ 308	2,320	54	2,245
Cash Generated from Operations	▲ 235	4,914	2,688	5,496
▲ Tax etc.	▲ 2,881	▲ 1,408	▲ 1,621	▲ 234
Net Cash from Operating Activities	▲ 3,115	3,506	1,064	5,262
Investment in Fixed Asset	17,838	21,768	19,739	30,830
Other Investment	▲ 511	▲ 195	192	223
Investment	17,327	21,573	9,931	31,053
Equity Capital / Government Grant during the period – Net	8,994	5,084	5,537	6,822
Foreign Grant/ Capital Grant during the period - Net	10,072	11,520	11,430	15,583
New Loans	2,651	2,886	3,891	5,759
Loan Repayments	▲ 351	▲ 17	▲ 850	▲ 665
Loan Interest paid	▲ 586	▲ 1,604	▲ 606	▲ 2,154
Financing	20,780	17,869	19,402	25,345
Net Increase of Cash	338	▲ 198	535	▲ 446

Source: NWSDB Annual Report 2009 (published) NWSDB Financial Statements for the year ended 31.12.2011 (not yet published)

5.3.4 NWSDB's Operating Cost and Debt Service Obligation

As explained in the above Section 5.3.3, NWSDB was not fulfilling its debt service obligation fully to GOSL in the recent years. NWSDB's Profit and Loss statement contained some irregularities in Depreciation and Revaluation items and, therefore, is not easy to understand. To understand the situation in more easy way, JICA Study Team made **Table 5.3.9** in which, non cash items, Depreciation and Revaluation, are excluded from the Profit and Loss table and the Scheduled Debt Payment (Principal) as shown in 'Loan Capital Payable' in 'Short Term Liabilities' of the Balance Sheet is added.

This table reveals that, during 2008-2010, NWSDB's combined total of its operating cost and the scheduled debt repayment has exceeded its revenue (Sale of Water + Other Operating Income). In another words, NWSDB's financial condition in the past years have not allowed NWSDB to fulfil its debt service (interest + principal) obligation to GOSL. The tariff revisions of both water tariff and sewerage tariff are imminent.

Table 5.3.9 NWSDB's Operation Cost + Scheduled Debt Service (Principal) (Loan Capital Payable at the beginning of the year) 2008-2011 (LKR. million)

	2008	2009	2010	2011
NWSDB's Operating Cost				
Direct Operating Expenses	6,089	6,322	7,062	7,470
Personnel Cost	2,663	2,830	3,347	3,345
Pumping Cost	2,105	2,026	2,104	2,417
Chemicals	436	422	413	427
Repairs & Maintenance	455	486	560	582
Establishment Expenses	213	230	249	272
Rent, Rates, Taxes, Security & Other Expenses	247	329	389	427

	2008	2009	2010	2011
NWSDB's Operating Cost				
Administration Overheads	1,895	2,062	2,565	2,447
Personnel Cost	1,327	1,501	1,896	1,814
Repairs & Maintenance	69	88	111	96
Establishment Expenses	269	293	347	339
Rent, Rates, Taxes, Security & Other Expenses	230	179	211	198
Other Operating Expenses (excluding non-cash expense such as Depreciation and Revaluation Deficit)	467	1,088	269	250
Finance Cost (Interest)	1,192	1,569	1,419	943
Loan Capital Payable at the beginning of the year	699	1,411	2,256	2,363
Total (Operating Cost + Scheduled Debt Payment (Principals))	10,342	12,452	13,571	13,473
(Ref) NWSDB's Sale of Water + Other Operating Income	8,134	11,067	12,310	13,698

Source: JICA Study Team based on the information in NWSDB Annual Report 2008, 2009 and Financial Statement 2011

5.3.5 Sewerage Tariff Revision

The sewerage tariff of NWSDB was introduced in March 2008 and revised in December 2011, which has become effective on January 2012. The sewerage tariff before the revision and the revised tariff are shown in **Table 5.3.10** and **Table 5.3.11**. NWSDB sewerage tariff is applied for the all NWSDB operated sewerage systems. NWSDB sewerage tariff is not applied for Kandy sewerage system which will be operated by KMC and the CMC portion of the Greater Colombo sewerage system which will be operated by CMC.

Table 5.3.10 Sewerage Tariff before the Revision (Effective March, 200)

Domestic Sewerage Tariff		
Usage Tariff		Service Charge (Fixed LKR. /Connection)
Monthly Water Consumption (Cum)	Tariff (LKR. per Cum)	
1-10	1.00	0
11-15	1.50	0
16-20	2.00	0
21-25	2.50	0
26-30	4.00	0
31-40	6.00	0
41-50	8.00	0
>50	10.00	0

Commercial Sewerage Tariff	
Usage Tariff	
Monthly Water Consumption (Cum)	Tariff (LKR. /Cum)
1-10,000	12
>10,000	15

Industrial Sewerage Tariff	
Usage Tariff	
Monthly Water Consumption (Cum)	Tariff (LKR. /Cum)
1-10,000	12
>10,000	15

Table 5.3.11 New Sewerage Tariff Effective January, 2012

Domestic Sewerage Tariff		
Usage Tariff		Service Charge (Fixed LKR. /Connection)
Monthly Water Consumption (Cum)	Tariff (LKR. per Cum)	
1-10	1.00	200.00
11-15	1.50	200.00
16-20	2.00	200.00
21-25	2.50	200.00
26-30	4.00	200.00
31-40	6.00	200.00
41-50	8.00	200.00
>50	10.00	200.00

Commercial Sewerage Tariff	
Usage Tariff	
Tariff (LKR. per Cum)	
	40.00

Industrial Sewerage Tariff	
Usage Tariff	
Tariff (LKR. per Cum)	
	65.00

Source: GOSL's Gazette No.1738/7 Dec. 28, 2011

By this revision, the bill value of the average users is increased by 10 times for domestic users, 3.3 times for commercial users and 5.1 times for industrial users.

Table 5.3.12 Bill Value before and after the Tariff Revision

Category	Assumed Avg. Consumption (m ³ /month)	Bill Value/ (LKR. Per month)	
		Before tariff revision	After tariff revision
Domestic	15	22.50	222.50
Commercial	30	360.00	1,200.00
Industrial	100	1,200.00	6,500.00

Source: NWSDB's Report on Revision of Sewerage Tariff for Domestic, Commercial and Industries for the Full Treatment of Wastewater obtained from NWSDB Sewerage Department

Is the revised sewerage tariff enough to cover the O&M cost of NWSDB sewerage operation?

Under the current practice, the capital expenditure of all the sewerage project of NWSDB is financed by the grant from the Central Government. Therefore, NWSDB does not need to pay the financial cost (amortization and interest payment). Therefore, if the tariff is at the level enough to cover the direct O&M cost of NWSDB, the cost recovery would be achieved, although, ideally, the depreciation cost had better also been recovered in order to secure the fund for the future replacement cost.

What is the direct O&M cost of NWSDB's sewerage operation? It is a difficult question, since NWSDB has no experience of the O&M of the modern sewerage project with substantial scale.

Average incremental cost (AIC) of Kandy City Wastewater Management Project (KCWMP), which is the direct O&M cost of KCWMP, which does not include the depreciation cost, was

estimated as LKR. 20/m³ at 2006 price. (Table 8.17 P.67 of Sri Lanka JBIC Water Sector Development Project Special Assistance for Project Implementation (SAPI) Draft Final Report September 2006). Taking into consideration the inflation in Sri Lanka during 2006-2012 as shown below, the AIC of KCWMP in 2012 price is estimated as LKR. 35.74/m³.

Table 5.3.13 Inflation in Sri Lanka 2006-2012

Year	2006	2007	2008	2009	2010	2011	2012
Inflation rate (%)	10.02	15.84	22.39	3.47	6.22	6.72	7.48
Price (2006=100)	100.00	115.84	141.78	146.70	155.82	166.29	178.73

Source: IMF World Economic Outlook Database, April 2012

NWSDB's new sewerage tariff for commercial users (LKR. 40 /m³) and industrial users (LKR. 65 /m³) exceeds KCWDP's direct OM cost (LKR. 35.47). The average billing value/m³ of domestic users (LKR. 222.50 ÷ 15 m³ = LKR. 14.8) is below KCWDP's direct O&M cost. Therefore, the cost recovery of future NWSDB's sewerage operation depends on the proportion of domestic users versus commercial/industrial users in the sewerage project area.

(Case-A) Assuming that the average water consumption per month is 15 m³ for domestic, 30 m³ for commercial, 100 m³ for industrial and the share of domestic users 80%, commercial users 16% and industrial users 4%, the average sewerage tariff revenue/m³ is LKR. 30.3/m³ which is 85% recovery of the direct O&M cost (LKR. 35.47).

(Case-B) Assuming that the average water consumption per month is 15 m³ for domestic, 30 m³ for commercial, 100 m³ for industrial and the share of domestic users 90%, commercial users 8% and industrial users 2%, the average sewerage tariff revenue/ m³ is LKR. 23.8/ m³ which is 67% recovery of the direct O&M cost (LKR. 35.47).

Table 5.3.14 Case A - Commercial/Industrial Connection : 20%

	Assumed Connection (Numbers)	Assumed Consumption (m ³ /month)	Bill value/month	Average tariff revenue/ m ³
Domestic	80	15×80	17,760	14.80
Commercial	16	30×16	19,200	40.00
Industrial	4	100×4	26,000	65.00
Total	100	2,080	62,960	30.27

Source: JICA Study Team

Table 5.3.15 Case B - Commercial/Industrial Connection : 10%

	Assumed Connection (Numbers)	Assumed Consumption (m ³ /month)	Bill value/month	Average tariff revenue/ m ³
Domestic	90	15×90	19,980	14.80
Commercial	8	30×8	9,600	40.00
Industrial	2	100×2	13,000	65.00
Total	100	1,790	42,580	23.79

Source: JICA Study Team

The following table is the comparison of wastewater tariff (household, commercial customers) in developing Asian countries, UK and Japan. NWSDB's wastewater tariff for household is higher than those in Jakarta, Manila, Hanoi and New Delhi. NWSDB's wastewater tariff for commercial customers are lower than those in Jakarta, Manila and New Delhi, but higher than Malaysia and Hanoi.

In Manila, the Philippines, environmental charge is charged to all the households and commercial buildings, regardless whether the house or the building is connected to the sewerage system or not, in addition to the sewerage tariff which is charged to those who is connected to the sewerage system. For those who are not connected to the sewerage system, Manila Water Company provides de-sludging services for their septic tanks. In Hanoi and other cities in Vietnam, the environmental charge (10% of water tariff) is charged to all the households who are not connected to the sewerage system once the sewerage system is introduced in some part of the city. In Singapore, in addition to the waterborne fee which is charged based on the water usage, the Sanitary Appliance Fee is charged as a fixed component based on the number of sanitary fittings in each premise. In Malaysia, IWK charges the Connected Sewerage Service Charges to those who are connected to the sewerage system and the Individual Septic Tank Services Charge, which is lower than the Connected Sewerage Service Charge, to those who are not connected to the sewerage system. IWK provides de-sludging service of septic tanks to those who are not connected to the sewerage system.

Table 5.3.16 Comparison of Wastewater Tariff (Household) among Developing Asian Countries, UK and Japan

Country/City (implementation agency)	Water volume per month from household (domestic) customer for which the price is applied (assumed water usage 15 m ³ /month)	Wastewater tariff per m ³ (local currency)	Wastewater tariff per m ³ (USD)
Jakarta (PD PAL JAYA)	Average household customers	471 IDR	0.050
Manila (Manila Water)	Residential Environmental Charge (20% of Water Charge) is applicable to all customers regardless whether he/she is connected to the sewerage system or not.	Sewerage Charge-0.000 Peso Environmental Charge-2.101 Peso Total-2.101 Peso	SC-0.00 EC-0.050 Total-0.050
Malaysia (IWK)	Domestic Residential customers and government quarters will now pay fixed charges which are no longer linked to water usage. Connected Sewerage Services -8 Ringgit/month Individual Septic Tank Services -6 Ringgit/month	Connected Sewerage Services-0.533 Ringgit Individual Septic Tank Services-0.400 Ringgit	Connected Sewerage Services-0.169 Individual Septic Tank Services-0.127
Sri Lanka (NWSDB)	Domestic	14.83 LKR.	0.112
Hanoi (HSDC)	Domestic up to 16 m ³ Wastewater tariff in Hanoi is 10% of water charge. 10% of water charge is also charged as 'environmental charge' to all the households who are not connected to the sewers.	400 VND	0.02 (sewerage tariff or environmental charge)

Country/City (implementation agency)	Water volume per month from household (domestic) customer for which the price is applied (assumed water usage 15 m ³ /month)	Wastewater tariff per m ³ (local currency)	Wastewater tariff per m ³ (USD)
Singapore (PUB)	Domestic The Sanitary Appliance Fee is a fixed component based on the number of sanitary fittings in each premise whereas the Waterborne Fee is charged based on the volume of water used in any premises.	Waterborne Fee-\$0.3 Sanitary Appliance Fee-\$0.2 Total-\$0.5	WF-0.239 SAF-0.159 Total-0.398
New Delhi	Domestic 10-20 m ³	Rs.2.178	0.039
London (Thames Water)	All customers	64.73 pence	1.011
Yokohama (Japan)	All customers 15 m ³	¥84	1.071

Source :JICA Study Team

Table 5.3.17 Comparison of Wastewater Tariff (Commercial) among Developing Asian Countries, UK and Japan

Country/City (implementation agency)	Water volume per month from commercial customer for which the price is applied (assumed water usage 200 m ³ /month)	Wastewater tariff per m ³ (local currency)	Wastewater tariff per m ³ (USD)
Jakarta (PD PAL JAYA)	Average non-household customers	4,557 IDR	0.482
Manila (Manila Water)	Business 200m ³ Environmental Charge (20% of Water Charge) is applicable to all customers regardless whether he/she is connected the sewerage system or not.	Sewerage Charge-13.40 Peso Environmental Charge-8.93 Peso Total-22.33 Peso	SC-0.320 EC-0.213 Total-0.533
Malaysia (IWK)	More than 200m ³	0.45Ringgit	0.148
Sri Lanka (NWSDB)	Commercial	40 LKR.	0.317
Hanoi (HSDC)	Industry Facility	750 VND	0.036
Singapore (PUB)	Non-domestic	\$0.6	0.477
New Delhi	Commercial/Industrial more than 100 m ³	Rs. 72.6	1.312
London (Thames Water)	All customers	64.73 pence	1.011
Yokohama (Japan)	All customers 200 m ³	¥ 214	2.683

Source: JICA Study Team

5.3.6 Proposed Water Tariff Increase

JICA Study Team learnt that NWSDB proposed the new Water Tariff Revision to the Ministry of Water Supply and Drainage. As of September 24, 2012, NWSDB's water tariff revision proposal has not been approved by the Cabinet. There is un-confirmed information, however, that the water tariff would be raised by 5-20% effective as of October 1, 2012.

5.3.7 Financial Projection of NWSDB

There is a book titled 'Five Year Business Plan 2011-2015' which the JICA Study Team obtained from the Corporate Planning Department of NWSDB which was prepared by Merchant Bank of Sri Lanka PLC. The Executive Summary of 'Five Year Business Plan 2011-2015' includes some projection tables on such items as follows.

- Future Capital Investment Portfolio for Water Supply & Sewerage Sector

- Debt Repayment, Revenue Allocation for Annual Loan Repayments
- Coverage (5) Trend Comparison
- Trend of Revenue Increment

However, it does not include the comprehensive financial projection for the future NWSDB (Profit and Loss, Balance Sheet, etc.) which is essential to make a good business plan. JICA Survey Team considers that this is due to the lack of the concept of financial management in the NWSDB management. NWSDB is largely engineer oriented organization. The current Financial Department of NWSDB is busy in day to day accounting of financial transactions and its reporting, and lacks the capacity to manage the financing of NWSDB from the long-term view point.

In this connection, the JICA proposed support for planning activities such as assistance for business planning and corporate planning, which is mentioned in M/D on SPL-93, should be revitalized.

Among donors other than JICA, ADB is the only institution which is likely to make serious effort to analyse the financial condition of NWSDB and to make financial projection of NWSDB. ADB mission including a financial analyst visited Sri Lanka in late July. JICA Study Team contacted with the ADB mission and the ADB's financial analyst agreed to provide its report on NWSDB's financial condition after it is finalized.

5.3.8 NWSDB's Financial Capacity to Cross Subsidies the Sewerage Operation

Although NWSDB's financial performance has improved in 2011, it is not enough to self-finance the rehabilitation of its water assets. Therefore, it is far beyond the NWSDB's financial capacity to cross subsidies its sewerage operation. Since there still remains large numbers of the un-served population of piped water supply service, any financial surplus of water supply operation, if any, should be used for the water supply operation. Therefore, it is the most important for NWSDB revenue from the sewerage operation to cover the operation and maintenance cost of the sewerage operation fully. Otherwise, the deficit of the sewerage operation would diversely affect the soundness of its water supply operation. To ensure such financial arrangement, it is necessary to separate the financial account of the sewerage operation from its water supply operation account.

In the recent NWSDB's Annual Report and Financial Statement, 'Segmental Gross Profit', in which the 'Water Service', 'Sewerage' and 'Ground Water' operations are shown separately. The 'Sewerage' segment shown in the Financial Statements for the year ended 31. 12. 2011 is as follows. The segmental gross profit 2011 of NWSDB's sewerage operation shows deficit. However, the sewerage tariff was revised effective on January 2012 and the billing value is expected to increase 3-10 times depending on the user category. The new tariff is close to fully

recover the direct cost of the sewerage operation depending on the proportion of user types. Therefore, it may not pose a serious threat to the financial performance of NWSDB. It should also be noted that NWSDB is gaining revenue from not only the sewerage tariff but also from the O&M services for the wastewater treatment facilities of industrial estates, housing complex, etc.

NWSDB admits that the current 'Segmental Gross Profit' is not the accurate accounting. The JICA Survey Team was informed that NWSDB is currently working to establish the formal separate accounting of its sewerage operation starting from this year. If such accounting system is in place, the financial discipline of NWSDB's sewerage operation will be improved.

Table 5.3.18 Segmental Gross Profit -31.12.2011 of NWSDB's Sewerage Operation (LKR.)

Item		Sewerage
Gross Income		
Sales		
	Metered Sales	26,677,208
Other Income		124,273,382
		150,950,590
Less : Direct Cost		
Personel Cost		
	Permanent	125,713,754
	Casual	1,644,346
Pumping Cost		20,525,189
Chemical Cost		4,304,671
Repairs & Maintenance		10,424,846
Establishment Expenses		8,497,636
Rent, Rates, Taxes, etc.		12,968,828
		184,079,270
Gross Profit for the Year		-33,128,680

Source: NWSDB Financial Statement 2011

5.4 Local Government's Financial Condition

5.4.1 Available Financial Resources for Local Governments

Sri Lanka's national tax revenue was LKR. 812,611 Million and the total local tax revenue was LKR. 36,014 Million, and the total of national tax revenue and the local tax revenue was LKR. 848,625 Million in 2011. GOSL transferred LKR. 94,602 Million to provincial councils as the block grant to support their activities. Thus, for the local governments of Sri Lanka (provincial councils), LKR. 130,616 Million (LKR. 36,014 Million + LKR. 94,602 Million) was the sum of the tax revenue (national + local) which was usable in 2011, which was only 15.4% of the total tax revenue (national + local) of Sri Lanka in 2011. This figure (15.4%) is far smaller than the corresponding figure in the case of Japan.

Table 5.4.1 Budget Outturn for Provincial Councils (LKR. million)

Item	2008	2009	2010	2011 (provisional)
Total Revenue	31,368	29,433	36,829	42,065
Tax Revenue	25,992	24,907	31,049	36,014
Non-tax revenue	5,376	4,526	5,780	6,051

Item	2008	2009	2010	2011 (provisional)
Total expenditure	120,011	130,260	145,491	154,838
Current expenditure	103,199	111,336	119,162	126,772
o/w Personal emoluments	79,717	86,547	91,644	101,374
Capital expenditure	16,812	18,924	26,329	28,066
Central government transfers	88,942	93,999	107,032	115,856
Block grants	76,773	77,386	85,299	94,602
Criteria based grants	2,304	2,276	2,612	3,871
PSDGs	7,262	10,945	11,683	9,409
Foreign grants for special projects	2,603	3,393	7,439	7,973

Source: Table 6.9 Page 143 of Central Bank of Sri Lanka Annual Report 2011

In Japan, the national tax revenue is estimated as ¥ 43.62 Trillion and the total local tax revenue was estimated as ¥ 35.31 Trillion, making total tax revenue (national + local) ¥ 78.94 Trillion in 2012 budget. From the national tax revenue (¥ 43.62 Trillion), ¥ 16.59 Trillion will be transferred to the local governments, thus ¥ 51.90 Trillion (¥ 35.31 Trillion + ¥ 16.59 Trillion), which is 65.7% of total tax revenue, will be usable for the operation of local governments, whereas in Sri Lanka, only 15.4% of total tax revenue is usable for the local governments' operation.

By this comparison, it can be understood how smaller share of Sri Lanka's total tax revenue is available for Sri Lanka's local governments. Moreover, local governments in Japan have the access to the financial market through such financial mechanism as Japan Financing Corporation for Municipal Enterprises, which is facilitated by the regulatory framework such as the Local Public Enterprise Law, which ensure the financial discipline of the local municipalities' revenue earning activities such as water works so that financial institutions can lend the money to such activities of local municipalities. Sri Lanka does not have these facilities. Therefore, the available financial resource for the local governments in Sri Lanka is very limited. Under such condition, it is apparent that the local governments in Sri Lanka can not conduct such enterprises as water works (drinking water supply and sewerage) which require large financial resources.

5.4.2 Financial Status of the 14 Cities

For each and every council, Income and Expenditure accounts for year 2006 to 2011 are given in Appendix 1.

Annual total amount of income of a city were not enough to cover its total expenditure of that year. Therefore the Central Government reimburses 70 % - 90 % of their salary expense as a grant. GOSL Budget provides allocation under Ministry of Local Government and Provincial Council for these Grants.

Therefore they are not in a position to do any capital improvements in the city by using their own funds. Capital improvement will be done with balance available in revenue over expenditure and capital grant from the Central Government.

Depreciation of fixed assets were not provided when ascertaining the surplus or deficit of the year and no financial arrangement is available for the replacement of capital assets

Funding arrangement from the outside is needed for any capital nature improvement proposal in all cities. The decision to take such funding arrangement for capital improvement as well as the amount involved will be dependent whether the council can bear the O&M cost and the financial cost.

5.4.3 Example of Kolonnawa Urban Council

Kolonnawa UC is a city in the outskirts of Colombo MC with about 62,000 populations, which is one of 14 cities targeted in this survey. JICA Survey Team obtained the 'Revenue and Expenditure Account for the year ended 31 December 2011' of Kolonnawa UC, which is summarized in Table 5.4.2. The size of total revenue and expenditure is about LKR. 135 million (¥ 80 million). Out of total expenditure, Personal Emoluments (salary) occupies 64%, out of which 85% is covered by the revenue grant provided by the Central Government. Capital expenditure is only LKR. 13.9 million of which LKR. 8.4 million is covered by the capital grant from the Central Government. It is apparent that this municipality does not have the fiscal capacity to share a certain part of the sewerage investment.

As far as the current financial arrangement of NWSDB's sewerage operation, in which NWSDB manages both the construction and the operation/maintenance of the sewerage project, is applied for the sewerage projects in the financially weak local municipalities like Kolonnawa, it does not affect the viability of the sewerage project, as far as the composition of user types is correct and the users have the willingness to pay of the sewerage tariff.

If the local municipalities are required to share a certain part of the sewerage investment cost, this weak financial capacity of local government becomes an apparent obstacle.

Table 5.4.2 Revenue and Expenditure of Kolonnawa UC in 2011 (LKR. million)

Item	2011	Item	2011
Total Actual Revenue	136.3	Total Actual Expenditure	132.1
Assessment Rates	31.3	Personal Emoluments	84.1
Rent	4.5	Travelling Expenses	0.6
License Fees	0.5	Supplies & Equipments	8.2
Charges for Services	7.6	Repairs to Capital Assets	12.8
Warrant Cost/Fine	2.7	Transport	8.6
Stamp Duty		Interest & Dividends	1.8

Item		2011	Item		2011
	Court Fines			Grants	0.9
	Revenue Grants	71.7		Pensions Gratuity	1.2
	Other Revenue	9.6		Capital Expenditure	13.9
	Capital Receipts (Grants)	8.4		Actual revenue over expenditure	4.2

Source: JICA Study Team

5.4.4 Present Status of Sewerage Sector in 14 Cities

(1) Dehiwala/ Mt. Lavinia Municipal Council and Kollonnawa Urban Council

Out of 14 cities surveyed, only the Colombo MC has a sewerage system which is owned and maintained by them. In addition to that Dehiwala Mt. Lavinia MC area and Kollonnawa UC area have sewerage systems which are maintained by the NWSDB and not by the relevant Council.

At the end of 2011, 1,650 no of sewerage connections have been given by the NWSDB in Dehiwala Mt.Lavinia Sewerage System and 1,550 no of connections have been given by the NWSDB in Kollonnawa Sewerage System. (Source – NWSDB annual Report 2011 which is not published yet) The total O&M cost of the sewerage system which are maintained by the NWSDB is born by the NWSDB and tariff is also charged by NWSDB with the Water Bill in these areas. Therefore, these municipal councils do not have any income or expenditure on Sewerage.

(2) Colombo MC

Sewerage System in the Colombo MC area is maintained by them and the tariff is charged with Rates. No separate income recognition from sewerage is found in the council accounting system. But the O&M expenditure and Capital expenditure on sewerage have been accounted separately. The actual O&M cost and capital cost and budgeted cost for year 2012 is given below.

Table 5.4.3 CMC's Accounting for its Sewerage Operation

Year	Recurrent (O&M) Expenditure LKR. : m	Capital Expenditure LKR. : m	Total LKR. : m	Assessment Rates & Taxes Income LKR. : m	% of Total Expenditure over Assessment rates income
2006	13.72	49.63	63.35	1952.47	3.24 %
2007	15.52	50.23	65.75	2096.55	3.14 %
2008	27.12	28.02	55.14	2081.36	2.65 %
2009	17.34	26.03	43.37	2148.93	2.01 %
2010	25.79	62.91	88.70	2226.96	3.98 %
2011	52.11	80.66	132.77	2445.30	5.43 %
2012 (Budget)	26.75	85.00	111.75	2158.43	5.17 %

Source: JICA Study Team

It is revealed that while the O&M cost of the system is increasing the assessment rates income remained unchanged. Because of that the council would be able to face very critical condition of finding funds within the organization in future.

Therefor an outside funding method for the total rehabilitation of the sewerage system is needed. When the total rehabilitation is completed, it will reduce the rehabilitation & maintenance cost that incurred by the council. Then, they would be able to bear the finance cost of funding. Repayment of capital could be decided by considering additional income that would occur after the completion of the work and funding conditions as well as the funding amount.

(3) All Other Cities

MCs - Kaduwela, Matara, Matale, Nuwara Eliya , Babulla, Batticaloa, Kalmunai

UCs - Kalutara ,Peliyagoda , Trincomalee.

PSs - Kelaniya

All the above cities do not have sewer system in operation and no recurrent cost or capital cost involvement in the sewerage sector.

The revenue collected by the councils does not cover the recurrent expenditure of councils except Kaduwela MC. The recurrent cost was covered only when considering the Revenue grant (reimbursement of salaries) (please see Appendix 1). Any capital improvement is viable only with outside funding.

Kaduwela MC

Rapid development is progressing in the Kaduwela MC area and many land transactions were took place. Therefore the reimbursement of Stamp Duties income was high. This was accounted under “other revenue income”. Stamp Duty reimbursement is not a stable source of income. Therefore the financial stability cannot be assessed on this income source. If assessment rates increase the financial status will also be improved. Due to political reason the assessment rates have not been raised since it converted into Municipal council in July 2011

5.5 Financing of the House Connection Cost

House connection cost for sewerage is more expensive than the house connection cost for water supply. In Sri Lanka, it costs US\$300-500/connection. It is sometimes beyond the affordable limit of households, especially for poor households. Even for the normal households, it is difficult to justify the household expenditure for such purpose, particularly if their house is already equipped by septic tank. So, the issue of the high house connection cost would be the most important issues to be tackled in order to achieve the sewerage coverage target in

Mahinda Chintana (7% by 2020). As a solution, GPOBA project 'Increasing household access to domestic sanitation in Greater Colombo, Sri Lanka' would provide an useful lessons.

How to solve the issue of high house connection cost? (GPOBA)

GPOBA project 'Increasing household access to domestic sanitation in Greater Colombo, Sri Lanka'	
(1) Status of the GPOBA project	The F/S was conducted in 2010 and the Grant Agreement (US\$10million) was signed on Dec.2011. Now is the tender documents preparation stage, Tender documents for 1,400 house connections were sent to World Bank for their approval.
(2) Scope of the GPOBA project	Provide 12,000 house connections to the sewerage system and 3,000 on-site improvements in the existing Mt. Lavinia-Dehiwela sewerage scheme, in the new Ratmalana/Moratuwa/Ja-Ekera scheme and in the existing Kolonawa scheme.
(3) Eligible household for GPOBA grant	Household income is less than LKR. 20,000 per month.
(4) House connection covered by the GPOBA grant	Service pipe (main sewer to the inlet chamber), inlet chamber and the in-house piping connecting toilet and kitchen to the inlet chamber.
(5) Cost for a house connection and low cost technology	The usual house connection costs US\$300-500. In the GPOBA project, the low cost technology (simplified sewer and shallow depth) is used. Therefore, the house connection costs LKR. 5,000 to LKR. 10,000.
(6) Cost sharing	World Bank 60% GOSL 25% NWSDB 10% Community 5%
(7) People's response	People's response is good. 700 applications are already received.
(8) Contact person in World Bank	Mr. Xavier, World Bank Mr. Shane, World Bank Sri Lanka Office
(9) Documents	GPOBA Commitment Paper 'Increasing household access to domestic sanitation in Greater Colombo, Sri Lanka 2011/9 Project Implementation Manual 2010/8/10

Source: JICA Survey Team based on hearing with NWSDB Acting Project Director GPOBA Project dated on June 28, 2012)

5.6 Fundamental Issue regarding Sewerage Sector Financing in Sri Lanka

5.6.1 Central Government versus Local Government

Under the current financial arrangement, all funding for sewerage investment comes from the central government. There is no financial contribution of the local government for the construction of sewerage facilities.

What are pros and cons of this type of the extremely centralized arrangement?

The merit of this arrangement is that the sewerage investment can be realized regardless of the financial capability of the local government. If NWSDB will conduct not only the construction but also the operation and maintenance, even the lack of technical capacity of the concerned local government does not matter. It should be noted, however, that the affordability to pay of the users, not of the local government, does matter because the operation and maintenance cost of the sewerage facilities should be recovered by the payment of sewerage tariff by users.

The demerits of this arrangement are;

Firstly, the size of possible sewerage investment will be confined to the size of the possible budget allocation of GOSL.

Secondly, the 'polluter pay' principle, which should be the basis of any kind of environmental financing, can't prevail fully. In Sri Lanka, the 'polluter pay' principle is already starting to prevail in commercial and industrial sector, thanks to the regulatory function of the Central Environmental Authority. But, if common residents in municipalities prove to be the largest polluters, why do not they pay for the cleaning of the wastewater they discharge to the environment?

This financial arrangement in Sri Lanka is very different from the financial arrangement for the construction of sewerage facilities in Japan. In Japan, the responsibility of construction of sewerage facilities belongs to the local government, according to 'polluter to pay' principle, including mobilization of finance. The central government will provide the subsidies to the local governments for the construction of sewerage facilities. But the central government subsidy does not cover the entire cost of the sewerage facilities. Coverage ratio of the central government subsidy is determined according to the rule set by the national government, i.e., 55% for the sewage treatment plant and 50% for main and secondary sewers. The remaining portion must be covered by the local government.

The local government usually mobilizes the financial resources for the remaining portion by issuing Municipal bonds. In order to facilitate the issuance of Municipal bonds by the local government, Japan Finance Corporation for Municipal Enterprises was established by the national government in 1957. Municipal bonds shall be redeemed by the local governments. However, around 50% of required funds for redemption and interest are eligible for compensation by the national government as a distribution of local allocated tax. These systems had supported local governments to mobilize the financial resources for the development of sewerage systems.

Large local governments have the technical capacity to implement the sewerage project but medium and small sized local governments often lack their own technical capacity. To support them in technical matters, Japan Sewage Works Agency were created in 1978 by the equity

contribution of local governments to provide the technical assistance to those local governments which are in short of technical capacity to implement the sewerage projects.

Please note that there are a few numbers of developing countries which have been successful in sewerage system development by the centralized approach such as Tunisia (ONAS) and Indah Water Konsortium (IWK) in Malaysia. On the other hand, it is very difficult to find the clear successor based on the decentralized approach in the sewerage development in the developing world. Japan's approach may be categorized in between the centralized approach and the de-centralized approach.

5.6.2 Grant versus Loan

The sewerage investment requires huge financial resources. On the other hand, people's willingness to pay is low for the sewerage service compared to the drinking water. Therefore, it is not realistic to achieve full cost recovery including capital cost by the sewerage tariff.

There is also the external economy factor. In case of drinking water, the recipient of water supply service and the beneficiary of that service is the same. Therefore, the full cost recovery is considered to be the most important principle in the water supply service. In sewerage sector, however, the recipient of the sewerage service and the beneficiary of the sewerage investment is not always the same. Imagine such case as there are City-A (up-stream) and City-B (down-stream) along the same river. Even if the sewerage service is introduced in City-A, but is not introduced in City-B, the residents of City-B will benefit from the cleaner river water quality and the lower water purification cost. If that is the case, it is not reasonable for the residents of City-A alone to pay all the cost of sewerage service. There is a room that the nationwide sharing of the cost of sewerage service by the way of national subsidy is justified. On the other hand, the 'polluter to pay' principle must also prevail.

From this view point, the appropriate mix of grant (subsidy) financing and loan financing would be the desirable solution for the sewerage financing. In this regard, the case of the Greater Colombo Wastewater Management Project (CMC portion), in which 82.5% of the total cost is financed by grant and 17.5% is financed by loan, is a reasonable solution, considering the relatively high affordability of commercial and industrial users in the Central Colombo Area.

5.6.3 Financing of On-site Sanitation

In Sri Lanka, while all financial resources for sewerage scheme comes from Central Government, the cost for the on-site treatment system needs to be borne by the residents or local government and there is no contribution of the Central Government. This situation is unfair for the local government and its residents who need to depend on the on-site system for the foreseeable future since the sewerage development.

This neglect of on-site sanitation, especially, of the management of sludge accumulated in septic tanks is a common phenomenon in Asian developing countries. In some countries, i.e., India, Vietnam and Indonesia, however, the septage management, the proper collection and disposal of sludge produced from on-site sanitation facilities such as septic tanks, is becoming recognized as the national issue. In Japan, the installation of the packaged aerated wastewater treatment plant (Johkasou), which is the regulated on-site sanitation facility in Japan, by households, and the installation of the sludge treatment facility by municipalities to treat the sludge from Johkasou, are subject to the national government's subsidy.

5.6.4 Economic Impact of Sanitation

The most difficult problem in the development of sanitation including sewerage system is its low priority in the development agenda of both the government and the households of developing countries. Without convincing politicians, government officials and common citizens on the link between sanitation and economic development with strong evidence, it is very difficult to raise the priority of sanitation in the development agenda.

According to WSP (World Bank's Water and Sanitation Program) study 'Economic Impact of Sanitation in Southeast Asia', Cambodia, Indonesia, the Philippines and Vietnam is losing UD\$ 9 Billion annually due to the poor sanitation. Indonesia alone lost US\$ 6.3 Billion, 2.3% of GDP in 2006.

The above WSP study gave a strong impact, particularly, on the Government of Indonesia. By the initiative of BAPPENAS, at the central government level, the National Water Supply and Sanitation Working Group was organized by eight relevant ministries and agencies as a cross-ministerial organization. At the local level, urban sanitation strategies were formulated. Using the methodology established in this process, the 'Acceleration of Urban Sanitation Development Program 2010-2014' was prepared and it was adopted at the national conference on urban sanitation strategies in 2009. US\$ 5.5 Billion was allocated for sanitation investment for the period 2010-2014, which was a big increase from almost zero level before 2008.

Indonesia's annual amount for sanitation investment, US\$ 1.1 Billion, is about 0.13% of Indonesia's GDP. Japan invested 1% of GDP for sewerage alone at its peak time around year 2000. Tunisia and Malaysia, both of which are successful in increasing their sewerage coverage to 70%, are spending around 0.2% of GDP for sewerage alone. The driving forces for the sewerage system development in Tunisia and Malaysia were their desire to attract tourists and the foreign direct investment. The corresponding figure of Sri Lanka is currently 0.06%. How much % of GDP should be spent for sanitation/sewerage in order to clean up already polluted rivers, lakes and coastal waters in developing countries might be different country by country and the comprehensive study is necessary for each country to determine its own target figure.

There is no such report as the economic impact of sanitation in Sri Lanka. This may be one of the reasons why the sewerage is given low priority in Sri Lanka. It is strongly recommended to conduct such study in Sri Lanka.

In almost all developing countries, with the exception of Tunisia and Malaysia, the priority of sanitation or sewerage is still low in their development agenda. Particularly, the sewerage investment is not considered as the attractive investment because of its high cost and the difficulty of cost recovery. Japan was also no exception 40 years ago. In 1964, when Tokyo Olympic Game was held and the Bullet Train started operation, Japan's sewerage coverage ratio was only 8%. What changed such situation was the politics. In 1960s, there happened many incidence of the human sufferings including deaths due to the environmental pollution such as MINAMATA Disease which killed at least 314 people and more than 2,000 people were crippled. Once such evidences were given, politicians must do their job. Japanese parliament session in 1970 was called 'Pollution Parliament'. Only the issues related to pollution were debated and 14 laws were passed all related to environment. Then, everybody in Japan started to invest in the wastewater management. Now, Japan's wastewater is 100% treated by either the public sewerage system or the well regulated on-site system (Johkasou system and nightsoil treatment).

Table 5.6.1 Expenditure on Sanitation/Sewerage per GDP in Selected Countries

Country	How much is spent for sanitation (sewerage)?	Percentage in GDP
Japan	¥ 3.5 Trillion (2000) sewerage only	1.00%
Tunisia	TD 525 Million sewerage only	0.26%
Malaysia	RM 992 Million (2006) sewerage only	0.17%
Indonesia	US\$ 5.5 Billion (2010-1014) all sanitation	0.13%
Sri Lanka	LKR. 5,880 Million (NWSDB 4,930 Million + CMC 950 Million) (2012 Budget) sewerage only	0.06%

The legal framework, financial and institutional arrangements which were considered to be instrumental for Japan's sewerage development is explained in the JBIC Pamphlet 'Legal Framework, Finance and Institutional Arrangement of Japan's Sewerage System' as attached in Appendix 2.

5.6.5 Private Public Partnership (PPP) for Sewerage

Since the sewerage development requires huge resources, the available resources needs to be mobilized not only from the public sources but also from the private sources. The private sector involvement would also contribute to the more efficient management of the sewerage system. Therefore, the Private Public Partnership (PPP) should be pursued whenever possible. On the other hand, the low willingness to pay for the sewerage service would become the obstacle for the introduction of PPP in the sewerage sector. Special attention should be paid to this special feature of the sewerage financing.

The Lakdiyatha Passikudah Project is the first PPP project in the sewerage sector in Sri Lanka. A 750 m³/day wastewater treatment plant using MBBR process, which was commissioned in March 2012, is supposed to treat the wastewater of 14 hotel resorts (total 930 rooms) in Passikudah Bay near Baticaloa and all the treated water is to be recycled to these hotel resorts for irrigation (gardening) purpose after the sand-filtration process without discharged to the bay, since the Passikudah Bay is relatively small water body which requires special attention.

The Rs 185 million 'Lakdiyatha Passikudah' facility was designed and built, and will be operated for 20 years (BOT), by a joint venture involving the Veolia Water, India and Puritas Pvt Ltd which is a subsidiary company of Haycarb PLC representing the Purification Sector of the Hayleys Group, Sri Lanka.

Sri Lanka is endowed by beautiful coasts and the preservation of the water quality of coastal water is important for tourism. Commercial buildings including hotels and industries are mandated by the Central Environment Authority to treat their wastewater according to the effluent standard. Environment Protection License (ELP) is to be renewed each year. Therefore, all the hotels, new and existing, are required to install wastewater treatment facilities. Puritas Pvt Ltd has supplied about 150 wastewater treatment plants to customers, majority of which are hotels, some of them are operated by Puritas.

The lands for hotel resorts in Passikudah Bay are leased by the Sri Lanka Tourism Development Authority (SLTDA) with infrastructures. The Lakdiyatha Passikudah Project was tendered and contracted by SLDTA. SLDTA will pay the sewerage tariff to 'Lakdiyatha Passikudah' according to the agreed tariff schedule based on the volume of treated water which is about Rs 180-330/m³ when the volume is less than 13,500 m³ (60% of capacity) and Rs.50-60/m³ when the volume is 13,500 m³ or more. Average tariff would be Rs.130-220/m³ which is higher than NWSDB's sewerage tariff for commercial users (Rs.40/m³) and for households users (average Rs 15/m³). This tariff includes not only wastewater treatment tariff but also water tariff for the recycled water. Suppose if hotels are connected to NWSDB's water supply system, they will be charged Ps.65/m³ for water supply. By this tariff, the cost recovery of all the investment cost and O/M cost in 8 years is expected.

This tariff needs to be paid by SLDTA to 'Lakdiyatha Passikudah' even if some hotels switch to other service providers. There is no plan for NWSDB to install sewerage system near Passikudah Bay since it is an isolated location.

JICA Survey Team considers that this PPP arrangement was possible since the customers are only hotels, whose willingness to pay is high, and no households, whose willingness to pay are low (Rs.15/m³), are involved, and there are no public sewerage system nearby in the

foreseeable future. When household customers are involved, such a BOT type PPP arrangement would not be possible for the sewerage development.

For the sewerage development covering both commercial and household customers, the lease type PPP and the management contract type PPP, in which the facilities are built by the public sector and the management, operation and maintenance of these facilities will be contracted out to the private sector, is recommendable.

CHAPTER 6 FINDINGS AND RECOMMENDATION FOR SEWERAGE SECTOR

6.1 Central Government Issues

6.1.1 Policy, Law, and Standard

At the present, promotion of sewerage project is aimed at the following purposes;

- Reduction of water borne diseases
- Hygiene living environment
- Protection of water quality at intake of water supply systems

In the near future, local hygiene conditions such as water environment of drains, streams and ponds in city area should also be included in the purpose of sewerage, and the bigger rivers also be focused in the future in national level. Ideal water environment conditions are firstly discussed and tolerant water quality of various locations of ocean, rivers, lakes, and tanks are determined based on the required levels of water use at the location and the downstream. Based on the target conditions by location, various measures to control inflow pollutant loads can be prepared in efficient, effective, and economic manners. One of the measures is sewerage development and the others are enforcement of discharge quality control for hospitals, industries, and agricultural lands.

(1) Environmental Act

Although National Environmental (Protection and Quality) Regulations, No. 1 (2008, CEA) prescribes tolerant wastewater discharge quality for various factories, hospital and WWTP into surface water and into sewer system. The scheme of environmental protection and tolerant values are sufficient; however there is no penal clause in it. And in the case of discharge of bad quality wastewater, CEA has to sue relevant factory and it takes long time to settle the issue.

The above mentioned basin wide management and discharge load control should be included in Environmental Act. Launching of preparatory works is recommended to determine tolerant water quality of various locations of ocean, rivers, lakes, and tanks, and preparation and implementation of compliance measure for the designated water quality standards is regulated in the Act in the future.

(2) Sewerage Law

The Sewerage Act is not yet established in Sri Lanka. Instead, “National Policy in Sanitation (MOWSD 2011)” approved by the minister on 16th February 2012 prescribes connection to the sewerage system and payment of service charge which are commonly described in the sewerage law in other countries. However, those are not obligatory and no penal clause is

prescribed. Meantime, NWS&DB Act, local government by-law, and municipal by-law will cover the provision for sewerage regulation for obligatory house connection, sewerage charge, restriction on discharge to sewerage system etc.

Establishment of Sewerage Law is inevitable to regulate sewerage works in national levels in the future, and preparation of standard ordinance for the sewerage works is at least required to democratic promotion of the sewerage development at the moment.

(3) Sewerage Sludge Disposal Method

Although Technical Guidelines on Solid Waste Management (Pollution Control Division CEA) is valid in Sri Lanka, it does not contain sludge generated from WWTP. Whether sludge generated in WWTP can be legally dumped or disposed in solid waste dumping site or not is still pending matter.

Since the solid waste dumping sites do not comply with the standards or have not enough capacity for the future at almost all the local governments surveyed, regulatory setting or technical solution on the matter are required.

6.1.2 Financial Arrangement of Central Government

The three aspects are pointed out as issues in financial arrangement, and the present situations and desirable directions in the future are discussed.

(1) Budget Allocation

As discussed in the previous chapter 5, budget allocation of capital expenditure of MOWSD is 6.3 % of total capital expenditure of LKR468,769 million in 2011. Moreover, sewerage investment occupies only 11.5 % of capital investment of capital expenditure of MOWSD, which means sewerage investment is 0.7% of total capital investment of GOSL in 2011.

In order to increase the share of sewerage investment in the national budget, the comprehensive review of the GOSL's public investment program providing strong priority to sewerage investment or new budget source has to be created, for instance introduction of environmental tax as earmarked budget for sewerage development.

(2) Financial Allocation in MOWSD

At present, new sewerage projects are generally discussed and identified in MOWSD, MOLG, and NWSDB. MOWSD and NWSDB have also responsible for increasing of pipe-borne water supply coverage in the country. Since the public request to receive pipe-borne water supply services rather than sewerage, it cannot help prioritising water supply development irrespective of importance on individual project and funding is arranged in similar nature. In fact, the ratios

of sewerage scheme in total capital investment on NWSDB accounts for only 12.7% (2010), 11.5% (2011), and 15.1 (2012 estimate).

The attempt to separate sewerage account from water supply in NWSDB has been arranged and it is reported that independent account of sewerage activities is started from this year, 2012. It is recommended to strengthen further independency by separating sewerage administration from water supply works in central government level so that sewerage budget would be discussed apart from water supply budget.

(3) Financial Arrangement of Sewerage Project

Under the current practice, the capital expenditure of all sewerage projects of NWSDB is financed by the grant from the Central Government irrespective of sources of fund, and NWSDB does not need to pay the financial cost (amortization and interest payment). Therefore, NWSDB is trying to recover direct operation and maintenance (O&M) costs of sewerage system by collection sewerage users charge, although, ideally, the depreciation cost could be recovered to secure the fund for the future replacement.

On the other hand, financial arrangement for the sewerage system in CMC area of the Greater Colombo sewerage system is completely different. GOSL will provide 82.5% of the total project cost of the Greater Colombo Wastewater Management Project Phase I to CMC as a grant and remaining 17.5% will be provided as on-lending.

As a movement of the Central Government, it is informed that Ministry of Finance intends to make proportion of capital investment as 85% of grant and 15 % of on-lending for sewerage project.

It is reasonable for executive agency to have responsibility for infrastructure development, however new financial mechanism to support executive agency is required for sewerage development in the present difficult situation for increasing sewerage users charge.

6.1.3 Institutional Arrangement of Central Government

(1) Public Involvement Mechanism

As far as sewerage project, the public is reluctant to connect from their property to public sewer even in sewer served area, as they tend to think the present on-site system is enough to treat their wastewater. And during the sewerage construction works, the public blames troublesome trench works in sewer installation on public road, especially closing traffics during the construction works. The public should understand necessity, benefits of sewerage project and the extent of their responsibility for proper solution of their wastewater issues for preservation of sustainable environment.

The public involvement with proper knowledge and sense of responsibility are the essential factors for financial improvement of sewerage development, and thus public awareness campaign is also inevitable for successful promotion in sewerage and sanitary sector.

The public should obtain proper knowledge on sanitary issues, their possible effects, possible solution, and benefits drawn from sewerage development. Sewerage project not only solves the existing problems of on-site treatment such as difficulty of septic tank installation, seepage overflow etc. but also contribute to local economic growth by promotion of employment, industry and tourism development, better traffic conditions with reinforced road surface, and exemption from maintenance of on-site facilities etc.

It takes long time for the public to understand Polluter-Pays-Principle, and it is necessary to start public awareness program for the public to reach this Principle. It is also important to show the actual data on deterioration progress in the environment for the public to recognise what is happening in the surrounding environment.

(2) Executive Agency of Sewerage Works

From financial and technical points of view, there is no alternative of executive agency for sewerage works other than national level such as NWSDB at the moment, though it should be local government according to the policy of the country.

Meanwhile, NWSDB is expected to be a leading entity in identifying and executing sewerage project, and strengthen and upgrading of O&M capacity for the existing and constructing sewerage system.

Possible strategy for decentralization will be the NWSDB to implement sufficient number of projects to have good connection number to run the section autonomously. Once it is established, the NWSDB can train and provide assistance for gradual taking over of schemes to local governments and NWSDB would be play an important role as technical and training center for sewerage works, as a central government entity should involve the field of high specialty nature like sewerage works.

6.2 Technical Issues

(1) Water Quality Data

Staff of all local governments surveyed deplores that the water quality in rivers, lakes, and sea has been deteriorated, however their sighs is not based on the evidence of data but on the complaints from residents. CEA has monitored the water quality in a few rivers in Sri Lanka, however only a few data monitored is published as shown in **Appendix 3**. And the majority of rivers, lakes, and sea are out of the monitoring and no water quality data is accumulated.

When a sewerage works project is planned, environmental water quality is crucial background data to select treatment process and discharging point of treated effluent etc. And the data will be a significant parameter in determination of the priority to introduce sewerage system. Therefore, the monitoring has to be carried out at least main rivers, lakes and sea.

(2) Ocean Outfall

Ocean outfall with preliminary treatment is one of the disposal ways for collected wastewater. However, it is noted that the construction cost of ocean outfall facilities are quite expensive as estimated as LKR 2.9 billion in Sri Jayawardanepura Kotte wastewater collection and disposal project and as LKR1.0 Billion in Kattankudy wastewater disposal project. The cost may almost equivalent to the construction cost of secondary treatment plant. Moreover, secondary treatment plant may have to be constructed in the future.

(3) Wastewater Treatment Option

The local government surveyed can be categorized into 4 types in respect of wastewater treatment options by natural and physical characteristics. Since it is effective for the public to recognize the successful development in sanitation and sewerage, best practice model cities shall be created at least in one city by the following category.

- i. Areas covered by Greater Colombo Sewerage Master Plan (CMC, Dehiwala/Mt. Lavinia MC, Kaduwela MC , Kolonnawa UC, Kelaniya PS, Peliyagoda UC)
- ii. Central high land area located at upstream of rivers (Matale MC, Nuwara Eliya MC, Badulla MC)
- iii. Thunami affected coastal area (Batticaloa MC,)
- iv. Other coastal area (Kalutara UC, Matara MC, Klmunai MC, Trincomalee UC,)

6.3 Issues in Sewerage Implementation Sites

(1) House Connection

Even in sewer covered area, individual connection to sewerage system is only 77 % in CMC, 33 % in Dehiwala/Mt. Lavinia MC, and 14% in Kolonnawa UC in 2008. Residents reluctant to connect to sewerage system due mainly to high connection cost. Number of connection is crucial for sustainable and stable sewerage management, since the O/M cost is usually covered by service charge paid by domestic, commercial and institutional connections.

Both technical and financial solutions are required to accelerate house connection works. Economical connection technology using small PVC sewer pit, which is popular for sewer plumbing in private property in Japan, can be one of the technical solutions.

GPOBA project to increase the household access to safe sanitation in Greater Colombo area, but it is only for poor households. Introduction of revolving fund project for house connection is one of the financial solutions.

(2) Greater Colombo Sewerage Master Plan

Greater Colombo wastewater and Sanitation Master Plan (World Bank) was prepared in 1993 and the contents are already outdated. For example, urbanized area and population predicted in that times will be quite different from those in nowadays. Although it is outdated, framework of some current sewerage projects is based on the master plan. For example in sewerage project in Sri Jayawardhanapura Waste Water Collection & Disposal area, an ocean outfall pipeline through CMC area is planned to be constructed with LKR 29 billion which might be equivalent to the cost for construction of WWTP in Kotte area.

The update of the master plan is desirable to facilitate sewerage development for the remaining areas of Greater Colombo in effective and efficient manner.

