Democratic Socialist Republic of Sri Lanka

Data Collection Survey on Solid Waste Management in Democratic Socialist Republic of Sri Lanka

Final Report

February 2016

Japan International Cooperation Agency
(JICA)

Kokusai Kogyo Co., Ltd.

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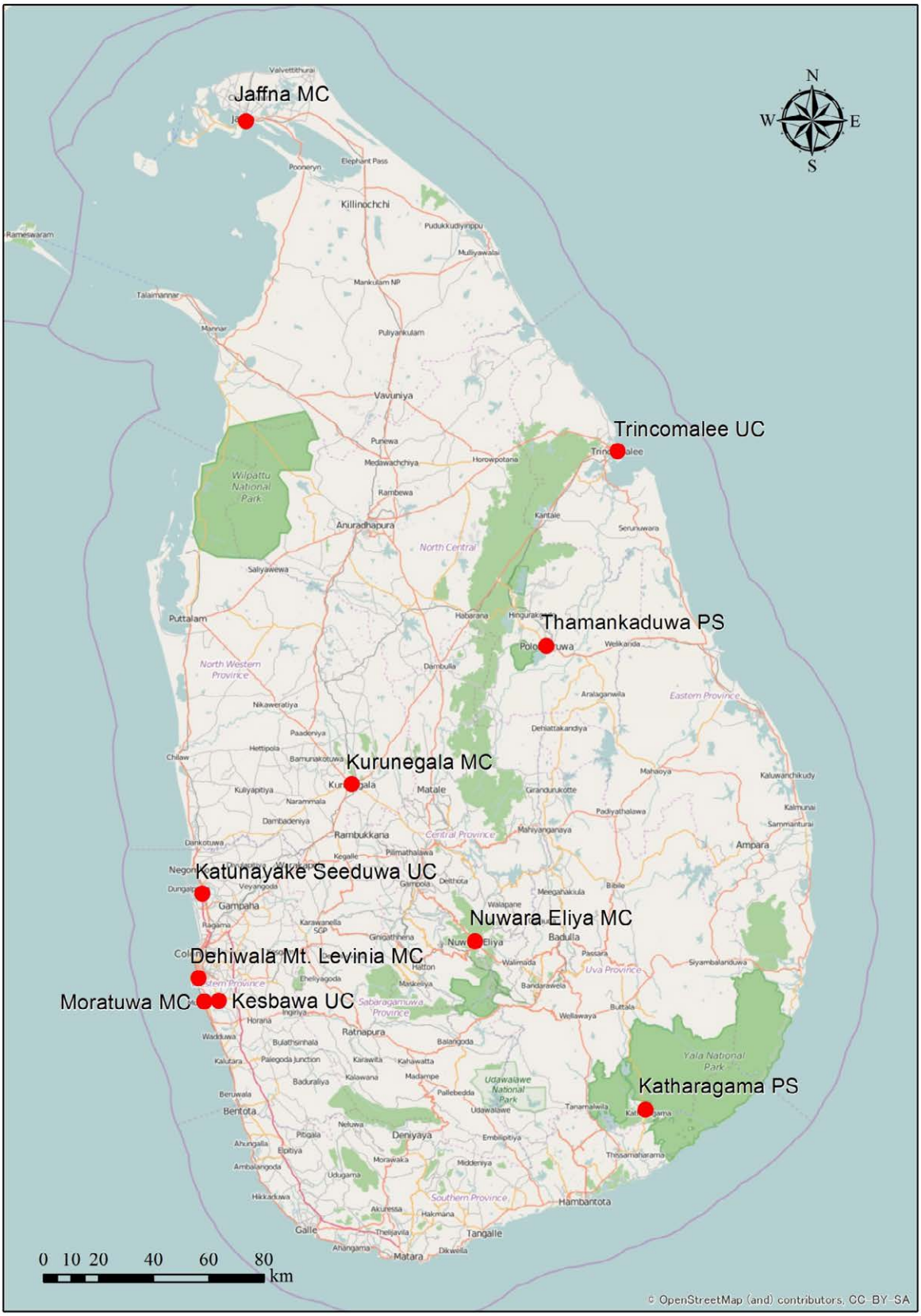

Ten (10) Priority Local Authorities

Contents

Contents of Figure

Contents of Table

Abbreviations

ACLG	Assistant Commissioner of Local Government
ADB	Asian Development Bank
CBO	Community-Based Organization
CD	Capacity Development
CDA	Community Development Assistant
CDO	Community Development Officer
CEA	Central Environmental Authority
CIDA	Canadian International Development Agency
CLG	Commissioner of Local Government
C/P	Counter Part
CPHI	Chief Public Health Inspector
CUP-NSWMSC	Capacity Upgrading Project for National Solid Waste Management Support Centre
DEO	Divisional Environmental Officer
EDCF	Economic Development Cooperation Fund
EIA	Environmental Impact Assessment
EPL	Environmental Protection License
EPR	Extensive Producers Responsibilities
FCM	Federation of Canadian Municipalities
F/S	Feasibility Study
IEE	Initial Environmental Examination
JICA	Japan International Cooperation Agency
JST	Japan Science and Technology Agency
KOICA	Korean International Cooperation Agency
LA	Local Authority
LKR	Sri Lanka Rupee
LGIIP	Local Government Infrastructure Development Fund
LLDF	Local Loans and Development Fund
MC	Municipal Council
M/M	Minutes of Meeting
MoMDE	Ministry of Mahaweli Development & Environment
MOH	Medical Officer of Health
MoH	Ministry of Health, Nutrition and Indigenous Medicine
MoLGPC	Ministry of Local Government and Provincial Councils
MoPAHA	Ministry of Public Administration and Home Affairs
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
NEA	National Environmental Act
NGO	Non-Governmental Organisation
NSSWM	National Strategy for Solid Waste Management
NSWMSC	National Solid Waste Management Support Centre
O&M	Operation and Maintenance
PC	Provincial Council
PEA	Provincial Environmental Authority
PHI	Public Health Inspector
PS	Pradeshiya Sabha
R/D	Record of Discussion
SATREPS	Science and Technology Research Partnership for Sustainable Development

S/C	Steering Committee
SLILG	Sri Lankan Institute of Local Governance
SWM	Solid Waste Management
UC	Urban Council
UDA	Urban Development Authority
UNOPS	United Nations Office for Project Services
VAT	Value-Added Tax
VBB	Volume Based Bag
WMA	Waste Management Authority
WtE	Waste-to-Energy
3 Rs	Reduce, Reuse and Recycle

Exchange rate： 1LKR = 0.871Yen (October, 2015)

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1 Background and Objective of Survey

1.1 Background

GNI per capita of Sri Lanka was 1,770 USD in 2008, while it was approximately 3,400 USD in 2014 and Sri Lanka has become a middle-income country. The main issues of Municipal Solid Waste (MSW) in Sri Lanka were the discharge, storage, collection and transportation before 2009 and the government of Sri Lanka made significant efforts to improve these issues to maintain the public sanitation environment. However, since 2009 the main issues have shifted to establishing the proper intermediate treatment and final disposal to maintain environmental considerations as a middle-income country.

In accordance with "Vision for A New Sri Lanka"the 10-year National Development Plan) (2006-2016), the government of Sri Lanka has strengthened the feasible solid waste management to overcome the following main issues:

- Establishment of National Solid Waste Management Support Center (NSWMSC) in 2006 by Ministry of Local Government and Provincial Council
- National Policy on Solid Waste Management (2007)

Pilisaru Programme (2008) by Central Environmental Authority (CEA) under Ministry of Environment. 115 compost plants were constructed through the Pilisaru Programme.

The government of Japan supported the improvement of SWM in Sri Lanka as shown in the following table:

Table 1-1: Support for improving SWM by the government of Japan

Duration	Title of project	Outline
2002-2003	Feasibility study project "The Study on Improvement of Solid Waste Management in Secondary Cities in Sri Lanka" by JICA	Recommendation of SWM support system to local authorities from the central government
2007-2011	Technical support project "Capacity Upgrading Project for the National Solid Waste Management Support Centre " by JICA	The capacity upgrading of NSWMSC in accordance with the above mentioned recommendation of feasibility study
2014	Networking on Kita Q system composting by IGES	Technical support of Kita Q system composting at Kuliyapitiya Urban Council
2011-2016	SATREPS project "Development of appropriate technologies for pollution control and environmental restoration of solid waste landfill" by JICA	Formulation of guide for the planning, management and pollution control of solid waste landfill (published March 2016)

Despite making significant efforts, the improvement of SWM is still limited and there are issues regarding the improper maintenance of disposal sites, insufficient improvement of disposal sites, lack of volume reduction by separate collection and recycling, and late introduction of intermediate treatment facility.

1.2 Objective

This survey consists of the following three objectives:

Objective of this survey	・Survey the project results, such as the current status of the technical support to local authorities by NSWMSC and the utilization of guides regarding planning, management and pollution control supported by the Japanese government and the Sri Lanka government ・Survey the issue for the dissemination of project output of technical support conducted by the Japanese government based on the collection of information in terms of the current status of SWM at local authorities, management of organizations, operations and maintenance, finance, and the SWM system including generation, collection, transportation, intermediate-treatment, recycling and final disposal. ・Identify priority issues and support needs. Once these have been identified, study the possibility of providing support. If support is possible, look into specific support measures.

1.3 Outline of the survey

The outline of the survey is described as following items in the final report.

1. Outline and objective of survey
2. Basic information of Sri Lanka
3. Current status and issues of solid waste management sector
4. Basic information of priority local authorities
5. Prediction of future waste amount and quality
6. Possibility of support for solid waste management

1.4 Survey period

This survey started from 24th July, 2015 and ended in 11th March, 2016.

1.5 Survey area

1.5.1 Selection of survey candidates local authority

Thirty two (32) local authorities as survey candidates were selected at the 1st stakeholder meeting on 26 August 2015, furthermore another local authority was added at the 2nd stakeholder meeting on 7 October 2015. As a consequence, thirty three (33) local authorities were selected as survey candidate at the stakeholder meetings.

Table 1-2: Thirty three (33) local authorities as survey candidates selected at the stakeholder meetings.

No	Province	Local authority		Waste collection amount (ton/day)	No	Province	Local authority		Waste collection amount (ton/day)
1	Northern	Karachchi	PS	6	18	Uva	Badulla	MC	28
2	Northern	Vadamarachchi (South-West)	PS	5	19	Western	Gampaha	MC	17
3	North-Central	Hingurakgoda	PS	10	20	Western	Negombo	MC	68
4	Uva	Kataragama	PS	8	21	Western	Katunayake Seeduwa	UC	35
5	Southern	Hambantota	MC	8	22	Western	Kotikawatta Mulleriyawa	PS	38
6	Eastern	Kinniya	PS	6	23	Western	Moratuwa	MC	85
7	Western	Kalutara	PS	8	24	Western	Kesbewa	UC	54
8	North-central	Thamankaduwa	PS	10	25	Western	Kolonnawa	UC	30
9	Northern	Jaffna	MC	69	26	Western	Maharagama	UC	82
10	North-Central	Anuradhapura	MC	25	27	Western	Kaduwela	MC	85
11	Eastern	Trincomalee	UC	26	28	Western	Kalutara	UC	20
12	Eastern	Batticaloa	MC	60	29	Western	Beruwela	UC	14
13	North-Western	Chilaw	UC	18	30	Western	Colombo	MC	775
14	North-Western	Kurunegala	MC	48	31	Western	Dehiwela Mt. Lavinia	MC	170
15	Central	Nuwara Eliya	MC	21	32	Western	Sri Jayawardenapura Kote	MC	100
16	Sabaragamuwa	Kegalle	UC	15	33	Central	Kandy	MC	130
17	Sabaragamuwa	Rathnapura	MC	32					

The selection criteria of 33 local authorities as survey candidate are shown as follows;

(1)There are serious issues of solid waste management.

(2)Daily waste collection amount

- Less than 10 ton/day: approximately 20% of all survey candidates
- 10-100 ton /day: approximately 70% of all survey candidates
- More than 100 ton/day: approximately 10% of all survey candidates

1.5.2 Priority local authority

The questionnaire survey and interview survey by phone call were conducted by the consultant since September 2015.to realize the current status of solid waste management in 33 local authorities as survey candidate selected at the stakeholder meetings. The data and information of current condition of solid waste management were evaluated based on the following flow.

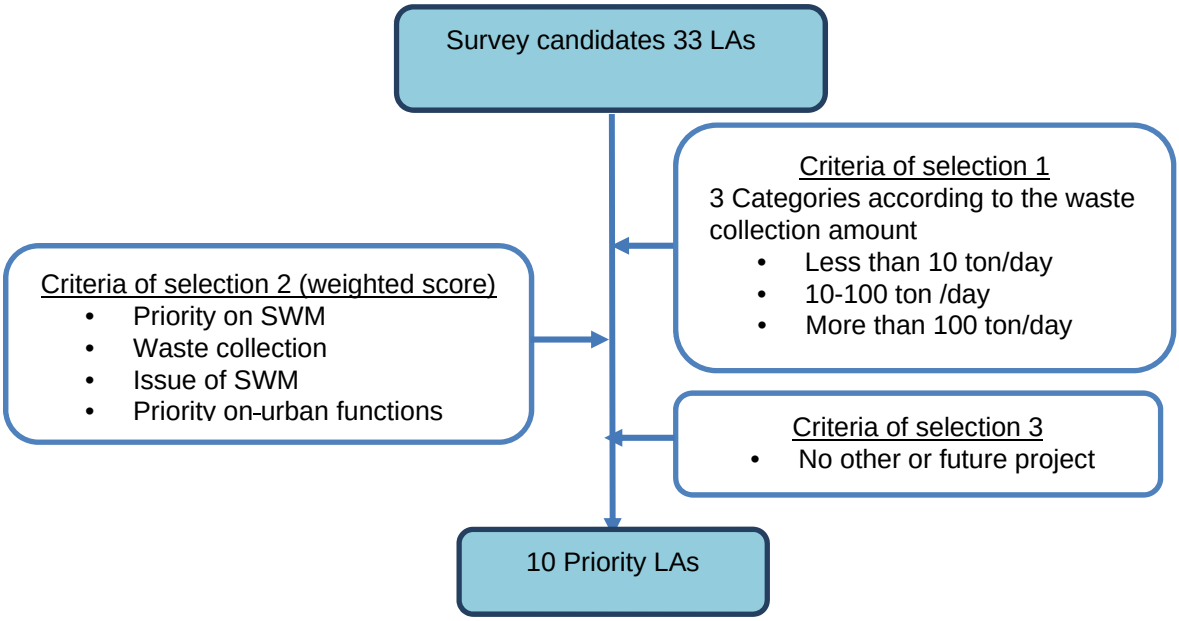


Figure 1-1: Flow chart to select 10 priority local authorities

Table 1-3: Criteria to select 10 priority local authorities

Selection criteria 1	Detail Criteria	Weighting			Remark
Priority of SWM	• There is a SWM Master plan	No (-)	Yes (+)		High score is evaluated as high Intention to SWM
	• The ratio of SWM budget of the total LA budget	x<25% (-)	25%< x<50% (+)	50%<x (++)	Higher score is evaluated as higher Intention to SWM
Priority on urban functions	• Population density (persons per km2)	x<1,000 (-)	1,000< x<5,000 (+)	5,000<x (++)	Higher score is evaluated as more people are effected by SWM
	• Importance as traffic point	No (-)	Yes (+)		Higher score is evaluated as more people are effected by SWM
Waste collection	• Waste collection ratio	x<25% (++)	25%< x<50% (+)	50%<x (-)	More score is evaluated as high necessity of collection improved
Issue of SWM	• Collection and transportation of waste	No issue (-)	There is issue (+)		More score is evaluated as high necessity of issue solve
	• Compost plant	No issue (-)	There is issue (+)		
	• MRF	No issue (-)	There is issue (+)		
	• Bio-Gas	No issue (-)	There is issue (+)		
	• Night soil	No issue (-)	There is issue (+)		
	• Necessity of disposal site (DS) improvement	No (-)	Yes (+)		Generally life span of new DS is longer than improved DS. New DS gives larger impact to SWM than improved DS.
	• Necessity of new disposal site (DS)	No (-)	Yes (++)		

33 local authorities as survey candidate are evaluated based on the data, information and selection criteria in following table.

Table 1-4: Evaluation of 33 local authorities as survey candidate

No.	Province	Local Authority		W-collection (t/day)	Priority of SWM Urban function				W-collection rate	Issue								Total score	Future project
					Master plan	SWM budget	Population density	important location for traffic		Collection & Transportation	Intermediate Treatment			3Rs	Night Soil	Final disposal			
											Compost	MRF	Bio gas			Improvement	New		
1	Northern	Karachchi	PS	6	-	-	-	+	++	+	-	-	-	-	-	+	-	5	
2	Northern	Vadamarachchi (South-West)	PS	5	-	+	-	-	-	-	-	-	-	-	-	+	-	2	
3	North-Central	Hingurakgoda	PS	10	-	-	-	-	+	-	-	-	-	-	-	+	-	2	
4	**Uva**	**Kataragama**	**PS**	**8**	+	+	-	+	-	+	+	-	-	+	+	+	-	**8**	
5	Southern	Hambantota	MC	8	-	-	-	+	-	+	+	-	-	+	-	+	-	5	
6	Eastern	Kinniya	PS	6	+	++	-	-	++	+	-	-	-	-	-	-	++	8	
7	Western	Kalutara	PS	8	-	-	+	+	+	+	-	-		-	-	+	-	5	
8	**North-Central**	**Thamankaduwa**	**PS**	**10**	-	-		+	++	+	-	-	+	+	+	+	-	**8**	
9	**Northern**	**Jaffna**	**MC**	**69**	-	-	++	+	-	+	+	-	+				++	**8**	
10	North-Central	Anuradhapura	MC	25	-	-	+	+	+	-	-	-	-	+		+	-	5	EDCF
11	**Eastern**	**Trincomalee**	**UC**	**26**	-	+	++	+	+	+	-	-	-	+		+	-	**8**	
12	Eastern	Batticaloa	MC	60	-			+	+	-	-	-	-				++	4	UNOPS
13	North-Western	Chilaw	UC	18	+		+	+	-	-	-	-	-	+			++	6	
14	**North-Western**	**Kurunegala**	**MC**	**48**	+		+	+	-	+	+	-	-	+	+	+	-	**8**	
15	**Central**	**Nuwara Eliya**	**MC**	**21**	+		+	+	-	+	-	-	-		+	+	-	**6**	
16	Sabaragamuwa	Kegalle	UC	15		+	+	+	-	-	+	-	-		-	-	++	6	
17	Sabaragamuwa	Rathnapura	MC	32	+	-	+	+	-	+	-	-	-	+	-	-	-	5	
18	Uva	Badulla	MC	28	-	-	-	+	-	-	+	+	-		-	-	-	3	Korean company
19	Western	Gampaha	MC	17	+	-	+	+	+	+		-	-	+	-	-	-	6	
20	Western	Negombo	MC	68	+	-	+	+	-	+	+	-	-		-	-	-	5	
21	**Western**	**Katunayake Seeduwa**	**UC**	**35**		+	++	+	-	+		-	-	+	-	+	-	**7**	
22	Western	Kotikawatta Mulleriyawa	PS	38	+	-	-	+	+	+		-	-	-	-	-	++	6	KOICA
23	**Western**	**Moratuwa**	**MC**	**85**	-	++	++	+	-	+		-	-		-	+	-	**7**	
24	**Western**	**Kesbewa**	**UC**	**54**	-	-	+	+	+	+		-	-	+	-	+	-	**6**	
25	Western	Kolonnawa	UC	30	+	-	++	+	-	+	+	-	-	-	-	Meethotamurlla		6	
26	Western	Maharagama	UC	82	-	+	+	+	-	+	-	-	-	-	-	+	-	5	
27	Western	Kaduwela	MC	85	-	-	+	+	+	+	-	-	-	+	-	+	-	6	
28	Western	Kalutara	UC	20	-	-	+	+	-	+	-	-	-	+	-	+	-	5	
29	Western	Beruwela	UC	14	-	+	-	-	-	+	-	-	-	-	-	+	-	3	
30	Western	Colombo	MC	775	+	-	++	+	-	+	-	-	-	-	-	Meethotamurlla		5	
31	**Western**	**Dehiwala Mt. Lavinia**	**MC**	**170**	-	+	++	+	-	+	-	-	-	-	-	+	-	**6**	
32	Western	Sri Jayewardenepura Kotte	MC	100	-	-	++	+	-	+	-	-	-	+	-	+	-	6	
33	Central	Kandy	MC	130	+	-	-	+	-	-	-	-	-	-	-	+	-	3	EDCF

33 local authorities were evaluated and 10 priority local authorities were selected at the 2nd stakeholder meeting on 7th October 2015.

Table 1-5: 10 priority local authorities

Waste collection amount	No.	Province	Local authority	
Less than 10 ton/day	1	Uva	Kataragama	PS
	2	North Central	Thamankaduwa	PS
10-100 ton /day	3	Northern	Jaffna	MC
	4	Eastern	Trincomalee	UC
	5	North-Western	Kurunegala	MC
	6	Central	Nuwara Eliya	MC
	7	Western	Moratuwa	MC
	8	Western	Kesbewa	UC
	9	Western	Katunayake Seeduwa	UC
More than 100 ton/day	10	Western	Dehiwala Mt. Lavinia	MC

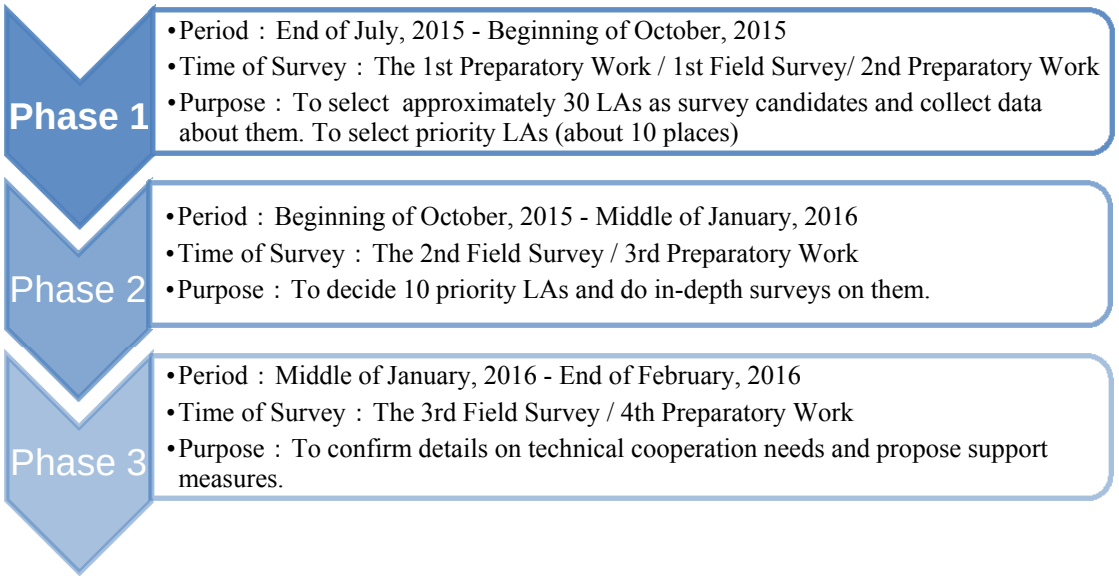
1.6 Government organization, institute and local authority to be studies

Government organization, institution and local authorities related on solid waste management to be studied are shown as follows;

- Ministry of Mahawelli Development and Environment【MoMD&E】
- Central Environmental Authority【CEA】
- Ministry of Provincial Council and Local Government
- National Solid Waste Management Support Center【NSWMSC】
- Urban Development Authority【UDA】
- Ministry of National Policies & Economic Affairs, Department of National Planning【NPD】
- Colombo Municipal Council【CMC】
- 10 priority local authority

1.7 Survey schedule

This survey is conducted in three phases. Focus points in each phase are as follows:



Detail survey schedule is as follows:

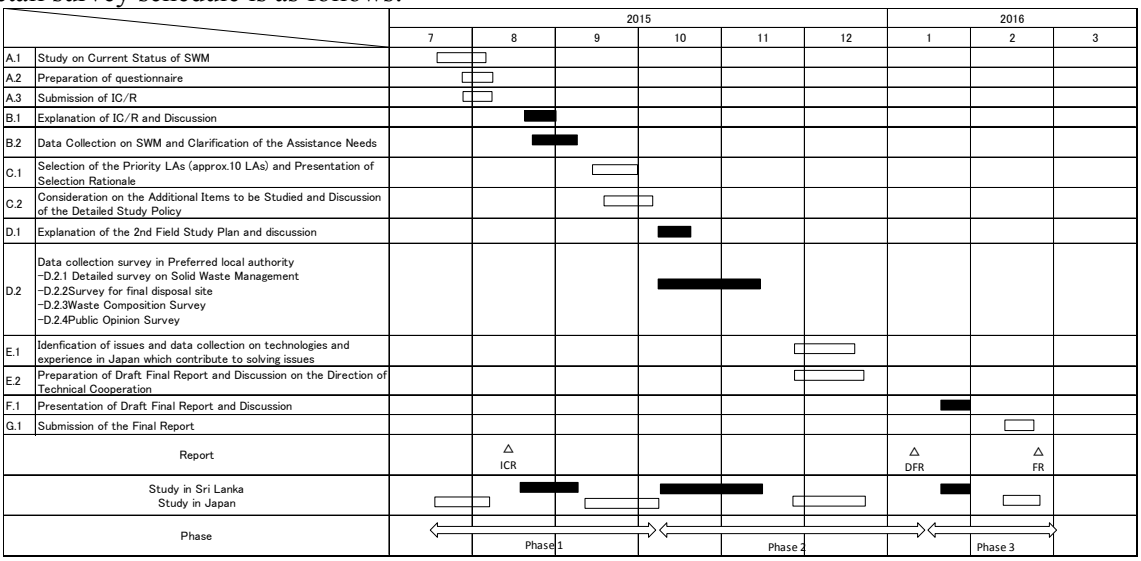


Figure 1-2: Survey schedule

2 Basic Information of the Democratic Socialist Republic of Sri Lanka

2.1 Summary

Sri Lanka is located in south-southeast from the Indian subcontinent and separated from there by their Poak Straits. The distance of Sri Lanka is 445km from north to south and 225km from east to west, the coastline of Sri Lanka is approximately 1,340km long and the area is 65,610km$^{2.}$

Table 2-1: General information of Sri Lanka

Country name	the Democratic Socialist Republic of Sri Lanka
Capital city	Sri Jayewardenepura Kotte
Government	Parliamentary democracy
Population	20,360,000 (2012)
Labour force	7,860,000 (2012)
Average age	32.1 age (2015)
Language	Official language: Sinhala and Tamil/Connected language: English

Reference: Census of Population and Housing – 2012 Sri Lanka Department of Census and Statistics
CIA HP：https://www.cia.gov/library/publications/the-world-factbook/fields/2177.html#ce

2.2 Natural environmental condition

Sri Lanka has a rainy season and dry season; it rains a lot in the southwest and highlands from May to October from the southwest monsoon and in the north and northeast from November to March from the northeast monsoon. The average temperature is 27 degrees Celsius in Colombo, 16 degrees Celsius in Nuwara Eliya; the climatic characteristic in Sri Lanka is small temperature fluctuations throughout the year.

Table 2-2: Average temperature and rainfall monthly in Colombo, Jaffna and Trincomalee

LA	Colombo		Jaffna		Trincomalee	
Geography	Western coastal area		Northern coastal area		Eastern coastal area	
Month	Monthly av. temp	Monthly av. rainfall	Monthly av. temp	Monthly av. rainfall	Monthly av. temp	Monthly av. rainfall
1	31.5	32.7	25.3	92.8	29.8	36.2
2	27.8	122.5	25.6	22.7	30.3	184.1
3	31.4	220.9	27.9	-	32.0	68.7
4	31.9	267.7	30.7	8.5	33.6	48
5	31.9	169.2	30.5	80.6	34.8	122.6
6	31.3	237.8	31.3	8.1	35.3	22.3
7	31.2	37.3	30.9	1.6	36.0	9.5
8	31.3	90.7	29.7	108.5	35.9	30.7
9	30.6	631.4	28.9	35.7	34.7	255.6
10	30.8	235.4	28.2	262.1	31.9	393.8
11	30.9	525.8	26.2	496.4	30.3	647.7
12	31.4	376.6	26.2	251.6	30.3	211.1
Av. temp	31.0	-	28.5	-	32.9	-
Av. rainfall	-	2948.0	-	1368.6	-	2030.3

Table 2-3: Average temperature and rainfall monthly in Kurungala, Katharagama and Nuwara Eliya

LA	Kurunegala		Katharagama		Nuwara Eliya	
Geography	Inland area		Southern coastal area		Plateau area	
Month	Monthly av. temp	Monthly av. rainfall	Monthly av. temp	Monthly av. rainfall	Monthly av. temp	Monthly av. rainfall
1	32.2	5.9	32.0	7.5	20.6	1.9
2	32.8	34.3	32.5	37.2	19.7	248.1
3	34.5	207.2	32.5	57.2	21.7	42.7
4	33.3	367.5	31.8	137.7	22.0	123.9
5	32.8	159.8	31.0	48.8	21.8	203.9
6	32.2	76.4	31.5	18.7	20.2	130
7	32.6	20.1	31.2	31.9	19.4	96.9
8	33.0	74.3	30.7	159.3	19.8	75.3
9	32.2	125.0	29.7	300.8	20.4	234.5
10	31.9	282.5	30.7	163.8	20.7	318.4
11	31.4	422.0	30.9	228.2	20.5	280.2
12	31.3	275.2	31.0	125.3	19.7	265.4
Av. temp	32.5	-	31.3	-	20.5	-
Av. rainfall	-	2050.2	-	1316.4	-	2021.2

Reference: Department of Meteorology

In 2004, more than 35,000 people died from the tsunami caused by the Sumatra earthquake. The tsunami damaged coastal areas from the north and east to south and the fact that most of the victims had never experienced earthquakes is considered to have significantly increased the death toll.

2.3 Socio-Economic Conditions

2.3.1 Social Conditions

The total population of Sri Lanka was 20.7 million people as of 2014. The population density is 330 persons per sq.km and is highest in the western part of the country along the coast, especially in and around the capital. The Sinhalese constitute the largest ethnic group in Sri Lanka accounting for 72.9% of the total population. Other ethnic groups are Tamils and Sri Lankan Moors occupying 18% and 8% of the total population respectively.

Sri Lanka is a multi-religious country. 70% of the Sri Lankans are Buddhists. The other dominant religions are Hinduism and Islam since the Hindus and Muslims account for 10% and 8.5% of the total population, respectively.

The country is known for its social welfare system. The Government of Sri Lanka made many efforts in its social welfare policies by implementing medical services free of charge and introducing free education system from general to university levels. The compulsory education in Sri Lanka is nine years, starting in primary school at age five. This aforementioned effort is considered to have helped Sri Lanka achieve a literacy rate of 95%, which is relatively high among developing countries. Sri Lanka also ranks highly on the Human Development Index; 0.75 in 2014 ranking it 73rd among 187 countries.

Other high educational rates in the country are the computer utilization rate at 35% and the primary school enrolment rate at 98.5%.

In 2014, government spending on health and education was equal to 1.4% of GDP for the health

sector and 1.9% of GDP for the education sector.

However, the Gini coefficient increased to 0.48 in 2014 from 0.36 in 2010, indicating a continuous increase in income disparity over the last four years. As for poverty, the Poverty Head Count Index has decreased considerably from 15.2% to 6.7% since 2007.

The key social indicators of Sri Lanka are presented in the table below.

Table 2-4: Key Social Indicators of Sri Lanka

No	Indicators	Unit	Value
1	Population	thous.psn	20,675
2	Population density	psn/sq.km	330
3	Literacy Rate	percent	95.0%
4	Average household size	psn/HH	3.9
5	Average household income	LKR/HH/month	45,878
6	Income disparity (Gini coefficient)	coefficient	0.48
7	Poverty Head Count Index		
	2006/2007		15.2
	2009/2010		8.9
	2012/2013		6.7
8	Human Development Index		0.75
	Rank among 187 countries		73
9	Employment:		
	Employment at private sectors	thous.psn	8,424
	Agriculture	percent	28.5%
	Industry	percent	26.5%
	Services	percent	45.0%
	Employment at government sectors	thous.psn	1,330
	State sector	percent	51.3%
	Provincial public sector	percent	29.0%
	Semi government sector	percent	19.7%
10	Education		
	General Education		
	Student/teacher ratio		18
	Primary net enrolment ratio	percent	98.5%
	University Education		
	Student/teacher ratio		17
	Enrolment ratio (age 19-23 years)	percent	6.3%
	Government expenditure on education	percent of GDP	1.9%
11	Public Health		
	Hospital beds	beds/1000 psn	3.7
	Persons per doctor		1155
	Nurses	nurses/10000 psn	15.5
	Government expenditure on health	percent of GDP	1.4%

Source: Central Bank of Sri Lanka, 2015, "Annual Report-2014"

For 26 years starting from 1983, Sri Lanka suffered an internal conflict that arose between the Government and the Liberation Tigers of Tamil Eelam (LTTE), an anti-government militant group based in northern Sri Lanka. The LTTE waged an insurgency against the government to create an independent state in the north and east of the country for the Tamil people.
Sri Lanka has been facing challenges related to development, improvement of social services and establishment of economic infrastructure in the areas affected by the conflict and areas hit by the tsunami that occurred in 2004.

2.3.2 Economic Conditions

Since the end of the civil war, the economy of Sri Lanka has been improving continuously and its GDP per capita reached 3,625 USD (nominal-base). Resulting from improvements of economic activities and demand recovery, the national economic growth rate reached 8.2% in 2011, to date the highest on record. Despite the decrease to 6.3% in 2012, the economic growth rate recovered during the following two years and reached 7.4% in 2014. The annual average growth for the last four years was estimated at more than 6%.Although the Sri Lankan economy was traditionally plantation-oriented and based mainly on production of tea, rubber and coconuts, recent industrialization has been diversifying the economy. Annual output growth of the industrial sector exceeded 10% for the past four years. Due to the recovery of employment conditions driven by economic growth, the unemployment rate has continuously decreased and dropped to 4.3% in 2014. Likely, the inflation rate stayed at levels below 10% and is estimated at 3.3% in 2014. Although the exports increased by 7.1% in 2014 and exceeded 10 billion USD, the deficit of external trade balance increased due to the faster increase rate of the imports (7.8% increase from the 2013 level). Thanks to the improvement of public safety, the number of tourists from abroad increased from 650,000 people in 2010 and reached over 1,000,000 people for the third consecutive year. The major economic indicators of Sri Lanka are as follows.

Table 2-5: Key Economic Indicators of Sri Lanka

No	Indicators	Unit	2000	2009	2010	2011	2012	2013	2014
1	DEMOGRAPHY:								
	Population	thous.psn	19,102	20,476	20,675	20,869	20,328	20,483	20,675
	Population growth	%	1.4	1.1	1	1	0.9	0.8	0.9
	Labour force (LF)	thous.psn	6,827	8,074	8,108	8,555	8,454	8,802	8,805
	LF participation rate	%	50.3	48.7	48.1	47.8	52.6	53.8	53.3
	Unemployment rate	%	7.6	5.8	4.9	4.2	4	4.4	4.3
2	OUTPUT:								
	GDP at current prices	US$ billion	16.6	42.1	49.6	59.2	59.4	67.2	74.9
	Per capita GDP at current prices	US$	869	2,054	2,397	2,836	2,922	3,280	3,625
	GDP growth	%	6	3.5	8	8.2	6.3	7.2	7.4
	Agriculture	%	1.8	3.2	7	1.4	5.2	4.7	0.3
	Industry	%	7.5	4.2	8.4	10.3	10.3	9.9	11.4
	Service	%	7	3.3	8	8.6	4.6	6.4	6.5
3	Aggegate demand saving								
	Consumption	% of GDP	82.6	82.1	80.7	84.6	83.1	80	78.9
	Investment	% of GDP	28	24.4	27.6	29.9	30.6	29.5	29.7
	Net exports	% of GDP	-10.6	-6.5	-8.3	-14.5	-13.7	-9.5	-8.6
	Exports	% of GDP	39	21.3	22.4	23.1	22.8	22.5	22.3
	Imports	% of GDP	49.6	27.8	30.7	37.6	36.5	32	30.9
	Domestic savings	% of GDP	17.4	17.9	19.3	15.4	16.9	20	21
	National savings	% of GDP	21.5	23.7	25.4	22.1	24	25.8	27
4	EXTERNAL TRADE:								
	Trade balance	US$ million	-1,798	-3,122	-4,825	-9,710	-9,417	-7,609	-8,287
	Exports	US$ million	5,522	7,085	8,626	10,559	9,774	10,394	11,130
	Imports	US$ million	7,320	10,207	13,451	20,269	19,190	18,003	19,417
5	PRICES:								
	Colombo CPI (2006/07 = 100), annual average	percentage change		3.5	6.2	6.7	7.6	6.9	3.3
	Wholesale Price Index (1974 = 100), annual average	percentage change	1.7	4.2	11.2	10.6	3.5	9.2	3.2
6	EXCHANGE RATE (ANNUAL AVERAGE):								
	LKR to 1US$	LKR	75.78	114.94	113.06	110.57	127.6	129.11	130.56

Source: Central Bank of Sri Lanka, 2015, "Annual Report-2014"

2.3.3 Penetration of Japanese-affiliated Companies into the Country

According to a survey conducted by JETRO in November 2014, the number of Japanese-affiliated companies operating in Sri Lanka was 118 and 64 of them were registered members of the Japan Chamber of Commerce and Industry (JCCI).

Among the 64 members of the JCCI, 24 were manufacturing companies, 20 were construction companies and the rest were trading and service entities.

Table 2-6: List of Japanese-affiliated Companies Operating in Sri Lanka

Types	Name of the companies		
Manufacturing (24 companies)	Colombo Dock Yard	D&O International	Jagreen
	Lanka Ecom	Lanka Naigai	MASPRO Lanka
	MIC Lanka	Mogami Steel Tech	Metatechno Lanka
	Tokyo Cement	Tropical Funding	Okaya Lanka
	Colombo Power	FDK Lanka	Sato Chemifa Lanka
	Lanka Harness	Lanka Pr.	Wakaki Lanka
	MIRRAI	Noritake Lanka	YKK Lanka
	TOS Lanka	Usui Lanka	Inoac Polymer Lanka
Construction (20 companies)	Daiho Corporation	Daimei SLK	DPM Consulting
	Kumagai Gumi	Kurimoto	Maeda Corporation
	Penta-Ocean Construction	Sanken Construction	Shin Nippon Lanka
	J-Power	Kinden	Taisei Corporation
	Nippon Koei	NJS Consultants	TOA Corporation
	Kitano Lanka	Wakachiku Construction	WKK Lanka (World Kaihatsu Kogyo)
	Oriental Consultants	Katahira & Engineers	
Trading and Service (20 companies)	ITOCHU Corporation	Mitsubishi Corporation	Mitsui & Co
	NHS International	Bansei Royal Resorts	Rohto Pharmaceutical Co
	Nihon Bashi	Jalanka International	World Lanka Tours
	Lanka Top (Ginza Hosen)	Shanthi Lanka	Srieko Holidays
	New World Securities	IDEAL Finance	Yusen Logistics & Kusuhara Lanka
	Kaihatsu Management	Expolanka International	Toyota Tsusho
	Toyota Lanka	Tozai Boeki Kaisha	

Source: JETRO, 2014, "Business Environment in Sri Lanka"

In October 2013, JETRO implemented a survey targeting the above companies in order to identify business needs of the companies operating in Sri Lanka. The survey revealed the following breakdown for number of years Japanese-affiliated companies have worked in Sri Lanka: about 40% had worked in Sri Lanka for more than 20 years while 26% for 10 to 20 years and 35% for less than 10 years in the country. This implicates that the penetration of Japanese companies into the country increased after 1995 (Figure 2-1).

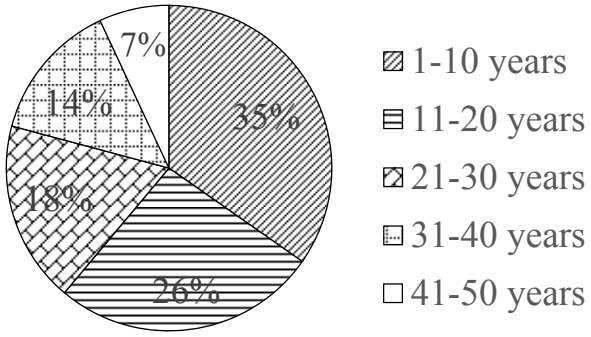


Figure 2-1: Share of Companies by Operated Years in Sri Lanka

According to the results of the survey, the majority of the companies started working in Sri Lanka because of the following reasons:

- Cheap labour
- Expected potential of economic growth
- Implementation of ODA projects
- Connections in Sri Lanka and
- Improvements in public safety.

At the same time, the companies indicated the following items as merits of investing in Sri Lanka:

- Stable political and social conditions
- Expected potential for economic growth
- High quality of human resources and
- Geographical advantage

In addition to the above advantages, there are possibilities that Sri Lanka will function as a gateway to India for Japanese companies and provide them with opportunities of tourism-oriented businesses and penetration to new markets. Therefore, it is expected that penetration of Japanese Companies into the country will increase in the future.

2.4 Administrative Division

For administrative purposes, Sri Lanka is divided into nine provinces and twenty-five districts. There is a parallel mechanism of administrative divisions; one of them is a central government line which is a division under the Ministry of Public Administration and Home Affairs (MoPAHA) and the other is Local Authority (LA) under each Provincial Council (PC). The former has taken over the governance mechanism of the colonial era; the PC was introduced in 1987 with the aim of resolving the post-civil war.

2.4.1 District and Division

Sri Lanka is divided into 25 districts. Each district is administered under a District Secretariat and the District Secretary who is appointed by the central government governs the District. The main tasks of the District Secretariat involve coordinating communications and activities between the central government and the Divisional Secretariats which is affiliated with the District Secretariats. The District Secretariat is also responsible for implementing and monitoring development projects at the district level and assisting lower-level subdivisions in their activities, as well as revenue collection and coordination of elections in the district. A district is divided into 256 Divisional Secretary's Divisions (commonly known as DS divisions),

which are in turn subdivided into Grama Niladhari (GN) Divisions.

2.4.2 Province and Local Authority

There have been provinces in Sri Lanka since the 19th century, but they had no legal status until 1987 when the 13th Amendment to the 1978 constitution established provincial councils after several decades of increasing demand for a decentralization of the Government of Sri Lanka. Although each PC receives administrative support and budget allocation from the Ministry of Local Government and Provincial Councils (MoLGPC), it is an autonomous body not under the authority of any Ministry. Some of its functions have been undertaken by central government ministries, but authority over land and police is not as a rule given to PCs. Prior to 1987, all administrative tasks for the provinces were handled by a district-based civil service which had been in place since colonial times. Now each province is administered by a directly elected PC.

The PC has been given the oversight responsibility for operation and management of LAs; it also has a right to dissolve the LA. There is an administrative officer called the Provincial Commissioner of Local Government (CLG) who is in charge of the LAs in the PC and also the Assistant Commissioner of Local Government (ACLG) who is in charge of the LA of each district.

The LAs are divided into three types according to its population and size: Municipal Councils (MC, 23) which corresponds to the city, Urban Councils (UC, 41) which corresponds to the town, and Pradeshiya Sabha (PS, 271) which corresponds to the village. They are responsible for providing a variety of local public services including roads, sanitation, drains, waste collection, housing, libraries, public parks and recreational facilities. The following shows the distribution of LAs by province and a diagram of government agency relationship in Sri Lanka.

Table 2-7: Distribution of LAs by Province[1]

Province	MC	UC	PS	Total
Central	4	6	33	43
Eastern	3	5	37	45
North Central	1	0	25	26
North Western	1	3	29	33
Northern	1	5	28	34
Sabaragamuwa	1	3	25	29
Southern	3	4	42	49
Uva	2	1	25	28
Western	7	14	27	48
Total	23	41	271	335

[1] Finance Commission of Sri Lanka Annual Report 2013

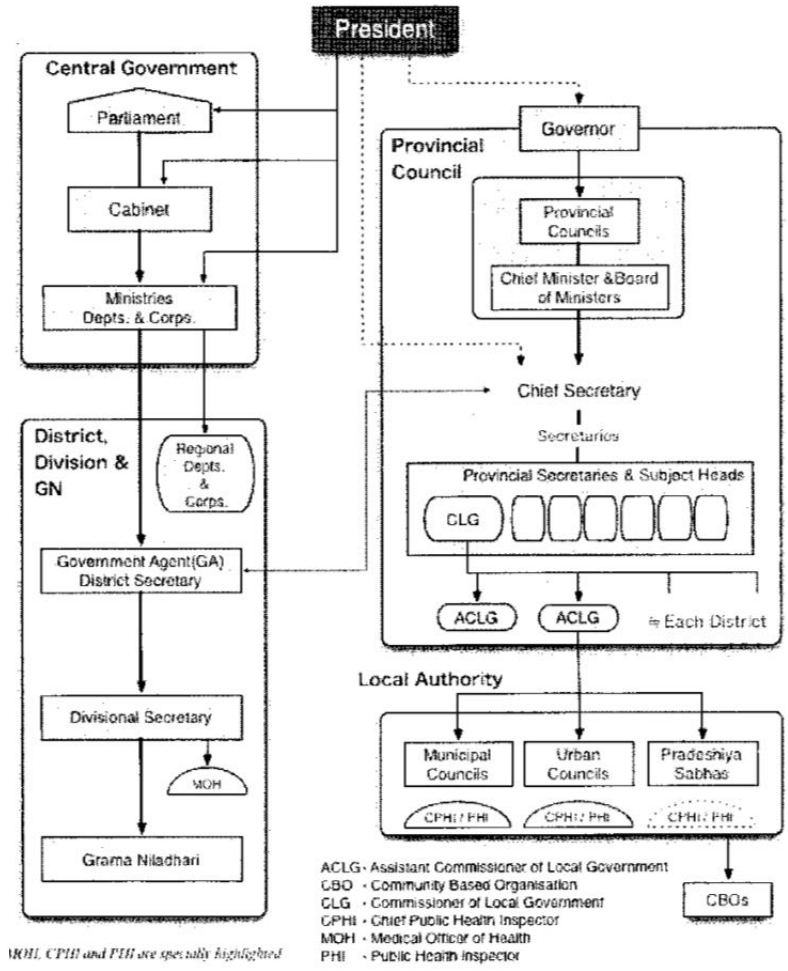


Figure 2-2: Diagram of Government Agency Relationship in Sri Lanka[2]

2.5 Institutional System According to the Waste Management

2.5.1 Jurisdiction and Role of Related Institutions

a. Central Government Agencies

Central government agencies that are related to laws and administrations of waste management are the Ministry of Local Government and Provincial Councils (MoLGPC) responsible for the local government, the Ministry of Mahaweli Development and Environment (MoMDE) which are leading administrative guidance from the perspective of environmental protection, the Ministry of Megapolis and Western Development (MoMWD) responsible for planning for the megapolis development, and the Ministry of Health, Nutrition and Indigenous Medicine (MoH) which are leading administrative guidance from the perspective of health and sanitation. In addition, National Solid Waste Management Support Center (NSWMSC) and the Central Environmental Authority (CEA) are affiliated respectively to the MoLGPC and MoMDE. An overview of the role and jurisdiction of each agency is shown below.