(3) Trench Works in Sewer Construction

The following issues were found in Ratmalana / Moratuwa sewerage construction site.

- There were many damages occurred to the properties along the roads, where deep sewers were installed by digging trench in narrow space.
- Public complains concentrated to the road closing for sewer construction trench works.
- There are difficulties encountered in locating underground utilities.

Technical solution will be provided by employing Jacking and tunneling method for which various technologies are developed for every soil conditions and every diameter of sewer in Japan. Japanese technology of non-dig inspection and rehabilitation methods for sewers are also useful for deteriorated and/or aged sewer in Greater Colombo Sewerage System. Non-dig detecting system for underground utilities is also desirable to be developed.

(4) Treatment of Industrial and Hospital Wastewater

Two (2) of the industrial parks and almost all large scale public hospitals surveyed install individual WWTP based on National Environmental (protection and quality) Regulation (EPL). Most of them are operated and maintained poorly due to inappropriate treatment process, capacity, and lack of knowledge of staff in the facilities, while a few of them are managed well. For example, WWTP in Seetawakapula industrial zone is operated well except colour due to appropriate treatment process and capacity. On the other hand WWTP in Biyagama zone where wastewater is treated partly lagoon process and partly OD process is operated quite poorly due to mainly shortage of capacity. (According to the industrial zone, the facility will be renovated and the capacity will be expanded in near future.) Effluent of both facilities is discharged upper

stream of the intake of the Ambathale water purification plant facing to the Kelani River, therefore effluent quality has to be controlled carefully.

6.4 Issues in Community and Local Government

(1) Septic tank Overflows

Night soil flows into the septic tank is settled and decomposed under anaerobic condition and the overflow of the septic tank flows into the soakage tank and soaks into the ground. Residual organic substances are decomposed in the ground. When the soakage tank is functioned well, the system is good enough to remove organic pollutants. All the local governments surveyed have ordered to use septic tank system for night soil treatment and a large portion of houses adopt the system. However, when the ground water level rises in rainy season treated night soil hardly soaks into the ground. On the contrary the ground water soaks into the soakage tank and septic tank overflows. All the local governments surveyed suffered from such situation.

(2) Inadequate Equipment and Difficulties in Finding Land for Sanitary Services

Many surveyed local government insist shortage and deteriorated or aged conditions of gully sucker for de-sludging from septic tank and lorry for solid waste transportation. As local government budget is generally limited, donor's supports are expected. They also explain the difficulties in finding appropriate land for septage treatment and sanitary land fill site for solid waste.

CHAPTER 7 RECOMMENDED ROAD MAP TO PROMOTE SEWERAGE DEVELOPMENT AND POSSIBLE ASSISTANCE OF DONORS

7.1 Road Map to Promote Island-wide Sewerage Development

The most important factor in promoting a sewerage project is public awareness and support for the project. The public must have proper knowledge on sanitary issues, the related impacts and solutions, and benefits of sewerage development. They should also understand their role and that of various levels of governments and contribute accordingly to achieve the best solution.

Sewerage coverage should continue to be expanded to achieve the national target. It is important to prepare carefully for the extensive undertakings of these sewerage developments. The following steps are proposed.

Step 1 : Increase the sewerage coverage and prepare for broad implementation of sewerage projects as well as improvement of on-site treatment

- Increase house connection in the area covered by the existing sewer system
- Preparation of sewerage projects for selected model cities
- Accelerate the progress of projects that are already formulated
- Update the Greater Colombo Wastewater Management Master plan
- Secure land for sanitary treatment and disposal sites
- Improve sanitary conditions and introduce awareness raising programs in selected areas
- Monitor water quality in public water bodies and compile long term monitoring data base
- Establish independent sewerage accounting in NWSDB

Step 2 : Create ideal environmental model cities and further awareness raising

- Implement sanitation and sewerage development in selected model cities
- Publicize awareness raising programs by showing improved environment of the model cities, including data on improved water quality of watercourses over time
- Identify priority areas based on accumulated water quality data
- Strengthen technical capacity of sewerage unit in NWSDB
- Set water quality standards for public water bodies

Step 3 : Institutional arrangement for nationwide water environment conservation activities

- Prepare relevant laws and regulations, and enforcement programme for basin wide

river water quality management

- Prepare decentralisation procedure for infrastructure development and administration
- Rearrange water sector organizations

7.2 Possible Assistance of Donors

To achieve the first step mentioned above, the possible assistance programs shown in **Table 7.2.1** are proposed to be executed under various schemes, such as Grant Aid (GA), Technical Cooperation (TC), Preparatory Study (PS), or Loan Project (LP).

Table 7.2.1 Proposed Candidates for Donor Assisted Program

No.	Name	Purpose and Contents	Scheme
(1)	Revolving Fund Project for house connections in the existing sewer covered area	<ul style="list-style-type: none"> - Increase house connections in the area covered by the existing sewer system - Identify unconnected households - Design and construct rider pipe and house connection plumbing 	LP or GA
(2)	Preparatory study and awareness raising program for sewerage project for creating best practice model cities	<ul style="list-style-type: none"> - Select cities according to categories described in Chapter 6, to be developed as model cities for best practice of sanitation; the choices may depend on complementary circumstances, such as the present conditions of sanitation and availability of required land - Conduct preparatory study for sewerage project or project combining sewerage system development, on-site sanitation and solid waste disposal. - Awareness raising program is carried out in the selected cities in advance 	PS and LP
(3)	Preparatory study for the formulated sewerage project	<ul style="list-style-type: none"> - Accelerate the progress of the formulated project - Prepare proposal for loan project 	PS
(4)	Greater Colombo Wastewater Management Master Plan Update	<ul style="list-style-type: none"> - Bring the Greater Colombo Wastewater Management Master plan up to date with more current information and data 	TC, PS, or LP
(5)	Water Quality Monitoring Project	<ul style="list-style-type: none"> - Monitor water quality on an island wide basis and compile long term data on major water bodies, and drains, streams, and ponds in selected cities. 	TC
(6)	Procurement of gully sucker and solid waste lorries	<ul style="list-style-type: none"> - Procure gully suckers and solid waste lorries for the cities requested 	GA

(1) Revolving Fund Project for house connection in the existing sewer covered area

As mentioned in Chapter 6, 6.3 (1) House Connections, there are a substantial number of unconnected households in the sewer covered areas of Greater Colombo. The potential number of people served by new connections in CMC, Dehiwala/Mt. Lavinia MC, and Kolonnawa UC are estimated to be from 150,000 to 200,000, which is equivalent to 0.75% to 1.0% of the total national population. Financial support for households as well as technical assistance for economical connection is effective to promote house connection and increase sewerage coverage ratio of the country.

(2) Preparatory study for sewerage project for creating best practice model cities

It is recommended to provide a sewerage system for at least one city in each category to demonstrate to the public the ideal sanitary condition. The selection of the cities depends on the maturity for introduction of sewerage system, such as community desire, city's intention and availability of required land etc. Possible technical solutions are summarized by category as follows. Awareness raising activities should be carried out for the selected cities in advance.

- i. Areas covered by Greater Colombo Sewerage Master Plan (CMC, Dehiwala/Mt. Lavinia MC, Kaduwela MC, Kolonnawa UC, Kelaniya PS, Peliyagoda UC)
 - 40% of Kolonnawa UC is not served by sewerage system, but is included in the future service area of the Colombo sewerage system identified in the existing Master Plan. The area can be served by installing the collection system and house connection pipes and connecting to the existing Colombo system.
 - A part of Kolonnawa UC is in the same situation as the above unserved areas of Kolonnawa UC.
 - Kelaniya PS and Peliyagoda UC are identified in the same catchment area planned to have a new ocean outfall in the Master Plan.
 - It is desirable to identify wastewater collection system and disposal methods by reviewing the existing Master Plan prepared in 1993
- ii. Central high land area located at upstream of rivers (Matale MC, Nuwara Eliya MC, Badulla MC)
 - As the cities are located at upstream of the Rivers, treatment process should be selected taking into account the required water environment at the location and downstream. Nitrogen removal process may be required to minimize adverse effects to the downstream intakes of water supply and other water uses. One of the possible solutions would be applying the Advanced Oxidation Ditch process for wastewater treatment.
- iii. Tsunami affected coastal area (Batticaloa MC)
 - The most practical and economical process for the area where relatively large land is available would be the anaerobic pond system with facultative and maturation ponds, which can accommodate sludge from septic tank (septage).
 - The areas can be served by the most economical sewerage system in both construction and O&M aspects.
- iv. Other coastal area (Kalutara UC, Matara MC, Kilmunai MC, Trincomalee UC)
 - The treatment process would be selected depending on the land available.
 - The anaerobic pond system with facultative and maturation ponds and ocean outfall are also alternative solutions.

(3) Preparatory study for the formulated sewerage project

The sewerage projects listed in Table 3.1.5 of this report have already been formulated and possible financial sources are identified or going to be identified. However, according to the sewerage section at NWSDB the mobilization of funds is not secured until negotiations and loan agreements are finalised. As the projects are urgently required in the country, there is the possibility of finding other sources of funding.

(4) Greater Colombo Wastewater Management Master Plan Update

Revision of the existing Master Plan prepared in 1993 has not been discussed within NWSDB; it is, however, desirable to update it for the following reasons.

- The water supply mater plan being revised with JICA loan project will be finalized by 2013.
- All the information on social and environmental situations has changed during the two decades since the last master plan.
- Detailed results of the 2011 Census will be released soon. The Executive Summary was disclosed on April 20th, 2012 in which the total National population of 20,277,597 and annual population growth ratio by District were provided.
- Various alterations to the sewerage system have been made since the master plan and more changes will be made by on-going projects and the next ADB project which is located downstream of future expansion areas.

It is unlikely that NWSDB will have enough manpower or funds to update the master plan, when they intend to do so. Donor support will be required in this case.

(5) Water Quality Monitoring Project

The idea to monitor water quality and to compile long term data was not discussed with national level authorities, however it is recommended to conduct on-going monitoring and compile the data for the following reasons.

- The public should recognize the actual situation and transition of water quality deterioration as supported by scientific data.
- The water quality data in public water bodies will be the significant parameter in determining the priority to implement a sewerage project.
- The water quality data in drains, streams and outlets in city areas can measure the need and beneficial impact of a sewerage project.
- The Island wide water quality data in the Rivers can measure the need and effect of a sewerage project and are the basic data needed for a nationwide water environment improvement strategy.

(6) Vehicles for Improved Sanitation

Many surveyed cities identified a shortage of gully suckers for de-sludging septic tanks and lorries for solid waste transportation. Most of the existing vehicles are ageing and need replacement.

CHAPTER 8 POSSIBLE APPLICATION OF JAPANESE TECHNOLOGIES

8.1 Requirements for Advanced Technologies

As mentioned in 6.3 Issues in Sewerage Implementation Sites, (3) Trench Works in Sewer Construction, sewer constructions are sometimes implemented under difficult conditions, such as having to dig deep trenches along narrow roads. These operations are not only awkward and troublesome, but may also post some degree of danger for the residents nearby. Therefore, advanced technologies, such as no-dig pipe construction process, may have to be considered even if the cost is higher. The latest technological innovations for WWTP also have the advantages of being more energy efficient and easier to operate and maintain.

8.2 Applicable Japanese Technologies

Japan made major advances in sewerage technologies when the country had to rapidly increase the sewerage service ratio in the 1980's. These technologies had been adopted in many sewer systems and wastewater treatment plants in Japan and other countries. The features of these sewerage technologies, highly valued in Japan and world-wide, are their abilities to save energy and space. The four technologies presented in this section are: (1) technology to rehabilitate old sewer pipes, (2) no-dig pipe construction method, (3) oxidation ditch process with advanced treatment, and (4) screw press sludge dewatering process. In addition, house connection pit made of plastic and membrane filtration etc. should also be considered.

(1) Technology to Rehabilitate Old Sewer Pipes

Plastic coating of sewer pipes can extend their service life significantly. The SPR process is the original Japanese technology. The rehabilitation procedure is simple. A plasticized PVC sheet is applied spirally to the internal surface of the aged pipe and the joint of the sheet is packed by plastic tape. No digging or stoppage of sewer flow is required. Although the diameter of the pipe is reduced by the thickness of the plastic sheet, the much smoother plasticized surface offsets the reduction in pipe diameter.

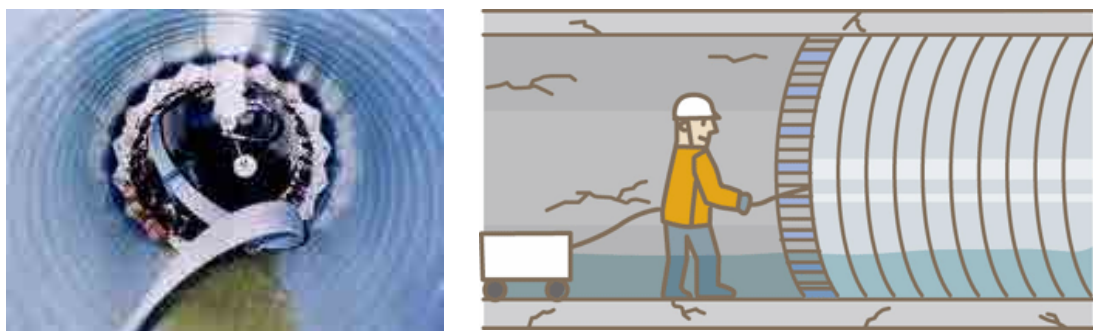


Figure 8.2.1 Rehabilitation of Sewer Pipe by SPR Process

(2) No-dig Pipe Construction Method

Although open-cut pipe construction is relatively easy and inexpensive to implement, it is highly undesirable in heavy traffic locations and where the road is narrow. Under these circumstances and particularly for very deep pipes, the method of choice has to be no-dig or trenchless technique, even though the cost is usually high. A rotating blade on the front edge of the machine bores into the ground and segments of the pipe is installed in the dugout space one by one. The distinct advantages of the Japanese technology are:

- * The blade of the rotator is adaptable to every kind of soil conditions.
- * The digging direction can be controlled accurately.
- * The method can also be used for small diameter pipes.



Figure 8.2.2 Pipe Construction by No-dig Process



Figure 8.2.3 Blade part of the Jack

(3) Oxidation Ditch Process with Advanced Treatment

The oxidation ditch process (OD) has been used worldwide due to easy operation and maintenance and high performance in organic pollutant removal. However, it does not remove nitrogen and phosphorus adequately. The Japan Sewerage Works Agency (JS) developed the advance treatment process which allows sufficient solid and hydraulic retention times, and includes intermittent aeration. Ammonium nitrogen in the wastewater is nitrified to nitrite and nitrate nitrogen in the ditch under aerobic condition and then de-nitrified to nitrogen gas under anaerobic condition when aeration is stopped. According to JS, the process removes more than 85% of the nitrogen. Half of the phosphorus in the influent wastewater will be removed as waste sludge. The addition of chemical coagulants such as alum or PAC at the outlet of the ditch will achieve 90% removal if required.



Figure 8.2.4 Large Scale OD Plant



Figure 8.2.5 Small Scale OD Plant

(4) Screw Press Sludge Dewatering

Sludge is the byproduct of wastewater treatment. Treatment and disposal of the sludge is always a big issue in the wastewater treatment plants. Small scale plants often have sludge drying beds. For large scale plants or plants located near residential areas, drying beds are not practical because odor and insects can be a problem. Instead belt-press or centrifugal dewatering machines are commonly used. The screw press dewatering machine developed in Japan is much smaller than the belt-press and centrifugal machines, and is much easier and cheaper to operate and maintain. According to Ishigaki Company Ltd., the leading company in the screw press machine in Japan, its O/M cost is 1/4 of centrifugal and 2/3 of belt-press dewatering machines.



Figure 8.2.6 Screw-press Sludge Dewatering Machine

ANNEXES

Annex 1 COLOMBO Municipal Council (CMC)

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

CMC lies on the coastal plain and the land is mostly flat and undulating towards the inland area to MSL 30 m.

1.1.2 Receiving Water

Surface water bodies are part of the Colombo metropolis, as lakes, canals, swamps or the Ocean, all of these elements being interconnected. The CMC boundaries are constituted by natural or artificial water bodies with the Ocean westwards, the Kalini River northwards, and canals southwards and eastwards. These various water bodies have multiple economic, leisure and environmental functions.

1.1.3 Meteorology

Colombo City, on the west coast, is in the west zone of Sri Lanka with an average rainfall between 2,000-2,500mm. Average relative humidity varies all along the year from 73 % to 75 % during the days and from 87 % to 89 % during the nights. The highest daily maximum temperatures generally occur in April (31.5 °C) while lowest daily minimum occurs in January (22.3 °C). Table 1.1 shows Precipitation and Temperature Records of CMC for last 10 years.

1.2 Sociology

1.2.1 Population

The Colombo Municipal Council is the largest local authority in Sri Lanka and one of the oldest in South Asia. Established in 1865, it has grown into a large organization catering to the needs of a resident population of 637,865 (2001 census) and a floating population of nearly 400,000 (estimated). It covers an area of 37.31 km².

The council with 53 Elected Councilors and 15 Departments is mainly responsible for the provision of services; public health and curative services, solid waste management, maintenance of roads, street lighting, water and drainage, and veterinary services. In addition to these there are number of departments providing social services, sports and recreation services, library services, public assistance, together with finance, rates, secretarial and training departments. The Council has a cadre of over 12,000 personnel.

The Council is the highest policy and decision making body. The Mayor who is an elected representative is the Chief Executive Officer. There are fifteen (15) Standing Committees and

each committee has 6 elected members. The Standing Committees are related to relevant departments of the council.

1.2.2 Quality of Life

Colombo is one of the most crowded cities in Asia. The Greater Colombo area contains over 4 million people or 26% of the island's population, but covers only 5.6% of the total land area. Over the past two decades population size and density within CMC area has shown marked increase despite declining population growth rates. It is estimated that 50% of the population is living in low income settlements. In-migration also plays an important role in the increase of population of the CMC and is associated with unplanned and unhealthy urban settlement enclaves. It is estimated that the CMC area supports nearly 400,000 floating population. They also contribute to problems of provision of safe water and sanitation, solid waste disposal and transport.

1.2.3 Industries

The survey on river Kelani basin industries revealed that no more than 6% of industries have installed operational treatment plant. The following industrial sectors are considered the greatest polluters in Sri Lanka.-Natural rubber industry, Leather industry, Milk Industry, Textile Industry and Pesticides Industry.

There is no big industry in the Colombo area, the industrial pattern is dense and composed of small industries located along the canals.

1.2.4 Public Facilities

1) Educational facilities

There are 47 public schools, and 11 private schools of which 2 are international schools and 97 preschools of which 15 are run by the Municipality.

2) Medical facilities

CMC in general is well served with medical services both public and private. There are 11 government hospitals and 19 private hospitals providing medical facilities to the people living in Colombo city and also to all the people of the country.

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to On-site Sanitation

Regulations made by the Minister under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.1.2 Regulation and Rules regarding to Water Works

The National Water Supply and Drainage Board Law, No. 2 of 1974 of the National State Assembly

2.1.3 Regulation and Rules regarding to Solid Waste Service

Regulations made by the Chief Minister, Provincial council, Western Province and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.2 Organization of the City

2.2.1 Organization of the City

Figure 1.1 shows organization chart of CMC.

2.2.2 Organization of Sewerage Works

O&M of Colombo Sewerage System is being done by CMC. Figure 1.2 shows organization chart of O&M of sewerage works.

2.2.3 Organization of On-site Sanitation Works

On-site sanitation works is being carry out by CMC and the details of staff involved with site sanitation is shown in the Organization Chart in Figure1.1.

2.2.4 Organization of Water Works

NWSDB is doing O&M of Colombo City Water Supply Scheme and Figure1.3 shows water works organization chart.

2.2.5 Organization of Solid Waste Service

Solid Waste Service is being carried out by Municipal Council and the details of staff involved with Solid Waste Service are shown in the Organization Chart in Figure 1.1.

2.2.6 Organization for Hazardous Wastewater Control

It is being carried out by Central Environmental Authority (CEA).

2.3 Budget

2.3.1 Total Budget of the City (CMC) - 2011 year- LKR 7,750 Million

2.3.2 Budget for Sewerage Works (CMC) - 2011 year LKR 1,289 Million

2.3.3 Budget for on-site sanitation Works (CMC) - included into the budget of solid waste service.

2.3.4 Budget for Water Works (NWSDB) - LKR 457 Million

2.3.5 Budget for Hazardous Wastewater Control - Not known.

It may be included in CEA Budget.

3. Public Works

3.1 Sewerage Works

3.1.1 Progress

The existing CMC Sewerage Scheme was constructed by the British 1906 and 1920. The system was improved and extended in the eighties and nineties. As per the Greater Colombo Master Plan-1993 and Atkin's Report-1999, a system improvement project began in 2004 with the support of Danish Cooperation. Presently, Greater Colombo Wastewater Improvement Project is being implemented under ADB Loan to rehabilitate two sea outfalls and pump houses, replacing of 10km sewer pipes and investigation and submission of report on the present conditions of 125km length of existing sewer pipes.

3.1.2 Service Condition

Several concrete pipes are in poor condition or plugged, mostly because of chemical attacks due to the dysfunction of pumping stations and of the entire system. The main cause of plugged pipes is poor pumping station maintains and subsequent weak flow in the pipes, favoring sedimentation of sand and other garbage.

The major part of pumping stations is in poor condition, mainly due to poor O&M, lack of staff training and excessive sand pumping.

Sedimentation of sands has accumulated inside the sea outfalls.

3.1.3 Service Charge

No separate service charge imposed by CMC for Sewerage service. It is Included in the property tax of CMC

3.1.4 Existing Sewerage Facilities

(1) Wastewater Collection System

The existing sewer system which runs through CMC area serves about 80% of area of the City, Total length of sewer pipe line laid is about 320 km.

(2) Kind of Wastewater

Wastewater from kitchens and bathrooms from houses and other places, night soil from latrines, waste water and other waste from hospitals, commercial places, Industries and other places located in the sewerage area of the city.

(3) Treatment Plants - Not available

(4) Pump Facilities

The collection system includes 18 pumping stations, 13 of which are connected on the sea outfalls and their distribution and conditions are prominent for the whole system. The Wastewater is pumped into the ocean with primary treatment from two outlets (seaoutfalls) located in Wellewatte and Mutwal. The sea outlet at Wellewatte has a 1500 mm diameter pipe and is approximately 1,400 m long. Sedimentation sands have accumulated up to 90 cm inside the pipe but wastewater can still flow through. The second outlet in Mutwal was initially 2,000 m long but after various incidents the pipe was badly damaged shortening to 1,500 m. The diameter is also of 1,500 mm and also here sedimentation sands have accumulated up to 90 cm.

3.1.5 Development Project

Greater Colombo Wastewater Improvement Project is being implemented by ADB Loan to rehabilitate two sea outfalls and pump houses, replacing of 10km sewer pipes and investigation and submission of report on the present conditions of 125km length of existing sewer pipes

3.1.6 Potential Demand of Sewerage Service

Only 80% of City Area is served by the existing Sewerage Scheme. The rest of the City depends on septic tanks and pit latrines for disposal of night soil. Some People who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards. There is a necessity to expand the existing CMC Sewerage Scheme to cover the balance area of CMC.

3.1.7 Development Budget - Available for the improvement of existing scheme.

3.1.8 Source of Budget for Development - ADB, GOSL, and CMC

3.1.9 Operation and Maintains System

O&M is being carried out by CMC. **Figure 1.2** shows organization chart of O&M of sewerage works.

3.1.10 O&M Budget for the year 2011 - LKR 663 Million

3.1.11 Source of Budget for Operation and Maintains - CMC Funds

3.1.12 Outstanding issues in Sewerage Works

(a) The existing Scheme covers only 80% of CMC Area.

(b) The present conditions of existing sewerage scheme are not satisfactory. Part of the Scheme is being improved by ADB funded project. Funding is to be identified for the balance works of the improvement of whole scheme.

3.2 On-site Sanitation Works

3.2.1 Progress - Constructed individual septic tanks and pit latrines in the balance area of CMC.

3.2.2 Service Condition - CMC is de-sludging the septic tanks on request

3.2.3 Treatment Process - Anaerobic treatment process in the septic tanks.

3.2.4 Development Project - Not implemented

3.2.5 Potential Demand of On-Site Sanitation System

Required for the housing schemes and low income settlements

3.2.6 Operation and Maintenance System - CMC is de-sludging the septic tanks on request

3.2.7 Operation and Maintenance Budget - included into the sewerage budget.

3.2.8 Source of Budget for Operation and Maintenance - CMC.

3.2.9 Outstanding issues in on-site sanitation works

(a) Not adequate gulley bowsers available at CMC.

(b) Conditions of the bowsers are not satisfactory

(c) Overflowing of septic tanks especially during the rainy seasons.

3.3 Water Works

3.3.1 Progress

The existing Water Supply Scheme for CMC is maintained and operated by NWSDB. Manager (O&M) located at Maligakandea Manger's Office is responsible for the operation and maintains works of the scheme. Please refer Figure 36 for the details of Organization Chart.

3.3.2 Water Source- Kelani River

Raw water is taking from the Kelani River at the Intake at Ambethale.

3.3.3 Service Charge

As per the Tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009.

3.3.4 Purification Plant

Located at Ambetale. Full treatment Process. Capacity of the Treatment Plant-125 million Gallon per day

3.3.5 Outstanding issues - Some of the pipes in the distribution pipes are more than 100 years old and are leaking increasing the NRW percentage.

3.4 Solid Waste Service

3.4.1 Collection System

Contracts were awarded to private companies by CMC for collection and transporting of solid waste to the dumping site.

3.4.2 Disposal Site - Meethotamulla.

3.4.3 Service Charge - No separate charge imposed. Included in the property tax.

3.4.4 Outstanding Issues

(a) Transport facilities for solid waste are not adequate and conditions of the vehicles also not satisfactory.

(b) Capacity of the dumping site is not sufficient and condition also not satisfactory.

3.5 Hazardous Wastewater Control

3.5.1 Industrial Wastewater Control - carrying out by Central Environmental Authority

3.5.2 Hospital Wastewater Control - carrying out by Central Environmental Authority

4. Outstanding issues in Sewerage Sector and Measures to Overcome those issues

4.1 Sewerage Works

4.1.1 Organization - No major issues

4.1.2 Development - Only 80% of MC area is covered by existing sewerage scheme. Donor Funding is to be identified for the expansion of the scheme.

4.1.3 Operation and Maintenance - Present system is seem to be not satisfactory. Staff training is required.

4.2 On-site Sanitation

4.2.1 Organization - CMC is carrying out the de-sludging of septic tanks when requested by the rate payers.

4.2.2 Development - On site Sanitation facilities required for housing schemes and low income housing settlements. Investigate and design separate sanitation facilities for the above places or to expand the existing system to cover the balance area.

4.2.3 Operation and Maintains

CMC is doing the de-sludging of septic tanks and require more Gulley Suckers.

4.3 Hazardous Wastewater

4.3.1 Organization - Individual Industry/ Hospitals. Presently they do not have separated their treatment plants to treat wastewater before releasing to the main scheme or natural stream.

4.3.2 Development - CEA will have to check the quality of effluent and advise them have to separate treatment plant in their premises

4.3.3 Operation and Maintains - Individual Institution has to carry out the operation and maintains works.

4.3.4 Control System - CEA will have to carry out the control system.

Table 1.1 Precipitation and Temperature Records of CMC

Item	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precipitation (mm/month)	2002	46.1	96.4	42.3	296.4	372	69	18.2	42.5	140.3	445.2	299.5	231.8
	2003	138.5	89.3	164	95.9	284.8	181.6	185.7	77.1	247.8	185.3	374.4	6.6
	2004	8.5	60.1	30.9	70.9	232.8	191.3	124.8	138.4	356.7	363	264.1	116.6
	2005	167	8.6	120.3	212.4	285.6	220.2	165.8	21.8	85.3	504	760.4	262.4
	2006	126.9	156.9	266.9	103.4	193.1	183.1	96.8	270.6	129	619.9	524.7	51.9
	2007	91.1	9.9	60.5	374.1	432.4	79.9	106.6	260.5	229.3	292.1	128.8	119.6
	2008	30.6	118.5	293.7	435.9	170.6	250.5	185.8	140.1	155.2	491.6	140.9	208.7
	2009	117.9	4.9	209.1	359.5	103.5	156.7	113.6	92.5	172.3	26.6	448.4	149.4
	2010	21	4.5	72.3	482.9	727.8	200.4	117.8	14.7	306.6	158.3	971.5	292.1
	2011	61.7	33.7	149.5	354.3	197.8	178.6	98.2	148.6	76.2	242	188.3	45.3
Temperature (°C)	2002	27.4	27.8	28.5	28.3	28.8	28.5	28.4	28.3	28.7	27.1	27.2	27
	2003	27.1	27.8	28	28.9	29.1	28.6	28.4	28.5	28.2	27.7	27.4	27.9
	2004	28.3	28.1	28.7	29	28.6	28.3	28	28	27.2	27.1	27.1	27
	2005	27.5	27.8	28.6	28.4	28.7	28.5	27.9	28.5	28	27.3	26.6	26.8
	2006	26.7	27.7	27.7	28.8	28.5	28.1	28	27.6	27.9	27.3	27.2	27.2
	2007	27.4	27.3	28.3	28.2	28.9	28.4	27.9	27.9	27.9	26.9	27.2	26.9
	2008	26.9	27.1	27.4	27.6	28.7	27.9	27.5	27.6	27.8	27.3	27.3	27.1
	2009	27	27.01	27.9	28.6	29.2	28	27.9	28.3	28	27.7	27.1	27.6
	2010	27.7	28.6	29	28.8	28.6	28.6	27.8	28	27.9	27.9	27	26.5
	2011	26.6	27	28.2	28								

COLOMBO MUNICIPAL COUNCIL

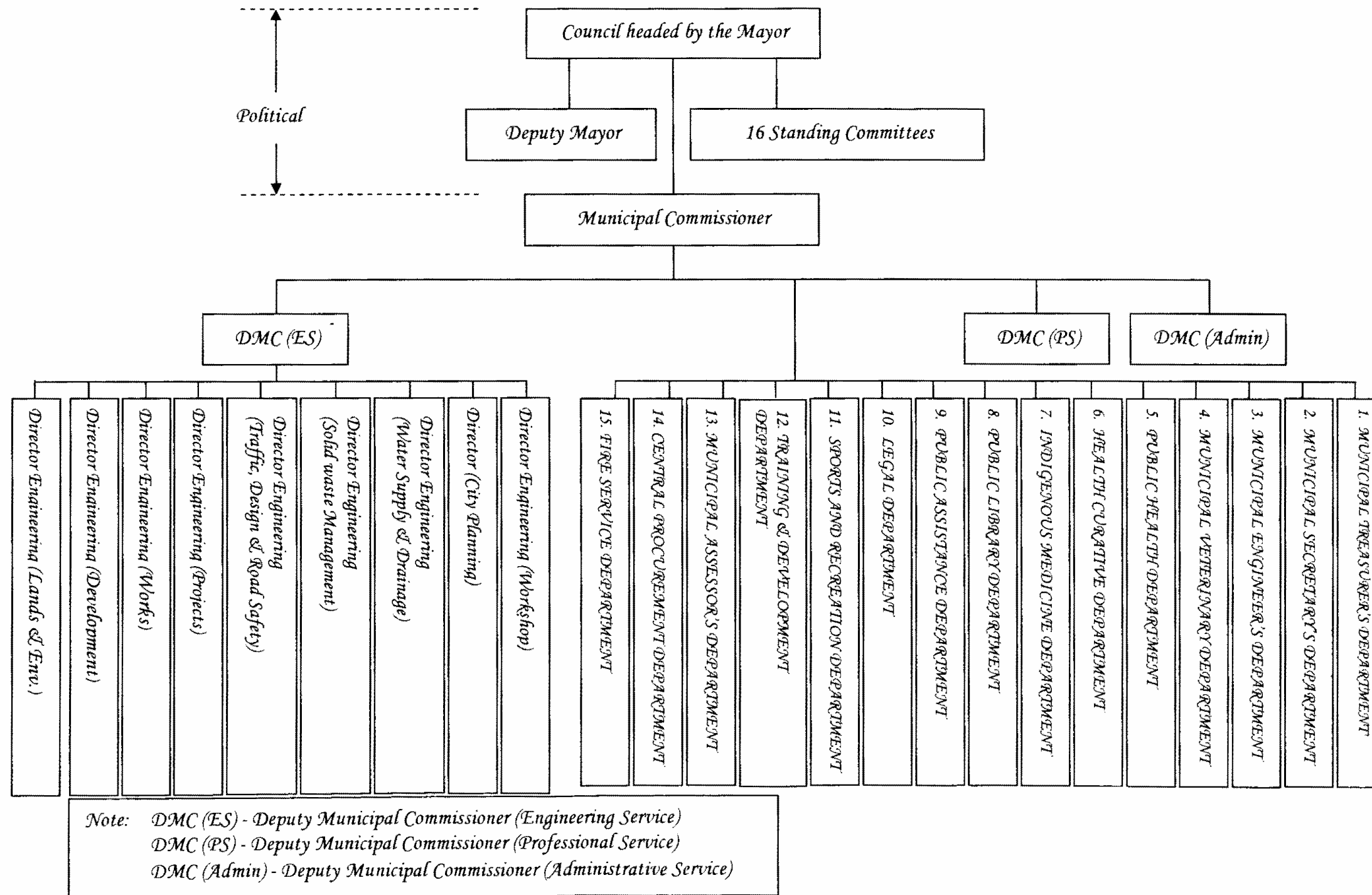


Figure 1.1 Organization Chart for CMC

**Organization Chart - Drainage Division
CMC**

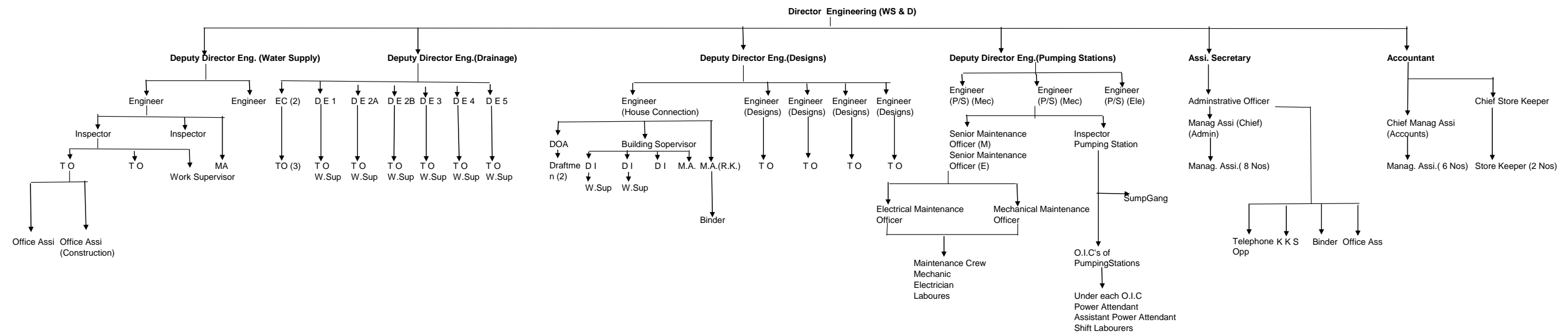


Figure 1.2 Sewerage O&M Organization for CMC

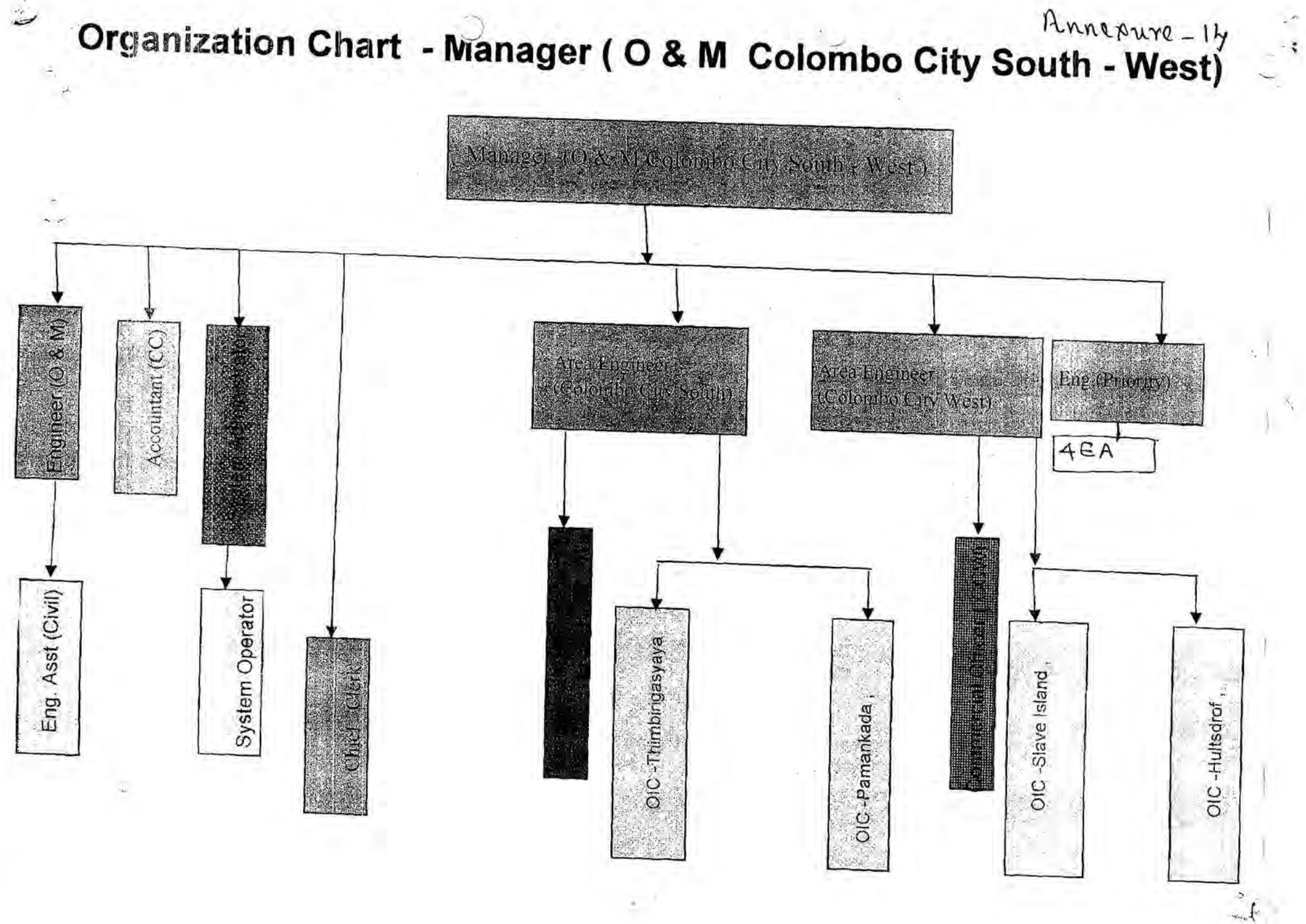


Figure 1.3 Water Supply Organization for CMC (1)

Annexure - 14

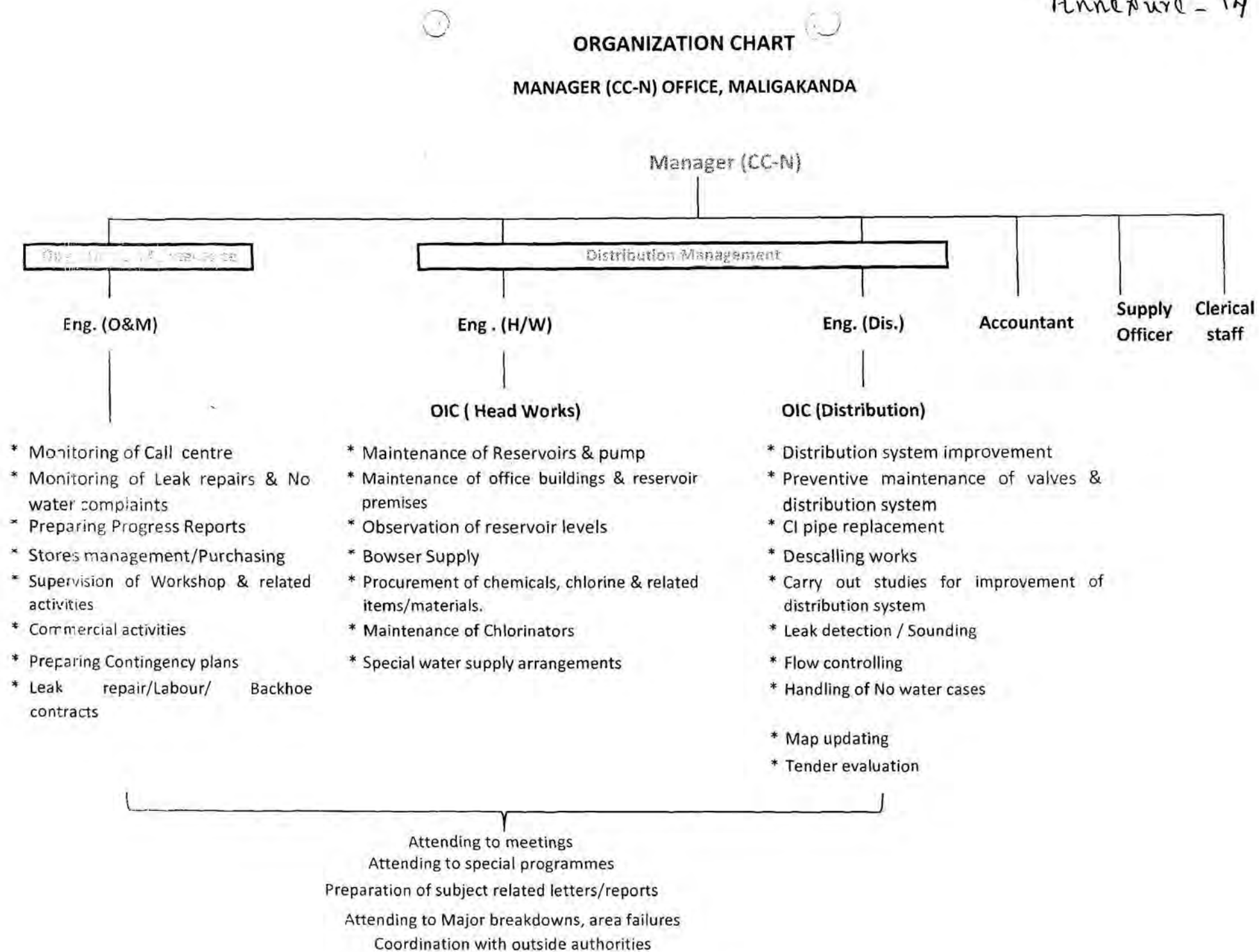


Figure 1.3 Water Supply Organization for CMC (2)

Annex 2 DEHIWALA/MOUNT LAVINIA MC (DMMC)

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Dehiwala/Mt. Lavinia MC (DMMC) area lies on the coastal plain and the land is mostly flat and undulating towards the inland area to MSL 30m. Soils are made of red yellow Podozols (Laterite) and Regosols with low humic gleys in valleys and stream beds.

1.1.2 Receiving Water

A significant feature is the large extent of wet lands around the Weras Ganga (river) and Bolgoda Lake the two major water bodies. The Belanwila and Attidiya marshes are noteworthy for their bio diversity and as such are considered as an ecological protected zone.

1.1.3 Meteorology

DMMC area is lying in the wet zone and receives an average annual rainfall between 2000 to 3000 mm mainly during the south west monsoon and the inter monsoon periods. Mean average day temperature is around 28 °C and average maximum between 30.5 to 31 °C. Minimum night temperature varies from 26 °C to 27 °C.

1.2 Sociology

1.2.1 Population

The total extent of 2,109 ha of Municipality is distributed in 29 wards and the area (ha) and Population in each ward are given in **Table 2.1**. DMMC was established in 1959 when its population was over 100,000. During an 8-year period from 1963 to 1971 the population further increased at a high growth rate of 3 to 4% from 110,934 persons to 154,194 persons after which there was a declining trend.

The total population and its distribution ward wise from 1971 to 2001, according to census years are given in **Table 2.2**. Projections of the population ward wise to year 2011 according to observed growth trend are also given in **Table 2.2**. The population increased from 154,194 to 173,529 in 1981 at an average annual growth (AAGR) of 1.18 %. From 1981 to 1991 a decrease in the AAGR gave a population of 191,639 in 1991 and which at the recent census in 2001 stood at 209,787 further decreasing to 0.90 %.

A projection of the population for the next ten year period till 2011 has been made on a declining growth rate of 0.66 % based on the following assumptions:-

(1) Land scarcity and high land value.

- (2) High density and development of commercial and other small scale industrial activities discouraging immigration.
- (3) Levels of infrastructure services being inadequate to meet needs of resident population.

On the above basis, the population in 2011 is estimated at 224,102. Actually, the above estimate population figure in 2011 can be checked when the report of census and statics survey carried out by the Government in 2011 is published in the November 2012.

1.2.2 Quality of Life

The low rise residential development within the limited land extents of wards and without adequate open space is typical of DMMC. The overcrowding has led to many issues in the city such as large volume of solid waste generated and the existing water supply system being unable to cope with the demand.

The delivery of infrastructure services in DMMC has not kept pace with the growing demand of the increasing population. This is reflected in the poor quality of the built environment.

1.2.3 Industries

The Ratmalana ward in the DMMC is the major industrial area in which over 500 industries are located. Some of the large scale industries located in Ratmalana is as follows:

- (1) Singer - Sewing machines and home appliances such as TV's etc.
- (2) Bata - Footwear manufacture for export and local markets
- (3) Glaxo - Pharmaceuticals, milk powder infant food products.
- (4) Maliban - Biscuits.
- (5) Uswatte - Confectionery.

Out of 500 Industries, 140 are large scale industries and also some small scale industries are scattered in other parts of the town.

However, along with Industrial development, DMMC allowed housing development on the large tracts of land available at that time in the vicinity of the Industries. This has now caused serious environmental issues in the residential areas.

1.2.4 Public Facilities

(1) Educational facilities

There are 39 public schools, and 8 private schools of which 2 are international schools and 97 preschools of which 15 are run by the Municipality.

(2) Medical facilities

DMMC in general is well served with medical services both public and private. The Colombo South Teaching Hospital at Kalubowila with bed strength of about 700 provides the medical needs of DMMC. In addition to above, there are 3 private hospitals and over 100 Dispensary/ Clinics providing medical facilities to the rate payers of DMMC.

(3) Postal facilities

There are 3 main Post Offices at Dehiwala, Mount Lavinia and Ratmalana, 23 sub post offices and a few Agency Post Offices in DMMC. These provide an adequate service to the resident population.

(4) Recreational facilities

Open spaces and green areas for leisure and recreation in the sense of their accessibility to communities within walking distance are very few. Housing development and subdivisions of land have been permitted without adequate attention being paid to open space among residential areas, so that the people live in a crowded environment.

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

The existing sewer system which runs from Mount Lavinia to Wellawatte serves only a very limited area of the city. The rest of the city depends on septic tanks and pit latrines for disposal of night soil. Some people who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards.

1.3.2 Industrial Wastewater

Most of the Factories located at Ratmalana discharge raw untreated effluent into open drains leading to natural waterways or low lying land and thereby polluting the ground water table which is very high in this area.

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to On-site Sanitation

Regulations made by the Minister under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.2.1.3. Regulation and Rules regarding to Water Works:

The National Water Supply and Drainage Board Law, No. 2 of 1974 of the National State Assembly

2.1.2 Regulation and Rules regarding to Solid Waste Service

Regulations made by the Chief Minister, Provincial council, Western Province and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.2 Organization of the City

2.2.1 Organization of the City

Figure 2.1 shows organization chart of DMMC.

2.2.2 Organization of Sewerage Works

Operation and Maintains of Dehiwala Mount Lavinia Sewerage Scheme is doing by NWSDB.

Figure 2. 2 shows sewerage O&M organization chart of DMMC.

2.2.3 Organization of On- site Sanitation Works

On- site Sanitation Works is being carry out by Municipal Council and the details of staff involved with site sanitation is shown in the Organization Chart in **Figure 2.1**

2.2.4 Organization of Water Works

O&M of Dehiwala Mount Lavinia Water Scheme is doing by NNWSDB. **Figure 2.3** shows water works O&M organization chart of DMMC.

2.2.5 Organization of Solid Waste Service

Solid Waste Service is being carry out by Municipal Council and the details of staff involved with Solid Waste Service is shown in the Organization Chart in **Figure 2.1**

2.2.6 Organization for Hazardous Wastewater Control:

It is being carried out by CEA.

2.3 Budget

2.3.1 Total Budget of the City (DMMC) - 2011 year- LKR 942 Million

2.3.2 Budget for Sewerage Works (NWSDB) - 2011 year LKR 28 Million

2.3.3 Budget for on-site sanitation Works (DMMC) - included into the budget of solid waste service.

2.3.4 Budget for Water Works (NWSDB) - LKR 131.6 Million

2.3.5 Budget for Hazardous Wastewater Control - Not known.

It may be included in CEA Budget.

3. Public Works

3.1 Sewerage Works

3.1.1 Progress

The existing Dehiwala –Mount Lavinia Sewerage Scheme was constructed under the World Bank/ Saudi/GOSL Funding and commissioned in 1989.

3.1.2 Service Condition

The system is more than 23 years old and there are 5,000 premises within the severed area of DMMC but only 1,650 houses are connected to the system. Almost all drains and water bodies including coastal area are polluted with waste water released from the places which are not connected to the Sewer System.

3.1.3 Service Charge

As per the tariffs gazette (No. 1738/7) on 28.12.2011 with effective from 1st January 2012, attached the copy of Gazette Notification for details (**Table 2.3**)

3.1.4 Existing Sewerage Facilities

(1) Wastewater Collection System

The existing sewer system which runs from Mount Laviniya to Wellawatte serves only a very limited area of the City, about 5-6% of the total city area. Total length of sewer pipe line laid is about 23.5 km.

(2) Kind of Wastewater

Wastewater from kitchens and bathrooms from houses and other places, night soil from latrines, waste water and other waste from hospitals, commercial places, industries and other places located in the sewered area of the city.

(3) Sewer Pipe

Dia (mm)	200	250	300	400	525	600	1000
Length (km)	18.5	0.5	1.0	1.0	0.4	1.0	1.1

(4) Treatment Plants - Not available

(5) Pump Facilities

- a. Wellawatte Pump House include 3.Nos Pumps- capacity-100l/sec., 48meter head
- b. Mt. Lavinia Pump House include 3. Nos Pumps - capacity-170l/sec., 40meter head

(6) Operation and Maintains

It is being carried out by NWSDB. Manager (O&M-Sew) located at Wellewatte Office is responsible for O&M works of the sewerage scheme.

3.1.5 Development Project

- (a) Project funded by World Bank (50%)/ GOSL(35%)/ Water Board(10%) and community(5%) is being implemented for the provision of sewer connections to the individual houses on cessionary basis.
- (b) Another Sewerage Project funded by SIDA is in progress now to connect the Industries and houses in Ratmalane Area.

3.1.6 Potential Demand of Sewerage Service

Only 5% of City Area is served by the existing Sewerage Scheme. The rest of the City depends on septic tanks and pit latrines for disposal of night soil. Some People who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards.

3.1.7 Operation and Maintains System

Preventive and Corrective Maintains Program is being implemented by Manager (O&M)-Wellawatte. Please refer Figure 2.2 for the details of Organization Chart of O&M Staff for the Sewerage Scheme.

3.1.8 Operation and Maintance Budget for the year 2011 - LKR. 28 Million.

3.1.9 Source of Budget for Operation and Maintains - provided by NWSDB Funds,.

3.1.10 Outstanding issues in Sewerage Works

- (a) The existing Scheme covers only 33% of the total M.C.Area.
- (b) Only 1,650 connections were given out of 5,000 premises within sewerred area.
- (c) Monthly income is not sufficient to recover the O&M monthly cost.

3.2 On-site Sanitation Works

3.2.1 Progress - Constructed individual septic tanks and pit latrines.

3.2.2 Service Condition - DMMC is desludging the septic tanks on request

3.2.3 Treatment Process - Anaerobic treatment process in the septic tanks.

3.2.4 Potential Demand of On-Site Sanitation System

Required for the housing schemes and low income settlements

3.2.5 Operation and Maintenance System - DMMC is desludging the septic tanks on request

3.2.6 Operation and Maintenance Budget - Not available.

Source of Budget for O&M – Payment is made by the people to DMMC for the desludging of septic tanks by the gully sucker sent by DMMC.

3.2.7 Outstanding issues in on-site sanitation works

- (1) Not adequate gulley bowsers available at DMMC.
- (2) Conditions of the bowsers are not satisfactory
- (3) Overflowing of septic tanks especially during the rainy seasons.

3.3 Water Works

3.3.1 Progress

The existing water supply scheme for Dehiwala-Mount Laviniya is maintained and operated by NWSDB. Manager (O&M) located at Dehiwela Manger's Office is responsible for the operation and maintenance works of the scheme. Please refer **Figure 2.3** for the details of Organization Chart.

3.3.2 Water Source - Kelani River. Raw water is taking from the Kelani River at the Intake at Ambathale.

3.3.3 Service Charge

As per the Tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009.

3.3.4 Purification Plant

Located at Ambathale. Full treatment Process. Capacity of the Treatment Plant-125 million Gallon per day

3.3.5 Outstanding issues - No major outstanding issues

3.4 Solid Waste Service

3.4.1 Collection System

DMMC is using 43 vehicles to transport solid waste from houses to dumping site at Attediye.

3.4.2 Service Charge - No separate charge imposed. It is included in the property tax.

3.4.3 Outstanding Issues

- (a) Transport facilities for solid waste are not adequate and conditions of the vehicles also not satisfactory.
- (b) Capacity of the dumping site is not sufficient and conditions also not satisfactory.

3.5 Hazardous Wastewater Control

3.5.1 Industrial Wastewater Control - carrying out by CEA

3.5.2 Hospital Wastewater Control - carrying out by CEA

4. Outstanding issues in Sewerage Sector and Measures to Overcome those issues

4.1 Sewerage Works

4.1.1 Organization - No major issues

4.1.2 Development - Only 5% of MC area is covered by existing sewerage scheme. Donor Funding is to be identified for the expansion of the scheme

4.1.3 Operation and Maintenance - Present system is seem to be satisfactory.

4.2 On-site Sanitation

4.2.1 Organization - DMMC is carrying out the de-sludging of septic tanks when requested by the rate payers.

4.2.2 Development - On site Sanitation facilities required for housing schemes and low income housing settlements. Investigate and design separate sanitation facilities for the above places and are to be provided.

4.2.3 Operation and Maintenance

DMMC is doing the de-sludging of septic tanks and require more Gulley Suckers.

4.3 Hazardous Wastewater

4.3.1 Organization - Individual Industry/ Hospitals. Presently they do not have their treatment plants to treat wastewater before releasing to the main scheme or natural stream.

4.3.2 Development - CEA will have to check the quality of effluent and advise them have to separate treatment plant in their premises

4.3.3 Operation and Maintenance - Individual Institution has to carry out the operation and maintenance works.

4.3.4 Control System - CEA will have to carry out the control system.

Table 2.1 Area and Population by Ward (Ward – wise Population Densities 2001, 2011)

Ward No	Ward	Extent (ha)	Density / Persons per hector	
			2001	2011
	Wilawila	50.2	142	149
	Dutugemunu	76.9	75	77
	Kohuwela	85.0	109	121
	Kalubowila	50.6	118	123
	Hathbodiya	40.2	152	154
	Saranankara	36.5	159	164
	Galwala	45.8	160	159
	Dehiwala West	47.5	123	129
	Dehiwala East	46.7	114	117
	Uddyana	51.7	150	161
	Nedimala	74.0	151	160
	Malwatha	36.6	142	155
	Jayathileke	39.5	184	199
	Karagampitiya	40.7	153	163
	Kawdana East	120.7	62	70
	Kawdana West	51.8	147	160
	Galkissa	29.1	275	310
	Vidyalaya	74.9	89	94
	Watarappola	39.5	178	183
	Katukurundawatta	115.8	54	61
	Attidiya North	114.3	68	75
	Wathumulla	54.6	114	120
	Wedikanda	64.3	122	128
	Pirivena	63.2	110	120
	Attidiya South	140.2	57	62
	Vihare	68.3	119	124
	Ratmalana West	38.4	204	218
	Ratmanala East	106.3	73	81
	Kandawala	305.6	32	33
	DMCC	2109.0	99	106
Population of DMCC			209,787	224,102

Table 2.2 Population projection up to 2011 (Ward – wise Population Densities 1971 – 2011)

Ward No	Ward	Extent Ha	Density / Persons per Hector				
			1971	1981	1991	2001	2011
	Wilawila	50.2	94	107	124	142	149
	Dutugemunu	76.9	70	72	74	75	77
	Kohuwela	85.0	72	84	97	109	121
	Kalubowila	50.6	106	108	114	118	123
	Hathbodiya	40.2	143	145	149	152	154
	Saranankara	36.5	140	147	154	159	164
	Galwala	45.8	107	128	145	160	159
	Dehiwala West	47.5	100	107	115	123	129
	Dehiwala East	46.7	104	107	111	114	117
	Uddyana	51.7	111	122	136	150	161
	Nedimala	74.0	94	112	129	151	160
	Malwatha	36.6	105	116	129	142	155
	Jayathileke	39.5	131	150	166	184	199
	Karagampitiya	40.7	130	139	145	153	163
	Kawdana East	120.7	38	46	54	62	70
	Kawdana West	51.8	99	114	129	147	160
	Galkissa	29.1	148	189	228	275	310
	Vidyalaya	74.9	69	76	83	89	94
	Watarappola	39.5	142	157	169	178	183
	Katukurundawatta	115.8	34	40	47	54	61
	Attidiya North	114.3	43	50	59	68	75
	Wathumulla	54.6	94	99	106	114	120
	Wedikanda	64.3	96	106	113	122	128
	Pirivena	63.2	78	92	102	110	120
	Attidiya South	140.2	44	49	53	57	62
	Vihare	68.3	89	103	112	119	124
	Ratmalana West	38.4	145	169	188	204	218
	Ratmanala East	106.3	51	59	65	73	81
	Kandawala	305.6	23	27	30	32	33
	DMCC	2109.0	73	82	91	99	106
Population of DMCC			154,194	173,529	191,639	209,787	224,102

Table 2.3 Sewerage Service Charge
The Gazette of the Democratic Socialist Republic of Sri Lanka
EXTRAORDINARY

No. 1738/7, WEDNESDAY, DECEMBER 28, 2011

(Published by Authority)

PART 1 : SECTION (1) – GENERAL

Government Notifications

THE NATIONAL WATER SUPPLY & DRAINAGE LAW NO. 02 OF 1974

NOTICE is hereby given in terms of Section 84 (7) of the National Water Supply & Drainage Board Law, No 02 of 1974, of the following tariffs will be revised with effect from 1st January 2012 for sewerage services from consumers connected to the sewerage systems/networks owned, operated and maintained by National Water Supply and Drainage Board.

DINESH CHANDRA RUPASINGHE

GUNAWARDENA

MINISTER OF WATER SUPPLY AND
DRAINAGE

Ministry of Water Supply & Drainage
No. 35, "Lakdiya Medura, " New Parliament Road"
Pelawatta, Battaramulla

Rate I

Domestic Tariff- this tariff shall apply to sewerage services provided to premises for domestic purposes.

Water Consumption (cu.m)	Usage Sewerage Tariff per cu.m (Rs)	Service Charge (Rs)
0		
1 - 10	1.00	200.00
1 - 15	1.50	200.00
1 - 20	2.00	200.00
1- 25	2.50	200.00
1 - 30	4.00	200.00
1 - 40	6.00	200.00
1 -50	8.00	200.00
>50	10.00	200.00

Rate II

Commercial Tariff – this tariff shall apply to sewerage services provided to premises for commercial purposes.

Water Consumption (cu.m)	Sewerage Tariff (per cu.m)
0	
>0	Rs. 40.00

2A

Part 1: SEC (1) – GAZETTE EXTRAORDINARY OF THE DEMOCRATIC OF THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA – 28.12.2011

Rate III

Industrial Tariff – this shall apply to sewerage services provided to premises for mass production purposes.

Water Consumption (cu.m)	Sewerage Tariff (per cu.m)
0	
>0	Rs. 65.00

The sewerage charge for the relevant month of billing under Domestic tariff, Commercial tariff and Industrial tariff shall be devised on the consumption of water, taking into consideration the utilization

of all sources of water supply.

Disconnection of Supply to Consumer who default to pay Sewerage Chargers:

Where the water supply charge and sewerage charge payable by a person in respect of any month is not paid within thirty days from the date of receipt of an invoice for payment relating to such chargers, water services will be cut off in accordance with Section 88 (1) of the National Water Supply and Drainage Board Law, No. 2 of 1974.

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Organization Chart for Manager's Office at Dehiwala -Mount Lavinia

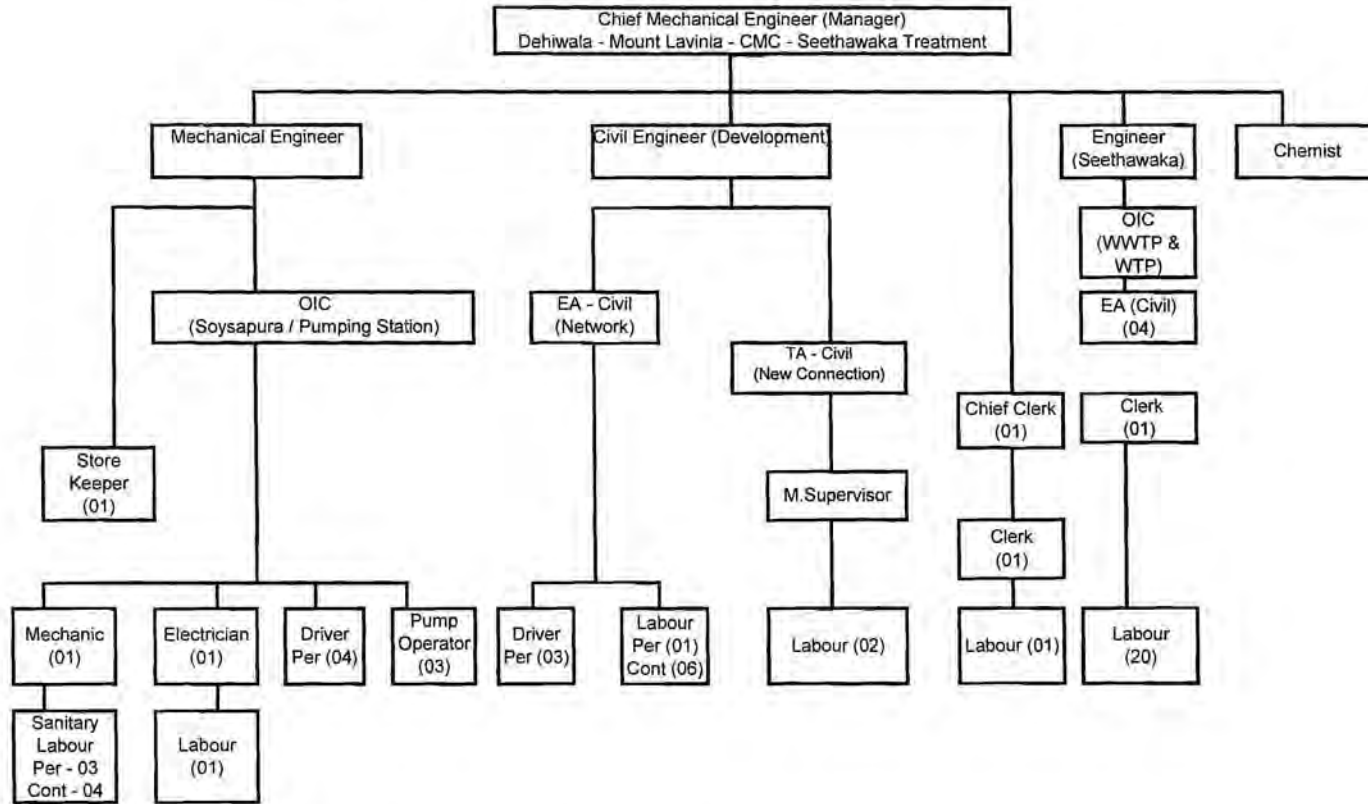
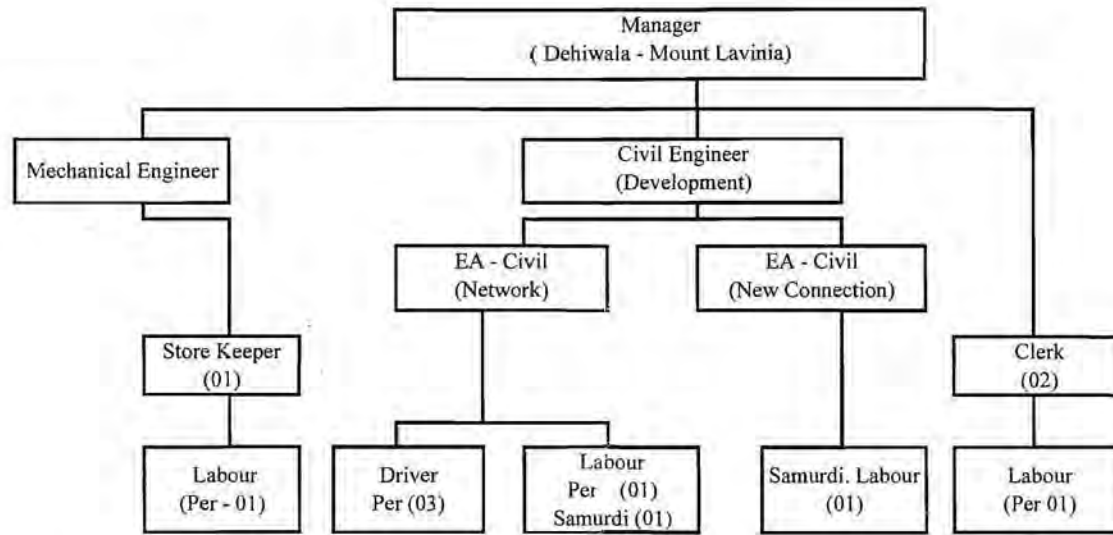


Figure 2.1 Organization Chart of DMMC

ORGANIZATION CHART FOR MANAGER'S OFFICE DEHIWALA/MOUNT LAVINIA

(Sewerage)



Manager	1	Store Keeper	1
Mechanical Engineer	1	Driver	3
Civil Engineer	1	Permanent Labour	3
E A	2	Samurdi Labour	2
Clerk	2		
		Total	16

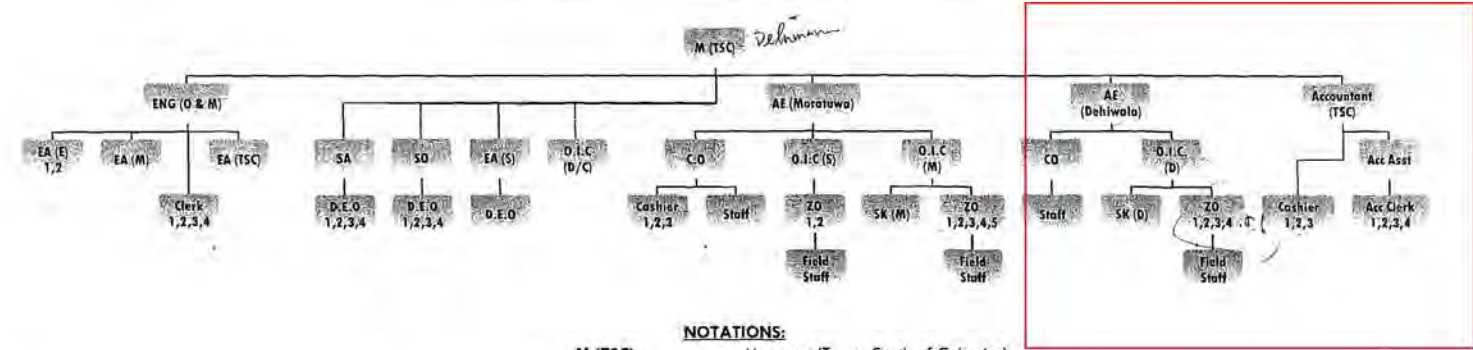
Figure 2.2 O&M Organization for DMMC Sewerage Scheme

Annexure - 12

National Water Supply & Drainage Board
Western South Regional Support Centre
TSC Region

ORGANIZATION STRUCTURE OF TSC REGION

water



NOTATIONS:

- M (TSC) - Manager (Towns South of Colombo)
- ENG (O & M) - Engineer (Operation & Maintenance)
- AE - Area Engineer
- CO - Commercial Officer
- OIC - Officer in Charge
- ZO - Zone Officer
- SK - Store Keeper
- SA - System Administrator
- SO - System Operator
- EA (S) - Engineering Assistant (Supplies)
- EA (E) - Engineering Assistant (Electrical)
- EA (M) - Engineering Assistant (Mechanical)
- EA (TSC) - Engineering Assistant (TSC)
- CC - Chief Clerk
- DEO - Data Entry Operator

Figure 2.3 O&M Organization for DMMC Water Supply

Annex 3 KADUWELA MC

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Kaduwela MC is situated in Colombo District adjoining the Jayawardenapura City, new Capital of Sri Lanka and located on the almost flat land.

1.1.2 Receiving Water

The Kelani Ganga (river) flows through Kaduwela MC and the raw water is taking from Kelani River at Ambethale, downstream of Kaduwela.

1.1.3 Meteorology

Kaduwela MC is lying in the wet zone and receives an average annual rainfall between 2000 to 3000 mm mainly during the south west monsoon and the inter-monsoon periods. Mean average day temperature is around 28 °C and average maximum between 30.5 to 31 °C. Minimum night temperature varies from 26 C to 27 °C.

1.2 Sociology

1.2.1 Population

The total extent of 87.71km² of Municipality is distributed in 57 GN Divisions and the population in each GN Divisions is given in **Table 3.1**. The total population of the City is 265,990 in 2010.

1.2.2 Quality of Life

Majority of the families living in the city are engaged in government and private sector employment. The rest of the families depend on business, self employment and agriculture.

1.2.3 Industries

No major industries found in Kaduwela MC Area

1.2.4 Public Facilities

(1) Educational facilities

There are 34 public schools available in the city area for the education of the students living in Kaduwea MC and suburbs.

(2) Medical facilities

Kaduwela in general is well served with medical services both public and private hospitals. Three Hospitals in Kaduwela MC Area provides the medical needs of the people living in Kaduwela MC.

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

The whole city except Jayawadenagama Housing Scheme depends on septic tanks and pit latrines for disposal of night soil. Some people who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards.

Jayawadenagama Housing Scheme Sewerage Scheme serves the population of 3,600 people living in Housing Scheme. It consists of 5.8km sewer collection pipes and two pump houses from which sewer is pumped into the sewer system of Colombo.

1.3.2 Industrial Wastewater

No major industries.

2.1 Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding On site Sanitation

Regulations made by the Minister under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.1.2 Regulation and Rules regarding to Water Works

The National Water Supply and Drainage Board Law, No. 2 of 1974 of the National State Assembly

2.1.3 Regulation and Rules regarding to Solid Waste Service

Regulations made by the Chief Minister, Provincial council, Western Province and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.2 Organization of the City

2.2.1 Organization of the City

Figure 3.1 shows organization chart of Kadowela MC.

2.2.2 Organization of Sewerage Works

Organization Chart of Jayawadenagama Housing Sewerage Scheme is shown in **Figure 3.2**.

2.2.3 Organization of on- site Sanitation Works

On- site sanitation works is being carried out by Municipal Council and the details of staff involved with site sanitation is shown in the Organization Chart in **Figure 3.1**.

2.2.4 Organization of Water Works

Operation and Maintains of Kaduwela Water Scheme is being done by NWSDB. **Figure 3.3** shows water works organization chart.

2.2.5 Organization of Solid Waste Service

Solid Waste Service is being carried out by Municipal Council and the details of staff involved with Solid Waste Service are shown in the Organization Chart in **Figure 3.1**.

2.2.6 Organization for Hazardous Wastewater Control - It is being carried out by CEA.

2.3 Budget

2.3.1 Total Budget of the City (Kaduwela) - 2011 year- LKR 579 Million

2.3.2 Budget for on-site sanitation Works (Kaduwela) - included into the budget of the City.

2.3.3 Budget for Water Works (NWSDB) - LKR 98.3 Million

2.3.4 Budget for Hazardous Wastewater Control - Not known. It may be included in Central Environmental Authority Budget.

3. Public Works

3.1 Sewerage Works

No existing Sewerage Scheme operating for the City. Only Sewerage Scheme is operating by NWSDB for Jayawadenagama Housing Scheme.

3.1.2 Existing Sewerage facilities (Jayawadenagama Housing scheme)

- (1) Wastewater Collection system consists of 160 dia. PVC Pipe-1.6km and 110 dia PVC Pipe 4.2km
- (2) Two Pump Houses at Jayawadenagama and Diyawanna Garden – 2Nos. Pumps installed. Capacity-15liter/sec, 12.3l/s respectively

3.1.3 Potential Demand of Sewerage Service

The whole City except Jayawadenagama Housing Scheme depends on septic tanks and pit latrines for disposal of night soil. Some People who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and

posing health hazards. Accordingly, there is a necessity for the Sewerage Scheme for the City of Kaduwela

3.1.4 Operation and Maintains System - NWSDB is operating Jayawadenegama Housing Sewerage Scheme

3.1.5 Operation and Maintenance Budget for the year 2011 - LKR 3.66 Million

3.1.6 Source of Budget for Operation and Maintains - NWSDB

3.1.7 Outstanding issues in Sewerage Works -

(1) Entire Sewerage Scheme is more than 30 years old and need the urgent rehabilitation and improvements to the scheme

3.2 On-site Sanitation Works

3.2.1 Progress - Constructed individual septic tanks and pit latrines.

3.2.2 Service Condition - MC is desludging the septic tanks on request

3.2.3 Treatment Process - Anaerobic treatment process in the septic tanks.

3.2.4 Potential Demand of On-Site Sanitation System

Required for the housing schemes and low income settlements

3.2.5 Operation and Maintenance System - MC is desludging the septic tanks on request.

3.2.6 Source of Budget for Operation and Maintenance

Payment is made by the people to MC for the desludging of septic tanks by the gully sucker sent by MC.

3.2.7 Outstanding issues in on-site sanitation works

(a) Not adequate gully bowsers available at MC. Available 2 Nos. gully bowsers (capacity - 4000 lt. and 1400 lt.)

(b) Conditions of the bowsers are not satisfactory

(c) Overflowing of septic tanks especially during the rainy seasons.

3.3 Water Works

3.3.1 Progress

The existing Water Supply Scheme for Kaduwela is maintained and operated by NWSDB. Manager (O&M) located at Kotte Manger's Office is responsible for the operation and maintains works of the scheme. Please refer Figure 3.3 for the details of Organization Chart.

3.3.2 Water Source - Kelini River. Raw water is taking from the Kelani River at the Intake at Ambatale.

3.3.3 Service Charge

As per the Tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009.

3.3.4 Purification Plant

Located at Ambatale. Full treatment Process. Capacity of the Treatment Plant-125 million gal./day

3.3.5 Outstanding issues - No major outstanding issues

3.4 Solid Waste Service

3.4.1 Collection System

Kaduwela MC is transporting solid waste from houses to Compost Project Site at Sedawatte, nearly 5km away from Kaduwela MC.

3.4.2 Disposal Site - Sedawatte, nearly 5 km away from Kaduwela MC

3.4.3 Service Charge - No separate charge imposed. It is included in the property tax.

3.4.4 Development Project - Completed Compost Project at Welahandye. Capacity 10 t/day

3.4.5 Outstanding Issues

- (a) Transport facilities for solid waste are not adequate and conditions of the vehicles also not satisfactory.
- (b) Capacity of the dumping site at Sedawatte is not sufficient. Almost filled.
- (c) No sanitary land filling or any other treatment to the garbage dumped at Sedawatte dumping site. It will affect the health condition of the people living close to the site.

3.5 Hazardous Wastewater Control

3.5.1 Industrial Wastewater Control - carrying out by CEA

3.5.2 Hospital Wastewater Control - carrying out by CEA

4. Outstanding issues in Sewerage Sector and Measures to Overcome those issues

4.1 Sewerage Works

No existing Sewerage Scheme except for Jayawadenagama Housing Scheme. There is a necessity for Sewerage Scheme for the urban area of Battremulla where Govt Institutions are

located near the new Parliament.

4.2 On-site Sanitation

4.2.1 Organization - MC is carrying out the desludging of septic tanks when requested by the rate payers.

4.2.2 Development - On site Sanitation facilities required for housing schemes and low income housing settlements. Investigate and design Separate Sanitation facilities for the above places and are to be provided.

4.2.3 Operation and Maintains

MC is doing the desludging of septic tanks and requires more Gulley Suckers. Sludge is dumped into CMC Pump House.

4.3 Hazardous Wastewater

4.3.1 Organization - Individual Industry/ Hospitals. Presently they do not have separate treatment plants to treat wastewater before releasing to the natural stream.

4.3.2 Development - CEA will have to check the quality of effluent and advise them to have a separate treatment plant in their premises

4.3.3 Operation and Maintains - Individual Institution has to carry out the operation and maintains works.

4.3.4 Control System - CEA will have to carry out the control system.

Table 3.1 Population of Kaduwela MC

Division	2007	2008	2009	2010
Ranala		4,520	4,550	4,500
Nawagamuwa	5,071	5,106	5,141	5,962
Nawaga. - Sou.	2,488	2,505	2,517	3,150
Ihala Bomiriya	3,658	3,683	3,708	4,725
Wekewatta	3,011	3,031	3,051	3,825
Pahala-Bomiriya - A	3,604	3,628	3,652	4,725
Pahala-Bomiriya - B	4,392	4,422	4,472	5,175
Kotalawala	5,451	5,488	5,525	5,850
Kaduwela	4,527	4,558	4,590	4,725
hewagama	3,661	3,686	3,711	4,050
Hewagama	3,661	3,686	3,711	4,050
Raggahawa	3,807	3,832	3,857	4,387
Welivita	4,497	4,528	4,559	5,625
Mahadeniya	4,707	4,739	4,771	6,075
Malabe East	4,697	4,729	4,761	5,850

Division	2007	2008	2009	2010
Malabe West	5,888	5,928	5,968	5,850
Malabe North	6,993	6,839	6,886	7,200
Thalangama N. A.	10,013	10,081	10,150	10,125
Thalangama N. B.	4,463	4,464	4,526	4,162
Muttetugoda	7,328	7,378	7,428	6,750
Pothuarawa	6,791	6,837	6,884	7,200
Thalahana - North	3,219	3,240	3,261	3,712
Thalahana - South	2,841	2,860	2,879	3,375
Jayawadanagama	2,895	2,915	2,935	2,587
Pahalawala	6,122	6,164	6,206	5,625
Asiriuyana	4,197	4,226	4,555	3,937
Wicramasinhapura	3,790	8,810	3,845	3,375
Kumaragewatta	4,873	4,906	4,939	5,400
Batopotha	7,781	7,834	7,887	7,875
Aruppittiya	2,206	2,221	2,336	2,587
Wellipillawa	2,473	2,490	2,507	2,812
Dedigamuwa	2,014	2,027	2,040	2,137
Embilladeniya	1,391	1,400	1,410	2,025
Batewela	2,068	2,082	2,096	2,362
Oruwala	3,857	3,883	3,909	4,725
Shanthalokagama	5,229	5,264	5,299	9,225
Korathota	8,004	8,058	8,112	9,000
Welihinda	1,695	1,707	1,719	2,700
Thunandahena	3,090	3,111	3,132	4,275
Pore	4,206	4,234	4,262	5,287
Borulugoda	2,549	2,566	2,583	3,375
Athurigiriya	6,084	6,125	6,166	5,850
Athurigiriya South	3,635	3,660	3,685	3,937
Thaladiyawala	3,118	3,139	3,160	3,262
Kalapluwawa	4,600	4,631	4,662	4,387
Walpola	9,254	9,317	9,380	8,775
Kotuwegoda	3,159	3,181	3,203	2,812
Sri Subithipura	3,031	3,051	3,071	2,362
Battaramulla South	2,587	2,605	2,623	2,025
Battaramulla North	3,997	4,024	4,051	2,812
Udumulla	3,052	3,073	3,094	2,637
Rajamalwatta	2,914	2,934	2,954	1,800
Hokandara North	5,569	5,607	5,645	5,737
Hokandara East	3,746	3,771	3,796	4,612
Arangala	4,852	4,885	4,918	4,725
Hokandara South	4,453	4,483	4,513	5,175
Wellangiriya	4,262	4,290	4,318	4,725
Total	264,127	252,442	249,569	265,990

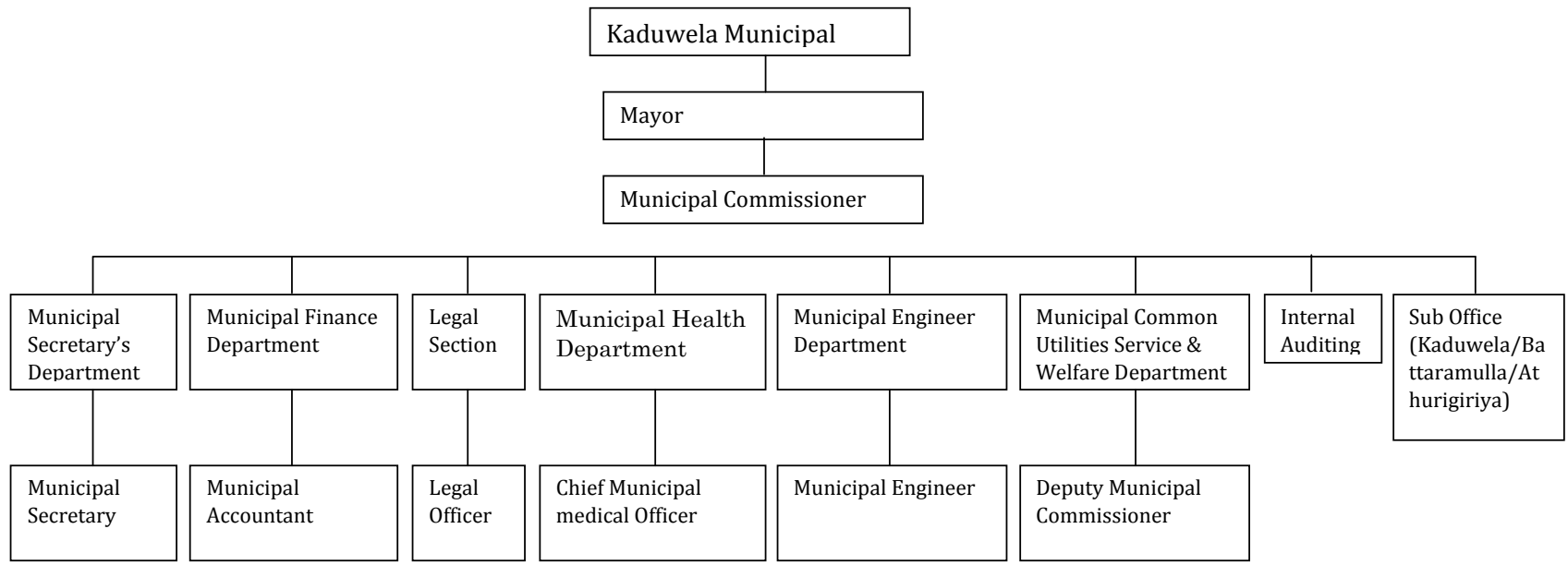


Figure 3.1 Organization Chart of Kaduwela MC

Attachment 2

Annexure - 08

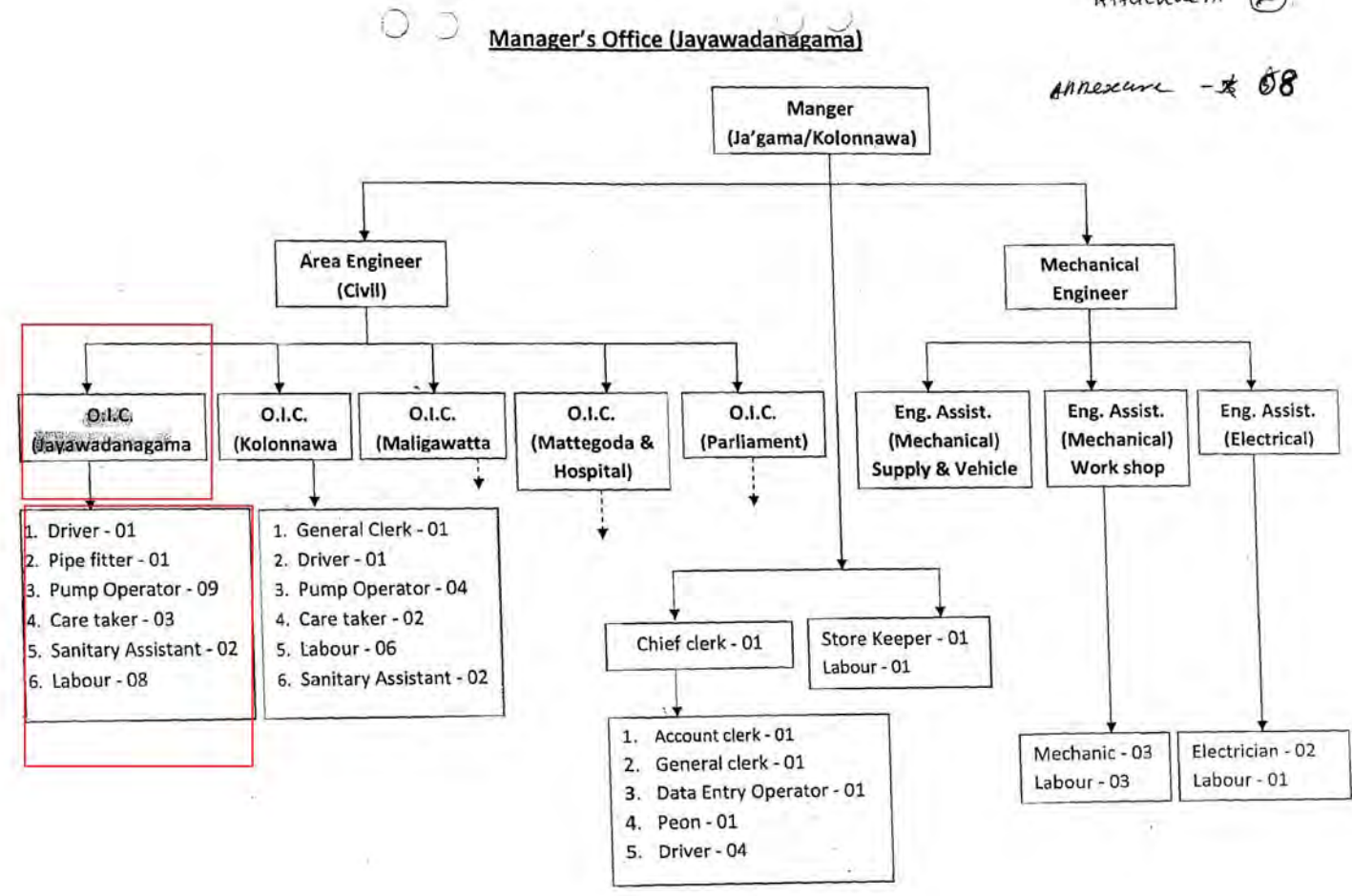


Figure 3.2 Organization Chart for Jayawadenagama Sewerage scheme

Annexure - 11

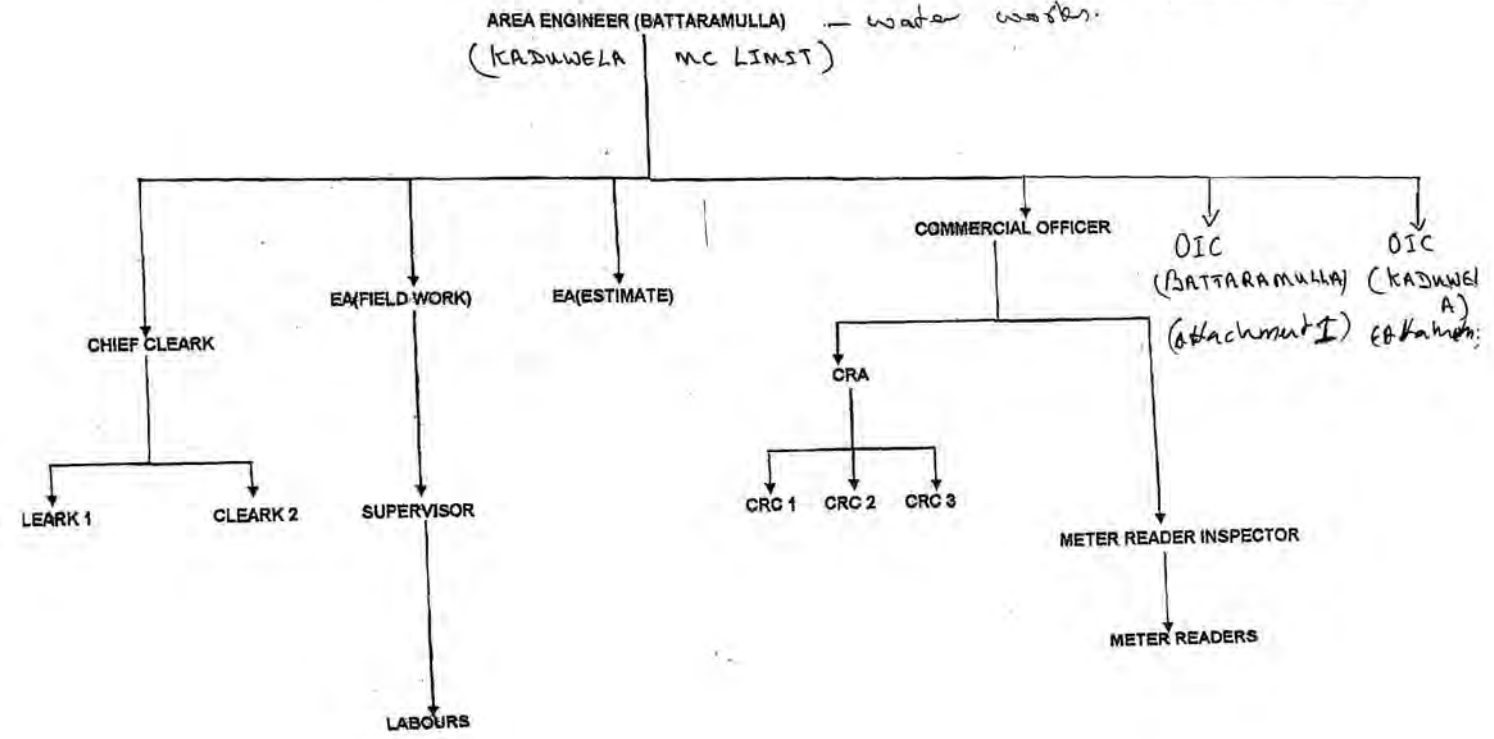


Figure 3.3 Organization of Water Works (1)

Attachment I
Annexure II

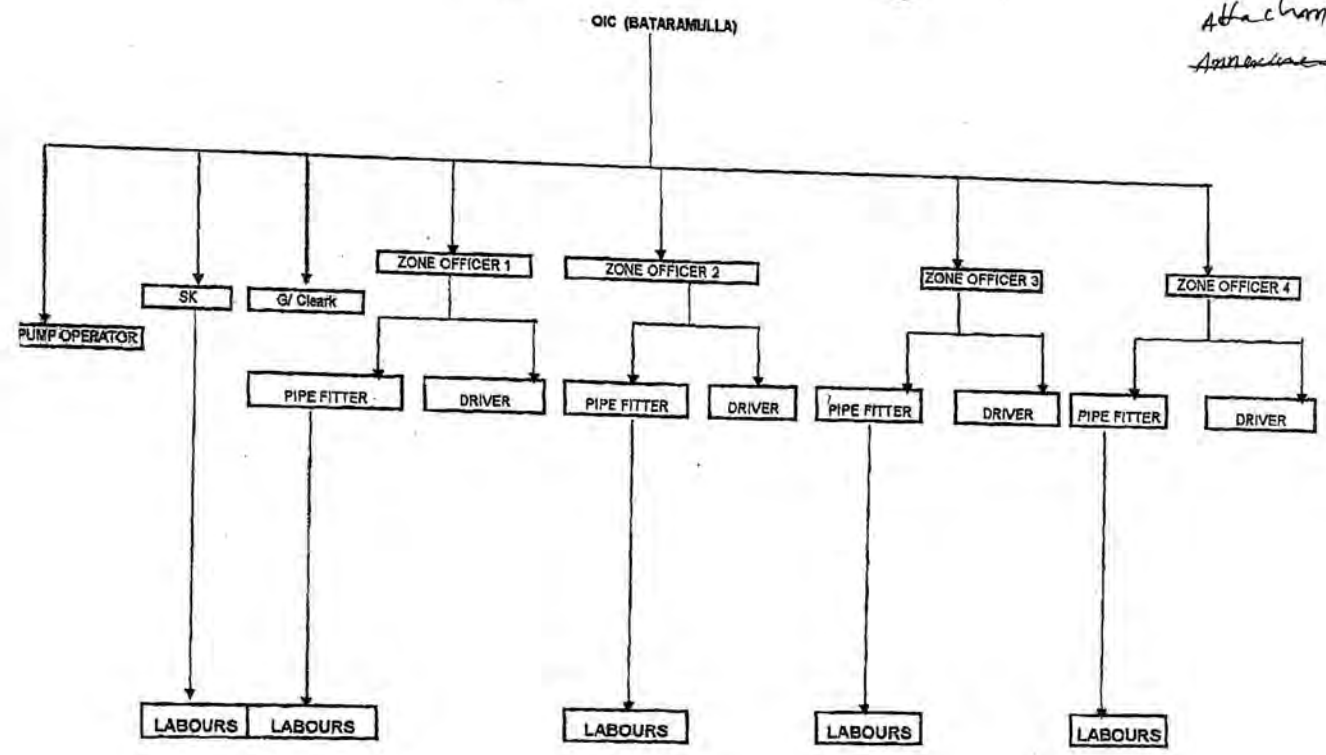


Figure 3.3 Organization of Water Works (2)

Attachment 2
Annexure 11

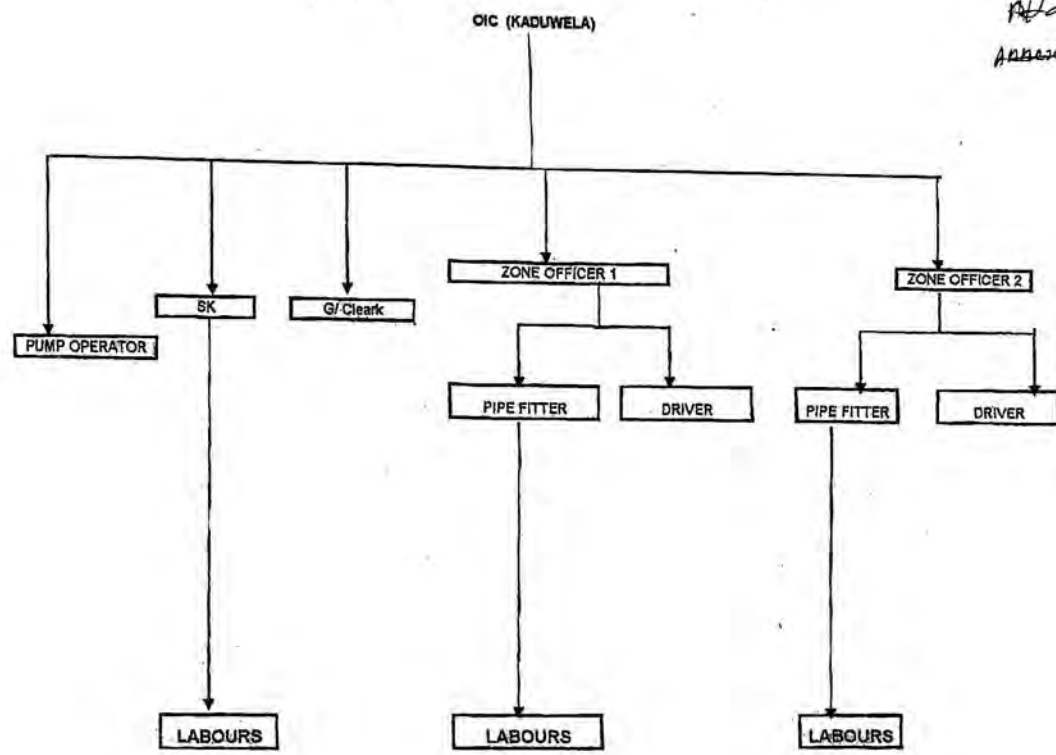


Figure 3.3 Organization of Water Works (3)

Organization Chart for Solid Waste division - Kaduwela Municipal

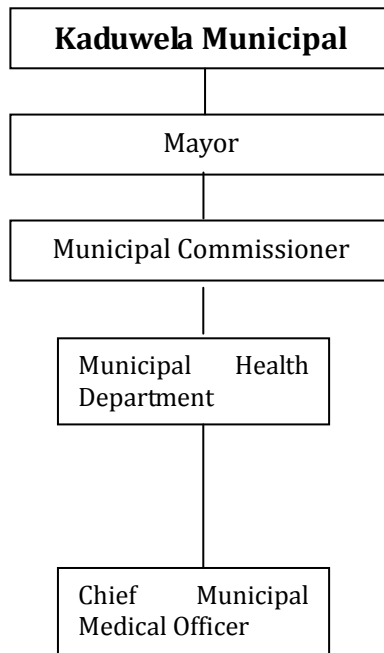


Figure 3.4 Organization of Solid Waste Service

Annex 4 KOLONNAWA UC

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

The land is mostly flat and some areas, especially, portion of Sedawatte, Ward No.7 of Kolonnawa UC which lies between Kelani Ganga and Rail-Way is affected by flooding during rainy season. It is bounded on the west by CMC and on the other boundary by Kaduwela MC and Kottekawatte PS Area.

1.1.2 Receiving Water

The only river of any appreciable size is the Kelani Ganga (River) which passes close to Kolonnawa urban area. Two small watercourses flow northwards through Kolonnawa urban area to discharge into Kelani River, but these are almost dry during the dry weather period. The water in these is foul as they virtually act as open sewers and the flow is negligible because their points of discharge at the coast are often blocked by a sandbar.

1.1.3 Meteorology

Kolonnawa UC is lying in the wet zone and receives an average annual rainfall between 2,000 to 3,000 mm mainly during the south west monsoon and the inter monsoon periods. Mean average day temperature is around 28 °C and average maximum between 30.5 to 31 °C. Minimum night temperature varies from 26 C to 27°C.

1.2 Sociology

1.2.1 Population

The total extent of 1,060 ha of urban area is distributed in 13 wards and population in 2001 was 57,688 as shown in **Table 4.1**. The total population in Kolonnawa UC in 2010 is 62,335.

1.2.2 Quality of Life

The Urban Area is generally a mixture of high to medium density housing and commercial warehousing.

1.2.3 Industries

No major industries found in Kolonnawa UC.

1.2.4 Public Facilities

(1) Educational facilities

There are 7 public schools are available in Kolonnawa UC to provide the education facilities living in UC and suburbs.

(2) Medical facilities

No major facilities in Kolonnawa UC

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

The existing sewer system which runs through Kolonnawa UC serves only about 60% of the town area. The length of the sewer lines lay about 20.6 km. The rest of the City depends on septic tanks and pit latrines for disposal of night soil. Some people who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards.

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to On-site Sanitation:

Regulations made by the Minister under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.1.2 Regulation and Rules regarding to Water Works:

The National Water Supply and Drainage Board Law, No. 2 of 1974 of the National State Assembly

2.1.3 Regulation and Rules regarding to Solid Waste Service

Regulations made by the Chief Minister, Provincial council, Western Province and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.2 Organization of the City

2.2.1 Organization of the Town

Organization chart of Kolonnawa UC is shown in **Figure 4.1**.

2.2.2 Organization of Sewerage Works

Operation and Maintains of Kolonnawa Sewerage Scheme is doing by NWSDB. Organization chart of sewerage O&M is shown in **Figure 4.2**.

2.2.3 Organization of On-site Sanitation Works

On-site sanitation works is being carried out by UC and the details of staff involved with site sanitation is shown in the Organization Chart in **Figure 4.1**.

2.2.4 Organization of Water Works

Operation and Maintenance of Kolonnawa water scheme is being done by NWSDB. Water works O&M organization chart is presented in **Figure 4.3**.

2.2.5 Organization of Solid Waste Service

Solid waste service is being carry out by UC and the details of staff involved with solid waste service is shown in **Figure 4.1**.

2.2.6 Organization for Hazardous Wastewater Control

It is being carried out by CEA.

2.3 Budget

2.3.1 Total Budget of the City (Kolonnawa U.C) - 2011 year - LKR 139.8 Million

2.3.2 Budget for Sewerage Works (NWSDB) - 2011 year LKR 12.88 Million

2.3.3 Budget for on-site sanitation Works (Kolonnawa U.C) - included into the budget of city.

2.3.4 Budget for Water Works (NWSDB) - LKR 104.4 Million

2.3.5 Budget for Hazardous Wastewater Control - Not known. It may be included in Central Environmental Authority Budget.

3. Public Works

3.1 Sewerage Works

3.1.1 Progress

The existing Kolonnawa sewerage scheme was constructed under the World Bank/ Saudi/GOSL funding and commissioned in 1989. The total length of sewer lines laid in UC area is about 20.6 km covering about 60% of total UC area.

3.1.2 Service Condition

The system is more than 23 years old and is covering about 60% of the UC area. Almost all drains and water bodies are polluted with waste water released from the places which are not connected to the sewer system.

3.1.3 Service Charge

As per the tariffs gazette (No.1738/7) on 28.12.2011 with effective from 1st January 2012 Attached the copy of Gazette Notification for details (**Table 4.2**)

3.1.4 Existing Sewerage facilities

(1) Wastewater Collection System

The existing sewer system serves only 60% area of the city. Total length of sewer pipe line laid is about 20.6km.

(2) Kind of Wastewater

Wastewater from kitchens and bathrooms from houses and other places, night soil from latrines, waste water and other waste from hospitals, commercial places, industries and other places located in the sewerred area of the city.

(3) Sewer Pipe

Dia (mm)	160	200	250	300	400	525	600
Length (km)	4.9	12.5	2.2	0.3	0.5	0.4	0.10

(4) Treatment Plants - Not available

(5) Pump Facilities

- a. Pump House No.1 include 2.Nos Pumps- capacity-28.5 l/sec
- b. Pump House No.2 includes 2. Nos Pumps - capacity-9.6 l/sec.
- c. Pump House No.3 includes 2. Nos Pumps - capacity-26.1 l/sec.
- d. Pump House No.4 includes 2. Nos Pumps - capacity-40 l/sec.

3.1.5 Potential Demand of Sewerage Service

Only 60% of UC Area is served by the existing sewerage scheme. The rest of the city depends on septic tanks and pit latrines for disposal of night soil. Some people who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards.

3.1.6 Operation and Maintains System

O&M od sewerage system is being carried out by NWSDB.

Manager (O&M-Sew) located at Jayawadenagama Office is responsible for operation and maintenance works of the sewerage scheme. Preventive and Corrective Maintenance Program is being implemented by Manager (O&M) - Jayawadenagama. **Figure 4.2** shows the details of Organization Chart of O&M Staff for the Sewerage Scheme.

3.1.7 Operation and Maintenance Budget for the year 2011 -LKR 12.8 Million.

3.1.8 Source of Budget for Operation and Maintains - provided by NWSDB Funds,

3.1.9 Outstanding issues in Sewerage Works

- (a) The existing Scheme covers only 60% of the total UC Area.
- (b) The houses located in the low lying areas cannot be connected to the existing sewer system

3.2 On-site Sanitation Works

3.2.1 Progress - Constructed individual septic tanks and pit latrines.

3.2.2 Service Condition - UC is de-sludging the septic tanks on request

3.2.3 Treatment Process - Anaerobic treatment process in the septic tanks.

3.2.4 Potential Demand of On-Site Sanitation System

Required for the housing schemes and low income settlements

3.2.5 Operation and Maintenance System - UC is de-sludging the septic tanks on request

3.2.6 Operation and Maintenance Budget - Not available.

3.2.7 Source of Budget for Operation and Maintenance - Payment is made by the people to UC for the de-sludging of septic tanks by the gulley sucker sent by UC.

3.2.8 Outstanding issues in on-site sanitation works

- (a) Not adequate gulley bowsers available with UC
- (b) Conditions of the bowsers are not satisfactory
- (c) Overflowing of septic tanks especially during the rainy seasons.