[2] Excerpted from the Preliminary Survey Report of Capacity Upgrading Project for National Solid Waste Management Support Centre in Sri Lanka (2007)

Related Agencies	Role and Jurisdiction
Ministry of Local Government and Provincial Councils (MoLGPC)	They are responsible for the implementation of policies and plans for Local Authorities (LA) through the nine Provincial Councils (PC). They are mainly responsible for the coordination between the central government and PCs, supporting the formulation and implementation of national policy related to PCs and LAs, financial and technical assistance, and assistance for human resources development and research for good governance. In this Ministry, there are other institutions such as the Local Loan and Development Fund (LLDF) responsible for funding for LAs and the Sri Lankan Institute of Local Governance (SLILG) responsible for administrative capacity building and research for LAs.
Ministry of Mahaweli Development and Environment (MoMDE)	They formulate a national policy in relation to waste management. In 1998, they have prepared a municipal waste database in Sri Lanka and made a revision in 2005. While preparing the database, they make use of LAs in waste generation amount surveys and waste composition surveys so that the LAs can understand the importance of recycling, proper waste collection, intermediate treatment, and final disposal.
Ministry of Megapolis and Western Development (MoMWD)	The MoMWD is a new ministry appointed by the Cabinet of Sri Lanka after August 2015 elections. The ministry is in charge of discovering solutions to resolve the garbage, housing of shanty dwellers issues as well as drawing new traffic plans to avoid traffic jams in busy towns. Regarding SWM, since each LA is responsible for managing the regional activities by legislations, the ministry is not directly involved but responsible for assisting LAs with improvement of SWM. On the other hand, since there are a lot of projects related to SWM being carried out by individual ministries and organizations, there was a need for a mechanism for overall management of these activities. Therefore, the ministry as a decision-making organization in accordance with SWM established the Committee of Secretaries, which consists of the top of the following secretaries. They shall collectively manage the activities of the individual institutions that are working individually and all of the SWM projects must be approved by them. • MoMWD • MoLGPC • Ministry of Water Supply and City Planning • Sri Lanka Land Reclamation and Development Corporation（SLLRDC） • Provincial Council of Western Province (Chief Secretary of the province) • MoMDE Currently only the Western Province becomes one of the members of the committee but in the future, all of the provinces are planned to join. [3]
Ministry of Health, Nutrition and Indigenous Medicine (MoH)	They have jurisdiction over the policy-making, monitoring and management of medical waste and they prepared the Healthcare Waste Management National Policy to encourage proper disposal of medical waste. They dispatch the Public Health Inspector (PHI) to all the cities and towns and some of the villages and allocate a post called Chief PHI (CPHI) to a senior PHI who is in charge of supervision and management of PHIs. The Divisional Secretary's Division has jurisdiction over the Medical Officer of Health (MOH), and they are working together with the PHI to

[3] Based on the results of the interview with the additional secretary of MoMWD on January 19, 2016.

Related Agencies	Role and Jurisdiction
	improve and preserve the health and hygiene of the region.
National Solid Waste Management Support Center (NSWMSC)	The NSWMSC was established by the MoLGPC in 2007, was recommended by "the JICA Study on Improvement of Solid Waste Management in Secondary Cities (2002-2003)" in order to assist LAs to improve the solid waste management problem. The staffs consist of 15 officers (1 Director, 3 Assistant Directors, 10 Development Officers, and 1 Management Assistant) in total[4]. Their main duties are as follows: • To provide a variety of manuals and guidelines to facilitate LAs to implement proper SWM. • To provide a variety of technical assistance on solid waste management to LAs. • To collect and study information on the current SWM practices and the practices in LAs, as well as those in foreign countries. The NSWMSC then provides this useful information to LAs. • To facilitate LAs to get technical and financial assistance from NGOs and donors • To promote, evaluate, and make recommendations to the National Strategy for Solid Waste Management. • To collect and analyse the waste management data of LAs. The organizational chart of the NSWMSC is shown in the following Figure2-2.
Central Environmental Authority (CEA)	The CEA is one of the main implementing arms of the National Environmental Act (NEA) under the MoMDE and is responsible for the supervision and management of solid waste. They consist of six major divisions such as the Human Resource Development, the Administration & Finance Division, the Environmental Pollution Control (EPC) Division, the Environmental Management and Assessment (EM&A) Division, the Environmental Education and Awareness (EE&A) Division, the Project Division and the Provincial Networking Division. The Environmental Assessment Unit under the Environmental Management and Assessment Division is responsible for implementing the Environmental Impact Assessment process according to the NEA. The Environmental Pollution Control Division is engaged in regulatory activities associated with the contamination of air, water, soil and industrial pollutions. These functions are performed by the following four units: Pollution Control Unit, Waste Management Unit, Laboratory Services Unit and Monitoring Unit. The Waste Management Unit is in charge of the Scheduled Waste Management. The Project Division consists of the following four units: the Pilisaru Waste Management Project Unit, the Waste Disposal Facility Construction Unit, the National Post Consumer Plastic Waste Management Project (NPCPWMP) Unit and the Sanitary Landfill Site Unit[5]The organizational chart of the CEA is shown in Figure2-3.

[4] Based on the results of the interview on August 25, 2015
[5] Based on the results of the interview on August 31, 2015

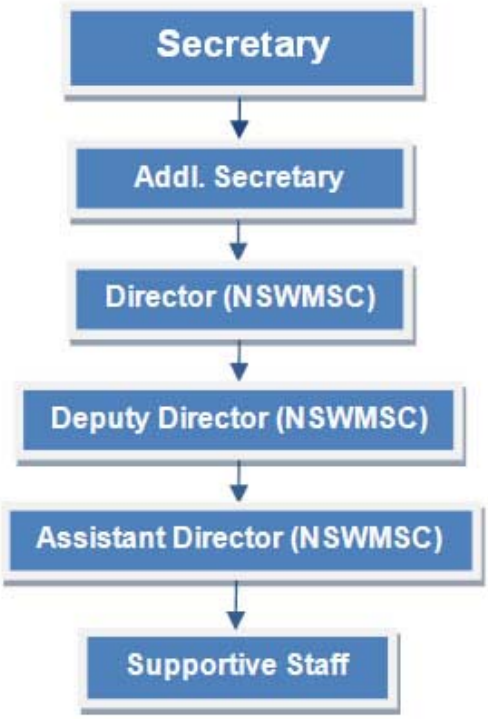


Figure 2-3: Organizational Chart of the NSWMSC[6]

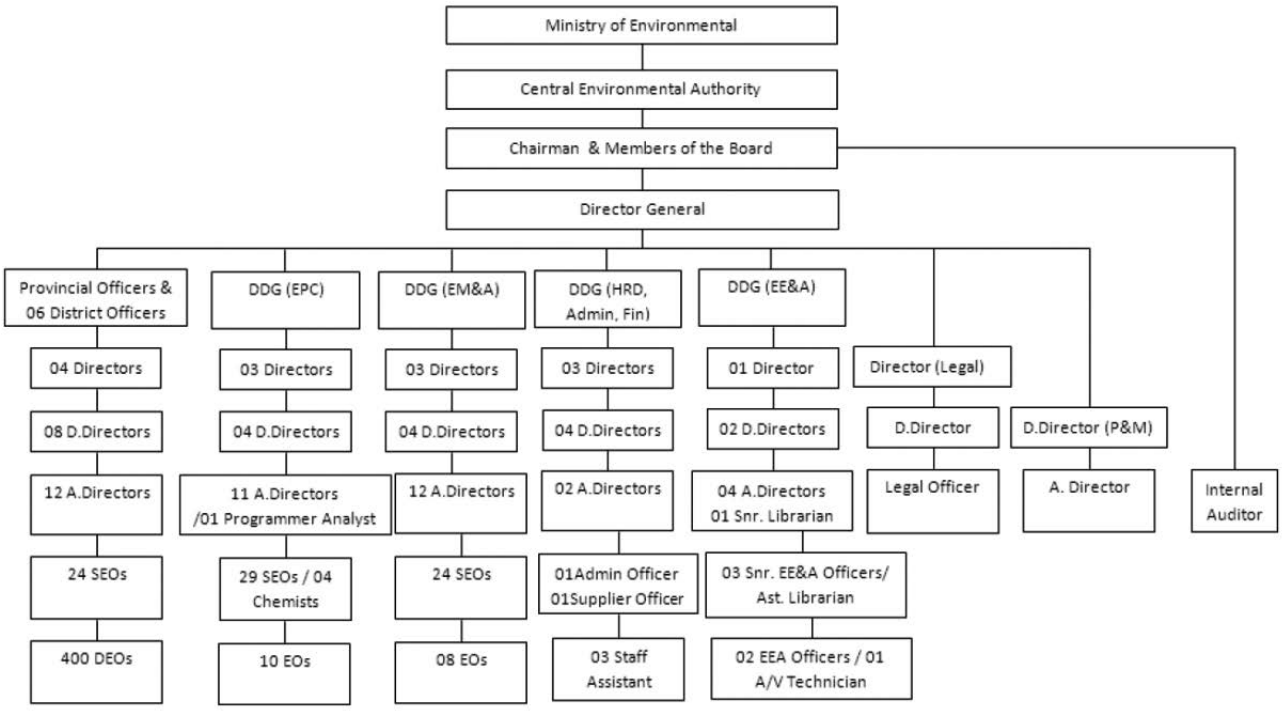


Figure 2-4: Organizational Chart of the CEA[7]

[6] NSWMSC website (http://www.lgpc.gov.lk/eng/?page_id=1118)
[7] CEA Annual Report 2012

b. Local Government Agencies

At the local level, as supervision rights over LAs was handed over from central government to the PCs through the 13th Amendment of the 1987 constitution, the rights relating to waste management were accordingly handed over to the PC. Also LAs are responsible for collection and disposal of waste generated by residents who live in the region.

Only in the Western Province, the Waste Management Authority (WMA), founded under the Western Provincial Council, is in charge of the cluster waste management system. An overview of the role and jurisdiction of each agency is shown below.

Related Agencies	Role and Jurisdiction
Provincial Council (PC)	There are nine PCs across the country. They provide substantial administrative guidance to the District and LAs of the region. Their duty is to provide administrative services for the basic daily life of citizens and community such as waste management. Regarding financial assistance for waste management in LAs, LAs have to submit the application of costs – excluding small amounts (5,000-15,000Rs.) – including costs associated with the placement of staff to the PC. It is necessary to get approval from the PC. The PC has engineers in the Local Government Department in the PC, therefore they dispatch engineers in cases where the LA does not have engineer(s) but needs technical support or guidance for waste disposal, or there is a request from LAs. If a ministry asks LAs for some request(s) or guidance, it has to be done through the PC.
Local Authority (LA)	LAs, under the supervision of the PCs, are responsible for providing administrative services in accordance with the regional environment such as health and hygiene, waste disposal, regional environmental protection, and park management. Although they are able to formulate the laws through parliament and to give instructions to the regional police, it is said that the legislative system of local government is not fully functional. The CPHI (Chief PHI) or the Public Health Department in LAs that is directed by the PHl conduct actual operations and management of municipal waste. The(C) PHl conducts not only collection, transportation, and disposal of waste but also supervises the health management of waste collection workers and gives guidance and training on waste collection (e.g. health management guidance such as wearing gloves). In addition, they are in charge of recording the attendance of waste collection workers and their allocation for collection area(s), and receiving complaints from residents.

2.5.2 Jurisdiction and Role of Related Institutions in Western Province

Western Province consists of three districts; Gampaha, Colombo, and Kalutara and there are 48 LAs within the region. There are 13 LAs in the Colombo District that has the most serious SWM problems among all districts and they share three disposal sites (Karadiyana, Meethotamulla, and Kaduwela). In the Western Province, the Waste Management Authority (WMA) is responsible for supporting LAs to improve their SWM. An overview of the role and jurisdiction of each agency is shown below.

Related Agencies	Role and Jurisdiction
Western Provincial Council (WPC)	The WPC provides substantial administrative guidance to the District and LAs of the Western Province; however SWM is delegated to the Waste Management Authority (WMA), which was established under the WPC. All of LAs in the Western Province are supposed to manage their wastes in accordance with the MSW Management Rule No.1 (2008) formulated by the WPC. The Department of Local Government (DLG) under the WPC is responsible for coordination between LA and the central government / WPC in the Western Province, for monitoring the financial status of each LA and also for allocation of subsidies from the central government and WPC to each LA taking into account the sector-specific maximum expenditure (Ceiling) defined by Finance Commission and the priority of expenditures. The head of the DLG is appointed as the Commissioner of Local Government (CLG), under which there are three Assistant Commissioners in charge of each district in the Western Province.
Waste Management Authority of Western Province (WMA)	WMA, established in 2004 under Waste Management Statute No.9 of the Western Provincial Council in 1999 is responsible for supervision of waste management of the entire WP. The WMA Statute No.1 was formulated in 2007 and it specifies jurisdiction, function and responsibility of the WMA. According to the statute, WMA is responsible for providing technical and financial assistances to all Las of the WP to build their capacities in SWM, collecting waste data in WP, developing common final disposal sites to LAs and also assisting to LAs to inculcate waste management discipline among the public (through public awareness activity and environmental education etc.). WMA formulated the five-year Action Plan for 2015 - 2020, the targets such as improving the collection rate up to 72% by 2020 from 61% in 2015, the recycling rate (based on waste generation amount) up to 38% by 2020 from 17% in 2015, the recovery rate by compost and incineration up to 71% by 2020 from 13% in 2015 have been set. Seven LAs (Moratuwa MC, Boralesgamuwa UC, Kesbewa UC, Dehiwala Mount Lavinia MC, Sri Jayewardenapura Kotte MC, Maharagama UC, Homagama PS) out of thirteen LAs in the Colombo District are using Karadiyana cluster disposal sites, and WMA is in charge of its operation and maintenance, including the collection of tipping fees. Currently in this disposal site, the Waste Management Plaza has been planned and under construction including such facilities as a sorting yard, bio-methanization, Waste to Energy in addition to the existing composting facility[8]. WMA consists of five working divisions including Technical Section, Financial Section, Administrative Section, Legal Section and Media Section. The organizational chart of the WMA is shown in the following Figure2-5.
Colombo Municipal Council (CMC)	WMA is in charge of macro management and planning of SW of entire Western Province. However, CMC is in charge of operation and management of Meethothamulla disposal site which is shared with Kolonnawa UC. Waste collection in CMC is conducted using 90 units of vehicles including 63 compactor trucks which were provided by JICA in the 1990s and collection area is divided into six Districts. Waste collection, street cleaning and waste transportation in the CMC are conducted by the outsourced two private companies (Carekleen and Abans) according to the waste management guidelines formulated by the CMC. The collection coverage are is approximately 100%.

[8] Based on the results of the JICA data collection survey

[8] WMA Our Plans for the Future Period Goals Objectives Strategies &Act

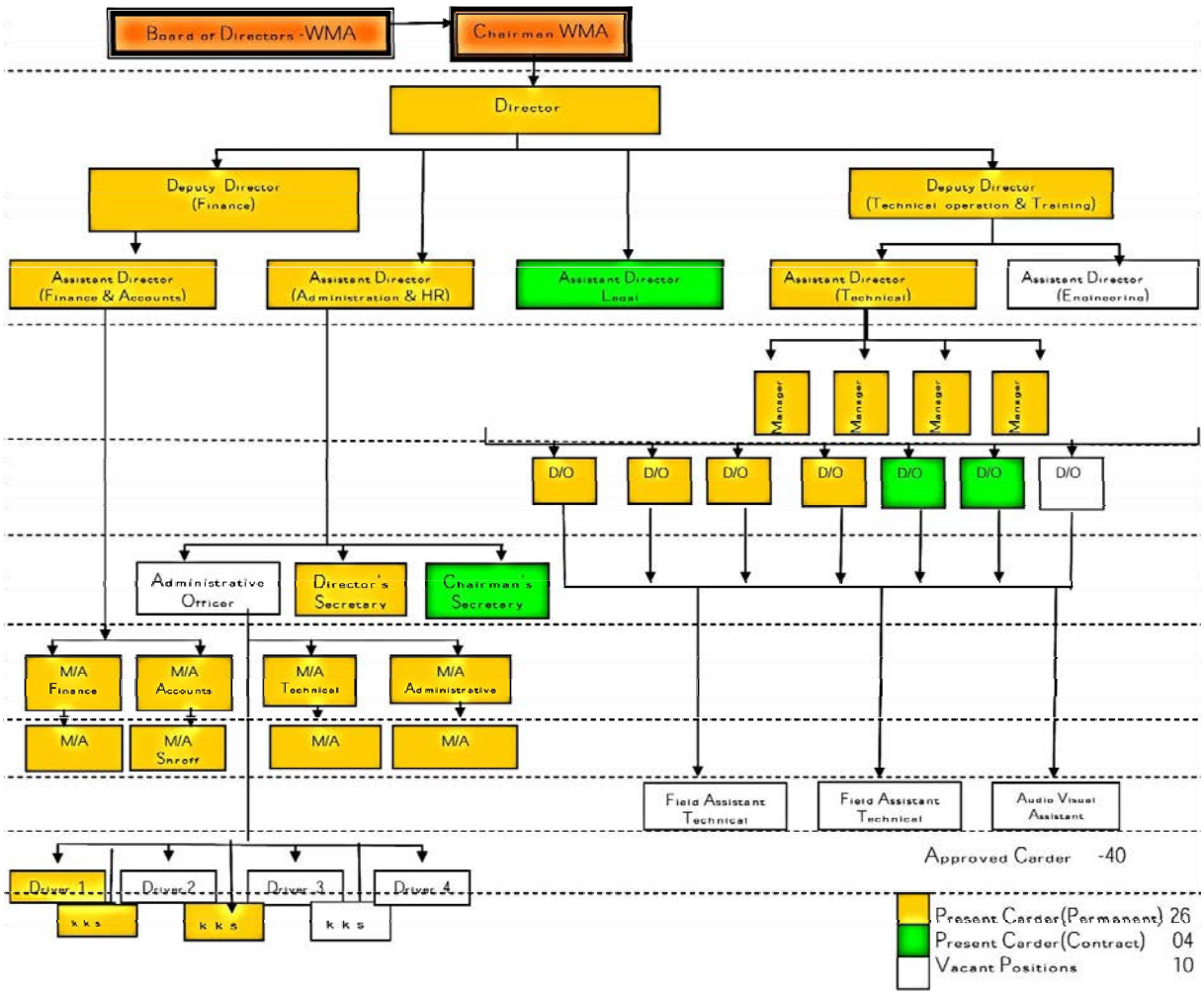


Figure 2-5: Organizational Chart of the WMA[9]

ion Plans

[9] WMA Our Plans for the Future Period Goals Objectives Strategies &Act

3 Current Status and Issues of the Solid Waste Management Sector

3.1 National Level Plan and Strategy

In Sri Lanka, the National Strategy for Solid Waste Management (NSSWM) has been formulated in 2000. It stipulates solid waste management to be conducted as follows:

- Prioritize waste avoidance and reduction over the next stage of waste recycling and other forms of environmentally sound disposal
- Reuse unavoidable waste as much as possible
- Maintain the content of hazardous substances in waste at the lowest possible level and
- Guarantee an environmentally sound residual waste treatment and disposal as basic prerequisites for human existence.

In 2007, the National Policy on Solid Waste Management[10] was formulated. It defines the environmental accountability and social responsibility of all waste generators, waste managers and service providers and aims to actively involve individuals and all institutions in integrated and environmentally sound solid waste management practices.

Consequently, the CEA initiated the "Pilisaru" National Solid Waste Management Program in 2008 and donated a grant totalling about 5.6 billion rupees (about 4.6 billion yen) to the local governments that implement solid waste management activities.

On the other hand, the Sri Lanka Government prioritizes appropriate and sustainable SWM, a Ten-year Horizon Development Framework (2006-2016)" and identifies the importance of the promotion of the 3Rs and the establishment of an environmentally friendly final disposal site for sustainable SWM system. The government is preparing the investment plan. In 2009, they also formulated the "National Action Plan for the Haritha Lanka Programme (2009 ~ 2016)" with the aim of sustainable development, in which they identify SWM as one of the priority issues and set a strategy for adopting appropriate infrastructure and/or alternative methods necessary for SWM in each LA. The national level plans and policies/strategies in Sri Lanka are summarized in the following table.

Table 3-1: Plans and Policies/Strategies related to SWM

Year	Policy & Regulation	Description
2000	National Strategy for Solid Waste Management (NSSWM)	■ 3-years action plan, Waste reduction, 3R implementation
2003	Caring for Environment Phase I (2003-2007) Phase II (2008-2012)	■ Funded by United Nations Developing Program; UNDP ■ National Environmental Action Plans
2005	Vision for A New Sri Lanka	■ A Ten Year Horizon Development Framework 2006-2016 formulated by Ministry of Finance and Planning ■ Solid waste and pollution management included in the investment plan
2007	National Policy on Solid Waste Management	■ Waste reduction, 3R implementation, Sanitary landfills ■ Capacity building, Research and development (Best Available Technologies (BAT), Best Environmental Practices (BEP)
2008	Pilisaru Programme Phase I(Jan. 200 –Dec. 2013) Phase II(Jan. 2014–Dec. 2018)	■ National level programme for solid waste management under the chairmanship of Ministry of Environment, CEA, and others. ■ Initial budget amount: 5.675 bil LKR. ■ Target is to introduce small and medium waste treatment system in all local government authorities by year 2018 and to cover 50% by year 2016.
2009	National Action Plan for Haritha Lanka Programme	■ Establishment of National Council for Sustainable Development (NCSD) ■ Sustainable development: Harita (Green) Lanka Programme

3.2 Laws and Regulations related to Waste

3.2.1 Waste Management

a. Legal Framework

In Sri Lanka, LAs are responsible for collection and disposal of waste generated by residents who live in the region, which is stipulated in the Municipal Councils Ordinances No.16, Urban Council Ordinance No.61, and Pradeshiya Sabha Act No. 15. Each LA has been given the authority to define the implementation rules necessary for the waste management and regulation and to impose penalties.

At the provincial level, as supervision right over LAs was handed over from the central government to the PCs through the 13th Amendment of the 1987 constitution, its rights relating to waste management were accordingly handed over to the PC in the Provincial Council Act No. 42.

In 1980, the MoMDE formulated the National Environmental Act (NEA) No.47 aiming to preserve the environment, to maintain environmental quality and to prevent pollution. Consequently, the CEA has been established and their jurisdictions, functions, and responsibilities are defined in the NEA. Furthermore, the Amendment to the NEA in 1993 requires an Environmental Impact Assessment (EIA) for the establishment of such facilities as intermediate treatment and final disposal site(s) with a capacity exceeding 100 ton/day. The legal frameworks related to SWM are summarized in the following table.

Table 3-2: Legal Frameworks Related to SWM

Year	Policy & Regulation	Description
1939	Urban Council Ordinance No. 61 of 1939	■ Sections 118, 119, and 120 ■ Specify waste management responsibilities of UCs
1946	Nuisance Ordinance No. 62 of 1939 and No. 57 of 1946	■ Section 1-12
1947	Municipal Councils Ordinances No. 16 of 1947	■ Sections 129, 130, and 131 in 1980 ■ Legal and regulatory framework for waste management at the MC level
1979	Code of Criminal Procedure Act No. 15 of 1979 – Public Nuisances	■ Section 98
1987	Provincial Councils Act No.42 of 1987	■ Amended by Act No.56 of 1988 ■ LAs contain provisions for waste management
1987	Pradeshiya Sabha Act No.15 of 1987	■ Sections 93 and 94 ■ Specify waste management responsibilities of PSs
1980	National Environmental Act No.47 of 1980	■ Section 12 and 26 ■ Establishment of CEA ■ Amended by Act No.56 of 1988 (Introduction of EPL, IEE, EIA) ■ Amended by Act No. 53 of 2000, Gazette Extra ordinary No.1466/5 of 2006
2007	Prevention of Mosquitoes Breeding Act No.11 of 2007	■ Prohibition against creating conditions favourable to the breeding of mosquitoes.
2008	National Thoroughfares Act No. 40 of 2008	■ Section 64 (a), (b), (c) and Section 65
2009	Gazette No. 1627/19 National Environmental (Municipal Solid Waste) Regulations, No. 1 of 2009.	■ General Rules on SWM discharge and collection of waste(Prohibition of waste dumping at national highway and at any place other than places designated for such purpose by the LA

b. Environmental Standards

The wastewater discharge standards are stipulated under the NEA according to the type of industries and discharge methods. According to the list of "The prescribed activities for which a license is required" (NEA No. 47, 1980 Section 23A amended by Act No. 1533/16 2008, CEA), Waste Water Treatment Plants (WWTPs) as well as hospitals and factories using hazardous substances are required to register on an annual basis. Amendments are also being proposed to

the NEA to overcome delays in enforcement actions. No amendment components address "wastewater" of any kind at present.

National Environmental (protection and quality) Regulation (EPL) -1990. Gazette Notification Number 595/16 in 1990 and its amendment of Gazette Notification Number 1534/18 in 2008 provide the "General Standards for discharge effluents into inland surface waters". The EPL is applied for the following projects related to SWM11;

- Common wastewater (industrial or sewage) treatment plants
- Incinerators with a feeding capacity of five or more metric tons per day.
- Water treatment plants with a treatment capacity of 10,000 or more cubic meters per day.
- Municipal solid waste and other solid waste composting plants with a capacity of 10 or more metric tons per day.
- Solid waste recovery/recycling or processing plants with a capacity of 10 or more metric tons per day.
- Solid waste disposal facility with a disposal capacity of 10 or more metric tons per day.
- All toxic and hazardous waste treatment facilities or disposal facilities or recycling/recovering or storage facilities.
- The defined project for the SWML is Industries /facilities that generate scheduled waste.

The Scheduled Waste Management License (SWML) is stipulated in the in the Gazette Extra ordinary No. 924/13 of 1996, No. 1159/22 of 2000, and No. 1533/16 of 2008. There is no penal clause for non-compliance although legal action is always necessary against the violation of the regulations.

The standards concerning water reuse are published by the Sri Lanka Standards Institute but currently there are no governmental requirements for the usage of sludge. The Sri Lanka Standard for Compost from Municipal Solid Waste and Agricultural Waste - SLSI 1246 was published in 2003. However, the "Sri Lanka Standard Specification for Organic Fertilizers" is still in the draft format. Moreover, the code of practice for design and construction of Bio Gas System for domestic (household) use was published as SLS 1292 – Part 1 in 2006. The publication of Part 2 covering the farm scale system with capacity ranging from 10-100m3 is still in progress[12]. The environmental standards related to SWM in Sri Lanka are summarized in the following table.

[11] Based on the results of the JICA data collection survey

[11] WMA Our Plans for the Future Period Goals Objectives Strategies &Action Plans

[11] WMA Our Plans for the Future Period Goals Objectives Strategies &Action Plans

[11] Naofumi Sato, Ken Kawamoto and Mangalika Lokuliyanaga "Current condition and issues of municipal solid waste management in Sri Lanka" (2014)

[12] JST-JICA SATREPS Project: Environment Business Survey in Sri Lanka (May, 2014)

Table 3-3: Environmental Standards Related to SWM

Year	Pollution control regulation	Descriptions
1983	SLS 614 of 1983 – Part 1	■ Sri Lanka standards specifications for potable water ■ Prescribes the physical and chemical requirements, and methods of sampling and test for drinking water.
1983	SLS 614 of 1983 – Part 2	■ Sri Lanka standards specifications for potable water ■ Prescribes the bacteriological requirements and the methods of sampling and test for drinking water.
1984	SLS 652 of 1984	■ Tolerance limits for industrial effluents discharged into inland surface waters
1984 /1985	SLS 722 of 1984/1985	■ Tolerance limits for inland surface waters for use as raw water for public water supply
1990	Gazette Extraordinary No. 595/16 of 1990	■ National Environmental Protection and Quality Regulations ■ Specify content and specifications of EPL, the tolerance limits for wastewater discharge from major industries and activities ■ Amended by Gazette Extra ordinary No. 924/13 of 1996, No. 1159/22 of 2000, No. 1533/16 of 2008 ■ Scheduled waste management license (SWML)
1993	Gazette Extraordinary No. 772/22 of 1993	■ National Environmental (Procedure for approval projects) Regulations ■ Specify project approval agencies, projects for IEE/EIA approvals ■ Amended by Gazette Extra ordinary No.859/14 of 1995 and No. 1104/22 of 1999
1994	Gazette Extraordinary No. 850/4 of 1994	■ National Environmental Regulations on Ambient Air Quality ■ Amended by Gazette Extra ordinary No. 156/22 of 2008
1996	Gazette Extraordinary No. 924/12 of 1996	■ National Environmental Noise Control Regulations
2000	Gazette Extraordinary No. 1137/35 of 2003	■ National Environmental Regulations for Mobile Air Quality (Air Emission, Fuel and Vehicle Importation Standards)
2003	SLSI1246 of 2003	■ Sri Lanka Standard for Compost from Municipal Solid Waste and Agricultural Waste
2006	SLS 1292 of 2006	■ Code of Practice for Design and Construction of Biogas Systems – Part 1 Domestic Biogas Systems
2006	Gazette Extraordinary No. 1466/5 of 2006	■ Regulation on Prohibition of Manufacture of Polythene or Any Product of 20 micron or below thickness
2008	Gazette Extraordinary No. 1534/18 of 2008	■ National Environmental Protection and Quality Regulations ■ Management of scheduled waste

c. Guidelines

Guidelines related to SWM have been developed by several relevant ministries. Among them, the guidelines developed by the CEA are to provide guidelines on the basic waste treatment technology at the national level. But the CEA hopes that the local governments will be able to review them and develop more stringent guidelines by themselves in the future. The guidelines related to SWM in Sri Lanka are summarized in the following table.

Table 3-4: Guidelines Related to SWM

Year	Guideline	Relevant authority	Descriptions
2001	Healthcare Waste Management Guideline	Ministry of Health, & Indigenous Medicine	To provide evidence based recommendation to clinicians to manage hospital generated waste with minimum harm to the environment.
2003	Solid Waste Management Guideline for Local Authorities	Ministry of Home Affairs, Provincial Councils and Local Government	To support the SWM practice for LAs
2005	Technical Guidelines on Municipal Solid Waste Management in Sri Lanka	Central Environmental Authority (CEA)	To support the SWM and sitting of engineered landfills
2007	Technical Guidelines on Solid Waste Management in Sri Lanka	Central Environmental Authority (CEA)	To support the SWM and sitting of engineered landfills[13]
2009	Guidelines for the Management of Scheduled Waste in Sri Lanka	Central Environmental Authority (CEA)	To manage the scheduled waste management

[13] Regarding the final disposal, there is a regulation on open dumping by law but there are only two sanitary landfill sites (the Moon Plains Landfill Site in Nuwara Eliya, Maligawatte Landfill Site in Dompe) and it is difficult for small LAs with less than 10 ton/day of waste generation amount to construct a final disposal site taking into consideration their financial capacity. Therefore, the guideline has flexibility and does not require the installation of leachate treatment facility.

3.2.2 Environmental Impact Assessment (EIA)

a. The law and guideline related to EIA

The EIA in Sri Lanka was introduced in the Coastal Conservation Act No.57/1981, but the EIAs for projects was only implemented in coastal areas. On the other hand, the National Environmental Act (NEA), enacted in 1980 and amended in 1988, included legislation related to the EIA. The NEA made implementation of an EIA mandatory. In the NEA, the Project Approving Agency (PAA) is responsible for the approval of the EIA. The organization designated as the PAA is to be that which is most relevant depending on the project characteristics such as its size, ecosystem and whether the area is inhabited by rare species and so on. It is also stipulated that the project owner, including the Central Environmental Authority (CEA), cannot be the PAA. Four related gazettes are listed below.

- No. 772/22 (24th of June, 1993)
- No. 859/14 (23rd of February, 1995)
- No. 1104/22 (5th of November, 1999)
- No. 1108/1 (29th of November, 1999)

Outline the type of projects that must conduct an environmental impact assessment (prescribed projects). Prescribed projects are those that have a seriously a negative impact on the environment and/or those that will be implemented in an environmentally sensitive area. The EIA is mandated in the National Heritage and Wilderness Act in 1988, the North Western Provincial Council Environmental Statute in 1990 and the Fauna and Flora Protection Ordinance in 1993.

Table 3-5: Act, Statute and Ordinance list which mandate EIA

Name	Targeted Area	Enacted/amended year	Project Approving Agency
Coastal Conservation Act	Coastal Area	1981	Coast Conservation Department (CCD)
National Environmental Act	The area provided in Part IV C	1988	Central Environmental Authority and related authorities and departments
National Heritage and Wilderness Act	Nature and wilderness area	1988	Department of Wildlife Conservation
North Western Provincial Council Environmental Statute	Northwestern province	1990	Provincial Environmental Authority of the North Western Province
Fauna and Flora Protection Ordinance	Within 1 mile form National Protection area	1993	Department of Wildlife Conservation

Reference: Profile on Environmental and Social Considerations in Sri Lanka (JICA, 2012)

Guidance for Implementing the Environmental Impact Assessment Process was prepared in 1993 by the CEA to enhance implementation of the EIA procedure by the PAA and the latest version was made in 2006.

b. The contents of EIA procedure

The NEA divides the EIA procedure into two steps according to the project scale and extent and

level of negative impact of the project. The details are as follows.

b.1 Initial Environmental Examination (IEE)

The Implementation of the IEE shall be mandatory when the PAA deems that the project doesn't have a severe environmental impact. The IEE report shall normally be composed within 10 pages and it should be conducted based on a brief survey of relevant documents and data. The composition of the IEE report is as follows:

1. Executive summary
2. Objective, necessity and statutory requirement for the project
3. General and current environment
4. Environmental impact
5. Mitigation measures and environmental monitoring plan
6. Appendix

b.2 Environmental Impact Assessment (EIA)

The Implementation of the EIA shall be mandated when the PAA deems that the project has a severe environmental impact. The EIA report shall include not only the general survey, assessment and evaluation but also the Cost Benefit analyses. Generally, the projects targeted for the EIA in Sri Lanka are large scale developments for water resources, construction of roads and pipelines including environmental protection areas. The composition of the EIA report is as follows:

1. Executive summary
2. Objective, necessity and statutory requirement for the project
3. Outline of the project and alternative plan
4. Environmental impact
5. Mitigation measures and Cost and benefit analyses
6. Environmental monitoring planning
7. Appendix

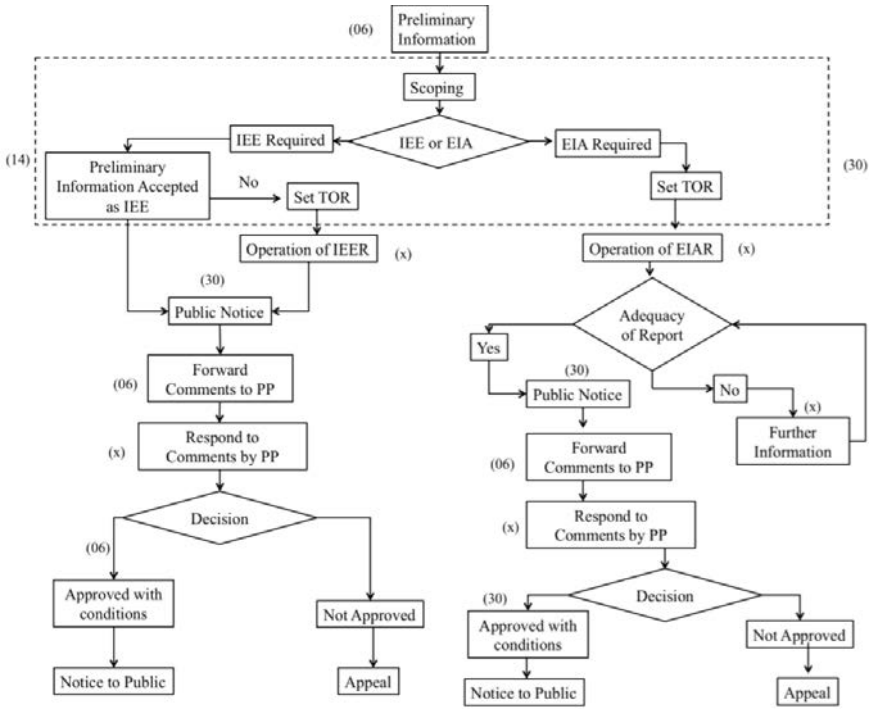
c. EIA procedure

1. The Project Proponent (PP) supplies preliminary information to the PAA.
2. The PAA implements scoping (environmental assessment) considering the environmental impact and then, along with related organizations, asks the PP questions regarding the project. The PAA then carries out the implementation decision of the EIA or IEE, taking the results of questions into account, and then it finalizes the TOR for the project.
3. The PP prepares the IEE/EIA report in three languages; English, Sinhala and Tamil. After it is submitted to the PAA, the PAA publishes the IEE/EIA report in the aforementioned three languages in the newspaper.
4. The PAA and the CEA review the IEE/EIA report and then the PAA notifies the PP of their questionnaire for the project. Their questionnaire and opinion can be looked through (reviewed) for 30 working days. If there is an argument between residents, the PAA and CEA have to hold a public hearing.
5. The PAA can require the PP to provide clear and detailed answers depending on the residential review.
6. The PAA can determine if a project gets passed or rejected with the CEA's approval. In case it passes, the project shall be within acceptable environmental impact levels.
7. In case it is rejected, a petition by the PP shall be permitted.

8. In case it is passed, the PP and the PAA shall implement the monitoring for environmental impact items.

d. Approval procedure for EIA

The flow of the EIA procedure by the PAA is as follows



Source: Road Development Authority. 2009. Environmental and Social Safeguards Manual.

Figure 3-1: The flow of EIA procedure by PAA

Review and monitoring of the development project at the coastal area by the Coast Conservation Department shall be required under the Coastal Conservation Act. The flow of the EIA procedure by the CCD is similar to the PAA flow.

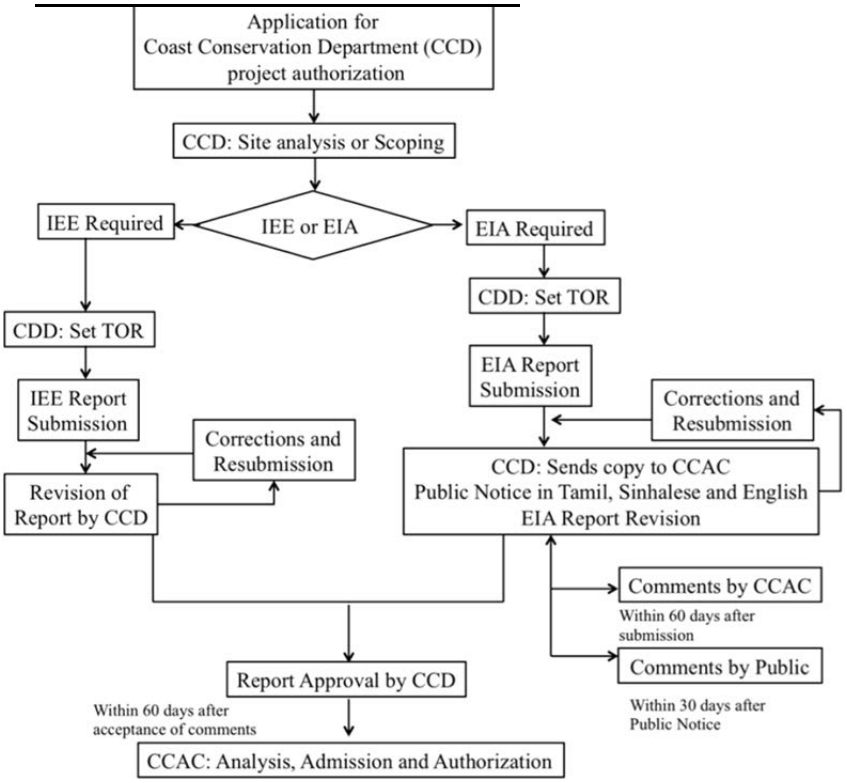


Figure 3-2: The flow of EIA procedure by CCD

e. The Laws and regulations related to EIA

The Laws and regulations related to EIA are as follows

Table 3-6: The Laws and regulations related to EIA

No.	Name of legislations and Policies	Year
1	Forest Ordinance No. 16 of 1907 (as amended) and the Rules and Regulations underthe Ordinance	1907
2	Fauna and Flora Protection Ordinance No. 2 of 1937 (as amended by Act Nos. 49 of 1993, 12 of 2005) and the Regulations under the Ordinance	1937
3	Mines and Minerals Act	1973
4	National Water Supply and Drainage Board Law	1974
5	Coast Conservation Act	1981
6	National Aquatic Resources Research and Development Agency Act	1981
7	National Heritage Wilderness Act	1987
8	National Environmental Action Plan	1991
9	Clean Air 2000 Action Plan	1993
10	Forestry Sector Master Plan: To translate policy strategies into action (1995–2020)	1995
11	National Biodiversity Conservation Action Plan	1998
12	National Industrial Pollution Management Policy	1998
13	National Strategy for Solid Waste Management	2002
14	Caring For The Environment 2003–2007: Path to Sustainable Development, the successor of NEAP 1998–2001	2003
15	National Environment Policy	2003
16	National Forestry Policy	2005
17	Progress Report 2011 and Action Plan 2012 (regularly published)	2012
18	Biodiversity Conservation in Sri Lanka: A Framework of Action	1998
19	Forestry Sector Master Plan—to translate policy strategies into action (1995–	1995

No.	Name of legislations and Policies	Year
	2020)	
21	National Biosafety Policy	2005
22	National Forestry Policy	2005
23	National Policy on Elephant Conservation and Management	2006
24	National Wetland Policy and Strategy	2006
25	National Wildlife Policy	2000
26	National Environmental Act No. 47 of 1980 (as amended by Acts No. 56 of 1988 and 53 of 2000) and the Regulations under the Act	1980
29	Mahaweli Authority of Sri Lanka Act No. 23 of 1979 (as amended) and the Regulations under the Act	1979
30	State Lands Ordinance No. 8 of 1947 (as amended) – Parts VI, VIII, IX	1947
32	Irrigation Ordinance No. 32 of 1946 (as amended) – Part VI	1946
33	Water Resources Board Act No. 29 of 1964 (as amended)	1964
34	Coast Conservation Act No. 57 of 1981 (as amended)	1981
35	Marine Pollution Prevention Act No. 35 of 2008	2008
36	Fisheries and Aquatic Resources Act No. 2 of 1996 (as amended)	1996
37	National Heritage Wilderness Areas Act No. 3 of 1988	1988
38	Soil Conservation Act No. 25 of 1951 (as amended)	1951
39	Plant Protection Act No. 35 of 1999	1999
40	Felling of Trees (Control) Act No. 9 of 1951 (as amended)	1951
41	Flood Protection Ordinance No. 4 of 1924 (as amended)	1924
42	Water Hyacinth Ordinance No. 4 of 1909	1909
43	Control of Pesticides Act No. 33 of 1980 (as amended)	1980
44	Atomic Energy Authority Act No. 19 of 1969	1969
45	Health Services Act No. 12 of 1952 (as amended)	1952
46	Municipal Councils Ordinance No. 29 of 1947 (as amended)	1947
47	Urban Councils Ordinance No. 61 of 1939 (as amended)	1939
48	Pradeshiya Sabha Act No. 15 of 1987 (as amended)	1987
49	Urban Development Authority Law No. 41 of 1978 (as amended)	1978
50	Sri Lanka Land Reclamation and Development Corporation Act No. 15 of 1968 (as amended)	1968
51	Agrarian Development Act No. 46 of 2000 – Part II	2000
52	National Aquaculture Development Authority of Sri Lanka Act No. 53 of 1998 (as amended)	1998
53	Sri Lanka Sustainable Energy Authority Act No. 35 of 2007	2007
54	Code of Criminal Procedure Act No. 15 of 1979 (as amended) – Section 98 and Section 261 of the Penal Code (as amended)	1979
55	Nuisances Ordinance No. 15 of 1862 (as amended)	1862
56	Land Acquisition Act, No. 9 (1950/1956)	1950
57	Crown Lands Ordinance (1956/1960)	1956
58	Land Development (Amendment) Act, No. 9	1995
59	Land Development (Amendment) Act, No. 20	1996
60	A Reprint of the Land Development Ordinance (Chapter 464) as amended by Acts Nos. 60 of 1961 and 16 of 1969	1935
61	Temple Land Compensation Ordinance	Unknown
62	Guidance for Implementing the Environmental impact Assessment Process, Central Environmental Authority, No. 1 - General Guide for Project Approving Agencies (PAA), No. 2 - General Guide for Conducting Environmental Scoping	1995
63	Environmental Guidelines for Road and Rail Development in Sri Lanka, Central Environmental Authority	1997
64	National Involuntary Resettlement Policy	2001

Source: Profile on Environmental and Social Considerations in Sri Lanka, July 2012, JICA

f. Permission and License related to Environment

The Environmental Protection License (EPL) is Sri Lanka's major regulatory program for control of industrial pollution stipulated in the National Environmental Act No. 47 of 1980, which was amended by Acts No.56 of 1988 and No. 53 of 2000. Industries and activities that have to be issued EPLs are classified under three categories: Category A, B and C. If a proposed project falls under Category A, the project proponent requires an EPL from the CEA, while Category C projects require EPLs from the respective local authorities. Like Category A, Category B projects require EPLs from the CEA, but the EPLs can be processed though the regional office of the CEA.

In Sri Lanka, solid waste is categorized into three groups mainly according to the generation sites: Municipal solid waste, health-care waste and hazardous waste. In the actual disposal and treatment, health-care waste is divided into either municipal solid waste (non-hazardous waste) or hazardous waste (NSWMSC and JICA 2008).

Municipal solid waste is managed by Local Authorities (LAs). While the disposal and treatment of hazardous waste is the responsibility of the discharger, the CEA is responsible for the supervision of hazardous waste management. As for municipal solid waste (non-hazardous waste), the CEA asks LAs for site clearance of municipal solid waste facilities, including landfills. A facility that receives over 100 tons/day has to perform an EIA and receives approval while one that receives less than 100 tons/day needs only an environmental recommendation from the CEA (NSWMSC and JICA 2008). In addition to an EIA, a facility that receives over 10 tons/day has to obtain an EPL.

3.3 Current Situation of Waste Management Sector

3.3.1 Collection and Disposal Amounts of General Waste

The waste generation amount in Sri Lanka has increased from around 6,400 ton/day in 1999 (UNEP, 2001) to 10,786 ton/day since 2009 (University of Moratuwa and NSWMSC, 2013) due to the economic growth after the end of the civil war.

Among the nine provinces, the generation amount of the Western Province is the largest, accounting for 33% of the total generation amount of the country while that of the Uva Province occupies the smallest share of generation amount (only 5%). As for amounts of collected waste, the amount of waste collected in the Western Province is also the biggest occupying 52% in the total collected waste of Sri Lanka and those of the Uva and the North-central provinces are the smallest accounting for only 3%. The waste collection rate in the Western Province, which includes the major metropolitan areas, is 51%, the highest among all the provinces. On the other hand, the waste collection rate in the North-central province is the lowest (15%).

As some local authorities operate several disposal sites, the number of final disposal sites in the country was 349 in 2013, exceeding the number of total local authorities (335). The total amount of waste disposed at final disposal sites was estimated to be equal to the total collected waste.

Among the final disposal sites of Sri Lanka, the Moon Plain Disposal Site in Nuwara Eliya was constructed by JICA in 2003 as a controlled disposal site and the regional disposal site in the Ampara District of the Eastern Province was constructed by UNOPS. There is also the Dompe Disposal Site, a sanitary landfill site supported by KOICA.

Detailed information of the waste generation amounts, the collection amounts, the waste collection rates and the number of final disposal sites of Sri Lanka are as follows.

Table 3-7: SWM Indicators of Sri Lanka

Provinces	Generation amounts (ton/day)		Collection amounts (ton/day)		Collection rates	Number of final disposal sites
1. Northern	566	5%	178	5%	31%	16
2. Eastern	785	7%	347	10%	44%	40
3. North-central	616	6%	91	3%	15%	35
4. North-western	1,134	11%	187	5%	16%	45
5. Central	1,585	15%	304	9%	19%	47
6. Sabaragamuwa	835	8%	178	5%	21%	30
7. Uva	587	6%	116	3%	20%	24
8. Western	3,502	33%	1,793	52%	51%	52
9. Southern	1,158	11%	264	8%	23%	60
Total	10,768	100%	3,458	100%	32%	349

Source: Moratuwa University and NSWMSC, 2013

3.3.2 Intermediate Treatment

In Sri Lanka, one of the major types of intermediate treatment facilities is a compost facility. Although there were 71 compost facilities in 2010, the number increased to 112 and the total processing capacity of the facilities reached 542 ton/day resulting from the Pilisaru project and support by the NSWMSC.

The Western Province possesses the largest number of compost facilities (21 facilities) among the nine provinces in Sri Lanka and the total daily processing capacity of the compost facilities in the province is 117 ton/day. On the other hand, the Eastern Province operates three facilities only with a total processing capacity of 11 ton/day. As the compost plant of the Karadiyana Disposals Site in the Colombo District was not operational in 2015, it was not included in the information.

Table 3-8: Target waste diversion through composting (MoMDE, 2015)

Province	District	No of composting facilities	Target waste handling by compost plants (Ton/day)
Northern Province	Jaffna	3	11
North Central Province	Anuradhapura	14	47
	Polonnaruwa	2	12
	Sub total	15	59
North Western Province	Kurunegala	16	88
	Puttalam	5	30
	Sub total	21	118
Central Province	Kandy	4	17
	Matale	4	8
	Nuwara Eliya	2	5
	Sub total	10	30
Western Province	Colombo	2	7
	Kalutara	7	69
	Gampaha	8	41
	Sub total	17	117
Southern Province	Hambantota	8	30
	Matara	7	51
	Galle	9	13
	Sub total	24	94
Sabaragamuwa Province	Kegalle	6	34
	Rathnapura	2	2
	Sub total	8	36
Uva Province	Badulla	5	52
	Monaragala	2	4
	Sub total	7	56
Eastern Province	Ampara	5	13
	Baticaloa	1	9
	Sub total	6	22
Total		112	542

3.3.3 Industrial Waste

a. Organizational and Legal Framework

In Sri Lanka, industrial waste was considered as hazardous waste that requires special control and classified as "Scheduled Waste". This type of waste is regulated by the Guidelines for the Management of Scheduled Waste in Sri Lanka. According to this guideline, generators of scheduled waste must obtain the Scheduled Waste Management License (SWML) in addition to the Environmental Protection License (EPL). The EPL must be obtained every year from the time of construction for any facility that would generate the specified type of waste.