3.3 Water Works

3.3.1 Progress

The existing water supply scheme for Kolonnawa is maintained and operated by NWSDB. Manager (O&M) located at Kotte Manger's Office is responsible for the operation and maintains works of the scheme. **Figure 4.3** shows the details of Organization Chart.

3.3.2 Water Source - Kelani River. Raw water is taking from the Kelani River at the Intake at Ambatale.

3.3.3 Service Charge

As per the Tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009.

3.3.4 Purification Plant

Located at Ambatale. Full treatment Process. Capacity of the Treatment Plant-125 million Gallon per day

3.3.5 Outstanding issues - No major outstanding issues

3.4 Solid Waste Service

3.4.1 Collection System

UC is using 11 vehicles to transport solid waste from houses to Dumping Site at Meethotamulla.

3.4.2 Disposal Site - Meethotamulla

3.4.3 Service Charge - No separate charge imposed. It is included in the property tax.

3.4.4 Outstanding Issues

(a) Transport facilities for solid waste are not adequate and conditions of the vehicles also not satisfactory.

(b) Capacity of the dumping site is not sufficient and conditions also not satisfactory.

3.5 Hazardous Wastewater Control

3.5.1 Industrial Wastewater Control - carrying out by CEA

3.5.2 Hospital Wastewater Control - carrying out by CEA

4. Outstanding issues in Sewerage Sector and Measures to Overcome those Issues

4.1 Sewerage Works

4.1.1 Organization - No major issues

4.1.2 Development

Only 60% of UC area is covered by existing sewerage scheme. Donor Funding is to be identified for the expansion of the scheme

4.1.3 Operation and Maintains - Present system is seem to be satisfactory.

4.2 On-site Sanitation

4.2.1 Organization - UC is carrying out the de-sludging of septic tanks when requested by the rate payers.

4.2.2 Development - On site Sanitation facilities required for housing schemes and low income housing settlements. Investigate and design separate sanitation facilities for the above places or to be connected to the existing sewer lines if feasible.

4.2.3 Operation and Maintains

UC is doing the desludging of septic tanks and require more Gulley Suckers.

4.3 Hazardous Wastewater

4.3.1 Development - CEA will have to check the quality of effluent and advise them have to

separate treatment plant in their premises

4.3.2 Operation and Maintains - Individual institution has to carry out the operation and maintains works.

4.3.3 Control System - CEA will have to carry out the control system.

Table 4.1 Population of Kolonnawa UC by Ward in 2001

Ward	Population
Wadulla	7,579
Sedawatta	6,879
Weheragoda	2,101
Orugodawatta	5,882
Meethotamulla	8,364
Wellampitiya	226
Kuruniyawatta	3,570
Kollonnawa	2,317
Dahampura	5,837
Singhapura	4,023
Salamulla	5,196
Wijayapura	3,182
Gajabapura	2,532
Total	57,688

Table 4.2 Gazette Notification for sewerage Charge

**The Gazette of the Democratic Socialist Republic of Sri Lanka
EXTRAORDINARY**

No. 1738/7, WEDNESDAY, DECEMBER 28, 2011

(Published by Authority)

PART 1 : SECTION (1) – GENERAL

Government Notifications

THE NATIONAL WATER SUPPLY & DRAINAGE LAW NO. 02 OF 1974

NOTICE is hereby given in terms of Section 84 (7) of the National Water Supply & Drainage Board Law, No 02 of 1974, of the following tariffs will be revised with effect from 1st January 2012 for sewerage services from consumers connected to the sewerage systems/networks owned, operated and maintained by National Water Supply and Drainage Board.

DINESH CHANDRA RUPASINGHE GUNAWARDENA
MINISTER OF WATER SUPPLY AND DRAINAGE

Ministry of Water Supply & Drainage
No. 35, "Lakdiya Medura, " New Parliament Road"
Pelawatta, Battaramulla

Rate I

Domestic Tariff- this tariff shall apply to sewerage services provided to premises for domestic purposes.

Water Consumption (cu.m)	Usage Sewerage Tariff per cu.m (Rs)	Service Charge (Rs)
0		
1 – 10	1.00	200.00
1 – 15	1.50	200.00
1 – 20	2.00	200.00
1- 25	2.50	200.00
1 – 30	4.00	200.00
1 – 40	6.00	200.00
1 -50	8.00	200.00
>50	10.00	200.00

Rate II

Commercial Tariff – this tariff shall apply to sewerage services provided to premises for commercial purposes.

Water Consumption (cu.m)	Sewerage Tariff (per cu.m)
0	
>0	Rs. 40.00

2A

Part 1: SEC (1) – GAZETTE EXTRAORDINARY OF THE DEMOCRATIC OF THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA – 28.12.2011

Rate III

Industrial Tariff – this shall apply to sewerage services provided to premises for mass production purposes.

Water Consumption (cu.m)	Sewerage Tariff (per cu.m)
0	
>0	Rs. 65.00

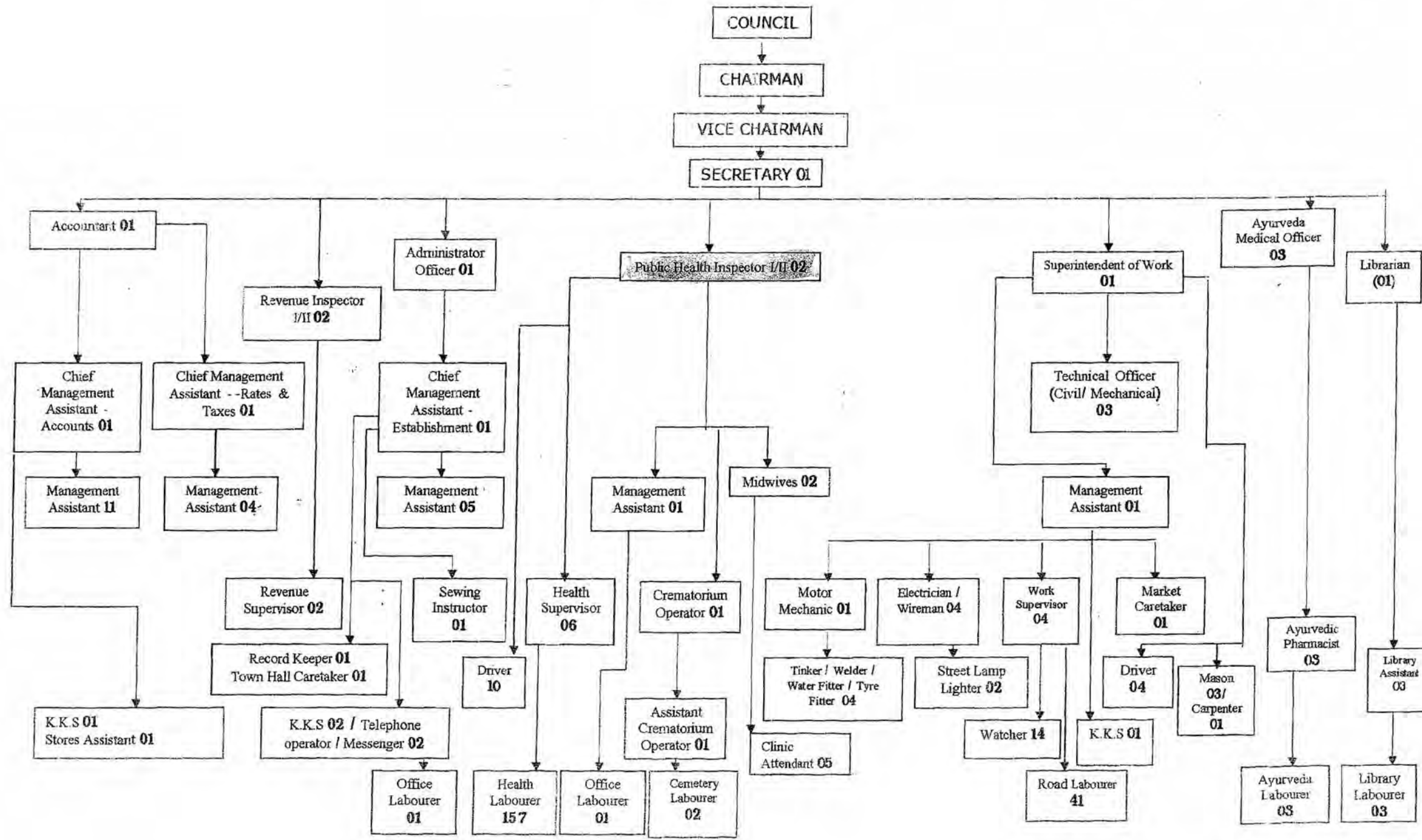
The sewerage charge for the relevant month of billing under Domestic tariff, Commercial tariff and Industrial tariff shall be devised on the consumption of water, taking into consideration the utilization of all sources of water supply.

Disconnection of Supply to Consumer who default to pay Sewerage Chargers:

Where the water supply charge and sewerage charge payable by a person in respect of any month is not paid within thirty days from the date of receipt of an invoice for payment relating to such chargers, water services will be cut off in accordance with Section 88 (1) of the National Water Supply and Drainage Board Law, No. 2 of 1974.

ORGANISATION CHART OF KOLONNAWA URBAN COUNCIL

Annexure - 06 A-3



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Figure 4.1 Organization Chart of Kolonnawa UC

Attachment 2.
Annexure - 10

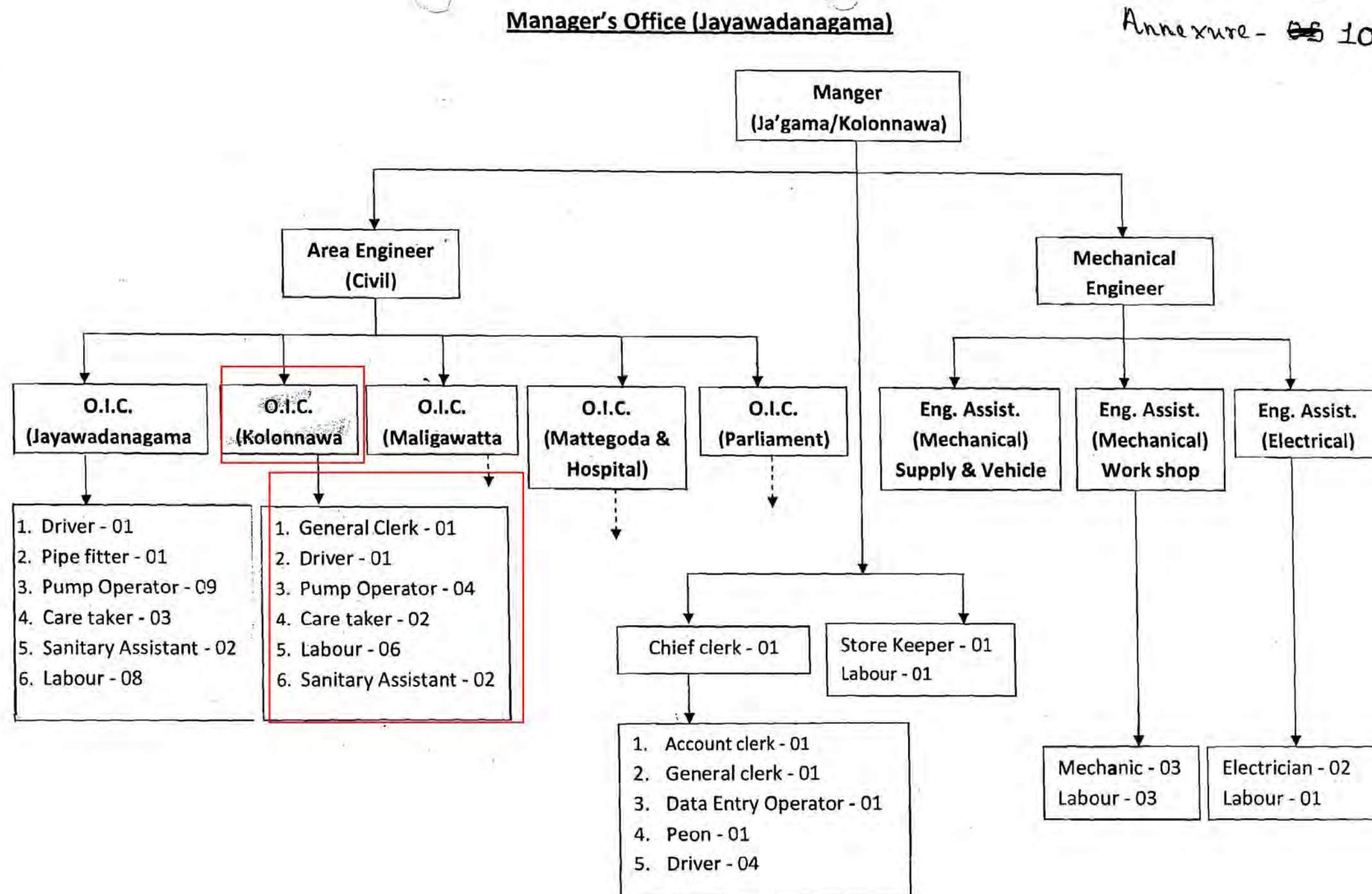


Figure 4.2 Organization of Sewerage Works

Annexure - 13

**Kolonnawa Maintenance Office
Organization Chart**

water works

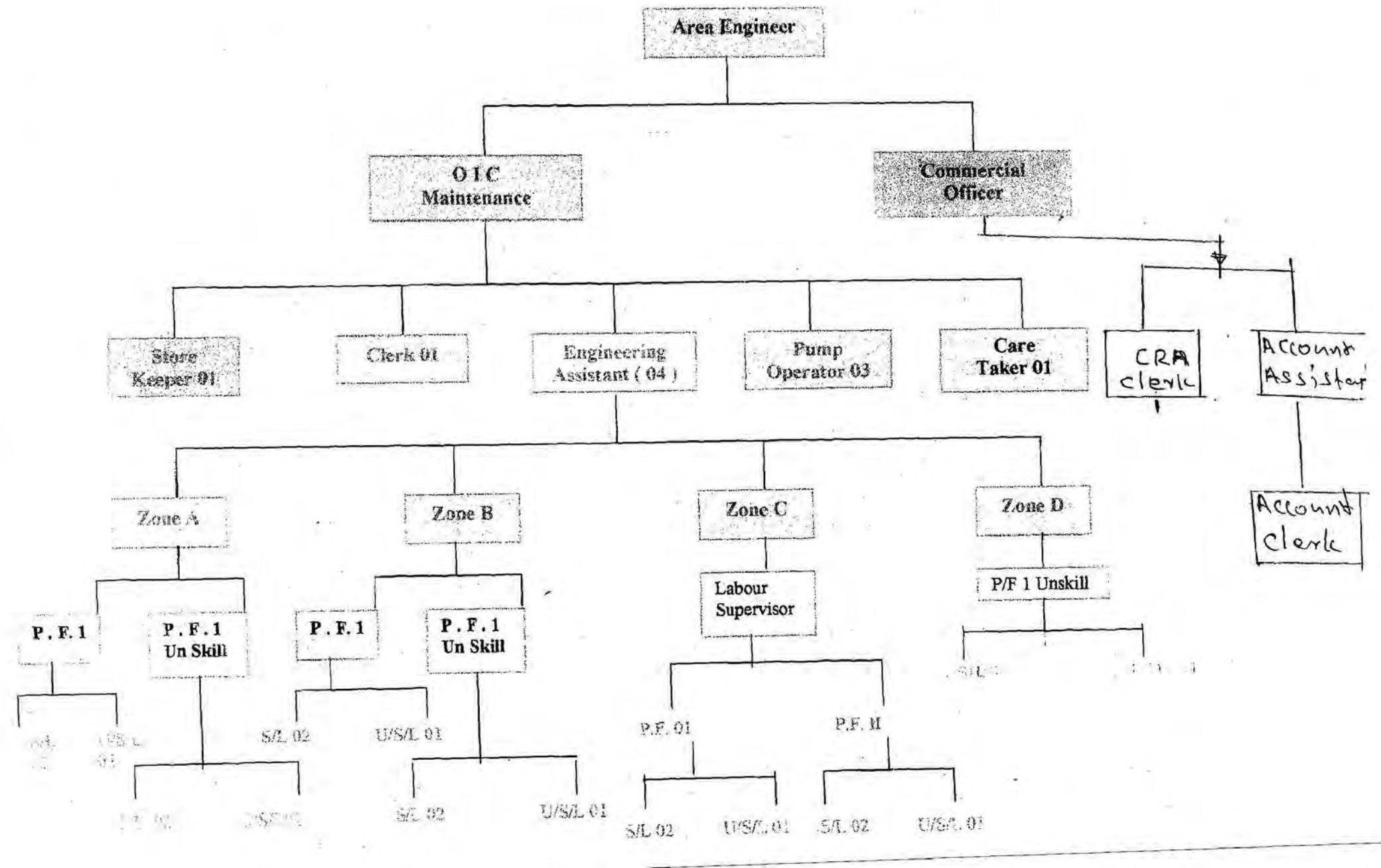


Figure 4.3 Organization of Water Works

Annex 5 KELANIYA PS

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Kelaniya PS is situated in the Gampaha District of Western Province along Colombo-Kandy Road and in the interior part of the country also. Kelaniya PS is a rapidly developing area as a gateway to the Colombo, commercial centre of Sri Lanka.

1.1.2 Receiving Water

The Kelani Ganga (river) flows through Kelaniya PS and meets the Indian Ocean at Modera sea shore

1.1.3 Meteorology

Area is lying in the wet zone and receives an average annual rainfall between 2000 to 2500 mm mainly during the south west monsoon and the inter-monsoon periods. Mean average day temperature is around 28°C and average maximum between 30 to 31°C. Minimum night temperature varies from 26 °C to 27 °C.

1.2 Sociology

1.2.1 Population

The total extent of about 1,824 ha of PS Area is distributed in 30 wards (30 GN Divisions). The total population of PS is around 117,005 in 2010.

1.2.2 Quality of Life

Most of the people in Kelaniya PS are living in low income settlements. They are uneducated persons and depend on temporary employments with the daily payments. Others are govt. / private sector employees, business people and also doing some sort of self employments.

1.2.3 Industries

No major industries

1.2.4 Public Facilities

(1) Educational facilities

There are 17 public schools available in the city area for the education of the students living in Kelaniya P.S and suburb.

(2) Medical facilities

No major hospital available in Kelaniya PS area. Only private clinics/ medical centers available in the town area for the treatment of out-door patients.

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

The whole town depends on septic tanks and pit latrines for disposal of night soil. Some people who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards.

1.3.2 Industrial Wastewater

No major industries are found in Kelaniya PS area.

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to On-site Sanitation:

Regulations made by the Minister under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.1.2 Regulation and Rules regarding to Water Works:

The National Water Supply and Drainage Board Law, No. 2 of 1974 of the National State Assembl

2.1.3 Regulation and Rules regarding to Solid Waste Service

Regulations made by the Chief Minister, Provincial council, Western Province and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.2 Organization of the Town

2.2.1 Organization of the Town

Figure 5.1 shows organization chart of Kelaniya SP.

2.2.2 Organization of Sewerage Works

No existing sewerage Scheme is operating for Kelaniya P.S.

2.2.3 Organization of On- site Sanitation Works

On-site sanitation works is being carried out by Kelaniya PS and the details of staff involved

with site sanitation is shown in the Organization Chart in **Figure 5.1**.

2.2.4 Organization of Water Works

Operation and Maintains of Kelaniya Water Scheme is being done by NWSDB. **Figure 5.2** shows water works organization chart.

2.2.5 Organization of Solid Waste Service

Solid waste service is being carried out by PS and the details of staff involved with solid waste service is shown in the Organization Chart in **Figure 5.1**

2.2.6 Organization for Hazardous Wastewater Control - It is being carried out by CEA.

2.3 Budget

2.3.1 Total Budget of the City - 2011 year - LKR135.44 Million

2.3.2 Budget for On-site sanitation Works - included into the budget of solid waste service.

2.3.3 Budget for Water Works (NWSDB) - LKR 20.77 Million

2.3.4 Budget for Hazardous Wastewater Control - Not known. It may be included in Central Environmental Authority Budget.

3. Public Works

3.1 Sewerage Works - No existing Sewerage Scheme operating for the PS area

3.1.1 Potential Demand of Sewerage Service

The whole PS depends on septic tanks and pit latrines for disposal of night soil. Some people who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards. Accordingly, there is a necessity for the sewerage scheme for the town of Kiribathgoda in Kelaniya PS area

3.1.2 Outstanding issues in Sewerage Works - No existing Sewerage Scheme for the town. There is a necessity only for Kiribathgoda town located in PS area.

3.2 On-site Sanitation Works

3.2.1 Progress - Constructed individual septic tanks and pit latrines.

3.2.2 Service Condition - PS is de-sludging the septic tanks on request

3.2.3 Treatment Process - Anaerobic treatment process in the septic tanks.

3.2.4 Potential Demand of On-Site Sanitation System

Required for housing schemes and low income settlements

3.2.5 Operation and Maintains System - PS is de-sludging the septic tanks on request

3.2.6 Source of Budget for Operation and Maintains - Payment is made by the people to PS for

the desludging of septic tanks by the gulley sucker sent by PS

3.2.7 Outstanding issues in on-site sanitation works

- (a) Not adequate gulley browsers available at PS.
- (b) Conditions of the browsers are not satisfactory
- (c) Overflowing of septic tanks especially during the rainy seasons.
- (d) Sludge is delivering to CMC pumping house

3.3 Water Works

3.3.1 Progress

The existing water supply scheme for Kelaniya is maintained and operated by NWSDB and served population is shown in **Table 5.1**. Manager (O&M) located at Kelaniya Manger's Office is responsible for the operation and maintains works of the scheme. **Figure 5.2** shows the details of Organization Chart.

Table 5.1 Water Supply Served Population in Kelaniya PS

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Population	78,652	81,652	84,972	89,632	93,032	96,636	97,936	99,928	103,328	111,160

3.3.2 Water Source - Kelani Ganga(River). Raw water is taking from the Kelani River at the Intake at Ambatale.

3.3.4 Service Charge

As per the tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009.

3.3.5 Purification Plant

Located at Ambatale. Full treatment Process. Capacity of the Treatment Plant-56.25 m³/day

3.3.6 Outstanding issues - No major issues

3.4 Solid Waste Service

3.4.1 Collection System

Kelaniya PS is transporting solid waste from houses to compost project site at Manelgama.

3.4.2 Disposal Site - Manelgama located within S area.

3.4.3 Service Charge - No separate charge imposed. It is included in the property tax.

3.4.4 Development Project - Completed the Compost Site at Manelgama by Kelaniya PS

3.4.5 Outstanding Issues

Transport facilities for solid waste are not adequate and conditions of the vehicles also not satisfactory.

3.5 Hazardous Wastewater Control

3.5.1 Industrial Wastewater Control - carrying out by CEA

3.5.2 Hospital Wastewater Control - carrying out by CEA

4. Outstanding issues in Sewerage Sector and Measures to Overcome those Issues

4.1 Sewerage Works

No existing Sewerage Scheme. There is a necessity for sewerage scheme

4.2 On-site Sanitation

4.2.1 Organization - PS is carrying out the desludging of septic tanks when requested by the rate payers.

4.2.2 Development – On-site Sanitation facilities required for housing schemes and low income housing settlements. Investigate and design separate sanitation facilities for the above places and are to be provided.

4.2.3 Operation and Maintains

PS is doing the desludging of septic tanks and requires more Gulley Suckers. Sludge is dumped into the pumping station operated by CMC at Maligakande (about 5 km away from Kelaniya Town)

4.3 Hazardous Wastewater

4.3.1 Organization - No major Hospital or Industries in Kelaniya PS area

4.3.2 Development - Not applicable

4.3.3 Operation and Maintains - Not applicable

4.3.4 Control System - CEA will have to carry out the control system if necessary.

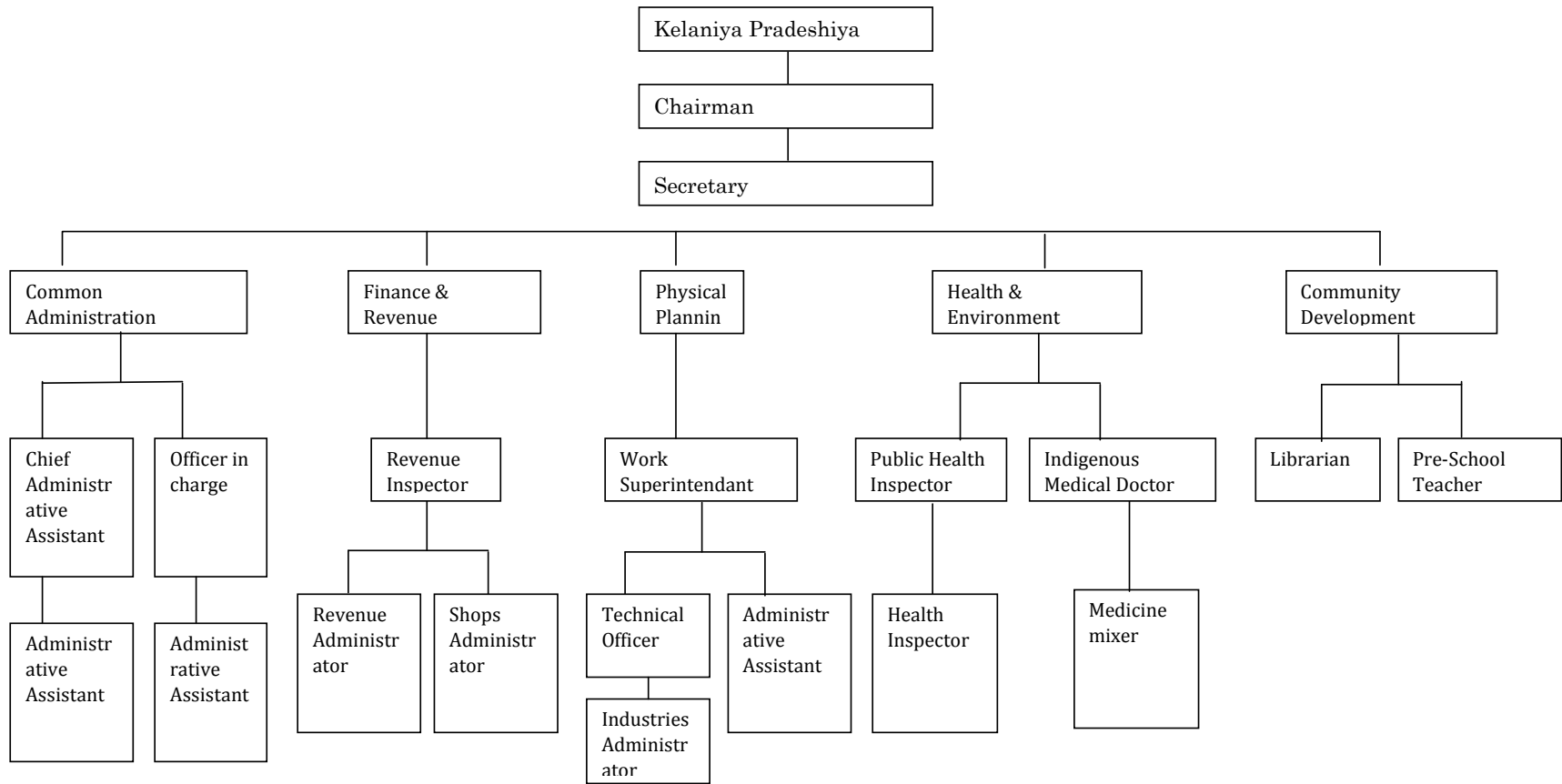


Figure 5.1 Organization Chart of Kelaniya PS

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4.1

ORGANIZATIONAL CHART

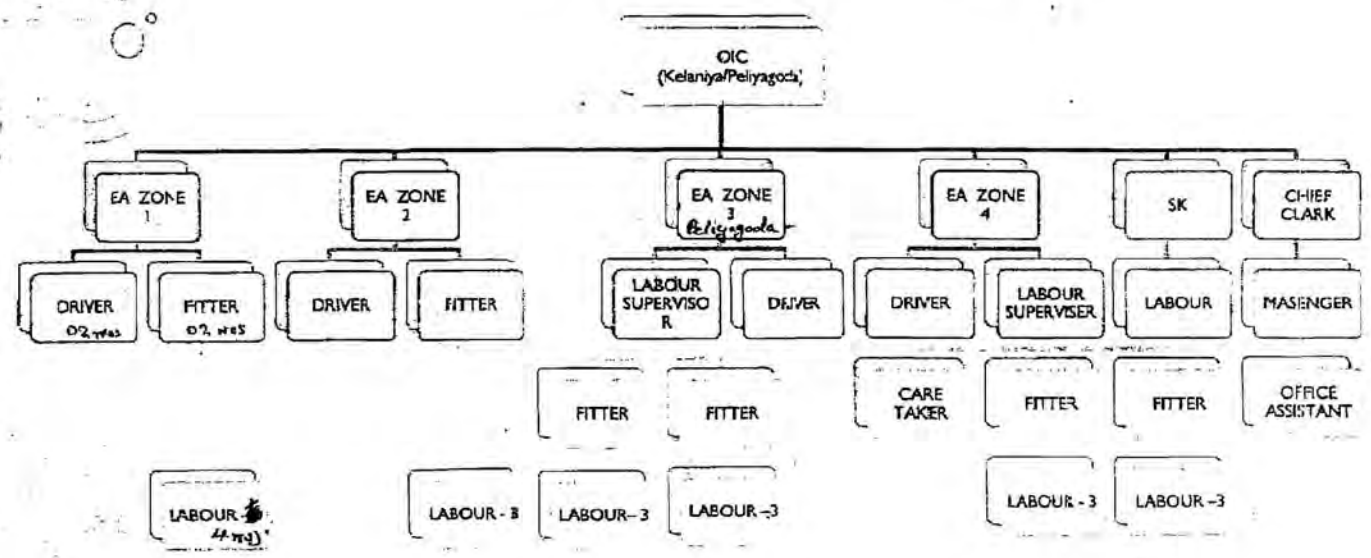


Figure 5.2 Organization of Water Works

Annex 6 PELIYAGODA UC

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Peliyagoda UC is situated in the Gampaha District of Western Province along Colombo - Negombo Road and in the interior part of the country also. Peliyagoda is a rapidly developing area as a gateway to the Colombo, commercial centre of Sri Lanka.

1.1.2 Receiving Water

The Kelani Ganga (river) flows close to Peliyagoda UC and meets the Indian Ocean at Modera sea shore

1.1.3 Meteorology

Peliyagoda UC is lying in the wet zone and receives an average annual rainfall between 2000 to 2500 mm mainly during the south west monsoon and the inter-monsoon periods. Mean average day temperature is around 28°C and average maximum between 30 to 31°C. Minimum night temperature varies from 26 C to 27°C.

1.2 Sociology

1.2.1 Population

The total extent of about 3.6 km² of the UC is distributed in 07 wards (07 GN Divisions). The total population of the UC is 36,650 in 2010.

1.2.2 Quality of Life

Most of the people in Peliyagoda UC are living in low income settlements. They are uneducated persons and depend on temporary employments with the daily payments. Others are govt. / private sector employees, business people and also doing some sort of self employments.

1.2.3 Industries

- (1) Construction industry including concrete products.
- (2) Timber industries.
- (3) Paper industries.

1.2.4 Public Facilities

(1) Educational facilities

There are 06 public schools available in the city area for the education of the students living in Peliyagoda Town and suburb.

(2) Medical facilities

No major hospital available in Peliyagoda PS. Only private clinics/ medical centers available in the town area for the treatment of out-door patients.

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

The whole town depends on septic tanks and pit latrines for disposal of night soil. Some people who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards.

1.3.2 Industrial Wastewater

No major industries are found in Peliyagoda UC.

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to On-site Sanitation

Regulations made by the Minister under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.1.2 Regulation and Rules regarding to Water Works

The National Water Supply and Drainage Board Law, No.2 of 1974 of the National State Assembly.

2.1.3 Regulation and Rules regarding to Solid Waste Service

Regulations made by the Chief Minister, Provincial council, Western Province and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.2 Organization of the Town

2.2.1 Organization of the Town

Figure 6.1 shows organization chart of Peliyagoda UC.

2.2.2 Organization of Sewerage Works

No existing sewerage scheme is operating for Peliyagoda PS.

2.2.3 Organization of On-site Sanitation Works

On-site sanitation works is being carry out by UC and the details of staff involved with site sanitation is shown in the Organization Chart in **Figure 6.1**

2.2.4 Organization of Water Works

Operation and Maintains of Peliyagoda water scheme is being done by NWSDB. **Figure 6.2** shows water works organization chart.

2.2.5 Organization of Solid Waste Service

Solid waste service is being carried out by UC and the details of staff involved with solid waste service is shown in the Organization Chart in **Figure 6.1**

2.2.6 Organization for Hazardous Wastewater Control - It is being carried out by CEA.

2.3 Budget

2.3.1 Total Budget of the City - 2011 year - LKR 141.8 Million

2.3.2 Budget for on-site sanitation Works - included into the budget of solid waste service.

2.3.3 Budget for Water Works (NWSDB) - LKR 32.25 Million

2.3.4 Budget for Hazardous Wastewater Control - Not known. It may be included in Central Environmental Authority Budget.

3. Public Works

3.1 Sewerage Works - No existing Sewerage Scheme operating for the Town

3.1.2 Potential Demand of Sewerage Service

The whole Town depends on septic tanks and pit latrines for disposal of night soil. Some people who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards. Accordingly, there is a necessity for the sewerage scheme for the town of Peliyagoda

3.1.3 Outstanding issues in Sewerage Works - No existing sewerage scheme for the Town. There is a necessity.

3.2 On-site Sanitation Works

3.2.1 Progress - Constructed individual septic tanks and pit latrines.

3.2.2 Service Condition - UC is de-sludging the septic tanks on request

3.2.3 Treatment Process - Anaerobic treatment process in the septic tanks.

3.2.4 Potential Demand of On-Site Sanitation System

Required for the 07 housing schemes and low income settlements

3.2.5 Operation and Maintains System - UC is de-sludging the septic tanks on request

3.2.6 Source of Budget for Operation and Maintenance - Payment is made by the people to UC for the de-sludging of septic tanks by the gulley sucker sent by UC

3.2.7 Outstanding issues in on-site sanitation works

- (a) Not adequate gulley browsers available at UC.
- (b) Conditions of the browsers are not satisfactory
- (c) Overflowing of septic tanks especially during the rainy seasons.
- (d) Sludge is delivering to CMC pumping house

3.3 Water Works

3.3.1 Progress

The existing water supply scheme for Peliyagoda is maintained and operated by NWSDB. Manager (O&M) located at Keliye Manger's Office is responsible for the operation and maintains works of the scheme. The details of Organization Chart is shown in **Figure 6.2**.

3.3.2 Water Source - Kelani Ganga(River). Raw water is taking from the Kelani River at the Intake at Ambatale.

3.3.3 Service Charge

As per the tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009.

3.3.4 Purification Plant

Located at Ambatale. Full treatment Process. Capacity of the Treatment Plant-56.25 m³/day

3.4 Solid Waste Service

3.4.1 Collection System

Peliyagodaa UC is transporting solid waste from houses to compost project site at Sedawatte.

3.4.2 Disposal Site - Sedawatte nearly 7km away from the Town.

3.4.3 Service Charge - No separate charge imposed. It is included in the property tax. UC is paying

to private company at a rate of LKR 1,120 per MT for the disposing of garbage at disposal site maintained by private company.

3.4.4 Outstanding Issues

Transport facilities for solid waste are not adequate and conditions of the vehicles also not satisfactory.

3.5 Hazardous Wastewater Control

3.5.1 Industrial Wastewater Control - carrying out by CEA. Hospital Wastewater Control-carrying out by CEA

4. Outstanding issues in Sewerage Sector and Measures to Overcome those issues

4.1 Sewerage Works

No existing sewerage scheme. There is a necessity for sewerage scheme

4.2 On-site Sanitation

4.2.1 Organization - UC is carrying out the de-sludging of septic tanks when requested by the rate payers.

4.2.2 Development - On-site sanitation facilities required for housing schemes and low income housing settlements. Investigate and design separate sanitation facilities for the above places and are to be provided.

4.2.3 Operation and Maintains

UC is doing the de-sludging of septic tanks and requires more gulley suckers. Sludge is dumped into the pumping station operated by CMC at Maligakande (about 5km away from Peliyagode Town)

4.3 Hazardous Wastewater

4.3.1 Organization - No major hospital or industries in Peliyagoda Town Area

4.3.2 Development - Not applicable

4.3.3 Operation and Maintains - Not applicable

4.3.4 Control System - CEA will have to carry out the control system if necessary.

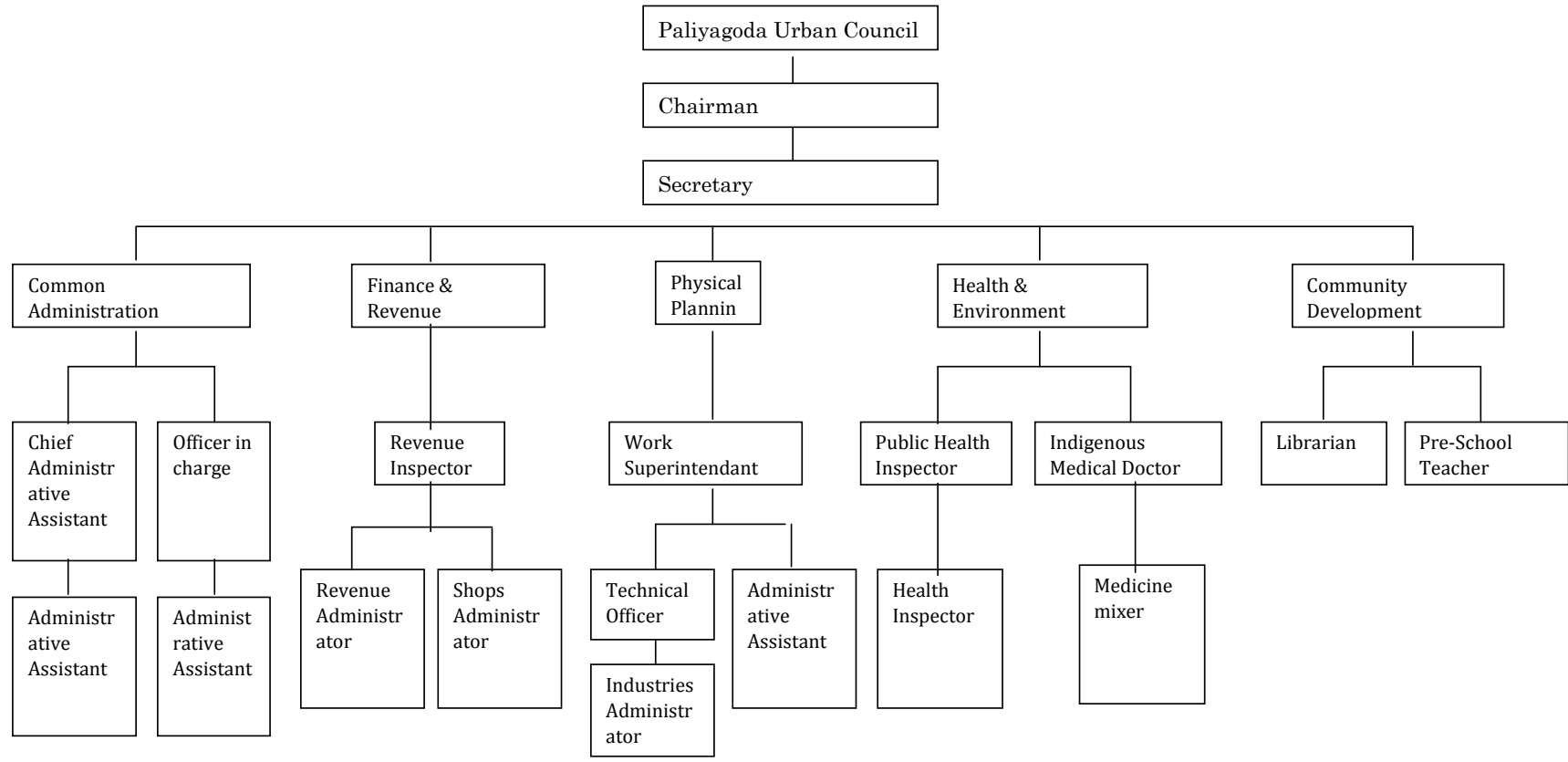


Figure 6.1 Organization Chart of Peliyagoda UC

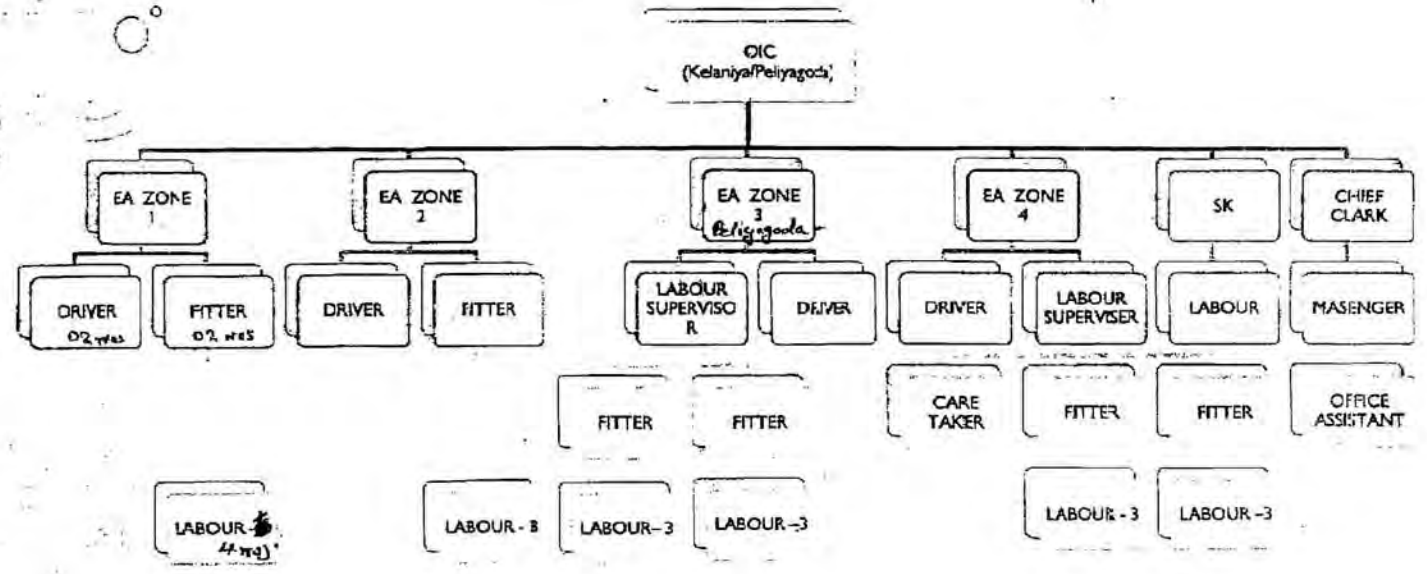
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Annexure-09

ORGANIZATIONAL CHART



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Figure 6.2 Organization for Water Works

Annex 7 KALUTARA UC

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Kalutara UC is situated in the South Western Coastal belt of the country and in the interior part of the country also. Kalutara is a rapidly developing area as a gateway to the Colombo, commercial centre of Sri Lanka.

1.1.2 Receiving Water

The Kalu Ganga (river) flows through Kalutara Town and meets the Indian Ocean at Kalutara sea shore

1.1.3 Meteorology

Kalutara UC is lying in the wet zone and receives an average annual rainfall between 2500 to 3000 mm mainly during the south west monsoon and the inter-monsoon periods. Mean average day temperature is around 28°C and average maximum between 30 to 31°C. Minimum night temperature varies from 26 C to 27 °C.

1.2 Sociology

1.2.1 Population

The total extent of 8.5 km² of the UC is distributed in 11 wards (16 GN Divisions) and population in each ward is given in **Table 7.1**. The total population of the UC is around 34,678 in 2011.

1.2.2 Quality of Life

It was found that the average level of monthly household income in the town area higher than LKR 16,000. According to the poverty assessment survey, 30% social subsidy recipients have been identified within Kalutara UC.

1.2.3 Industries

No major industries found within Town Area.

1.2.4 Public Facilities

(a) Educational facilities

There are 16 public schools and 04 international schools available in the city area for the education of the students living in Kalutara UC and suburb.

(b) Medical facilities

Kalutara in general is well served with medical services both public and private. The Main hospital at Nagoda and three private hospitals provide the medical needs of the people living in Kalutara UC and Kalutara District.

(c) Postal facilities

There is one main Post Office at Kalutara and few sub post offices in Kalutara Town Area. These provide an adequate service to the resident population.

(d) Recreational facilities

There is one main play grounds are available in Kalutara UC for providing the sports facilities to the rate payers of the city.

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

The whole Town depends on septic tanks and pit latrines for disposal of night soil. Some people who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards.

1.3.2 Industrial Wastewater

No major industry is found in Kalutara UC.

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to On site Sanitation

Regulations made by the Minister under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.1.2 Regulation and Rules regarding to Water Works

The National Water Supply and Drainage Board Law, No.2 of 1974 of the National State Assembly.

2.1.3 Regulation and Rules regarding to Solid Waste Service

Regulations made by the Chief Minister, Provincial council, Western Province and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.2 Organization of the Town

2.2.1 Organization of the Town

Figure 7.1 shows organization chart of Kalutara UC

2.2.2 Organization of Sewerage Works

No existing Sewerage Scheme is operating for Kalutara Town.

2.2.3 Organization of On- site Sanitation Works

On-site Sanitation Works is being carried out by Urban Council and the details of staff involved with site sanitation are shown in the Organization Chart in **Figure 7.1**.

2.2.4 Organization of Water Works

Operation and Maintenance of Kalutara Water Scheme is being done by NWSDB. **Figure 7.2** shows water works organization chart.

2.2.5 Organization of Solid Waste Service

Solid waste service is being carry out by UC and the details of staff involved with solid waste service is shown in the Organization Chart in **Figure 7.1**

2.2.6 Organization for Hazardous Wastewater Control - It is being carried out by National Environmental Authority.

2.3 Budget

2.3.1 Total Budget of the City (Kalutara) - 2011 year- LKR 262.9 Million

2.3.2 Budget for on-site sanitation Works (Kalutara) - included into the budget of solid waste service.

2.3.3 Budget for Water Works (NWSDB) - LKR41.7 Million

2.3.4 Budget for Hazardous Wastewater Control - Not known. It may be included in Central Environmental Authority Budget.

3. Public Works

3.1 Sewerage Works - No existing sewerage scheme operating for the City

3.1.1 Potential Demand of Sewerage Service

The whole Town depends on septic tanks and pit latrines for disposal of night soil. Some People who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards. Accordingly, there is a necessity for the Sewerage Scheme for the Town of Kalutara

3.1.2 Outstanding issues in Sewerage Works - No Sewerage

3.2 On-site Sanitation Works

3.2.1 Progress - Constructed individual septic tanks and pit latrines.

3.2.2 Service Condition - UC is de-sludging the septic tanks on request

3.2.3 Treatment Process - Anaerobic treatment process in the septic tanks.

3.2.4 Potential Demand of On-Site Sanitation System

Required for the housing schemes and low income settlements

3.2.5 Operation and Maintains System - UC is de-sludging the septic tanks on request

3.2.6 Source of Budget for Operation and Maintains - Payment is made by the people to UC for the de-sludging of septic tanks by the gulley sucker sent by UC

3.2.7 Outstanding issues in On-site sanitation works

- (a) Not adequate gulley browsers available at UC.
- (b) Conditions of the browsers are not satisfactory
- (c) Overflowing of septic tanks especially during the rainy seasons.
- (d) Sludge is delivering to the open land without any treatment

3.3 Water Works

3.3.1 Progress

The existing water supply scheme for Kalutara is maintained and operated by NWSDB. Manager (O&M) located at Kalutara Manger's Office is responsible for the operation and maintains works of the scheme. **Figure 7.2** showas the details of Organization Chart.

3.3.2 Water Source - Kalu Ganga(River). Raw water is taking from the Kalu River at the Intake at Kethhena.

3.3.3 Service Charge

As per the Tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009.

3.3.4 Purification Plant

Located at Kethhene. Full treatment Process. Capacity of the Treatment Plant-56.25 m³/day

3.3.5 Development Policy - Not available.

3.3.6 Development Project - Augmentation of Kalutara Integrated Water Supply Project-Stage 111 in planning stage.

3.3.7 Outstanding issues

(a) Capacity of the existing water supply project is not sufficient and need the augmentation and improvement of the existing scheme.

(b) Salinity intrusion into the intake at Kethhena during the draught period

3.4 Solid Waste Service

3.4.1 Collection System

Kalutara UC is transporting solid waste from houses to compost project site at Pohorawatta village, nearly 7km away from Kalutara UC.

3.4.2 Disposal Site - Pohorawatta village, nearly 7km away from Kalutara City.

3.4.3 Service Charge - No separate charge imposed. Included in the property tax.

3.4.4 Development Project - Completed Compost Project at Pohorawatta.

3.4.5 Outstanding Issues

Transport facilities for solid waste are not adequate and conditions of the vehicles also not satisfactory.

3.5 Hazardous Wastewater Control

3.5.1 Industrial Wastewater Control - carrying out by CEA

3.5.2 Hospital Wastewater Control - carrying out by CEA

4. Outstanding issues in Sewerage Sector and Measures to Overcome those issues

4.1 Sewerage Works

No existing sewerage scheme. There is a necessity for sewerage scheme

4.2 On-site Sanitation

4.2.1 Organization - UC is carrying out the de-sludging of septic tanks when requested by the rate payers.

4.2.2 Development - On-site sanitation facilities required for housing schemes and low income housing settlements. Investigate and design separate sanitation facilities for the above places and are to be provided.

4.2.3 Operation and Maintains

UC is doing the de-sludging of septic tanks and requires more gulley suckers. Sludge is dumped into the Pumping Station operated by NWSDB at Mt-Lavinia (about 20 km away from Kalutara)

4.3 Hazardous Wastewater

4.3.1 Organization - Individual Industry/ Hospitals. Presently they do not have separate treatment plants to treat wastewater before releasing to the natural stream.

4.3.2 Development - CEA will have to check the quality of effluent and advise them to have a separate treatment plant in their premises

4.3.3 Operation and Maintains - Individual Institution has to carry out the operation and maintains works.

4.3.4 Control System - CEA will have to carry out the control system.

Table 7.1 Population Of Kalutara UC

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Kalutara North	3,249	3,258	2,400	2,415	2,448	2,463	2,480	1,570	1,692	2,769
Desanthra Kalutara	2,580	2,681	1,996	2,101	2,128	2,042	2,096	2,150	2,172	2,248
Thotupola	1,627	1,688	1,214	1,260	1,276	1,292	1,302	1,396	1,472	1,578
Viddiyasara	2,135	2,340	1,650	1,659	1,668	1,968	1,720	1,868	1,976	2,075
Deshathra Kalutara West	2,015	2,160	1,989	1,902	1,918	1,922	1,946	1,969	1,989	2,066
Kalutara South	3,701	3,718	1,260	1,280	1,362	1,398	1,415	1,496	1,576	1,907
Kalutara South	1,427	1,438	1,602	1,458	1,476	1,496	1,512	1,562	1,586	1,609
Welapura	1,696	1,720	1,440	1,460	1,447	1,505	1,542	1,596	1,614	1,677
Mahawatta	2,098	2,111	1,830	1,896	1,912	1,946	1,962	1,998	2,206	2,307
Kuda Heenatiyangala	2,378	2,450	2,502	2,540	2,561	2,596	2,628	2,524	2,641	2,706
Kurunduwatta	2,171	2,210	2,115	2,165	2,179	2,196	2,211	2,345	2,496	2,577
Akkaragoda	1,516	1,614	1,420	1,432	2,462	2,496	2,519	2,596	2,641	1,715
Nagoda West	4,965	5,080	3,840	3,870	3,960	4,012	4,161	4,191	4,216	4,223
Wettumakada	1,661	1,812	1,912	1,948	1,972	1,996	2,078	2,096	2,102	2,127
Kalapuwa	2,182	2,261	1,315	1,240	1,240	1,268	1,215	1,396	1,502	1,691
Katukurunda	1,260	1,314	1,297	1,176	1,215	1,296	1,302	1,351	1,398	1,403
Total	36,661	37,855	29,782	29,802	31,224	31,892	32,089	32,104	33,279	34,678

ORGANIZATION CHART
NATIONAL WATER SUPPLY & DRAINAGE BOARD - REGIONAL OFFICE (KALUTARA)
KALUTARA WATER SUPPLY SCHEME

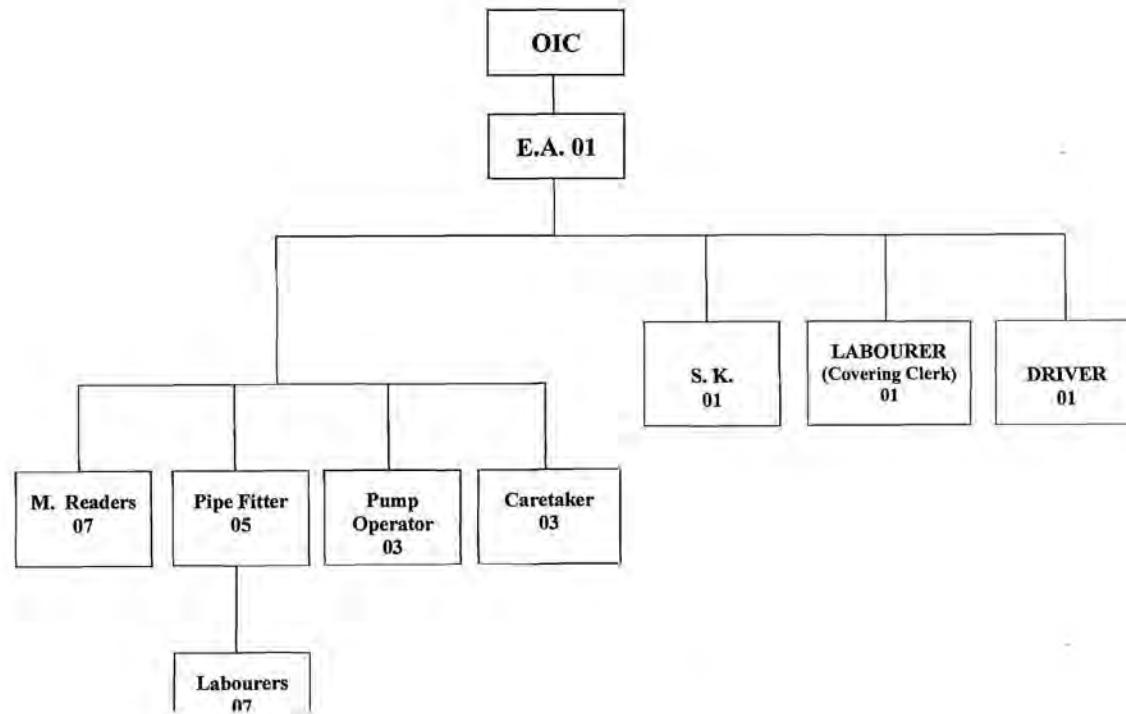


Figure 7.2 Organization for Water Works

Annexure 06

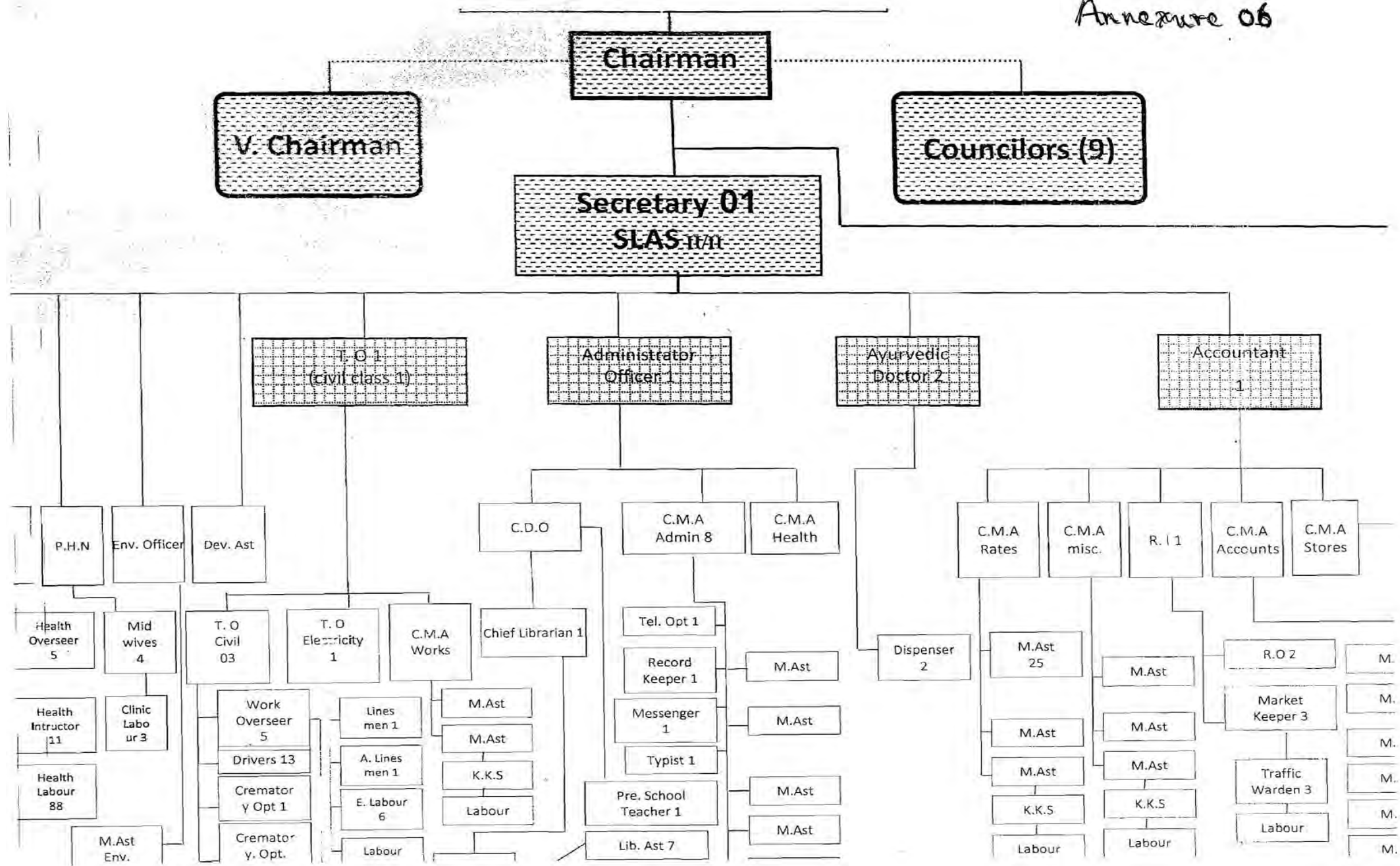


Figure 7.1 Organization of Kalutara UC

Annex 8 MATALE MC

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Matale MC in Central Province is located on central mountain region and almost encircled by mountains. The A9 Kandy – Jaffna highway is crossing the city and “Sudu Ganga” a tributary of the Mahaweli River is directing across the mountain gaps towards northern direction from eastern boundary. Matale is considered as clean and green city.

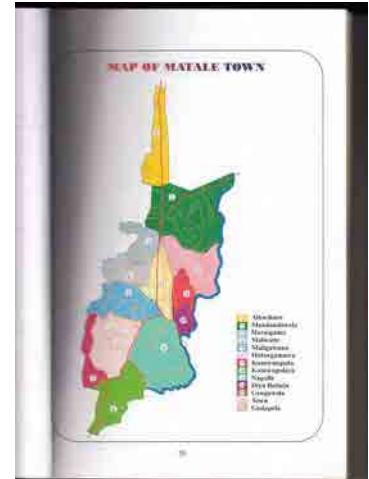


Figure 8.1 City Map

The latitude of Matale, is 7° 28' 15"N while the longitude is 80° 37' 27"E. The average elevation is about 654 m above M.S.L. The city is also bounded by foothills of Knuckles called Wiltshire. The highest point on the Knuckles range is Gombaniya (1,906m) above M.S.L. (Mean Sea Level).

Aluwihara Rajamaha Viharaya is an ancient temple more than 2000 years old, where Buddhist scriptures were written on ola - leaves. This temple is situated 3 km north direction on A9 highway from Matale city centre.

1.1.2 Receiving Water

Sudu Ganga, one of the major tributaries of the Mahaweli River (Basin No 60) is flowing towards northern direction from eastern boundary of the city.

Brahmana Ella, a stream of Sudu Ganga flowing across the town towards eastern direction and meet at a downstream location.

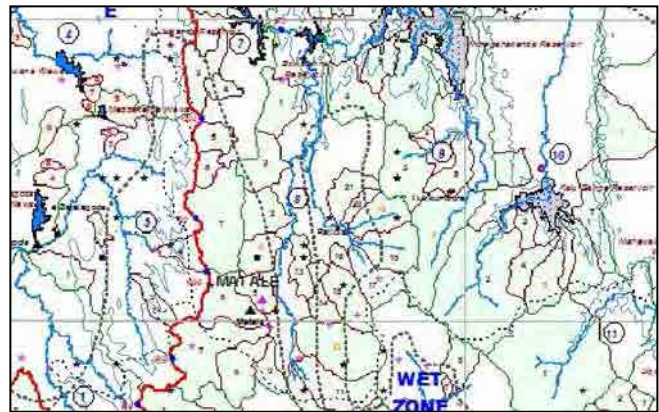


Figure 8.2

The Branford Mini Hydro Power Project is located across Sudu Ganga at 7° 28' 54"N, 80° 37' 54"E which is downstream of the Matale MC.

1.1.3 Meteorology

Matale MC located within the wet zone of Sri Lanka, which has a hot and humid tropical climate. The mean annual temperature is 25.2° C, although typically this ranges from 18° C on

cooler nights during the rainy season, to 31° C during the day in the dry months. The mean annual temperature during the period 2002 – 2011 at Katugastota was 24.9° C

Matale receives rainfall of between 528 to 3,220 mm per annum, from both monsoons. The average annual rainfall during the period 2002 – 2011 was 1895 mm most of which fell in the north east monsoon. This suggests a decline in annual rainfall from earlier years, since the 1871 to 1980 average was 1,950 mm.

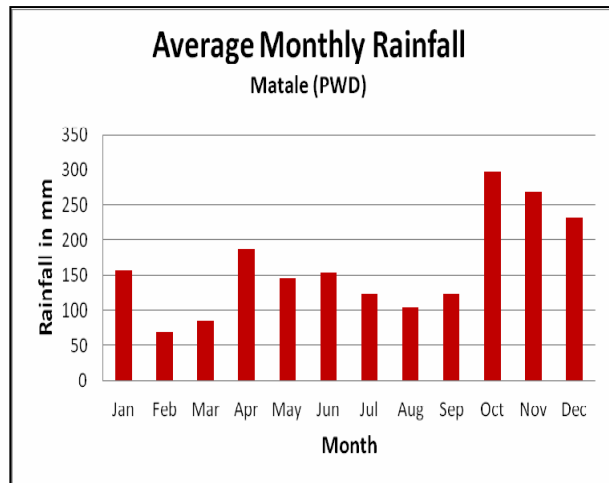


Figure 8.3

1.1.4 Groundwater

The shallow ground water stratum of the hilly area is very thin and there is less potential for groundwater abstraction. Although the groundwater level in the hilly slopes are not deep, during long dry spells dug wells are getting almost dry.

However, flat terrain close to Brahmana Ella, has more potential for both deep & shallow groundwater extraction. The deep groundwater is possible from colluviums found in the basin. There are 27 artisan wells in and around the city. Kandy Municipal Council has developed three artesian wells in “Dola” at Dole road, “Bubula” at Diyabubula road and one well at Godapola road area for public bathing. Those artisan wells have attraction for local visitors.

The shallow groundwater is used for drinking purpose.

1.2 Sociology

1.2.1 Population

The total extent of council area is 861 ha. The council area is distributed among 13 wards, and population in each ward is given in **Table 8.1**. The total population of the Matale MC area in year 2010 is 45,577.

As per the exponential growth model, population growth rate was calculated as 3.7% for the Matale MC area. This higher increase of population is due to the migration of Tamils and Muslims from Eastern Province and suburbs.

1.2.2 Quality of Life

The average level of monthly household income in the town area is higher than Rs.32,313 According to the poverty assessment survey, 15% social subsidy recipients have been identified

within Matale Town Area.

1.2.3 Industries

The largest porcelain plant of “Noritake” is situated in Matale. There are several lime kilns at Aluvihare, Rattota, Walliwela, Kawdupellella, Madawalaulotha, Yatawatta and Maduragoda villages which are suburb of Matale. The employment opportunities for about 30,000 people in Matale district are depend on lime and porcelain industry.

Tea, rubber, coconut and spices are grown in Matale district and the collection centers, trading establishment and exporters’ offices have set up their business centers in the city. Visitors can see several spice gardens in Palapathwela area.

Tourism is another potential sector. The city is strategically situated in between Kandy and Dambulla. The Aluwihare temple, Knuckles mountain range, Pitawala pathana, the little worlds end (Punchi Lokantaya), Wiltshire mountain range-hiking, Brandigala mountain, and spice gardens are few of attraction closeby. Municipal park & rest house at the center of the town, The Weera Puranappu monument, The old railway station where the railroad (completed in 1880) that starts from Colombo ends, Christ Church, Matale, The Hindu kovil with its theru festival, The old clock tower, Trincomalee veediya

There are no large scale industries found in the city. However, Matale is considered as commercial & Administration Centre in Matale Distruct. Therefore service sector (Banking, Transportation, Insurance & warehouse) and government sector is more predominant in Matale City. The city has over 8,000 trade establishments and over 200 small and medium scale industries such as

1.2.4 Public Facilities

The Public library, a mobile library and four reading centers, children park and guest house, vehicle maintaining centre, and computer training centre run by MC. The road network within the Matale MC is being carpeted and minor roads are improved with concrete surface.

(1) Educational facilities

There are several public schools provide education for stuent population. The National Schools namely Science College, Hindu College, Vijaya College, St Thomas' College, St. Thomas' Girls' School, Christ Church College, Packiam School, Zahira School, Sri Sangamitta Balika School, Ahmed Rahman Memorial High School, are the popular schools among students and parents.

Few international schools including Royal English School are also functioning in the city area

for the education of the students living in Matale City and suburb.

(2) Medical facilities

Matale General Hospital is the leading hospital in the Municipality area.

(3) Postal facilities

There is one main Post Office at Matale and few sub post offices are located in Matale MC area. These provide an adequate service to the resident population.

(4) Recreational facilities

In Matale there are 2 international level Hockey grounds. In 2006, South Asian Games {SAG} was held at “Nandametra” Hockey Ground. This is of Aster turf while old “Edward” park which is presently under construction is of grass turf. Matale is famous for Hockey as a game

Municipal council is having national level athletic ground, sport complex namely “Bernard Aluvihara” Stadium There are many recreational facilities including “Nanayakkara” Park, children play ground, “Aluvihare” Buddhist Monastery and other religious places provides spiritual guidance.

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

Street drains and drainage channels are discharged into natural stream of Sudu Ganga namely Brakmana Ella. The natural stream is heavily polluted with grey water & plastic waste. The main drain at Gongawala road is one of the examples of polluted drains.

Table 8.2 Type of Sanitation

Septic Tanks	Cesspits	Pit Latrine	Dry (Eco) Sanitation
70%	20%	10%	0%

1.3.2 Industrial Wastewater

No major industries are found in Matale Town area except medium scale wood based industries (3 Nos. saw mills), apparel manufacturing Industries (Juranza Fashion Garment and Winter Knitting Garment) and a Food Industry. (Diana Chocolate Company). The discharges from vehicle service stations (transportation) and hotels & restaurants are strictly under vigilance of MC.

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to Sewerage Works

Since there is no central municipal sewage treatment in Matale town, septic tanks and soil absorption systems need to be developed. The Specifications for these systems are given in the Code of Practice for the Design and Construction of Septic Tanks (Sri Lanka Standard 745 1986).

There are no large hotels of more than 100 rooms that are required to install waste water treatment facilities.

2.1.2 Regulation and Rules regarding to On-site Sanitation

The **Central Environmental Authority** (CEA) administers the National Environmental Act and its regulations. Regulations made by the Minister of Environment under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

The Environmental Protection License (EPL) is a regulatory / legal tool under the provisions of the National Environmental Act. Central Provincial Office, located at Polgolla Dam Site, issues Environmental Protection Licenses for industries listed in the category “B” in the gazette notification no 1533/16 dated 25.01.2008 in order to prevent and control pollution issues. In the case of industries falling into the category “A”, the Provincial Office processes the applications and forwards the files to CEA Head Office for issue of license issued with a view to achieving the following objectives.

- To prevent or minimize the release of discharges and emissions into the environment from prescribed (industrial) activities in compliance with national discharge and emission standards.
- To develop an approach to pollution control that considers discharges from prescribed (industrial) processes to all media (air, water, land) in the context of the effect on the environment.
- To contain the burden on industry, in particular by providing guidance on pollution control for polluting processes.
- To ensure that the system responds flexibly both to changing pollution abatement

2.1.3 Regulation and Rules regarding to Water Works

The National Water Supply and Drainage Board Law, No. 2 of 1974 of the National State Assembly is the appropriate regulation and rules for water works.

2.1.4 Regulation and Rules regarding to Solid Waste Service

Matale MC in the Matale District, in the Central Province has right to issue any by-laws in terms of the Municipal Councils Act, No. 16 of 1947.

A new set of by-laws have been formulated for the management of solid waste in Municipal Council areas in general. It covers waste generated from several sources within a municipality including Households, Commercial establishments, Industries, Market, Street Vendors, Construction, Hospitals, Public Places and any others. However the by-laws are not in effect as the final draft is still awaiting cabinet approval.

2.2 Organization of the Town

2.2.1 Organization of the Town

The organization chart of the Matale MC is provided in the **Figure 8.4**.

2.2.2 Organization of Sewerage Works

No existing Sewerage Scheme is operating for Matale MC. The only sewerage scheme in operation is at the General Hospital.

2.2.3 Organization of On-site Sanitation Works

On-site Sanitation Works is being carry out by MC and the details of staff involved with site sanitation is shown in the Organization Chart in **Figure 8.5**. Two medical officers are responsible in this regard.

2.2.4 Organization of Water Works

Operation and Maintains of Matale Water supply Scheme is carried out by NWSDB under Regional Support Centre (RSC) - Central Province. The Area Engineer (Matale) assisted by Officer in Charge is responsible in operation & maintenance of Matale water supply scheme.

2.2.5 Organization of Solid Waste Service

Solid Waste Service is being carried out by MC and the details of staff involved with Solid Waste Service are shown in the Organization Chart in **Figure 8.4**.

2.2.6 Organization for Hazardous Wastewater

The Control is being carried out by Central Environmental Authority. Mostly hospital waste comprises the hazardous waste. The hospital director is responsible on disposal with incinerator. The radioactivity wastes are collected by the respective suppliers.

2.3 Budget

2.3.1 Total Budget of the City

The scale of income and expenditure of the Municipal Council (Matale) is given in the **Table 8.3**.

Table 8.3 Finance Details

Matale Municipal Council - Scale of Finance				Population in 2010 - 45,577			
Item	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Total Revenue	98.03	130.59	163.51	187.31	176.97	193.83	158.37
Total Expenditure	128.03	148.40	167.36	173.25	180.19	185.32	163.76
Total Surplus / (Deficits)	(30.00)	(17.81)	(3.85)	14.06	(3.22)	8.51	(5.39)

2.3.2 Budget for on-site sanitation Works

The budget for on-site sanitation is included under health services. It is noted that this includes administration, preventive services, food sanitation, cleaning environmental health, maternity & child welfare, health studies, solid waste management and maintenance of graveyards.

The highest component is allocated for solid waste management.

Table 8.4 Finance Details

Matale Municipal Council - Solid Waste Management			Population in 2011 - 45,577		
Item	2008	2009	2010	2011	2012
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Expenditure Health Services	32.90	34.38	31.15	31.18	34.96

2.3.3 Budget for Water Works (NWSDB)

Budget & Expenditure for water works of the Matale MC area indicates the expenditure on three distribution systems of Matale scheme.

Budget & Expenditure of Water works are maintained by respective OICs under Manager (Matale). The number of connections is approximately 17,000.

2.3.4 Budget for Hazardous Wastewater Control

It is not known. It may be included in Central Environmental Authority Budget under their regional office in Matale. The hospital hazardous waste and their disposal are under the responsibility of the suppliers and may be included under Hospital Budget.

3. Public Works

3.1 Sewerage Works

There is no city sewerage system.

3.1.1 Development Policy

A policy needs to be developed. The experience gained in proposed Kanthakudy, and existing Colombo, Kandy, Hikkaduwa & Welimada Sewerage schemes may leads to the national policy.

3.1.2 Development Project

It is not implemented any project related to sewerage. The drainage improvement is being done under pavement and road development works.

3.1.3 Potential Demand of Sewerage Service

Although, 70 % of the households in the Matale MC are having proper septic tanks, 30% of the households direct their grey water and pit latrine and cesspit overflows to public drains.

The combine grey water and sewage especially from disadvantage groups in the city especially in “Parawatta” area is to be attended as priority project.

Municipal Council, NWSDB and Health authorities welcome the new sewerage system for the city. According to the Mayor and his staff, the city next priority is sewerage system.

3.1.4 Development System

It was revealed that combine sewer and grey-water collection system with treatment facility is required to prevent further deterioration of Sudu Ganga water quality, improvement in environment and advancement in quality of the life.

3.1.5 Operation and Maintains System

NWSDB may carry out the operation & maintenance of the City sewerage system & increasing coverage under Integrated Matale, Hali-Ela and Ella Water Supply Scheme.

3.1.6 Outstanding issues in Sewerage Works

The design of the new sewerage system should accommodate the minimum operation & maintenance cost & connection charges and quality standard of the effluent to natural streams.

3.2 On-site Sanitation Works

3.2.1 Progress

The cesspits and pit latrine in Parawatta area became a social and environment issue. The 70% of the households of the city belongs to middle and high income groups have proper septic tanks and soakage arrangement to suite the ground condition.

3.2.2 Service Condition

MC is de-slugging the septic tanks on request. The collected gully is currently disposed close to sport complex and MC Plant.

Matale MC has two gully bowsers. The vehicle fleet is to be strengthened with at least one new vehicle. Under JICA assistance a tractors with trailer was received in 2011 for solid waste management.

3.2.3 Treatment Process

The septic system has two primary components: the septic tank which breaks down the sewage through anaerobic action and the soakage tanks or pit which operates aerobically. The septic tank slows down the flow of raw sewage and stimulates the removal of solids by settlement. Septic tanks reduce BOD by 30-50 percent and fecal bacteria content is only slightly reduced. Therefore, the effluent is discharged into unsaturated soil to remove more of the solid matter and toxins.

The septage disposal is carried out in well designed system built in corner of the cemetery, under German Government financial assistance. The treatment system is a replica of Nuwara Eliya system with further modifications.

3.2.4 Development Policy

The national policy on sewerage sector including onsite sanitation is also at the draft stage. However, Municipal Council is strictly adhering to “Planning Committee Approval”.

3.2.5 Development Project

At present Council is working with local NGO “sewanatha” for improvement of cesspits in Parawatta area.

3.2.6 Potential Demand of On-Site Sanitation System

There is major demand from citizens of Parawatta area to improve their cesspits or pit latrine to a proper system which will not deteriorate their environment and the neighborhood.

3.2.7 Development System

The replacement of cesspits and pit latrine to septic tanks is the alternative system until sewerage project will be established.

3.2.8 Development Budget

It is not identified, and development will be on pro poor donation.

3.2.9 Source of Budget for development

The development budget is expecting from a NGO as a grant and individual contribution from household.

3.2.10 Operation and Maintains System

Matale MC is de-slugging the septic tanks on request.

3.2.11 Operation and Maintains Budget

It is under the health services allocation of Matale MC.

3.2.12 Source of Budget for Operation and Maintains

The payment is made by the people to MC for the de-sludging of septic tanks by the gully sucker sent by MC. The collection is sufficient to meet the cost. The payment from house hold is LKR 3,000 and from a commercial place LKR 5,000.

3.2.13 Outstanding issues in on-site sanitation works

- (a) Overflowing of septic tanks especially during the rainy seasons at Parawatta area.
- (b) Not possible to implement proper onsite sanitation in commercial areas.

3.3 Water Works

3.3.1 Progress

The existing Water Supply Schemes for Matale city is maintained and operated by NWSDB. The Area Engineer office is located at Matale and OIC (Matale) under Area Engineer are responsible for the operation and maintains works of the Matale Water Supply Scheme.

Approximately 17,000 connections are maintained by NWSDB. In 2012, and the coverage is expected to be 90% of the population in Matale MC.

3.3.2 Water Source

Sudu Ganga is the major water source for existing Matale Water Supply. The intake is

constructed at Kivula/Ulpathpitiya. For the Greater Matale Water Supply Project, a new intake will be constructed at the same place.

The springs at Pahala Jalasaya area is also tapped and water extraction is around 300 m³/day.

Water from the Sudu Ganga intake is transmitted to the treatment plants at Kivula in Matale (13,000 m³/day). Under the stage I improvement the capacity will be enhanced to 20,000 m³/day from 13,000 m³/day.

Under the Greater Matale Water Supply Project, It is proposed to construct additional plant capacity to increase the total production to 60,000 m³/day from Sudu Ganga.

3.3.3 Service Charge

As per the Tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009. The scheme specific tariff is adopted by MC and charges are slightly higher than the national tariff.

3.3.4 Purification Plant

The purification plant is 62 years old and designed during British administration. This plant capacity will be augmented to 20,000 m³/day and the present capacity at Kivula is 13,000 m³/day. The treatment process is full treatment with rapid sand filtration.

The springs at Pahala Jalasaya area is treated by disinfecting with chlorination.

The capacity of the proposed additional treatment plant will be 40, 000 m³/day and thus total production will be 60,300 m³/day.

3.3.5 Development Policy

The National Physical Planning Policy and Key projects, prepared under the section of 5 (a) and (b) of the Town and Country Planning (Amendment) Act., No. 49 of 2000, and approved by the National Physical Planning Council as per Section 4B of the Act on 11.01.2011, for the information of the general public were published on Part I: Section (I) - General No. Gazette No 1729/15 on Thursday, October 27, 2011.

3.3.6 Development Project

The proposed Greater Matale Water Supply project is about to commence with signing agreement with bilateral assistance in the range of LKR 8,000 Million to provide drinking water to Matale and surrounding areas..

3.3.7 Outstanding issues

- (a) Some of the places at high elevations could not supply the water
- (b) Promotion on rainwater harvesting is not adequate.

3.4 Solid Waste Service

3.4.1 Collection System

The collecting waste in Matale Town and residential areas are functioning very well with Private Public Partnership (PPP). However, MC is the sole authority for the collection of Municipal Solid Waste in Matale and carried out under five different waste collection routes to cover almost entire 13 wards.

The partnership with UNESCAP and SEVANATHA, MC is successfully implementing zero waste disposals in three wards. The biodegradable waste is converted to composting at two plants located close to the cemetery and Gongala market. In addition to the three wards, by-lanes off the MC road are also included in the zero disposal programme.

The “Just in time” waste collection system is practiced by MC in 10 wards. Waste collection is carried out before the daily city activities begin in order to avoid creating traffic and other issues.

3.4.2 Disposal Site

The existing disposal site is a leased private land called “Wariyapolawatta” close to “Diyabubula” stream about 3 km away from town centre. The disposal site at Matale does not follow sanitary landfill techniques and has a negative environmental impact.

The collected waste is dumped on the gentle slope towards the stream. The dumped waste is not covered by soil and it is burned. There is negative environmental impact, such as, offensive odor, flies, birds, fire and smoke and so on. However, there is minor negative social impact due to existence of few households nearby.

The council is looking for a new land in Rattota Pradeshiya Sabha and negotiation is being carried out.

3.4.3 Service Charge

The composting programme was completely changed the situation of the Matale City. It is now earning money for the Council while creating new employments for the city workers.

Presently there is no separate charge imposed and it is included in the property tax.

3.4.4 Development Policy

Under UNEP assistance Matale MC has developed its own policy and is being implemented successfully. The replication of this model is promoted among other Local Government Organisation by Central Environmental Authority PILISARU Programme. Sri Lanka Navy has also replicated it in the Eastern Province of Sri Lanka. This policy is based on the several documents prepared by Central Environment Authority, *Ministry of Environment*, National Solid Waste Management Support Centre, Sri Lanka Standard Institution, and Department of National Planning.

3.4.5 Development Project

Matale MC (MMC) is being implementing a successful project and set up a model to other small municipal councils. Considering the commitment the request for technical assistance, initiative by the mayor, council members and staff of the local government & national agencies, International Environmental Technology Centre (IETC) of United Nations Environmental Program (UNEP) in Japan decided to provide technical and financial assistance to develop ISWM action plan for Matale in 2010.

National Cleaner Production Centre, Sri Lanka an institute under UNIDO was identified as the local partner to provide technical assistance and serve as the local counter-part.

Furthermore, Matale MC and UNEP agreed to launch the project on "Integrated Solid Waste Management Plan for Matale MC".

JICA & "Pilisar" Project funded the second composting plant.

3.4.6 Outstanding Issues

- (a) Poor Market for recyclable waste items (Price fluctuation)
- (b) Leachate from present dumping site at Wariyapola estate pollutes "Diyabubula" oya another stream of "Sudu ganga"
- (c) Development of Engineered Sanitary Landfill at Wiharagama watta in Rattota Pradeshiya Sabha (PS) area is being delayed due to agreement with PS.

3.5 Hazardous Wastewater Control

The Technical Guidelines on Solid Waste Management in Sri Lanka was prepared on Hazardous Waste by Hazardous Waste Management Unit, Pollution Control Division, and Central Environmental Authority in November 2008

3.5.1 Industrial Wastewater Control

The Environmental Protection Licenses (EPL) is issued by the Provincial Office of the Central Environmental Authority located at Matale.

The discharges from slaughter house, vehicle service stations (transportation) and hotels & restaurants are covered under EPL.

It is the responsibility of LAs to regulate and control activities which are detrimental to the environment and public health in accordance with powers and authority vested in LAs under Local Government Laws and by-laws. Therefore Matale MC controls the activities related to small scale industries which tend to pollute the environment (eg. rice mills, timber mills, metal quarries, grinding mills, lathe workshops and garages)

3.5.2 Hospital Wastewater Control

The hospital has a waste water treatment plant. The system is aeration, settling tank, anaerobic digester and drying beds and chlorinated waste is released to the natural drain and finally ends up at Sudu Ganga.

The hazardous solid waste is separated. The kitchen waste is converted to biogas and it is a good model for energy recovery. The incinerator is not working and it is the priority of the hospital in handling hazardous waste.

4. Outstanding issues in Sewerage Sector and Measures to Overcome those Issues

4.1 Sewerage Works

There is no existing Sewerage Scheme. There is a necessity for Sewerage Scheme combining grey water with secondary treatment facility.

4.2 On-site Sanitation

4.2.1 Organization

MC is carrying out the de-sludging of septic tanks when requested by the rate payers.

4.2.2 Development

The development of cesspits to acceptable decentralized systems is urgent. The new treatment facility is to introduce, where gully sucker or manual cleaning is not possible especially at Helagama, a settlement at Wimaladarmarama Mawatha .

4.2.3 Operation and Maintains

MC is doing the de-sludging of septic tanks and requires one new Gulley Suckers. Sludge is

dumped into the seepage disposal facility at the isolated place at Matale General Cemetery.

4.3 Hazardous Wastewater

4.3.1 Organization

The Individual Industries and the General Hospitals is responsible in disposal under EPL. Presently primary treatments are being carried out according to the EPL.

4.3.2 Development

CEA will have to check the quality of effluent and advise them to have a separate treatment plant in their premises.

4.3.3 Operation and Maintains

The individual Institution has to carry out the operation and maintains works.

4.3.4 Control System

CEA will have to carry out the control system and monitor the EPL conditions.

Table 8.1 Population – Matale City

Name of Ward	Area (ha)	2001	2002	2003	2004	2005	2006	2007	2010
Aluvihare	66.15	1481	1547	1617	1690	1766	1845	1928	2200
Mandandawela	148.83	7103	7422	7455	8104	8468	8849	9246	10550
Harasgama	32.07	1788	1868	1952	2040	2132	2227	2327	2656
Malwatta	34.81	2934	3066	3204	3348	3499	3656	3820	4359
Maligathenna	80.71	3126	3267	3414	3567	3727	3825	4070	4644
Hulangamuwa	82.57	2767	2891	3021	3157	3299	3447	3602	4110
Koobiyangoda	50.10	980	1023	1069	1117	1167	1220	1275	1455
Kotuwegedara	82.68	313	327	342	358	374	390	408	466
Nagolla	132.30	1009	1054	1102	1151	1203	1257	1313	1499
Diyabubula	16.53	1647	1722	1798	1879	1964	2052	2144	2447
Gonagawala	33.08	3647	3490	3340	3197	3059	2928	2802	4162
Muslim town	36.07	4930	4718	4515	4321	4135	3957	3787	5625
Godapola	65.01	1230	1177	1127	1078	1032	987	945	1404
Total	860.91	32,955	33,572	33,956	35,007	35,825	36,640	37,667	45,577

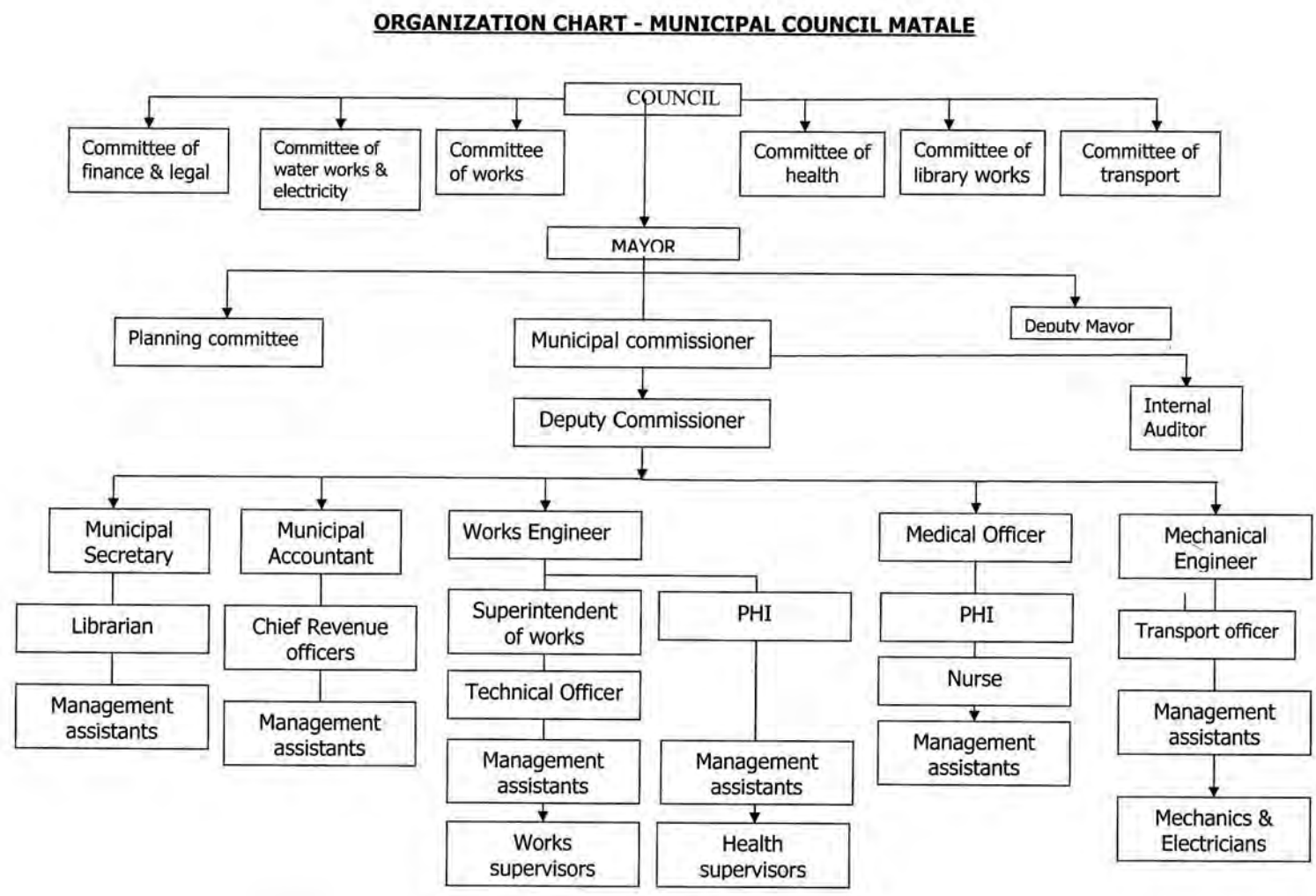


Figure 8.4 Organisation Chart – Matale Municipal Council

Organization chart of Sanitation unit

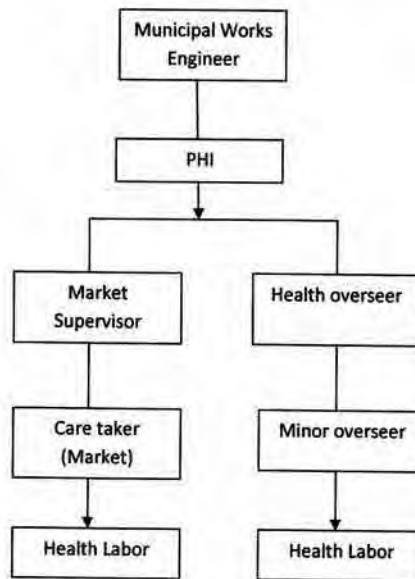


Figure 8.5 Orgnisation Chart – Sanitation

Annex 9 NUWARA ELIYA MC

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Nuwara Eliya MC is in the central mountain region and almost encircled by mountains.

The latitude of Nuwara Eliya, is $6^{\circ} 58' 11''\text{N}$ while the longitude is $80^{\circ} 46' 12''\text{E}$. The average elevation of the undulating green grass British styled country is 1,868 m above M.S.L.

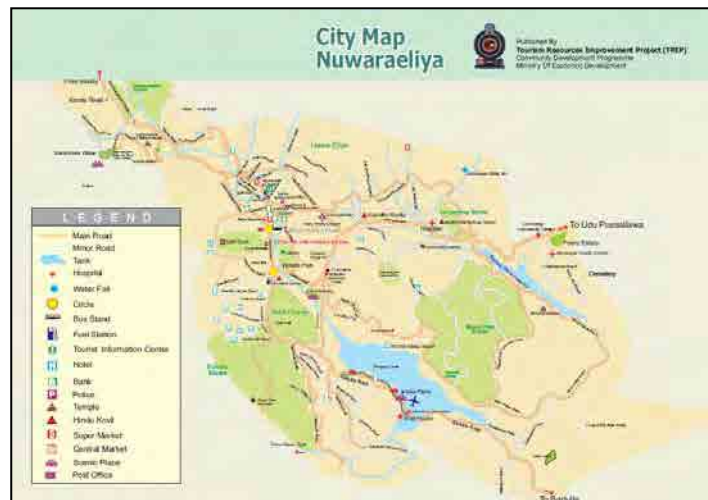


Figure 9.1 City Map

The city is bounded by foothills of Pidurutalagala (2,524 m) from Northern direction.

Kikilimana (2,237 m), a gentle shaped hill is situated at the north western end of Nuwara Eliya town. The south east of Nuwara Eliya is bounded by foothills of Hakgala Mountain (2,169 m) while One Tree hill (2,165 m) is the western boundary.

The eastern slope of one tree hill is mainly residential as well as an area of hotels and guest houses. The A5 Peradeniya-Chenkalady highway enters the city between the gap of Kikilimana and Pidiruthalagala, (Top-pass) and leave the city at Seetha-Eliya, foothills of Haggala mountain. Similarly The A7 highway, Avissawella - Nuwara Eliya, enters the city through Nanu Oya from Scrub Estate (Proposed site for sewerage treatment plant).

1.1.2 Receiving Water

Upper Nanu Oya Catchment

Upper Nanu Oya or Gregory Lake catchment starts from Shanthippura and Bambarakele area. Glen Falls, the second largest waterfall in the city (10 m high) which falls from the Single Tree Mountain also join the Nanu Oya before Gregory's Lake. Nanu Oya continues after the lake and the journey ends at Upper Kotmale



Figure 9.2

reservoir. (Mahaweli Basin No 60).

Upper Bomburu Ella Catchment (Barrack Plane Reservoir catchment)

The road Lady McCulurmn Drive in the city separates the Upper Nanu Oya catchment and Upper Bomburu Ella catchment. In Nuwara Eliya area, Bombura Ella catchment can be named as Barrack Plane Swamp (Reservoir) catchment.

The 30m high Lovers Leap begins its journey as a fountain at the Southern slope of Sri Lanka`s highest mountain (Pidurutalagala). The wonderful lovers leap falls is visible from the second mile post on B332. Nuwara Eliya - Uda Pussellawa Road.



Figure 9.3

Uma Oya which is fed by Bomburu Ella (Pidurutalagala Mountain), Kuda Oya (Hakgala Mountain), Ambewela Oya and Mahathatilla Oya (Horton Plains) joins Mahaweli river (Basin No 60) at Rantambe reservoir. Therefore two water sheds have completely different routes.

1.1.3 Meteorology

Nuwara Eliya MC located within the wet zone of Sri Lanka which has cooler climate than the lowlands of Sri Lanka, with a mean annual temperature of 15.5°C. In the winter months it can be as low as 3°C and as high as 24° C during the day in the dry months. The mean annual temperature during the period 2002 – 2011 was 16.3° C.

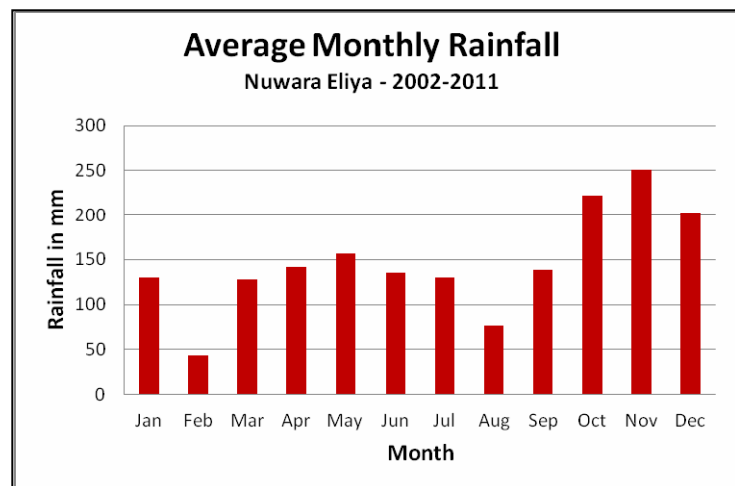


Figure 9.4

Nuwara Eliya receives on average 2,164 mm of precipitation annually. The average annual rainfall during the period 2002 – 2011 was 1,735 mm.

1.1.4 Groundwater

During the groundwater exploration carried under JICA assisted Nuwara Eliya Water Supply Project, it was confirmed that fractured rock aquifers also follow the watersheds discussed above and no interconnection between them due to charnokite basement rock between the ridges.

Four wells were constructed at Upper Nanu Oya aquifer to extract about 2,850 m³/day. Similarly five wells were constructed at Upper Bomburu Ella aquifer 3,200 m³/day. It is also confirmed that a connection between deep confined aquifer and shallow aquifer. The total extraction is less than the one third of the total potential of both aquifers. (Upper Nanu Oya aquifer, the average daily recharge for last 30 years is 7,184 m³/day \approx 8.3 % of the rainfall).

The colluviums aquifers are in existence in two basins due to the presence of relatively high permeable crystalline rocks such as crystalline limestone and calc gneisses with high percentage of calcite. (over 50%). However, water quality is extremely good due to regular flushing as a result of high rainfall and topographical release.

1.2 Sociology

1.2.1 Population

The total extent of council area is 1,500 ha. The council area is distributed among 14 wards and Population in each wards are given in **Table 9.1**. The total population of the Nuwara Eliya MC in year 2011 is estimated at 35,846.

As per the exponential growth model, population growth rate was estimated as 0.08% for the Nuwara Eliya MC area.

1.2.2 Quality of Life

The average level of monthly household income in the town area is LKR 34,329. The Gini Coefficient of the household income is 0.46. The data are obtained from household Income and Expenditure Survey - 2009/10 -Preliminary Report.

1.2.3 Industries

Tea, vegetables, flowers and potato cultivation are the main source of income for citizens. Accept tea factories and few garment factories, There are no large scale industries found in the city.

However, Nuwara Eliya is considered as Commercial, Agricultural and Administrative Centre of the District. Therefore service sector (Banking, Transportation, Insurance & warehouse) and government sector are more predominant in Nuwara Eliya City. The city has over 1,500 trade establishments and over 850 government properties and offices.

The brewing of beer was started in Nuwara Eliya by Sir Samuel Baker in 1881 at Lover's Leap. It had been continuously in business since 1884 until 2001. Ceylon Breweries was one of the finest in the island. Ceylon Brewery Limited had wound up operations in Nuwara Eliya by shifting to Biyagama after 120 years.

1.2.4 Public Facilities

There are so many beautiful and scenic places in Nuwara Eliya city and around the city to have so many entertaining events for citizens and visitors such as; tracking, camping, bird watching, mountaineering, rafting, sight seeing tours, boating, mountain biking, fishing and adventure sports etc.

Uji City in Kansai Province of Japan is the sister city of Nuwara Eliya, since 1986. Recently, Yongzhou city in Hunan province of China and Vidnoye city in Moscow Oblast of Russia commenced their ties between Nuwara Eliya.

(1) Educational facilities

There are several public schools provide education for the students. Among them the National Schools namely Gamini M.M.V, ST. Xaviers College, Holy Trinity S.V, ST'Clair T.M.V, Sri Senananda M.V, Senarath M.V, Paynter Memorial School and Good Shepherd B.M.V are the popular schools among students and parents.

Few international schools including Sussex College and Lyceum International school also functioning in the city area for the education of the students living in Nuwara Eliya City and suburb.

(2) Medical facilities

Nuwara Eliya General Hospital is the leading hospital in the Municipality area.

(3) Postal facilities

There is one main Post Office at Nuwara Eliya and few sub post offices are located. These provide an adequate service to the resident population.

(4) Recreational facilities

Victoria Park and newly developed recreation facilities around Gregory's Lake are public places for visitors and citizens. The race course, sport complex and Town hall are some of the properties maintained by the MC.

Just opposite of the Victoria Park, over a hundred years old 18 holes golf course is in operation for its members. It is one of the biggest attractions for visitors. Temporary memberships are granted for visitors by paying the stipulated amount (LKR 500/day in 2012).

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

Street drains and drainage channels are discharged into Upper Nanu Oya or Upper Bomburu Ella.

The pollution loads of the drains are higher at Lady McCulurmn Drive, Bambarakele, Race Course, Kelegala and Bonavista area due to high population density. Pro poor poverty alleviation programme is carried out by Urban Development Authority, MC and Asia Foundation to improve their quality of life and the environment. They do not have enough space to dispose their grey water and construction of soakage pit. Most of the combined grey water & overflow from septic tanks contaminate the public drains.

Table 9.2 Type of Sanitation

Septic Tanks	Cesspits	Pit Latrine	Dry (Eco) Sanitation
30%	50%	20%	0%

1.3.2 Industrial Wastewater

No major industries are found in Nuwara Eliya Town area.

The discharges from vehicle service stations (transportation) and hotels & restaurants are strictly under vigilance of MC.

Grand Hotel and Jetwing St. Andrew's Hotel are having separate waste water treatment plants confirming to CEA standards. The leading hotels in Nuwara Eliya are always support the environmental preservation programmes organized by Nuwara Eliya MC, National Zoological Gardens, the Wildlife Department, Forest Department and Urban development Authority.

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to Sewerage Works

Since there is no central municipal sewage treatment in Nuwara Eliya town, septic tanks and soil absorption systems need to be developed. The Specifications for these systems are given in the Code of Practice for the Design and Construction of Septic Tanks (Sri Lanka Standard 745 1986).

There are two large hotels of more than 100 rooms that are required to install waste water treatment facilities.

2.1.2 Regulation and Rules regarding to On-site Sanitation

The Central Environmental Authority (CEA) administers the National Environmental Act and its regulations. Regulations made by the Minister of Environment under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

The Environmental Protection License (EPL) is a regulatory / legal tool under the provisions of the National Environmental Act. Central Provincial Office, located at Polgolla Dam Site, issues Environmental Protection Licenses for industries listed in the category “B” in the gazette notification no 1533/16 dated 25.01.2008 in order to prevent and control pollution issues. In the case of industries falling into the category “A”, the Provincial Office processes the applications and forwards the files to CEA Head Office for issue of license issued with a view to achieving the following objectives.

- To prevent or minimize the release of discharges and emissions into the environment from prescribed (industrial) activities in compliance with national discharge and emission standards.
- To develop an approach to pollution control that considers discharges from prescribed (industrial) processes to all media (air, water, land) in the context of the effect on the environment.
- To contain the burden on industry, in particular by providing guidance on pollution control for polluting processes.
- To ensure that the system responds flexibly both to changing pollution abatement

2.1.3 Regulation and Rules regarding to Water Works

The provision of Section 272 of Part XIII of the Municipal Councils Ordinance as amended from the Municipal Councils and Urban Councils Act, No. 42 of 1942, Municipal council can decide their by-laws on 32 aspects. The following matters related to Water & Sanitation are listed below for reference

Article - 3.0	Drainage
Article - 4.0	Waterworks
Article - 5.0	Sanitation
Article - 9.0	Slaughter Houses
Article - 21.0	Laundries & washing
Article - 28.0	The establishment, maintenance, working and supply and the recovery charges in connection there with public services, such as water supply, public baths, bathing places, laundries and places for washing animals.

2.1.4 Regulation and Rules regarding to Solid Waste Service

Nuwara Eliya MC in the Nuwara Eliya District, in the Central Province has right to issue any by-laws in terms of the Municipal Councils Act, No. 16 of 1947.

A new set of by-laws have been formulated for the management of solid waste in MC areas in general. It covers waste generated from several sources within a municipality including Households, Commercial establishments, Industries, Market, Street Vendors, Construction, Hospitals, Public Places and any others. However the by-laws are not in effect as the final draft is still awaiting cabinet approval.

2.2 Organization of the Town

2.2.1 Organization of the Town

The organisation chart of the Nuwara Eliya MC is provided in the **Figure 9.5**. Under the Mayor and the council directives, the commissioner is responsible for overall coordination. The Municipal Engineer is the key member.

2.2.2 Organization of Sewerage Works

No existing Sewerage Scheme is operating for Nuwara Eliya town under the Municipal Council. The sewerage scheme in operation is at the General Hospital, Grand Hotel and Jetwing St. Andrew's Hotel.

2.2.3 Organization of On-site Sanitation Works

On-site Sanitation Works is being carry out by MC. Public Health Officers are responsible in this regard.

2.2.4 Organization of Water Works

Operation and Maintains of Nuwara Eliya Water supply Scheme is carried out by the Municipal Council. **Figure 9.5** shows the organization chart of the water works of the MC.

The Superintendent of works (Water) is responsible in operation & maintenance of Nuwara Eliya water supply scheme.

2.2.5 Organization of Solid Waste Service

Solid Waste Service is being carried out by MC and the Public Health Inspector is the in charge.

2.2.6 Organization for Hazardous Wastewater

The Control is being carried out by Central Environmental Authority. Mostly hospital waste

comprises the hazardous waste. The hospital director is responsible on disposal with incinerator. The radioactivity wastes are collected by the respective suppliers.

2.3 Budget

2.3.1 Total Budget of the City

The scale of income and expenditure of the MC is given in the **Table 9.3**.

Table 9.3 Finance Details

Nuwara-Eliya Municipal Council - Scale of Finance			Population in 2011 - 35,846				
Item	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Total Revenue	119.51	147.79	-	246.05	225.88	270.00	201.85
Total Expenditure	124.97	143.97	-	177.74	222.24	313.97	196.58
Total Surplus / (Deficits)	(5.46)	3.82	-	68.31	3.64	(43.97)	5.27

2.3.2 Budget for on-site sanitation Works

The budget for on-site sanitation is included under health services. It is noted that this includes administration, preventive services, food sanitation, cleaning environmental health, maternity and child welfare, health studies, solid waste management and maintenance of graveyards.

The highest component is allocated for solid waste management.

2.3.3 Budget for Water Works (NWSDB)

Budget & Expenditure for water works of the Nuwara Eliya MC is given in the **Table 9.4**, which indicates the expenditure on Nuwara Eliya Water Supply Scheme.