In Sri Lanka, Holcim Geo-cycle Company, which is the only company that possesses the scheduled waste treatment license, conducts proper treatments on scheduled waste. Companies generating the scheduled waste must have carried out construction with qualified organizations on collection and treatment of their scheduled waste and introduce a declaration system for tracking and monitoring the treatments implemented on their scheduled waste.

The monitoring of scheduled waste generating companies targets only those with SWML.

b. Scheduled Waste Data Management

Companies with SWML are obliged to report to the Central Environmental Authority (CEA) about the types and amounts of their scheduled waste. Presently, 350 entities were identified as having obtained the SWML. Although the CEA has information about each of the entities, there are no completely updated statistics about the scheduled waste.

The generation amount of the scheduled waste is 53,000 ton/year, according to the statistics compiled in 2003.

3.3.4 Medical Waste

a. Organizational and Legal Framework

In Sri Lanka, the Ministry of Health (MoH) supervises medical waste. The MoH has been promoting proper disposal of medical infectious waste to be discharged from medical organizations in accordance with the Healthcare Waste Management National Policy (draft) and the National Guideline of Medical Infectious Waste.

The guideline also regulates methods of e-waste and cytotoxic waste management, and color codes for separation of medical waste. Although the Amendment to the National Environmental Act (NEA) of 2008 indicated that all medical organizations must obtain the Environmental Protection License (EPL) together with either the Scheduled Waste Management License (SWML) or the Hazardous Waste Management License (HWML). There is only a limited number of hospitals that possess both of the licenses.

As only 45 hospitals that are under supervision of the central and the provincial governments obtained both the EPL and the SWL among the public hospitals, the Government of Sri Lanka has been promoting other hospitals on qualification for both of the licenses under the Sri Lanka Health Sector Development Project (II Phase) financed from a loan of the World Bank.

b. Current Conditions of Medical Waste Treatment

There are around 1,000 medical organizations nationwide. Forty of them are large-scale hospitals. Although medical waste at the large-scale hospitals is separated in accordance with the guidelines, treatment and disposal of medical waste have not been conducted properly.

Since a waste incinerator with a processing capacity of 7 ton/day was constructed in Moratuwa

in 2014 under the Grant Aid by the Government of Korea, medical waste generated at hospitals in Kandy, Badulla, Galle and Jaffna is being disposed at this facility. The operation and maintenance of this facility was transferred to a private company under the principle of public-private partnership (PPP). The treatment fee (collection and transportation costs are included) of the facility is 67 LKR/kg for general medical waste and 80 LKR/kg for hazardous and infectious medical waste. There are also several small-scale medical organizations with small incinerators.

In addition to the above, a project for construction of a regional medical waste treatment facility for infectious waste of 134 hospitals has been approved and is expected to be financed with soft loans from the Government of Australia. If the facility is constructed, medical waste from the surrounding medical organizations will be transported to and treated at this facility.

c. Medical Waste Data Management

Although the MoH manages data of medical waste generated at around 35 major hospitals, an integrated database of all medical waste generated in the country has not been developed as yet. This data was created under a past donor-financed project.

3.3.5 Waste to Energy

a. Policy of Renewable Energy

The Ministry of Power and Energy has formulated the National Energy Policies and Strategies of Sri Lanka (2008) which envisages the gradual increase of non-conventional renewable energy resources to provide the right mix to generate electricity, as summarised in following Table.

Table 3-9: Generation mix proposed by the National Energy Policies and Strategies (2008)

Year	Conventional Hydrolytic (%)	Maximum from Oil (%)	Coal (%)	Minimum from non-conventional renewable energy (%)
1995	94	6	-	-
2000	45	54	-	1
2005	36	61	-	3
2010	42	31	20	7
2015	28	8	54	10

Source: (M/P&E, 2008).

The Government has also recognised the need to elevate biomass as both a commercial crop as well as the third fuel option for electricity generation and accordingly declared Gliricedia sepium as the fourth plantation crop after tea, rubber and coconut in 2005. Biofuels, as an important constituent of transport energy, will be developed to take a 20 % share by 2020.

b. Status of Waste to Energy Projects

Although several waste to energy (WtE) projects were launched or announced previously, none of them have been completed yet.

Table 3-10: Status of WtE projects in Sri Lanka

Site	Execution body	Detail
Karadiyana at Kesbewa in Western Province.	Octagon Consolidated Berhad (Malaysian) and WMA	The build-own-operate plant at a cost of US$248 million will be using an Advanced Thermal Gasification Process capable of destroying up to 1,000 tonnes a day of local municipal solid waste and generate a minimum of 40MW electricity. The launch ceremony was held in 06 October, 2011, however, the project infrastructure has not been developed yet.
Kerawalapitiya, Muthurajawela in Western Province.	Orizon Renewable Energy (Pvt) Ltd,	Sri Lanka conducted an Environmental Impact Assessment (EIA) study for 40mw mixed municipal solid waste to energy, project at Kerawalapitiya, Muthurajawela. The Project would have constructed a comprehensive and environmentally acceptable Waste to Energy Plant in an area of 20 acres of uninhabited land at Kerawalapitiya, Muthurajawela to generate power from the gasification of municipal solid waste. The EIA was completed by the end of year 2010. This project was also not initiated.
Korathota, Kaduwela in Western province.	Renewgen Environment Protection Kotte (Pvt) Ltd and WMA	In year 2012, the WMA and Renewgen Environment Protection Kotte (Pvt) Ltd collaborated to implement a waste to energy project would have add 8 Mw to the national grid. This would have been implemented in Korathota, Kaduwela in the Western province. The Company has tied up with Hitachi Zosen as its technology partner to use this technology in the project. However, this project was not implemented due to various financial and socio-economic issues.
Kaburupitiya, Matara in Southern Province	Biogreencycle Ltd. CEA	The inauguration was held for the technological portion of the third phase of the project under the patronage of the Central Environment Authority (CEA) with Biogreencycle Ltd. However, the project was halted in mid-2015 due to insufficient fund allocation by the Ministry of Environment through the CEA
Jathikapola and Narahenpita in Colombo MC.	Sri Lanka Sustainable Energy Authority and the Colombo Municipal Council	The Sri Lanka Sustainable Energy Authority in collaboration with the Colombo Municipal Council has implemented the first pilot scale biogas project at Jathikapola in Narahenpita. This project is deemed to generate 26,280 kWh of electricity per annum from market waste generated in the premises
The Kandy Municipal Council.	The Kandy Municipal Council signed and EcoTech Lanka Limited	The Kandy Municipal Council signed an agreement with EcoTech Lanka Limited to establish a 10Mw Waste to Energy facility at Gohagoda in year 2008. The first EIA was completed by 2010; however the project is still at the site rehabilitation stage.

3.4 Outcome of Japanese Support for Solid Waste Management in Sri Lanka

3.4.1 Current Condition of Support by NSWMSC for Solid Waste Management of Local Authorities

NSWMSC was established in 2007 In accordance with recommendation of "The Study on Improvement of Solid Waste Management in Secondary Cities in Sri Lanka (2012)" by JICA. Furthermore capacity of NSWMSC was enhanced during the "Capacity Upgrading Project for the National Solid Waste Management Support Centre" (2007-2011) by JICA. After the JICA Project, NSWMSC has supported to solve the issue of local authorities. The breakdown of support activities by NSWMSC in 2012 and 2013 are shown in the following tables.

Table 3-11: The Breakdown of Support Activities by NSWMSC for Local Authorities in 2012

Support	Detail		Cost (LKR)
1.Continuation project	1.1 Kalpitiya PS：	Construction of compost plant	10,837,413.59
	1.2 Nochchiyagama PS	Construction of compost plant	4,973,226.62
	1.3 Kinniya PS：	Construction of compost plant	9,740,304.00
	1.4 Kinniya UC：	Construction of compost plant	10,980,968.88
	1.5 Tawalama PS：	Construction of compost plant	4,567,116.51
	1.6 Dibulagala PS：	Expantion of compost plant	1,393,070.63
		Total	42,492,100.23
2. Promotion of 3Rs	2.1 Distribution of home compost		3,791,550.00
	2.2 Distribution of Waste Separation Bin		354,200.00
	2.3 Weligama UC：Establishment of Plastics/ Polythene recycling centers		5,829,692.16
		Total	9,975,442.16
3 Improvement of existing final disposal site	3.1 Rathnapuara MC：Improvement of existing final disposal site		3,272,547.50
	3.2 Kuliyapitiya UC：Improvement of existing final disposal site		1,422,040.60
		Total	4,694,588.10
4 Improvement of existing compost plant	4.1 Haldummulla PS：Improvement of existing compost plant		3,201,294.74
	4.2 Baddegama PS：Improvement of existing compost plant		1,069,685.86
	4.3 Tangalle UC：Improvement of existing compost plant		2,926,300.77
		Total	7,197,281.37
5.Construction of new compost plant	5.1Nuwaragampalatha (Central) PS		6,249,971.39
	5.2Minipe PS		4,741,180.21
	5.3Mannar UC		11,034,498.04
	5.4Karachchi PS		7,847,658.02
	5.5Pelmadulla PS		9,485,311.63
	5.6Nuwara Eliya PS		11,610,570.41
		計	50,969,189.70
6. Training Programs for officers and workers on SWM			1,854,700.00
		total	181,733,530.82

Source:NSWMSC Annual Report 2012

Table 3-12: The Breakdown of Support Activities by NSWMSC for Local Authorities in 2013

Support	Detail	Cost (LKR)
1.Continuation project	1.1 Kalpitiya PS： Construction of compost plant	1,959,289.26
	1.2 Nochchiyagama PS: Construction of compost plant	893,652.68
	1.3 Kinniya UC： Construction of compost plant	1,931,193.79
	1.4 Nuwaragampalatha PS：Construction of compost plant	240,000.00
	1.5 Minipe PS：Construction of compost plant	3,356,781.43
	Total	8,380,917.16
2. Promotion of 3Rs	2.1 Distribution of home compost	1,395,195.00
	2.2 Distribution of Waste Separation Bin	3,169,470.96
	Total	4,564,665.96
3 Improvement of existing final disposal site	3.1 Rathnapuara MC：Improvement of existing final disposal site	1,552,934.92
	3.2 Kuliyapitiya UC：Improvement of existing final disposal site	112,831.50
	Total	1,665,766.42
4 Improvement of existing compost plant	4.1 Baddegama PS:Improvement of existing compost plant	693,694.73
	4.2 Tangalle UC: Improvement of existing compost plant	2,038,961.56
	Total	2,732,656.29
5.Construction of new compost plant	5.1 Mahiyanganaya PS	3,660,349.72
	5.2 Paranagama PS	1,634,303.05
	Total	5,294,652.77
6. Distribution of Waste Separation Bin to Province		20,000,000
7. Design of sanitary landfill site at Madulla PS		40,000
8. Training Programs for officers and workers on SWM		202,621
9.All island SWM completion		2,985,375.50
10.Procuremne t of excavator		9,450,000.00
11.Others		7,232,385.09
	Total	62,549,040.19

Source:NSWMSC Annual Report 2013

3.4.2 Outlook of the utilization of the guideline for planning, management, and pollution control of waste landfills by SATREPS

a. Outline of the guideline for planning, management, and pollution control of waste landfills by SATREPS

The objectives of the SATREPS project are to develop a pollution prevention and remediation technology of waste disposal sites that take into account the regional characteristics in Sri Lanka and to formulate the guideline for sustainable and applicable planning, maintenances and operations for waste landfills in collaboration with the Ministry of Local Government and Provincial Council and the Ministry of the Environment. In addition, strengthening research and development capacities of the related counterpart organizations and training young engineers and researchers of both countries through the SATREPS are also the other objectives. The SATPREPS consists of five activities and the【Activity 5】is as follows.

【Activity 5】Finalise the guideline for sustainable and applicable planning, maintenances and operations for waste landfills. This guideline will be effectively utilized in the field in order to contribute to sustainable waste management.

The following four items are required as outcomes of【Activity 5】and they were integrated into the guideline for planning, management and pollution prevention for waste landfills (2016 edition). The workshop has already been held to listen to the opinions of the relevant officials of the Ministry of Local Government and Provincial Council and the Ministry of the Environment.

Outcome 1: The cases of social competence evaluation and improvement plans (action plan) for the waste management business of local government

Outcome 2: The cases of hazard map for the appropriate site selection for landfills and the guideline for appropriate site selection for new landfills based on the technical approach in the Central Province and the Southern Province.

Outcome 3: Suggestion for environmental monitoring plan and methodology for existing landfills and its surroundings and the monitoring cases.

Outcome 4: Introduction of case studies and combination examples of low-cost, low-maintenance, low-environmental impact site-specific pollution control and restoration techniques for waste landfill sites.

These outcomes were integrated into the guideline for planning, management and pollution prevention for waste landfills (2016 edition), which was submitted to the Ministry of Local Government and Provincial Council and the Ministry of the Environment and is expected to be posted on the website of the University of Peradeniya, CEA and NSWMSC. Moreover, even after the end of the SATREPS project, this guideline will be updated regularly by the committee members consisting of NSWMSC, CEA and the university officials under the initiative of the Ministry of Local Government and Provincial Council.

b. Outlook of the utilization of the guideline for planning, management, and pollution control of waste landfills by SATREPS

The major organizations related to the SWM in Sri Lanka are the Ministry of Local Government and Provincial Council, the Ministry of Environment, NSWMSC, CEA, provincial councils and local governments and any of them need what is described in the guideline for planning, management, and pollution control of waste landfills (2016 edition), therefore it is determined to be fully utilized. In particular, the cases shown in the above mentioned outcomes from 1 to 3 seem to be possibly used immediately. However, regarding the "Outcome 4: Introduction of case studies and combination examples of low-cost, low-maintenance, low-environmental impact site-specific pollution control and restoration techniques for waste landfill sites", outdoor experimental studies are still in progress so it cannot be applied to the site immediately. For this reason, the pollution control and restoration techniques (selection of the liner material and the soil covering specification) should be partially used.

The table of contents of the guideline and the relevant organizations to be expected to utilize it are shown below.

Table 3-13: The table of contents of the guideline and the relevant organizations to be expected to utilize it

Table of Contents	Major Organizations who utilize it	Purposes of utilization
1.Introduction	—	—
2. Solid Waste Management in Sri Lanka	CEA/Provincial Councils	To develop legislation of SWM
	NSWMSC	To assist Local Governments in formulating Action Plans
	Local Governments	To formulate Action Plans
3.Risk Assessment and Risk Management of Waste Landfill	NSWMSC/CEA/ Provincial Councils	To develop legislation of SWM
	Local Governments	To formulate Action Plans
4.Environemtal Monitoring of Existing Waste Landfill	CEA/ Local Governments	To develop and implement the environmental monitoring plans
5. Landfill Site Selection	NSWMSC/CEA/Provincial Government/Local Governments	To select suitable landfill sites based on the technical approach
6. Pollution Control Techniques for Waste Landfill	Local Governments/ NSWMSC / CEA	To properly plan and operate landfill sites by introducing low-cost, low-maintenance, low-environmental impact site-specific pollution control and restoration techniques for waste landfill sites.
7.Conclusive Remarks and Futre Prospective	—	—

3.5 The SWM Problems at the National Level

The Government of Sri Lanka (GOSL) indicated the lack of sustainability in the SWM system as a critical issue in the Ten-year National Development Plan (2006-2016). It emphasized the importance of promotion of the 3Rs and establishment of environment-friendly disposal sites for accomplishment of a sustainable SWM system, and prepared an investment plan.

Moreover, the GOSL prepared the National Action Plan for the Haritha Lanka Programme (2009-2016) in 2009 aiming for sustainable development in the country. Within this programme, SWM issues were also indicated as critical development issues and establishments or proper replacements of SWM infrastructures in local authorities was stressed within the strategy. However, the current waste collection rate estimated based on the generation amount has been 51% in the Western Province, the most populated province in the country, and only 32% on average for the country (Moratuwa University and NSWMSC, 2013).

One of the reasons for the insufficient implementation of SWM improvement plans is the insufficiency of the legal system such as a special law on waste treatment. The contents that are required in Sri Lanka's laws and regulations on waste treatment are as follows:

(1)Definition of waste: General waste and Industrial waste
(2)Obligations of relevant parties: Provinces, regions, local authorities, business entities and residents
(3)Obligations related with waste treatment: Local authorities and business entities
(4)Waste treatment plan
(5)Waste treatment standards: Collection, transportation, treatment and disposal of general and industrial waste

The definitions of solid waste, management policy, service, facility, recycling, regulation, penalty and so on are mentioned in the Japanese "Waste Management and Public Cleansing Law". Local authorities in Japan formulate the solid waste regulation or by-law according to above mentioned law and execute the solid waste management based on the clear legal basis. On the other hand, there is no such higher law of solid waste management in Sri Lanka. The local authorities cannot formulate proper regulation or by-law and it causes importer solid waste management.

Table 3-14: Japanese Waste Management and Public Cleansing Law

CHAPTER I GENERAL PROVISIONS

CHAPTER II MUNICIPAL SOLID WASTE
- Section 1 Municipal Solid Waste Management
- Section 2 Municipal Solid Waste Management Service
- Section 3 Municipal Solid Waste Disposal Facility
- Section 4 Special Provision on Recycling of Municipal solid waste
- Section 5 Export of Municipal solid waste

CHAPTER III INDUSTRIAL WASTE
- Section 1 Industrial Waste Management
- Section 2 Information Processing Center and Industrial Waste Appropriate Management Promotion Center
  - Subsection 1 Information Processing Center
  - Subsection 2 Industrial Waste Appropriate Management Promotion Center
- Section 3 Industrial Waste Management Service
- Section 4 Specially Controlled Industrial Waste Management Service
- Section 5 Industrial Waste Disposal Facility
- Section 6 Special Provisions Pertaining to Recycling of Industrial Waste
- Section 7 Export and Import of Industrial Waste

CHAPTER III-II WASTE MANAGEMENT CENTER

CHAPTER IV MISCELLANEOUS REGULATIONS

CHAPTER V PENAL REGULATIONS

3.6 Other Donor's Activities

In Sri Lanka, activities of the donors related to SWM are very dynamic. The outlines of their activities and the lessons learned are described below.

3.6.1 United Nations Office for Project Services（UNOPS）

a. Environmental Remediation Programme (ERP)

The UNOPS implemented the Environmental Remediation Programme (ERP) with the CEA as a counterpart in the Ampara District in the Eastern Province of Sri Lanka by using the supporting funds for the tsunami victims. This programme was conducted in Phase 1 (2007 - June 2011) and Phase 2 (July to June 2013, 2011) and the budgets for each phase was 10.5 million euros (14.3 million dollars) and 2.14 million euros (2.91 million US dollars) respectively. In this programme, they conducted capacity training for waste management officers and public awareness activities in all of the 12 municipalities including the Ampara District and also provided seven disposal sites, five recycling centers, five compost plants, and

one transfer station.

A fee-based waste collection system has been established in the Eastern Province, which is now being adopted by local authorities in other parts of the country. Also the marketing channels to sell compost produced from collected waste have been established and over 1,700 bags of compost are now produced each month, generating over US$ 28,000 in revenue per year.

In addition, this project has been recognized as a best practice of waste management by the CEA. The factors for success include community awareness programmes and school recycling projects, which were launched to encourage locals to 'reduce, reuse and recycle'. Also specific training was provided for women to help ensure their households properly disposed of waste.

Building on the success and lessons learnt in Ampara, the UNOPS is now implementing a new project to support local authorities in the neighbouring district of Baticaloa, with financial support from the EU[14].

As a lesson learned, in order to continue to maintain the running of constructed waste treatment facilities, it is essential to conduct capacity building for SWM of the LA that operates the facility and also to establish a financial system that will secure a sufficient budget for SWM. The Sri Lankan side always has a strong demand for hard facilities. However, there is a risk that the built facilities could be left alone without actually carrying out any operations. The counterpart of this project was the CEA but it should be noted that they are merely a policy-making institution and not the implementing agency of waste management. In addition, since there is no cooperation between the MoLGPC, which has control over the LAs that execute the decisions made by the CEA, and the CEA, there were many cases of delays and suspensions in the implementation stage15.

Other than this programme, the UNOPS is planning to implement SWM projects in the five target municipalities in Jaffna in the Northern Province and is currently seeking funds. They are also considering the possibility of assistance to the coastal district (Chillaw, Negombo, etc.) of the Western Province where their waste problem is serious.

3.6.2 KOICA

a. Construction of the Dompe Final Disposal Site

KOICA started the project for Sri Lanka's first sanitary landfill in Maligawatte in 2008 with the CEA as a counterpart. The construction started from 2014 and the operation started in April 2015. The Korea Kunhwa Engineering & Consulting Co., Ltd. was in charge of the design. KOICA and the Sri Lankan Government funded the project with 4.5 million USD and $ 1.5 million USD respectively16.

It was designed for a cluster system in the beginning of the project but only accepts waste from the Dompe PS due to opposition from the community. In Sri Lanka, not only in the case of the Dompe landfill site but across the country, there is always strong public opposition towards the construction of such waste treatment facilities and many of the projects have been suspended. Therefore, careful consideration and consultation with residents are needed in this regard.

b. Construction of Incineration Facility in the Kotikawattha Mulleriyawa PS

KOICA is implementing the construction project of incineration in the Kotikawattha

[14] UNOPS Homepage:
(https://www.unops.org/english/News/UNOPS-in-action/Pages/Converting-waste-into-benefits-for-the-entire-community.aspx)
(viewed on July 28, 2015)
[15] Based on the results of the interview with UNOPS on September 4, 2015
[16] JST-JICA SATREPS Project: Environment Business Survey in Sri Lanka (May, 2014)

Mulleriyawa PS with the CEA as a counterpart. It is designed to receive 22 – 25tons/day for incineration out of 40 ton/day of waste collected in the region and the total cost of O&M is estimated at 800,000USD annually.

c. Pilot Project for Volume Based Bag (VBB) System

The KOICA has been planning to introduce the volume based bag (VBB) system with the WMA as a counterpart since 2013. They started the pilot project in October 2015 and sell plastic bags (20L) for mixed waste for 40Rs each.

In Sri Lanka, waste collection service has been provided for residents for free of charge in most areas, therefore residents are not willing to pay money for such services. However, it is essential for the LAs to ensure sufficient budgets for SWM for the establishment of a sustainable waste management system as well as construction of such facilities. It is important to attempt to introduce such a system.

3.6.3 Korean Economic Development Cooperation Fund（EDCF）

The EDCF has been implementing the construction project of sanitary landfill in four cities (Anuradhapura, Kandy, Colombo, and Hikadduwa) from May 2014 to February 2018 with the MoMDE as a counterpart. The total budget of the project is 42 million USD and the landfill construction sites include Monriviawatte, Payagola, Gonadhikawatte, and Keerikulama. They are now in the detailed design stage and the Korean Kunhwa Engineering & Consulting Co., Ltd. is in charge of the design.

Each of the sanitary landfills is designed for as a cluster system covering 20 LAs. Regarding the Payagola disposal site, there has been strong opposition from residents living in the vicinity of the original planned disposal site, Panadura, and so the site was changed to Payagola and thus progress is slower than the other sites (currently under the review of the F/S). The outline of each site is shown below.

Table 3-15: The outline of EDCF project site

Name of DS	Total site area	Landfill area	Capacity	Lifespan	Service target LAs
Monriviawatte	8.1ha	3.4ha	37.8t/d	32 years	7 LAs including Rajgama PS
Gonadhikawatte	11.3ha	3.9ha	76/t/d	20 years	11 LAs including Udunuwara PS
Keerikulama	9.7ha	4.6ha	15.2t/d	32 years	2 LAs including East Nuwaragampalatha PS

Although the project has been signed with the MoMDE, the LAs are in charge of its operation after the construction of the facility. There have been such concerns that the MoMDE has no control over the LAs and the LA has neither technical skills nor financial capacity to cover the cost of O&M after the construction of the facilities17.

3.6.4 Asian Development Bank (ADB)

a. Local Government Enhancement Sector Project (LGESP)

The ADB has implemented the "Local Government Enhancement Sector Project (LGESP)" from September 2011 to December 2016, which includes a waste management component. The target sites are 108 LAs in seven provinces excluding the Northern Province and the Eastern Province (all are pradeshiya sabhas). LGESP is supporting the 108 LAs to develop reform plans

[17] Based on the results of the interview with EDCF on September 3, 2015

and SWM action plans. SWM action plans had been developed together with the Project Management Unit (PMU) under the command of a technical officer of the LA and have already been developed in all of the target LAs. According to the developed action plans, they have been implementing home composting, community awareness activities, and waste separation and also provided 200 home compost bins, tractor and collection equipment for each LA. In addition, compost centres have been constructed with a two-step loan in four PSs (Agalawatta, Hambantota, Wilgamuwa, and Balangoda)18.

b. Mainstreaming Integrated Solid Waste Management in Asia

The ADB has implemented regional technical assistance called "Mainstreaming Integrated Solid Waste Management in Asia" since December 2013, which includes Sri Lanka as a target country. SWM is also one of the components and two cities will be selected but are still undetermined.

Other than that, the project investigation of SWM that covers the Eastern and the Northern provinces such as Trincomalee, has been implemented but is still in the proposal stage.

3.6.5 World Bank

a. Metro Colombo Urban Development Project

The World Bank has implemented the “Metro Colombo Urban Development Project” with the Ministry of Defence and Urban Development as a C/P from 2012 to 2017. The project includes five target sectors such as flood protection, the central government administration, SWM, urban transport and the sub-national government administration. The total project budget is 326 million USD, of which 6% is allocated for SWM mainly for the improvement of the waste collection system19.

b. Strategic Cities Development Project

The World Bank has implemented the “Strategic Cities Development Project” with the Ministry of Economic Development as a counterpart from 2014 to 2019. The total project budget is 192.08 million USD and SWM is included in its component. The target areas include the Kandy District and the Galle District20.

3.6.6 VNG International (International Co-operation Agency of the Association of Netherlands Municipalities) & Velsen helps Galle Foundation

a. LOGO South Country Programme Sri Lanka

The VNG International and Velsen Helps Galle Foundation have jointly implemented the “LOGO South Country Programme Sri Lanka” for the tsunami affected area to support the administrative capacity building of LAs since 2004. This project aims to develop integrated SWM plans and the project plan in such target areas as Galle, Akameemana, Habaraduwa, Welligama and Matara. In the beginning of the project, each LA carried out their activities individually with the support of the VNG but in 2007 a regional approach has been taken by involving the governor of the Southern Province as a counterpart. After that, the cooperation between LAs and commitment to the project have been secured. Consequently, the project was

[18] ADB Homepage http://www.adb.org/projects/42459-013/main (viewed on September 6, 2015)
[19] World Bank Home page: (http://www.worldbank.org/projects/P122735/metro-colombo-urban-development-project?lang=en) (viewed on July 28, 2015)
[20] World Bank Homepage: http://www.worldbank.org/projects/P130548?lang=en (Viewed on September 3, 2015)

decided to continue after 200921.

3.6.7 Federation of Canadian Municipalities (FCM)

a. MCP (Canada/Sri Lanka Municipal Cooperation Program)

The FCM has implemented the MCP (Canada/Sri Lanka Municipal Cooperation Program) with the MoLGPC as a counterpart with the financial support of the Canadian International Development Agency (CIDA) in the tsunami affected area since 2005. The target LAs include Baticaloa, Trincomalee, Ampara, Galle, and Matara and it covers good governance, gender, and SWM.

3.6.8 SEVANATHA Urban Resource Center

Community Based Solid Waste Management Project in Matale and Rathnapura Cities (Integrated Resource Recovery Centre Project - IRRC)

SEVANATHA is a NGO founded in 1989 in Colombo. They have implemented the "Community Based Solid Waste Management Project in Matale and Rathnapura Cities (Integrated Resource Recovery Centre Project - IRRC)" with the financial and technical assistance of UN-ESCAP since 2007. The IRRC aims to promote a business model for the implementation of the 3R approach based on the perspective that producing sufficient benefits from waste is necessary for the establishment of sustainable SWM. In Matale, intensive community awareness activities have been carried out to promote waste separation and currently seven tons of organic compost is being produced daily. The compost plant, constructed in 2014 in Kanadola of the Rathnapura City, produces five tons of compost daily22.

3.6.9 Energy Forum

a. Integrated Sustainable Waste Management Center, Hambantota

Energy Forum is an NGO founded in 1991, aiming to promote renewable energy and sustainable SWM. With financial assistance from WASTE Netherlands and VNG International, they had implemented the SWM capacity development project called the "Integrated Sustainable Waste Management Center, Hambantota" from 2007 to 2010. They established the Town Clearing Society (TCS) which was made the SWM section independent from the Hambantota UC and implemented the production and sales business of the compost and plastic chips in the Hambantota disposal site in order to achieve financial independence23. This kind of assistance reveals the establishment of a secured system, which enables benefits to be generated from waste for sustainable SWM.

3.6.10 Sri Lankan Government

a. Metro Colombo Solid Waste Management Project

The Sri Lankan Government is planning a project to transport waste to be collected in the Colombo MC to the disposal site in the Puttalam District by train. This is called the “Metro Colombo Solid Waste Management Project”. Since it is impossible for the MC to establish a new disposal site due to the lack of land, the plan is to reload the collected waste in the

[21]VNG International “LOGO South Country Program Sri Lanka” http://www.cities-localgovernments.org/committees/cib/Upload/compendium/EN_38_LOGO_South_Country_Programme_Sri_Lanka.pdf（2006）

[22] SEVANATHA Home page http://www.sevanatha.org.lk/ongoing-project-community-based-solid-waste-management.html（viewed on July 28, 2015）

[23] Energy Forum Homepage http://efsl.lk/AboutUs.aspx (viewed on September 4, 2015）

Kolannawa Transfer Station, which is planned to be constructed in the existing Meethotamulla disposal site, and transfer it to a new final disposal site in Puttalam by train (20ft container x 26 units). The EIA has already been submitted to the CEA, but it is said that the actual operation will start after three years even if it is approved. The total project budget is estimated at 107 million USD (SLR 14,017 million) and the operation costs of the Puttalam disposal site are estimated at 10.8USD/ton24. The outline of the projects related to the SWM of each donor is summarized in the following table.

[24] Based on the results of the interview with CMC on August 28, 2015

Table 3-16: Projects Related to the SWM of Each Donor

Donor	Year	Project title	Project cost	Location	Main Facility	Remark
EU (UNOPS)	2007-2013	Environmental Remediation Programme (ERP)	US$ 14.3million:2007-2011 (phase1), US$ 2.91million:2011-2013(phase2)	Ampala District, Eastern Province	7 Engineered landfills, 5 compost facilities, 1 transfer station, 4 recycling stores, waste collection equipment etc	■ Regional disposal of solid waste ■ Community awareness & capacity building ■ Installation of User Fee Scheme in 4LAs ■ Collection improvement ■ Establishment of Data Base on Business & HH in 10 LAs ■ Formulation of SWM by-law ■ Business and market development for compost
EU (UNOPS)	2013	Environmental Remediation Programme (ERP)		Baticaloa District, Eastern Province	Engineered landfills, compost facilities, transfer station, recycling stores, waste collection equipment etc.	■ Community awareness & capacity building ■ Installation of User Fee Scheme ■ Collection improvement ■ Formulation of SWM by-law ■ Business and market development for compost
KOICA	2008-2015	Dompe Sanitary LF project	US$ 4.5 million By KOICA, US$1.5million by SLGov't	Dompe PS, Maligawatte, Western Province	Construction of composting plant complexes and engineered landfill (area: 31 ha)	■ C/P: CEA ■ Waste amount: 10 tons/day ■ Constructed in Apr. 2015 ■ Designed by Korean Kunhwa Engineering & Consulting Co., Ltd ■ Originally designed for cluster system but only accept waste collected in Dompe PS due to public protest.
KOICA	2012	Kotikawatthaha Mulleriyawa PS		Kotikawatthaha Mulleriyawa PS	Construction of incinerator in Kotikawatthaha Mulleriyawa PS	■ C/P: CEA ■ 22～25t/day out of total 40t/d waste generated in Kotikawatthaha Mulleriyawa PS will be treated. ■ Estimated cost for O&M will be 800,000USD
KOICA	2013	Volume Based Bag (VBB) Pilot Project	US $10,000	Western Province		■ C/P: WMA ■ Volume Based Bag system for revenue raising ■ 40LKR. for 20L plastic bag for mixed waste ■ Pilot scale project will be implemented from Oct. 2015
EDCF	2014-2018		US$ 42million	Anuradhapura, Kandy, Colombo, Hikadduwa	Construction of 4 sanitary LFs in Monriviawatte, Payagola, Gonadhikawatte, Keerikulama	■ Currently in detailed design stage ■ Designed by Korean Kunhwa Engineering & Consulting Co., Ltd. ■ Cluster System covering 20LAs ■ Payagola LF is delayed due to public protest and currently under evaluation of F/S

ADB	2011-2016	Local Government Enhancement Sector Project (LGESP)		108 LAs (PS level) in all provinces except Northern Province and Eastern Province	200 home compost bins for each LA, provision of waste collection and landfill equipment, Compost centre in 4PS(Agalawatta, Hambantota, Wilgamuwa, Balangoda)	■ Formulation of Reform Plan and SWM Action Plan ■ All 108 LAs completed SWM A/P ■ Home compost ■ Community awareness activities ■ Waste segregation at source
ADB	2013	Mainstreaming Integrated Solid Waste Management in Asia				■ Regional Technical Assistance ■ SWM is one of the components ■ 2 cities will be selected but not yet selected.
World Bank	2012-2017	Metro Colombo Urban Development Project	US$ 326million			■ C/P: Ministry of Defence and Urban Development ■ Consists of Flood Protection, Central Government Administration, SWM, Urban Transport, Sub-national Government Administration ■ 6% of the total budget is allocated for SWM
World Bank	2014-2019	Strategic Cities Development Project	US$ 192.08million	Kandy district, Galle district		■ SWM is one of the components
Federation of Canadian Municipalities (FCM) , CIDA	2005	MCP(Canada/Sri Lanka Municipal Cooperation Program)		Baticaloa, Trincomalee, Ampara, Galle, Matara		■ To improve local governance (operations management, service delivery and strengthened participatory mechanisms) in LAs that were affected by the Tsunami in 2004. ■ SWM is one of the components
VNG International, Velsen helps Galle Foundation	2004	LOGO South Country Programme Sri Lanka		Galle, Akameemana, Habaraduwa, Welligama and Matara		■ Formulation of Integrated SWM plan, ■ Regional approach was taken with the Governor of the Southern Province after 2007. ■ Project extended after 2009.
SEVANATHA, UN-ESCAP	2007-on going	Community Based SWM Project in Matale and Rathnapura Cities (Integrated Resource Recovery Centre Project - IRRC		Matale MC and Rathnapura MC	Construction of IRRCs at Kanadola in Rathnapura MC and in Matale MC	■ Aiming at promoting a business MoMDE to implement the 3R (Reduce, Reuse and Recycling) approach ■ Matale IRRC handles 7 t/d of organic waste and collects and separates all the recyclable materials for selling at the local market. ■ 5t/d capacity IRR Centre was built at Kanadola in Rathnapura in 2014 and currently running its operation.
Energy Forum, WASTE Netherlands, VNG International	2007-2010	Integrated Sustainable Waste Management Center, Hambantota		Hambantota UC	Compost plant, Plastic recycling facility	■ Establishment of Town Clearing Society (TCS) ■ Establishment of self-support accounting system through manufacture and sale of compost and plastic chip material
Sri Lankan Government	2012-on going	Metro Colombo Solid Waste Management Project	US $107 million (≒ LKR 14017 million)	Puttalam District, Meethotamulla	Sanitary Land Fill in Aruakkalu in the Puttalam District, Transfer station in Meethotamulla	■ Waste generated in the Metro Colombo Region 1200MT/d will be transported by train from a transfer station at Meethotamulla to Sanitary Land Fill in Aruakkalu in the Puttalam District ■ EIA already completed and under evaluation. ■ Future operation cost for LF in Puttalam will be 10.8USD/t

4 Basic Information of the Priority Local Authorities

4.1 Kataragama Pradeshiya Sabahas in Uva Province -

4.1.1 Outline of the LA (Local Authority)

Kataragama is in the Monaragala District of the Uva Province, in the southeast of Sri Lanka. It is located at the entrance of the Yala National Park, known for safari, and is a sacred place for the Sri Lankan people. The total area is 586.84 km2.

Although Kataragama was a small village surrounded by jungles in the early days, the city has undergone many improvements with successive governments investing in public transportation, medical facilities, business development and hotel services since the 1950s. When the Kataragama festival is grandly held from July to August every year, the Perahera parade is performed throughout the town every night and a number of people visit there from abroad as well as from Sri Lanka. The main industries are tourism, hotel services, wood processing and agriculture25.

The climate of Kataragama is hot all throughout the year. The average maximum temperature is around 25-28 degrees Celsius. In Kataragama, the six months from October to February and from April to June make up the rainy season. The remaining times are the dry season which sometimes causes drought. The average rainfall is 1,000-1,500ml per year26.

The Kataragama PS (Municipal Council) has 5 GNs (Grama Niladhari –Village Officer) divisions. The floating population reaches up to 30,000 people as many tourists and pilgrims visit the temples. The population trend from 2010-2015 of the Kataragama PS is as follows.

Table 4-1: Population Trend of Kataragama PS (2010-2015)

Year	2010	2011	2012	2013	2014	2015
Population	21,867	22,187	22,415	21,912	22,087	NA

Source: Divisional Secretariat, Kataragama (Population is estimated by the population growth rate)

4.1.2 Current Status and Problems of Solid Waste Management

a. Organization and Legal System

a.1 Legislation and Policy

The Kataragama PS implements solid waste management activities based on the Pradeshiya Sabhas Act (No. 15 of 1987).

a.2 Solid Waste Management Plan

The PS has formulated an action plan related to SWM in 2010. Also, with the support of the Pura Negma "Local Government Enhancement Sector Project (LGESP)[27]", implemented by the UDA and ADB, a master plan for waste management was formulated in 2014. Based on this

[25] Based on the interview with the Secretary of Kataragama PS (November 6, 2015)
[26] Kataragama Divisional Secretariat Annual Report 2014 (Divisional Secretariat, Kataragama)
[27] Targets are 108 municipalities (all are Pradeshiya Sabaha level) in seven provinces with the exception of the Northern Province and the Eastern Province. It helps the municipalities to formulate a Reform Plan and SWM Action Plan. The implementation period is from September 2011 to December 2016.

action plan, the PS implements public awareness activities, promotion of home composting, and waste separation.

a.3 Organization

In Kataragama PS, the Public Health Section is in charge of solid waste management. The head of the Public Health Section is the Technical Officer (TO) who supervises the collection (truck) drivers. Under that, there is a Labor Administrator who supervises street sweeping and waste collection that Road Sweepers and Health Labourers conduct. The Development Assistant is appointed by the Uva Provincial Council and assigned to a subject officer in waste management in the Kataragama PS to support the TO. The role of the Public Health Section is as follows:

- Waste collection and transportation Service
- Public health activities (dengue fever prevention)
- Road sweeping
- Public awareness of waste separation
- Disposal of animal bodies

In the Kataragama PS, there are no MOHs (Medical Officer of Health) nor PHIs. Although there is one MOH and two PHIs in the Provincial Health Ministry, they come to support dengue prevention activities only upon request from the PS. They are not actively involved in SWM activities.

The following figure shows the organizational structure and the staff of the Kataragama PS.

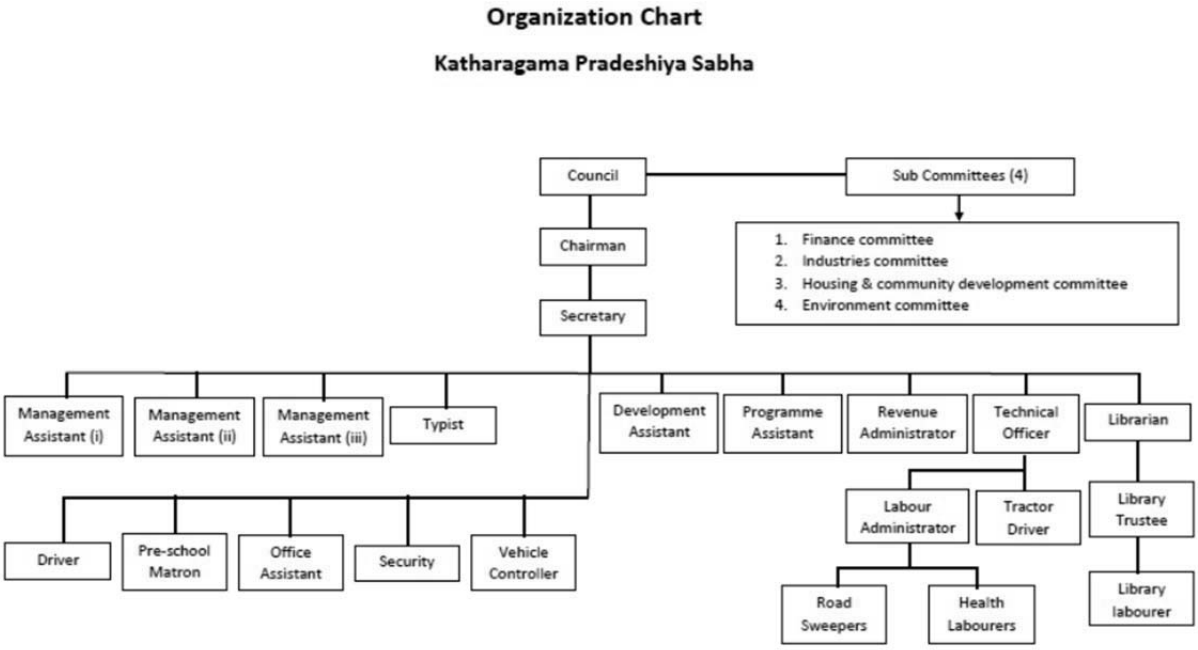


Figure 4-1: Organizational chart of whole Kataragama PS

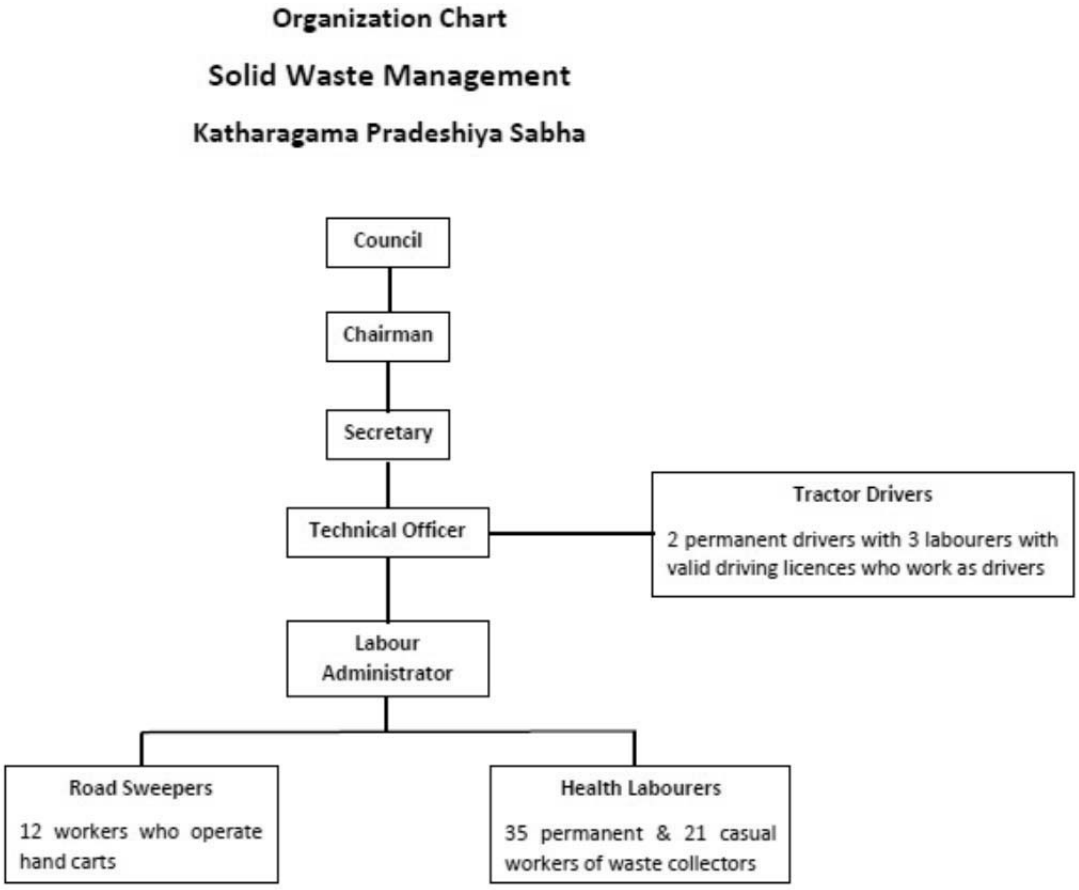


Figure 4-2 Organizational chart of SWM section in Kataragama PS

Table 4-2: Staff related to SWM in Kataragama PS

Staff		Number	Remarks
Engineer		0	
TO(Technical Officer)		1	Head of Public Health Section
Subject Officer of SWM (Development Assistant)		1	
Labor Administrator		1	
Work Administrator		1	Occasional Support
Health Administrator		1	Occasional Support
MOH(Medical officer of health)		0	
PHI(Public health inspector)		0	
SV(Supervisor)		0	
Collection workers	Permanent	35	
	Temporary	21	
Road Sweepers	Permanent	12	
Driver	Permanent	2	+3 stand-by drivers
	Temporary	0	
Disposal site workers	Permanent	0	
Other (Compost plant)	Permanent	11	Including 7workers+3security+1tractor driver
Total			

a.4 Issues of Organization and Legal System

Compared to the MC and the UC, the PS constantly lacks human resources. The technical officer (TO) and subject officer of SWM are supposed to play the main roles in waste management activities, however they tend to be occupied with daily activities and it seems that only the secretary understands the whole waste management system.

Also, there is a shortage of collection workers so there are many complaints that the collection service is not provided in a timely manner.

b. Technical System

b.1 Storage and Discharge

In the Kataragama PS, the separate collection system has just been introduced in some areas at the end of October 2015. However, containers for separating organic waste have not yet been distributed to each household. Therefore, residents have been instructed to discharge separated organic waste and other waste in a different plastic bags. Since the door-to-door collection is provided by the PS, residents put waste on the roadside in the morning of the designated collection day.

b.2 Collection Subject

The Kataragama PS directly collects and transports waste from residential and commercial areas. On the other hand, the PS is not in charge of collection in the temple area so the temple related staff collect and transport waste by themselves. In addition, when there are religious festivals, the Physical Planning Dept. 28(affiliated with the Ministry of Housing and Construction) collects waste generated from these activities as only the PS itself cannot deal with the huge amount. Under the supervision of TO, two collection drivers and 35 collection workers collect waste.

b.3 Collection Method

The collection area of the PS is divided into three areas; the Sella Kataragama area near the Sella Kataragama disposal site, the city area which is the center of the PS, and the Wedasifi area near the Galapitagalayaya disposal site. The city area and the Wedasifi area are divided into three areas; A, B, C. The separate collection area includes area B and C but not area A, the most commercialized areas. In those areas, waste is separated into organic and other waste.

[28] There is a branch office of the Physical Planning Dept. in the temple area.