Table 9.4 Finance Details

Nuwara-Eliya - Municipla Council - Water Works		Number of Connection in 2012: 8351			
Item	2008	2009	2010	2011	2012
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Expenditure Water Works	15.80	18.58	18.58	27.00	30.00

2.3.4 Budget for Hazardous Wastewater Control

It is not known. It may be included in Central Environmental Authority Budget under their regional office in Nuwara Eliya. The hospital hazardous waste and their disposal are under the responsibility of the suppliers and may be included under Hospital Budget.

3. Public Works

3.1 Sewerage Works

The feasibility study for sewerage system was concluded in 2001 under JICA technical cooperation. The grant project was about to commenced. However, public protest against the proposed treatment plant site at Scrub Estate area led the authorities to abandon the implementation.

Since the study was done 10 years ago, before the implementation, the feasibility study is to be reviewed.

3.1.1 Development Policy

A policy needs to be developed. The experience gained in proposed Kanthakudy, and existing Colombo, Kandy, Hikkaduwa & Welimada Sewerage schemes may leads to the national policy.

3.1.2 Development Project

The drainage improvement is being done under pavement and road development works.

According to the feasibility study, the priority project area for sewerage system was identified as follows.

- 1) City centre, surrounding commercial and residential areas from St. Andrews Hotel in north up to end of Victoria Park in south along Nanu Oya (2,000 m³/day)
- 2) Area around General Hospital and Brewery and along Udupussalawa road. (800 m³/day)

The proposed treatment (2,800 m³/day) will be aerated lagoon system which comprises of

- 1) Grit Chamber & Screen (Parallel flow type - 0.5m x 2.7m x 0.3 m - 1.778 m³/m²/day -0.15 m/s - 3 basins, 1 standby)
- 2) Complete Mixing Aerated Lagoon (Rectangular - 14.0m x 25.0 m x 3.0 m - 13 kw,- 1.5 days - 4 basins)
- 3) Partial Mixing Aerated Lagoon (Rectangular - 12.0m x 16.0 m x 4.0 m - 6 kw, - 2.0 days - 3 cells x 4 basins)
- 4) Disinfection tank. (Rectangular - 1.0m x 15.0 m x 1.0 m - 15.4 min - 2 basins)

The natural drying of lagoon sludge will be converted to compost.

3.1.3 Potential Demand of Sewerage Service

Although, 30 % of the households in the Nuwara Eliya MC are having proper septic tanks, 70% of the households direct their grey water and pit latrine and cesspit overflows to public drains. In the city centre space for construction of septic tank and soakage arrangement is difficult.

MC, NWSDB and Health authorities welcome the new sewerage system for the city. According to the Mayor and his staff, the city next priority is sewerage system and development of recreation areas around Gregory's Lake. (foot paths, jogging tracks).

The land issue of the sewerage treatment plant was resolved.

3.1.4 Development System

The initial development system is clearly defined in the feasibility study. However, the system should be reviewed with the gazette Urban Development Plan of the Nuwara Eliya MC.

3.1.5 Development Budget

The development budget as per base year is LKR 418 million. The base year is 2001 and the conversion rate is taken as ¥ 1.80 equivalent to LKR 1.00

3.1.6 Source of Budget for Development

It is not identified yet.

3.1.7 Operation and Maintains System

MC may carry out the operation & maintenance of the City sewerage system with institutional support from NWSDB.

3.1.8 Operation and Maintains Budget for the year 2011

It is not applicable. The estimated figure based on base year (2001) is LKR 4.62 million. The electricity cost is LKR 2.5 million and personnel expenses LKR 1.1 million. The chemical and repair cost is not significant.

3.1.9 Source of Budget for Operation and Maintains

Most probably, it should be under, MC allocation.

3.1.10 Outstanding issues in Sewerage Works

The design of the new sewerage system should accommodate the minimum O&M cost and connection charges and quality standard of the effluent to natural streams.

- 1) The land for the treatment plant should be acquired before the implementation.
- 2) The Continues technical assistance from NWSDB to be achieved with contractual arrangement such as laboratory facilities, periodic inspection and activities during the

construction phase.

3.2 On-site Sanitation Works

3.2.1 Progress

The cesspits and pit latrine in Nuwara Eliya is 70% of the households of the city. High suspended solids are overflowing from the cesspits or from bottom of the tank. Therefore this will cause clogging of the seepage pits and shorten the operation life of the pit.

Due to the high water table, dispersion trench or sub surface biological filter with under drains and effluent led into a drain or used for gardening may enhance the operation life of the septic tank or cesspits. Since first phase of sewerage system will be limited to city centers and surrounding, onsite sanitation should continue for another decade.

3.2.2 Service Condition

MC is de-slugging the septic tanks on request. The collected gully is currently disposed at Moon Plain Septage treatment facility.

Nuwara Eliya MC has two gully bowsers. The vehicle fleet is to be strengthened with at least one new vehicle.

3.2.3 Treatment Process

The septic system has two primary components: the septic tank which breaks down the sewage through anaerobic action and the soakage tanks or pit which operates aerobically. The septic tank slows down the flow of raw sewage and stimulates the removal of solids by settlement. Septic tanks reduce BOD by 30-50 percent and fecal bacteria content is only slightly reduced. Therefore, the effluent is discharged into unsaturated soil to remove more of the solid matter and toxins.

The septage disposal is carried out in well designed system built in Moon Plain under JICA assistance.

3.2.4 Development Policy

The national policy on sewerage sector including onsite sanitation is also at the draft stage. However, MC is strictly adhering to “Planning Committee Approval”.

3.2.5 Development Project

At present Council is working with UDA, and Asia Foundation for improvement of cesspits in several tenements listed under waste water.

3.2.6 Potential Demand of On-Site Sanitation System

There is major demand from citizens of tenements to improve their cesspits or pit latrine to a proper system which will not deteriorate their environment and the neighborhood.

3.2.7 Development System

The replacement of cesspits and pit latrine to septic tanks with suitable soakage arrangement discussed above is the development alternative until larger scale sewerage project will be established to cover possible municipal area.

3.2.8 Development Budget

It is not identified, and development will be on pro poor donation.

3.2.9 Source of Budget for development

The development budget is expecting from a NGO (Asia Foundation) as a grant and individual contribution from household.

3.2.10 Operation and Maintains System

Nuwara Eliya MC is de-slugging the septic tanks on request.

3.2.11 Operation and Maintains Budget

It is under the health services allocation of MC.

3.2.12 Source of Budget for Operation and Maintains

The payment is made by the people to MC for the de-sludging of septic tanks by the gulley sucker sent by MC. The collection is sufficient to meet the cost. The payment from house hold is LKR 3,000 and from a commercial place LKR 4,500.

3.2.13 Outstanding issues in on-site sanitation works

- (a) Overflowing of septic tanks especially during the rainy season due to poor soakage.
- (b) Not possible to implement proper onsite sanitation in commercial areas.

3.3 Water Works

3.3.1 Progress

The existing Water Supply Schemes for Nuwara Eliya city is maintained and operated by Nuwara Eliya MC. The Superintendent of Works – Nuwara Eliya is responsible for the operation and maintenance works of the Nuwara Eliya Water Supply Scheme. The

Organization Chart of MC is given under **Figure 9.5**

Approximately 6,000 house connections, 850 government properties, and 1,500 commercial places are serviced by the MC and the coverage is about 90% of the population in Nuwara Eliya Municipality area.

3.3.2 Water Source

Apart from the Upper Nanu Oya well field (2,850 m³/day) and Upper Bomburu_Ella well field (3,200 m³/day), there are eleven surface water intakes in eleven sub catchments. The total production is 3,770 m³/day. The demand is met by operating both surface water intakes and groundwater wells.

The complete list of the surface water sources and the production capacity is given below.

1) Haddon Hill	1,800
2) Piyathissapura	110
3) New Water Field	40
4) Old Water Field	40
5) Pedro	110
6) Gemunu Mawatha	110
7) Lovers' Lip	900
8) Low Area 2	410
9) Nasby	110
10) Gamunupura	40
11) Vijithapura	100

3.3.3 Service Charge

The scheme specific tariff is adopted by MC and charges are slightly higher than the national tariff.

3.3.4 Purification Plant

The surface water sources are treated by disinfecting with chlorination. Some of the intakes are designed for partial sedimentation and screening.

Ground water quality is extremely satisfying the mineral water standards and no treatment is required.

3.3.5 Development Policy

The National Physical Planning Policy and Key projects, prepared under the section of 5 (a) and (b) of the Town and Country Planning (Amendment) Act., No. 49 of 2000, and approved by the National Physical Planning Council as per Section 4B of the Act on 11.01.2011, for the information of the general public were published on Part I: Section (I) - General No. Gazette No 1729/15 on Thursday, October 27, 2011.

3.3.6 Development Project

Nuwara Eliya water supply project was financially supported initially by ADB assisted 2nd water supply project. However, during the festival season, dry weather prevails and surface water sources getting dry and conflict situation for agricultural water demands.

In 1998, JICA carried out feasibility studies and prepared a master plan at the request of the Government for the improvement of the water supply and sanitation facilities. At this juncture, JICA provided technical & financial assistance as grant project, to explore the groundwater abstraction. The Project for Improvement of Nuwara Eliya Water Supply was successfully implemented and the distribution and transmission system also developed to reduce the non-revenue water percentage. The grant project has ¥ 481 million as design and technical assistance and construction package is ¥ 555 million.

3.3.7 Outstanding issues

- (a) The water meters connected to estimate the non revenue water are bypassed to avoid pressure reduction. The technical solution is possible to correct the orifice meters.
- (b) During the dry season, treated water is used to protect the cultivations thus avoiding legal and illegal tapping is not possible. Separate agricultural water supply from Gregory's Lake is under consideration.
- (c) Strict preservation of Eleven (11) sub-catchments of upper reaches as per the catchment protection plan.
- (d) Use of chemical fertilisers and pesticides in watersheds.
- (e) Low pressure situations at higher elevation.

3.4 Solid Waste Service

3.4.1 Collection System

The collecting waste in Nuwara Eliya Town and residential areas are functioning very well. The city is nice and tidy.

3.4.2 Disposal Site

An alternative practical solution was implemented in 2003 supported by JICA, since composting of degradable waste is not feasible under cold and extremely wet conditions. Thus,

the solid waste of this city is disposed in a Semi-Aerobic Engineered Landfill in the nearby Galway forest area at Moon-Plain.

The leachate that moves down through the solid waste in the landfill site is first filtered as it passes through the sand layer. This leachate is collected by perforated leachate collection pipes laid at bottom. It is conveyed to the leachate treatment facility consisting of 11 ditches interconnected in a zig-zag manner. Tanks are filled with coconut coir as the bio-filter media. The effluent from the treatment facility is released to the nearby stream as per the quality standards stipulated by Central Environmental Authority (CEA).

The facility is designed for 191,000 m³ volume for 20 years operation and the area of the landfill is 2 ha.

3.4.3 Service Charge

Presently there is no separate charge imposed and it is included in the property tax.

3.4.4 Development Policy

Under JICA & CEA assistance Nuwara Eliya MC has developed their own policy and is being implemented successfully. This policy is based on the several documents prepared by Central Environment Authority, *Ministry of Environment*, National Solid Waste Management Support Centre, Sri Lanka Standard Institution, and Department of National Planning.

3.4.5 Development Project

Nuwara Eliya MC is being implementing a successful project and set up a model to other small municipal councils.

Composting is carried out at household level to reduce the waste at generation. Pilisaru Project of CEA and JICA provide assistance.

3.4.6 Outstanding Issues

(a) Septage treatment facility to be enhanced due to high demand.

3.5 Hazardous Wastewater Control

The Technical Guidelines on Solid Waste Management in Sri Lanka was prepared on Hazardous Waste by Hazardous Waste Management Unit, Pollution Control Division, and Central Environmental Authority in November 2008

3.5.1 Industrial Wastewater Control

The Environmental Protection Licenses (EPL) is issued by the Provincial Office of the Central Environmental Authority located at Polgolla.

The discharges from slaughter house, vehicle service stations (transportation) and hotels and restaurants are covered under EPL.

It is the responsibility of LAs to regulate and control activities which are detrimental to the environment and public health in accordance with powers and authority vested in LAs under Local Government Laws and by-laws. Therefore Nuwara Eliya MC control the activities related to small scale industries which tend to pollute the environment. (eg. lathe workshops and garages)

3.5.2 Hospital Wastewater Control

The hospital has a waste water treatment plant. The system is aeration, settling tank, anaerobic digester and drying beds and chlorinated waste is released to the facultative ponds then to drain and finally ends up at Bomburu Ella.

The hazardous solid waste is separated. The kitchen waste is converted to biogas and it is a good model for energy recovery. The incinerator is not working and it is the priority of the hospital in handling hazardous waste.

4. Outstanding issues in Sewerage Sector and Measures to Overcome those issues

4.1 Sewerage Works

There is no existing Sewerage Scheme. There is a necessity for Sewerage Scheme combining grey water with secondary treatment facility at town centers specified above.

4.2 On-site Sanitation

4.2.1 Organization

MC is carrying out the de-sludging of septic tanks when requested by the rate payers.

4.2.2 Development

The development of cesspits to acceptable decentralized systems is urgent.

4.2.3 Operation and Maintains

MC is doing the de-sludging of septic tanks and requires one new Gully Suckers. Sludge is dumped into the septage disposal facility at Moon Plain Sanitary Landfill site.

4.3 Hazardous Wastewater

4.3.1 Organization

The Individual Industries and the General Hospitals is responsible in disposal under EPL. Presently primary treatments are being carried out according to the EPL.

4.3.2 Development

CEA will have to check the quality of effluent and advise them to have a separate treatment plant in their premises.

4.3.3 Operation and Maintains -

The individual Institution has to carry out the operation and maintains works.

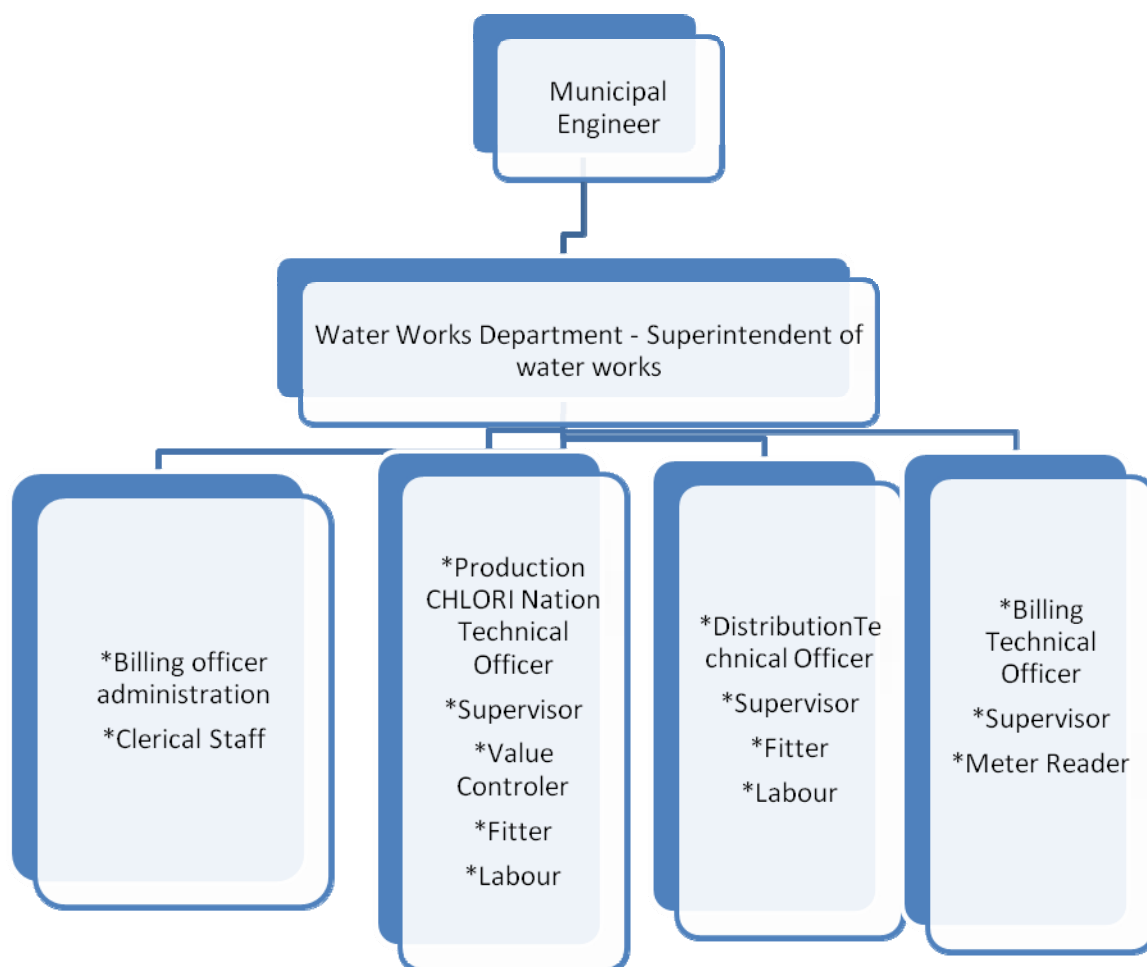
4.3.4 Control System

CEA will have to carry out the control system and monitor the EPL conditions.

Table 9.1 Population data

Name of Ward	Area (ha)	2001	2011
Nuwara Eliya		1878	2034
Magasthota		1518	1644
Kalukele		1131	1225
Kelegala		1874	2029
N' Eliya Central		4712	5103
Sandathenna		2803	3035
Hawaeliya West		1888	2045
Hawaeliya North		2686	2909
Hawaeliya East		2327	2520
Bulu Ela		1674	1813
Bambarakele		3557	3852
N' Eliya West		2540	2751
Shanthipura		1319	1428
Kalapura		3210	3476
Total	1500	33,117	35,864

The 2011 population figures are based on the forecasting of 0.8% growth.



	Item	Approved No	Present No
1	Technical Officer	1	1
2	Overseair	1	1
3	Value Operater	6	4
4	Turnkey Operater	5	1
5	Pump Operater	4	0
6	Meter Reader	4	2
7	Labour	5	5
	Total	26	14

Figure 9.5 Organisation chart – Water works

Annex 10 BADULLA MC

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Badulla MC is located on the southeast of central mountain region and almost encircled by the Badulu Oya River in Uva Province. The latitude of Badulla, is 6° 58' 59.99"N while the longitude is 81° 03' 00.00"E. The average elevation is about 680 m above M.S.L. (Mean Sea Level.). The city is also bounded by foothills of Namunukula range of mountains. The highest peak of the Namunukula range is 2,016 m above M.S.L.

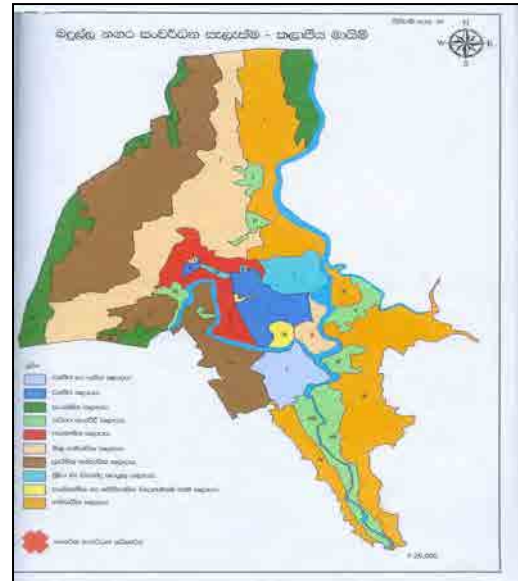


Figure 10.1 City Map with Details Required

Badulla became one of the provincial administrative hubs of the British rulers. The city was the end point of upcountry railway line built by the British in order to take mainly tea plantation products to Colombo.

1.1.2 Receiving Water

Badulu Oya, one of the major tributaries of the Mahaweli River (Basin No 60) is crossing the Badulla city.

There are six intakes constructed for water supply at possible streams of Badulu Oya. The locations are situated at Mederiya, Westmoiand, K'Mawatha, Viyadiguna, Nykadapeela and Dehigolla.



Figure 10.2

Since during dry season, the area is facing acute water shortage. Therefore, NWSDB is planning to construct two storage reservoirs at Demodara (0.358 million m³) across Badulu Oya and at Morethota (0.138 million m³) across Morethota Oya. (Another tributary of the Mahaweli River).

Mean annual flow of Badulu Oya at Demodara reservoir site 36.6 million m³ (\approx 1.16 m³/s). Similarly the respective flow at Morethota reservoir is 13.9 million m³ (\approx 0.44 m³/s).

1.1.3 Meteorology

Badulla Municipal Council located within the intermediate zone of Sri Lanka, which has a hot and humid tropical climate. The mean annual temperature is 25.2°C, although typically this ranges from 17.1°C on cooler nights during the rainy season, to 30.2°C during the day in the dry months. The mean annual temperature during the period 2002 - 2011 was 23.8°C.

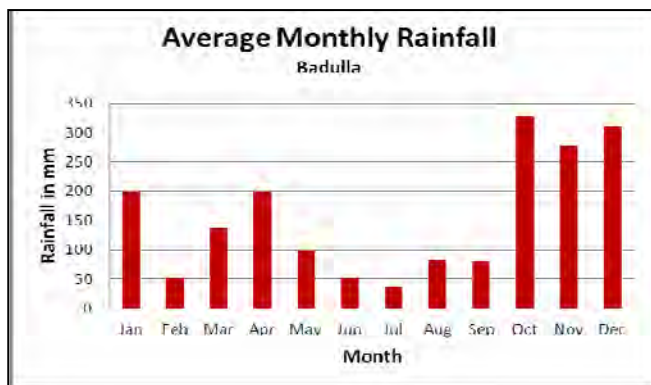


Figure 10.3

Badulla (Poonagala) receives rainfall of between 907 to 1,187 mm per annum, from both monsoons. The low rainfall is due to the leeward of the Northeast monsoon.

Badulla city is situated at windward side and average annual rainfall during the period 2002 - 2011 was 1,868 mm and most of which fell in the north east monsoon as shown in **Figure 10.3**.

1.1.4 Groundwater

The ground water stratum of the hilly area is very thin and there is less potential for groundwater abstraction. The groundwater level in the hilly slopes are not deep and during dry season dug wells are getting almost dry.

However, flat terrain close to Badulu Oya, has more potential for both deep and shallow groundwater extraction. The deep groundwater is possible from colluviums found in the basin. The shallow groundwater is used for drinking purpose.

1.2 Sociology

1.2.1 Population

The total extent of MC area is 1,050 ha. The council area is distributed among 15 wards and population in each ward is given in **Table 10.1**. The total population of the Badulla MC area in year 2010 is 46,578. According to the 2001 census, the city has population of 7,834, Muslims 3,618 Tamils, 29,856 Sinhalese, 368 others



Figure 10.4 Map of Wards Municipal Council

As per the exponential growth model, population growth rate was calculated as 1.2% for the Badulla MC Area.

1.2.2 Quality of Life

The average level of monthly household income in the town area is higher than Rs.32,313. According to the poverty assessment survey, 15% social subsidy recipients have been identified within Badulla Town Area.

1.2.3 Industries

There are no large scale industries found in the city. However, Badulla is considered as commercial & administration centre in Uva Province. Therefore service sector (Banking, Transportation, Insurance & warehouse) and government sector is more predominant in Badulla City.

1.2.4 Public Facilities

There is one public library and 6 cinemas are in the city limits. The road network within the Badulla City was carpeted (10.5 km) and most of the minor roads were renovated with concrete. Badulla General Hospital was developed with all facilities. Fire Department of the municipality was modernized with several fire fighting vehicles, bowsers and an ambulance.

(1) Educational facilities

There are 17 public schools provide education for approximately 14,250 student population. The number of teachers is around 1,000.

Dharmadutha College, Vishaka Girls' High School, Viharamahadevi Ballika Maha Vidyalaya, Badulla Central School, Uva Maha Vidyalaya, Al-Adhan M.V, Tamil Girls M.V and Barathy M.V are the popular schools among students and parents.

Two international schools are also functioning in the city area for the education of the students living in Badulla City and suburb.

(2) Medical facilities

Badulla General Hospital is the leading hospital in the Municipality area having 1,300 beds, 41 wards and facilities for around 3,000 outpatient treatment and clinics. There are 200 doctors and 1,800 staff employed by Health Authorities.

(3) Postal facilities

There is one main Post Office at Badulla and few sub post offices are located in Badulla Town

Area. These provide an adequate service to the resident population.

(4) Recreational facilities

One major sport complex is being developed under present council administration. There are many recreational facilities including “Senanayake” Park, children play ground, green spaces spread in Muthiyanganaya Buddhist Monastery and surrounding other religious places.

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

Street drains and drainage channels are discharged into Badulu Oya. The Central Environment Authority and Water Resources Board have prepared a project proposal under “Pivithra Ganga” (Cleaner River) programme in 2009, since pollution load from Badulla City pollutes the river Mahaweli very severely. The main objective of “Cleaner River” programme was achieving sustainable urbanization through ecosystem management and poverty reduction. The activities include identification of pollution threats, mobilization of disadvantage group for income generation through cleaning the environment and food production by protecting the banks and energy from the waste / sewage.

Badulupitiya and Sumanathissagama are very densely populated areas located just above the flood plains of Badulu Oya. They do not have enough space to dispose their grey water and construction of soakage pit. Most of the combined grey water & overflow from septic tanks contaminate the public drains.

In Helagama, a settlement at Wimaladarmarama Mawatha, there is no space for soakage facilities for septic tank. There is no access for gully sucker in emptying the septic tank. Their overflows and emptying the septic tanks are directed to common drain. There is a court case against the residents from public. The only solution is construction of a common septic tank / bio gas reactor on the public land and connects their sewer through a pipe network.

Apart from above three settlements, most of the residents have proper septic tanks.

Table 10.2 Type of Sanitation

Septic Tanks	Cesspits	Pit Latrine	Dry (Eco) Sanitation
70%	20%	10%	0%

1.3.2 Industrial Wastewater

No major industries are found in Badulla Town area except discharges from slaughter house, vehicle service stations (transportation) and hotels and restaurants.

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to Sewerage Works

Since there is no central municipal sewage treatment in Badulla town, septic tanks and soil absorption systems need to be developed. The Specifications for these systems are given in the Code of Practice for the Design and Construction of Septic Tanks (Sri Lanka Standard 745 1986).

There are no large hotels of more than 100 rooms that are required to install waste water treatment facilities. There is no space for tourism development within the city area.

2.1.2 Regulation and Rules regarding to On-site Sanitation

The Central Environmental Authority (CEA) administers the National Environmental Act and its regulations. Regulations made by the Minister of Environment under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

The Environmental Protection License (EPL) is a regulatory / legal tool under the provisions of the National Environmental Act. Uva Provincial Office located at Badulla, issues Environmental Protection Licenses for industries listed in the category “B” in the gazette notification no 1533/16 dated 25.01.2008 in order to prevent and control pollution issues. In the case of industries falling into the category “A”, the Provincial Office processes the applications and forwards the files to CEA Head Office for issue of license issued with a view to achieving the following objectives.

- To prevent or minimize the release of discharges and emissions into the environment from prescribed (industrial) activities in compliance with national discharge and emission standards.
- To develop an approach to pollution control that considers discharges from prescribed (industrial) processes to all media (air, water, land) in the context of the effect on the environment.
- To contain the burden on industry, in particular by providing guidance on pollution control for polluting processes.
- To ensure that the system responds flexibly both to changing pollution abatement

2.1.3 Regulation and Rules regarding to Water Works

The National Water Supply and Drainage Board Law, No. 2 of 1974 of the National State Assembly is the appropriate regulation and rules for water works.

2.1.4 Regulation and Rules regarding to Solid Waste Service

Badulla MC in the Badulla District, in the Uva Province has right to issue any by-laws in terms of the Municipal Councils Act, No. 16 of 1947. The similar notifications were published in the Government Gazette Part IV (B) - Local Government No. 1,755 - Friday, April 20, 2012 on municipal road development.

2.2 Organization of the Town

2.2.1 Organization of the Town

The organization chart of the Badulla MC is headed by the Mayor, and the commissioner is the overall in charge. The head of departments are Municipal Engineer, Chief Public Health Inspector and Chief Accountant.

2.2.2 Organization of Sewerage Works

No existing Sewerage Scheme is operating for Badulla town under the Municipal Council. The only sewerage scheme in operation is at the General Hospital.

2.2.3 Organization of on-site Sanitation Works

On-site Sanitation Works is being carried out by Municipal Council and the details of staff involved with site sanitation are under the respective Public Health Inspector.

2.2.4 Organization of Water Works

Operation and Maintains of Badulla Water supply Scheme is carried out by NWSDB, Regional Support Centre (RSC) – Uva Province. The Area Engineer (Badulla) assisted by Officer in Charge is responsible in operation and maintenance of Badulla water supply scheme.

2.2.5 Organization of Solid Waste Service

Solid Waste Service is being carried out by MC under the Public Health Inspector.

2.2.6 Organization for Hazardous Wastewater

The Control is being carried out by CEA. Mostly hospital waste comprises the hazardous waste. The hospital director is responsible on disposal with incinerator. The radioactivity wastes are collected by the respective suppliers.

2.3 Budget

2.3.1 Total Budget of the City

The scale of income and expenditure of Badulla MC is given in the **Table 10.3**.

Table 10.3 Finance Details

Badulla Municipal Council - Scale of Finance			Population in 2010 - 46,578				
Item	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Total Revenue	81.04	84.77	114.84	128.52	144.20	149.23	117.10
Total Expenditure	89.65	105.07	111.16	136.89	153.47	147.79	124.01
Total Surplus / (Deficits)	(8.61)	(20.30)	3.68	(8.37)	(9.27)	1.44	(6.91)

2.3.2 Budget for on-site sanitation Works

Table 10.4 Solid Waste Management

Badulla Municipal Council - Solid Waste Management			Population in 2011 - 46,578		
Item	2008	2009	2010	2011	2012
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Expenditure Health Services	15.23		18.43	20.51	23.46

The budget for on-site sanitation is included under health services. It is noted that this includes administration, preventive services, food sanitation, cleaning environmental health, maternity and child welfare, health studies, solid waste management and maintenance of graveyards.

2.3.3 Budget for Water Works (NWSDB)

Budget & Expenditure of Water works are maintained by respective OICs under Area Engineer (Badulla). The number of connections is 11,788.

2.3.4 Budget for Hazardous Wastewater Control

It is not known. It may be included in CEA Budget under their regional office in Badulla. The hospital hazardous waste and their disposal are under the responsibility of the suppliers and may be included under Hospital Budget.

3 Public Works

3.1 Sewerage Works

There is no city sewerage system.

3.1.1 Development Policy

A policy needs to be developed. The experience gained in proposed Kanthakudy, and existing Colombo, Kandy, Hikkaduwa and Welimada Sewerage schemes may leads to the national policy.

3.1.2 Development Project

It is not implemented any project related to sewerage. The drainage improvement is being done under pavement and road development works.

3.1.3 Potential Demand of Sewerage Service

Although 70 % of the households in the Badulla MC are having proper septic tanks, 30% of the households direct their grey water and pit latrine and cesspit overflows to public drains.

The combine grey water and sewage especially from disadvantage groups in the city and those living close to flood plains should be collected and treated as a priority project to safe guard the water pollution. Residents from Badulupitiya, Helagama and Sumanathissagama appreciate possible biogas generation from sewage.

The following records were obtained from the Badulla Hospital on water borne disease. This shows mark decline in the water borne disease due to proper services provided by NWSDB, MC and Health Department.

Table 10.5 Water Borne Disease in Badulla City Finance Details

Year	2009	2010	2011	2012	Total
Diseases					
Dysentery	12	4	3	-	19
Enteric Fever	1	1	5	1	8
Viral Hepatitis	19	7	3	-	29

The council received several complaints from Inhabitants on sanitation or water environment

Table 10.6 Complaints on Sanitation and Environment

Complaint of Inhabitants on Sanitation or Water Environment

Year Complaint	2009	2010	2011	2012	Total
Dysentery	17	14	9	4	44

MC, NWSDB and Health Authorities welcome the new sewerage system for the city. According to the Mayor, the progress is made on several aspects such as solid waste management, housing complexes at Kailagoda and Badulupitiya for minor employees of the council, upgraded city road net work, new playground complex and stadium.

The next priority is sewerage system, followed by providing vehicle parking facilities and pavement development for pedestrian similar to Colombo.

3.1.4 Development System

It was revealed that combine sewer and grey-water collection system with treatment facility is required to prevent further deterioration of Badulu Oya water quality, improvement in environment and advancement in quality of the life.

As a first step introducing sewer network in the critical areas of Badulupitiya, Helagama and Sumanathissagama to be connected with multiple decentralized waste water treatment systems with bio gas generation. One of the council members from Badulupitiya area accompanied the study team emphasized on the council attempts to secure a grant project for pro poor communities in those three locations.

Implementing a three priority schemes in those three locations may change the entire city environmental health standards.

3.1.5 Operation and Maintains System

The operation and maintenance of proposed three schemes of Badulupitiya, Helagama and Sumanathissagama are to be maintained by the housing committees with the technical guidance from NWSDB. The municipality health staff will monitor the disposal standards.

NWSDB may carry out the operation and maintenance of the city sewerage system and increasing coverage under Integrated Badulla, Hali-Ela and Ella Water Supply Scheme.

3.1.6 Outstanding issues in Sewerage Works

The design of the new sewerage system should accommodate the minimum operation and maintenance cost, and connection charges and quality standard of the effluent to natural streams.

3.2 On-site Sanitation Works

3.2.1 Progress

The cesspits and pit latrine in Badulupitiya, Helagama and Sumanathissagama became a social and environment issue. The 70% of the households of the city belongs to middle and high income groups have proper septic tanks and soakage arrangement to suite the ground condition.

3.2.2 Service Condition

MC is de-slugging the septic tanks on request. The collected gully is currently disposed close to

sport complex and MC Plant.

Badulla MC has two gully bowsers. The vehicle fleet is to be strengthened with at least one new vehicle. The vehicles are 15 years in operation.

3.2.3 Treatment Process

The septic system has two primary components: the septic tank which breaks down the sewage through anaerobic action and the soakage tanks or pit which operates aerobically. The septic tank slows down the flow of raw sewage and stimulates the removal of solids by settlement. Septic tanks reduce BOD by 30-50 percent and fecal bacteria content is only slightly reduced. Therefore, the effluent is discharged into unsaturated soil to remove more of the solid matter and toxins.

The septage disposal is carried out in an isolated pit in adjoining park area temporarily. The dried sludge is sent for composting.

3.2.4 Development Policy

The national policy on sewerage sector including onsite sanitation is also at the draft stage. MC is strictly adhering to "Planning Committee Approval".

3.2.5 Development Project

At present MC is planning to shift the septage treatment facility to a new land away from the sport complex.

3.2.6 Potential Demand of On-Site Sanitation System

There is major demand from citizens of Badulupitiya, Helagama and Sumanathissagama to improve their cesspits or pit latrine to a proper system which will not deteriorate their environment and the neighborhood. There is a court case against some of the Helagama residents.

3.2.7 Development System

The surface water & groundwater pollution from the cesspits and pit latrine can be prevented by introducing decentralized waste water treatment systems with bio gas generation. They expect to use bio gas for cooking.

3.2.8 Source of Budget for Operation and Maintains

The payment is made by the people to MC for the de-sludging of septic tanks by the gully sucker sent by MC. The collection is sufficient to meet the cost. The payment from house hold

is LKR 2,500 and from a commercial place LKR 5,000.

3.2.9 Outstanding Issues in On-site Sanitation Works

- (a) Overflowing of septic tanks especially during the rainy seasons at Badulu Oya flood plains.
- (b) New Septage disposal facility to be constructed away from sport complex.
- (c) Converting Cesspits & pit latrines for bio gas generation from decentralized waste water treatment.
- (d) Not possible to implement proper onsite sanitation in commercial areas.

3.3 Water Works

3.3.1 Progress

The existing Water Supply Schemes for Badulla city is maintained and operated by NWSDB. The Area Engineer office is located at Badulla and OIC (Badulla) under Area Engineer are responsible for the operation and maintains works of the Badulla Water Supply Scheme.

Approximately 11,788 connections are maintained by NWSDB. In 2011, and the coverage is expected to be 90% of the population in Badulla Municipality area.

3.3.2 Water Source

Badullu Oya is the major water source for existing Badulla Water Supply.

Water from Nykadapeela and Dehigolla are chlorinated and released to the respective distribution system

Water from other four intakes is transmitted to the two treatment plants at Eadaluwa and Bandarapura.

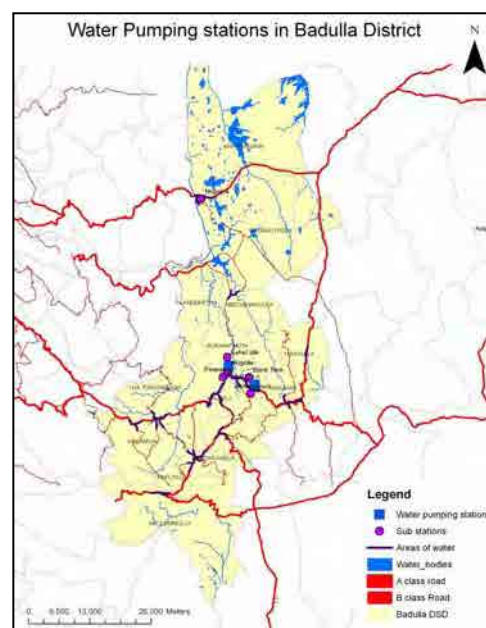


Figure 10.5

3.3.3 Service Charge

As per the Tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009. The scheme specific tariff is adopted by MC and charges are slightly higher than the national tariff.

3.3.4 Purification Plant

The two purification plants are located at Eadaluwa & Bandarapura in Badulla.

The treatment process is rapid / slow sand filtration. It is a modern DAF System, (Flocculation, Coagulation, Sedimentation, filtration & Disinfection). The capacity of the Treatment Plant is 54,500 m³/day (12 mgd/day).

Water from other four intakes were transmitted to the two treatment plants at Eadaluwa and Bandarapura.

3.3.5 Development Policy

The National Physical Planning Policy and Key projects, prepared under the section of 5 (a) and (b) of the Town and Country Planning (Amendment) Act., No. 49 of 2000, and approved by the National Physical Planning Council as per Section 4B of the Act on 11.01.2011, for the information of the general public were published on Part I: Section (I) - General No. Gazette No 1729/15 on Thursday, October 27, 2011.

3.3.6 Development Project

The proposed Integrated Badulla, Ella & Hali-Ela Water Supply Scheme aims to harvest water from the Badulu Oya and Morethota Oya by constructing two dams across the river/stream and the water will be channeled into a treatment plant located at Uduwara (15,000 m³/day). The service area covers Badulla, Haliela, Demodara and Ella townships and their suburbs.

The proposed concrete gravity dam at Demodara, will be 15 m high and will form a reservoir of capacity of 358,000 m³ having a full supply depth of 13m. This is located near the 123 km post on the Welimada - Badulla road.

The proposed Morethota concrete gravity dam which will be 23.5m high, and will form a reservoir with a capacity of 130,000m³ with a full supply depth of 20m and be located 1km downstream of the confluence near the old 20 mile post on the Haputale-Bandarwella- Badulla Road.

Several groundwater storage tanks will be located at Uduwarawatta-(2,750m³), Judge's Hill (1,000m³), Uduwela (250 m³), Kumbalwela-(500 m³), Ella (140 m³), Kithal Ella-(125 m³).

The land acquisition has already commenced. Under Section 92 of the National Water Supply and Drainage Board Act, No. 02 of 1974, land acquisition notification was published on Part I: Section (I) - General No. Gazette No No. 1755/4 – Monday, April 23, 2012 related to the construction of the Water Tank, Pump-House and the Office for supply water to Ella town and Demodara Pump House.

3.3.7 Outstanding issues

- (a) Some of the places at high elevations need pumping due to low pressure of the existing gravity supply.
- (b) Promotion on rainwater harvesting is not adequate.
- (c) Authorities are not allowed to supply water for area identified as critical landslide and floods prone. Due to the humanitarian and political pressure, those policies have to overlook.
- (d) Severe water scarcity during dry months
- (e) Dug wells are not possible in highlands.

3.4 Solid Waste Service

3.4.1 Collection System

The Collecting waste in Badulla Town and residential areas are functioning well.

The MC received the financial and technical support on Solid Waste Management from JICA & “Pilisaru” Project administered by CEA.

3.4.2 Disposal Site

The existing disposal site is being converted to a playground. The disposal site is also near the sport complex and the stadium which is northern border of the city centre. The citizens in Badulupitiya tenements, Hanwella, Hindagoda, and Gangaboda areas on the other side are complaining the unbearable stink. Moreover, the schools are located nearby.

The council is looking for a new land that belonged to the Wildlife Department at the 5th mile post on the Badulla-Mahiyangana Road.

3.4.3 Service Charge

The composting programme was completely changed the situation of the Badulla City. It is now earning money for the Council while creating new employments for the city workers.

Presently there is no separate charge imposed and it is included in the property tax.

3.4.4 Development Policy

Under JICA assistance Badulla MC has developed their own policy. However, it is not implemented yet due to the changes of the long term plan in SWM. The policy is based on the following documents.

- 1) National Policy on Solid Waste Management, Ministry of Environment, Sri Lanka, 2007.
(Ministry of Environment, (<http://www.environmentmin.gov.lk>)

- 2) National Strategies on Solid Waste Management, National Solid Waste Management Support Centre February 2008, (<http://www.pclg.gov.lk/en/download/Reports/Report2007.pdf>)
- 3) Sri Lanka Standard 1246: 2003 (UDC 628.477.4) Specification for Compost from Municipal Solid Waste Management and Agricultural Waste, Sri Lanka Standard Institution
- 4) Sri Lanka the Emerging Wonder of Asia, Mahinda Chintana Vision for the Future, The Development Policy Framework, Government of Sri Lanka, Department of National Planning, Ministry of Finance and Planning, 2010
- 5) Technical Guideline on Solid Waste Management in Sri Lanka, CEA, Sri Lanka, June 2005

3.4.5 Development Project

Under JICA and “Pilisaruru” Project, collecting solid waste is limited in the urban area. At the remote locations, home composting is promoted. The total daily collection is 35 -33 metric tons. The municipal council has implemented an ambitious composting programme by converting 20 tons of solid waste.

At the moment municipal council is struggling the clearance of backlog collected at the composting site.

3.4.6 Outstanding Issues

- (a) Although transport facilities for solid waste are adequate and conditions of the vehicles also not satisfactory.
- (b) Council needs to find new site for disposal of solid waste and septage.
- (c) Ultimatum is with clearing backlog and keeping the composting site clean, tidy and without any bad odor.
- (d) Implementing the council policy on 3R is not effective. (The reducing waste at the source, recycling and reusing)
- (e) Need more emphasis on home composting.

3.5 Hazardous Wastewater Control

The Technical Guidelines on Solid Waste Management in Sri Lanka was prepared on Hazardous Waste by Hazardous Waste Management Unit, Pollution Control Division, and CEA in November 2008.

3.5.1 Industrial Wastewater Control

The Environmental Protection Licenses (EPL) is issued by the Provincial Office of the Central Environmental Authority located at Badulla.

The discharges from slaughter house, vehicle service stations (transportation) and hotels and

restaurants are covered under EPL.

It is the responsibility of LAs to regulate and control activities which are detrimental to the environment and public health in accordance with powers and authority vested in LAs under Local Government Laws and by-laws. Therefore Badulla MC control the activities related to small scale industries which tend to pollute the environment (eg. rice mills, timber mills, metal quarries, grinding mills, lathe workshops and garages)

3.5.2 Hospital Wastewater Control

The hospital has a model waste water treatment plant which was developed during the Publics Works Department tenure. The system is anaerobic digester and trickling filter for waste water treatment. The chlorinated waste is released to the natural drain and finally ends up at Badulu Oya.

Badulla General Hospital has increased its capacity and facilities. The nurses' training school was introduced. Therefore recently treatment facility was augmented.

The hazardous solid waste is separated. The kitchen waste is converted to biogas and it is a good model for energy recovery. The incinerator is not working and it is the priority of the hospital in handling hazardous waste.

4. Outstanding issues in Sewerage Sector and Measures to Overcome those Issues

4.1 Sewerage Works

There is no existing Sewerage Scheme. There is a necessity for Sewerage Scheme combining grey water with secondary treatment facility.

4.2 On-site Sanitation

4.2.1 Organization

MC is carrying out the de-sludging of septic tanks when requested by the rate payers.

4.2.2 Development

The development of cesspits to acceptable decentralized systems is urgent. The new treatment facility is to introduce, where gully sucker or manual cleaning is not possible especially at Helagama, a settlement at Wimaladarmarama Mawatha .

4.2.3 Operation and Maintains

MC is doing the de-sludging of septic tanks and requires one new Gulley Suckers. Sludge is dumped into the septage disposal facility at valathapitiya.

4.3 Hazardous Wastewater

4.3.1 Organization

The Individual Industries and the General Hospitals is responsible in disposal under EPL. Presently primary treatments are being carried out according to the EPL.

4.3.2 Development

CEA will have to check the quality of effluent and advise them to have a separate treatment plant in their premises.

4.3.3 Operation and Maintains

The individual Institution has to carry out the operation and maintains works.

4.3.4 Control System

CEA will have to carry out the control system and monitor the EPL conditions.

Table 10.1 – Populations by Wards

Name of Ward	Area (ha)	2001	2004	2007	2010
Kailagoda	77			3757	3920
Puwakgodamulla	82	Sinhalese		3716	3826
Pitawela	87	29856		2597	2696
Helagama	74	Muslims		2460	2536
Katupelellagama	71	7834		2087	2127
Pin Arawa	66	Tamils		2776	2874
Welekade	67	3618		3347	3495
Malwatta	70	Others		2868	2926
Dharmadutha	61	368		3394	3457
Central	53			4644	4745
Muthiyangana	66			3157	3266
Mailagasthenna	70			2575	2655
Kanupelella	69			2842	2937
Hingurugamuwa	73			2691	2771
Hindagoda	64			2263	2347
Total	1,050	41,676	43,096	45,174	46,578

Annex 11 BATTICALOA MC

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Batticaloa MC is situated in the Eastern Coastal belt. The latitude of Batticaloa, is 7° 43' 0.00"N while the longitude is 81° 42' 0.00"E. The city is generally flat with the exception of Puliyantivu area which is slightly higher than the rest of the area. The elevation of the city is between 1.20 m and 4.0 m above mean sea level. (M.S.L.)

It is the only Municipality in Batticaloa District. The different parts of the city are connected through bridges at various locations of the lagoon.



Figure 11.1

Puliyantivu East & Puthunagar GN divisions are isolated and the access is possible by boats. Batticaloa MC coincides with the Manmunai North D.S. Division.

1.1.2 Receiving Water

There is no specific river crossing the city. However Batticaloa lagoon is fed by many river basins. The lagoon is 56 km long and extends from Eravur to Kalmunai. This lagoon opens in to the sea at Kallar and Palameenmadu. The northern opening is between Palameenmadu and Navalady GN Divisions as shown in Figure 11.2.

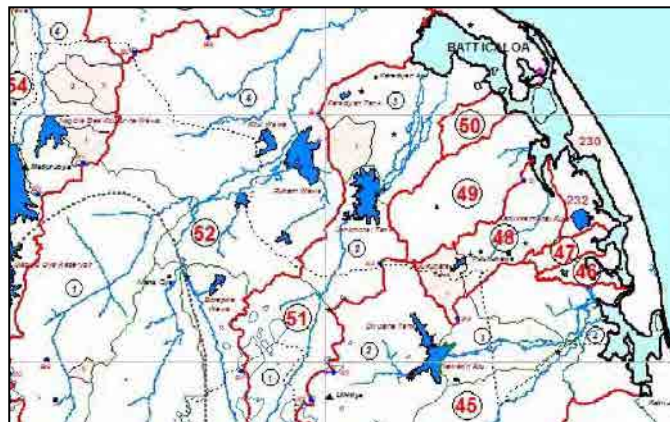


Figure 11.2

The rivers feeding Batticaloa lagoon are Anmdella Oya & Nawakiri Aru (Basin No: 45), Thupakeni Tank (Basin No: 46), Namukafda Aru (Basin No: 47), Manadputty Aru (Basin No: 48), Pathanthoddaehne Aru (Basin No: 49), Vett Aru (Basin No: 50), and Megalawatawan Aru and Unichchi (Basin No: 51). The new source for drinking water is from Unichchi Tank.

1.1.3 Meteorology

Batticaloa MC located within the dry zone of Sri Lanka, which has a hot and humid tropical climate. The mean annual temperature is 27.7° C, although typically this ranges from 24° C on

cooler nights during the rainy season to 34° C during the day in the dry months. The mean annual temperature during the period 2002 – 2011 was 28.6 °C

Batticaloa receives rainfall of between 568 to 2,795 mm per annum, primarily, about 60%, from the northeast monsoon during October to February. Average annual rainfall during the period 2002 - 2011

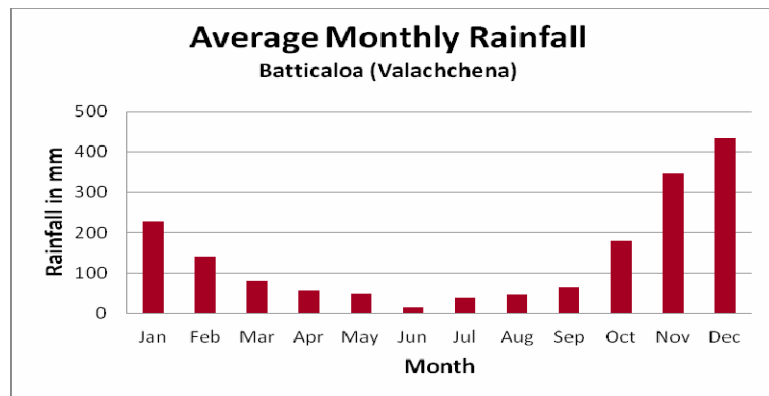


Figure 11.3

was 1,803 mm most of which fell in the north east monsoon. This suggests an increase in annual rainfall from earlier years, since the 1940 to 1994 average was 1,650 mm.

1.1.4 Groundwater

The rocky, gravel, sandy and marshy soil is found in the City area. Therefore, Mugathuvaram , Kallady, Kokuvil, Karuvepankeni and Urani areas have a potential coastal aquifer. Batticaloa water supply scheme which was started in 1917 and renovated in 1962 was purely depend on groundwater until year 2011 from 12 wells.

Out of these twelve wells, two wells were abandoned due to salinity intrusion at Mugathuvaram. NWSDB harvests 1,500 m³/day from 10 wells. (5 wells in Mugathuvaram, 3 wells in Kallady, one each in Kokuvil and Urani).

Although the present water source is from Unichchi reservoir, majority (70 % percent of the population) uses private dug wells for drinking water and 2% depends on common wells.

In Karuvepankeni, there is one well owned by the Batticaloa MC. About 100m³/day of water is obtained from it and supplied to houses in Thiruperunthurai. As the result cone of depression due to the pumping, the wells located near the pumping stations become dry during period of drought.

1.2 Sociology

1.2.1 Population

The total extent of council area is 6,426 ha excluding water bodies. The council area is distributed among 19 wards (48 GN Divisions) and population in entire MC is given in **Table 11.1**. The total population of the Batticaloa MC area in year 2011 is 95,138.

As per the exponential growth model, population growth rate was calculated as 1.9 % for the Batticaloa MC Area. This is due to migration of people from suburbs during the conflict time as Batticaloa city was a safer area for all communities.

1.2.2 Quality of Life

The average level of monthly household income in the town area is Rs. 34,329. The Gini Coefficient of the household income is 0.46. The data are obtained from household Income and Expenditure Survey - 2009/10 -Preliminary Report.

1.2.3 Industries

Batticaloa is a commercial city with few medium scale industries including garment factory (01 Nos), grinding, timber and rice mills, and several engineering workshops.

Fishery has identified as a key sector in Batticaloa area. Sinnauppodai, Amirthakaly, Palameenmadu and Thiraimadu are the boat anchoring points located in the city. The fish cleaning and selling are being carried out in those areas while environment is keeping tidy.

The main agricultural crops available within the city area are limited to coconut (Kokkuvil, Navatkerny, Palameenmadu area) and paddy (Panichayadi, Periyakulam, Thimalathivu, Sethukuda area) cultivation. In this limited localities, there is no industrial sector development related to agriculture.



Figure 11.4 Land Use Map

1.2.4 Public Facilities

The city has four main divisions namely Pullianthivu, Koddamunai, Kallady, and Puthur.

- **Pullianthivu:**

Many government department and offices including MC & District Secretariat, schools, banks religious places, General Hospital, Weber Stadium and Shops are located.