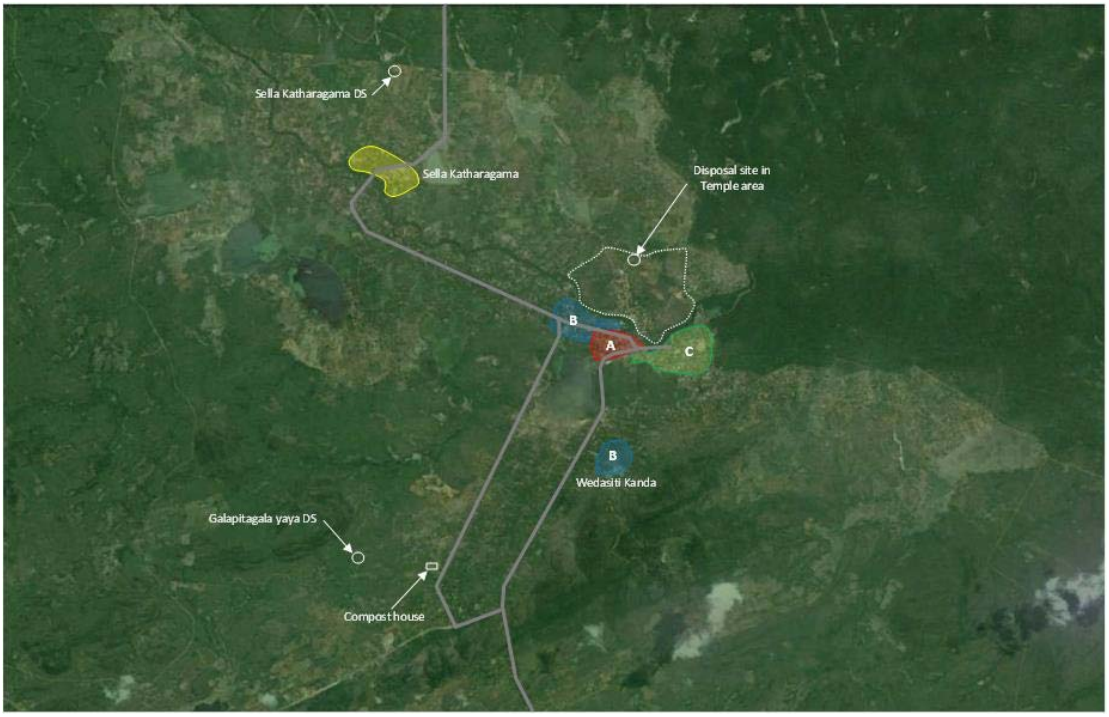


Figure 4-3: Waste collection area and disposal sites in Kataragama PS (as of Nov. 2015)

Collection coverage of the PS is around 40% by area basis. The following table shows the collection method and frequency of waste.

Table 4-3: Waste collection methods and frequency of Kataragama PS

Area	Type of waste	Collection method	Frequency
Area A and Sella Kataragama	Mixed waste	House-to-house collection	Everyday
Area B & C	Organic waste	House-to-house collection	Twice/week
	Other waste	House-to-house collection	Once/week

b.4 Collection Amount

Waste collected by the Kataragama PS is transported to the Galapitagalayaya DS and the Sella Kataragama DS. Since there is no truck scale, the accurate waste amount is not recorded. However, if it is estimated from the number of truck loads (1 load ≒ 1.5ton), it is 8 loads/day, so the collected amount is about 12 ton/day.

b.5 Collection Fee

The Kataragama PS does not collect any waste collection fees from households. On the other hand, they collect fees from hotels and guesthouses (depending on the size) in the PS every month. They do not collect any fees from other business entities.

Table 4-4: Collection fee for hotels in Kataragama PS

Type of waste	Size of hotels	Fee(LKR/month)
General waste	Less than 5 rooms	1,000
General waste	5-20 rooms	2,000
General waste	More than 20 rooms	3,000

Since the separate collection system has been introduced, a new charging system will be soon applied based on the Pradeshiya Sabhas Act (No. 15 of 1987) as below.

Table 4-5: New collection fee after introduction of separate collection in Kataragama PS (not effective as of Nov. 2015)

Type of waste	Type of business	Fee(LKR/month)
Organic waste	Hotels	Max. 4,000
Other waste	Hotels	Max. 6,000
Organic waste	Other businesses than hotels	Max. 1,000
Other waste	Other businesses than hotels	Max. 1,500

b.6 Collection Vehicles

The PS has three tractors for waste collection and modified one tractor for the collection of night soils into waste collection. Therefore, they have four tractors for waste collection in total. All of the vehicles are almost 100 % in operation although they frequently need some minor repair works. The following table shows the number of collection vehicles.

Table 4-6: Collection vehicles of Kataragama PS

Type of vehicles	Number	Number not in operation (average)	Remarks
Tractor with trailer	4	0	All are working but frequent minor repair work needed
Tractor with gully sackers	1		Used for compost plant
Hand cart	6		
Tipper	1		

The PS keeps the driving record of each vehicle including mileage and collection areas covered.

b.7 Maintenance Methods of Collection Vehicles

The Kataragama PS has neither workshop nor engineer; they outsource all repair works. Whenever the drivers find problems, they report to the secretary and the TO and the TO investigates the problems. The driver submits a request letter to the development assistant, then the development assistant estimates the costs. If the purchase or repair work costs less than 1,000 LKR, it will be paid in cash. If it costs less than 5,000 LKR, the Development Committee's approval is necessary (but no quotation is needed). If it costs more than 5,000 LKR, the Development Committee's approval and quotations from three different sources are necessary.

b.8 Intermediate Treatment

In Kataragama, there is one compost plant which consists of a biogas facility and a recycling center where recyclables are sorted and stored. This plant has been established by the Swedish

Cooperative Centre called AfATE (Alliance for Appropriate Technology Exchange) in 2013 but when they left in 2014, it failed. Then, the Hambandotta SMDF (Social Mobilization Development Foundation) came to support the PS in resuming separate collection in August 2015. The PS has just resumed separate collection in collaboration with the NGO29 since the end of October 2015. The PS provides workers, water, electricity and uniforms, etc and the NGO gives financial support and advice.

The structure of the compost is an aerobic fermentation system, where waste is rotated over the three phases within the concrete rocks with holes for ventilation. Leachate is stored in the tank and pumped up to use for the adjustment of the water content of the compost (namely, is added to maintain the appropriate moisture content in the compost heaps). The organic waste transported to the compost plant comes from a separate collection area (the area B & C) and the total amount is 7 load/month (around 0.35 ton/day). The production of compost is 700 kgs/month and the selling price is 10 LKR/kg. Most is sold to the residents at the weekend market. The compost residue is buried in a pit within the compound. The details are shown in the following table.

Table 4-7: Intermediate treatment facilities in Kataragama PS

Type	Execution body	Address	Capacity	Year of establishment	Remarks
Compost plant	PS & NGO(the land is leased by the Dept. of Forestry)	Galapitagalaya ya ,Raja Mawata, Kataragama	0.35 ton/day	2013	Fenced by electric wires to avoid elephants.
Small-scale biogas facility			5kg/day	2013	The produced biogas is used for the kitchen in the compost plant.
Recycling facility			NA	2013	Not in operation as of Nov. 2015 as separate collection has just started.

Photo：Compost plant in Kataragama PS

[29] The NGO members do not consist of the community nearby the plant but of traders and social activists in Kataragama PS.

Photo：Recycling facility in Kataragama PS

b.9 Final Disposal

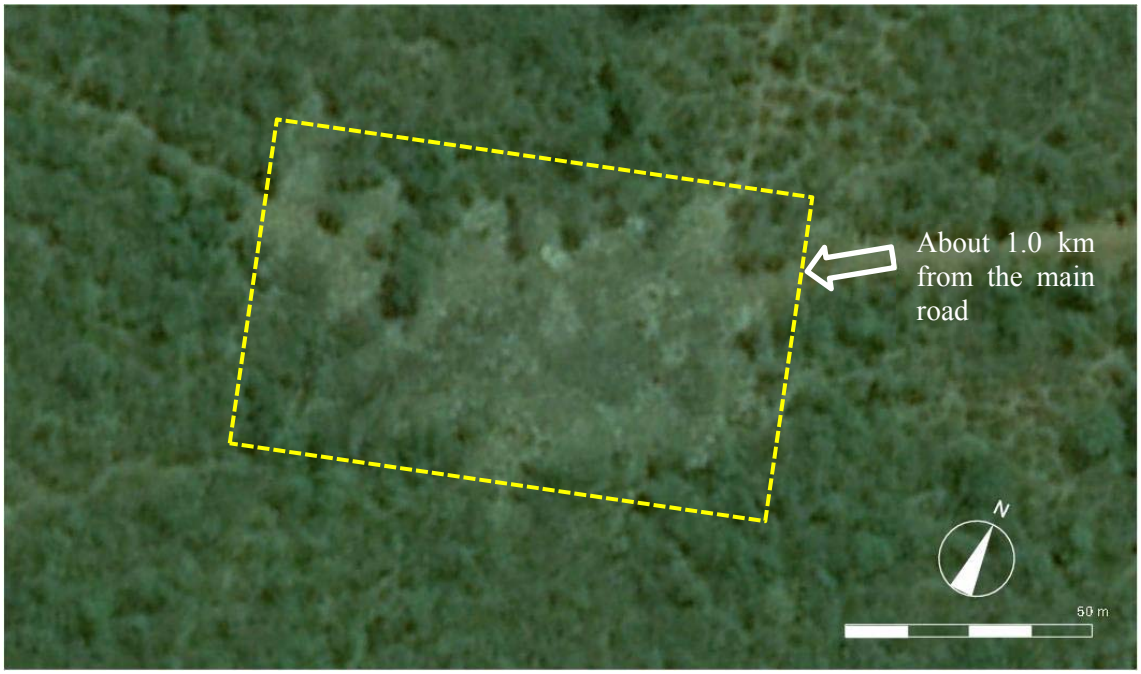
Kataragama has three final disposal sites (see Figure 4-3 of b2.2). The PS is in charge of the Galapitigala Yaya disposal site and the Sella Kataragama disposal site. The other disposal site is located in the temple area and the Physical Planning Department collects and disposes waste generated from the worshipers and the temple areas.

Approximately 75% of waste collected by the PS is transported to the Galapitigala Yaya disposal site, and 25% to the Sella Kataragama disposal site. Both disposal sites are open dumping sites and daily landfilling is not conducted.

(1) Galapitigala Yaya Disposal Site

It is located approximately 7km southwest from the PS City Hall and the total area is two acres (0.81ha). The land had been used in leasehold from the Divisional Secretariat in 1987 but was transferred to the PS from 2001 to the present.

Usually nobody stays at the disposal sites but the collection driver reports the situation to the TO. Approximately 6 load/day (about 10 tons) of waste is disposed. There are about 50 wild elephants living in the surroundings of the disposal site and they sometimes come to seek food.



Collected waste is unloaded where it is accessible. Surrounding environment is poor due to bad odor and flies.

Access road to the DS: disposal site becomes inaccessible during the rainy season

When DS cannot be accessed waste is dumped along the access road

(2) Sella Kataragama Disposal Site

It is located approximately 7km northwest from the PS City Hall and the total area is two acres (0.8ha). The land has been used in leasehold (annually updated) from the Provincial Secretariat. The PS collects general waste and septic tank sludge in the Sella Kataragama area. The collection amount of general waste is two load/day (about 3 tons/day). On the other hand the septic tank sludge is dumped into the hole, and local residents complain about it overflowing during the rainy season.

A site survey of this disposal site was not conducted as we had no access to the site because of heavy rain. For this reason only the photograph and satellite photo of the access road are shown below.

There was no evidence of waste scattering as observed from the satellite photo.

Passage from Kataragama road

Kataragama road

b.10 Issues of Technical System

Regarding collection and transportation, no specific containers for separated organic waste are distributed to the residents, therefore it is inefficient for collection workers to open the plastic bags to check whether it is organic waste or other waste each time they load waste. In order to make it more efficient and hygienic, containers for separate collection should be distributed to the residents.

Collection service is only provided to the commercial area and the hotels; in the residential area it is based on self-disposal such as open burning and burying. The UC has many tourists, therefore the improvement of collection service rates is an urgent issue for environmental conservation.

As for the intermediate facility, it is a challenge to operate the compost plant sustainably in the future.

There are four dumping sites (final disposal site) in the PS; two sites are operated by the PS and one site is located in the temple area and the waste is disposed by the Kataragama branch of the

National Physical Planning Dept. The remaining site is an illegal dumping site. All of the final disposal sites are open dumping and not managed well. It is an urgent issue to establish a management system for final disposal site as the final destination of municipal solid waste.

c. Recycling Activities

c.1 Source Separation

In some areas of the Kataragama PS, buckets for separated organic waste were distributed by the WMA to residents in 2013. However, residents used them for cooking or washing at home as the public awareness activities were not fully implemented.

In the Kataragama PS, separate collection is introduced in some areas in order to recover organic waste to be brought to the compost plant. Additionally, source separation is being promoted. On the other hand, no collection service is provided by the PS in most areas, therefore residents bury waste in a pit in the backyard or burn it on site. Also, the valuable materials are sold to informal recyclers.

We did not find any community recycling systems or recycling activities.

c.2 Reduction of Organic Waste

The Kataragama PS does not subsidise any home compost bins. Moreover, the incentive to do home composting is considered to be low because the coverage area of waste collection services is high and there is a large commercial area.

The Kataragama PS, with the support of Pura Negma project, distributed home compost bins to 70 tax-payers of the assessment tax as of November 2015. It is planned to provide 200 more bins within the next 3 months.

c.3 Recycling Valuable Materials

It is said that four middleman shops that buy and sell valuable materials exist in the suburbs of the Kataragama PS. We conducted an interview with one of these shops. Most of the valuables are collected by middleman shop workers with handcarts in the neighbouring area. The summary of the interview is shown below.

Table 4-8: Purchase of valuable materials at Middleman Shop

Type of Valuables	Collection amount (ton/mth)	Buying price (LKR/kg)	Selling price (LKR/kg)	Destination	Remarks
Plastic	―	―	―	―	Not collected because the market value is low for its bulky volume
PET	―	―	―	―	
Polythene	0.3	10	45	Recycler at Colombo	
Metal 1	0.3	―	―	―	Other than Metal 2. Not sold because the market value is low
Metal 2	0.25	8	15	Middleman at Colombo	Fish can etc.
Glass	1	2	5.75	Recycler at Colombo	Sale after crushing
Cardboard	0.5	5	18	Recycler at Colombo	
Newspaper	0.2	15	25	Local Flower Shop	Reuse as wrapping paper
Paper	0.3	5	18	Recycler at Colombo	Mainly used book

＊Based on the interview with Middleman Shop owner (November 5, 2015)

Photo：Middleman shop in the city

c.4 Issues of Recycling Activities

While the system of separate collection has only just begun in some areas of the Kataragama PS, it is necessary to first encourage residents to make sure they separate their waste (source separation). It is necessary to establish a system (effective and hygienic storage and discharge method, setting a separate collection date and time, providing reliable collection services, etc.) that can be easily understood and adopted by residents.

Recycling of valuable materials is performed in middleman shops. There are types of recyclables which are not bought and sold even though they are marketable. Such materials such as Plastic and PET are bulky so the market value is comparatively low. Therefore, they are not recovered and found at the final disposal site. Also, for most of the recyclers the final destination of valuables are located in the capital Colombo so the transportation cost is high and therefore the price they are will to pay is low. Compression and palletisation of valuable materials is necessary to increase the added value.

d. Public Awareness

d.1 Current Situation of Public Awareness Activities

In the Kataragama PS, separate collection has been implemented in some areas and public awareness activities to promote source separation have been carried out. An outline of public awareness activities are shown below.

Table 4-9: Outline of Public Awareness Activities in Kataragama

Public Awareness Activities	
Execution body	PS(Supported by the CEA and PHI)
Title	Source separation activities
Budget source	None (SMDF is expected to provide financial support in future)
Budget amount	None
Methods	Public announcement through loud speaker Monitoring of separate collection by police

Besides that, in accordance with the time of festivals, the Kataragama PS holds a meeting with the Trade Association and instructs them to improve the handling of waste in the PS.

d.2 Participation Level and Manners of Citizens

The level of cooperation of the residents for source separation is low because separate collection has just started. Many of the complaints that the PS receives from residents are related to poor waste discharge manners of the tourists and worshipers of the temples.

d.3 Issues of Public Awareness Activities

In the Kataragama PS, public awareness activities for source separation are conducted but the level of cooperation of the residents is still low. It is essential to set the discharging rules (target waste for separation, collection date, discharge point, and discharge method) in order for residents to easily understand. It is also necessary to implement environmental education in schools as well as activities to improve discharge manners at the same time.

e. Finance

e.1 Financial Condition of the Pradeshiya Sabha

The table below shows the past three years of financial data for the Katharagama Pradeshiya Sabha (Katharagama PS). According to the table, the difference between annual revenues and expenditures of the pradeshiya sabha has been positive in each year and its share in total annual revenues accounted for 6% on average. However, observing the condition year by year, the amount of total expenditures was at same levels with those of the revenues except in the year 2014.

Table 4-10: Annual Revenue and Expenditure of Katharagama PS (Unit: Thousand LKR)

No	Category	2012	2013	2014	Annual Averages 000 LKR	Annual Averages %
1	Approved Budget	71,622	79,156	85,748	78,842	
2	Actual					
	Revenue	32,663	44,495	74,882	50,680	100.0%
	Own-source revenue	18,329	0,330	20,455	19,705	38.9%
	Grant	14,334	24,165	54,427	30,976	61.1%
	Expenditure	32,400	43,571	67,330	47,767	94.3%
	Recurrent	30,625	42,387	45,790	39,600	78.1%
	Capital	1,776	1,184	21,540	8,167	16.1%
	Profit or loss	263	924	7,552	2,913	5.7%

Source: Katharagama PS, "Programme Budget: 2013-2015"

The share of own-source revenues is roughly 40% while that of grants was estimated as roughly 60% (table below).

Table 4-11: Breakdown of Annual Revenue of Katharagama PS (Unit: thousand LKR)

No	Types of Revenues	2012	2013	2014	Annual Average 000 LKR	Annual Average %
1	Own-Source Revenue:					
	Rates & Taxes	1,241	1,512	864	1,206	2.4%
	Rents	6,393	8,031	7,784	7,403	14.6%
	License	452	732	756	647	1.3%
	Fees For Services	1,314	1,976	1,759	1,683	3.3%
	Warrant Costs And Fines	1,841	1,989	0	1,277	2.5%
	Other Income	7,087	6,090	9,292	7,490	14.8%
	Total Own-Source Revenue	18,329	20,330	20,455	19,705	38.9%
2	Grants:					
	Recurrent Grant:	14,334	21,060	26,532	20,642	40.7%
	Salaries	14,334	21,060	26,532	20,642	40.7%
	Council Members Allowances					0.0%
	Other Recurrent Grant					0.0%
	Capital Grants	0	3,105	27,895	10,333	20.4%
	Total Grants	14,334	24,165	54,427	30,976	61.1%
	Total	32,663	44,495	74,882	50,680	100.0%

Source: Katharagama PS, "Programme Budget: 2013～2015"

The share of capital grants in the total revenues is relatively large, accounting for around 20%. On the other hand, the amount of total recurrent expenditures occupies 80% in the total expenditures of the pradeshiya sabha and its amount is almost double in comparison with that of the own-source revenues. According to the tables, the pradeshiya sabha has not spent all the capital grants received in the latest two years.

Table 4-12: Breakdown of the Annual Expenditure of Katharagama PS (Unit: Thousand LKR)

No	Types of Expenditures	2012	2013	2014	Annual Average 000 LKR	Annual Average %
1	Recurrent Expenditures:					
	Personal Emoluments	20,591	28,121	33,180	27,297	57.1%
	Travelling	307	596	359	421	0.9%
	Requisites And Equipment	1,530	3,596	3,582	2,903	6.1%
	Repairs And Maintenance Of Capital Assets	835	1,936	1,353	1,374	2.9%
	Transportation, Communication, Utility And Other Services	4,185	6,275	6,805	5,755	12.0%
	Interest	0	0	0	0	0.0%
	Grants, Subsidies And Contributions	597	507	512	538	1.1%
	Pensions, Retirements, Benefits And Gratuities	0	0	0	0	0.0%
	Other Expenditures	2,580	1,356	0	1,312	2.7%
	Total Recurrent Expenditures	30,625	42,387	45,790	39,600	82.9%
2	Capital Expenditure	1,776	1,184	21,540	8,167	17.1%
	Total Expenditure	32,400	43,571	67,330	47,767	100.0%

Source: Katharagama PS, "Programme Budget: 2013-2015"

According to financial data provided by the Katharagama PS, the pradeshiya sabha has limited financial sources. As a result of the block grants released by the central government, the total expenditures equalled to the total revenues of Katharagama PS.

Although it is not facing financial difficulties, it cannot necessarily be considered that the pradeshiya sabha has been implementing public services sufficiently. Investments for quality improvement of public services force the local authority to depend on external sources.

e.2 SWM Finance

In the Katharagama PS, all resources of the Public Health Inspectors' (PHI) section are utilized for implementing all activities undertaken by the section. Therefore, it was impossible to separate SWM expenses from those of other activities that the section implements.

The table below shows the financial data of the PHI section for the past three years.

Table 4-13: Annual Revenues and Expenses of PHI Section (Unit: Thousand LKR)

No	Types of Expenses	2012	2013	2014
A	Approved Budget	5,170	19,326	21,186
B	Revenues:			
1	Collected Waste Fees	136	330	629
2	Other Revenues	6,964	9,990	12,759
	Total Revenues	7,101	10,320	13,387
C	Actual Expenditures:			
1	Personal Emoluments	10,389	14,055	15,687
2	Supplies And Materials Expenses	196	892	236
3	Repairs And Maintenance Of Vehicles	479	1,180	1,123
4	Final Disposal Payment			
5	Other Expenses	2,650	3,346	3,153
	Total Expenditures	13,714	19,473	20,199
	Collected Waste Fees in the Total Revenues	1.9%	3.2%	4.7%
	Total Revenues in the Total Expenditure	51.8%	53.0%	66.3%

Note: Part of the 2012 data is missing.
Source: Katharagama PS (part of the data is taken from "Programme Budget: 2013-2015")

The total revenues of the PHI section equal 50% to 66% of its total expenses. However, the revenues from the collected waste fees account for 2% to 5% in the total revenues of the section. Therefore, it can be considered that the SWM activities were financed from other sources of the pradeshiya sabha. .

According to the Katharagama PS, waste fees are collected only from shops and hotels as these types of businesses generate a lot of waste. However, only 35 businesses that paid the waste fee as of 31 October 2015.

The waste fees were set at a monthly basis and the amounts of waste have not been considered. The table of fees is as follows.

Table 4-14: List of Waste Fees (Tax* Included)

No	Types of Waste	Unit	Tariff
1	Separated waste from traders (shops)	LKR/month	1000.00
2	Unseparated waste from traders (shops)	LKR/month	1500.00
3	Separated waste from guest houses, lodges and hotels	LKR/month	4000.00
4	Unseparated waste from guest houses, lodges and hotels	LKR/month	6000.00

*-Tax rates: Nation building tax-2%, VAT-12%
Source: Katharagama PS (results of interview survey)

e.3 Problems Identified in the SWM Financial System

Households residing along main roads and in the central parts of the pradeshiya sabha receive waste collection service for free of charge while the households residing in the rest of the area are not served. The pradeshiya sabha does not collect waste fees from businesses except for some shops and hotels; and therefore, the revenues of waste fees have been limited considerably.

4.1.3 Waste Amount and Composition Survey

a. Waste Generation Amount

The waste generation amount was calculated based on the waste generation rate obtained by SATREPS in March 2014 and waste generation units obtained by a locally outsourced survey. The results reveal that the waste generation rate is 721g/person/day.

Table 4-15: Waste Generation Amount of Kataragama PS

Source		Generation rate		Generation sources	Generation (ton/day)
Residential	Collection	0.41	Kg/person/day	19,010	7.8
Commercial	Hotels (large)	155.00	Kg/(hotel)	1	0.2
	Hotels (middle)	29.00	Kg/(hotel)	2	0.1
	Hotels (small)	4.10	Kg/(hotel)	279	1.1
	Restaurants (large)	66.50	Kg/(restaurant)	2	0.1
	Restaurants (middle)	29.50	Kg/(restaurant)	5	0.1
	Restaurants (small)	13.80	Kg/(restaurant)	94	1.3
	Organic-shops (large)	11.50	Kg/(shop)	3	0.0
	Organic-shops (middle)	6.00	Kg/(shop)	9	0.1
	Organic-shops (small)	11.00	Kg/(shop)	30	0.3
	Non-organic shops (large)	7.25	Kg/(shop)	1	0.0
	Non-organic shops (small)	1.90	Kg/(shop)	80	0.2
Institutions	Schools	127.50	Kg/(school)	5	0.6
	Hospitals	1,087.00	Kg/(hospital)	1	1.1
	Public office	20.00	Kg/(institution)	29	0.6
	Bank/Private office	2.00	Kg/(institution)	8	0.0
	Buddhist temples	2.00	Kg/(temple)	32	0.1
	Hindu temples	5.00	Kg/(temple)	3	0.0
	Mosques	1.10	Kg/(mosque)	1	0.0
	Churches	0.50	Kg/(church)	0	0.0
Industries	Large	187.50	Kg/(industry)	0	0.0
	Domestic	6.00	Kg/(industry)	0	0.0
Market		120.00	Kg/market	0	0
Port		1,800.00	Kg/port	0	0
Total					13.7

b. Waste Composition

The results of the locally outsourced survey on waste composition, conducted from 6 to 11 October, are shown below.

Organic waste such as kitchen waste and green waste is 81.6 % of the total amount. The apparent specific gravity is as heavy as 0.598 ton/m^3, which reveals that the content of organic waste is large. On the other hand, valuable materials such as paper, textile, plastic, metal, and glass bottle are as little as 12.9%.

Table 4-16: Waste Composition and Apparent Specific Gravity of Kataragama PS

Category	Rate
Kitchen waste	63.3%
Paper	7.1%
Textiles	0.6%
Grass & wood	18.3%
Soft Plastics	3.9%
Hard Plastics	0.5%
Rubber & leather	0.2%
Metal	0.2%
Glass & bottles	0.6%
Stone & ceramic	5.4%
Other	0.0%
	100.0%
Apparent Specific Gravity	0.598 ton/m^3

4.1.4 The Result of Public Opinion Survey

The demographics of the surveyed households are as follows: 99% of the surveyed households are Sinhalese, and 1 % is Tamils. Data on the average number of people per households and monthly income is set out in the table below.

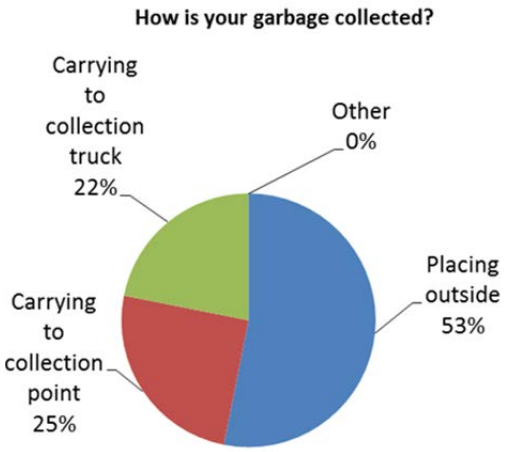
Table 4-17: Average and standard deviation values of income and family size

Category	Number of sample	Average of family members / employees	Income/Turnover (LKR/month)
High	34	4.3	172, 500
Middle	86	4.4	48, 012
Low	41	4.0	23, 476
Business	44	2.6	3, 677, 386

In the Kataragama PS, only 44 % of surveyed households are provided with a garbage collection service, of which 36 % stated they use this service. Only 41 % of surveyed households are "very satisfied" with the present SWM services provision, while 39 % are "somewhat satisfied".

Item	No. of sample	%
Yes	71	44
No	90	56
Total	161	100

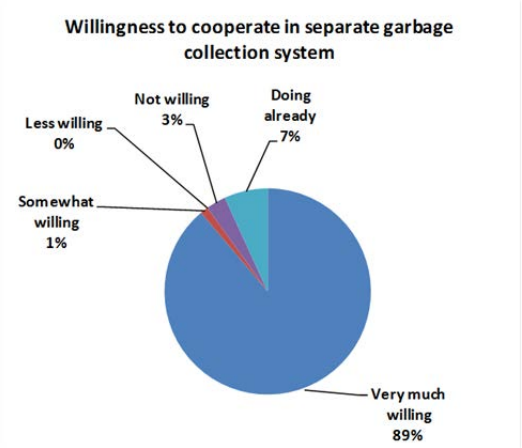
Figure 4-4: Availability of garbage collection service in the Kataragama PS



Item	No. of sample	%
Placing outside	85	53
Carrying to collection point	41	25
Carrying to collection truck	35	22
Other	0	0
Total	161	100

Figure 4-5: Method of garbage discharge by residences in KPS area

- ✓ Out of the Households' who use the garbage collection service, the main methods of waste discharge are shown in upper figure. The most common methods are discharging it outside their premises for house to house collection (53%) and carrying garbage to the collection point (25%) and to the collection truck (22%).
- ✓ Out of households who use the service, only 11 % receive a daily garbage collection service while 56% stated that they received the service 2-3 times/week.
- ✓ 61% of surveyed households discharge garbage as soon as it is generated and 28% discharge their garbage daily.
- ✓ In general, adult females handle waste in about 84% of surveyed households.
- ✓ As shown in lower Figure, only 7% of households separate their garbage into organic and inorganic waste at the source of generation. Only 3% of surveyed households are not/less willing to cooperate with source separation for recycling. The rest of the households are very much willing (89%) and somewhat willing (1%) to cooperate in the source separated garbage collection system.
- ✓ Further, 72 % of surveyed households stated that there are recyclable collectors or someone who comes to collect their reusable or recyclable materials. Hence, an informal recycling system is well established in the Kataragama PS area.



Item	No. of sample	%
Very much willing	143	89
Somewhat willing	2	1
Less willing	0	0
Not willing	5	3
Doing already	11	7
Total	161	100

Figure 4-6: Willingness of residences to participate in the source separated garbage collection system in the Kataragama PS

- ✓ Only 13% of surveyed households use kitchen/garden waste for composting and also used the finished compost for their own garden.
- ✓ Not many surveyed households (75%) have ever discussed proper garbage discharge methods at the community level.
- ✓ A notable feature is that 100% of households stated that SWM awareness programmes are very necessary
- ✓ 75% of households do not like to pay for SWM services mainly because of the revenue tax they paid for the KPS. The average WTP (willingness to pay) for improved SWM services is 42 ± 91 LKR/month per households.
- ✓ Out of all surveyed households, 12% stated that they sell/give away glass and bottles for recycling, and 39% of residences sell/give-away plastics for recycling. But only 1% of households sell/give-away cans and metals for recycling. Cardboard and paper recycling were 1% and 19% respectively.

4.1.5 Waste Flow (2015）

The current waste flow has been prepared by analysing the locally outsourced public opinion survey, statistical data collection, and the results of the census.

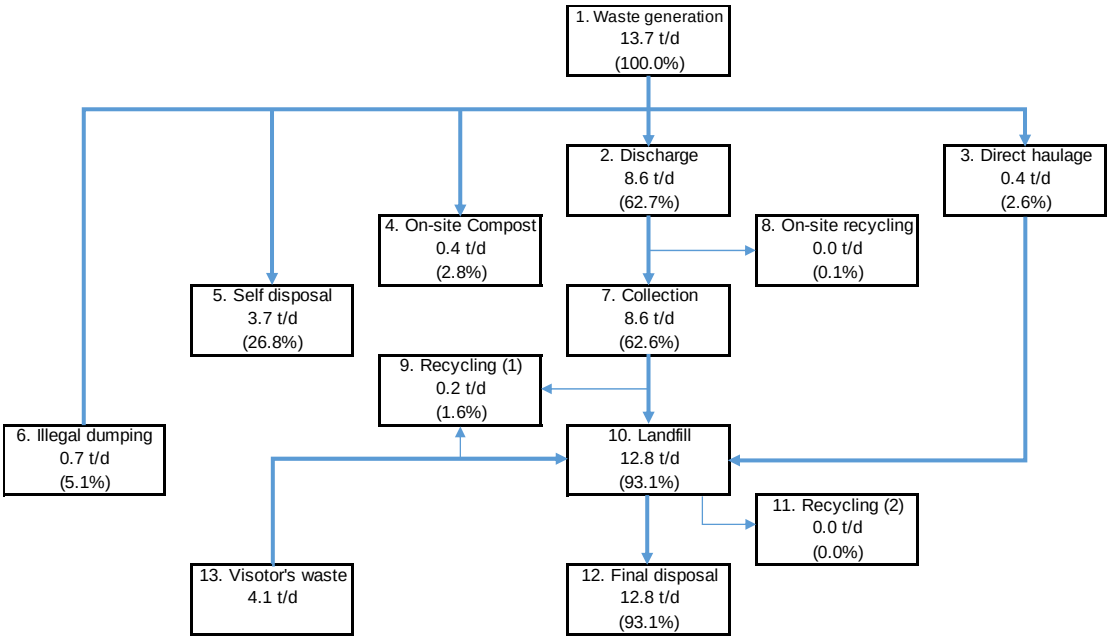


Figure 4-7: Waste Flow of Kataragama PS (2015)

According to the waste flow, the collection rate ((discharge amount + direct loading amount)/generation amount) is 65.7%. Self-disposal such as burning and burying on site is 26.8%, and illegal dumping is 5.1%. The total recycling rate including compost and recycling activities is as low as 4.7%.

One feature of the Kataragama PS is that there are a lot of worshipers at the temples and waste generated by them is about 30% of that of residents. In addition, the waste generation amount is as high as approximately 50 tons/day when worshipers come (including from India) in April, July, and December.

4.1.6 Current Situation of Other Waste Management

a. Current Situation of Industrial Waste Management

a.1 Generation Amount & Disposal Amount

Since general waste generated by businesses such as shops is collected together with general municipal waste, the generation amount and the disposal amount of industrial waste are not identified.

a.2 Collection, Transportation and Disposal

General waste from businesses is collected together with general municipal waste and discharged at the Galapitagalayaya DS. The UC is not involved in the handling of the hazardous waste of industrial waste.

a.3 Tipping Fee

The tipping fee (gate fee) of general waste from business entities that are collected together with mixed waste is free of charge.

b. Current Situation of Medical Waste Management

b.1 Generation Amount & Disposal Amount

In the Kataragama PS, there is only one large hospital and the total generation amount of general waste is 1 load/week (1.5 tons/week).

b.2 Collection, Transportation and Disposal

General waste generated from the large hospital is collected by the PS once a week (additional collection is provided upon request) and transported to the Galapitagalayaya DS. However, medical waste is disposed by the hospital itself and the PS is not involved.

b.3 Tipping Fee

The tipping fee (gate fee) is free of charge as waste from the hospital is collected together with general municipal waste.

c. Current Situation of Night Soil Management

c.1 Generation Amount & Disposal Amount

The accurate amount of night soil is not recorded by the PS.

c.2 Collection, Transportation and Disposal

Night soil generated by around 100 hotels and public bathrooms is collected by the Kataragama PS and disposed at the Sella Kataragama DS. The PS collects night soil from households and business entities only upon request.

c.3 Tipping Fee

The tipping fee (gate fee) for households and business entities is 5,000LKR/load (3,500L) but for temples and army camps it is free of charge.

4.1.7 Needs for Solid Waste Management

a. Improvement of Technical System

a.1 Improvement of Collection Service Rate

The collection service rate is as low as 65.7% and more than 1/4 of waste is self-disposed. Self-disposal includes open burning and burying and it is undesirable to burn plastics and to bury non-degradable waste from the point of view of environmental protection. Therefore, it is desirable for the Kataragama PS to reduce the self-disposal rate by increasing the collection rate.

a.2 Response to the Change of Waste Generation

The Kataragama is a sacred place for Hindus at the southernmost tip of South Asia and it is also adjacent to the Yara National Park. For these reasons, it is visited by many worshipers and tourists. The waste generation amount during the season becomes three times more than that of normal time, which is far beyond the capacity of the Kataragama PS. For this reason, the waste generated in the temples is collected and disposed by the National Physical Planning Department in the disposal site of the temples (open dumping). It is desirable to centrally manage the waste generated in the same region to reduce the load on the environment. a.3. of final disposal site improvement

a.3 Improvement of Disposal Site

All three disposal sites in the Kataragama PS are open dumping and have many environmental protection issues such as waste scattering and overflow of leachate. In addition, the access road to the disposal site is unpaved so it becomes muddy during the rainy season and this makes it difficult to reach to the disposal site so the waste is dumped on the road side. It is desirable to establish a system that can be managed properly by integrating these disposal sites.

b. Improvement of Organization and Legislation

b.1 Strengthening Finance on Solid Waste Management

The financial condition of the Kataragama PS is relatively good because it is rich in tourism resources. However, the budget allocated for waste management is limited and is only sufficient to maintain the current situation. Improvement of the waste collection rate and of the disposal site is urgent issues, as mentioned above. Therefore, the financial situation needs to be improved to enable sufficient allocation of budget for solid waste management.

4.2 Thamankaduwa Pradeshiya Sabha in North-Central Province

4.2.1 Outline of the Local Authority

In earlier times, the surrounding areas of the Thamankaduwa Pradeshiya Sabha (PS) flourished as the second largest city in Sri Lanka. However, the area was looted once and relinquished to invaders for a while. In 1948, Mr. D.S. Senanayake carried out a resettlement program for farmers.

The area was historically called "Vijithagama" and renamed "Thamankaduwa Disawa" in 1815. In 1953, it became the administrative district Polonnaruwa. During the early period of the Polonnaruwa District, it had two revenue divisions: Sinhala Paththuwa and Thamankaduwa. In 1924, an election system was introduced in accordance with a resolution by the Village Council. After the abolishment of the village council system in 1980, a new council system was introduced for administration of this local authority. Under the new system, the Polonnaruwa District was divided into five areas in 1983 and Thamankaduwa PS was established based on a small town named Thamankaduwa. The administrative borders of Thamankaduwa PS were settled in 1987. The first election for the village council was organized in 1991 and 14 members were elected as council members.

The land along Mahawelli River, which flows through the territory of the PS, is considered suitable for agriculture. The Thamankaduwa PS consists of 53 Grama Nilathari Divisions (GN divisions), the smallest administrative unit. The dynamics of the population in the local authority for the years 2013 to 2015 is shown in the table below.

Table 4-18: Dynamics of Population in Thamankaduwa PS (2012 to 2015)

Years	2012	2013	2014	2015
Population	82,426	83,034	84,047	84,869

Source: Estimated based on the census data of 2012

4.2.2 Current Situation and Problems of Solid Waste Management

a. Organization and Legal System

a.1 Legislation and Policy

The Thamankaduwa PS implements solid waste management (SWM) activities based on the Pradeshiya Sabha Act of 1987.

a.2 Organization

The Thamankaduwa PS administration consists of nine sections including the Accounting section, Development section and Works section. The Health section is in charge of SWM activities.

SWM in the PS is implemented by two officers: a public health inspector (PHI) and a technical officer (TO). However, the Department of Archaeology, Ministry of Education is responsible for positioning dust bins in archaeological areas of Thamankaduwa for separated waste.

The organization charts of the Thamankaduwa PS and SWM in the PS are as follows.

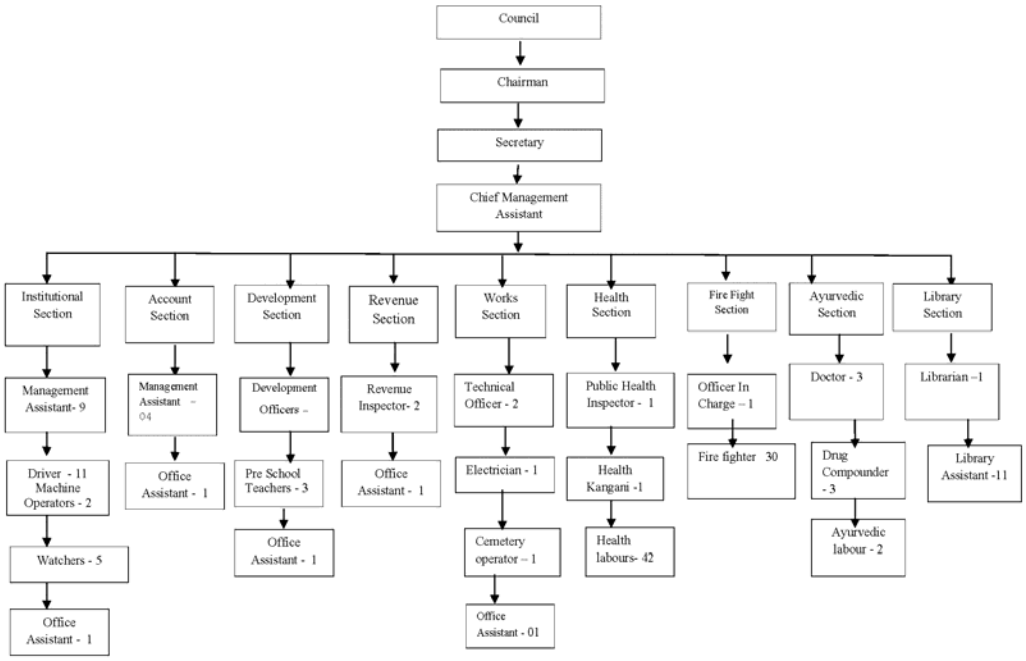


Figure 4-8: The organization chart of the Thamankaduwa PS

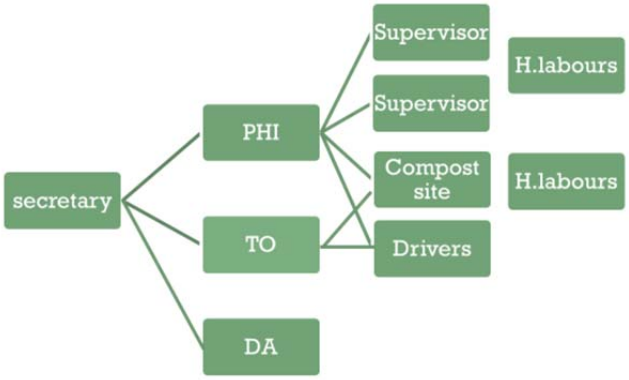


Figure 4-9: The organization chart of SWM in Thamankaduwa PS

Table 4-19: Staff related to SWM in Thamankaduwa PS

Staff	Number	Remarks
Engineer	0	
Technical officer (TO)	2	One of the TOs is in charge of SWM
Medical officer of health (MOH)	0	
Public health inspector (PHI)	1	
Supervisor (SV)	2	One of the two posts has been vacant.
Collection workers		
Permanent	33	
Temporary	2	
Driver		
Permanent	4	
Temporary	-	
Disposal site workers	4	
Other	1	Development Officer

a.3 Solid Waste Management Plan

The Thamankaduwa PS has not formulated any master plan or action plan related to SWM.

a.4 Issues of Organization and Legal System

As SWM in Thamankaduwa is implemented by a PHI and a TO, the number of staff is insufficient for SWM on a pradeshiya sabha-scale.

b. Technical System

b.1 Storage and Discharge

The Thamankaduwa PS collects organic and inorganic waste separately by implementing separate collection service. The degree of cooperation by the residents on waste separation and separate discharge was estimated as 75% (based on results of the interview surveys with PS officials).

b.2 Collection and Transportation

The PS is obliged to collect waste discharged by each generation source in its territory and transport the collected waste to the disposal site. Waste collection services are conducted separately for town areas (areas along main roads and commercial zones) and residential areas.

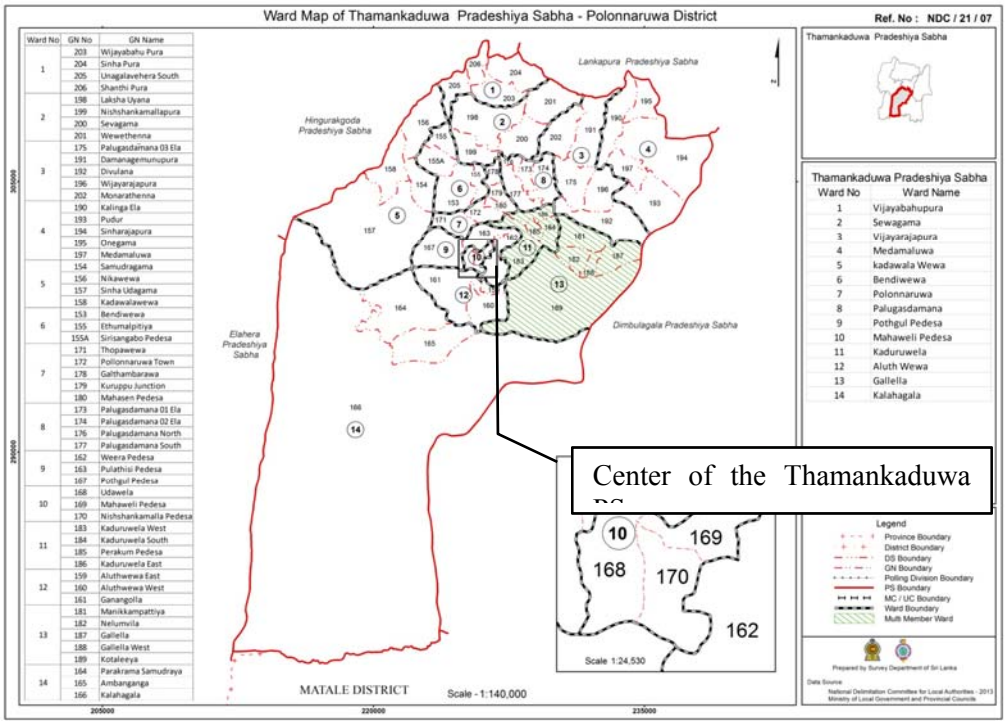


Figure 4-10: Map of the Thamankaduwa PS

The Thamankaduwa PS conducts waste collection services with four tractors and 35 workers (two of them are temporary workers). The PS is planning to purchase a compactor truck in the near future.

Table 4-20: Collection equipment of the Thamankaduwa PS

Vehicle type	Number	Remarks
Compactor truck (12-14 m3)	(1)	To be purchased
Tractor	4	
Hand-cart	3	
Vacuum truck	1	
Tipper (8.5m3)	1	

As for the collection methods, door-to-door collection is implemented in the residential areas while waste in the downtown, the areas located along main roads, is collected through kerbside-collections. As for archaeological areas and the surroundings of an artificial lake, dustbins for three types of separated waste – organic, polyethylene and papers – have to be placed in accordance with regulations. The Ministry of Education is responsible for placing the dustbins and collection of waste in these areas.

Waste collection fees are collected from 52 large-scale businesses including factories, but not from residents. The average amount of waste fees to be collected from these businesses is 1,000 LKR per collection. The collection frequency is compiled in the table below.

Table 4-21: Waste collection frequency

Area	Frequency	Remarks
Commercial areas in the downtown	Daily	Two shifts: day and night shifts
Residential areas	Once a week	
Archaeological areas and surroundings of the artificial lake	Twice a week	

Waste for the entire town is collected by tractors.

Trailers are divided for collecting separated organic and inorganic waste.

Photo: Waste collection manner in the Thamankaduwa PS

The Thamankaduwa PS does not have a workshop; and therefore, equipment maintenance and repairs are conducted at a private garage. Maintenance costs that exceed 5,000 LKR must be approved by the mechanical engineer while those below 5,000 LKR are expended with the approval of the secretary.

b.3 Intermediate Treatment

Inorganic waste collected and transported through separate collections is sorted into soft plastics, hard plastics, glass and PET bottles at the recycling center located in the territory of the disposal site. Other types of recyclables are collected by private recyclers at generation sources.

Table 4-22: Intermediate treatment facility in the Thamankaduwa PS

Facility Type	Execution body	Address	Capacity (m3/day)	Established year	Remarks
Recycling facility	Thamankaduwa PS	Located in the territory of the disposal site	72	2015	Sorts plastics and PET bottles

Photo: The recycling center (left) and sorted plastic materials (right)

Although there is a compost plant in the premises of the disposal site, it has essentially not been in operation. As wild elephants come to the site searching for food, the organic waste is stored in a storage tank of an obsolete gas collection facility immediately after its transportation to the disposal site. After the waste has decomposed, the organic waste is put out of the storage tank and discharged to the disposal site.

b.4 Final Disposal

The Thamankaduwa PS transports collected waste to a disposal site located at a distance of four km from the downtown. As sufficient area is secured for the disposal site, lifetime-related problems are not expected.

However, the most serious problem with the disposal site is that related with wild elephants. As the elephants come to the site searching for food, there are risks of elephant attacks on drivers and collection workers. In relation to this problem, the Thamankaduwa PS dug trenches and erected electric fences as protection measures around the site. However, the elephants continue breaking through these measures and accessing the site.

Accidents resulting in the death of elephants from eating plastic bags has been one of the national problems recently.

Conditions of the disposal site

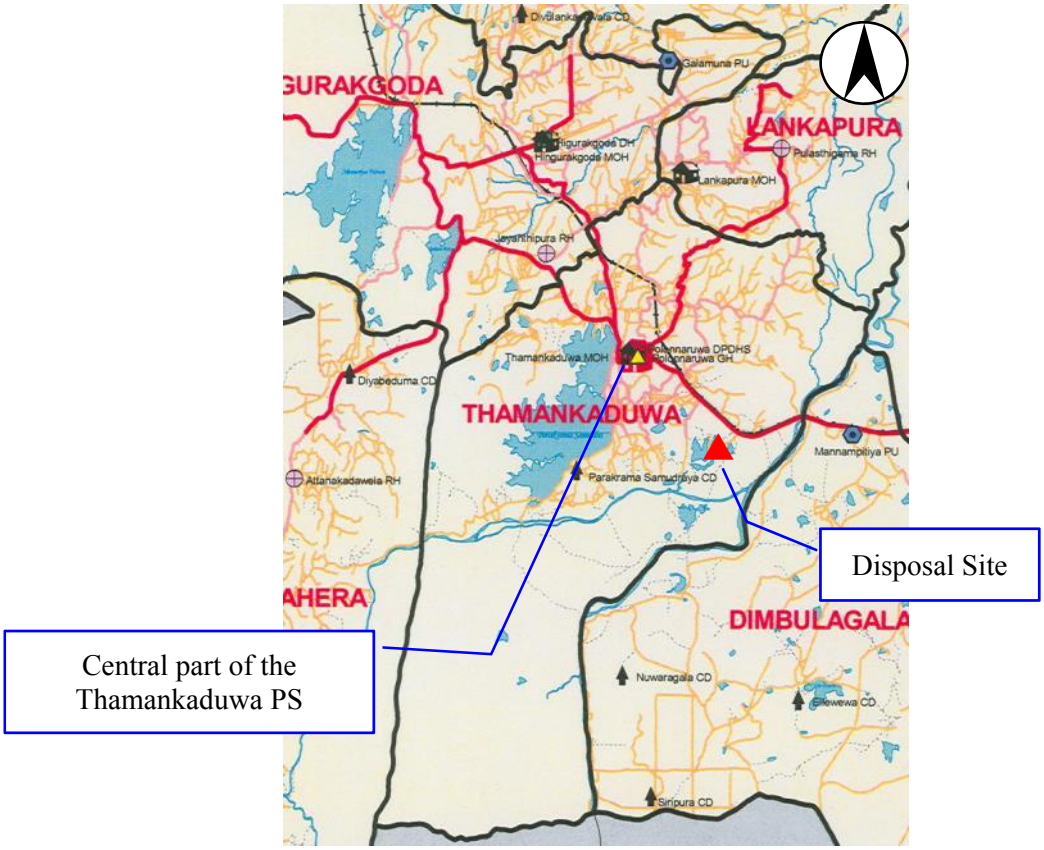
Trench for prevention of elephant access

Manner of chasing elephants by firecrackers and blank shots (shotgun)

The electric fence broken by elephants

An elephant searching for food at the disposal site

Photo: The final disposal site of the Thamankaduwa PS



Source: Results of interview surveys with Thamankaduwa officials

Figure 4-11: Location of the disposal site

Table 4-23: Detailed information about the disposal site of the Thamankaduwa PS

Site name		Gallalla Disposal Site
1) Address		Gallalla
2) Coordination		E81°3′19.2 N7°54′14.8
3) Method of operation		Open-dumping
4) Disposal amount (t/day)	Year	
	2015 (Average of August to November)	15.3
5) Expected remain of life span (years) in 2015		More than 10 years
6) Executing organization of final disposal site		Thamankaduwa PS
7) Tipping fee (LKR/ton)		None
8) Unit cost of operation (LKR/t) in 2014		380 LKR/t
9) Disposal area (ha)		1.6 ha
10) Environmental License and Environmental Clearance		None

Figure 4-12: A satellite image of the disposal site

b.5 Issues of the final disposal site

The most serious problem with the final disposal site is access by wild elephants in spite of preventive measures (building fences and trenches, etc), taken by the pradeshiya sabha. Thus, one of the issues facing the Thamankaduwa PS is the time and cost required for restoration of the broken electric fences and the trenches.

c. Recycling Activities

c.1 Source Separation

Separate collection services are implemented for organic and inorganic waste.

c.2 Composting

Although a compost plant has been constructed in the premises of the disposal site, the plant has not been utilized. In addition to this, home composting is not conducted.

c.3 Recycling of Valuable Materials

Besides the recycling center operated by the Thamankaduwa PS, there are seven private recycling facilities in the territory of the pradeshiya sabha.

The private recyclers collect recyclables on their own in the city and trade them with the following prices.

Table 4-24: Recyclable trading prices at private recycling facilities

Types of recyclables	Purchasing price (LKR/kg)
Plastics	25
Glass bottles	13 to 15 per bottle
Metals	28
Coconuts	5

Based on interviews with recyclers

c.4 Issues of Recycling Activities

The business environment is not so favourable for the recycling centers due to limited markets and imports of cheap recyclables from India and China.

d. Public Awareness

d.1 Degree of Cooperation by Residents

The degree of residents' cooperation on separate collection is relatively high (75%).

d.2 Current Situation of Public Awareness Activities

Awareness raising activities are implemented at schools and during visits to households and businesses by the SV and the PHI who are in charge of SWM in the pradeshiya sabha.

d.3 Issues of Public Awareness Activities

Although the degree of residents' cooperation on separate discharge is relatively high under the current separate discharge system, it is necessary to conduct awareness raising activities to maintain the residents' cooperation if waste is separated into more categories in the future.

e. Finance

e.1 Financial Condition of the Local Authority

The difference between annual revenues and expenditures of the Thamankaduwa pradeshiya sabha has been positive from 2012 to 2014 and its share in total annual revenues accounted for 56% on average as shown in the table below..

Table 4-25: Annual Revenue and Expenditure of Thamankaduwa PS (Unit: Thousand LKR)

No	Category	2012	2013	2014	Annual Average	
					1,000 LKR	%
1	Approved Budget	95,948	99,759	102,974	99,560	
2	Actual					
	Revenue	86,718	94,361	96,566	92,548	100.0%
	Own-source revenue	43,862	48,567	50,351	47,593	51.4%
	Grant	42,856	45,794	46,215	44,955	48.6%
	Expenditure	39,486	38,514	44,118	40,706	44.0%
	Recurrent	35,086	38,483	44,098	39,222	42.4%
	Capital	4,400	31	20	1,484	1.6%
	Profit or loss	47,232	55,847	52,448	51,842	56.0%

Source) Thamankaduwa PS "Programme Budget：2013-2015"

The share of own-source revenues is roughly 51.4% while that of grants was estimated as roughly 48.6% as shown in the table below.

Table 4-26: Breakdown of Annual Revenue ofThamankaduwa PS (Unit: thousand LKR)

No	Types of Revenues	2012	2013	2014	Annual Average 1,000 LKR	%
1	Own-Source Revenues:					
	Rates & Taxes	5,708	6,546	7,943	6,732	7.3%
	Rents	12,126	13,064	16,272	13,821	14.9%
	License	3,623	5,878	5,949	5,150	5.6%
	Fees For services	4,970	6,945	7,215	6,377	6.9%
	Warrant Costs And Fines	7,946	9,938	9,517	9,134	9.9%
	Other Income	9,489	6,196	3,455	6,380	6.9%
	Total Own-Source Revenues	43,862	48,567	50,351	47,593	51.4%
2	Grants:					
	Recurrent Grant:	42,817	45,756	46,175	44,916	48.5%
	Salaries	40,527	44,579	45,007	43,371	46.9%
	Council Members Allowances	1,148	1,146	1,148	1,147	1.2%
	Other Recurrent Grant	1,142	31	20	398	0.4%
	Capital Grants	39	38	40	39	0.0%
	Total Grants	42,856	45,794	46,215	44,955	48.6%
	Total	86,718	94,361	96,566	92,548	100.0%

Source: Thamaknaduwa PS “Programme Budget：2013-2015”

The share of capital grants in the total revenues is accounting for around 3.6%. On the other hand, the amount of total recurrent expenditures occupies 96.4% in the total expenditures of the pradeshiya sabha.

Table 4-27: Breakdown of the Annual Expenditure of Thamankaduwa PS (Unit: Thousand LKR)

No	Types of Expenditures	2012	2013	2014	Annual Average 000 LKR	%
1	Recurrent Expenditures:					
	Personal Emoluments	22,734	26,583	27,489	25,602	62.9%
	Travelling	671	436	479	529	1.3%
	Requisites And Equipment	3,059	4,600	8,018	5,226	12.8%
	Repairs And Maintenance Of Capital Assets	4,850	3,236	4,017	4,034	9.9%
	Transportation, Communication, Utility And Others Rervices	3,110	3,150	3,580	3,280	8.1%
	Interest	97	93	86	92	0.2%
	Grants, Subsidies And Contributions	487	312	345	381	0.9%
	Pensions, Retirements, Benefits And Gratuities	78	73	84	78	0.2%
	Other Expenditures					
	Total Recurrent Expenditures	35,086	38,483	44,098	39,222	96.4%
2	Capital Expenditure	4,400	31	20	1,484	3.6%
	Total Expenditure	39,486	38,514	44,118	40,706	100.0%

Source : Thmankaduwa PS “Programme Budget：2013～2015”

e.2 SWM Finance

In the Thamankaduwa PS, all resources of the Health Section are utilized for implementing all activities undertaken by the section. Therefore, it is difficult to separate SWM expenses from those of other activities that the section implements.

The total revenue of the Health Section mainly consists of waste collection fee from business institute and it is approximately 8,551,000 LKR (2014), while the expenditure is 29,172,000 LKR (2014). The table below shows the financial data of the Health Section from 2012 to 2014.

Table 4-28: Annual Revenues and Expenses of Health Section (Unit: Thousand LKR)

No	Types of Expenses	2012*	2013	2014
A	Approved Budget	95,948	99,759	102,974
B	Revenues:			
	Total Revenues			8,511
C	Actual Expenditures:			
1	Personal Emoluments			14,250
2	Total Supplies and Materials Expenses			5,769
3	Repairs And Maintenance of Vehicles			603
4	Fuel And Lubricants			5,150
5	Other supplies			2,850
	Other Expenses			550
	Total Expenditures			29,172

Source :Thamankaduwa PS, No data of 2012 and 2013

e.3 Cost of Waste Collection Service

The expenses of waste collection and transportation for the years 2012 to 2015 were as follows

Table 4-29: Waste collection and transportation costs

	Item	Cost (1000LKR/year)
1	Pay	10,192
2	Fuel	2,515
3	Maintenance	288
	Total	12,996
	12,996,000LKR/14.7 ton/day/365day	2,422(LKR/ton)

The unit collection and transportation cost was estimated as 2,422 LKR/ton from the data of 2015.

e.4 Operation Cost of Disposal Site

The waste disposal expenses for the past four years from 2012 to 2015 were shown in the table below.

Table 4-30: Waste disposal costs

	Item	Cost (1000LKR/year)
1	Pay	1,852
2	Fuel	119
3	Maintenance	355
	Total	2,326
	2,326,000LKR/15.3 ton/day/365day	416(LKR/ton)

The unit disposal cost was estimated as 416 LKR/ton from the data of 2015.

e.5 Issues of Financial System

Total SWM expenses accounted for 7% of the total expenditures of the Thamankaduwa PS in 2014. Considering the SWM financial data, the amount of total expenditures exceeded that of revenues to a small extent. In order to ensure profitability, the pradeshiya sabha needs to optimize waste fees to be collected from large-scale businesses.

4.2.3 Waste Amount and Composition

a. Waste Generation Amount

The waste generation amount is estimated based on the generation rates identified by the Waste Amount and Composition Surveys (WACS) implemented in the Central and Southern Provinces of Sri Lanka under SATREPS and the number of generation sources surveyed during this study by a local consultant. The results showed the generation rate of the municipal solid waste (MSW) was 1.038 kg/person/day.

Table 4-31: The generation amount of MSW in the Thamankaduwa PS

	Source	Generation rate		Generation sources	Generation (ton/day)
Residential	Collection	0.42	Kg/person/day	84,869	35.64
Commercial	Hotels (large)	155.00	Kg/(hotel)	8	1.24
	Hotels (middle)	29.00	Kg/(hotel)	60	1.74
	Restaurants (middle)	29.50	Kg/(restaurant)	53	1.56
	Restaurants (small)	13.80	Kg/(restaurant)	223	3.08
	Organic-shops (large)	11.50	Kg/(shop)	30	0.35
	Organic-shops (small)	11.00	Kg/(shop)	70	0.77
	Non-organic shops (large)	7.25	Kg/(shop)	143	1.04
	Non-organic shops (small)	1.90	Kg/(shop)	1,742	3.31
Institutions	Schools	127.50	Kg/(school)	102	13.01
	Hospitals	1,087.00	Kg/(hospital)	10	10.87
	Public office	20.00	Kg/(institution)	472	9.44
	Bank/Private office	2.00	Kg/(institution)	492	0.98
	Buddhist temples	2.00	Kg/(temple)	41	0.08
	Hindu temples	5.00	Kg/(temple)	1	0.01
	Mosques	1.10	Kg/(mosque)	22	0.02
	Churches	0.50	Kg/(church)	5	0.00
Industries	Domestic	6.00	Kg/(industry)	828	4.97
Total					88.11

b. Waste Composition

The waste composition was estimated based on the results of the Waste Composition Survey (WCS) conducted in this study. The share of organic waste that includes kitchen waste, grass and wood occupies 70% while all other inorganic waste (papers, textiles, plastics, metals and glass) occupies the remaining 30%.

Table 4-32: Waste composition of the Thamankaduwa PS

Category	Shares
Kitchen waste	51.7%
Paper	16.1%
Textiles	2.7%
Grass & wood	15.6%
Soft Plastics	8.1%
Hard Plastics	1.4%
Rubber & leather	1.1%
Metal	1.6%
Glass & bottles	0.4%
Stone & ceramic	1.3%
Other	0.0%
Total	100.0%

4.2.4 Results of the Public Opinion Survey

The demographics of the surveyed households are as follows: 97% are Tamil and only 3 % are Muslims. Data on the average number of people per household and monthly income is shown in the table below.

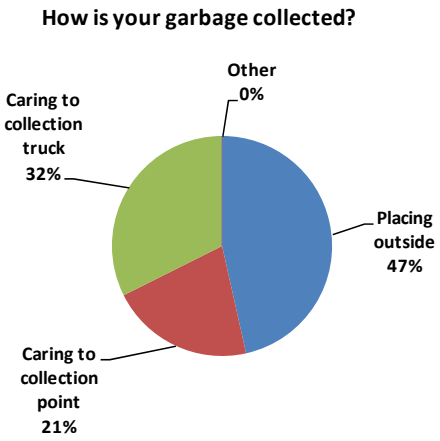
Table 4-33: Average and standard deviation values of income and family size

Category	Number of sample	Average of family members / employees	Income/Turnover (LKR/month)
High	28	4.4	61,500
Middle	71	4.3	35,451
Low	51	4.5	16,569
Business	28	4.4	61,500

Item	No. of sample	%
Yes	83	55
No	67	45
Total	150	100

Figure 4-13: Availability of garbage collection service in the Thamankaduwa PS

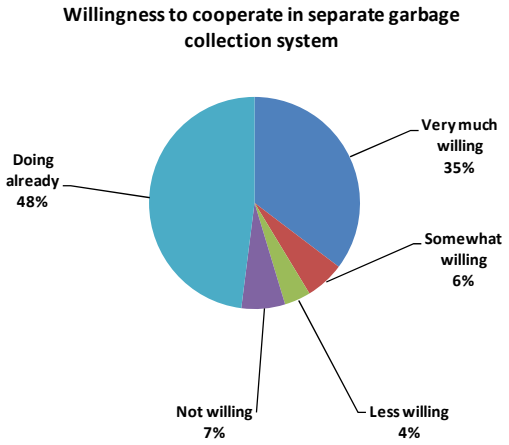
✓ In the Thamankaduwa PS, only 55 % of surveyed households are provided with a garbage collection service, of which only 68% stated they use this service. Only 35 % of surveyed households are "very satisfied" with the present SWM services provision, while 53 % are "somewhat satisfied".



Item	No. of sample	%
Placing outside	70	47
Carrying to collection point	32	21
Carrying to collection truck	48	32
Other	0	0
Total	150	100

Figure 4-14 Method of garbage discharge by residences in the Thamankaduwa PS area

- ✓ Households' main methods of waste discharge are shown in above figure. The most common methods are discharging it outside their premises for house to house collection (47 %), carrying garbage to the collection truck (32%), and 21% of residences disposed waste at designated disposal points.
- ✓ Only 6% of surveyed households receive a daily garbage collection service while 35 % stated that they received the service once/week and 51% received the service 2-3 times/week. However, 64% discharge their garbage as soon as it is generated and 34 % discharge their garbage daily, the gap between discharge and collection being slightly greater for the residences far away from the city center. The discrepancy between these figures explains the large amount of discarded garbage present on many streets around the Thamankaduwa PS.
- ✓ In general, adult females handle waste in about 53 % of surveyed households.
- ✓ As shown in table below, 48 % of surveyed households practice source separation. Additionally, 91 % of surveyed households stated that there are recyclable collectors or someone who comes to collect their reusable or recyclable materials. Hence, an informal separation recycling system is well established in the Thamankaduwa PS area.



Item	No. of sample	%
Very much willing	53	35
Somewhat willing	9	6
Less willing	6	4
Not willing	11	7
Doing already	71	48
Total	150	100

Figure 4-15: Willingness of residences to participate in the source separated garbage collection system in the Thamankaduwa PS

- ✓ Only 23 % of surveyed households use kitchen/garden waste for composting and also used the finished compost for their own garden.
- ✓ Only 31% of households have ever discussed proper garbage discharge methods at the community level.
- ✓ 96 % of households stated that SWM awareness programmes are very necessary while the other 4 % stated "somewhat necessary".
- ✓ The average WTP (willingness to pay) for improved SWM services is 56 ± 76 Rs/month per household. However, 49 % of households do not like to pay for SWM services.
- ✓ Out of all surveyed households, 24 % stated that they sell/give away metal for recycling and 12 % of residences sell/give-away tins and cans for recycling. Glass and bottle recycling is practiced by 26 % of households while plastic recycling is practiced by 8 %. The percentage of households involved in paper recycling was low (11 %).

4.2.5 Waste Flow

The current waste flow in the pradeshiya sabha was identified based on the results of the public opinion survey, the survey on waste generation sources, the review of statistical data and the survey conducted by a local consultant.

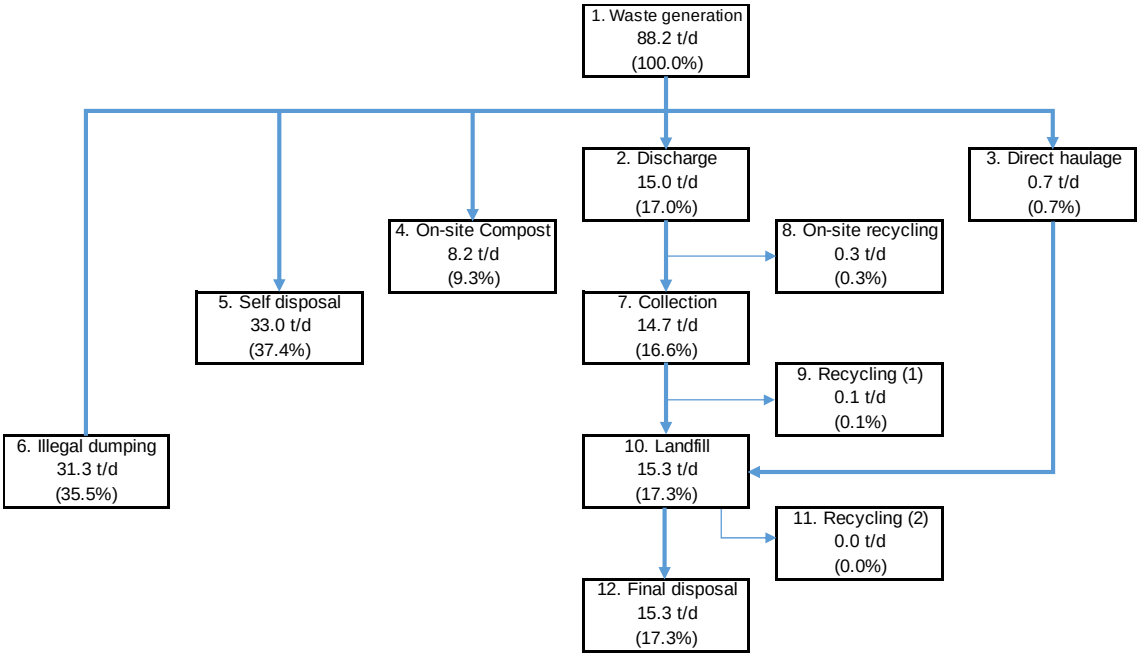


Figure 4-16: Current waste flow in the Thamankaduwa PS (2015)

According to the waste flow, the waste collection rate is very low (17.8%=[Discharged amount+Direct transportation]/Generation amount). The shares of self disposal at generation sources such as burning and burying waste, illegal dumping and recyclable collection are 41.2%, 31.3% and 0.4% in the total generation amount respectively.

4.2.6 Current Situation of Other Waste Management

a. Current Situation of Industrial Waste Management

Industrial waste is not generated in the Thamankaduwa pradeshiya sabha territory.

b. Current Situation of Medical Waste Management

b.1 Generation and Disposal Amounts

The hospital of the Thamankaduwa PS transports its hazardous or infectious waste to Colombo itself. Only general waste of the hospital is collected by the pradeshiya sabha.

b.2 Collection, Transportation, Treatment and Disposal

As there are occasions that a small amount of hazardous or infectious waste is mixed with the general waste collected from the hospital, the pradeshiya sabha incinerates this waste at the disposal site whenever identified.

b.3 Collection and Transportation Costs

20,000 LKR/month is collected from the hospital as a waste fee for collection of general waste.

c. Current Situation of Night Soil Management

c.1 Collection, Transportation, Treatment and Disposal

The Thamankaduwa PS used to discharge night soil in the forest near the PS. Presently, the PS has been storing night soil collected in its territory. However, no treatment is conducted on the collected night soil. As the storing capacity of the night soil storage yard is limited, it is impossible for the PS to collect all night soil generated in its territory.

c.2 Collection and Treatment Costs

No fees are collected for night soil collection.

4.2.7 Solid Waste Management Improvement Needs

a. Improvement of Technical System

a.1 Disposal Site Improvement Measures

The issue related with wild elephants is not only a problem related with SWM, but also a problem related to the residents' safety and is unique to Sri Lanka. Although the problem should be addressed by the entire nation, the Thamankaduwa pradeshiya sabha should take preventive actions such as strengthening the current protection fences and trenches and/or establishing elephant feeding points in different places from the viewpoint of SWM.

a.2 Improvement of Waste Collection Rate

According to the interview results, the coverage of waste collection services in the Thamankaduwa PS is 12% in terms of area (55 km2/268 km2) and 48% in terms of population (42,100 people/96,800 people). However, the waste collection rate is only 18% based on the waste flow. The main reasons for the low rate are that (1) the pradeshiya sabha has a wide territory and does not conduct collection services in low-populated areas, and (2) the number of vehicles and collection workers are not sufficient for implementing collection services in all areas of the pradeshiya sabha.
The Thamankaduwa pradeshiya sabha is required to improve the service coverage by increasing the number of collection equipment.

a.3 Enhancement of 3Rs / Public awareness activity

Thamankaduwa PS has started the operation of small scale compost plant and material recovery facility. The separation of organic waste and valuable waste at generation source is important to manage the intermediate treatment facility. Hence, the enhancement of 3Rs and public awareness activity is essential for Thamankaduwa PS.

4.3 Jaffna Municipal Council in Northern Province

4.3.1 Outline of the LA

The Jaffna Municipal Council (MC), which is located on the Jaffna peninsula, is situated in northern Sri Lanka. It is the capital city of the Northern Province and is the core of politics, economy and culture. The climate of the Jaffna MC belongs to a "dry zone" and in particular, the minor islands area is extremely dry. The rainy season is from October to December during the Northern East monsoon season and there is some rain in April and May. (Source: Democratic Socialist Republic of Sri Lanka, the project for development planning for the rapid promotion of reconstruction and development in Jaffna District final report JICA, November 2011)
Although the annual economic growth rate of Sri Lanka had dropped off to 3.5% in 2009 due to worldwide economic stagnation and the prolonged ethnic violence since the 1980's, it recovered to 7.4% in 2014 after the end of ethnic violence. Consequently, the annual GDP per capita reached 3,625 USD in 2014 and Sri Lanka has now reached the lower position of a middle-income country[30]. In spite of a nation-wide economic recovery in Sri Lanka, there are economic disparities between its nine provinces. The annual economic growth rate in the Northern Province from 2011 to 2012 reached 25.9%; however the development in the Northern Province is still insufficient and this causes the GDP of the Northern Province to occupy approximately 4.0% of the total Sri Lanka GDP[31].

The Jaffna MC consists of 47 Grama Nilathari Divisions (GN divisions), which are minimum administrative units and 23 Wards. The population of Jaffna MC between 2010 and 2015 is shown in the following table.

Table 4-34: Population Trend of Jaffna MC (2010-2015)

Year	2010	2011	2012	2013	2014	2015(9月)
Population	87,995	91,309	89,655	89,887	90,559	91,100

Source: Jaffna district secretariat and Nallur district secretariat

The returning of Internal Displaced People from the Jaffna MC to their hometowns caused a reduction of the population from 2011 to 2012.

4.3.2 Current Status and Problems of Solid Waste Management

a. Organization and Legal System

a.1 Legislation and Policy

The Five-Year Investment Programme: The Northern Provincial Council (2009-2013) planned by the Northern Provincial government, appropriated the budget for solid waste management of local authorities to promote community development. However, the Five-Year Investment Programme has not been updated (or renewed) since the previous programme finished at the end of 2013.
PHYSICAL PLAN FOR THE NORTHERN PROVINCE Volume One: The Plan Ministry of Construction, Engineering Services, Housing & common Amenities (Draft December 2012) which looks from the viewpoint of preventing environmental deterioration through future economic growth, proposes reviewing the recycling method of solid waste and public awareness activities.

[30]Japan Ministry of foreign affairs: http://www.mofa.go.jp/mofaj/area/srilanka/data.html, October 2015
[31] p 49 Sri Lanka Socio Economic Data 2014, Central Bank of Sri Lanka , June 2014

a.2 Solid Waste Management Plan

The Jaffna MC has not formulated any master plan or action plan related to SWM.

a.3 Organization

The collection of municipal solid waste, sweeping of streets and public areas, operation of intermediate treatment facilities such as compost plants, and operation of landfill sites are carried out by the Public Health Engineering Division (PHED) under the Medical Officer of Health (MOH) department in Jaffna. As for the maintenance of collection vehicles and assembling of public waste bins, these activities are carried out through workshops under the Engineer Department. The main duties of the PHED—the organization in charge of waste disposal—is as follows:

- Waste collection and transportation Service
- Public health activities (prevention of communicable diseases such as dengue fever)
- Road sweeping
- Fee-based waste collection service
- Operation of compost plant, promotion of waste separation and operation of final disposal site

The senior supervisor belonging to the PHDE is the person in charge of solid waste management, while the Public Health Inspector (PHI) belonging to the Food and Drug Division is mainly in charge of public awareness activities on solid waste. Two Municipal Engineers in the Works Engineering Department are in charge of the technical aspect of solid waste management; however, both positions are vacant as of October 2015.

The organization chart and staff related to solid waste management of Jaffna MC is shown below.

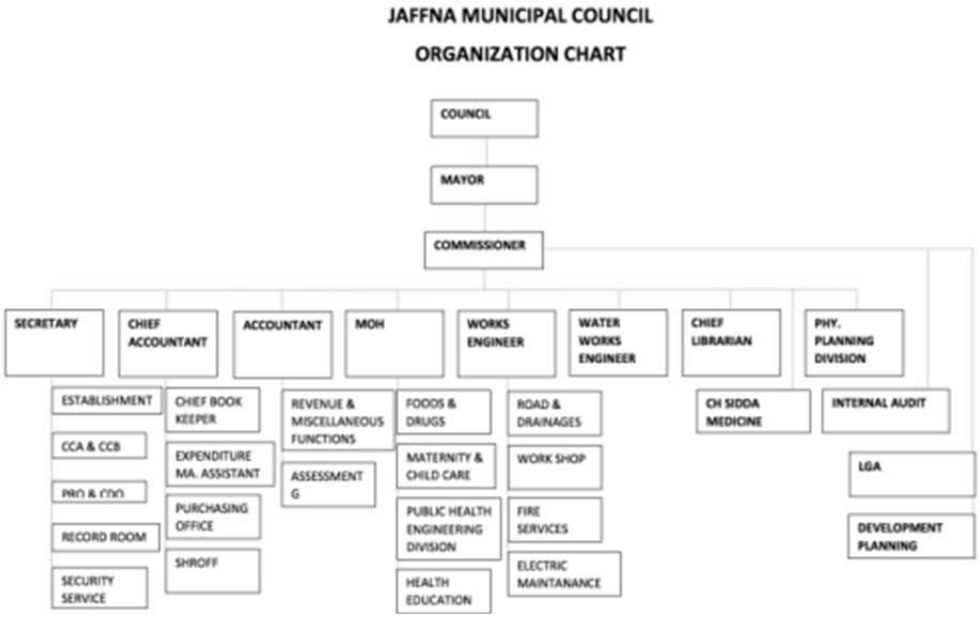


Figure 4-17: Organizational chart of the Jaffna MC

Table 4-35: Staff related to SWM in the Jaffna MC

Staff		Number	Remarks
Engineers		2	Vacant
TO(Technical Officer)		12	
MOH(Medical officer of health)		3	Out sourcing
PHIs(Public health inspector)		12	
SV(Supervisor)		30	
Senior supervisor for 7ZONEs		(7)	
Supervisor for wards		(23)	
Supervisor's Helpers/ 'kangani'		15	
Collection workers	Permanent	326	
	Temporary	118	
Drivers	Permanent	23	
	Temporary	7	
Disposal site workers	Permanent	4	
Other (Compost yard)		6	
Total			

a.4 Solid Waste Management Plan

The Jaffna MC has not formulated any master plan or action plan related to SWM.

a.5 Issues of Organization and Legal System

Since The Jaffna MC has not formulated any master plan or action plan related to SWM, the solid waste management is not systematically implemented. Although the number of Engineer to be assigned is two, however there is no Engineers at the Jaffna MC. The engineering support to solid waste management becomes insufficient due to lack of Engineer.

b. Technical System

b.1 Storage and Discharge

In the Jaffna MC, the kerbside collection system with waste bins and the stationed collection system for mixed waste have been implemented thus far. Mixed waste from residents, which is stored in the waste collection bins, is discharged on the curb and collected by collection vehicles. Large amounts of waste generated by large shops and large restaurants, etc., are stored in 100 litre or 200 litre barrels and are collected door to door by collection vehicle.

Photo：Waste storage barrels for large waste generators in Jaffna MC

b.2 Collection and Transportation

The collection and transferring of municipal solid waste is carried out by the Jaffna MC. The frequency of kerbside collection and stationed collection is approximately two times a week and the door to door collection of large amounts of waste is daily. The garden waste is collected for an additional charge when the residents request it to be collected.

Table 4-36: Waste collection charge in the Jaffna MC

Types of waste collection		Cost (LKR)
● Kerbside collection and stationed collection in residential area		Free
● Collection of large amounts of waste	200 litre barrel	230
	100 litre barrel	150
● Garden waste (1 load of tractor)		575

The waste discharged in narrow road areas where collection vehicles cannot pass is collected by handcarts (0.7m3). The rate of waste collection coverage in the administrative area is approximately 80%, while the non-coverage area — where residents dispose of the waste themselves — is approximately 20%.

The drivers of collection vehicles consist of 23 permanent and seven casual (temporary) drivers with the PHD. The collection vehicles consist of four compactor trucks (three of them are under repair), 18 tractors (eight of them are under repair) and 12 rental tractors from a private company. The rental charge of tractors is 1,500LKR per load at the final disposal site. The running mileage and collection area of each collection vehicle is recorded as a working record.

The collection vehicles and tractors are maintained at the workshop at the same premises of the Jaffna MC office.


Photo：Waste collection by handcart (0.7m^3) and maintenance workshop

b.3 Intermediate treatment

The compost plant and sorting yard of recyclable materials are operated by the Jaffna MC. The details are described in the following table.

Table 4-37: Intermediate treatment facility in the Jaffna MC

Intermediate treatment	Execution body	Address	Waste amount received (ton/week)	Establish ment	Remarks
Compost plant	Jaffna MC	Kakkaith ivu, Araly Rd, Jaffna	9-10	2002	Produced roughly 200kg/week of compost
Sorting yard of recyclable material			Under construction	2015	Polyethylene, plastic, PET bottle

Source: Jaffna MC senior supervisor

The compost plant receives between six to seven loads of garden waste and produces approximately 200kg of compost in a week with eight workers. Due to the lack of workers, the compost plant does not function at its full capacity. The selling price of compost is 6.0LKR/kg.

The sorting yard for recyclable waste funded by the Pilisaru project is under construction at the same premises of the compost plant. The crushing machine (of plastics) will be installed after construction.


Photo：Compost plant and crushing machine of plastic

b.4 Final disposal

The municipal waste collected by the Jaffna MC is disposed at the Kallundai disposal site nearby the abandoned salt field in Valikamam-South West PS. The Kallundai disposal site has been in operation since 2002 and is shared by the Jaffna MC, Valikamam-South West PS and Nallur PS.

The operation of the Kallundai disposal site, such as recording of collection vehicle data and moving of disposed waste by heavy machinery is conducted by the PHDE and the Engineering Works department of the Jaffna MC. The disposal amount at the disposal site is 113.1 ton/day (Jaffna 102.2 ton/day, Valikamam-South West PS:3.1 ton/day, Nallur PS: 7.8 ton/day) according to the records at the gate.

The area of the current disposal site is approximately 10 hectares, and the site has not been officially approved for use as a disposal site by the three LAs since 2002. Consequently, the Northern Provincial Land commissioner requested the Land commissioner General to lease 20.813 hectares including the current 10 hectares and another future 10.813 hectares as a long term contract according to the request from the Jaffna MC in June 2013. However, a long-term lease has not been approved by the central Land commissioner General as of October 2015.

The location of incoming waste from the three local authorities to the Kallundai disposal site and other details are provided in the following figure and table.

Table 4-38 Detail of Kallundai disposal site

Site name		Kallundai disposal site			
11) Address		No. 02 under the plan number of PPYa 2390 at Kallundai, Navali South GN division			
12) Coordination		E79°58′31.9 N9°41′52.9			
13) Method of operation		Open dumping (with control gate)			
14) Disposal amount (t/day)	Year	Jaffna MC	Valikamum-SW PS	Nallur PS	Total
	2015 (Average. Apr-Sept)	102.2 (70.5-131.5)	3.1	7.8	113.1
15) Expected remaining life span (years) in 2015		5			
16) Executing organization of final disposal site		Jaffna MC			
17) Tipping fee (LKR/ton)		450			
18) Unit cost of operation (LKR/t) in 2015		92			
19) Disposal area (ha)		Current: approximately10 ha Future: 10.813 ha Total: 20.813 ha			
20) Environmental License and Environmental Clearance		None			

Source: Jaffna MC

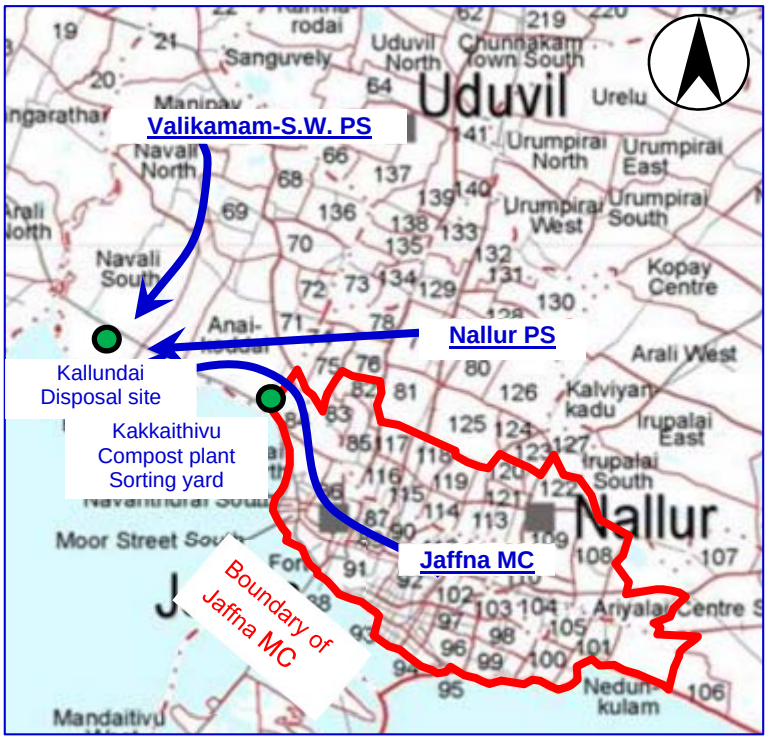


Figure 4-18: location of incoming waste from three local authorities to the Kallundai disposal site

Figure 4-19: Satellite image of Kallundai disposal site

b.5 Issue of Technical system

Due to the insufficient number of waste collection workers and malfunction of collection vehicles, the Jaffna MC does not properly collect the waste and this causes sanitary and environmental issues in the town.

An insufficient budget and lack of knowledge of proper operation of the disposal site has caused serious environmental issues to the surrounding area.

Photo: Scattered illegally discharged waste

c. Recycling Activities

c.1 Source Separation

Although the Jaffna MC has conducted the source separation and separate collection with a designated tractor (over the course of a week) through a public awareness programme at Bazar DN, there is no programme or activities as source separation organized by the Jaffna MC at other areas. The households usually separate the bottles, papers, metals, plastics and so on at the generation source and then sell it to private recycling shop(s). The total amount of recyclable waste separated at households in the Jaffna MC town reaches approximately 200kg/day.

c.2 Reduction of Organic Waste

There are no organic waste reduction programmes or activities organized by the Jaffna MC.

c.3 Recycling of Valuable Materials

There are two Recyclable Waste Operation Shops in Jaffna town and the shops buy plastic, cans, metal and others materials. The total amount of buying valuable material at the two shops is approximately 10,000kg/month and the price of each valuable material is described in the following table.

Table 4-39: the price of each valuable material

Valuable material	Buying price (LKR/kg)
Plastic	35
Can	35
Polyethylene	10
Plastic chair	80
Becket	50

Source: Recyclable waste Operation shop

Photo: Recyclable Waste Operation Shop

c.4 Issues of Recycling Activities

Since the source separation and separate collection are not officially conducted by the Jaffna MC — excluding the Bazar area — citizens separate and sell valuable materials to private recycling shops by themselves. The buying price of valuable materials to private recycling shops is always affected by the international market price and it is not always stable.

d. Public Awareness

d.1 Current Situation of Public Awareness Activities

The Jaffna MC has conducted source separation and separate collection with a designated tractor (over the course of a week) as a public awareness programme at the Bazar area. The Jaffna MC supports schools and citizen groups to disseminate the source separation and separate collection with waste separate bins. Moreover, the Jaffna MC distributed leaflets to all households in the Jaffna MC to cooperate in carrying out the separate collection from June to August 2015.

Photo: Waste Separate Bin

d.2 Issues of Public Awareness Activities

Although the Jaffna MC has conducted source separation and separate collection as a public awareness programme in the Bazar area, the rate of dissemination of the programme (namely the waste separation rate) is low due to insufficient human resources, knowledge, educational materials and so on.

e. Finance

e.1 Financial Condition of Municipal Council

The difference between annual revenues and expenditures of the Jaffna Municipal Council has been positive from 2012 to 2014 and its share in total annual revenues accounted for 7.7% on average as shown in the table below.

Table 4-40: Annual Revenue and Expenditure of Jaffna MC (Unit: Thousand LKR)

No	Category	2012	2013	2014	Annual Average	
					1,000 LKR	%
1	Approved Budget	71,622	79,156	85,748	78,842	
2	Actual					
	Revenue	527,611	752,720	731,428	670,586	100.0%
	Own-source revenue	130,850	212,556	345,157	229,521	34.2%
	Grant	396,761	540,164	386,271	441,065	65.8%
	Expenditure	527,514	697,258	631,391	618,721	92.3%
	Recurrent	449,392	691,096	525,700	555,396	82.8%
	Capital	78,122	6,162	105,691	63,325	9.4%
	Profit or loss	97	55,462	100,037	51,865	7.7%

Source: Jaffna MC, "Programme Budget：2013-2015"

The share of own-source revenues is roughly 30.8% while that of grants was estimated as roughly 69.2 % as shown in the table below.

Table 4-41: Breakdown of Annual Revenue of Jaffna MC (Unit: thousand LKR)

No	Types of Revenues	2012	2013	2014	Annual Average	
					1,000 LKR	%
1	Own-Source Revenues:					
	Rates & Taxes	21,200	21,403	56,920	33,174	5.2%
	Rents	39,420	64,270	59,952	54,547	8.6%
	License	9,730	12,909	13,005	11,881	1.9%
	Fees For services	23,294	23,718	26,765	24,592	3.9%
	Warrant Costs And Fines	4,478	4,620	13,470	7,523	1.2%
	Other Income	32,728	85,635	75,035	64,466	10.1%
	Total Own-Source Revenues	130,850	212,555	245,147	196,184	30.8%
2	Grants:					
	Recurrent Grant:	347,001	514,164	350,551		
	Salaries	344,913	512,076	348,463	401,817	63.1%
	Council Members Allowances	2,088	2,088	2,088	2,088	0.3%
	Other Recurrent Grant					
	Capital Grants	49,760	26,000	35,720	37,160	5.8%
	Total Grants	396,761	540,164	386,271	441,065	69.2%
	Total	527,611	752,719	631,418	637,249	100.0%

Source:Jaffna MC,"Programme Budget:2013-2015"

The share of capital grants in the total revenues is accounting for around 12.8%. On the other hand, the amount of total recurrent expenditures occupies 87.2% in the total expenditures of the pradeshiya sabha.

Table 4-42: Breakdown of the Annual Expenditure of Jaffna MC (Unit: Thousand LKR)

No	Types of Expenditures	2012	2013	2014	Annual Average 000 LKR	Annual Average %
1	Recurrent Expenditures:					
	Personal Emoluments	371,337	598,014	390,889	453,413	71.2%
	Travelling	2,138	2,150	3,583	2,624	0.4%
	Requisites And Equipment	23,282	24,582	39,448	29,104	4.6%
	Repairs And Maintenance Of Capital Assets	24,696	27,500	48,760	33,652	5.3%
	Transportation, Communication, Utility And Others Rervices	18,147	20,150	26,482	21,593	3.4%
	Interest	1,061	2,000	2,008	1,690	0.3%
	Grants, Subsidies And Contributions	1219	1,700	3,420	2,113	0.3%
	Pensions, Retirements, Benefits And Gratuities	7,512	15,000	11,110	11,207	1.8%
	Other Expenditures					0.0%
	Total Recurrent Expenditures	449,392	691,096	525,700	555,396	87.2%
2	Capital Expenditure	78,122	61,620	105,691	81,811	12.8%
	Total Expenditure	527,514	752,716	631,391	637,207	100.0%

Source:Jaffna MC,"Programme Budget:2013-2015"

e.2 SWM Finance

The total revenue of Public Health Engineering Division mainly consists of the waste collection fee from business institute. It is approximately 22,722,000 LKR (2012) and 29,728,000 (2013), while the expenditure is 95,250,000 LKR (2012) and 178,189,000LKR (2013). The table below shows the financial data of Public Health Engineering Division from 2012 to 2014.

Table 4-43: Annual Revenues and Expenses of Public Health Engineering Division of Jaffna MC (Unit: Thousand LKR)

No	Types of Expenses	2012*	2013	2014
A	Approved Budget	115,221	280,138	163,708
B	Revenues:	22,722	29,782	29,212
C	Actual Expenditures:			
	Personal Emoluments	83,976	144,146	118,057
	Supplies And Material Expenditures:	5,302	15,582	10,350
	Equipment For Disposing Garbage	308	4,899	404
	Fuel And Lubricants	4,522	9,073	8,294
	Uniforms for Workers	340	1,249	1,432
	Awareness Program	98	107	149
	Other supplies	34	254	71
	Repairs And Maintenance of Vehicles	1,458	4,030	4,353
	Final Disposal Payment	2,128	5,532	7,369
	Other Expenses	4,386	8,899	2,780
	Total expenditure	97,250	178,189	142,909

Source:Jaffna MC,"Programme Budget:2013-2015"

e.3 Cost of waste collection

Collection of municipal solid waste is executed by the Jaffna MC and the cost of waste collection is 4,771 LKR/tons (2015). The breakdown is as follows:

Table 4-44: Total cost of waste collection of Jaffna MC (2015)

	Items	Cost (1000LKR/year)
1	Personal emoluments	162,012
2	Fuel	6,000
3	Mechanical & Electrical Goods	50
4	Medical supplies	800
5	Uniform	1,300
6	Nallur festival	700
7	Buckets, basket	1,200
8	Repairs vehicles	2,200
9	Maintenance	800
10	Employee provident fund, trust fund	2,912
	Total	177,974
	177,974LKR/collection amount 102.2 ton/day/365day=	4,771(LKR/ton)

e.4 Operation cost of disposal site

The tipping fee at the disposal site is 450 LKR /load and this adds up in the general account budget. The operation cost of disposal sites consist of rental charge(s) of heavy machinery and the salary for security, which leads to an average 197 LKR per ton of waste.

Table 4-45: Total operation cost of the disposal site of the Jaffna MC (2015)

	Items	Cost (1000LKR/year)
1	Salary of security (1,200LKR x 2persons x 30daysx12months)	864
2	Rental charge of heavy machinery	900
3	Others	5,360
	Total	7,369
	7,369,000LKR/102.2 ton/day/365day	197 (LKR/ton)

e.5 Issues of SWM financial system

The majority of the capital expenditures are financed from the own-source revenues of the Municipal council or external funds. And there is no linkage between revenue from large waste collection and expenditure of SWM. Although LAs considers the balance sheet between revenue and expenditure totally, the sustainability of SMW is not considered well. For instance, the operation cost of final disposal site is 42LKR/ton and it seems not to be sustainable for proper operation of landfill site.

4.3.3 Waste Amount and Composition Survey

a. Waste Generation Amount

The waste generation amount was calculated based on the waste generation rate obtained by the University of Peradeniya “Feasibility Assessment of Plastic Recycling Center Establishment in Akkarapattu Municipal Council Area” in August 2015. The results reveal the municipal waste generation amount is 104.87 tons/day and the waste generation rate is 1,297g/person/day.

Table 4-46: Waste Generation Amount of Jaffna MC

	Source	Generation rate	unit	Generation sources	Generation (ton/day)
Residential	Collection	0.47	Kg/person/day	80,829	37.99
Commercial	Hotels (middle)	17.00	Kg/(hotel)	93	1.58
	Restaurants (middle)	17.00	Kg/(restaurant)	99	1.68
	Organic-shops (large)	50.00	Kg/(shop)	66	3.30
	Organic-shops (middle)	17.58	Kg/(shop)	42	0.74
	Non-organic shops (large)	50.00	Kg/(shop)	527	26.35
	Non-organic shops (small)	17.58	Kg/(shop)	1,285	22.59
Institutions	Schools	8.00	Kg/(school)	60	0.48
	Hospitals	5.25	Kg/(hospital)	19	0.10
	Public office	20.00	Kg/(institution)	374	7.48
	Bank/Private office	5.25	Kg/(institution)	43	0.23
	Buddhist temples	5.25	Kg/(temple)	1	0.01
	Hindu temples	5.25	Kg/(temple)	60	0.32
	Mosques	5.25	Kg/(mosque)	3	0.02
	Churches	5.25	Kg/(church)	27	0.14
Industries	Large	187.50	Kg/(industry)	0	0.00
	Domestic	6.00	Kg/(industry)	143	0.86
Drainage		,1,000.00	Kg	1	1.00
Total				0	104.87

b. Waste Composition

The results of the locally outsourced survey on waste composition which is considered animal feeding of kitchen waste conducted from 20 to 26 October in Kallundai Disposal Site is shown below.

Table 4-47: Waste Composition of the Jaffna MC

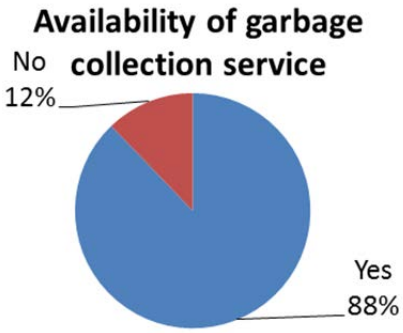
	Category	Rate (%)
1	Kitchen waste	68.9
2	Paper	2.7
3	Textiles	1.3
4	Grass & wood	15.1
5	Soft Plastics	3.6
6	Hard Plastics	0.4
7	Rubber & leather	0.2
8	Metal	0.3
9	Glass & bottles	0.4
10	Stone & ceramic	7.1
11	Other	0.0
	Total	100.0

4.3.4 The results of the Public Opinion survey

99% of the surveyed households are Tamil and only 1% is Muslims. Data on the average number of people per household and monthly income is set out in the Table below.