- **Koddamunai:**

Schools, Banks, Sri Lanka Telecom regional office for East, Shops and many government offices are located. Two bridges called Perya Palam and Puthuppalam connect Pulianthivu Island with Koddaminai land mass.

- **Kallady:**

There are many Government buildings and private industries, schools, hospitals and Eastern University Medical Faculty. Kallady Lady Manning Bridge connects Kallady and Arasay.

- **Puthur:**

This is where the domestic airport of Batticaloa is located.

(1) **Educational facilities**

There are several public schools including leading national school namely, St. Michael's College, Methodist Central College, Vincent Girls High School, Vivekanantha girls Vidyalayam and Shivanantha Vidyalayam, ST. Cecilyas girls M.V & Hindu colleges and few international schools available in the city area for the education of the students living in Batticaloa City and suburb.

(2) **Medical facilities**

Batticaloa Teaching Hospital is the leading hospital in the Eastern Province which is controlled by the Central Government. The teaching hospital in the Eastern Province provides main clinical teaching facility for the Eastern University. It has 900 beds.

(3) **Postal facilities**

There is one main Post Office at Batticaloa close to Weber's stadium and few sub post offices in Batticaloa Town Area. These provide an adequate service to the resident population.

(4) **Recreational facilities**

There are many play grounds partly maintained by the Council in addition to Weber's stadium. They are:-

- i) Thiruprenthurai grounds
- ii) Dutch Bar grounds near Sasthiriyar Road.
- iii) Bar Road grounds near Anandan Road.
- iv) New Kalmunai road at Navatkudah.
- v) Iruthayapuram West grounds.
- iv) Sinna Uranie grounds.

The Council also maintains 18 community Halls, 10 Children's playgrounds in addition to the above list. There are two public libraries at Pulianthivu (Main Library) and the other at Kallady.

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

The whole town depends on septic tanks and cesspits for disposal of night soil. Very few people who have settled near shrub jungles and lagoon shores and not having individual toilets continue to respond the nature call in hideouts. In some places, the discharges of the overflow of cesspits are connected into the waterways, thereby polluting the environment and posing health hazards. The Main Drain flowing to Kallady and from Hospital area to lagoon is polluted with grey water, debris and cesspit spillage.

Table 11.2 Type of Sanitation

Septic Tanks	Cesspits	Shrub jungles and lagoon shores	Dry (Eco) Sanitation
60%	38%	2%	0%

Once solid waste management is streamlined, as explained in the respective section given below, the significant remaining contributors to pollution are the urban sewage and grey-water.

1.3.2 Industrial Wastewater

No major industries are found in Batticaloa Town area except discharges from fish processing (fisheries), vehicle service stations (transportation) and hotels and restaurants. (tourism).

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to Sewerage Works

Since there is no central municipal sewage treatment or any proper disposal system (sea outfall) in Batticaloa town, septic tanks and soil absorption systems need to be developed. The Specifications for these systems are given in the Code of Practice for the Design and Construction of Septic Tanks (Sri Lanka Standard 745 1986).

There are no large hotels of more than 100 rooms that are required to install waste water treatment facilities. The "Biofilter Sewage Treatment Plants" have recently been installed in several hotels in Sri Lanka, which offers cost effective treatment and recycling for sewage and wastewater. Traditional treatment mechanisms are more costly and expensive to maintain.

2.1.2 Regulation and Rules regarding to On-site Sanitation

The CEA administers the National Environmental Act and its regulations. Regulations made by the Minister of Environment under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

The Environmental Protection License (EPL) is a regulatory / legal tool under the provisions of the National Environmental Act. The Provincial Office of the Central Environmental Authority located at Kantale issues Environmental Protection Licenses for industries listed in the category “B” in the gazette notification no 1533/16 dated 25.01.2008 in order to prevent and control pollution issues. In the case of industries falling into the category “A”, the Provincial Office processes the applications and forwards the files to CEA Head Office for issue of license issued with a view to achieving the following objectives.

- To prevent or minimize the release of discharges and emissions into the environment from prescribed (industrial) activities in compliance with national discharge and emission standards.
- To develop an approach to pollution control that considers discharges from prescribed (industrial) processes to all media (air, water, land) in the context of the effect on the environment.
- To contain the burden on industry, in particular by providing guidance on pollution control for polluting processes.
- To ensure that the system responds flexibly both to changing pollution abatement

2.1.3 Regulation and Rules regarding to Water Works

The National Water Supply and Drainage Board Law, No. 2 of 1974 of the National State Assembly is the appropriate regulation and rules for water works.

2.1.4 Regulation and Rules regarding to Solid Waste Service

Regulations made by the Chief Minister, Provincial council, Eastern Province and issued by the Gazette (Local Government) Part IV-B, No.1769 of the Democratic Socialist Republic of Sri Lanka on 27th July 2012. Under this notification several Pradeshiya Sabha’s in Eastern Province were covered.

A nominal charge from the citizens for solid waste management services of several Municipal Councils in eastern province were approved by the provincial council. Gazette notification will follow after the eastern province election.

2.2 Organization of the Town

2.2.1 Organization of the Town

The organization chart of the Batticaloa MC is provided in the **Figure 11.5**.

2.2.2 Organization of Sewerage Works

No existing Sewerage Scheme is operating for Batticaloa Town.

2.2.3 Organization of on- site Sanitation Works

On-site sanitation works is being carried out by MC and the details of staff involved with site sanitation is shown in the Organization Chart in **Figure 11.5**. Public Health Inspector is the officer in charge of the work.

2.2.4 Organization of Water Works

Operation and Maintenance of Batticaloa water supply scheme is carried out by NWSDB. Regional Support Centre (RSC) - Eastern Province. Manager (Batticaloa) is the officer in charge.

2.2.5 Organization of Solid Waste Service

Solid Waste Service is being carried out by MC and the details of staff involved with solid waste service are shown in the Organization Chart in **Figure 11.5**.

2.2.6 Organization for Hazardous Wastewater

The Control is being carried out by CEA. Mostly hospital waste comprises the hazardous waste. The hospital director is responsible on disposal with incinerator. The radioactivity waste is collected by the respective suppliers.

2.3 Budget

2.3.1 Total Budget of the City

The scale of income and expenditure of the Batticaloa MC is given in the **Table 11.3**.

Table 11.3 Finance Details

Batticaloa Municipal Council - Scale of Finance	Population in 2011 - 95,138						
	2006	2007	2008	2009	2010	2011	Average
Item	LKR: m	LKR: m	LKR: m	LKR: m	LKR: m	LKR: m	LKR: m
Total Revenue	114.95	172.46	164.60	179.42	244.68	170.14	174.38
Total Expenditure	113.32	130.94	134.14	183.17	175.68	156.69	148.99
Total Surplus / (Deficits)	1.63	41.52	30.46	(3.75)	69.00	13.45	25.39

2.3.2 Budget for on-site sanitation Works

The budget for on-site sanitation is included under health services. It is noted that this includes administration, preventive services, food sanitation, cleaning environmental health, maternity and child welfare, health studies, solid waste management and maintenance of graveyards.

2.3.3 Budget for Water Works (NWSDB)

NWSDB is carrying out the operation of water works supplied from Vavunathive treatment plant (42,000 m³/day) from 2011. Previously only 10 GN divisions of out of 48 GN divisions of

the MC area were provided water for two hours. (1,750 m³/day)

Budget and expenditure for water works of the Batticaloa MC area is allocated under NWSDB. From 2011 onward the expanded distribution network covers three distribution systems namely, Batticaloa, Irruthayapuram and Kallady.

Budget and expenditure of water works are maintained under Batticaloa water supply scheme for larger area. The number of connections is about 1,816.

2.3.4 Budget for Hazardous Wastewater Control

It may be included in Central Environmental Authority Budget under their regional office in Kanthale. The hospital hazardous waste and their disposal are under the responsibility of the suppliers and may be included under Hospital Budget.

3. Public Works

3.1 Sewerage Works

There is no existing Sewerage Scheme operating for the City

3.1.1 Development Policy

A policy needs to be developed. The experience gained in proposed Kanthakudy, and existing Colombo, Kandy, Hikkaduwa & Welimada Sewerage schemes may leads to the national policy.

3.1.2 Development Project

It is not implemented any project related to sewerage. The drainage improvement is being done under pavement and road development works. It is proposed to have the same sea outfall, treatment plant land for Kanthakudi sewerage project

3.1.3 Potential Demand of Sewerage Service

The whole town depends on septic tanks, cesspits and pit latrines for disposal of night soil. Majority of the town still depend on the groundwater for their water supply needs especially bathing, drinking and washing purpose. The groundwater pollution is mainly due to wastewater and septic tanks soakage. In absence of central disposal system, the pollution of environment and posing health hazards are inevitable. Accordingly, there is a necessity for the sewerage scheme for the Batticaloa Town.

3.1.4 Development System

It was revealed that combine sewer and grey-water collection system with sea outfall is required as a first step providing future development of treatment facilities closer to final

pumping stations.

3.1.5 Outstanding issues in Sewerage Works

The design of the new sewerage system should accommodate the minimum operation and maintenance cost and connection charges. The city drainage system is very old and need to be reviewed.

3.2 On-site Sanitation Works

3.2.1 Progress

The new individual septic tanks or cesspits are being constructed as per the standards. A septage disposal facility at Thiruperunthurai was constructed under JICA funding.

3.2.2 Service Condition

The MC is de-sludging the septic tanks on request.

The MC has two gully bowsers and each one has a 4,000 liter capacity. The MC receives around 8 gully removal requests per week. The collected gully is disposed at septage treatment plant located next to the dump site at Thiruperunthurai. The vehicle fleet is to be strengthened with one new vehicle.

3.2.3 Treatment Process

The septic system has two primary components: the septic tank which breaks down the sewage through anaerobic action and the soakage tanks or pit which operates aerobically. The septic tank slows down the flow of raw sewage and stimulates the removal of solids by settlement. Septic tanks reduce BOD by 30-50 percent and fecal bacteria content is only slightly reduced. Therefore, the effluent is discharged into unsaturated soil to remove more of the solid matter and toxins.

The septage disposal is carried out in a facultative pond. The liquid is insufficient and it serves as a drying bed. The JICA assisted system was again inspected by UN-Habitat – Japan.

The appropriate solution is connection of part of the combined city sewer into the facultative ponds under future sewerage project. The area has potential for tourism due to beautiful water front.

3.2.4 Development Policy

The national policy on sewerage sector including onsite sanitation is also at the draft stage. MC is strictly adhering to “Planning Committee Approval”.

3.2.5 Development Project

There is no project implemented in the City to improve cesspits to septic tanks.

3.2.6 Potential Demand of On-Site Sanitation System

There is a demand from citizens of the city for onsite system, as 1,000 new latrines are to be developed in the area. Approximately 2,700 families are using neighbors or open defecation.

3.2.7 Source of Budget for Operation and Maintenance

The payment is made by the people to MC for the de-sludging of septic tanks by the gulley sucker sent by MC. The collection is sufficient to meet the cost.

3.2.8 Outstanding issues in On-site Sanitation Works

- (a) Adequate gulley browsers available at MC, however, mechanical conditions of at least one browser shall be acceptable level.
- (b) Rainy season, part of the Town area is getting flooded, spillage of effluent and difficulty in usage.
- (c) Overflowing of septic tanks especially during the rainy seasons.
- (d) Septage disposal at Thiruperunthurai Solid Waste Dumping site to be coupled with the future sewerage project.
- (e) Review the Thiruperunthurai septage treatment facility and effective utilization of resources.
- (f) 1,000 new latrines to be replaced the cesspits.

3.3 Water Works

3.3.1 Progress

The existing water supply scheme for Batticaloa is maintained and operated by NWSDB. The manager (Batticaloa) office is located at Kallady. The manager is responsible for the operation and maintenance works of the Batticaloa water supply scheme.

Approximately 1,860 connections are maintained by NWSDB. In 2013, it is expected to cover 90% of the population in Batticaloa MC.

3.3.2 Water Source

At the moment new water source is being used. The main supply is from Unichchi Reservoir and the distance is 25 km from Batticaloa town. The treatment plant is 7 km from the town at Vavunathive.

The ground water from Batticaloa coastal aquifer was being tapped previously.

3.3.3 Service Charge

As per the tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009. The scheme specific tariff is adopted by MC and charges are slightly higher than the national tariff.

3.3.4 Purification Plant

The purification plant is located at Vaunathive. It is a modern DAF System, (Flocculation, Coagulation, Sedimentation, filtration & Disinfection).

The capacity of the Treatment Plant is 36,400 m³/day (Raw water 42,000 m³/day).

The previous ground water source has the capacity of 1,750 m³/day and only screening & chlorination were employed.

3.3.5 Development Policy

The National Physical Planning Policy and Key projects, prepared under the section of 5 (a) and (b) of the Town and Country Planning (Amendment) Act., No. 49 of 2000, and approved by the National Physical Planning Council as per Section 4B of the Act on 11.01.2011, for the information of the general public were published on Part I: Section (I) - General No. Gazette No 1729/15 on Thursday, October 27, 2011. (Batticaloa MC).

3.3.6 Development Project

By 2013, more than 3,532 connections will be provided from the three distribution systems namely, Batticaloa, Irruthayapuram and Kallady water supply schemes. Finally the system was designed to cover 90% of the household in the city.

3.3.7 Outstanding issues

- (a) No fresh water source in the City area.
- (b) Approximately 13,000 individual dug wells are in use. Therefore, obtaining NWSDB connection is not a priority.

3.4 Solid Waste Service

3.4.1 Collection System

Discharging and collecting waste at the Batticaloa MC seems to function satisfactorily. The scattered waste and waste piles are observed along the road and in the drainage, even though Batticaloa MC is providing frequently collection service.

The MC has engaged comparative old equipment including, one compactor, 9 four-wheel tractor, four tippers.

Market waste is separated at source. Attempts are also made for separation, collection with small carts, tractors and trucks, transported to disposal sites (Vehicles) from the vehicle fleet mentioned above.

The UNICEF - BMC Programme of collection of solid waste in narrow lanes are good example. (Motor Cycle mounted trailers).

3.4.2 Disposal Site

Batticaloa MC was supported by NECCDEP for SWM which included the construction of dumpsite, compost plant and equipment and machinery required for recycling.

The disposal site at Thiruperunthurai follows sanitary landfill techniques to lesser extent and still it has negative environmental impacts.

The collected waste is dumped on the Gentle slopes towards lagoon side. The dumped waste is not covered by soil and it is burned. There is negative environmental and social impact, such as, offensive odor, flies, birds, fire and smoke and so on.

3.4.3 Service Charge

A nominal charge from the citizens for solid waste management services of several PSs, UCs & MCs in eastern province were principally proposed by the respective local governments and approved by the provincial council. The Gazette notification is pending after the Election.

Presently there is no separate charge imposed and it is included in the property tax.

3.4.4 Development Policy

Under JICA assistance development policy was developed on solid waste management. The details are available in following documents.

- 1) National Policy on Solid Waste Management, Ministry of Environment, Sri Lanka, 2007. (Ministry of Environment, (<http://www.environmentmin.gov.lk>)
- 2) National Strategies on Solid Waste Management, National Solid Waste Management Support Centre February 2008, (<http://www.pclg.gov.lk/en/download/Reports/Report2007.pdf>)
- 3) Sri Lanka Standard 1246: 2003 (UDC 628.477.4) Specification for Compost from Municipal Solid Waste Management and Agricultural Waste, Sri Lanka Standard Institution

- 4) Sri Lanka the Emerging Wonder of Asia, Mahinda Chintana Vision for the Future, The Development Policy Framework, Government of Sri Lanka, Department of National Planning, Ministry of Finance and Planning, 2010
- 5) Technical Guideline on Solid Waste Management in Sri Lanka, Central Environmental Authority, Sri Lanka, June 2005

3.4.5 Development Project

The “Pilisarū” programme and many others promote composting as a means of reducing the burden on landfills.

3.4.6 Outstanding Issues

- (a) Although transport facilities for solid waste are adequate and conditions of the vehicles also not satisfactory.
- (b) No water supply facilities at Thiruperunthurai dumping site.
- (c) Negative environmental impact, such as, offensive odor, flies, birds, fire and smoke at the dumping site.
- (d) Septage treatment plant and resources to be utilized effectively.

3.5 Hazardous Wastewater Control

The Technical Guidelines on Solid Waste Management in Sri Lanka was prepared on Hazardous Waste by Hazardous Waste Management Unit, Pollution Control Division, and CEA in November 2008.

3.5.1 Industrial Wastewater Control

The Environmental Protection Licenses (EPL) is issued by the Provincial Office of the Central Environmental Authority located at Kantale.

The discharges from fish processing (fisheries), vehicle service stations (transportation) and hotels and restaurants (tourism) are covered under EPL.

3.5.2 Hospital Wastewater Control

The hospital has a waste water treatment plant. This facility is capable to treat the waste water and sewerage of hospital, prison, and nursing training school, for present and future development. The process comprise of screening, aerator, clarifier, anaerobic digester. The settled and clarified wastewater is chlorinated and sent to grass wetland and then released to the lagoon by gravity.

The hazardous solid waste is separated. The incinerator is working.

4. Outstanding Issues in Sewerage Sector and Measures to Overcome those Issues

4.1 Sewerage Works

There is no existing Sewerage Scheme. There is a necessity for Sewerage Scheme combining grey water.

4.2 On-site Sanitation

4.2.1 Organization

MC is carrying out the de-sludging of septic tanks when requested by the rate payers.

4.2.2 Development

The development of cesspits to acceptable septic tanks is required for housing schemes and low income housing settlements. Those who do not have any type of latrine need urgent attention. Around 1,000 new latrines are required.

4.2.3 Operation and Maintains

MC is doing the de-sludging of septic tanks and requires one new Gulley Suckers. Sludge is dumped into the facultative pond at Thiruperunthurai.

4.3 Hazardous Wastewater

4.3.1 Organization

The Individual Industries and the General Hospitals is responsible in disposal under EPL. Presently primary treatments are being carried out according to the EPL.

4.3.2 Development

CEA will have to check the quality of effluent and advise them to have a separate treatment plant in their premises.

4.3.3 Operation and Maintains –

The individual Institution has to carry out the operation and maintains works.

4.3.4 Control System

CEA will have to carry out the control system and monitor the EPL conditions.

Table 11.1 Population of Batticaloa MC

Name of Ward	Area (ha)	2001	2003	2007	2008	2011
Total MC	6,426	78,509	78,963	88,459	89,758	95,138

The total municipal council area is 7,509 ha. The water front is covered by 1,083 ha resulting effective area is around 6,426 ha.

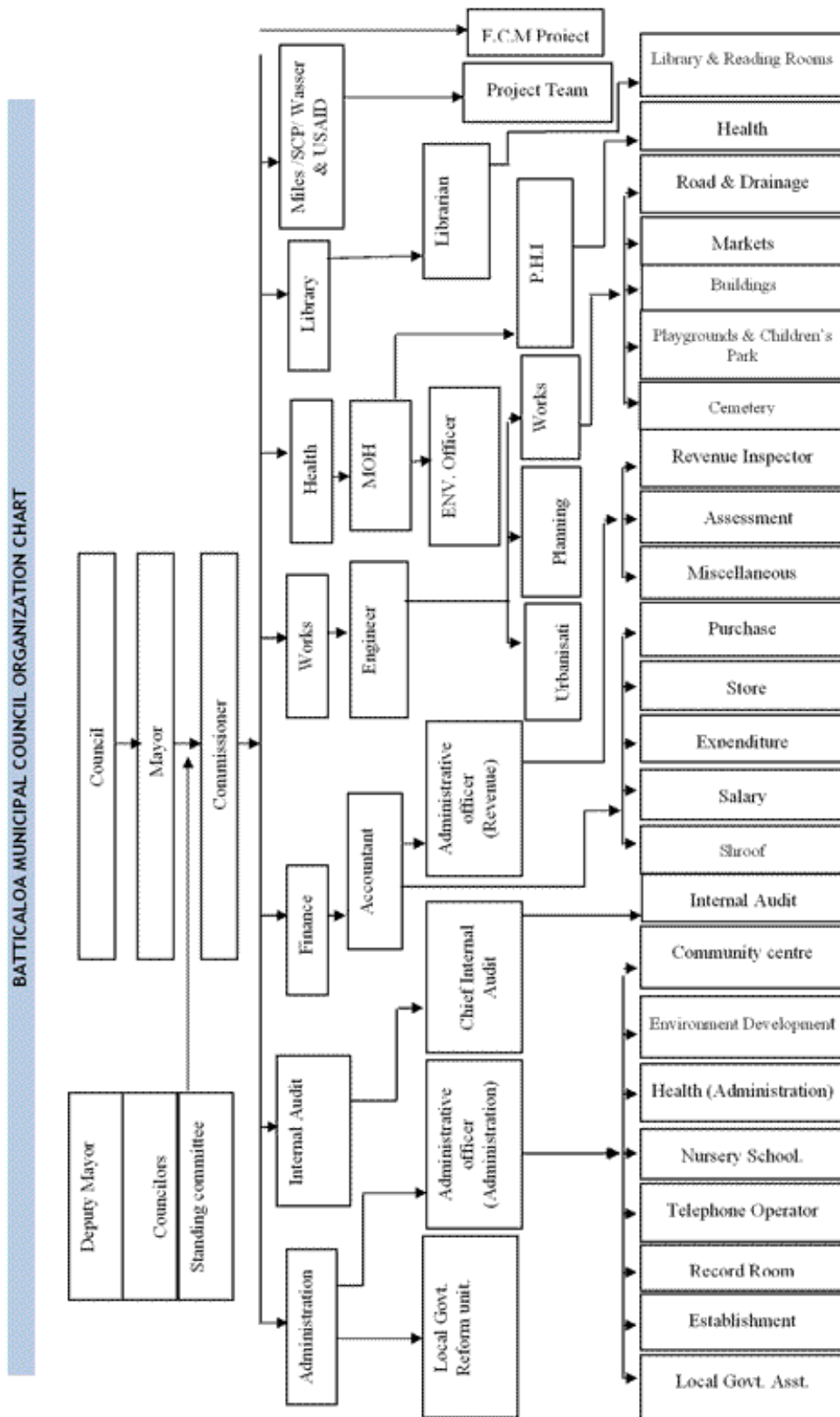


Figure 11.5 Organization Chart of Batticaloa MC

Annex 12 KALMUNAI MC

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Kalmunai MC is situated in the South Eastern Coastal belt. The latitude of Kalmunai, is 7° 24' 59.77"N while the longitude is 81° 49' 28.04"E. Kalmunai Municipal limits consist of three Divisional Secretariat Divisions namely Kalmunai Muslim Divisional Secretariat, Kalmunai Tamil Divisional Secretariat and Sainthamaruthu Divisional Secretariat covering the major towns such as Sainthamarathu, Kalmunai, Natpittimunai, Maruthamunai, Pandiruppu and Periyaneelavanai.



Figure 12.1

The Kalmunai MC area is bordered by sea beach of Bay of Bengal on the East, low land paddy field and swamp on the West, Periyaneelavanai on the North and Karaitivu on the South. It is a flat land having elevation ranging between 2.0 m to 4.0 m MSL.

The highest ground elevation in the municipality is at the national road A4 located in the west end of the municipality. (+ 4.0m MSL).

Storm water flows eastern direction towards beach of Indian Ocean and part towards the swamps on the west. Due to the sand dunes along the beach, a ridge was formed and diverting gravity flow is possible only through pipes or time to time making opening with machinery. Monsoon flooding in critical areas up to 1.0 m was avoided to certain extent by implementing a drainage project supported by North East Service Improvement Project (NELSIP) and United Nations Office for Project Services (UNOPS).

1.1.2 Receiving Water

There is no specific river crossing the Kalmunai city. However final irrigation drainage canals of Gal Oya (Basin No: 45) terminates at polluted fresh water swamp and unhealthy estuary located in the western boundary of the Kalmunai (“Gal” Amuna” or “Kalmunai” means Stone Anicuts) City.

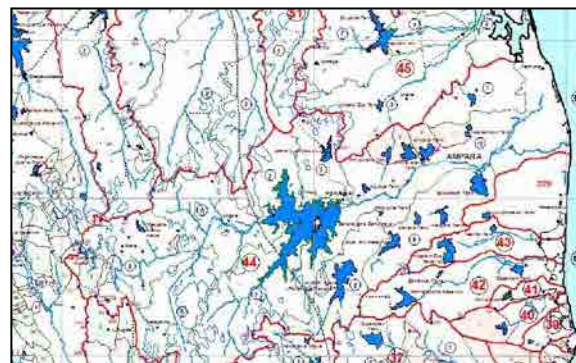


Figure 12.2

Weeragoda tank and Chadayamthalawa (“Dadayamthalawa”) irrigation tanks are the nearby

fresh water sources.

The source for the Kalmunai water supply is from Weeragoda tank treatment plant is located at Bangalawadiya in Sammanthurai. The source of the water supply scheme for Maruthamunai and Pandiruppu area under ECTAD Phase II project is drawn from Kondawattuwana tank in Ampara and treaded at Bangalawadiya.

1.1.3 Meteorology

Kalmunai MC located within the dry zone of Sri Lanka, which has a hot and humid tropical climate. The mean annual temperature is 28.7°C, although typically this ranges from 21°C on cooler nights during the rainy season, to 35°C during the day in the dry months. The mean annual temperature during the period 2002 – 2011 measured at Potuvil was 28.5° C.

Kalmunai receives rainfall of between 494 to 1,692 mm per annum, from both monsoons. However, it is dry during Southwest Monsoon period having an average rainfall less than 250 mm. the Northeast Monsoon brings more rainfall about 500-1,000 mm primarily, during October to February.

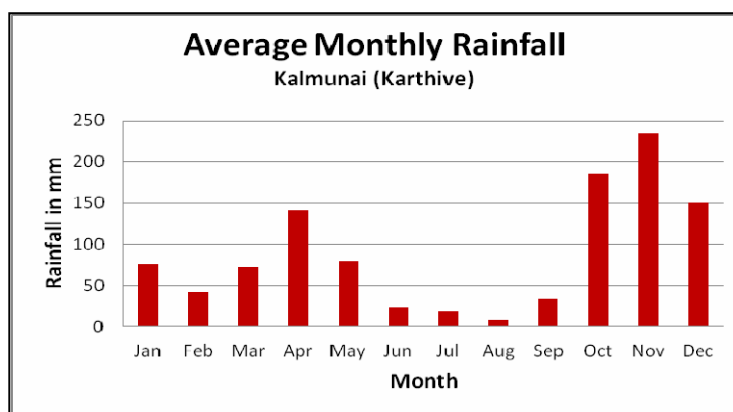


Figure 12.3

Average annual rainfall during the period 2002 – 2011 at Potuvil was 1,410 mm most of which fell in the north east monsoon. This suggests an increase in annual rainfall from earlier years, since the 1940 to 1993 average was 1,041 mm.

1.1.4 Groundwater

Until 2006, entire citizens depend on dug wells for their daily use such as drinking cooking and other purposes. Because of high population density, the wells used for their drinking purpose are also densely situated together with septic tanks and cesspits. The groundwater contamination is aggravated during the monsoon flooding overflowing of septic tanks and cesspits and no attenuation at unsaturated zone due to high ground water level.

1.2 Sociology

1.2.1 Population

The total extent of council area is 14,457 ha. However, inhabitable area excluding the paddy fields and reservations is limited to 2,280 ha. The council area is distributed among 3

Divisional Secretariat (19 wards or 76 GN Divisions) and population in each Divisional Secretariat of the Townships are given in **Table 12.1**. The total population of the Kalmunai MC area in year 2010 is 114,032.

As per the exponential growth model, population growth rate was calculated as 2.1% for the Kalmunai MC area, which is double the average value in Sri Lanka (0.8% - 1.1%).

1.2.2 Quality of Life

The average level of monthly household income in the town area is LKR 34,329. The Gini Coefficient of the household income is 0.46. The data are obtained from household Income and Expenditure Survey - 2009/10 -Preliminary Report.

1.2.3 Industries

Large industries are not found in the city. However, Kalmunai is considered as commercial centre in Ampara District. Large scale trading and money transaction are taken place in wholesale and retail trading. Therefore service sector (Banking, Transportation, Insurance & warehouse) is more active in Kalmunai City.

Fishery and paddy cultivation are identified as a key sector in Kalmunai area. The excess rice and fish production is transported to Colombo market on daily basis. Fisheries harbours and anchorages are being constructed at Periyaneelavanai, Kalmunai, Sainthamaruthu and Malikaikadu. There are about 15 medium scale rice mills are located in the city area.

1.2.4 Public Facilities

The city has three main divisions namely Sainthumarathu, Kalmunai & Maruthamunai.

(1) Educational facilities

There are 32 public schools provide education for approximately 25,000 student population. The number of teachers is around 970.

Fathima College, Zahira College, Mahmood Ladies College, Al/Mannar CC & Shams CC at Maruthamunaiat, High Uwesly School, Al Bahiriya, Al-Hilal, Malharusshams, Al Jalal are popular schools among students and parents.

Few international schools are also functioning in the city area for the education of the students living in Kalmunai City and suburb.

(2) Medical facilities

Kalmunai Base Hospital is the leading hospital in the Municipality area having 413 beds, 9 wards and facilities for 200 outpatient treatment and clinics. There are 60 doctors and 400 staff employed by Health authorities.

The recently developed Ashraff Memorial Hospital by the central government in 2010 has 310 beds. The hospital is sometimes called Kalmunai South Base Hospital or Kalmunai South Hospital.

(3) Postal facilities

There are two main Post Offices at Kalmunai and Sainthumarathu and few sub post offices in Kalmunai MC. These provide an adequate service to the resident population.

(4) Recreational facilities

There are many play grounds maintained by the Council. For conducting sport-meets, ceremonies, carnivals, exhibition etc. municipal council rents out its playgrounds, parks and halls. For visitors, tourist and local public there are no recreational facilities and not sufficient area for parking vehicles

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

Street drains or drainage channels are installed in very limited areas and there is no drainage facility in the rest of the area for grey water disposal. The Road Development Authority constructed the street drains along the A4 road and also some box culverts crossing the A4 road to discharge storm water to the swamps in the west end of the municipality. A drainage maintenance plan has been prepared by the MC.

The whole town depends on septic tanks and cesspits for disposal of night soil and waste water allowing to soakage through sandy soil.

Table 12.2 Type of Sanitation

Septic Tanks	Cesspits	Pit Latrine	Dry (Eco) Sanitation
10%	85%	5%	0%

Sainthumarathu wastewater drains to estuary is having high pollutants.

1.3.2 Industrial Wastewater

No major industries are found in Kalmunai MC area except discharges from fish processing

(fisheries), vehicle service stations (transportation) and hotels and restaurants.

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to Sewerage Works

Since there is no central municipal sewage treatment or any proper disposal system (sea outfall) in Kalmunai town, septic tanks and soil absorption systems need to be developed. The Specifications for these systems are given in the Code of Practice for the Design and Construction of Septic Tanks (Sri Lanka Standard 745 1986).

There are no large hotels of more than 100 rooms that are required to install waste water treatment facilities. There is no space for tourism development within the city area.

2.1.2 Regulation and Rules regarding to On-site Sanitation

The CEA administers the National Environmental Act and its regulations. Regulations made by the Minister of Environment under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

The Environmental Protection License (EPL) is a regulatory / legal tool under the provisions of the National Environmental Act. The Provincial Office of the Central Environmental Authority located at Kantale issues Environmental Protection Licenses for industries listed in the category “B” in the gazette notification no 1533/16 dated 25.01.2008 in order to prevent and control pollution issues. In the case of industries falling into the category “A”, the Provincial Office processes the applications and forwards the files to CEA Head Office for issue of license issued with a view to achieving the following objectives.

- To prevent or minimize the release of discharges and emissions into the environment from prescribed (industrial) activities in compliance with national discharge and emission standards.
- To develop an approach to pollution control that considers discharges from prescribed (industrial) processes to all media (air, water, land) in the context of the effect on the environment.
- To contain the burden on industry, in particular by providing guidance on pollution control for polluting processes.
- To ensure that the system responds flexibly both to changing pollution abatement.

2.1.3 Regulation and Rules regarding to Water Works

The National Water Supply and Drainage Board Law, No. 2 of 1974 of the National State Assembly is the appropriate regulation and rules for water works.

2.1.4 Regulation and Rules regarding to Solid Waste Service

Regulations made by the Chief Minister, Provincial Council, Eastern Province and issued by the Gazette (Local Government) Part IV-B, No.1769 of the Democratic Socialist Republic of Sri Lanka on 27th July 2012. Under this notification several Pradeshiya Sabha's in Eastern Province were covered.

Some PSs have already imposed a service charge on the people to cover the cost of collection of garbage from households. The service charge in respect of a Samurdhi family is LKR. 20 for a month. It is LKR. 50.00 per month for a non-Samurdhi Family. If paid upfront for one year both Samurdhi as well as non-Samurdhi families are given a discount of 10%. Some other PSs have not imposed such a service charge as the people have not expressed their consent.

A nominal charge from the citizens for solid waste management services of several MCs, UCs and PSs in eastern province was approved by the Provincial Council. Gazette notification will follow after the eastern province election in September 2012.

2.2 Organization of the Town

2.2.1 Organization of the Town

The Cadre details of the Kalmunai MC are provided in the **Figure 12.4**. Almost all the positions are filled. The key officials are the Commissioner, Municipal Engineer and Municipal Accountant.

2.2.2 Organization of Sewerage Works

No existing Sewerage Scheme is operating for Kalmunai town under the MC.

There are several sewerage schemes in operation for housing schemes constructed for people affected by Tsunamis in 2004. The housing society is responsible to share the operation and maintenance cost. Most of the societies continue their activities to the satisfactory level. However, Islamabath Housing Society and the maintenance of sewerage work are not functioning. Untreated wastewater flows towards the nearby temple.

The following Tsunami housing schemes are having sewerage systems, such as facultative ponds, wetlands, common septic tanks and improvised septic tanks suitable for high groundwater table. Islamabath Tsunami housing scheme has complicated package treatment plant with dual step pumping arrangement and it is now obsolete and became "white elephant".

- | | |
|---------------------|---|
| 1) Periyaneelawanai | Anaerobic Digester, Facultative Ponds and Wetland |
| 2) Pandirippu | |
| 3) Islamabath | Package treatment plant with settling tank, Filtration, Chlorination, Anaerobic Digester, |

- | | |
|----------------------------------|---|
| 4) Karavahu (Bolivarian Village) | Improvised individual septic tank & soakage pit |
| 5) Iralalikandan | Group septic tanks |
| 6) French City - Maruthamunai | Improvised individual septic tank & soakage pit |
| 7) Kurundiaddi | |
| 8) Sainthamaruthu, | |
| 9) Kalmunai Kudy | |

2.2.3 Organization of On- site Sanitation Works

On-site sanitation works is being carried out by MC and the details of staff involved with site sanitation is shown in the Cadre details in **Figure 12.4**. Public Health Inspector is the officer in charge of the work.

MC and Abia Group of Company (Pvt) Limited had an agreement for septage collection and disposal. The present council and the company has dispute over the agreement for charging from the citizen. Therefore MC has decided to construct a facility at Valathapitiya.

In absence of septage treatment facility in nearby townships and to treat the slaughter house waste, Mr. M.S. Ashraff, Managing Director of the private company made a larger capacity treatment facility. The slaughter house constructed by Abia Group of Company (Pvt) Limited (Tele: 0094672225344 or 0094773413965), is a model design to be adopted in other areas.

2.2.4 Organization of Water Works

Operation and Maintains of Kalmunai water supply scheme is carried out by NWSDB Regional Support Centre (RSC) – Eastern Province. Manager (Akkarapaththu) is the officer in charge. Three schemes namely Kalmunai WASS, Sainthumarathu WSS, and Marathamunai WSS under respective Officer in Charges of NWSDB are covering the city area.

2.2.5 Organization of Solid Waste Service

Solid Waste Service is being carried out by MC and the details of staff involved with Solid Waste Service is shown in the Cadre details in **Figure 12.4** headed by Public Health Inspector.

2.2.6 Organization for Hazardous Wastewater

The Control is being carried out by CEA. Mostly hospital waste comprises the hazardous waste. The hospital director is responsible on disposal with incinerator. The radioactivity wastes are collected by the respective suppliers.

2.3 Budget

2.3.1 Total Budget of the City

The scale of income and expenditure of the Kalmunai MC is given in the **Table 12.3**.

Table 12.3 Finance Details

Item	Kalmunai MC - Scale of Finance				Population in 2011 - 114,032		
	2006 LKR: m	2007 LKR: m	2008 LKR: m	2009 LKR: m	2010 LKR: m	2011 LKR: m	Average LKR: m
Total Revenue	-	73.28	61.61	64.77	86.60	111.60	79.57
Total Expenditure	-	69.42	61.03	70.14	77.40	100.71	75.74
Total Surplus / (Deficits)	-	3.86	0.58	(5.37)	9.20	10.89	3.83

2.3.2 Budget for on-site sanitation Works

The budget for on-site sanitation is included under health services. It is noted that this includes administration, preventive services, food sanitation, cleaning environmental health, maternity and child welfare, health studies, solid waste management and maintenance of graveyards.

2.3.3 Budget for Water Works (NWSDB)

Budget and expenditure for water works of the Kalmunai MC area are maintained by respective OICs under Manager (Akkarapattu) .

2.3.4 Budget for Hazardous Wastewater Control

It may be included in CEA Budget under their regional office in Kanthale. The hospital hazardous waste and their disposal are under the responsibility of the suppliers and may be included under Hospital Budget.

3. Public Works

3.1 Sewerage Works

There is no existing sewerage scheme operating for the City except several Tsunami Housing Schemes and Ashraff memorial Hospital at Kalmunai South.

3.1.1 Potential Demand of Sewerage Service

More than 85 % of the households in the Kalmunai township area use cesspits for disposal of sewage, while only about 10% of the households use septic tank and soakage pits. The remaining has pit latrine or dispose excrement in the beach.

The whole town depends on septic tanks, cesspits and pit latrines for disposal of night soil. The water supply coverage increased rapidly and thus increases in effluent discharge as waste water.

Accordingly, there is a necessity for the sewerage scheme for the Kalmunai Town as a high priority.

3.1.2 Development System

It was revealed that combine sewer and grey-water collection system with sea outfall is required as a first step providing future development of treatment facilities closer to final pumping stations at Sainthumarathu and Kalmunai Area.

In Marathamunai area there are ample spaces for low cost systems such as stabilization ponds, wetlands or decentralized waste water treatment systems with bio gas generation.

3.1.3 Outstanding issues in Sewerage Works

The design of the new sewerage system should accommodate the minimum operation and maintenance cost and connection charges.

3.2 On-site Sanitation Works

3.2.1 Progress

The cesspits are being improved to septic tanks.

3.2.2 Service Condition

MC is de-slugging the septic tanks on request. The collected gully is currently disposed at Malwaththa, which is state land. But it is expected to shift to the treatment facility constructed by UNOPS at Valathapitiya.

Kalmunai MC has two gully bowsers. The vehicle fleet is to be strengthened with one new vehicle.

3.2.3 Treatment Process

The septic system has two primary components: the septic tank which breaks down the sewage through anaerobic action and the soakage tanks or pit which operates aerobically. The septic tank slows down the flow of raw sewage and stimulates the removal of solids by settlement. Septic tanks reduce BOD by 30-50 percent and fecal bacteria content is only slightly reduced. Therefore, the effluent is discharged into unsaturated soil to remove more of the solid matter and toxins.

The septage disposal is carried out in an anaerobic chamber followed by wastewater treatment.

3.3.4 Development Policy

The national policy on sewerage sector including onsite sanitation is also at the draft stage. MC is strictly adhering to “Planning Committee Approval”.

3.2.5 Development Project

At present Council is implementing a project (WASSER), to construct septage treatment facility at Valathapitiya area for the night soil collected by the gully suckers. This is going to be the first in the Ampara District which will be managed by a Local Authority. Water and Sanitation of settlement in Eastern Srilanka (WASSER) is an EU funded project.

3.2.6 Potential Demand of On-Site Sanitation System

There is a demand from citizens to improve their cesspits to Septic tanks. Then they can use the groundwater for other purposes.

3.2.7 Development System

The groundwater polluted by the cesspits is prevented with improved septic tank system. About 150 cesspits were replaced with septic tanks

3.2.8 Development Budget

The development budget was obtained from European Union. The project was implemented from 2006 and completed in 2009.

3.2.9 Source of Budget for Operation and Maintains

The payment is made by the people to MC for the de-sludging of septic tanks by the gully sucker sent by MC. The collection is sufficient to meet the cost.

3.2.10 Outstanding Issues in on-site Sanitation Works

- (a) Resolving Public Private Partnership programme for septage removal and treatment. Better service from council and private party.
- (b) Overflowing of septic tanks especially during the rainy seasons.
- (c) Septage disposal facility at Valathapitiya to be started.
- (d) Converting Cesspits to septic tanks leads cost for the individuals. Therefore implementing sewerage system with sea-outfall is very urgent.
- (e) Implementing bio gas generation from decentralized waste water treatment.

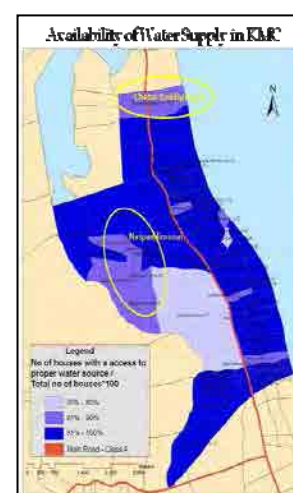


Figure 12.5
Water Supply Coverage

3.3 Water Works

3.3.1 Progress

The existing water supply schemes for Kalmunai city are maintained and operated by NWSDB. The manager (Akkarapattui) office is located at Akkarapattu. Respective OICs under Manager are responsible for the operation and maintains works of the three schemes. Approximately 11,440 connections are maintained by NWSDB. In 2013, it is expected to cover 90% of the population in Kalmunai MC area.

3.3.2 Water Source

NWSDB is carried out the operation of waterworks supplied from (Weeragoda Tank - Bangalawadiya) and Kondawattuwana Tank - Ampara. The treatment plant at Bangalawadiya has capacity of 4,500 m³/day and treatment plant at Ampara has capacity of 54,500 m³/day.

The ground water from Kalmunai coastal aquifer was being tapped previously.

3.3.3 Service Charge

As per the tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009. The scheme specific tariff is adopted by MC and charges are slightly higher than the national tariff.

3.3.4 Purification Plant

The main purification plant is located at Ampara. It is a modern DAF System, (Flocculation, Coagulation, Sedimentation, filtration & Disinfection). The capacity of the treatment plant is 54,500 m³/day (12 mgd/day).

The second treatment plant located at Bangalawadiya is basically a rapid sand filter. The capacity of the Treatment Plant is 4,500 m³/day (1 mgd/day).

Previous ground water source is used and still there are 12,423 private dug wells found within the Municipal limits.

3.3.5 Development Policy

Kalmunai MC was declared under the Urban Development authority Law No 41 of 1978 as Urban Development Area on 26th may 1999 under Gazette No 1081/17

The National Physical Planning Policy and Key projects, prepared under the section of 5 (a) and (b) of the Town and Country Planning (Amendment) Act., No. 49 of 2000, and approved by the National Physical Planning Council as per Section 4B of the Act on 11.01.2011, for the

information of the general public were published on Part I: Section (I) - General No. Gazette No 1729/15 on Thursday, October 27, 2011.

3.3.6 Development Project

Under the JICA funding, the transmission main from Kondawatuwana to Kalmunai are being carried out. The diameter of the pipe from Kondawatwana to Bangalawadiya is 700 mm and from Bangalawadiya to Kalmunai a new line will be constructed with 450 mm.

Rehabilitation and extension works of the distribution network were completed with the assistance of DANIDA, extensively targeting the rehabilitation of the connection to 2,100 households.

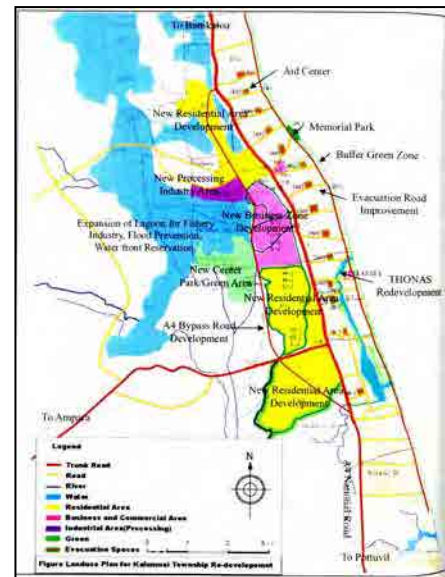


Figure 12.6 City Development Plan

3.3.7 Outstanding issues

- No fresh water source in the City area and water is to be transmitted from Ampara and Weeragoda Tank.
- Pressure on expansion and development of distribution system after Tsunami in 2004 due to the contamination on dug wells.

3.4 Solid Waste Service

3.4.1 Collection System

Collecting waste in Kalmunai Town and residential areas are not functioning well and causes negative environmental and social impact to the citizens. Particularly there is much waste scattered, heaped waste and drains blocked on the main road. The troubles of discharging and collection of wasted is caused by the collection tractors malfunctioning.

The MC has engaged comparative old equipments including, one compactor, 8 four wheel tractor, 2 hand tractors.

3.4.2 Disposal Site

The new transfer station funded by UNOPS was established in Karative PS. The received waste is transferred to Engineering landfill site funded by UNOPS at Addalachechna PS.

Kalmunai MC was supported by EU in SWM which included the construction of compost plant and equipment and machinery required for recycling. The compost plant at Neelaperiyavanai is model project in Sri Lanka. The market waste is converted to compost. The daily production is approximately 1,000 kg on a working day (40 x25 kg bags).

3.4.3 Service Charge

A nominal charge from the citizens for solid waste management services of several, PSs, UCs and MCs in eastern province were principally proposed by the respective local governments and approved by the provincial council. The Gazette notification is pending after the Election.

Presently there is no separate charge imposed and it is included in the property tax.

3.4.4 Development Policy

Under JICA assistance development policy was developed on solid waste management. The details are available in following documents.

- 1) National Policy on Solid Waste Management, Ministry of Environment, Sri Lanka, 2007.
(Ministry of Environment, (<http://www.environmentmin.gov.lk>)
- 2) National Strategies on Solid Waste Management, National Solid Waste Management Support Centre February 2008, (<http://www.pclg.gov.lk/en/download/Reports/Report2007.pdf>)
- 3) Sri Lanka Standard 1246: 2003 (UDC 628.477.4) Specification for Compost from Municipal Solid Waste Management and Agricultural Waste, Sri Lanka Standard Institution
- 4) Sri Lanka the Emerging Wonder of Asia, Mahinda Chintana Vision for the Future, The Development Policy Framework, Government of Sri Lanka, Department of National Planning, Ministry of Finance and Planning, 2010
- 5) Technical Guideline on Solid Waste Management in Sri Lanka, Central Environmental Authority, Sri Lanka, June 2005

3.4.5 Development Project

In Ampara district, the United Nations Office for Operational Services (UNOPS) has commenced a project on Integrated Solid Waste Management in the Kalmunai MC area, Ampara UC area and in twelve (12) PS areas with the participation of elected representatives and staff of those LAs since January 2010. The project has been able to complete the activities so far.

The LAs are operating in two clusters as well as independently. Kalmunai MC, Ninthavur PS, Karathivu PS, Sammanthurai PS and Addalachchanai PS form one cluster. They share one landfill located in Addalachchainai PS area. The PSs which send their garbage to the common landfill have to pay LKR 600.00 per every ton of garbage.

3.4.6 Outstanding Issues

- (a) Although transport facilities for solid waste are adequate and conditions of the vehicles also not satisfactory.

(b) Transport cost to Adalchena landfill site is a burden to MC

(c) The cost recovery to be charged from the citizens

3.5 Hazardous Wastewater Control

The Technical Guidelines on Solid Waste Management in Sri Lanka was prepared on Hazardous Waste by Hazardous Waste Management Unit, Pollution Control Division, and CEA in November 2008.

3.5.1 Industrial Wastewater Control

The Environmental Protection Licenses (EPL) is issued by the Provincial Office of the Central Environmental Authority located at Kantale.

The discharges from fish processing (fisheries), vehicle service stations (transportation) and hotels and restaurants are covered under EPL.

It is the responsibility of LAs to regulate and control activities which are detrimental to the environment and public health in accordance with powers and authority vested in LAs under Local Government Laws and by-laws. Therefore Kalmuanai MC controls the activities related to small scale industries which tend to pollute the environment (eg. rice mills, timber mills, metal quarries, grinding mills, lathe workshops and garages)

3.5.2 Hospital Wastewater Control

Kalmuanai Base Hospital is not having a waste water treatment plant. The only facility is the cluster of septic tanks and soakage pits all over free spaces. This facility is not capable to treat the waste water and sewerage of hospital during the rainy season.

Ashraff Memorial Hospital has a new sewerage system for present and future developments. The process comprise of screening, aerator, clarifier, anaerobic digester. The settled and clarified waste water is chlorinated and sent to the swamp.

The hazardous solid waste is separated at both hospitals. The incinerators are working at Kalmuanai north and south base Hospitals.

4. Outstanding issues in Sewerage Sector and Measures to Overcome those issues

4.1 Sewerage Works

There is no existing Sewerage Scheme. There is a necessity for Sewerage Scheme combining grey water.

4.2 On-site Sanitation

4.2.1 Organization

MC is carrying out the de-sludging of septic tanks when requested by the rate payers. A private company namely Abia Group of Company (Pvt) Limited is also handling septage collection and they are paying a nominal tax to the MC.

4.2.2 Development

The development of cesspits to acceptable septic tanks is required for housing schemes and low income housing settlements. Those who do not have any type of latrine need urgent attention.

4.2.3 Operation and Maintains

MC is doing the de-sludging of septic tanks and requires one new Gulley Suckers. Sludge is dumped into the septage disposal facility at Valathapitiya.

4.3 Hazardous Wastewater

4.3.1 Organization

The Individual Industries and the General Hospitals is responsible in disposal under EPL. Presently primary treatments are being carried out according to the EPL.

4.3.2 Development

CEA will have to check the quality of effluent and advise them to have a separate treatment plant in their premises.

4.3.3 Operation and Maintains –

The individual Institution has to carry out the operation and maintains works.

4.3.4 Control System

CEA will have to carry out the control system and monitor the EPL conditions.