Table 4-48: Average and standard deviation values of income and family size

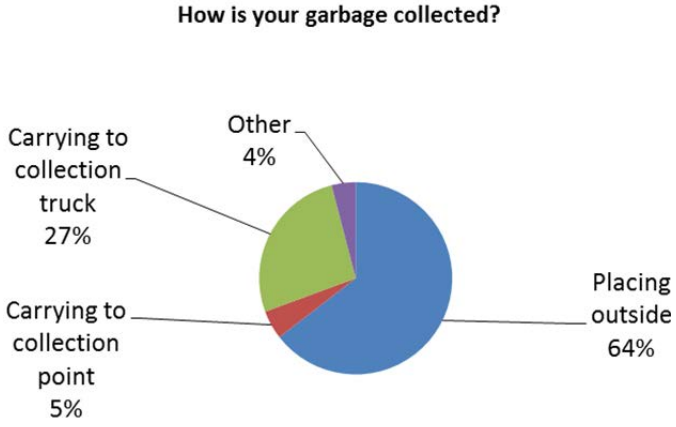
Category	Number of sample	Average of family members / employees	Income/Turnover (LKR/month)
High	39	4.9	39,744
Middle	66	5.0	18,447
Low	61	4.6	7,782
Business	44	3.3	53,780



Item	No. of sample	%
Yes	146	88
No	20	12
Total	166	100

Figure 4-20: Availability of garbage collection service in the Jaffna MC

- ✓ In the Jaffna MC, 88% of surveyed households are provided with a garbage collection service, of which 82% stated they use this service. Only 26% of surveyed households are "very satisfied" with the present SWM service provision, while 45% are "somewhat satisfied".



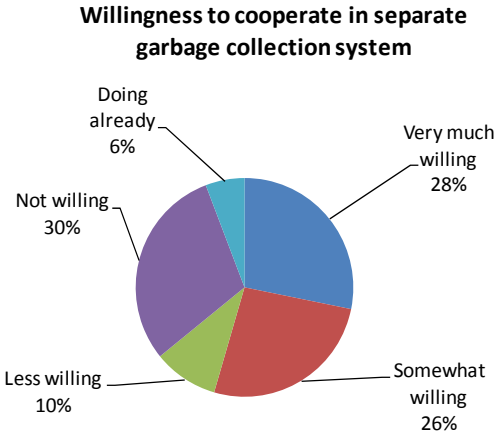
Item	No. of sample	%
Placing outside	106	64
Carrying to collection point	8	5
Carrying to collection truck	45	27
Other	7	4
Total	166	100

Figure 4-21: Method of garbage discharge by residence in JMC area

- ✓ Households' main methods of waste discharge are shown above Figure. The most common methods are discharging it at placing outside (64%) and carrying garbage to the collection truck (27%).
- ✓ Only 38% of surveyed households receive a daily garbage collection service while 13% stated that they received the service less frequently than once a week. However, 73% discharge their garbage as soon as it is generated and 22 % discharge their garbage daily; the gap between discharge and collection is slightly greater for the low income group. The

discrepancy between these figures explains the large amount of discarded garbage present on many streets around Jaffna.

- ✓ In general, adult females handle waste in about 76% of surveyed households.
- ✓ As shown in Figure-8, 30% of surveyed households are not willing to cooperate with source separation for recycling. In addition, only 59% of surveyed households stated that there are recyclable collectors or someone who comes to collect their reusable or recyclable materials. Hence, an informal source separation recycling system is not well established in the Jaffna MC area.



Item	No. of sample	%
Very much willing	46	28
Somewhat willing	43	26
Less willing	17	10
Not willing	50	30
Doing already	10	6
Total	166	100

Figure 4-22: Willingness of residences to participate in a source separated garbage collection system in Jaffna MC

- ✓ Only 8% of surveyed households use kitchen/garden waste for composting and also use the finished compost for their own garden.
- ✓ Not many surveyed households (64 %) have ever discussed proper garbage discharge methods at the community level.
- ✓ 57% of households stated that SWM awareness programmes are very necessary while 39% stated "somewhat necessary".
- ✓ The average WTP (willingness to pay) for improved SWM services is 207 ± 263 LKR/month per household. However 19% of households do not like to pay for SWM services.
- ✓ Out of all surveyed households, 13% stated that they sell/give-away metal for recycling and 12% of residences sell/give-away tins & cans for recycling. Glass and bottle recycling is only practiced by 8% of households while plastic recycling is 12%. The percentage of households who are involved in paper recycling (selling or giving-away) was low (3%).

4.3.5 Waste flow

Current waste flow has been prepared by analysing the locally outsourced public opinion survey, statistical data collection, and census results.

According to the waste flow, the collection rate ((discharge amount + direct loading amount)/generation amount) is 80.7%. As for the recycling rate for the generation amount, onsite compost is 5.9%, material recovery is 0.2%, and the total rate is 6.1%. On the other hand, the final disposal rate for the generation amount has reached 96.6%, which has become a burden on the Kallundai disposal site.

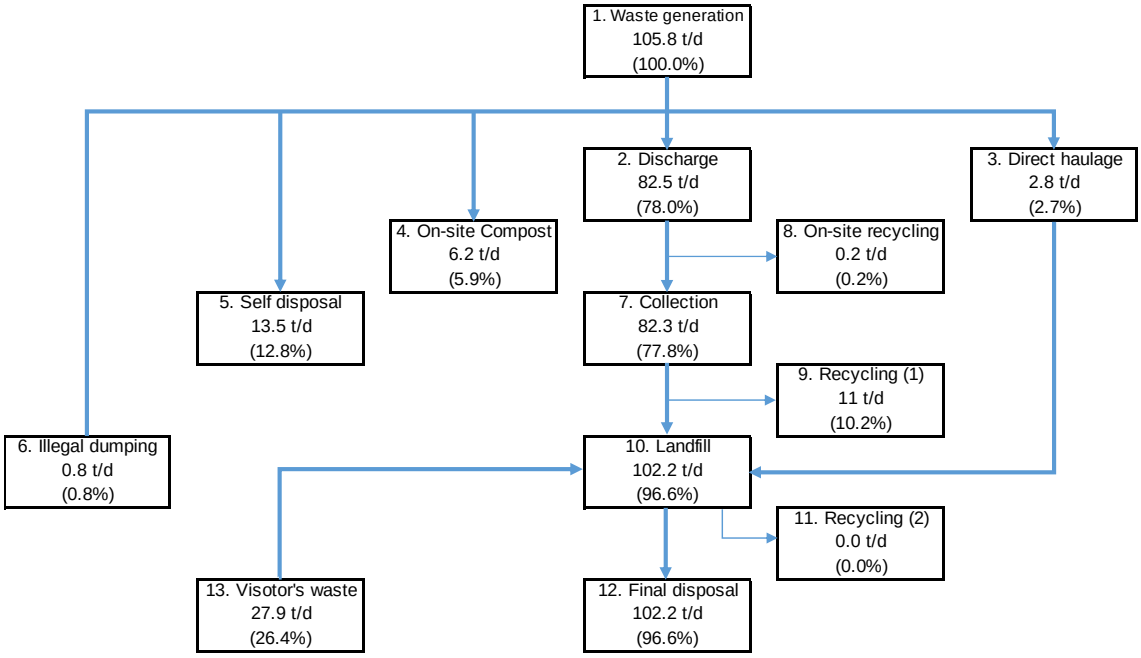


Figure 4-23: Waste flow of the Jaffna MC (2015)

4.3.6 Current Situation of Other Waste Management

a. Current Situation of Industrial Waste Management

Although there is a marine products factory and ice cream factory, they do not discharge any industrial waste or hazardous waste in the Jaffna MC.

b. Current Situation of Medical Waste Management

b.1 Generation Amount & Disposal Amount

The waste generation from hospitals mainly consist of municipal waste and the disposal amount at the Kallundai disposal site is approximately 4.5 tons/day. The infectious waste (syringes, etc.) is not collected nor taken to the disposal site since it is incinerated at the incinerator.

b.2 Collection/Transportation and Disposal

The Jaffna MC collects municipal waste from the hospitals and takes it to the Kallundai disposal site.

b.3 Collection fee

The collection fee is the same as the fee of large waste generators; 230LKR/200 litre barrel and 150LKR/100 litre barrel.

c. Current Situation of Night Soil Management

c.1 Generation Amount & Disposal Amount

The disposal amount of night soil at the Kallundai disposal site is approximately 11,000 litres/day, according to the records.

c.2 Collection/ Transportation and Disposal

Night soil is collected by collection vehicles operated by the Jaffna MC and the collected night soil is disposed of at the Kallundai disposal site without any treatment.

c.3 Collection fee

The collection fee of night soil is 0.66Rs/litre for liquid only, while sludge is 1.30Rs/litre.

4.3.7 Needs for Solid Waste Management

a. Improvement of Technical System

a.1 Rehabilitation of existing final disposal site and the establish of new final disposal site

The collected waste has been discharged at Kallundai disposal site where is abandoned saltpan for long time. The area of existing disposal site is approximately 10hectors, but the boundary of the site is not clear and the discharged waste is scattered without any control such as access road, covering soil and so on. Since the operation of existing disposal site seems to affect environmental adverse impact to surrounding area, the rehabilitation of existing disposal site is needed as soon as possible.

Jaffna MC plans to establish the new final disposal site next to existing disposal site which area also approximately 10 hectors, however the construction and management of new final disposal site face on the difficulty of construction and proper management. The proper technical and budget support is needed. Since the new final disposal site is expected to be a role of regional disposal site shared by several local authorities, the consensus to establish the proper management system among stakeholders is important.

a.2 Improvement of discharging and collection

According to the waste flow, the waste collection rate is as low as 75.7%, but the waste collection vehicles often become malfunction and it causes the difficulty of regular waste collection service. The renewal of waste collection vehicles to enhance the capacity of waste collection service is needed as the support.

a.3 Promotion of 3Rs

According to the result of WACS, the kitchen waste and garden waste occupy 84% of waste generation in Jaffna MC and most of kitchen waste is feeded to stray cows in the town. Jaffna MC is conducting the compost plant to deal with the garden waste and the material recovery facility, however the handling amount is quite small due to lack of technical issue and management issue.

a.4 Improvement of Organization and Legislation

Jaffna MC spends much budget and human resource to collect and discharge waste every day without the long-term plan including organization and legislation. The formulation of master plan of solid waste management is needed to improve and develop the future policy, legislation, organization, and budgeting regarding on solid waste management.

4.4 Trincomalee Urban Council in Eastern Province

4.4.1 Outline of the LA

The Trincomalee Urban Council (UC) is located on Sri Lanka's north-eastern coast. It is the capital city of the Eastern Province and is the core of politics, economy and culture. The climate of the Trincomalee UC is characterized by a "tropical summer low rainfall". The dry season is from February to September and the average annual precipitation is approximately 1,570mm. The coolest average temperature in the year, 26 degrees Celsius, is in December and January, while the hottest average temperature in the year, approximately 30 degrees Celsius, is from April to September.

Prior to the ethnic conflict in the early eighties, the Eastern Provincial contribution to the national GDP had been around 14%. However, with the escalation of ethnic violence, the Eastern Provincial contribution has been reduced to around 4.7% in 2005. After the ethnic conflict in 2009, the main industries of agriculture, fisheries, construction and tourism have rapidly recovered. (Source: p75 Eastern Development Plan 2011-2015, Eastern Provincial Council Trincomalee）

The Trincomalee UC consists of 17 Grama Nilathari Divisions (GN divisions). The population of the Trincomalee UC between 2010 and 2015 is shown in the following table.

Table 4-49: Population Trend of Trincomalee UC (2010-2014)

Year	2010	2011	2012	2013	2014
Population	65,848	54,776	55,479	57,244	55,564

Source: Trincomalee district secretariat

The returning of Internal Displaced People from the Trincomalee UC to their hometowns caused a reduction of the population from 2011 to 2012.

4.4.2 Current Status and Problems of Solid Waste Management

a. Organization and Legal System

a.1 Legislation and Policy

Eastern Development Plan 2011-2015, the Eastern Provincial Council Trincomalee formulated by the Eastern Province strengthened the capacity of solid waste management with the "Sectoral Development Plan" and appropriated the budget for introducing and disseminating good practices, the construction of facilities and the procurement of equipment.

a.2 Solid Waste Management Plan

The Jaffna MC has not formulated any master plan or action plan related to SWM.

a.3 Organization

Solid waste management is carried out by the Works Division under the Civil Department and the Health Division under the Health Department. The main duties of both organizations are as follows:

- Waste collection and transportation services（Works Division）
- Public health activities (prevention of communicable diseases such as dengue fever)

- Road sweeping
- Fee-based waste collection service
- Operation of compost plant, promotion of waste separation and operation of final disposal site

The technical officer with the Works Division is the person in charge of solid waste management, while the Public Health Inspector (PHI) belonging to the Public Health division is mainly in charge of public awareness activities on solid waste. The works division is in charge of the maintenance of collection tractors and trailers, and the assembling the public waste bins.

The organization chart and staff related to solid waste management of the Trincomalee UC is shown below.

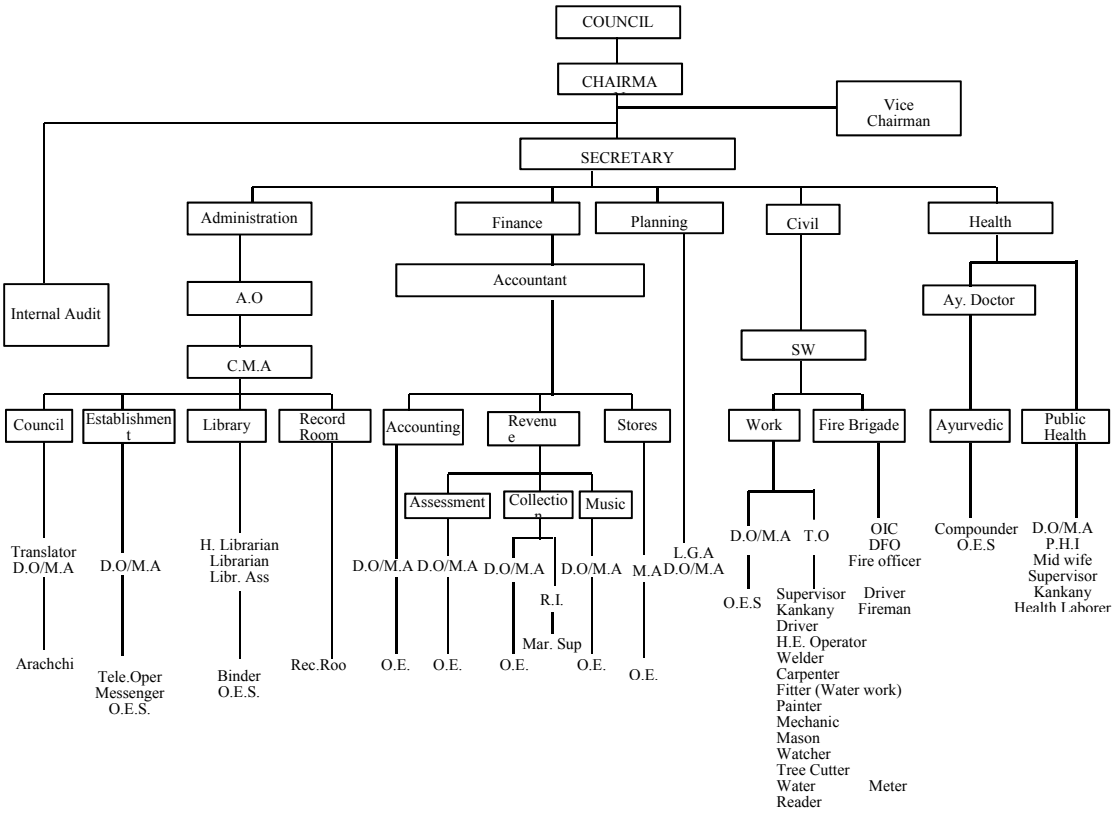


Figure 4-24: Organizational chart of Trincomalee UC

Table 4-50: Staff related to SWM in Trincomalee UC

Staff		Number	Remarks
Engineer		-	
TO(Technical Officer)		4	SWM:1
MOH(Medical officer of health)		1	Out sourcing
PHI(Public health inspector)		4	
SV(Supervisor)		5	
Collection workers	Permanent	110	
	Temporary	8	
Driver	Permanent	12	
Disposal site workers	Permanent	1	Guard
Total		144	

a.4 Solid Waste Management Plan

The Trincomalee MC has not formulated any master plan or action plan related to SWM though it should engage in SWM activities according to a 1947 municipal ordinance.

a.5 Issues of Organization and Legal System

Since The Trincomalee UC has not formulated any master plan or action plan related to SWM, the solid waste management is not systematically implemented.

b. Technical System

b.1 Storage and Discharge

In the Trincomalee UC, the kerbside collection system with waste bins for mixed waste has been implemented thus far. Mixed waste from residents, which is stored in the waste collection bins, is discharged on the curb and collected by collection vehicles. Large amounts of waste generated by hotels and hospitals, etc., are stored in 100 litre or 200 litre barrels and are collected daily through door to door collection vehicle(s). The plastic barrels are put into the market and communal area(s) and collected daily as well.


Photo：Waste storage barrels for large waste generators in Trincomalee UC

b.2 Collection and Transportation

The collection and transferring of municipal solid waste is carried out by the Trincomalee UC. The frequency of kerbside collection is once a week and the door to door collection of large amounts of waste are daily. For instance, some large hotels discharge the five barrels (Total 500-700liter) and are charged 4,000LKR per month. The waste collection charge in the Trincomalee UC is shown below.

Table 4-51: Waste collection charge in the Trincomalee UC

Types of waste collection	Cost (LKR)
Kerbside collection	Free
Collection of large amounts of waste	4,000LKR/month 3,000LKR/month 2,500LKR/month 2,000LKR/month 1,000LKR/month

The waste collection team consists of a driver for the collection tractor and 5-6 collection workers, while the collection vehicles consist of four compactor trucks (one of them is under repair), twelve tractors (six of them are under repair) and fifteen handcarts. The waste collected by the handcarts are loaded onto the tractors at the transfer place at the market or on the seashore and taken to the disposal site. The running mileage and collection area of each collection vehicle is recorded as a working record

The collection vehicles and tractors are maintained at the workshop which has twelve staff, three of whom are mechanics from nearby the Trincomalee UC office.


Photo：Waste collection by tractor and maintenance workshop

b.3 Intermediate treatment

Although there are no intermediate treatment facilities such as a compost plant or a material recovery facility being operated by the Trincomalee UC as of October 2015, a private recycling company will start operations of a material recovery facility at the current disposal site according to a memo of understanding between the Trincomalee UC and the private company.

Table 4-52: Intermediate treatment facility in Trincomalee UC

Intermediate treatment	Execution body	Address	Waste amount received (ton/week)	Establishment	Remarks
Material recovery facility	CGL International Eco Pvt Ltd	Kanniya Final disposal site	N.A.	2016 (planned)	Cardboard, plastic, metal and so on

Source: Trincomalee UC Secretory

b.4 Final disposal

The municipal waste collected by the Trincomalee UC is disposed at the Kanniya in a hilly forest area in Trincomalee Town & Gravets PS. The Kanniya disposal site has been in operation since 2005 and is shared by the Trincomalee UC and Trincomalee Town & Gravets PS as a regional disposal site.

The operation of the Kanniya disposal site, such as recording of collection vehicle data and moving of disposed waste by heavy machinery was conducted by the works division of the Trincomalee UC. But the private firm “CGL International Eco Pvt., Ltd.” has contracted with the Trincomalee UC to operate the disposal site, including the sorting of valuable materials, since October 2015 without any commission fee. The disposal amount at the disposal site is 62.2 ton/day (Trincomalee UC: 38.2ton/day, Town & Gravets PS: 5.2 ton/day, Police: 12.0 ton/day, other: 4.2 ton/day) according to the records at the gate.

The area of the current disposal site is approximately 0.4 hectares. Trincomalee UC has plans, however, to extend the area to approximately 12 hectares.

The location of incoming waste from the two local authorities to the Kanniya disposal site and other details are provided in the following figure and table.

Table 4-53: Details of Kanniya disposal site

Site name		Kanniya disposal site					
21) Address		Kanniya village, at about 9 km away from the city center of Trincomalee					
22) Coordination		E:081°10'07.1" N:08°36'36.4"					
23) Method of operation		Open dumping (with security control)					
24) Disposal amount (t/day)	Year	Trincomalee UC	Town & Gravets PS	Navy	Police	Other	Total
	2015 (Apr. – Sept. average)	38.2	5.2	2.6	12.0	4.2	62.2
25) Expected remaining life span (years) in 2015		????					
26) Executing organization of final disposal site		CGL International Eco Pvt Ltd					
27) Tipping fee (LKR/ton)		None					
28) Unit cost of operation (LKR/t) in 2015		92					
29) Disposal area (ha)		Currently approximately 2 ha (approximately 5 acres) Future approximately 10 ha (25acres) Total: approximately 12 ha					
30) Environmental License and Environmental Clearance		None					

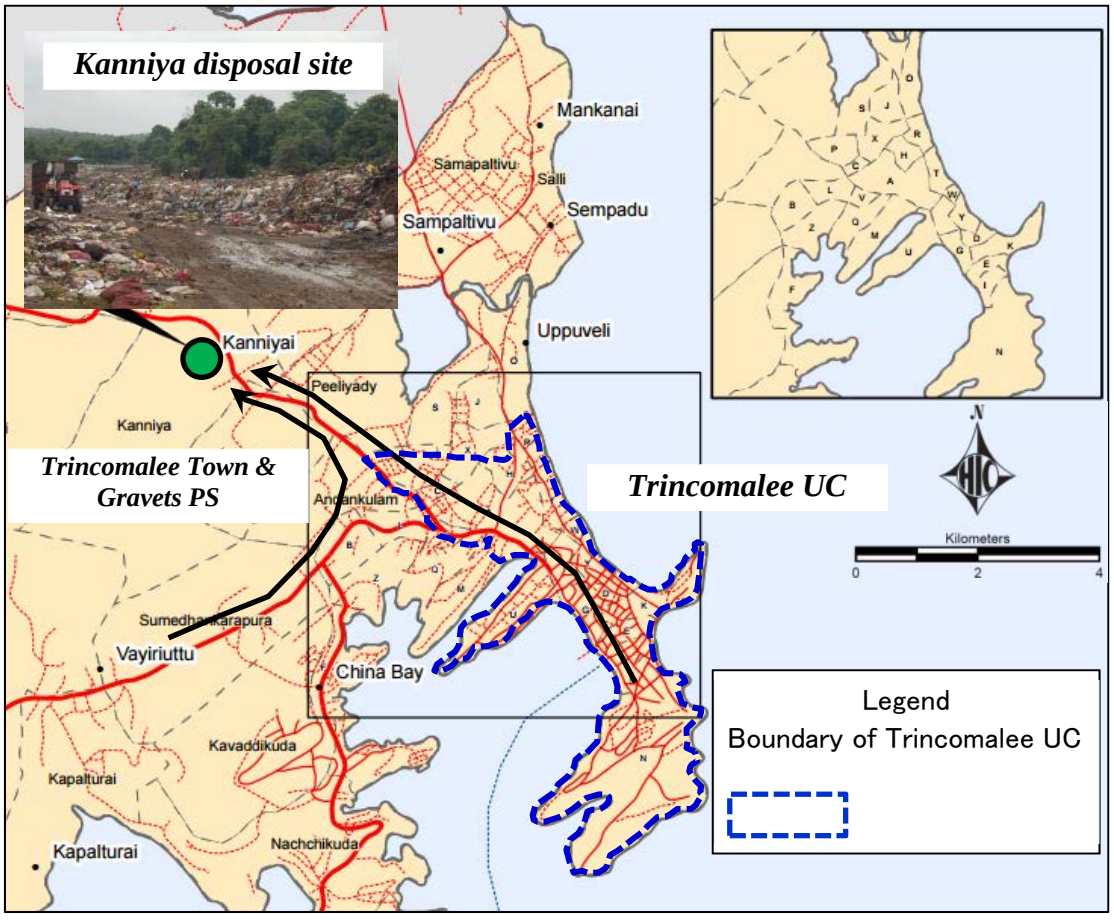


Figure 4-25: Location of incoming waste from two local authorities to the Kanniya disposal site

Figure 4-26: Satellite image of the Kanniya disposal site

b.5 Issue of Technical System

Due to the insufficient number of waste collection workers and malfunction of collection vehicles, the Trincomalee UC does not properly collect the waste and this causes sanitary and environmental issues in the town. According to an interview survey with the residents, although the frequency of original waste collection was once a week, the actual frequency is once every three weeks or less. Hence, the residents illegally discharge the waste on the road and this causes waste scattering.

An insufficient budget and lack of knowledge of proper operation methods at the Kanniya disposal site has caused the condition of the access road to deteriorate and much waste to be scattered along this road. After the last load of collected waste is discharged at the disposal site at around 2 pm, many wild elephants appear and scavenge the disposed waste every day. Scavenging by elephants disturbs proper operation of the disposal site.

Photo: Scattered illegally discharged waste and wild elephants at the disposal site

c. Recycling Activities

c.1 Source Separation

There are no source separation programmes or activities organized by the Trincomalee UC.

c.2 Reduction of Organic Waste

There are no organic waste reduction programmes or activities organized by the Trincomalee MC.

c.3 Recycling of Valuable Materials

There are two recyclable material dealers – that purchase and sell on plastics, cans, metals and other recyclable materials – in the Trincomalee UC and one in Town & Gravets PS. Taking valuable materials to the shops is done by the waste collection drivers and private recyclers who collect valuable materials from households.

Table 4-54: Prices of each valuable (recyclable) material

Valuable material	Buying price (LKR/kg)	Selling price (LKR/kg)
Metal	20	100
Plastic	20	100
Cardboard	8	300

Source: Trincomalee recyclable dealers

Photo: Recovered cardboard stacked in a Trincomalee recyclables dealer's premises ready for recycling

The private firm "CGL International Eco Pvt., Ltd.", which was commissioned by the Trincomalee UC to operate the Kanniya disposal site, has stated its intention to establish a recyclables recovery facility to collect cardboard, plastics, metals and so on. Accordingly, the collection and selling of valuable materials by the waste collection workers is prohibited by the Trincomalee UC.

c.4 Issues of Recycling Activities

Since the source separation and separate collection are not officially conducted by the Trincomalee UC as of October 2015, citizens separate and sell valuable materials to private recycling shops (recyclables dealers) by themselves. The buying price of valuable materials to private recycling shops is always affected by the international market price and it is not stable.

d. Public Awareness

d.1 Current Situation of Public Awareness Activities

Although the prevention of communicable diseases such as dengue fever is conducted as public awareness activities, other public awareness activities related to solid waste management are not carried out by the Trincomalee UC.

d.2 Issue of Public Awareness Activities

Since the public awareness activities related to solid waste management are not carried out by the Trincomalee UC, the 3R activities are not amply disseminated to the residents.

e. Finance

e.1 Financial Condition of Urban Council

The difference between annual revenues and expenditures of the Trincomalee Urban Council has been positive from 2012 to 2014 and its share in total annual revenues accounted for 18.1% on average as shown in the table below..

Table 4-55: Annual Revenue and Expenditure of Trincomalee UC (Unit: Thousand LKR)

No	Category	2012	2013	2014	Annual Average	
					1,000 LKR	%
1	Approved Budget	580,411	581,209	737,328		
2	Actual					
	Revenue	481,883	531,127	712,151	575,054	100.0%
	Own-source revenue	208,136	250,673	296,845	251,885	43.8%
	Grant	273,747	280,454	415,306	323,169	56.2%
	Expenditure	468,790	479,713	465,242	471,248	81.9%
	Recurrent	404,412	433,382	461,245	433,013	75.3%
	Capital	64,378	46,331	3,997	38,235	6.6%
	Profit or loss	13,093	51,414	246,909	103,805	18.1%

Source) Trincomalee UC "Programme Budget：2013-2015"

The share of own-source revenues is roughly 43.84% while that of grants was estimated as roughly 56.2% as shown in the table below.

Table 4-56: Breakdown of Annual Revenue of Trincomalee UC (Unit: thousand LKR)

No	Types of Revenues	2012	2013	2014	Annual Average 1,000 LKR	%
1	Own-Source Revenues:					
	Rates & Taxes	94,492	84,716	82,163	87,124	15.2%
	Rents	12,126	13,064	11,016	12,069	2.1%
	License	17,699	13,810	12,832	14,780	2.6%
	Fees For services	10,491	22,689	19,609	17,596	3.1%
	Warrant Costs And Fines	13,483	9,938	5,211	9,544	1.7%
	Other Income	59,844	106,456	166,014	110,771	19.3%
	Total Own-Source Revenues	208,135	250,673	296,845	251,884	43.8%
2	Grants:					
	Recurrent Grant:	208,520	224,785	240,983	224,763	39.1%
	Salaries	204,425	221,927	238,201	221,518	38.5%
	Council Members Allowances	2,354	2,415	2,470	2,413	0.4%
	Other Recurrent Grant	1,741	443	312	832	0.1%
	Capital Grants	65,227	55,668	174,322	98,406	17.1%
	Total Grants	273,747	280,453	415,305	323,168	56.2%
	Total	481,882	531,126	712,150	575,053	100.0%

Source) Trincomalee UC "Programme Budget：2013-2015"

The share of capital grants in the total revenues is accounting for around 8.1%. On the other hand, the amount of total recurrent expenditures occupies 91.9% in the total expenditures of theTrincomalee UC.

Table 4-57: Breakdown of the Annual Expenditure of Trincomalee UC (Unit: Thousand LKR)

No	Types of Expenditures	2012	2013	2014	Annual Average 000 LKR	Annual Average %
1	Recurrent Expenditures:					
	Personal Emoluments	279,015	284,331	322,940	295,429	62.7%
	Travelling	9,114	4,896	4,312	6,107	1.3%
	Requisites And Equipment	59,970	61,517	72,018	64,502	13.7%
	Repairs And Maintenance Of Capital Assets	18,979	30,333	25,669	24,994	5.3%
	Transportation, Communication, Utility And Others Rervices	30,692	27,599	27,951	28,747	6.1%
	Interest	2,754	20,311	3,962	9,009	1.9%
	Grants, Subsidies And Contributions	732	1,220	1,049	1,000	0.2%
	Pensions, Retirements, Benefits And Gratuities	3,156	3,175	3,345	3,225	0.7%
	Other Expenditures					
	Total Recurrent Expenditures	404,412	433,382	461,246	433,013	91.9%
2	Capital Expenditure	64,378	46,331	3,997	38,235	8.1%
	Total Expenditure	468,790	479,713	465,243	471,249	100.0%

Source) Trincomalee UC "Programme Budget：2013-2015"

e.2 SWM Finance

The total revenue of SWM mainly consists of tipping fee for the other LA's waste at the disposal site and the waste collection fee from business institute. It is approximately 8,511,000 LKR (2012) and 13,054,000 (2013), while the expenditure is 151,307,000 LKR (2012) and 177,320,000LKR (2014). The table below shows the financial data of SWM from 2012 to 2014.

Table 4-58: Annual Revenues and Expenses of SWM of Trincomalee UC (Unit: Thousand LKR)

No	Types of Expenses	2012*	2013	2014
A	Approved Budget	116,890	115,269	144,741
B	Revenues:	2,310	13,054	8,511
C	Actual Expenditures:			
	Personal Emoluments	91,082	92,920	108,423
	Supplies And Material Expenditures:			
	Equipment For Disposing Garbage	19,043	21,925	23,574
	Fuel And Lubricants			
	Uniforms for Workers			
	Awareness Program			
	Other supplies	1,433	1,022	2,239
	Total Supplies and Materials Expenses	20,476	22,947	25,813
	Repairs And Maintenance of Vehicles	10,144	1,875	603
	Final Disposal Payment	19,243	9,327	15,713
	Other Expenses	1,671	1,291	955
	Total expenditure	163,092	151,307	177,320

Source) Trincomalee UC "Programme Budget：2013-2015"

e.3 Cost of waste collection

Collection of municipal solid waste is executed by the Trincomalee UC and the cost of waste collection is 4,830 LKR/tons (2015). The breakdown is as follows:

Table 4-59: Total cost of waste collection of Jaffna MC (2015)

	Items	Cost (1000LKR/year)
1	Personal emoluments	55,650
2	Fuel	7,500
3	Uniform	500
4	Repair and maintenance of vehicles	2,250
5	Vehicles insurance	545
6	Employee provident fund, trust fund	900
	Total	67,345
	67,345,000LKR/collection amount 38.2 ton/day/365day=	4,830(LKR/ton)

e.4 Operation cost of disposal site

The tipping fee at the disposal site was free of charge before the private firm "CGL International Eco Pvt., Ltd." was commissioned by the Trincomalee UC in October 2015. The operation of the disposal site has been started by "CGL International Eco Pvt., Ltd." without any commission fee and tipping fee. The private company is expecting profits from sorting of valuable materials at the disposal site. The operation cost of disposal site consists of rental charge(s) of heavy machinery and the salary for security, which leads to an average 1,127 LKR per ton of waste.

Table 4-60: Total operation cost of the disposal site of the Trincomalee UC (2015)

	Items	Cost (1000LKR/year)
1	Salary of security (1,200LKR/day x 1person x 30daysx12months	438
2	Rental charge of heavy machinery	1,000
3	Others	14,275
	Total	15,713
	15,713,000LKR/38.2 ton/day/365day	1,127(LKR/ton)

e.5 Issues of SWM financial system

The majority of the capital expenditures are financed from the own-source revenues of the Municipal council or external funds. And there is no linkage between revenue from large waste collection and expenditure of SWM. Although LAs considers the balance sheet between revenue and expenditure totally, the sustainability of SMW is not considered well. For instance, the operation cost of final disposal site is 692 LKR/ton and it seems not to be sustainable for proper operation of landfill site.

4.4.3 Waste Amount and Composition Survey

a. Waste Generation Amount

The waste generation amount was calculated based on the waste generation rate obtained by the University of Peradeniya report "Feasibility Assessment of the Plastic Recycling Center Establishment in Akkarapattu Municipal Council Area" in August 2015. The results reveal the municipal waste generation amount is 62.09 tons/day and the waste generation rate is 1,235g/person/day.

Table 4-61: The generation amount of MSW in the Trincomalee UC

	Source	Generation rate	unit	Generation sources	Generation (ton/day)
Residential	Collection	0.470	Kg/person/day	50,268	23.63
Commercial	Hotels (middle)	17.00	Kg/(hotel)	50	0.85
	Restaurants (middle)	17.00	Kg/(restaurant)	161	2.74
	Organic-shops (middle)	17.58	Kg/(shop)	346	6.08
	Non-organic shops (large)	50.00	Kg/(shop)	110	5.50
	Non-organic shops (small)	17.58	Kg/(shop)	1,055	18.55
Institutions	Schools	8.00	Kg/(school)	265	2.12
	Hospitals	5.25	Kg/(hospital)	2	0.01
	Public office	20.00	Kg/(institution)	9	0.18
	Bank/Private office	5.25	Kg/(institution)	69	0.36
	Hindu temples	5.25	Kg/(temple)	52	0.27
	Mosques	5.25	Kg/(mosque)	9	0.05
	Churches	5.25	Kg/(church)	20	0.11
Industries	Large	187.50	Kg/(industry)	3	0.56
	Domestic	6.00	Kg/(industry)	14	0.08
Drainage		1,000.00	Kg	1	1.00
Total				0	62.09

b. Waste Composition

The results of a waste composition survey conducted in 2010 in the Kanniya UC by the NSWMSC are quoted as the result of waste composition of the Trincomalee UC.

Table 4-62: Waste Composition of the Trincomalee UC (quoted from the Kanniya UC)

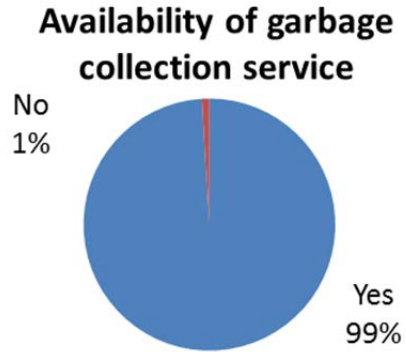
	Category	Rate (%)
1	Kitchen waste	12.0
2	Paper	4.0
3	Textiles	3.0
4	Grass & wood	37.0
5	Soft Plastics	2.0
6	Hard Plastics	1.0
7	Rubber & leather	1.0
8	Metal	1.0
9	Glass & bottles	2.0
10	Stone & ceramic	15.0
11	Other	22.0
	total	100.0

4.4.4 The results of the Public Opinion Survey

60% of the surveyed households are Tamil, 26% Sinhalese and 14% Muslims. Data on the average number of people per household and monthly income is set out in the table below.

Table 4-63: Average and standard deviation values of income and family size

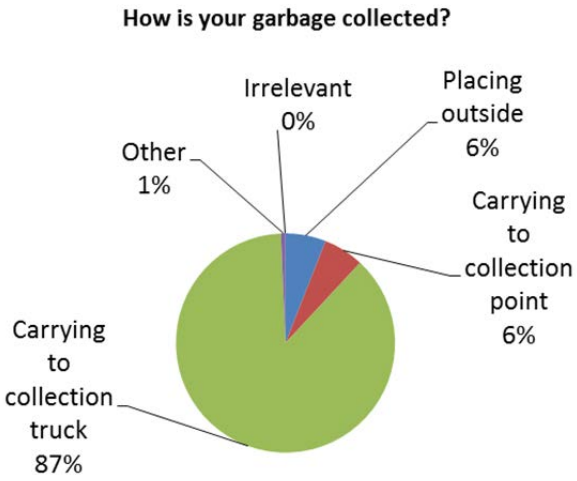
Category	Number of sample	Average of family members / employees	Income/Turnover (LKR/month)
High	51	4.7	58, 863
Middle	42	4.5	31, 524
Low	48	4.5	14, 569
Business	40	3.3	99, 789



Item	No.Sample	%
Yes	140	99
No	1	1
Total	141	100

Figure 4-27: Availability of garbage collection service in the Trincomalee UC

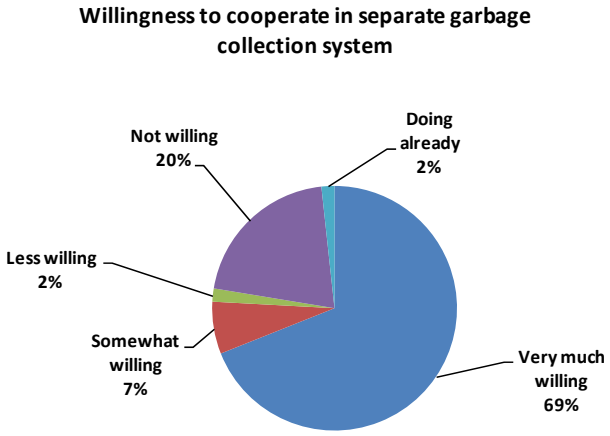
✓ In the Trincomalee UC, 99% of surveyed households are provided with a garbage collection service, of which 99% stated they use this service. Only 34% of surveyed households are "very satisfied" with the present SWM service provision, while 46% are "somewhat satisfied".



Item	No.Sample	%
Placing outside	8	6
Carrying to collection point	8	6
Carrying to collection truck	124	87
Other	1	1
Total	141	100

Figure 4-28: Method of garbage discharge by residence in the TUC area

- ✓ Households' main methods of waste discharge are shown in Figure 1. The most common method is carrying garbage to the collection truck (87%). 6% of residences discharge waste outside their premises for house to house collection while another 6% carry waste to waste collection points.
- ✓ 78% of surveyed households receive the garbage collection service once a week while 15% stated that they received the service less frequently than once a week. However, 61% discharge their garbage as soon as it is generated and 34% discharge their garbage daily. The discrepancy between these figures explains the large amount of discarded garbage present on many streets around Trincomalee.
- ✓ In general, adult females handle waste in about 79% of surveyed households.
- ✓ As shown in Figure-2, only 20% of surveyed households are unwilling to cooperate with source separation for recycling while the majority (69%) are very much willing to participate in the separate garbage collection system.
- ✓ In addition, 69% of surveyed households stated that there are recyclable collectors or someone who comes to collect their reusable or recyclable materials.



Item	No.Sample	%
Very much willing	97	69
Somewhat willing	10	7
Less willing	3	2
Not willing	28	20
Doing already	3	2
Total	141	100

Figure 4-29: Willingness of residences to participate in the source separated garbage collection system in Trincomalee UC

- ✓ Only 21% of surveyed households use kitchen/garden waste for composting and also use the finished compost for their own garden.
- ✓ Many surveyed households (60%) have discussed proper garbage discharge methods at the community level.
- ✓ 72% of households stated that SWM awareness programmes are very necessary while 24% stated "somewhat necessary".
- ✓ The average WTP (willingness to pay) for improved SWM services is 37 ± 57 LKR/month per household. However, 23% of households do not like to pay for SWM services.
- ✓ Out of all surveyed households, only 9% stated that they sell/give-away metal for recycling and 2% of residences sell/give-away tins & cans for recycling. Glass and bottle recycling is only practiced by 1% of households while plastic recycling is practiced by 11%. The percentage of households who are involved in paper recycling (selling or giving-away) was low (2%).

4.4.5 Waste flow

The current waste flow has been prepared by analysing the locally outsourced public opinion survey, statistical data collection, and census results.

According to the waste flow, the collection rate ((discharge amount + direct loading amount)/generation amount) is 65.6%. As for the recycling rate for the generation amount, onsite compost is 5.6%, material recovery is 0.2%, and the total rate is 5.8%. On the other hand, the final disposal rate for the generation amount has reached 61.5%, which has become a burden on the Kanniya disposal site.

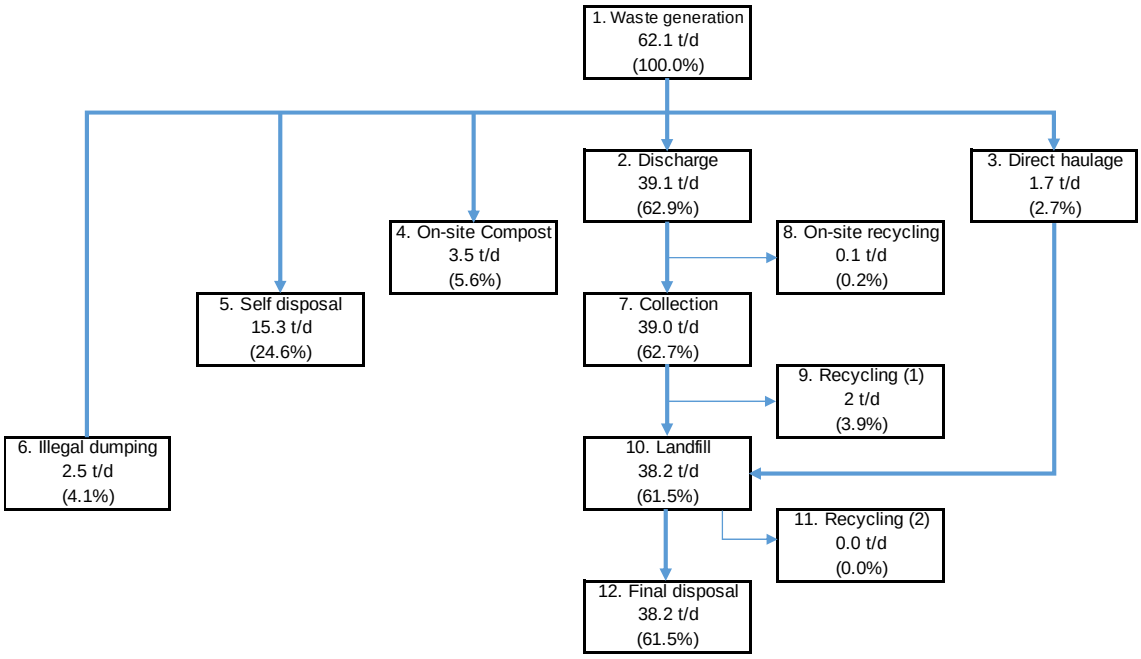


Figure 4-30: Waste flow in Trincomalee UC (2015)

4.4.6 Current Situation of Other Waste Management

a. Current Situation of Industrial Waste Management

There is no factory discharging industrial waste or hazardous waste in the Trincomalee UC.

b. Current Situation of Medical Waste Management

b.1 Generation Amount & Disposal Amount

The waste generation from hospitals mainly consist of municipal waste and the infectious waste (syringes, etc.) is not collected nor taken to the disposal site since it is incinerated in on-site incinerators.

b.2 Collection/Transportation and Disposal

The Trincomalee UC collects municipal waste from the hospitals and takes it to the Kanniya disposal site.

b.3 Collection fee

The collection fee of municipal waste from hospitals is charged the same as large waste generators in accordance with the size of the waste barrel.

c. Current Situation of Night Soil Management

c.1 Collection Amount

The disposal amount of night soil at the Kanniya disposal site is approximately 11,600 litres/day, according to the records.

c.2 Collection / Transportation and Disposal

Night soil is collected by collection vehicles operated by the Trincomalee UC and the collected night soil is disposed of at the Kanniya disposal site without any treatment.

c.3 Collection fee

The collection fee of night soil is 0.66Rs/litre for liquid only, while sludge is 1.30Rs/litre.

4.4.7 Needs for Solid Waste Management

a. Rehabilitation of existing final disposal site

Trincomalee UC has discharged the collected waste at the existing Kanniya disposal in the forest site since 2005 and it has caused the serious environmental issue surround area, therefore the rehabilitation of existing disposal site is required as soon as possible. The other issue is caused by many wild elephants which appear from the forest and scavenge the discharged waste at the disposal site around 2 p.m. every day. The wild elephants are quite dangerous to the human being and those disturb the operation of existing disposal site. The solution of anti-elephants at the existing disposal site is necessary.

b. Improvement of discharging and collection

According to the waste flow, the waste collection rate is as low as 62.9%, but the waste collection vehicles often become malfunction and it causes the difficulty of regular waste collection service. The renewal of waste collection vehicles to enhance the capacity of waste collection service is needed as the support.

c. Promotion of 3Rs

Any 3Rs activities are not officially carried out by Trincomalee UC. The private company has managed the operation of existing disposal site since October 2015 and it will start the sorting of valuable material waste in the future. The promotion of 3Rs to reduce the amount of waste at generation source is needed.

d. Improvement of Organization and Legislation

Trincomalee UC spends much budget and human resource to collect and discharge waste every day without the long term plan including organization and legislation. The formulation of master plan of solid waste management is needed to improve and develop the future policy, legislation, organization, and budgeting regarding on solid waste management.

4.5 Kurunegala Municipal Council in Northern Western Province

4.5.1 Outline of the LA

The Kurunegala Municipal Council is situated in western Sri Lanka and well known for its historically important religious places as well as its location as a gateway to major towns of the country such as Colombo, Kandy, Negombo, Anuradhapura and Trincomalee. The climate of the Kurunegala MC is characterized by a "Tropical rainforest". The dry season is from February to September and the average annual precipitation is approximately 1,570mm. The coolest average temperatures in the year are in December and January with an average temperature of approximately 26 degrees Celsius, while April to September has the hottest average temperatures in the year at an average of approximately 30 degrees Celsius.

The Kurunegala MC is the capital city of the Northern Western Province and is the core of politics, economy and culture. Since the Kurunegala MC is the main service centre of the province, the large number of service oriented institutions as well as higher education centers located within the boundaries of Kurunegala MC serve a floating population of about 250,000. On the other hand, since manufacturing activities are restricted within the LA area, it is home to only two garment factories.

The Kurunegala MC consists of twelve Grama Nilathari Divisions (GN divisions) and twelve wards. The population of the Kurunegala MC between 2010 and 2015 is shown in the following table.

Table 4-64: Population Trend of the Kurunegala MC (2010-2015)

Year	2010	2011	2012	2013	2014	2015
Population	27,141	27,682	26,931	27,043	26,727	26,903

Source: Sampath Pathikada of District Secretariat Kurunegala

4.5.2 Current Status and Problems of Solid Waste Management

a. Organization and Legal System

a.1 Legislation and Policy

The North Western Province Environmental Statute No. 12 of 1990 in the chapters below mentions plans and all necessary steps to be carried out to prevent the discharge of wastes into the environment and the measures for protecting and improving of the quality of the environment.

- ✓ Power and Functions of The Provincial Authority
- ✓ Environmental Projection
- ✓ Environmental Quality
- ✓ General

a.2 Solid Waste Management Plan

The Kurunegala MC has prepared a 5 year plan for 2010-2014 and 2015 -2018

a.3 Organization

Solid waste management is carried out by the Municipal Health Department (MHD) headed by the MOH who is responsible for overall SWM activities. The main responsibilities of the MHD

are the following:

- Allocation of labour/vehicles to collect, transport and dispose waste and maintaining the cleanliness and sanitation conditions of the municipal area.
- Cleaning of streets and drains and removal of such waste
- Septic tank and toilet emptying service
- Maintenance of public market, pola, slaughterhouse and cemetery
- Operation of recycling center and compost facility
- Infectious disease prevention services and control of fly and mosquito breeding sites
- Maternity and child care activities
- School health activities
- Activities related to food hygiene and safety

The health section receives direct support from the Municipal Engineers Department (MED) for vehicle repair, maintenance and driver management which is essential for SWM activities. Also the MED is responsible for the construction work related to SWM.

The PHI is assigned to SWM and full responsibility is handed over to him. The other four PHIs assist with the SWM duties and responsibilities of the MHD officers.

The organization chart and staff related to solid waste management of the Kurunegala UC is shown below.

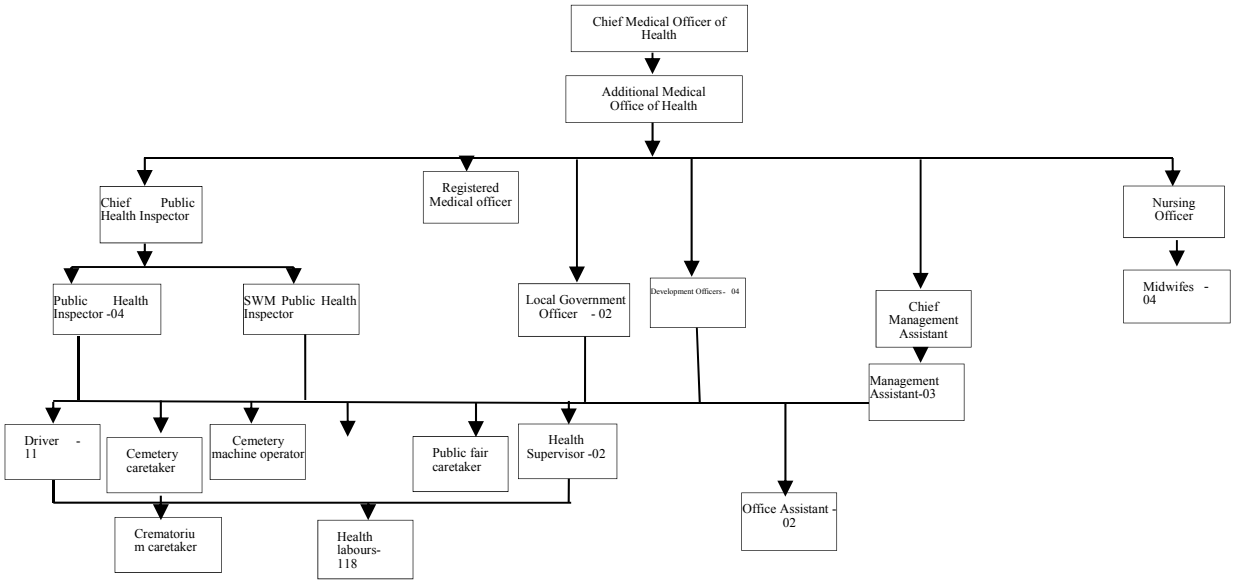


Figure 4-31: Organizational chart of the Kurunegala MC

Table 4-65: Staff related to SWM in the Kurunegala MC

Staff		Number	Remarks
Engineer		1	
TO(Technical Officer)		1	
MOH(Medical officer of health)		1	
Add MOH		1	
PHI(Public health inspector)		6	
Health Overseer		2	
Sub Overseer		12	
Collection workers	Permanent	186	
	Temporary	28	
Driver		15	Two of them are night soil collection vehicle derivers
Disposal site workers	Acting supervisor	2	
	Permanent	20	Compost and recycling facility
	Temporary	6	
Other		9	DO, Mgt Asst, Office Asst, Care takers,
Total		144	

a.4 Issues of Organization and Legal System

With regard to organization, the experienced MOH and PHI have taken the actual command of waste management and are working in close collaboration with the PHI and the SV. However, the absence rate of disposal site workers for the compost and recycling facility is high and it often causes a malfunction of the facility.

b. Technical System

b.1 Storage and Discharge

The kerbside collection is conducted by the Kurunegala MC and the residences have to store their mixed waste in a plastic barrel or a polythene sack and discharge them in front of their houses on the collection day. The owners of restaurants and shops also store their waste in plastic barrels of 100 or 200 litres, which are collected by door to door collection.

b.2 Collection and Transportation

Collection and transportation of solid waste is conducted by the Kurunegala MC as follows.

Table 4-66: The list of collection method, target area, frequency and target waste

Collection Method	Target area	Frequency	Target waste
House to house	Residential	Every day/ Every other day	Biodegradable
		Once a week	Non-biodegradable
	Commercial	Every day	Mixed
Separate	Residential	Every day/ Every other day	Biodegradable
		Once a week	Non-biodegradable
	Commercial	-	

Some small transfer stations for the SW called “Health Depot” have been installed in the city market site and the Solid Waste Management Center and solid waste between 6 tons to 10 tons

is collected everyday by handcarts and is transported to the final disposal site.


Photo: The small transfer station installed in the city market

The waste collection covers 100 % of the Kurunegala MC area and no collection fee is charged neither for residents nor large scale waste generators.

The collection vehicles and equipment are shown in the table below;

Table 4-67: Collection vehicles and equipment of the Kurunegala MC

Vehicle type	Number of vehicles	Notes
Compactor truck	6	4 trucks under repairing
Tractor	12	4 tractors under repairing
Hand Cart	38	
Lorry	2	

Source: Kurunegala MC

The running mileage and collected area of every vehicle are recorded as a working record by the Kurunegala MC. Repair and maintenance of collection vehicles are conducted at the workshop on the premises of the Kurunegala MC. The breakdown of personnel in the workshop is as follows.

Table 4-68: The personnel composition of the work shop in Kurunegala MC

Staff	Number of personnel
Technical Officer	1
Mechanic	1
Painter	1
Tinker	1
Driver	2
Others	9

Source: Kurunegala MC

Photo: The Workshop in Kurunegala MC

b.3 Intermediate treatment

Intermediate treatments are carried out by the Kurunegala MC as follows.

Table 4-69：Intermediate treatment facilities in Kurunegala MC

Types of Facility	Execution Body	Address	Capacity (ton/day)	Establishment year	Notes
Compost plant	Kurunegala MC	Sundarapola	50	2012	The capacity has decreased to 2 ton/day due to a lack of labour.
Sorting Yard			2	2010	
Recycling facility			3	2010	
Biogas facility		Public market	1	2014	

Source: Kurunegala MC

Two tons of organic waste from the town market and regular fair is collected and transferred to the compost plant which has a 50 ton capacity at the final disposal site.. Materials for pipes and bags are made of thread and grinded hard plastic at the Recycling facility. Organic waste corresponding to 6 tons per week is collected and generated methane gas every week. Bio-gas generation would cover the monthly electricity charge which is roughly 40,000LKR on the public market.

Photo 4：Compost plant, grinder machine in recycling facility and bio-gas generation facility

b.4 Final disposal

The solid waste collected by the Kurunegala MC and the Kurunegala PS is transferred to the Sundarapola final disposal site located in the Kurunegala PS. The Sundarapola final disposal site was established and has been in operation since 1922.

The operation area has approximately 5ha and the number of remaining sustainable years is expected to be approximately 10 years. The Kurunegala MC has the responsibility of vehicle record management at the entrance gate and regular waste relocation by heavy machines. A bobcat and an excavator are usually allocated in the Sundarapola final disposal site. The discharged solid waste amount is approximately 38 ton/day from the Kurunegala MC, approximately 10 ton/day from the Kurunegala PS and is estimated at approximately 48 ton/day in total. Discharged solid waste includes municipal solid waste from hospitals and factories as well. A tipping fee is charged to the solid waste only from the outside area of the Kurunegala MC and the Kurunegala PC.

Table 4-70：Tipping fee at the Sundarapola final disposal site for solid waste

Types of vehicle and waste	Tipping fee (LKR)
Three wheelers／Solid waste	220
Tractor／Solid waste	1,250
Dump truck／Solid waste	1,550
Dump truck／Glass	1,750

Source: Kurunegala MC

The location of incoming waste from the two local authorities to the Sundarapola disposal site and other details are provided in the following figure and table.

Table 4-71: Detailed information about the disposal site of the Kurunegala MC

Site name		Sundarapola disposal site				
31) Address		Waste e Center, Sundarapola, Yanthanpalaw				
32) Coordination		E:080°21'08.2" N:07°30'35.7"				
33) Method of operation		Open dumping (with security control)				
34) Disposal amount (t/day)	Year	Kurunegala MC	Kurunegala PS	Army	Private	Total
	2015 (9月 - 10月 平均)	1,159.2	304.7	18.6	8.6	1491.0
35) Expected remain of life span (years) in 2015		10 years				
36) Executing organization of final disposal site		Kurunegala MC				
37) Tipping fee (LKR/ton)		None				
38) Unit cost of operation (LKR/t) in 2015		Unknown				
39) Disposal area (ha)		Current approximately 5.25 ha (approximately13acr)				
40) Environmental License and Environmental Clearance		Environmental License was acquired in only first year.				

The solid waste flow for collecting, hauling and disposing in the Kurunegala MC are as follows

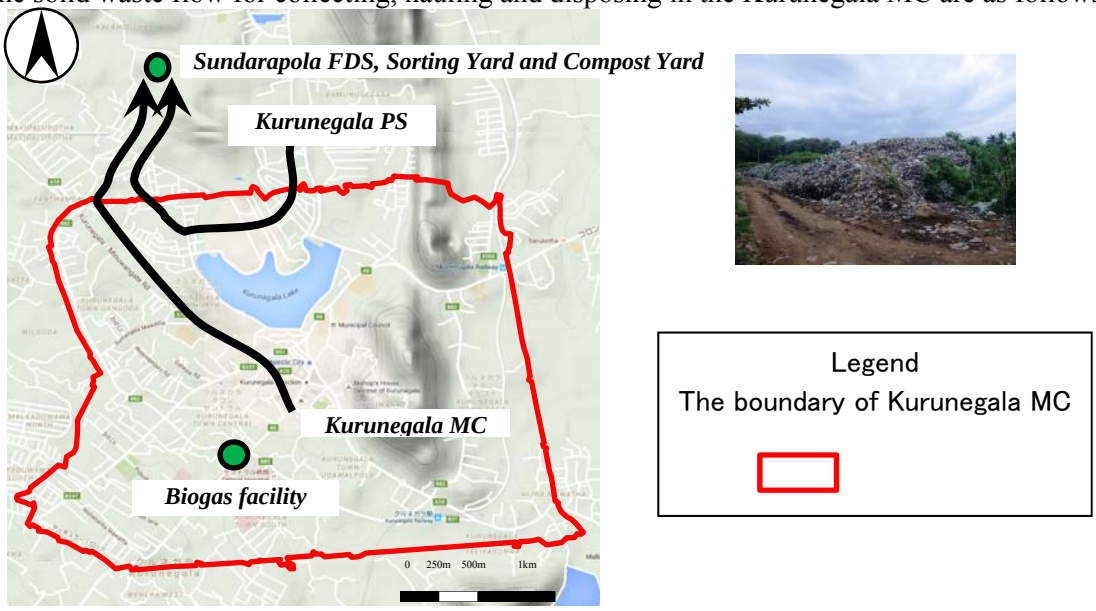


Figure 4-32: The solid waste flow for collecting, hauling and disposing in Kurunegala MC

Figure 4-33: Satellite photograph of Sundarapola final disposal site

b.5 Issue of technical system

Regarding waste collection and waste hauling in the Kurunegala MC, the residents complain about the low frequency for waste collection due to the low attendance of collection workers. 95% of the workers are Tamil. They often quit their job due to a low salary and go to Kandy and Colombo as migrant workers. Regarding separate collection, although the separate collection rate reached 75% in commercial areas and 50% in residential areas, the drivers have to collect the separated waste and discharge it to the Sundarapola final disposal site as mixed waste because they also have to cover the area for separate collection and unseparated (mixed) collection in the same day.

Regarding the workshop in the Kurunegala MC, the shortage of workers and vehicle replacement parts makes outsourcing necessary for major repairs. During the repair period, the collection area by the Kurunegala MC becomes limited due to the long procedure from the request to approval and finally completion for repair(s).

Regarding the compost yard in the Sundarapola final disposal site, the produced amount of compost has decreased since June 2015 due to the shortage of workers caused by employment

problems. Therefore, only 2tons/day of solid waste can be accepted at the compost yard. The compost price was originally 10LKR/5kg but is now 10LKR/1kg because of a stock shortage. The biogas facility was originally intended to generate 2.8kWh, sufficient to cover the monthly electricity requirements of the city market, which currently has a monthly electricity bill of roughly 40,000LKR. But the system is not currently functioning and generated methane gases are emitted in the atmosphere.

At the Sundarapola final disposal site, one or two complaints are made every day in the neighbourhood due to the offensive odor and a large number of harmful insects. Sludge which cannot be sent to the treatment facility is discharged to the pit excavated in the dumping area for solid waste because of inefficient capacity of the sludge treatment facility.

c. Recycling activity

c.1 Source Separation

As it was mentioned, the separate collection was initiated in December 2012 by the Kurunegala MC and the separation rate reached 75% in commercial areas and 50% in residential areas.

c.2 Reduction of Organic Waste

There are no points worthy of special mention.

c.3 Recycling of Valuable Materials

The Kurunegala MC allocates a supervisor and two workers in charge of purchasing and collecting recyclable waste in the Waste Management Center (WMC). A small facility is also installed in the WMC to transfer collected waste by some handcarts to a tractor and the collection workers of the handcarts can receive a monthly average income of between 300 and 400LKR by selling the collected recyclable waste. The recyclable waste items along with the buying price and the collection amount in the WMC are as follows (also refer to the photo following the tables).

Table 4-72: The buying price and collection amount of recyclable waste in WMC

Item	Buying price (LKR/kg)	Collection amount (kg/day)
Metal	20	50
Cardboard	8	150
Polythene	15	10
Plastic	15	50
Glass	1.5	200
Paper	5	40
Pet bottle	15	30
Coconut shell	4	50
Battery	50	1
Copper	350	1
Aluminium	250	5
Tin	8	50

Source: Waste Management Centre

On the other hand, there are 5 or 6 recyclable materials “middlemen” dealers in the administrative boundary of the Kurunegala MC and their buying price, selling price and collection amount of recyclable waste items are shown below. The recyclable waste carried from the administrative boundary of the Kurunegala MC occupies roughly half of the total.

Table 4-73: The selling price, purchase price and collection amount of recyclable materials by "middlemen" dealers in KMC

Item	Buying price (LKR/kg)	Selling price (LKR/kg)	Collection amount (t/month)
Metal	20	28	5
Cardboard	13	14	3
Plastic	20-40	70	0.1
Glass bin	2	3-5	1
Paper	4-10	18-30	0.2-0.8
Copper	400-450	500	0.1
Aluminium	100-110	140	0.2

Source: Middleman shop's owner

Photo : Recyclable waste separated in Waste Management Centre

c.4 Issues of Recycling Activities

The WMC and middlemen dealers have a common issue which is the shortage of stock space. According to the dealers, they will be able to increase the amount they purchase if they are able to expand the space of their premises as there is a high buyer demand.

d. Public Awareness

d.1 Participation Level and Manners of Citizens

There are no points worthy of special mention.

d.2 Current Situation of Public Awareness Activities

The personal (door-to-door) visits and awareness activities for schools and citizen groups, distribution of leaflets, posters on bulletin boards and seminars are implemented by the Kurunegala MC, NGO and IWMI (International Water Management Institute)

d.3 Issues of Public Awareness Activities

There are no points worthy of special mention.

e. Finance

e.1 Financial Condition of Municipal Council

The difference between annual revenues and expenditures of the Kuunegala Municipal Council

has been negative from 2012 to 2014 and its share in total annual revenues accounted for -51.97% on average as shown in the table below.

Table 4-74: Annual Revenue and Expenditure of Kurunegala MC (Unit: Thousand LKR)

No	Category	2012	2013	2014	Annual Average	
					1,000 LKR	%
1	Approved Budget	7,302,904	800,693	1,146,224		
2	Actual	794,605	110,460	1,186,220		
	Revenue	687,595	456,515	503,741	549,284	100.0%
	Own-source revenue	406,917	320,266	341,704	356,296	64.9%
	Grant	280,677	136,249	162,037	192,988	35.1%
	Expenditure	730,213	731,748	1,041,523	834,494	151.9%
	Recurrent	333,817	387,570	399,040	373,475	68.0%
	Capital	396,396	344,178	642,483	461,019	83.9%
	Profit or loss	-42,618	-275,233	-537,782	-285,211	-51.9%

Source: Kurunegala MC, "Programme Budget：2013-2015"

The share of own-source revenues is roughly 41.8% while that of grants was estimated as roughly 58.2 % as shown in the table below.

Table 4-75: Breakdown of Annual Revenue of Kurunegala MC (Unit: thousand LKR)

No	Types of Revenues	2012	2013	2014	Annual Average	
					1,000 LKR	%
1	Own-Source Revenues:					
	Rates & Taxes	120,985	141,325	142,500	134,937	18.0%
	Rents	49,199	62,181	69,475	60,285	8.0%
	License	6,058	6,456	7,856	6,790	0.9%
	Fees For services	58,652	62,958	71,415	64,342	8.6%
	Warrant Costs And Fines	2,344	3,326	4,084	3,251	0.4%
	Other Income	43,440	44,020	46,374	44,611	5.9%
	Total Own-Source Revenues	280,677	320,266	341,704	314,216	41.8%
2	Grants:					
	Recurrent Grant:	125,100	135,109	160,897	140,369	18.7%
	Salaries	1,140	1,140	1,140	1,140	0.2%
	Council Members Allowances					
	Other Recurrent Grant	323,373	344,178	642,483	436,678	58.2%
	Capital Grants	323,373	344,178	642,483	436,678	58.2%
	Total Grants	604,050	664,444	984,187	750,894	100.0%
	Total	125,100	135,109	160,897	140,369	18.7%

Source: Kurunegala MC, "Programme Budget：2013-2015"

The share of capital grants in the total revenues is accounting for around 57.0%. On the other hand, the amount of total recurrent expenditures occupies 43.0% in the total expenditures of the pradeshiya sabha.

Table 4-76: Breakdown of the Annual Expenditure of Kurunegala MC (Unit: Thousand LKR)

No	Types of Expenditures	2012	2013	2014	Annual Average 000 LKR	Annual Average %
1	Recurrent Expenditures:					
	Personal Emoluments	176,874	215,287	226,337	206,166	23.7%
	Travelling	2,807	4,265	4,363	3,812	0.4%
	Requisites And Equipment	20,953	23,614	28,262	24,276	2.8%
	Repairs And Maintenance Of Capital Assets	9,387	9,751	12,679	10,606	1.2%
	Transportation, Communication, Utility And Others Rervices	78,391	83,707	82,129	81,409	9.4%
	Interest	19,313	19,735	15,617	18,222	2.1%
	Grants, Subsidies And Contributions	20,243	21,152	22,832	21,409	2.5%
	Pensions, Retirements, Benefits And Gratuities	5,850	10,062	6,821	7,578	0.9%
	Other Expenditures					
	Total Recurrent Expenditures	333,817	387,572	399,040	373,476	43.0%
2	Capital Expenditure	396,396	344,178	747,111	495,895	57.0%
	Total Expenditure	730,213	731,750	1,146,151	869,371	100.0%

Source: Kurunegala MC, "Programme Budget：2013-2015"

e.2 SWM Finance

The total revenue of Municipal Health Department mainnly consists of the tipping fee for incoming waste from other LA's at the disposal site waste and the collection fee from business institute. It is approximately 2,310,000 LKR (2012) and 13,054,000 (2014), while the exipenditre is 44,718,000 LKR (2012) and 69,046,000LKR (2013). The table below shows the financial data of Municipal Health Department from 2012 to 2014.

Table 4-77: Annual Revenues and Expenses of Municipal Health Department of Kurunegala MC (Unit: Thousand LKR)

No	Types of Expenses	2012*	2013	2014
A	Approved Budget	44,614	56,648	58,812
B	Revenues:	2,310	13,054	8,511
C	Actual Expenditures:			
	Personal Emoluments	40,521	51,778	54,552
	Supplies And Material Expenditures:			
	Equipment For Disposing Garbage	585	815	820
	Fuel And Lubricants		11,100	4,587
	Uniforms for Workers	76		
	Boots for Workers		101	
	Awareness Program	28	50	176
	Other supplies		3,305	42
	Total Supplies and Materials Expenses			
	Repairs And Maintenance of Vehicles	175		100
	Final Disposal Payment		100	
	Other Expenses	3,333	1,797	3,340
	Total expenditure	44,718	69,046	63,822

e.3 Cost of waste collection

Collection of municipal solid waste is executed by the Kurunegala MC and the cost of waste collection is 6,834 LKR/tons (2015). The breakdown is as follows:

Table 4-78: Total cost of waste collection of Kurunegala MC (2015)

	Items	Cost (1000LKR/year)
1	Personal emoluments	88,441
2	Fuel	4,557
3	Mechanical & Electrical Goods	13,500
4	Medical supplies	-
5	Uniform	285
6	Buckets, basket	-
7	Repairs vehicles	1,467
8	Maintenance	710
9	Employee provident fund, trust fund	2,803
	Total	111,763
	111,762,741LKR/collection amount 44.8ton/day/365day	6,834(LKR/ton)

e.4 Operation cost of disposal site

The tipping fee at the disposal site is free for waste from the Kurunegala MC and the Kurunegala PS. The operation cost of disposal sites consist of rental charge(s) for heavy machinery and the salary for security, which leads to an average of 921LKR per ton of waste.

Table 4-79: Total operation cost of the disposal site of the Kurunegala MC (2015)

	Items	Cost (1000LKR/year)
1	Salary of security (1,200LKR x 2persons x 30daysx12months)	231
2	Rental charge of heavy machinery	1,407
	Total	1,638
	1,638,350LKR/38.6 ton/day/365day	116(LKR/ton)

e.5 Issues of SWM financial system

The majority of the capital expenditures are financed from the own-source revenues of the Municipal council or external funds. And there is no linkage between revenue from large waste collection and expenditure of SWM. Although LAs considers the balance sheet between revenue and expenditure totally, the sustainability of SMW is not considered well. For instance, the operation cost of final disposal site is 116LKR/ton and it seems not to be sustainable for proper operation of landfill site.

4.5.3 Waste amount and Waste composition

a. Waste amount

The waste amount in the Kurunegala MC is calculated by the waste generation unit of each source mentioned in the SWM Action Plan (2008) by the NSWMSC and the waste generation number of each source collected by the local survey in this project. As a result, the total waste generation unit in the Kurunegala MC is 1.84kg/person/day.

Table 4-80: SW generation amount in the Kurunegala MC

Source		Generation rate		Generation sources	Generation (ton/day)
Residential	Collection	0.25	Kg/person/day	25,571	6.49
	Non-collection	0.25	Kg/person/day	522	0.13
Commercial	Hotels (large)	51.90	Kg/(hotel)	0	0.00
	Hotels (middle)	25.95	Kg/(hotel)	10	0.26
	Hotels (small)	9.65	Kg/(hotel)	38	0.37
	Restaurants (large)	69.20	Kg/(restaurant)	0	0.00
	Restaurants (middle)	43.25	Kg/(restaurant)	14	0.61
	Restaurants (small)	9.65	Kg/(restaurant)	126	1.22
	Organic-shops (large)	207.60	Kg/(shop)	1	0.21
	Organic-shops (middle)	25.95	Kg/(shop)	18	0.47
	Organic-shops (small)	9.65	Kg/(shop)	71	0.69
	Non-organic shops (large)	43.25	Kg/(shop)	8	0.35
	Non-organic shops (small)	9.65	Kg/(shop)	762	7.35
Institutions	Schools	70.28	Kg/(school)	55	3.87
	Hospitals	202.85	Kg/(hospital)	27	5.48
	Public office	9.65	Kg/(institution)	280	2.70
	Bank/Private office	19.04	Kg/(institution)	20	0.38
	Buddhist temples	17.30	Kg/(temple)	13	0.22
	Hindu temples	17.30	Kg/(temple)	6	0.10
	Mosques	17.30	Kg/(mosque)	5	0.09
	Churches	17.30	Kg/(church)	10	0.17
Industries	Large	1,490.8	Kg/(industry)	3	4.47
	Domestic	8.65	Kg/(industry)	302	2.61
Market		649.30	Kg/market	3	1.95
Port		-	Kg/port	0	0.00
Drainage		745.40	Kg	7	5.22
Recyclables		382.43	Kg	7	2.68
Total					48.07
Population					26,093 person
Total waste generation unit					1.84 kg/person/day

Source: SWM Action Plan (2008), NSWMSC

b. Waste composition

Waste composition in the Kurunegala MC is referred to in the survey results in the SWM Action Plan (2008) by the NSWMSC. The result revealed the ratio of organic waste composed of kitchen waste and grass & wood occupies less than 70%, on the other hand, the ratio of recyclable waste composed of paper, textiles, plastic, metal and glass & bottles occupies close to 30%, which is the urbanized waste composition.

Table 4-81: Waste composition in Kurunegala MC

Category	Ratio
Kitchen waste	52.0%
Paper	15.7%
Textiles	5.9%
Grass & wood	16.0%
Soft Plastics	4.8%
Hard Plastics	1.4%
Rubber & leather	0.3%
Metal	2.0%
Glass & bottles	0.3%
Stone & ceramic	1.1%
Other	0.6%
	100.0%

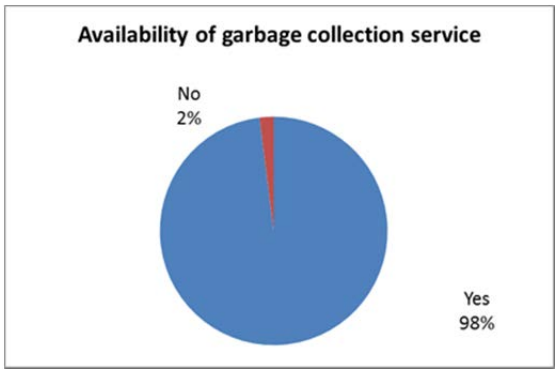
Source: SWM Action Plan (2008), NSWMSC

4.5.4 The result of public opinion survey

✓ The demographics for the surveyed households are as follows: 81% are Sinhalese, 17 % are Tamils and 2 % Muslims. The ethnicity could be further classified into income groups; 100% of the Sinhalese households make up the high income group, 98 % of Sinhalese make up the middle income group and 50 % of low income families were made up of Tamils. The data of the average number of people per household and monthly income is shown in the table below.

Table 4-82: Average and standard deviation values of income and family size

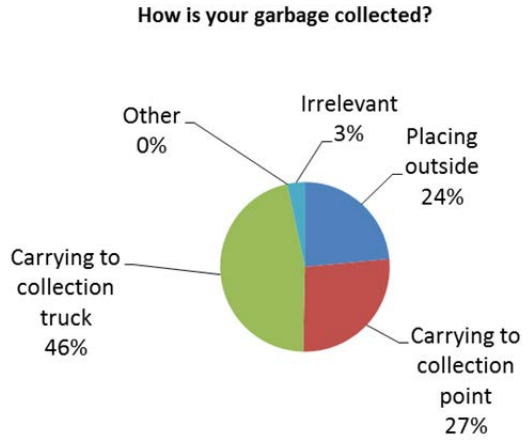
Category	Number of sample	Average of family members / employees	Income/Turnover (LKR/month)
High	48	4.3	63,521
Middle	52	4.4	34,865
Low	50	4.8	16,100
Business	41	6.2	371,243



Item	No.of Sample	%
Yes	147	98
No	3	2
Total	150	100

Figure 4-34: Availability of garbage collection service in the Kurunegala MC

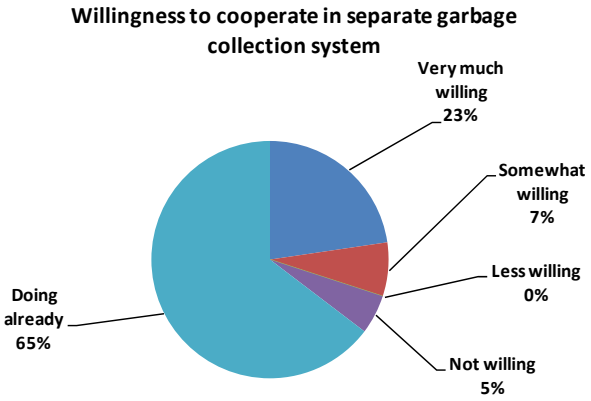
✓ collection service, of which 98% stated they use this service. 68 % of surveyed households are “very satisfied” with the present SWM services provision, while 26 % are “somewhat satisfied”.



Item	No.of Sample	%
Placing outside	36	24
Carrying to collection point	41	27
Carrying to collection truck	69	46
Other	0	0
Irrelevant	5	3
Total	150	100

Figure 4-35: Method of garbage discharge by residences in the KMC area

- ✓ Households' main methods of waste discharge are shown in upper Figure. The most common methods are carrying garbage to the collection truck (46%) and carrying garbage to the collection point (27%), and discharging it outside their premises for house to house collection (24%).
- ✓ Only 34% of surveyed households receive a daily garbage collection service while 44 % stated that they received the service 2-3 times/week.
- ✓ 69% discharge their garbage as soon as it is generated and 27 % discharge their garbage daily. Only 4% discharge their garbage 2-3 times per week.
- ✓ In general, adult females handle waste in about 67 % of surveyed households.
- ✓ As shown in lower Figure, 65 % of households separate their garbage into organic and inorganic waste at the source of generation. Only 5 % of surveyed households are not/less willing to participate in source separation for recycling. The rest of the households are very much willing (23 %) and somewhat willing (7 %) to participate in the source separated garbage collection system.
- ✓ Further, 73 % of surveyed households stated that there are recyclable collectors or someone who comes to collect their reusable or recyclable materials. Hence, an informal recycling system is well established in the Kurunegala MC area.



Item	No.of Sample	%
Very much willing	35	23
Somewhat willing	11	7
Less willing	0	0
Not willing	8	5
Doing already	98	65
Total	150	100

Figure 4-36: Willingness of residences to participate in the source separated garbage collection system in the Kurunegala MC

- ✓ 20 % of surveyed households use kitchen/garden waste for composting and 97% of them used the finished compost for their own garden.
- ✓ Not many surveyed households (48 %) have ever discussed proper garbage discharge methods at the community level, but 35% said that they discussed the garbage issue at community meetings.
- ✓ 92 % of households stated that SWM awareness programmes are very necessary while 7 % stated "somewhat necessary". Only 1% of surveyed households stated that awareness campaigns are not necessary or not needed at all.
- ✓ 49 % of households do not like to pay for SWM services mainly because of the revenue tax they paid for the KMC. The average WTP (willingness to pay) for improved SWM services is 68 ± 94 LKR/month per household.
- ✓ Out of all surveyed households, 11% stated that they sell/give away glass and bottles for recycling and 6% of residences sell/give-away plastics for recycling. Also, 1-8% of households sell/give-away cans and metals for recycling. Cardboard and paper recycling were 0 % and 10 % respectively.

4.5.5 Waste flow

The current waste flow in the Kurunegala MC is shown below. This was the result of analysis by collected statistic information, the census data in 2012, the public opinion survey and the waste generation survey in this project.

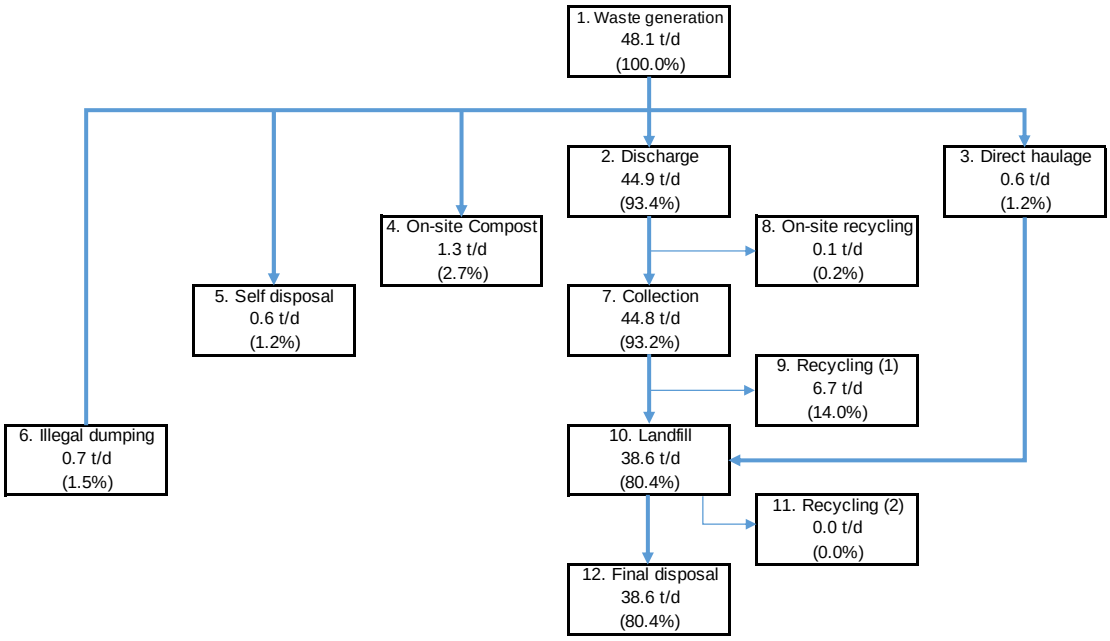


Figure 4-37: Current waste flow in Kurunegala MC（2015）

According to the waste flow, the waste collection ratio, which corresponds with the ratio of the discharged amount plus the ratio of the direct hauled waste amount, is calculated at 94.6%. The total of the ratio of on-site compost and self-disposal is 3.9%; and the ratio of illegal dumping is 1.5%. On the other hand, the ratio of the recycling, which occupies 14% in total, is high.

4.5.6 Current Situation of Other Waste Management

a. Current Situation of Industrial Waste Management

There are two garment factories in the boundary of the Kurunegala MC, but industrial waste (IW) is not discharged by either of the factories. Therefore, it is mentioned regarding solid waste (SW) generated from the industrial sector as follows.

a.1 Generation Amount & Disposal Amount

The collection and hauling of SW generated from the industrial sector is conducted by the Kurunegala MC and the hauled monthly amount to the SFDS is approximately two tractor loads.

a.2 Collection, Transpiration and Disposal

The IW is hauled to the SFDS by tractor and the tipping fee for discharge is 1,550Rs per tractor.

b. Current Situation of Medical Waste Management

b.1 Generation Amount & Disposal Amount

As of November 2015, the amount of solid waste generated from the medical sector hauled to the SFDS ranges between 1.5 and 2 tons/day. Regarding the medical waste (MW) such as used hypodermic syringes and needles, they are disposed by incineration facilities.

b.2 Collection, Transportation and Disposal

The collection and hauling of SW generated from the medical sector is conducted by the Kurunegala MC.

b.3 Tipping fee

It is free of charge, the same as with SW generated from other sectors.

c. Current Situation of Night Soil Management

c.1 Generation Amount & Disposal Amount

The discharged amount of night soil at the SFDS ranges between18,000 – 20,000L/day.

c.2 Collection, Transportation and Disposal

The collection and hauling of night soil is conducted by the Kurunegala MC. A sludge which cannot be sent to the treatment facility is discharged to the dumping area for SW because of inefficient capacity of the sludge treatment facility.

c.3 Tipping fee

The tipping fee is shown below and is different depending on the location and distance.

Table 4-83: Tipping fee for night soil in the Kurunegala MC

		Inside of Kurunegala MC		Outside of Kurunegala MC	
		Small	Large	Small	Large
Capacity of collection vehicle (L)		1,800	3,800	1,800	3,800
Service charge for residential area (LKR)		3,000	3,500	-	4,000
Service charge for commercial area (LKR)		3,500	4,000	-	4,500
Transportation fee (LKR)	Less than10km	300			
	10 - 20km	400			
	More than 20km	500			
	Tax (13%)				

Source: Kurunegala MC

4.5.7 Needs for Solid Waste Management

a. Improvement technical system

a.1 Improvement of compost plant and final disposal site

The proper operation of existing disposal site is essential in Kurunegala MC to extend the limited capacity and utilize Sundarapola final disposal site as long as possible, however the compost plant is not properly operated due to lack of technical and budget aspect. The improvement of existing compost plant is need as soon as possible.

The moving of discharged waste at the existing disposal site is carried out by heavy machinery regularly, however the frequency of covering soil is not enough and it causes environmental issue to surrounding area. The improvement of existing disposal site is need as soon as possible.

a.2 Improvement of discharging and collection

According to the waste flow, the waste collection rate is as low as 93.2%, but the waste collection vehicles often become malfunction and it causes the difficulty of regular waste collection service. The renewal of waste collection vehicles to enhance the capacity of waste collection service is needed as the support.

a.3 Promotion of 3R

According to the result of WACS, the kitchen waste and garden waste occupy 68% of waste generation in Kurunegala MC. Kurunegala MC is conducting the compost plant to deal with the mixed waste and the material recovery facility; however the handling amount is not so large due to lack of technical issue and management issue

b. Improvement of Organization and Legislation

Kurunegala MC spends much budget and human resource to collect and discharge waste every day without the long-term plan including organization and legislation. The formulation of master plan of solid waste management is needed to improve and develop the future policy, legislation, organization, and budgeting regarding on solid waste management.

4.6 Nuwara Eliya Municipal Council in Central Province

4.6.1 Outline of the LA

The Nuwara Eliya MC, which is the capital town of Nuwara Eliya district in Central Province. The Nuwara Eliya MC which land height above sea level is approximately1,900m is located near Horton highland where is the highest peak in Sri Lanka. Although the climate of Sri Lanka belongs to tropical rain forest, the Nuwara Eliya MC belongs to marine west coast climate and the coolest in Sri Lanka. The history of the Nuwara Eliya MC started as a Britain style summer resort during the colonial period and the golf course, horse race course, hotels, cottages, tea plantations, tea factories, villas of government have been constructed since in 1900's.

The main industry of the Nuwara Eliya MC consists of the eco-tourism to visit the highland, waterfalls and so on, the garment and cosmetic factories and the highland vegetable farms such as tomato, strawberry, and so on[32].

The Nuwara Eliya MC consists of 15 Grama Nilathari Divisions (GN divisions), which are minimum administrative units. The population of Nuwara Eliya MC between 2012 and 2015 is shown in the following table.

Table 4-84: Population Trend of Nuwara Eliya MC (2012-2015)

Year	2012	2013	2014	2015
Population	23,804	24,104	24,404	24,709

Source: Estimation based on the census data of 2012.

4.6.2 Current Status and Problems of Solid Waste Management

a. Organization and Legal System

a.1 Legislation and Policy

The Nuwara Eliya MC prepares the action plan including the Solid Waste Management and the progress report of Health Section activity every year. The activities of solid waste management in 2015 are described as follows;

✓ Abolishment of the stationed collection system:

The stationed collection system was stopped in the one of three collection area in October due to waste scattering caused by stray animals. Accordingly the door to door collection or bell collection started instead of the stationed collection system. The Nuwara Eliya will stop the stationed collection system at MC other two areas soon.

✓ Reduction of waste collection cost

a.2 Organization

The Nuwara Eliya MC reduced the cost of waste collection with changing the number of collection workers from three persons to two people per collection vehicle.

The Organization of the Nuwara Eliya MC consists of following four departments;

- Secretarial Department
- Engineering Department

[32] Modification some parts based on the report, "The preliminary survey for water supply and sewerage plan in Kandy and Nuwara Eliya, 1998, JICA".

- Health Department
- Accounts Department

The Health Department is in charge of whole solid waste management, while the Engineering Department is in charge of repairing and maintenance of collection vehicles and facilities at the final disposal site.

Public Health Inspector (PHI) belonging to Health Department is a person in charge of solid waste management of the Nuwara Eliya MC and the duty of PHI is shown as follows;

- Supervising of waste collection and transportation
- Management of final disposal site
- Management of Material Recovery Facility (would be started from 2016)
- Management of night soil treatment
- Public awareness

The main duty of the Engineering Department consists of as follows;

- Repairing and maintenance of collection vehicles
- Operation and maintenance of final disposal site

The organization chart and staff related to solid waste management of the Nuwara Eliya MC is shown below.

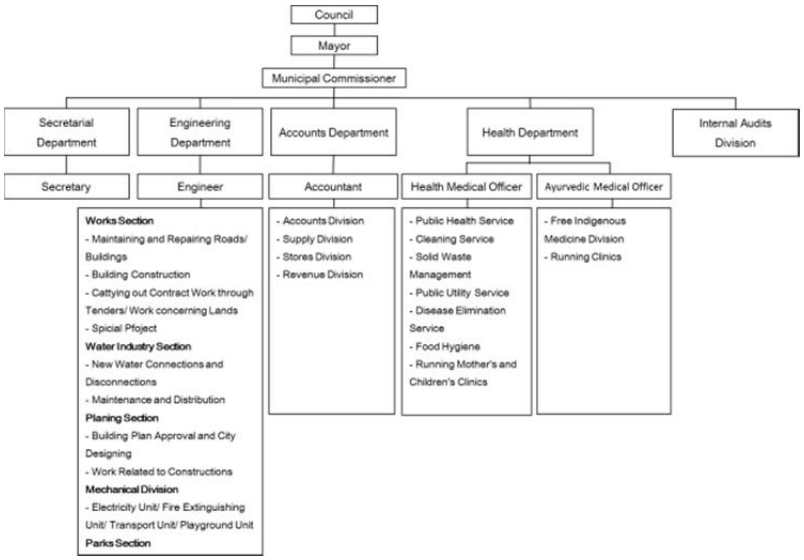


Figure 4-38: Organizational chart of the Nuwara Eliya MC

Table 4-85: Staff related to SWM in the Nuwara Eliya MC

Staff		Number	Remarks
Engineer		2	One of two is acting
TO(Technical Officer)		5	Two of five are in charge of SWM
MOH(Medical officer of health)		1	
PHI(Public health inspector)		4	
SV(Supervisor)		6	Five of six are acting
Supervisor's Helpers/ 'kangani'		6	
Collection workers	Permanent	90	
	Temporary	25	
Driver	Permanent	11	
	Temporary	-	
Disposal site workers	Permanent	3	
Other (Compost yard)		6	Management assistant;3, Support staff;2 Computer operator;1

a.3 Solid waste management plan

Nuwara Eliya MC has formulated the action plan of solid waste management since the feasibility study conducted by JICA in 2003.

a.4 Issue of Organization and Legal System

In SWM of Nuwara Eliya MC, the soft surface is conducted by Health Department, the hard surface is conducted by Engineering Department, and therefore division of work content is clear. And three PHIs are deployed to each collection area and they manage collection and transportation. Because SWM in Nuwara Eliya MC is performed organized, there is no issue of organization.

In institution, although the action plan of SWM is planned every year, there is no long-term plan. It is necessary to plan a long-term master plan.

b. Technical System

b.1 Storage and Discharge

Since the solid waste discharged by the residents was collected by the stationed collection system before October 2015, the residents were able to discharge solid waste any time without any rules of discharge schedule. But the kerbside collection system and the rule of discharge schedule have been introduced by Nuwara Eliya MC since October 2015, hence the residents must discharge the waste in front of the houses in accordance with the scheduled date at some areas.

b.2 Collection and Transportation

The collection and transferring of municipal solid waste to the final disposal site is carried out by the Nuwara Eliya MC. The Nuwara Eliya is divided into three collection areas and PHI managing the collection and transportation of solid waste is assigned at each area.

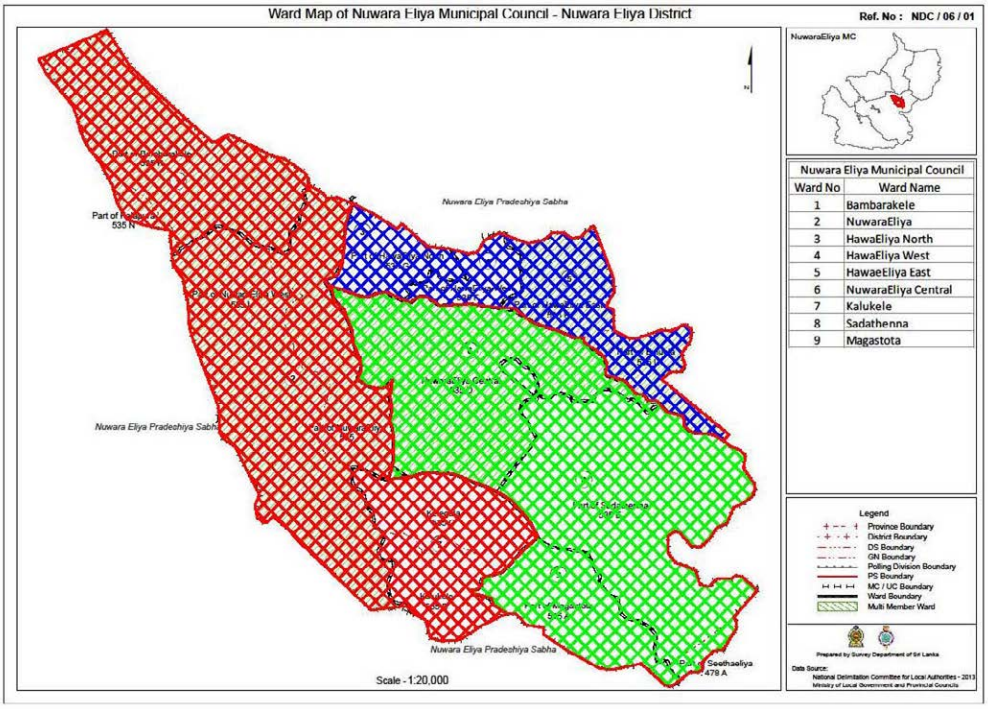


Figure 4-39: Solid Waste Collection Area in Nuwara Eliya MC

The Nuwara Eliya MC is collecting solid waste with following collection vehicles and 115 collection workers. Twenty five collection workers out of 115 workers are employed by temporary contract. The collection vehicles consist of two compactor trucks and four tractors as daily collection work.

Table 4-86: Solid waste collection vehicles owned by the Nuwara Eliya MC

Type	Qty.	Remarks
Compactor truck(12-14m^3)	1	
Compactor truck(6-8m^3)	2	One of two is backup
Tractor	10	Two of ten are backup and four of ten are under repairing
Handcart	35	
Three wheeler	1	Collection of infectious waste
Night soil collection tanker	2	Capacity 7.5m^3、3.5m^3
VAN	1	Inspection (shared by the other department)

The solid waste collection system consists of kerbside collection, bell collection and stationed collection in the Nuwara Eliya MC. There are two small scale transfer station for the solid waste collected by handcart to tractors at town centre and market. Basically collection fee of waste is not collected but 65,000LKR / month it is collected from only Economic Centre. Frequency of solid waste collection is described in the table below.

Table 4-87: Frequency of solid waste collection of the Nuwara Eliya MC

solid waste collection system	Frequency	Remarks
Municipal solid waste: commercial and residential area in the town centre	Daily	
Municipal solid waste: residential area in outskirts	Every other day	
Separated waste(PET, plastic)	Once a week	One time every two weeks in future
Inorganic waste	Once a week	One time every two weeks in future
Economic Centre	Daily	
E-Waste	Once a month	Under consideration

Primary collection by handcart in the town centre

Transfer station for the waste collected by handcarts to tractors in the town centre.

Stationed collection systems causes waste scattering by stray animals

Waste barrel installed by CEA in the town centre

Photo: Current status of solid waste collection in the Nuwara Eliya MC

There is workshop of Nuwara Eliya MC in the town centre and all vehicles and equipment including solid waste collection vehicles are repaired and maintained at the workshop. Workshop has two mechanics, two welders, and two assistants and there is storage of road construction material, such as gravel and sand.

Gavel and sand stored at the workshop

Solid waste collection tractor under maintenance

Photo: Workshop of the Nuwara Eliya MC

b.3 Intermediate treatment

The separation of PET was introduced at some areas in the Nuwara Eliya MC since October 2015. Accordingly the recycling centre to separate, crush and bale PET and plastic was constructed nearby current final disposal site in December 2015.