Table 12.1 Population of Kalumunai MC by Divisional Secretariat

Name of Ward	Area (ha)	2001	2003	2005	2010
Kalmunai Muslim D.S.		41,705	52,000	46,000	52,032
Kalmunai Tamil D.S.		28,724	33,000	30,000	33,000
Sainthumarathu D.S.		24,018	29,000	26,000	29,000
Total	2,280	94,447	98,024	102,000	114,032

14,457 (including Paddy Fields & Reservations)

Figure 12.4 Cadre Details -Kalmunai MC

Municipal Council - Kalmunai										
Cader Details Month of September - 2011										
S.No	Designation	Service/Grade	Department of Management service Approved Cadre							
			Agreed/Approve d Cadre	Permanent	Vacant	Casual	Contract	Acting/Substitute	Actual Possition	Excess
All Island service										
1	Commissioner	S.L.A.S.I	1	-	1	-	-	-	1	-
2	Chief Municipal Veterinary Surgion	SLAPHS-II	1	1	-	-	-	-	1	-
3	Administration Officer	S.L.A.S.III	1	1	-	-	-	-	1	-
4	Accountant	S.L.Acct.II/II	1	1	-	-	-	-	1	-
5	Ayurvedic Medical officer.	AMO II	1	-	1	-	-	-	-	-
6	Engineer	Civil SLES ii/II	1	1	-	-	-	-	1	-
7	Medical Officer of Health	MBBS	1	-	1	-	-	-	1	1
Schedule										
8	Management Asst.	M.A.S.Supra	1	1	-	-	-	-	1	-
9	Management Asst.	M.A.S.I	4	4	-	-	-	-	-	-
10	Management Asst.	M.A.II & III	27	24	3	-	-	-	24	-
11	Programme Asst.	PA	4	8	-	-	-	-	8	4
12	Local Govt.Asst.	LGA	-	1	-	-	-	-	-	1
13	Technical Officer	SLTS,Spl.Grade								
14	Technical Officer	SLT 1	1	1	-	-	-	-	-	-
15	Draughtsman	SLTS	1	1	-	-	-	-	1	-
16	T.O (Civil)	SLTS.II'A'								
17	T.O.(Civil)	SLTS.IIB	6	5	1	-	-	-	5	-
18	Librarian	S.L.L.S.II	-	-	-	-	-	-	-	-
19	Librarian	S.L.L.S.III	4	6	1	-	-	-	7	3
20	Revenue Inspector	R.II	2	-	2	-	-	-	-	-
21	Revenue Supervisor	RS	7	4	3	-	-	-	5	-
22	Public Health Inspector	PHI 11,1,(3, 1)	4	-	4	-	-	-	-	-
23	Traslater service	Tra.se	1	-	1	-	-	-	-	-
24	Traslater	G.Tr.S 11								
25	Food & Drugs Inspector	F&D Lector								
26	Nursery School Teacher	other Service	1	2	-	-	-	-	2	1
27	Mid wife	labour grade	2	-	2	-	-	-	1	1
28	Community Development Officer	CDO	-	1	-	-	-	-	1	1
Unschedule										
29	Station Officer	Labourer I&11								
30	Sub Officers	Fier bridade-III	-	-	-	-	-	-	-	-
31	Motorman	labourer	-	-	-	-	-	-	-	-
32	Firemen	labourer	-	-	-	-	-	-	-	-
33	Driver	driver service	6	6	-	-	-	-	9	15
34	Sanitary Kangany	Supervisor.S	3	3	-	-	-	-	3	-
35	K.K.S.	O.E.S.	5	3	2	-	-	-	2	5
36	Library sevaka	Library S	-	-	-	-	-	-	-	-
37	Messenger	O.E.S.	4	3	1	-	-	-	4	-
38	Welder	O.E.S.	-	-	-	-	-	-	-	-
39	Watcher	O.E.S.	14	13	1	-	-	-	5	18
40	Book Binder	O.E.S.	1	1	-	-	-	-	1	-
41	Market Supervisor	Supervisor S	1	1	-	-	-	-	1	-
42	Ayurvedic Dispenser	Supervisor S	1	1	-	-	-	-	-	-
43	Reading Room Supervisor	Supervisor S	-	-	-	-	-	-	-	-
44	Works Supervisor	Supervisor s	-	-	-	-	-	-	-	-
45	Works Kangany	Works	1	1	-	-	-	-	1	-
46	Carpenter	O.E.S.	1	1	-	-	-	-	1	-
47	Arachchi	O.E.S.	1	1	-	-	-	-	1	-
48	Water Meter Reader	O.E.S.	-	-	-	-	-	-	-	-
49	Telephone Operator	O.E.S.	-	-	-	-	-	-	-	-
50	Record Room Asst	O.E.S.	-	-	-	-	-	-	-	-
51	Library Asst	O.E.S.	12	12	-	-	-	-	17	29
52	Garden labourer	Labourer	-	-	-	-	-	-	-	-
53	Fitter	O.E.S.	-	-	-	-	-	-	-	-
54	Painter	O.E.S.	-	-	-	-	-	-	-	-
55	Mechanic	O.E.S.	-	-	-	-	-	-	-	-
56	Labourer(Ayurvedic)	O.E.S.	1	1	-	-	-	-	1	-
57	Office labourer	O.E.S.	4	4	-	-	-	-	4	-
58	Mason	O.E.S.	1	1	-	-	-	-	1	-
59	Asst. Clerk	Supervisor S	-	-	-	-	-	-	-	-
60	Store Counter	Supervisor S	-	-	-	-	-	-	-	-
61	Labourer Diesel Vehicle	Labourer	1	1	-	-	-	-	1	-
62	Works Labourer	Labourer	9	9	-	-	-	-	9	18
63	Sanitary Supervisor	Labourer	-	-	-	-	-	-	-	-
64	Sanitary Labourer	Labourer	-	-	-	-	-	-	-	-
65	Health Labourer	labour Grade	34	31	3	-	-	-	31	62
66	Water pump Care Taker	labour grade	-	-	-	-	-	-	-	-
67	Health Supervisor	Sur. & all Gr	-	-	-	-	-	-	-	-
68	Library Attendent	Labour Grade	-	-	-	-	-	-	-	-
69	Library Labourer	labour Grade	-	-	-	-	-	-	-	-
70	Labourer (Town Hall)	Labour Grade	1	1	-	-	-	-	1	-
71	Engine Operator (JCB)	Off. Em.& All	-	-	-	-	-	-	1	1
72	Board Man		-	-	-	-	-	-	-	-
73	Cemetry Care taker	labourer	-	-	-	-	-	-	-	-
74	Market Labourer	Labourer	4	4	-	-	-	-	4	-
75	Pump Operator	Fier bridade-II	1	1	-	-	-	-	1	-
76	Preventor	Fier bridade-II	-	-	-	-	-	-	-	-
	Total		178	158	29	1		76	234	10

Annex 13 MATARA MC

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Matara MC is the major city in the Southern Province covering nearly 13km² and located on the almost flat land parallel to the sea. Some part of the city is below the sea level.

1.1.2 Receiving Water

The Nilwala Ganga (river) flows through Matara city and meets the Indian Ocean at Matara sea shore

1.1.3 Meteorology

Matara MC is lying in the wet zone and receives an average annual rainfall between 2,000 to 2,500 mm mainly during the south west monsoon and the inter-monsoon periods. Mean average temperature is around 30°C and average maximum between 34 to 35°C. Minimum night temperature varies from 26 C to 27°C.

1.2 Sociology

1.2.1 Population

The total extent of 13km² of Municipality is distributed in 37 wards and the area (ha) and population in each ward are given in **Table 13.1**. The total population of the city is 70,210.

1.2.2 Quality of Life

Majority of the families living in the city are engaged in government and private sector employment. The rest of the families depend on business, self employment and fisheries industry.

1.2.3 Industries

Some of the large scale industries located in Matara is as follows:

- (a) Harischandre Factory- Food and oil items

1.2.4 Public Facilities

(1) Educational facilities

There are 24 public schools available in the city area for the education of the students living in Matara city and suburbs.

(2) Medical facilities

Matara in general is well served with medical services both public and private. The Main Hospital at Matara provides the medical needs of the people living in Matara City and Matara District. In addition to above, there are 6 private hospitals and many Dispensary/ Clinics providing medical facilities to the rate payers of Matara City.

(3) Postal facilities

There is one main Post Office at Matara and few sub post offices in Matara. These provide an adequate service to the resident population.

(4) Recreational facilities

There are three Main Play grounds are available in the city of Matara for providing the sports facilities to the rate payers of the city

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

The whole city depends on septic tanks and pit latrines for disposal of night soil. Some people who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards.

1.3.2 Industrial Wastewater

Most of the factories located at Matara discharge raw untreated effluent into open drains leading to natural waterways or low lying land and thereby polluting the ground water table which is very high in this area.

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to On-site Sanitation

Regulations made by the Minister under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.1.2 Regulation and Rules regarding to Water Works

The National Water Supply and Drainage Board Law, No.2 of 1974 of the National State Assembly.

2.1.3 Regulation and Rules regarding to Solid Waste Service

Regulations made by the Chief Minister, Provincial council, Southern Province and issued by

the Gazette (Extraordinary) No.1534/18 of the Democratic Socialist Republic of Sri Lanka on 01st February 2008.

2.2 Organization of the City

2.2.1 Organization of the City

Figure 13.1 shows Organization of Matara MC.

2.2.2 Organization of Sewerage Works

No existing sewerage scheme is operating for Matara MC.

2.2.3 Organization of On-site Sanitation Works

On-site sanitation works is being carried out by MC and the details of staff involved with site sanitation is shown in the Organization Chart in **Figure 13.1**.

2.2.4 Organization of Water Works

Operation and maintenance of Matara water scheme is doing by NWSDB. Water works O&M organization is presented in **Figure 13.2**.

2.2.5 Organization of Solid Waste Service

Solid Waste Service is being carried out by MC and the details of staff involved with Solid Waste Service are shown in the Organization Chart in **Figure 13.1**.

2.2.6 Organization for Hazardous Wastewater Control - It is being carried out by CEA.

2.3 Budget

2.3.1 Total Budget of the City (Matara) - 2011 year- LKR 280 Million

2.3.2 Budget for on-site sanitation Works (Matara) - included into the budget of solid waste service.

2.3.3 Budget for Water Works (NWSDB) - LKR 113. Million

2.3.4 Budget for Hazardous Wastewater Control - It may be included in Central Environmental Authority Budget.

3. Public Works

3.1 Sewerage Works - No existing Sewerage Scheme operating for the City

3.1.1 Potential Demand of Sewerage Service

The whole City depends on septic tanks and pit latrines for disposal of night soil. Some People who have settled near canals and marshland discharge the effluents directly into the waterways, thereby polluting the environment and posing health hazards. Accordingly, there is a necessity for the sewerage scheme for the city of Matara

3.1.2 Outstanding issues in Sewerage Works - No Sewerage

3.2 On-site Sanitation Works

3.2.1 Progress - Constructed individual septic tanks and pit latrines.

3.2.2 Service Condition - M.C is de-sludging the septic tanks on request

3.2.3 Treatment Process - Anaerobic treatment process in the septic tanks.

3.2.4 Potential Demand of On-Site Sanitation System

Required for the housing schemes and low income settlements

3.2.5 Source of Budget for Operation and Maintenance - Payment is made by the people to MC for the de-sludging of septic tanks by the gulley sucker sent by MC.

3.2.6 Outstanding issues in on-site sanitation works

- (a) Not adequate gulley bowsers available at MC.
- (b) Conditions of the bowsers are not satisfactory
- (c) Overflowing of septic tanks especially during the rainy seasons.
- (d) Sludge is delivering to the open land without any treatment

3.3 Water Works

3.3.1 Progress

The existing water supply scheme for Matara is maintained and operated by NWSDB. Manager (O&M) located at Matara Manger's Office is responsible for the operation and maintains works of the scheme. **Figure 13.2** shows the details of Organization Chart.

3.3.2 Water Source - Nilwala River. Raw water is taking from the Nilwala River at the Intake at Kadduwa/ Nadugala.

3.3.3 Service Charge

As per the Tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009.

3.3.4 Purification Plant

Located at Malimbede/ Nadugale. Full treatment Process. Capacity of the Treatment

Plant-45,000m³/day/ 9000m³/day

3.3.5 Development Project - Improvement of Greater Matara Water Supply Scheme in planning stage.

3.3.6 Outstanding issues - No major outstanding issues

3.4 Solid Waste Service

3.4.1 Collection System

Matara MC is transporting solid waste from houses to compost project site at Kotawila village, nearly 11km away from Matara City.

3.4.2 Disposal Site - Kotawila village, nearly 11km away from Matara City.

3.4.3 Service Charge - No separate charge imposed. It is included in the property tax.

3.4.4 Development Project - Completed Compost Project at Kotawila

3.4.5 Outstanding Issues

(a) Transport facilities for solid waste are not adequate and conditions of the vehicles also not satisfactory.

(b) Capacity of the compost site is not sufficient.

3.5 Hazardous Wastewater Control

3.5.1 Industrial Wastewater Control - carrying out by CEA

3.5.2 Hospital Wastewater Control - carrying out by CEA

4. Outstanding issues in Sewerage Sector and Measures to Overcome those issues

4.1 Sewerage Works

No existing Sewerage Scheme. There is a necessity for Sewerage Scheme

4.2 On-site Sanitation

4.2.1 Organization - MC is carrying out the de-sludging of septic tanks when requested by the rate payers.

4.2.2 Development - On-site Sanitation facilities required for housing schemes and low income housing settlements. Investigate and design Separate Sanitation facilities for the above places and are to be provided.

4.2.3 Operation and Maintains

MC is doing the de-sludging of septic tanks and requires more Gulley Suckers. Sludge is dumped into open land without any treatment affecting the health of the people living close to dumping site

4.3 Hazardous Wastewater

4.3.1 Organization - Individual Industry/ Hospitals. Presently they do not have separate treatment plants to treat wastewater before releasing to the natural stream.

4.3.2 Development - CEA will have to check the quality of effluent and advise them to have a separate treatment plant in their premises

4.3.3 Operation and Maintains - Individual Institution has to carry out the operation and maintains works.

4.3.4 Control System - CEA will have to carry out the control system.

Table 13.1 Population of Matara MC by Ward

Ward	Population	Ward	Population	Ward	Population
Walgama	2,503	Hittetiya-M	3,636	Uyanwatta-N	2,275
Walgama-N	2,287	Isadin Town	2,518	Weliweriya-E	2,914
Walgama-C	1,938	Nupe	911	Kadaweediya_W	1,763
Matotagama	1,915	Weliweriya-W	1,130	Uyanwatta	2,202
Welegoda-W	1,938	Kotuwegoda-N	1,192	Weragampita	3,018
Madiha-W	2,019	Eliyankada -S	1,706	Tudawa-S	1,457
Madiha-E	956	Kotuwegoda-S	1,129	Hittetiya-E	2,240
Walgama-S	1,953	Kotuwa	1,069	Tudawa-N	754
Polhena	2,168	Eliyakanda-N	1,232	Tudawa-E	1,241
Thotamuna	1,567	Kadaweediya-E	2,042	Sudarshi Place	1,637
Pamburana	2,570	Kadaweediya-S	1,349	Meddawatta	1,652
Welegoda-E	3,567	Walpala	2,523	Meddawatta-S	1,932
Hittetiya-W	1,307			Total	70,210

Organization Chart
Matara Municipal Council

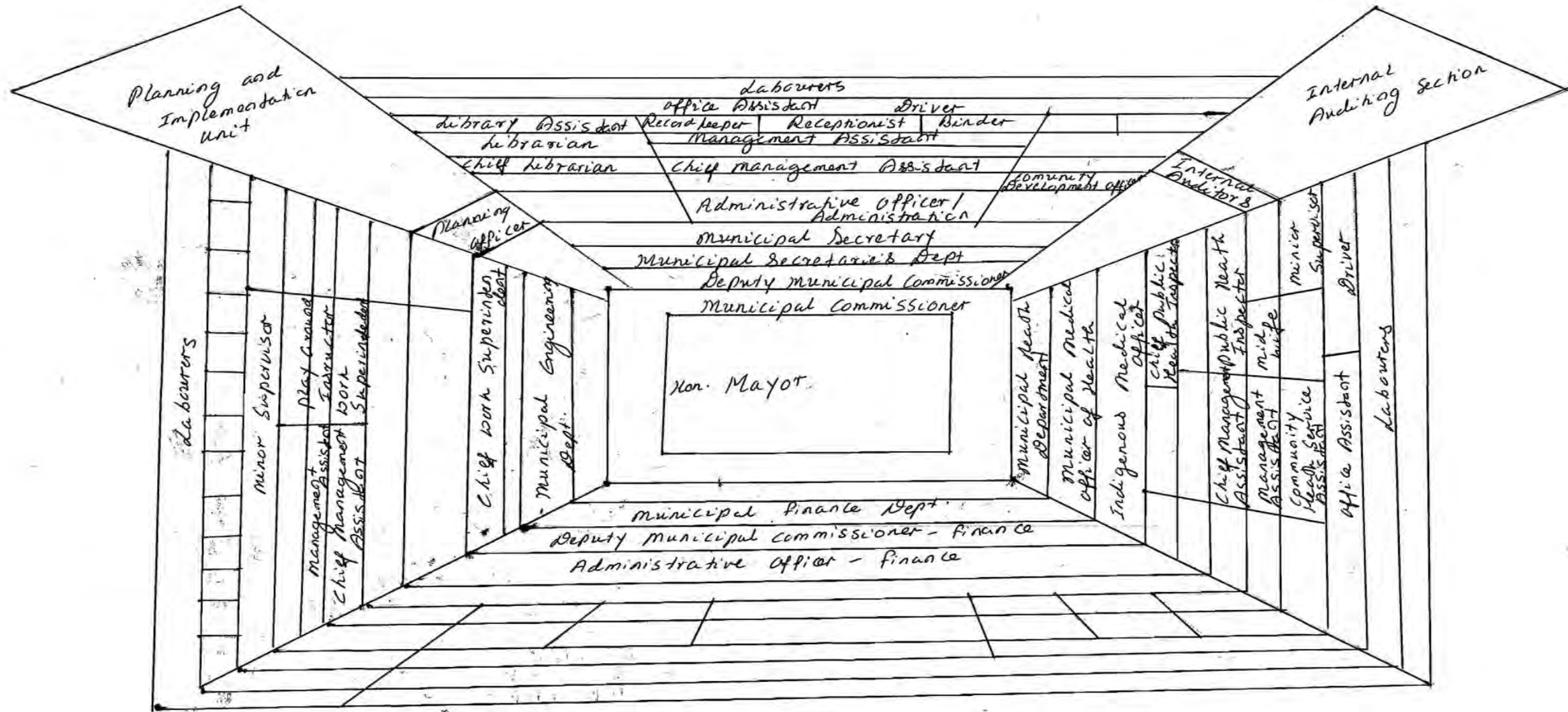


Figure 13.1 Organization Chart of Matara MC

Organization Chart of Malimbada (Matara) Water Supply Scheme

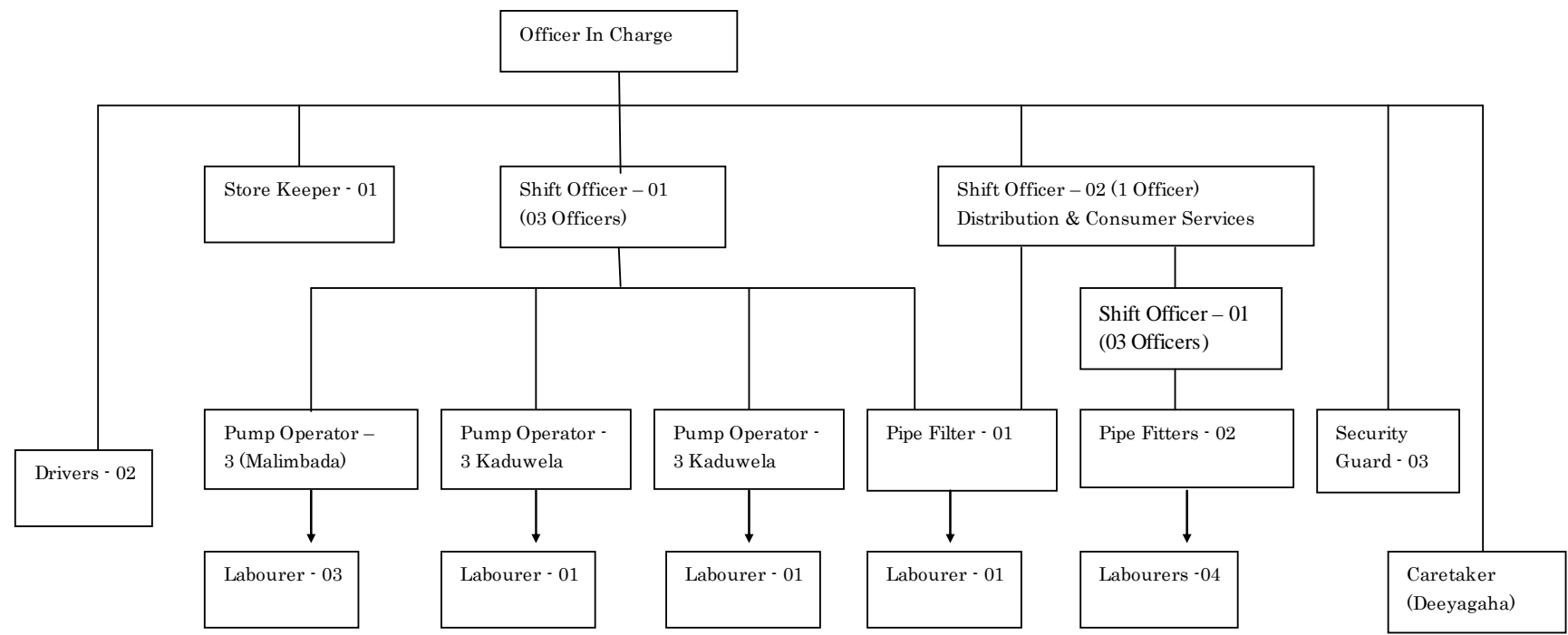


Figure 13.2 Organization of Water Works (1)

National Water Supply & Drainage Board
Matara/Mirissa Water Supply Scheme
Organization Structure

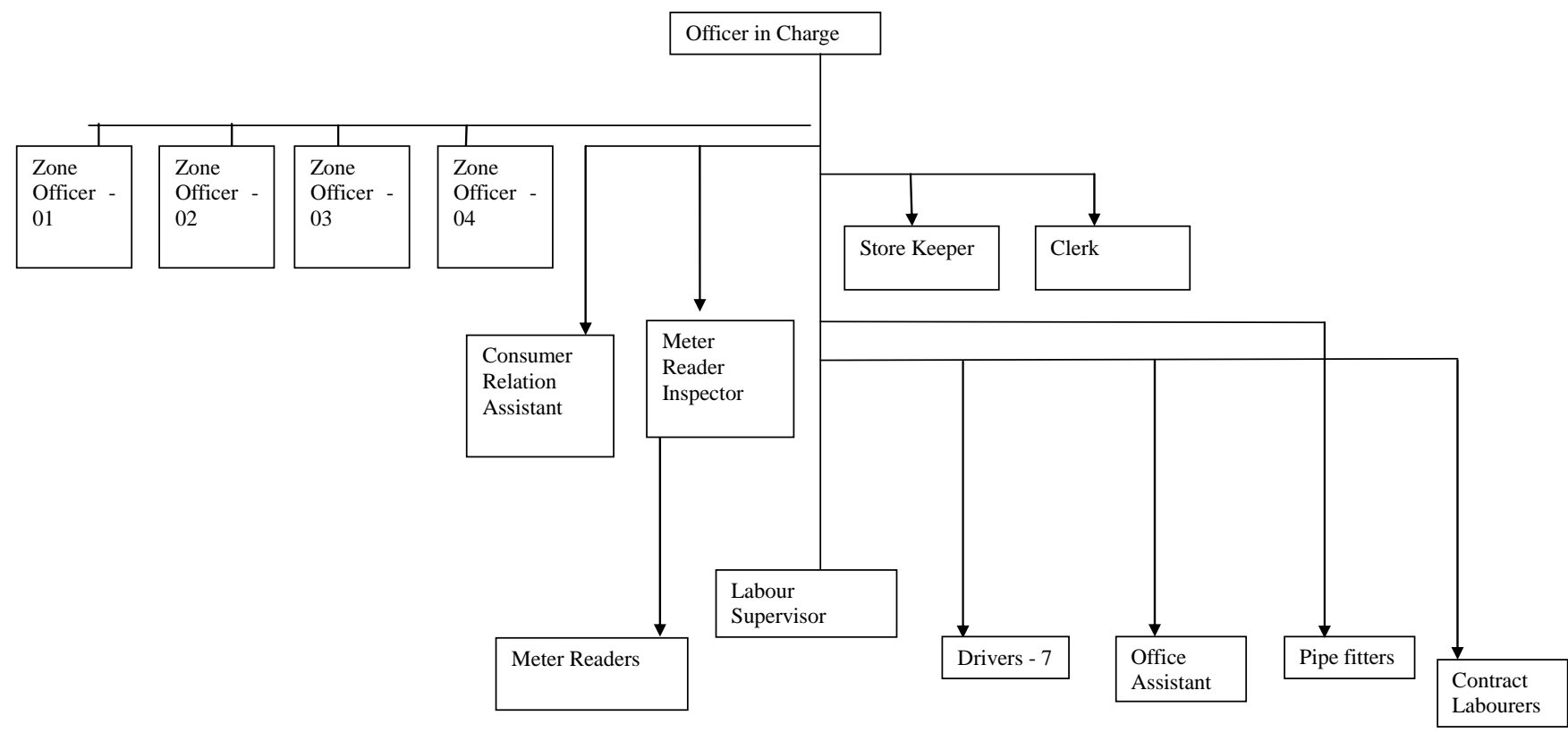


Figure 13.32 Organization of Water Works (2)

Annex 14 TRINCOMALEE UC

1. Outline of the City

1.1 Natural Condition

1.1.1 Topography

Trincomalee UC is situated in the North Eastern Coastal belt. The latitude of Trincomalee, is 8.5711° while the longitude is 81.2335° (E:08-40.331 & N:081-11.353).

Although it is a coastal town, the highest elevation of the Trincomalee town is 105 m above mean sea level. The average elevation of Trincomalee is 4 m and gentle sloping towards sea and the Bay.

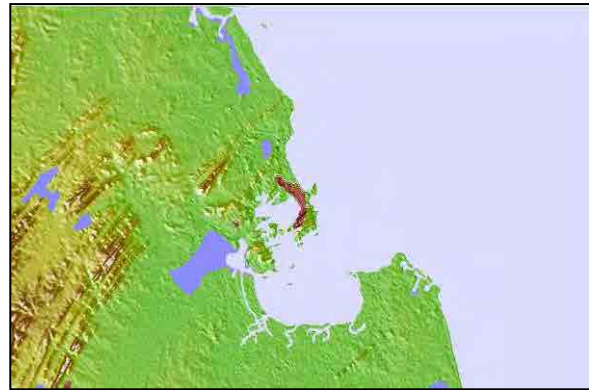


Figure 14.1

Similarly, due to extensive deep water, Trincomalee bay is functioned as natural harbor. Trincomalee bay consist of many outcroppings and smaller hills such as Swami rock, Chapel Hill (105 m), Diamond Hill (79 m), Greater Sober Island (70 m), Clappenburg Hill (100m). The bay is a large basin estuarine ecosystem rather than a single water body and consists of the large central estuary of Koddigar bay that is adjoining with smaller bays including Inner harbour bay with China bay and Thampalagamam bay, Shell bay, and Dutch bay.

1.1.2 Receiving Water

Trincomalee bay is fed by three river basins, Mahaweli river (Basin No 60), Kantale Basin and Per Aru Catchment (Basin No: 61) and Pan Oya (Basin No: 62)

Mahaweli is the largest river basin in the country and has a $10,327 \text{ km}^2$ catchment areas and an annual volume of runoff of $26,804 \text{ m}^3$.

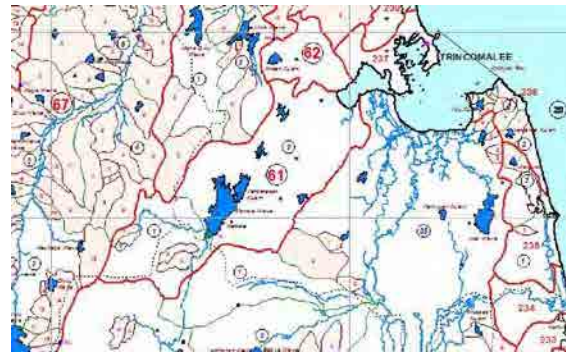


Figure 14.2

However, this river basin brings about $11,016 \text{ m}^3$ of annual discharge to Trincomalee bay. The annual volume of discharge varies due to diversions and storage in the reservoirs of the upstream Mahaweli Development schemes. Large amounts of drainage water are also added to the bay through the Kantale Irrigation scheme and Allai-Kantale scheme.

1.1.3 Meteorology

Trincomalee UC located within the dry zone of Sri Lanka, which has a hot and humid tropical climate. The mean annual temperature is 28.2° C , although typically this ranges from 18° C on cooler nights during the rainy season, to 39° C during the day in the dry months. The mean

annual temperature during the period 2002 – 2011 was 28.6° C

Trincomalee receives rainfall of between 765 to 2,580 mm per annum, primarily, about 60%, from the northeast monsoon during October to February. Average annual rainfall during the period 2002 – 2011 was 1,563 mm most of which fell in the north east monsoon. This suggests a

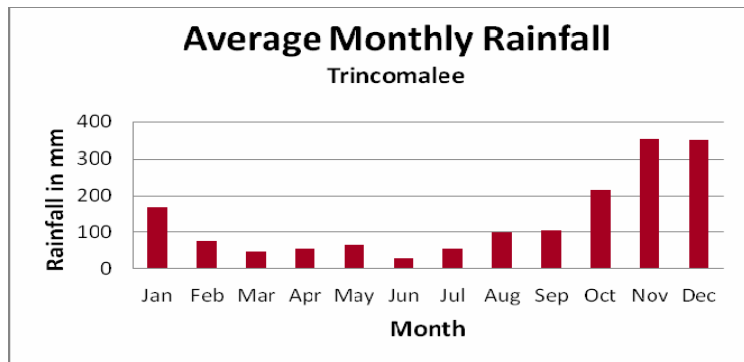


Figure 14.3

decline in annual rainfall from earlier years, since the 1869 to 1993 average was 1,612 mm.

1.1.4 Groundwater

The geological formations to the north and northwest of Trincomalee town consist of charnockites and quartzites, along with more recent alluvium. The areas south, southwest and southeast of Trincomalee bay are characterized by recent alluvium, and presence of garnet-biotite gneiss.

Soils are mostly sandy regosols and recent beach and dune sands, with areas of riverine alluvial soils. Further in the interior there are reddish-brown earths and their derivatives. Reddish-brown earths occur to the west and southwest of the city, whilst sandy regosols and alluvial soils are characteristic around the rest of the city. Low humic gley soils dominate the paddy lands in the adjoining areas of the City.

The major aquifer unit is of coastal sand overlying a coral basement. The infiltration rate, porosity and permeability of this sand formation are very high. More than 90% of the water percolates with the rains and which results in building up the fresh water body bounded with Salt-water interface in an unconfined coastal aquifer.

The salinity measured as electrical in this area varies from 700 μ S/cm 900 μ S/cm.

1.2 Sociology

1.2.1 Population

The total extent of council area is 750 ha. The council area is distributed among 12 wards (18 GN Divisions) and Population in each GN Division is given in **Table 14.1**. The total population of the Trincomalee UC area in year 2011 is 64,754. According to the census, multi cultural city has population of 47,234 Tamils, 9,523 Sinhalese, 7,581 Muslims and 415 others.

1.2.2 Quality of Life

The average level of monthly household income in the town area is Rs. 34,329. The Gini Coefficient of the household income is 0.46. The data are obtained from household Income and Expenditure Survey - 2009/10 -Preliminary Report.

1.2.3 Industries

Trincomalee is port city with commercial, naval and fisheries harbours. The services of harbour facilitate the industries such as Ilmanite mining & exporting, “Prima” flour processing industry, “Mitsui & Tokyo” cement producing industry, “Indian Oil” storage & refinery.

The most significant industrial activities of Trincomalee UC area are related to fisheries & tourism.

1.2.4 Public Facilities

The Trincomalee is the capital city of the Eastern Province of Sri Lanka. Most of the infrastructural facilities, government and private sector and also other service delivery centers are located in the town. The town center is congested due to few reasons namely narrow road net work, and high population visiting the town from other places and nearby locations. Moreover, the Army, Navy and Air force bases are located strategically in the suburbs and the city is well secured.

(1) Educational facilities

Zahira College, St Joseph Collage, R.K.M.Sri Koneswara Hindu College, Sri Shanmuga Hindu Ladies College, St Mary's College, Orr's Hill Vivekananda College, Vikneswara Mahavidyalayam Sinhala central college, Naamahal Vidyalayam, Kalaimahal Vidyalayam and St Francis Xavier School are the popular schools in the town.

(2) Medical facilities

Trincomalee General Hospital is well served with medical services such as six operation theaters, 600 beds and people from neighboring districts are also visiting daily for out patient treatment.

(3) Postal facilities

There are one main Post Office at Trincomalee and few sub post offices in Trincomalee Town Area. These provide an adequate service to the resident population.

(4) Recreational facilities

There is one main public play ground available in the City of Trincomalee for providing the sports facilities to the rate payers of the city

1.3 Source of Wastewater and Water Pollution

1.3.1 Domestic Wastewater

The whole town depends on septic tanks, cesspits and pit latrines for disposal of night soil. Some people who have settled near drainage canals and marshland discharge the overflow directly into the waterways, thereby polluting the environment and posing health hazards. The Power House Road - Main Drain (St. Joseph College), Drain close to Fish market & Clock tower, Drain close to "HNB", Drains close to "Kannai Amman kovil" & "Quitor Lubey" Church (Weeranagar), several Inner Harbour Road Drains are polluted with grey water, debris and cesspit spillage.

Table 14.2 - Type of Sanitation

Septic Tanks	Cesspits	Pit Latrine	Dry (Eco) Sanitation
40%	55%	5%	0%

Once solid waste management is streamlined, as explained in the respective section given below, the significant remaining contributors to pollution are the urban sewage and grey-water.

1.3.2 Industrial Wastewater

No major industries are found in Trincomalee Town area except discharges from fish processing (fisheries), vehicle service stations (transportation) and hotels and restaurants (tourism).

2. Administrative Organization

2.1 Regulation and Rules

2.1.1 Regulation and Rules regarding to Sewerage Works

Since there is no central municipal sewage treatment or any proper disposal system (sea outfall) in Trincomalee town, septic tanks and soil absorption systems need to be developed. The specifications for these systems are given in the Code of Practice for the Design and Construction of Septic Tanks (Sri Lanka Standard 745 1986).

Large hotels of more than 100 rooms are required to install waste water treatment facilities. The "Biofilter Sewage Treatment Plants" have recently been installed in several hotels in Sri Lanka, which offers cost effective treatment and recycling for sewage and wastewater. Traditional treatment mechanisms are more costly and expensive to maintain.

2.1.2 Regulation and Rules regarding to On-site Sanitation

The CEA administers the National Environmental Act and its regulations. Regulations made by the Minister of Environment under Section 32 read with Section 23A and 23B of the National Environmental act, No.47 of 1980 and issued by the Gazette (Extraordinary) No.1534/18 of the

Democratic Socialist Republic of Sri Lanka on 01st February 2008.

The Environmental Protection License (EPL) is a regulatory / legal tool under the provisions of the National Environmental Act. The Provincial Office of the Central Environmental Authority located at Kantale issues Environmental Protection Licenses for industries listed in the category “B” in the gazette notification no 1533/16 dated 25.01.2008 in order to prevent and control pollution issues. In the case of industries falling into the category “A”, the Provincial Office processes the applications and forwards the files to CEA Head Office for issue of license issued with a view to achieving the following objectives.

- 1) To prevent or minimize the release of discharges and emissions into the environment from prescribed (industrial) activities in compliance with national discharge and emission standards.
- 2) To develop an approach to pollution control that considers discharges from prescribed (industrial) processes to all media (air, water, land) in the context of the effect on the environment.
- 3) To contain the burden on industry, in particular by providing guidance on pollution control for polluting processes.
- 4) To ensure that the system responds flexibly both to changing pollution abatement.

2.1.3 Regulation and Rules regarding to Water Works

The National Water Supply and Drainage Board Law, No. 2 of 1974 of the National State Assembly is the appropriate regulation and rules for water works.

2.1.4 Regulation and Rules regarding to Solid Waste Service

Regulations made by the Chief Minister, Provincial council, Eastern Province and issued by the Gazette (Local Government) Part IV-B, No.1769 of the Democratic Socialist Republic of Sri Lanka on 27th July 2012. Under this notification several PSs in Eastern Province were covered.

A nominal charge from the citizens for solid waste management services of several Urban Councils & municipal councils in eastern province were approved by the provincial council. Gazette notification will follow after the eastern province election.

2.2 Organization of the Town

2.2.1 Organization of the Town

The organization chart of the Trincomalee UC is provided in the **Figure 14.4**.

2.2.2 Organization of Sewerage Works

No existing sewerage scheme is operating for Trincomalee Town.

2.2.3 Organization of on- site Sanitation Works

On-site Sanitation Works is being carried out by Urban Council and the details of staff involved with site sanitation are shown in the Organization Chart in **Figure 14.4**. Public Health Inspector is the officer in charge of the work.

2.2.4 Organization of Water Works

Operation and Maintains of Trincomalee Water supply Scheme is carried out by NWSDB. NWSDB, Regional Support Centre (RSC) – Eastern Province. Manager (Trincomalee) is the officer in charge.

The part of the water supply of the town is carried out by Trincomalee UC and the officer in charge is the Superintendent of Works. The bulk supply is provided by Sri Lanka Navy. The scheme specific tariff is applied.

2.2.5 Organization of Solid Waste Service

Solid waste service is being carried out by UC and the details of staff involved with Solid Waste Service are shown in the Organization Chart in **Figure 14.4**.

2.2.6 Organization for Hazardous Wastewater

The Control is being carried out by CEA. Mostly hospital waste comprises the hazardous waste and the Director.

2.3 Budget

2.3.1 Total Budget of the City

The scale of income and expenditure of the Urban Council (Trincomalee) is given in the **Table 14.3**.

Table 14.3 Finance Details

Trincomalee UC - Scale of Finance		Population in 2011 - 64,754					
Item	2006	2007	2008	2009	2010	2011	Average
	LKR: m	LKR: m	LKR: m	LKR: m	LKR: m	LKR: m	LKR: m
Total Revenue	58.22	82.14	93.10	95.08	112.73	-	88.25
Total Expenditure	65.14	86.65	96.96	94.46	111.66	-	90.98
Total Surplus / (Deficits)	(6.92)	(4.51)	(3.86)	0.61	1.07	-	(2.72)

2.3.2 Budget for on-site sanitation Works

The budget for on-site sanitation is included under health services. It is noted that this includes administration, preventive services, food sanitation, cleaning environmental health, maternity and child welfare, health studies, solid waste management and maintenance of graveyards.

Table 14.4 Expenditure & Budget for Health Services

Trincomalee UC - Health services		Population in 2011 - 64,754			
Item	2008	2009	2010	2011	2012
	LKR: m	LKR: m	LKR: m	LKR: m	LKR: m
Expenditure Health Services	41.83	45.95	51.59	75.10	75.00

2.3.3 Budget for Water Works (NWSDB)

NWSDB is carried out the operation of waterworks supplied from Kanthale treatment plant. Meantime Trincomalee UC is responsible for the connections provided by the Navy source.

Budget and expenditure for water works of the Trincomalee UC is given in the **Table 14.5**.

Table 14.5 Expenditure & Budget for Water Works

Trincomalee UC - Water Works		Number of Connection in 2012: 600			
Item	2008	2009	2010	2011	2012
	LKR: m	LKR: m	LKR: m	LKR: m	LKR: m
Expenditure Water Works	1.61	1.69	1.60	.93	1.93

Budget and expenditure of Water works are maintained under NWSDB - Trincomalee Water Supply Scheme for larger area

2.3.4 Budget for Hazardous Wastewater Control

It may be included in Central Environmental Authority Budget under their regional office in Kanthale. The hospital hazardous waste and their disposal are under the responsibility of the suppliers and may be included under Hospital Budget.

3. Public Works

3.1 Sewerage Works

There is no existing Sewerage Scheme operating for the City

3.1.1 Potential Demand of Sewerage Service

The whole town depends on septic tanks, cesspits and pit latrines for disposal of night soil. Majority of the town still depend on the groundwater for their water supply needs especially bathing & washing purpose. The minority of people of the town still use groundwater for drinking purpose. The groundwater pollution is mainly due to wastewater & septic tanks soakage. In absence of central disposal system, the pollution of environment and posing health hazards are inevitable. Accordingly, there is a necessity for the Sewerage Scheme for the Trincomalee Town.

3.1.2 Development System

It was revealed that combine sewer and grey-water collection system with sea outfall is required as a first step providing future development of treatment facilities closer to final pumping stations.

3.1.3 Outstanding issues in Sewerage Works

The design of the new sewerage system should accommodate the minimum operation & maintenance cost & connection charges. The city drainage system is very old and need to be reviewed. A mega tourist hotel will be constructed with in the city limit. The design & construction of first sea outfall can be advanced with upcoming hotel project.

3.2 On-site Sanitation Works

3.2.1 Progress

The new individual septic tanks or cesspits are being constructed as per the standards. A septage disposal facility at Kinniya is being constructed.

3.2.2 Service Condition

Urban Council is de-slugging the septic tanks on request. Trincomalee UC has three gully bowsers with 3,000 liter capacities and receives around 90 requests per month. The collected septage is openly disposed at the solid waste disposal site at Kinniya. The vehicle fleet should be strengthened with one new vehicle.

3.2.3 Treatment Process

The septic system has two primary components: the septic tank which breaks down the sewage through anaerobic action and the soakage tanks or pit which operates aerobically. The septic tank slows down the flow of raw sewage and stimulates the removal of solids by settlement. Septic tanks reduce BOD by 30-50 percent and fecal bacteria content is only slightly reduced. Therefore, the effluent is discharged into unsaturated soil to remove more of the solid matter and toxins

3.2.4 Source of Budget for Operation and Maintains

The payment is made by the people to UC for the de-sludging of septic tanks by the gully sucker sent by UC. The collection is sufficient to meet the cost.

3.2.5 Outstanding issues in on-site sanitation works

- (a) Adequate gully bowsers available at UC, however, mechanical conditions of the bowsers are not satisfactory
- (b) Rainy Season, part of the Town area is getting flooded, spillage of effluent & difficulty in usage.

- (c) Overflowing of septic tanks especially during the rainy seasons.
- (d) Sludge is disposal at Kinniya Solid Waste Dumping site without any treatment
- (e) Partially constructed the septage treatment facility at Kinniya.

3.3 Water Works

3.3.1 Progress

The existing Water Supply Scheme for Trincomalee is maintained and operated by NWSDB. The manager (Trincomalee) located at RSC (East) Office is responsible for the operation and maintains works of the Trincomalee Water Supply Scheme. The Organization Chart of Regional Support Centre(East) – NWSDB is given under **Figure14.5**.

Approximately 600 connections are maintained by Trincomalee UC and the responsibility is with the superintendent of works. The bulk supply is provided from Sri Lanka Navy.

3.3.2 Water Source

At the moment two water sources are being used. The main supply is from Kanthale Reservoir and the distance is 43km from Trincomalee town. The second source is located within Navy Premises.

The water source for the proposed augmentation is from an intake of “Maheveli” river at Allai. (Close to Ella Kanda Bridge)

3.3.3 Service Charge

As per the tariff introduced by the Gazette Notification (NO.1588/26) issued on 13th February with effect from 15th Feb.2009. The scheme specific tariff is adopted by UCI and charges are slightly higher than the national tariff.

3.3.4 Purification Plant

The purification plant is located at Kanthale. It is a modern DAF System, (Flocculation, Coagulation, Sedimentation, filtration & Disinfection) and the augmentation is also follow the same system with some improvement including sludge treatment.

The present capacity of the Treatment Plant is 56.25m³/day

3.3.5 Development Policy

The National Physical Planning Policy and Key projects, prepared under the section of 5 (a) and (b) of the Town and Country Planning (Amendment) Act., No. 49 of 2000, and approved by the National Physical Planning Council as per Section 4B of the Act on 11.01.2011, for the

information of the general public were published on Part I: Section (I) - General No. Gazette No 1729/15 on Thursday, October 27, 2011. (Trincomalee UC).

3.3.6 Development Project

Once the Greater Trincomalee Integrated Water Supply Project (GTIWSP) is completed, more than 65,000 connections can be given and 330,000 people will benefit. The coverage area of the Project is Trincomalee and Gravets, Kinniya, Thambalagamuwa and Kanthale. The components of the Greater Trincomalee Integrated Water Supply project are rehabilitation and upgrading of Kantale Water Treatment Plant (rehabilitation of clarifiers, filters, pumping building, construction of new filters and clarifiers, rehabilitation of building, reagent building, chlorination building and distribution tank), workshop, garages, generator and transformer building to increase the pipe borne water supply from 25,000 to 54,500 m³ / day.

3.3.7 Outstanding issues

- (a) Capacity of the existing water supply project is not sufficient and the augmentation and improvement of the existing scheme is in progress.
- (b) The present supply hours are less than 12 hours (3-12 hrs in alternative days) and moves are under way to increase the supply hours from 12 to 24 hours.

3.4 Solid Waste Service

3.4.1 Collection System

Discharging and collecting waste at the Trincomalee UC seems to function satisfactorily. However some waste scattering and heaped waste are observed in the town center and residential area after cultural events. Trincomalee UC collects waste daily with curbside collection at commercial shopping area, while two or three times a week with curbside collection at residential area as well.

The urban council has engaged comparative old equipments including compactors (4-nos), wheel tractors (4 Nos.) and a tipper.

3.4.2 Disposal Site

The disposal site is shared with the Trincomalee Town and Gravets Pradeshiya Sabah in the forest land, of an area of approx 4.45 ha and a distance from town of approx.14km. The disposal site at Kinniya does not follow sanitary landfill techniques and has a negative environmental impact.

The collected waste is dumped on the gentle slope in the forest. The dumped waste is not covered by soil and it is burned. There is negative environmental impact, such as, offensive odor, flies, birds, fire and smoke and so on; however, there is no negative social impact due to

non existence of households nearby.

3.4.3 Service Charge

A nominal charge from the citizens for solid waste management services of several, PSs, UCs & MCs in eastern province were principally proposed by the respective local governments and approved by the provincial council. The Gazette notification is pending after the Election.

Presently there is no separate charge imposed and it is included in the property tax.

3.4.4 Development Policy

Under JICA assistance development policy was developed on solid waste management. The details are available in following documents.

- 1) National Policy on Solid Waste Management, Ministry of Environment, Sri Lanka, 2007. (Ministry of Environment, (<http://www.environmentmin.gov.lk>)
- 2) National Strategies on Solid Waste Management, National Solid Waste Management Support Centre February 2008, (<http://www.pclg.gov.lk/en/download/Reports/Report2007.pdf>)
- 3) Sri Lanka Standard 1246: 2003 (UDC 628.477.4) Specification for Compost from Municipal Solid Waste Management and Agricultural Waste, Sri Lanka Standard Institution
- 4) Sri Lanka the Emerging Wonder of Asia, Mahinda Chintana Vision for the Future, The Development Policy Framework, Government of Sri Lanka, Department of National Planning, Ministry of Finance and Planning, 2010
- 5) Technical Guideline on Solid Waste Management in Sri Lanka, Central Environmental Authority, Sri Lanka, June 2005

3.4.5 Development Project

Septage treatment facilities are being constructed at Kinniya dumping ground. At Arunagiri Road JICA assisted Solid waste Management project was implemented. The vegetable market solid waste is converted to bio gas and will be utilized for the quarters of urban council employees.

3.4.6 Outstanding Issues

- (a) Transport facilities for solid waste are not adequate and conditions of the vehicles also not satisfactory.
- (b) Cultural festivals are spread throughout the year and additional cost to be borne by the council.
- (c) Negative environmental impact, such as, roaming wild animals including elephants,

offensive odor, flies, birds, fire and smoke at the dumping site.

3.5 Hazardous Wastewater Control

The Technical Guidelines on Solid Waste Management in Sri Lanka was prepared on Hazardous Waste by Hazardous Waste Management Unit, Pollution Control Division, CEA in November 2008.

3.5.1 Industrial Wastewater Control

The Environmental Protection Licenses (EPL) is issued by the Provincial Office of the Central Environmental Authority located at Kantale.

The discharges from fish processing (fisheries), vehicle service stations (transportation) and hotels and restaurants (tourism) are covered under EPL.

3.5.2 Hospital Wastewater Control

The hospital has a waste water treatment plant funded under NECORD Project. This facility is capable to treat the hospital waste water & sewerage for present and future development. The process is anaerobic digester. The settled and clarified waste water is pumped through a pressure filters with chlorination through a small sea outfall.

The hazardous solid waste is separated. The kitchen waste is converted to biogas and it is a good model for energy recovery. The incinerator is not working and it is the priority of the hospital in handling hazardous waste.

4. Outstanding issues in Sewerage Sector and Measures to Overcome those issues

4.1 Sewerage Works

There is no existing sewerage scheme and a necessity for Sewerage Scheme combining grey water.

4.2 On-site Sanitation

4.2.1 Organization

UC is carrying out the de-sludging of septic tanks when requested by the rate payers.

4.2.2 Development

The development of cesspits to acceptable septic tanks is required for housing schemes and low income housing settlements. Those settlements need urgent attention.

4.2.3 Operation and Maintains

UC is doing the de-sludging of septic tanks and requires new Gulley Suckers. Sludge is dumped into the dumping ground at Kinniya.

4.3 Hazardous Wastewater

4.3.1 Organization

The Individual Industries and the General Hospitals is responsible in disposal under EPL. Presently primary treatments are being carried out according to the EPL.

4.3.2 Development

CEA will have to check the quality of effluent and advise them to have a separate treatment plant in their premises.

4.3.3 Operation and Maintains

The individual Institution has to carry out the operation and maintains works.

4.3.4 Control System

CEA will have to carry out the control system and monitor the EPL conditions.

Table 14.1 Population of Trincomalee UC by GN Division

Name of Ward	Area (ha)	2010
Abayapura		4521
Anpuvalipuram		4607
Arasadi		4298
Arunagirinagar		1876
Jinnanagar		3330
Linganagar		3779
Manayaveli		5857
Mihindupura		1369
Murugapuri		3906
Orr's Hill		5259
Pattanathru		2380
Peruntheru		2631
Selvanayahapuram		1996
Sivapuri		5892
Sonagavadi		2998
Thillainagar		3068
Thirukadaloor		3696
Villundy		3290
Total	750	64,753

Organaization Chart

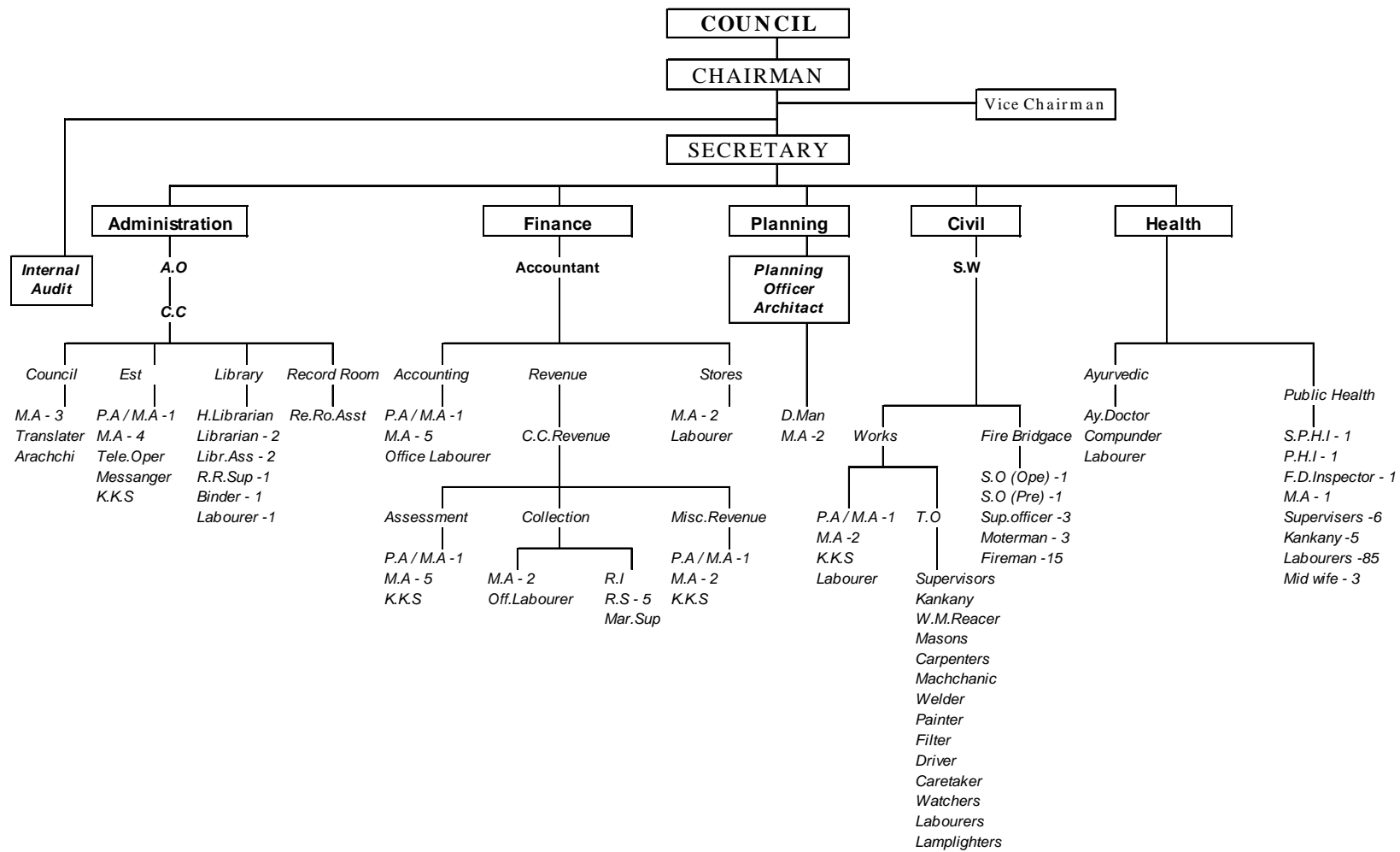


Figure 14.4 Organization Chart of Trincomalee UC