Table 4-88: Intermediate treatment facility in the Nuwara Eliya MC

Intermediate treatment	Execution body	Address	Waste amount received (ton/week)	Establishment	Remarks
Material Recovery Facility	Nuwara Eliya MC	Moon plain	N.A.	2016	separation, crush and baling PET and plastic

Photo: Under construction of Material Recovery Facility (left) and Crushing machine (right)

b.4 Final disposal

The Moon plain final disposal site is located approximately 4km distance from town centre of Nuwara Eliya MC. The Moon plain disposal site was constructed during JICA feasibility study as pilot project in 2003. The disposal site receives the solid waste collected by the Nuwara Eliya MC only.

The Moon plain disposal site was constructed with utilizing geographical features and consists

of disposal area, leachate treatment facility, night soil treatment facility, infectious waste discharge pit, small scale incinerator for garden waste and material recovery facility.

The area of current disposal site is approximately two hectors and remained life time is more than 10-15 years.

Waste disposal area

Leachate treatment facility

Photo: the Moon plain final disposal site of the Nuwara Eliya MC

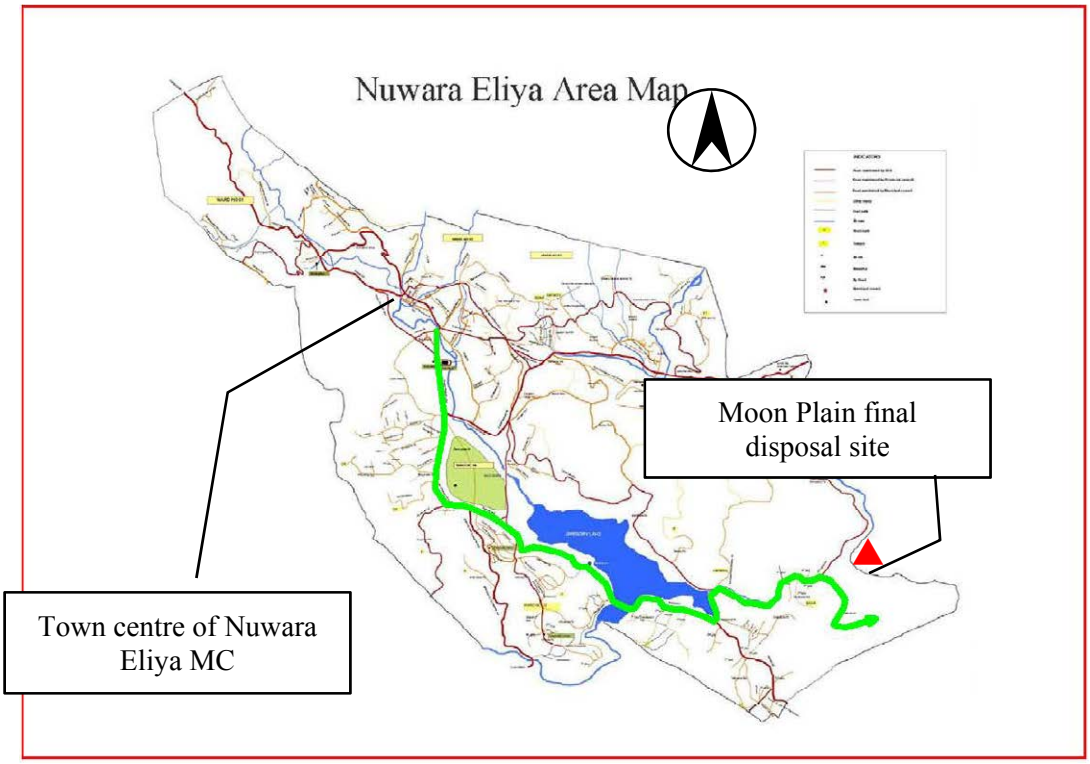


Figure 4-40: Location of Moon Plain final disposal site of the Nuwara Eliya MC

Table 4-89: Detail of Moon plain disposal site

Site name		Moon Plain landfill site
41) Address		Moon Plain, Nuwara Eliya
42) Coordination		E80°48′5.9 N6°57′32.7
43) Method of operation		Sanitary landfill
44) Disposal amount (t/day)	Year	
	2015 (10月-11月平均)	25.4
45) Expected remain of life span (years) in 2015		10 – 15 years
46) Executing organization of final disposal site		Nuwara Eliya MC
47) Tipping fee (LKR/ton)		None
48) Unit cost of operation (LKR/t) in 2015		92
49) Disposal area (ha)		Current: approximately 2 ha Future: 2 ha Total: 4 ha
50) Environmental License and Environmental Clearance		None

Source: Nuwara Eliya MC

Figure 4-41: Satellite image of Moon plain disposal site

b.5 Issue of final disposal site

Since Moon Plain was constructed at valley with utilizing geographical features, the rainwater and spring water easily gather and some of those are often flowing to the leachate treatment facility. Administer of water reservoir located downstream of effluent from leachate treatment facility complains that the effluent from Moon plain disposal site contaminated the public water quality.

b.6 Issue of Waste collection and transportation

Since the waste collection workers do not have the plan of family finances, some of them often take on leave next salary pay day. Furthermore, they often consume all salary within two weeks

after salary pay day and they work at tea plantation as part time job. Those absences of waste collection workers cause the trouble of waste collection schedule.

c. Recycling Activities

c.1 Source Separation

The source separation has been started at some area of the Nuwara Eliya since October 2015 and it is planned to disseminate to all area after completion of construction of Material Recovery Facility.

c.2 Reduction of Organic Waste

There is no compost plant managed by the Nuwara Eliya MC. The Nuwara Eliya MC intends to onsite compost and will distribute the 7,500 number of compost barrels to the residents. The Nuwara Eliya does not have the data of actual number of existing compost barrel and utilization rate of it.

c.3 Recycling of Valuables Materials

There are five recycling centre managed by the Nuwara Eliya MC and private company in the Nuwara Eliya MC boundary. The recycling centre receives plastic, metals polyethylene and those buying price is shown in the table below.

Table 4-90: the Buying Price of Valuable Material

Type of valuable material	Buying price (LKR/kg)
Plastic	10
Polyethylene	15-20
Metal	25
Paper	15

Source: Recycling centre

c.4 Issues of Recycling Activates

The buying price of valuable materials to private recycling shops is always affected by the international market price and it is not always stable.

d. Public Awareness

d.1 Current Situation of Public Awareness Activates

The current situation of public awareness is well since the residents keep the Nuwara Eliya MC clean and nice tourist town. The residents cooperate the introducing kerbside collection and separate collection system to keep discharge time and date since October 2015. Public awareness programme is often conducted by Nuwara Eliya MC with leaflet, poster, seminar and so on.

d.2 Issues of Public Awareness Activities

The public awareness activities must be promoted to disseminate the kerbside collection and separate collection system at whole area in Nuwara Eliya MC.

e. Finance

e.1 Finance condition of Municipal Council

The difference between annual revenues and expenditures of the Nuwara Eliya Municipal Council has been positive from 2012 to 2014 and its share in total annual revenues accounted for 7.7% on average as shown in the table below.

Table 4-91: Annual Revenue and Expenditure of Nuwara Eliya MC(Unit:Thousand LKR)

No	Category	2012	2013	2014	Annual Average	
					1,000 LKR	%
1	Approved Budget	337,622	315,749	355,160		
2	Actual					
	Revenue	296,259	309,773	373,915	326,649	100.0%
	Own-source revenue	192,592	198,956	273,521	221,690	67.9%
	Grant	103,667	110,817	100,394	104,959	32.1%
	Expenditure	373,098	277,921	355,212	335,410	102.7%
	Recurrent	175,897	205,027	283,072	221,332	67.8%
	Capital	197,201	72,894	72,140	114,078	34.9%
	Profit or loss	(76,839)	31,852	18,703	25,278	7.7%

Source: Nuwara Eliya MC, "Programme Budget：2013-2015"

The share of own-source revenues is roughly 67.9% while that of grants was estimated as roughly 32.1 % as shown in the table below.

Table 4-92: Breakdown of Annual Revenue of Jaffna MC (Unit: thousand LKR)

No	Types of Revenues	2012	2013	2014	Annual Average	
					1,000 LKR	%
1	Own-Source Revenues:					
	Rates & Taxes	74,371	78,265	81,957	78,198	23.9%
	Rents	32,559	37,688	87,807	52,685	16.1%
	License	11,477	15,098	16,771	14,449	4.4%
	Fees For services	12,595	13,021	16,238	13,951	4.3%
	Warrant Costs And Fines	4,260	751	732	1,914	0.6%
	Other Income	57,330	54,133	70,016	60,493	18.5%
	Total Own-Source Revenues	192,592	198,956	273,521	221,690	67.9%
2	Grants:					
	Recurrent Grant:					
	Salaries	73,760	109,796	99,370	94,309	28.9%
	Council Members Allowances	960	1,021	1,024	1,002	0.3%
	Other Recurrent Grant	564			564	0.2%
	Capital Grants	28,383			28,383	8.7%
	Total Grants	103,667	110,817	100,394	104,959	32.1%
	Total	296,259	309,773	373,915	326,649	100.0%

Source: Nuwara Eliya MC, "Programme Budget：2013-2015"

The share of capital grants in the total revenues is accounting for around 34.0%. On the other hand, the amount of total recurrent expenditures occupies 66.0% in the total expenditures of the pradeshiya sabha.

Table 4-93: Breakdown of the Annual Expenditure of Nuwara Eliya MC (Unit:Thousand LKR)

No	Types of Expenditures	2012	2013	2014	Annual Average 000 LKR	Annual Average %
1	Recurrent Expenditures:					
	Personal Emoluments	90,800	109,101	135,167	111,689	33.3%
	Travelling	642	780	2,433	1,285	0.4%
	Requisites And Equipment	43,400	45,047	83,913	57,453	17.1%
	Repairs And Maintenance Of Capital Assets	17,319	15,005	25,685	19,336	5.8%
	Transportation, Communication, Utility And Others Rervices	15,410	21,895	25,183	20,829	6.2%
	Interest	3,472	7,916	5,929	5,772	1.7%
	Grants, Subsidies And Contributions	2,289	2,692	2,396	2,459	0.7%
	Pensions, Retirements, Benefits And Gratuities	2,565	2,591	2,366	2,507	0.7%
	Other Expenditures					
	Total Recurrent Expenditures	175,897	205,027	283,072	221,332	66.0%
2	Capital Expenditure	197,201	72,894	72,140	114,078	34.0%
	Total Expenditure	373,098	277,921	355,212	335,410	100.0%

Source: Nuwara Eliya MC, "Programme Budget：2013-2015"

e.2 SWM Finance

The total revenue of Health Department mainly consists of the waste collection fee from business institute. It is approximately from 2,012,000 LKR (2014) to 2,429,000 (2012), while the exipenditre is from 23,658,000 LKR (2012) to 29,000,000LKR (2014). The table below shows the financial data of Public Health Engineering Division from 2012 to 2014.

Table 4-94: Annual Revenues and Expenses of Health Department of Nuwara Eliya MC (Unit: Thousand LKR)

No	Types of Expenses	2012*	2013	2014
A	Approved Budget	19,206	27,531	28,308
B	Revenues:	2,429	2,271	2,012
C	Actual Expenditures:			
	Personal Emoluments	14,055	17,902	22,153
	Supplies And Material Expenditures:			
	Equipment For Disposing Garbage	3	33	50
	Fuel And Lubricants	3,364	4,262	4,342
	Uniforms for Workers	122	442	1
	Boots for Workers	6	5	5
	Awareness Program			
	Other supplies	4	17	
	Total Supplies and Materials Expenses	589	875	774
	Repairs And Maintenance of Vehicles	5,128	2,374	2,040
	Final Disposal Payment			
	Other Expenses	387	496	235
	Total expenditure	23,658	26,406	29,600

Source: Nuwara Eliya MC, "Programme Budget：2013-2015"

e.3 Cost of waste collection

Collection and transportation of municipal solid waste is executed by the Nuwara Eliya MC and the cost of waste collection is 3,730 LKR/tons (2013). The breakdown is as follows:

Table 4-95: Waste collection cost in Nuwara Eliya (2015)

	Item	Cost (Thousad LKR)
1	Waste collection workers expenditure	71,808
2	Office expenses	6,258
3	Electricity	9
4	Other	-
	Total	78,075
	78,075,000LKR/collection amount 25.0 ton/day/365day=	8,556 (LKR/ton)

e.4 Operation cost of disposal site

Not available.

e.5 Issues of SWM financial system

The majority of the capital expenditures are financed from the own-source revenues of the Nuwara Eliya Municipal council or external funds. And there is no linkage between revenue from large waste collection and expenditure of SWM. Although Nuwara Eliya MC considers the balance sheet between revenue and expenditure totally, the sustainability of SMW is not considered well.

4.6.3 Waste Amount and Composition Survey

a. Waste Generation Amount

The waste generation amount was calculated based on the waste generation rate obtained by "Waste Amount and Composition Surveys (WACS) implemented in the Central and Southern Provinces of Sri Lanka, 2024.5, SATREPS" and "The Study on Improvement of Solid Waste Management in Secondary Cities in Sri Lanka, Action Plan for the Nuwara Eliya, Final Report, 2003.12, JICA" and the number of waste generation source collected at the survey in November 2015. The results reveal the municipal waste generation amount is 32.0 tons/day and the waste generation rate is 1,289g/person/day. Although the waste generation rate seems high, it includes the waste generation of floating population such as tourist.

Table 4-96: Waste Generation Amount of the Nuwara Eliya MC

Source		Generation rate		Generation sources	Generation (ton/day)
Residential	Collection	0.35	Kg/person/day	24,709	8.65
Commercial	Hotels (large)	161.00	Kg/(hotel)	18	2.90
	Hotels (middle)	24.00	Kg/(hotel)	176	4.22
	Restaurants (middle)	80.00	Kg/(restaurant)	60	4.80
	Restaurants (small)	21.60	Kg/(restaurant)	4	0.09
	Organic-shops (middle)	10.80	Kg/(shop)	71	0.77
	Organic-shops (small)	4.76	Kg/(shop)	109	0.52
	Non-organic shops (large)	9.31	Kg/(shop)	122	1.14
	Non-organic shops (small)	1.69	Kg/(shop)	567	0.96
Institutions	Schools	12.50	Kg/(school)	30	0.38
	Hospitals	170.00	Kg/(hospital)	16	2.72
	Public office	9.17	Kg/(institution)	8	0.07
	Bank/Private office	9.17	Kg/(institution)	56	0.51
	Buddhist temples	5.15	Kg/(temple)	10	0.05
	Hindu temples	37.08	Kg/(temple)	10	0.37
	Mosques	1.50	Kg/(mosque)	2	0.00
	Churches	10.00	Kg/(church)	9	0.09
Industries	Large	232.00	Kg/(industry)	8	1.86
	Domestic	116.00	Kg/(industry)	15	1.74
Total					31.84

b. Waste Composition

The waste composition obtained by ”Waste Amount and Composition Surveys (WACS) implemented in the Central and Southern Provinces of Sri Lanka, 2024.5, SATREPS” The ration organic waste such as kitchen waste and garden waste occupies approximately 80%, while the valuable materials such as paper, plastic and bottle is less than 20% of all waste generation.

Table 4-97: Waste Composition of the Nuwara Eliya MC

Category	Rate
Kitchen waste	74.6%
Paper	7.8%
Textiles	1.0%
Grass & wood	4.8%
Soft Plastics	4.2%
Hard Plastics	0.9%
Rubber & leather	0.4%
Metal	0.9%
Glass & bottles	1.7%
Stone & ceramic	0.5%
Other	3.2%
	100.0%

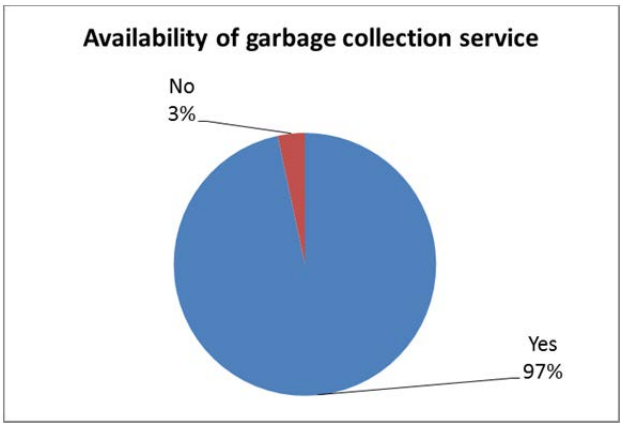
4.6.4 The results of the Public Opinion Survey

48% of the surveyed households are Sinhalese, 47 % are Tamils and 5 % Muslims. The

ethnicity could be further classified into 60% Sinhalese in high income group, 68 % of Sinhalese in middle income group and 82 % of low income families were Tamils. The data on the average number of people per household and monthly income is set out in the table below.

Table 4-98: Average and standard deviation values of income and family size

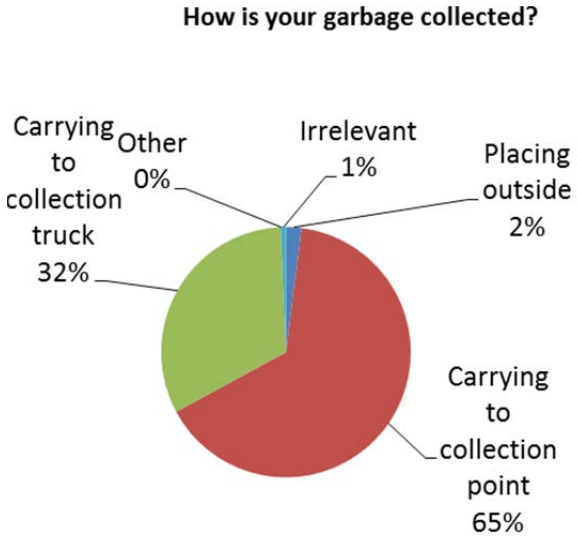
Category	Number of sample	Average of family members / employees	Income/Turnover (LKR/month)
High	47	4.3	60,383
Middle	53	5.2	27,340
Low	50	5.2	16,900
Business	37	3.4	349,083



Item	No. of Sample	%
Yes	146	97
No	4	3
Total	150	100

Figure 4-42: Availability of garbage collection service in the Nuwara Eliya MC

✓ In the Nuwara Eliya MC, 97 % of surveyed households are provided with a garbage collection service, of which 95% stated they use this service. 55 % of surveyed households are "very satisfied" with the present SWM services provision, while 27 % are "somewhat satisfied".



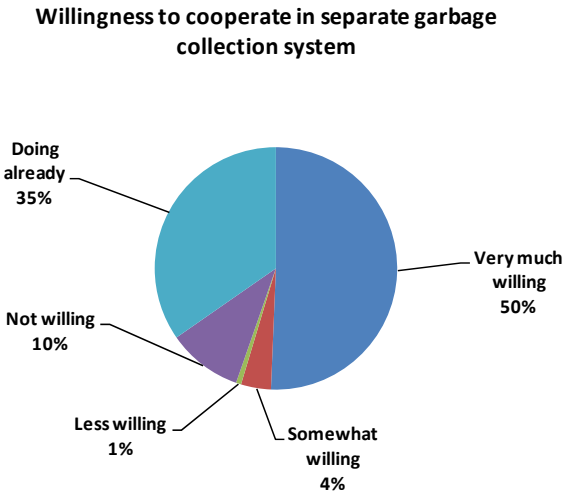
Item	No. of Sample	%
Placing outside	3	2
Carrying to collection point	98	65
carrying to collection truck	48	32
Other	0	0
Irrelevant	2	1
Total	150	100

Figure 4-43: Method of garbage discharge by residences in NEMC area

✓ Households' main methods of waste discharge are shown in upper Figure. The most

common methods are carrying garbage to collection point (65%) and carrying to garbage collection truck (32%) and discharging it outside their premises for house to house collection (2%).

- ✓ Only 40% of surveyed households receive a daily garbage collection service while 36 % stated that they received the service 2-3 times/week.
- ✓ 59% discharge their garbage as soon as it is generated and 32 % discharge their garbage daily. Only 9% of discharge their garbage 2-3 times per week.
- ✓ In general, adult females handle waste in about 53 % of surveyed households.
- ✓ As shown in lower Figure, 35 % of households separate their garbage into organic and inorganic waste at the source of generation. Only 6 % of surveyed households are not/less willing to cooperate with source separation for recycling. Rests of the household are very much willing (50 %) and somewhat willing (4 %) to cooperate in the source separated garbage collection system.
- ✓ Further, 72 % of surveyed households stated that there are recyclable collectors or someone who comes to collect their reusable or recyclable materials. Hence, an informal recycling system is well established in the Nuwara Eliya MC area.



Item	No. of Sample	%
Very much willing	75	50
Somewhat willing	6	4
Less willing	2	1
Not willing	15	10
Doing already	53	35
Total	150	100

Figure 4-44: Willingness of residences to participate in the source separated garbage collection system in the Nuwara Eliya MC

- ✓ Only 17 % of surveyed households use kitchen/garden waste for composting and 100% of them used the finished compost for their own garden.
- ✓ Not many surveyed households (53 %) have ever discussed proper garbage discharge methods at the community level, but 26% said that they discussed the garbage issue at community meetings.
- ✓ 88 % of households stated that SWM awareness programmes are very necessary while 11 % stated “somewhat necessary”. Only 1% of surveyed households stated that awareness campaigns are not necessary or not needed at all.
- ✓ 51 % of household do not like to pay for SWM services mainly because of the revenue tax they paid for NEMC. The average WTP (willingness to pay) for improved SWM services is 68 ± 125 LKR/month per household.

✓ Out of all surveyed households, 19 % stated that they sell/give away glass & bottles for recycling and 2 % of residences sell/give-away plastics for recycling. Also, 7-10 % of households sell/ give-away cans & metals for recycling. Cardboard and paper recycling were 0 % and 4 % respectively.

4.6.5 Waste flow

Current waste flow has been prepared by analysing the locally outsourced public opinion survey, statistical data collection, and census results.

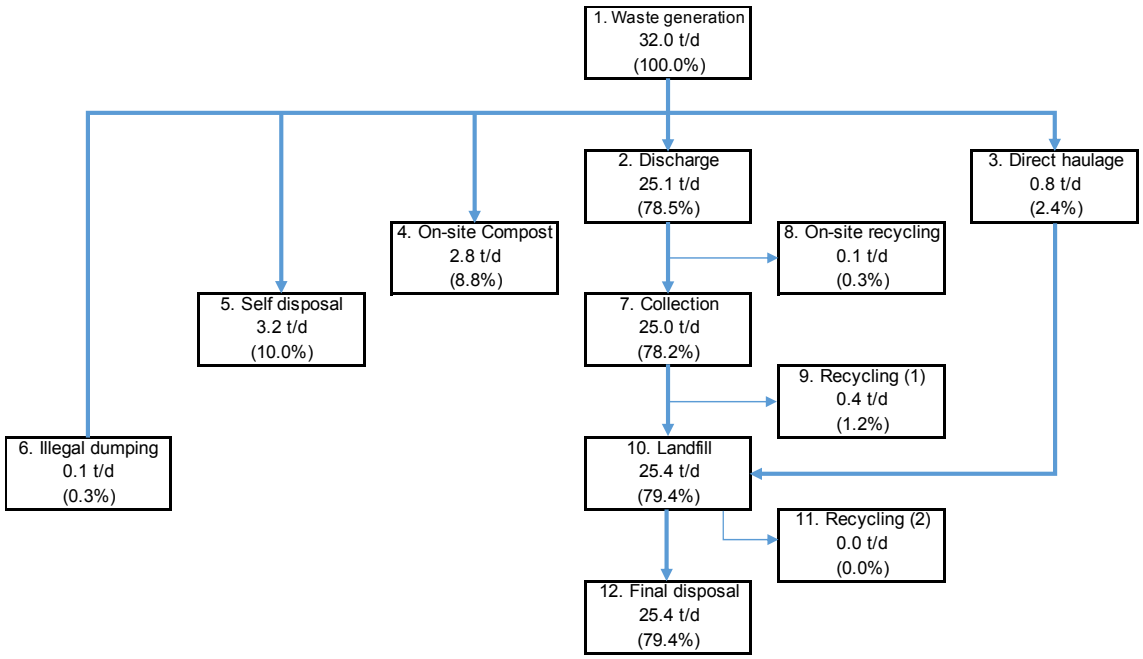


Figure 4-45: Waste flow of the Nuwara Eliya MC (2015)

According to the waste flow, the collection rate ((discharge amount + direct loading amount)/generation amount) is 80.9%. As for the recycling rate for the generation amount, onsite compost is 6.0%, illegal dumping is 0.3% and material recovery is 0.4%. The increasing rate of on-site compost and recycling are expected after the public awareness is promoted and the operation of material increasing is started fully by the Nuwara Eliya MC.

4.6.6 Current Situation of Other Waste Management

a. Current Situation of Industrial Waste Management

There is no any industrial waste except for the construction waste in the Nuwara Eliya MC. The construction waste is not collected by the Nuwara Eliya MC, hence the generator must transfer it to designated discharge place. The generation and discharge amount of construction waste are not recognized by the Nuwara Eliya MC. The designated discharge place of construction waste is located in the horse racing course, and the construction waste is utilized for the repairing and maintenance of horse racing course.

Photo: Construction Waste discharged at designated place in the horse racing course

a.1 Collection and tipping fee

There are no fees for construction waste charged by the Nuwara Eliya MC.

b. Current Situation of Medical Waste Management

b.1 Generation Amount & Disposal Amount

The syringe generated as infectious waste at the hospitals in the Nuwara Eliya MC is collected two loads per week and discharged at final disposal site by the Nuwara Eliya MC.

b.2 Collection/Transportation and Disposal

The collection and transportation of infectious waste is carried out by the Nuwara Eliya MC. The collected infectious waste is transport and discharge at the infectious waste pit near the Moon Plain disposal site. The infectious waste disposal pit has been operated since the final disposal site started the operation in 2003. The first infectious waste pit was covered by concrete after filling the infectious waste. The second infectious waste pit was constructed by the Nuwara Eliya MC and is functioning. The second infectious waste pit is expected to full soon, hence small incinerator is planned to install at each hospital for onsite treatment.

Photo: Infectious waste pit

b.3 Collection and tipping fee

There is no collection and tipping fee for infectious waste charged by the Nuwara Eliya MC

c. Current Situation of Night Soil Management

c.1 Generation Amount & Disposal Amount

The disposal amount of night soil is approximately 44 m3/day. (Night soil collection tanker of 3.5 m3: 4 roads/day, night soil collection tanker of 7.0 m3: 4 roads/day)

c.2 Collection/ Transportation and Disposal

Night soil is collected by collection vehicles operated by the Nuwara Eliya MC and the collected night soil is disposed of at the treatment facility in the Moon Plain disposal site. The collected night soil includes many condoms and sanitary napkins, and those often cause the blockage of treatment facility.

c.3 Collection and treatment fee

The collection and treatment fee of night soil charged by the Nuwara Eliya MC is shown in the table below.

Table 4-99: collection and treatment fee of night soil charged by the Nuwara Eliya MC

Capacity of night soil collection vehicle	Generator	Fee (LKR/load)	Remarks
$7.5m^3$	Household	2,825	In case of out of Nuwara Eliya MC boundary, the additional fee is charged according to the mileage
$7.5m^3$	Not household	4,520	
$3.5m^3$	household	1,412.5	

4.6.7 Needs for Solid Waste Management

a. Improvement of Technical System

a.1 Improvement and monitoring of leachate treatment facility at the final disposal site

Although the capacity of current final disposal site is quite enough for more than 10 years operation, the leachate treatment facility has some issues of function and monitoring. The proper monitoring has not been conducted for a couple of years, therefore it is difficult to recognize whether the treatment facility is functioning or not, and whether the effluent causes adverse environmental impact to down streams or not. The conducting regular monitoring, improvement of leachate treatment facility, prevention of the storm water is necessary.

4.7 Moratuwa Municipal Council in Western Province

4.7.1 Outline of the Local Authority (LA)

The Moratuwa Municipal Council (MC) is a large suburb of Colombo City, on the southwestern coast of Sri Lanka, near Dehiwala-Mount Lavinia. It is situated on the Galle–Colombo (Galle road) main highway, 18 km south of Colombo city centre. Moratuwa is surrounded on three sides by water—except in the north—by the Indian Ocean on the west, the Bolgoda lake on the south and the east. The total area is 23.4 km2.

The main industries of the MC include manufacturing of furniture, rubber products, batteries, transformers and wood handicrafts33. Although Moratuwa is considered the center of fisheries, trade and commerce, the MC is most famous for its furniture.

The society in Moratuwa consists of all ethnic and religious groups that exist in the country. Among these groups, the share of the Christian population is remarkably large in comparison with those in other local authorities of the country, second only to Negombo.

Colombo's climate is fairly temperate all throughout the year. From March to April the average maximum temperature is around 31 degrees Celsius. The only major change in Colombo's weather occurs during the monsoon seasons from May to August and October to January. This is the time of year where heavy rains can be expected. Colombo sees a relatively small diurnal temperature range, although this is more marked in the drier winter months, where minimum temperatures average 22 degrees Celsius. Rainfall in the city averages around 2,400 millimetres a year34.

The Moratuwa MC consists of 42 GN (Grama Niladhari - Village Officer) divisions. The population of the MC for the years 2010 to 2015 is as follows.

Table 4-100: Population of Moratuwa MC (2010-2015)

Year	2010	2011	2012	2013	2014	2015
Population	202,382	NA	167,255	NA	169,630	NA

Source: Divisional Secretariat, Moratuwa

4.7.2 Current Status and Problems of Solid Waste Management

a. Organization and Legal System

a.1 Legislation and Policy

The Moratuwa MC implements solid waste management and sewage treatment activities based on section 129-131 of the Municipal Council Ordinance (1947), the Public Nuisance Ordinance (1863) and the Waste Management Statute No. 01 of the Western Provincial Council (2007).

a.2 Solid Waste Management Plan

Although there is no plan formulated specifically for SWM of Moratuwa, the MC formulated a municipal 3-year action plan and a health section action plan. The 3-year action plan covered some SWM activities such as road cleansing, composting and sludge treatment.

a.3 Organization

[33] Based on results of interviews with CPHIs of Moratuwa MC (14 October, 2015).
[34] World Meteorological Organization, http://worldweather.wmo.int/en/city.html?cityId=227 (Accessed on 16 November, 2015)

In the Moratuwa MC, the Public Health Department is responsible for SWM activities. The department is headed by the Chief Public Health Inspector (CPHI). Public health inspectors (PHI) and supervisors (SV) assigned under the CPHI supervise waste collection services and road cleansing activities by zones. The responsibility of the Public Health Department is the following:

- Waste collection and transportation;
- Public health activities and measures (dengue fever prevention);
- Road sweeping;
- Public awareness on waste separation; and
- Removal of animal corpses

The Moratuwa MC does not have a TO (Technical Officer) or MOH (Medical Officer of Health). However, the mechanical engineer is responsible for inspection and maintenance of tractors and trailers.

The figure below shows the organizational structure and the staff of the Moratuwa MC.

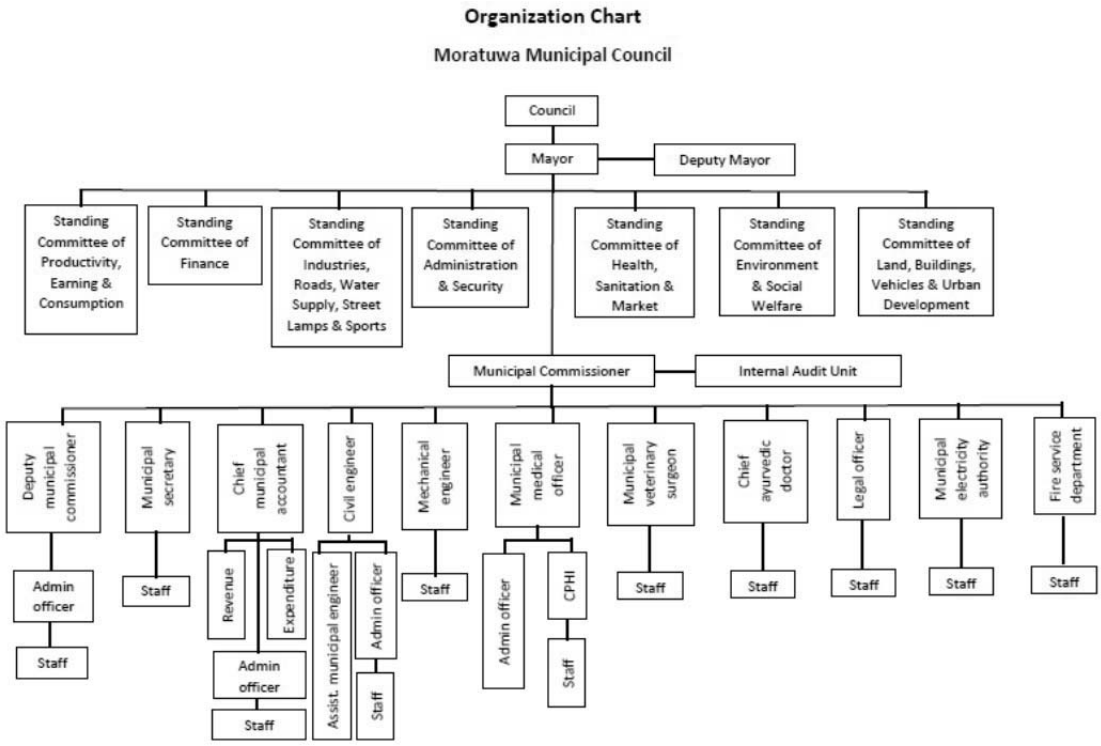


Figure 4-46: Organizational chart of Moratuwa MC

Table 4-101: Staff related to SWM in Moratuwa MC

Posts	Types	Number	Note
Engineer		2	
TO(Technical Officer)		0	
MOH(Medical officer of health)		0	
PHI(Public health inspector)		8	
SV(Supervisor)	Permanent	13	
	Acting	20	
Collection workers	Permanent	358	
	Temporary	118	
Driver	Permanent	10	
	Acting	16	
Total			

a.4 Issues of Organization and Legal System

The MC has not formulated any master plan or action plan for SWM specifically. However, daily activities by HPIs and SVs are well-interrelated under the supervision by the CPHI who is rich in SWM experience; and therefore, the MC can be assumed to not have any difficulties in staff allocation for implementing SWM activities.

b. Technical System

b.1 Storage and Discharge

The Moratuwa MC has been implementing a separate collection system for organic and inorganic waste since January, 2015. Under this system, buckets were distributed to tax payers— residents who actually paid their taxes—in order for them to use the buckets when storing and discharging separated waste. As collection workers do not collect waste that was not discharged in the designated buckets, the degree of residents' cooperation has been relatively high.

Figure 4-47：Example of method of waste separation and storage at a household

b.2 Collection and Transportation

The Moratuwa MC implements waste collection and transportation services directly to households. 26 drivers and 376 workers implement the services under the supervision of PHIs and SVs.

b.2.1 Collection Method

The municipal territory is divided into five collection zones. Waste in the zones is collected through door-to-door and bell collection methods by four compactor trucks and four tractors which are dispatched daily.

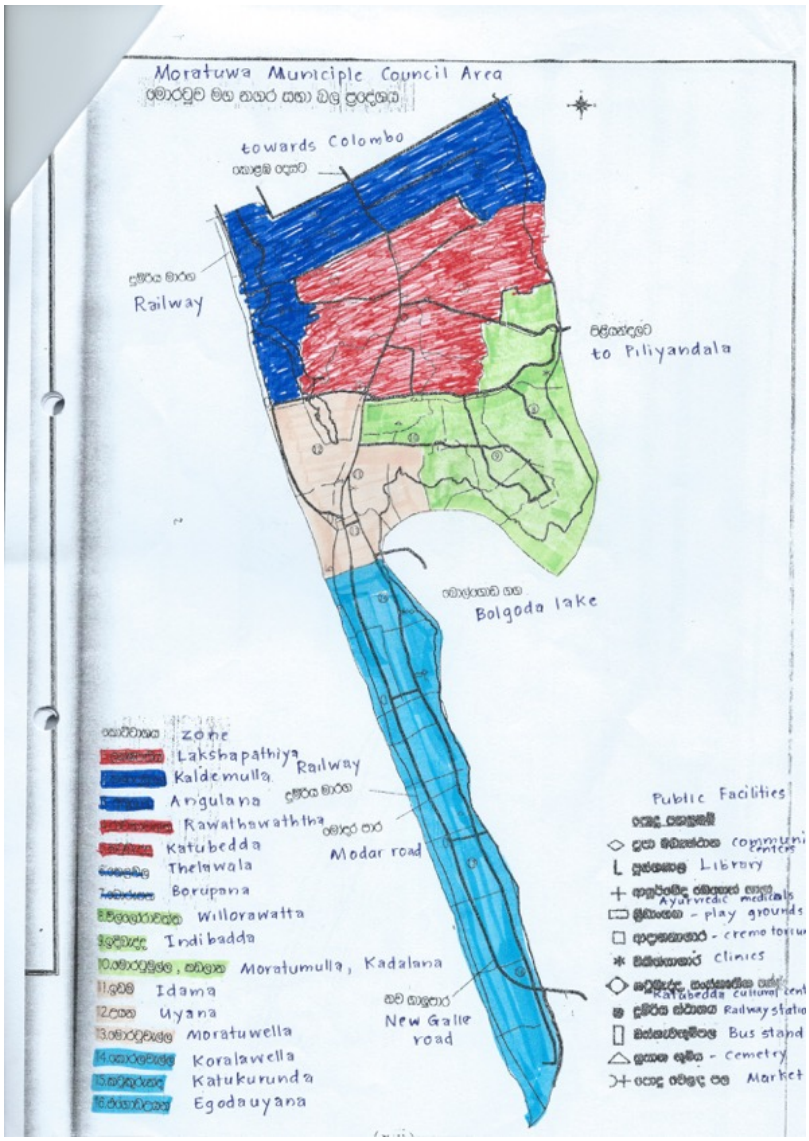


Figure 4-48: Waste collection zones in Moratuwa MC

The coverage of waste collection services in the MC is 99.9% by area basis. The collection methods and frequencies are as follows.

Table 4-102: Waste collection methods and frequencies in Moratuwa MC

Waste type	Collection method	Collection frequency	Note
Organic	Door-to-door	Daily	
Inorganic	Door-to-door	Once or twice a week	Inorganic waste is collected on weekends

b.2.2 Collection Amount

Waste collected in the Moratuwa MC is transported to the Karadiyana DS. According to the information provided by the disposal site, the amount of collected waste is 72 ton/day.

b.2.3 Collection Fee

The Moratuwa MC does not collect any waste collection fees from households. On the other hand, they collect fees from large waste generators and those who discharge construction waste. The waste fee is set for each trip (1,690 LKR per tractor load)

b.2.4 Collection Vehicles

The MC has sufficient collection vehicles to provide collection services to the entire MC. Also, hand carts are used for primary collection to provide collection services in inaccessible areas. The following table shows the number of collection vehicles.

Table 4-103: Collection vehicles of Moratuwa MC

Type	Number of vehicles	Number not in operation (average)	Remarks
Compactor truck (12-14m3)	8	4	Av. 80% of vehicles is sitting in the garage and need to be repaired.
Tractor with trailer	16	4	
Dump Truck (3m3)	4		
Tipper	4		
Hand cart	17		
Wheel Loader	2		

However, most of the collection vehicles have become obsolete and 80% of the fleet is kept in the garage waiting for maintenance. The following table shows the manufactured year of each collection vehicle.

Table 4-104: Manufactured year of the collection vehicles

Type of vehicle	Vehicle No	Model	Year of manufacture	Running condition
Compactor	48-6314	NISSAN FE6	1997.01.01	Running
Compactor	226-2024	ISUZU FRR33G	1999.01.21	Running
Compactor	226-2027	ISUZU FRR33G	1999.01.21	Running
Compactor	226-2031	ISUZU FRR33G	1999.01.21	Running
Compactor	226-0993	ISUZU FRR33G	1999.01.21	Not Running
Compactor	226-2025	ISUZU FRR33G	1999.01.21	Not Running
Compactor	226-2028	ISUZU FRR33G	1999.01.21	Not Running
Compactor	226-2030	ISUZU FRR33G	1999.01.21	Not Running
Tipper (Dump truck)	226-2050	ISUZU NPR66G	1999.01.21	Running

Type of vehicle	Vehicle No	Model	Year of manufacture	Running condition
Tipper (Dump truck)	226-2051	ISUZU NPR66G	1999.01.21	Running
Tipper (Dump truck)	226-2052	ISUZU NPR66G	1999.01.21	Running
Tipper (Dump truck)	226-2067	ISUZU NPR66G	1999.01.21	Running
Dump truck	LG-1751	MITSUBISHI FM617FDHR	2009.01.29	Running
Dump truck	LG-1752	MITSUBISHI FM617FDHR	2009.01.29	Running
Dump truck	LG-1754	MITSUBISHI FM617FDHR	2009.01.29	Running
Dump truck	LG-1755	MITSUBISHI FM617FDHR	2009.01.29	Running
Skip Hoist	226-2062	ISUZU FRR33F	1999.01.21	Running
Skip Hoist	226-2063	ISUZU FRR33F	1999.01.21	Running
Tractor	37-5795	M/F240	1986.03.22	Running
Tractor	RA-5835	TAFE35DI	2007.01.11	Under repair
Tractor	RA-5836	TAFE35DI	2007.01.11	Running
Tractor	RA-5838	TAFE35DI	2007.01.11	Under repair
Tractor	RA-5839	TAFE35DI	2007.01.11	Under repair
Tractor	RA-5840	TAFE35DI	2007.01.11	Under repair
Tractor	RA-9792	MAHINDRA 575DI	2008.05.02	Running
Tractor	RA-9793	MAHINDRA 575DI	2008.05.02	Running
Tractor	RA-9794	MAHINDRA 575DI	2008.05.02	Running
Tractor	RA-9795	MAHINDRA 575DI	2008.05.02	Running
Tractor	RA-9796	MAHINDRA 575DI	2008.05.02	Running
Tractor	RA-9797	MAHINDRA 575DI	2008.05.02	Running
Tractor	RA-9800	MAHINDRA 575DI	2008.05.02	Running
Tractor	RA-9801	MAHINDRA 575DI	2008.05.02	Running
Tractor	RA-9805	MAHINDRA 575DI	2008.05.02	Running
Tractor	RA-9814	MAHINDRA 575DI	2008.05.02	Running

b.2.5 Methods of Vehicle Maintenance

The Moratuwa MC has its own workshop in their compound where most of the maintenance and repair works for the municipal vehicles are done.

b.3 Intermediate Treatment

In 2013, the Waste Management Authority (WMA) assisted construction of a compost facility at a market of the MC. The compost facility receives organic waste being generated at the market and produces compost. The current daily processing volume is 1 ton of organic waste. The facility sells each kg of the produced compost for 12.51 LKR.

The MC assigned three workers for the facility and has been operating the facility in sufficient sanitary conditions. An observation found that waste around the facility had not scattered, no bad odour had been generated and almost no complaints had been raised by the surrounding residents.

The detailed information about the facility is the following.

Table 4-105: An intermediate treatment facility operated by Moratuwa MC

Facility type	Execution body	Location	Capacity (ton/day)	Constructed year	Remarks
Compost facility	MC (funded by WMA)	Behind MC market	1	2013	No waste scattering and bad odour

b.4 Karadiyana Final Disposal Site

The Colombo District of the Western Province consists of 13 local authorities. There are three final disposals sites – the Karadiyana disposal site (Karadiyana DS), the Meethotamulla disposal site (Meethotamulla DS) and the Kaduwela disposal site (Kaduwela DS) – in the district's territory.

Among the disposal sites, the Karadiyana DS is located in the very south of the district and receives waste from seven local authorities, the National Defence University, the Provincial Road Development Authority and other MSW transported directly from generation sources. The disposal site is operated by the WMA of the Western Province.

b.4.1 Overview of the Disposal Site

(1) Location of the Disposal Site

The Karadiyana DS is located in the territory of the Kesbewa UC near its borders with the Moratuwa MC, the Dehiwala Mt. Lavinia MC and the Boralesgamuwa UC.

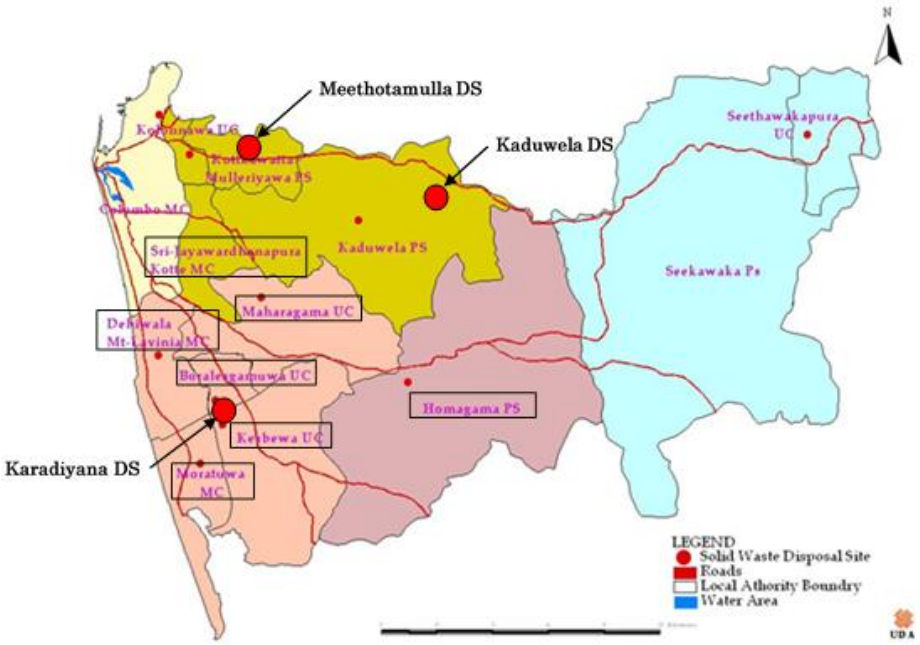


Figure 4-49: Location map of the Karadiyana DS

(2) Facilities, Equipment and Operation of the Disposal Site

The landfill area at the disposal site consists of three lots (an old and closed lot, a lot currently being used and a lot to be used in the future). The total area of the site is 37 acres (around 15 Ha).

As for the disposal site facilities, a control house and weighbridge were installed at the entrance and a compost facility is located to the north of the road that accesses the landfill area. 35 staffs of the WMA work for the disposal site. The facilities are presented in the table below.

Table 4-106: Facilities of Karadiyana DS

Facilities	Intended purpose
1. Office	Container offices (3 pcs)
2. Truck scale	For measuring received waste
3. Landfill lots	For disposal of received waste
4. Compost plant	For composting organic waste transported through separate collections
5. Sorting facility (MRF)	Under construction

In addition to the above, the site possesses the following equipment.

Table 4-107: Equipment of Karadiyana DS

Type	number	Note
Bulldozer	1	Own equipment for landfill work
Backhoe loader	1	Own equipment for landfill work
Dump truck	1	Own equipment for landfill work
Pickup truck	1	Own equipment for supervision
Van	1	Own equipment for workers commuting
Excavator (Leased)	2	Leased equipment for landfill work
Bulldozer (L)	2	Leased equipment for landfill work

Figure 4-50: Plan map of Karadiyana DS

b.4.2 Intermediate Treatment

(1) Compost Plant

As mentioned above, a compost plant with a daily processing capacity of 30 tons of organic waste is located on the premises of the Karadiyana DS. Although the facility was receiving organic waste transported from the Moratuwa MC—where separate collection had been introduced in January 2015—the trommel sieve of the facility later broke down and the WMA was forced to stop its operation. At the same time, it was decided to improve the facility; and thus, organic waste received for composting has currently been kept at the side of the facility.

Of the total organic waste coming into the compost plant, around 60% (the water content) evaporates during composting process, around 10 to 20% becomes (saleable) compost product, and the rest becomes residue and is transported to the disposal site. Although the WMA was selling the compost produced at the plant as Mihisaru brand compost, a considerable amount of stock is being kept at the plant at the moment.

Photo: Compost Plant at Karadiyana DS

(2) Recyclable collection by waste pickers

There are 20 organized waste pickers at the Karadiyana DS. The waste pickers collect the types of recyclables listed below from the waste received at the disposal site. 15% of total revenues of recyclables are spent by the WMA for purchasing helmets and gloves for the waste pickers.

Table 4-108: The amount of valuable recovery by waste picker

Types of recyclables	Amount to be collected (ton/week)
Plastic	1
PET	4
Polythene	1
Can	2
Others	2
Total	10

*Based on interview results with Karadiyana DS (25 August, 2015)

(3) Plan for the Karadiyana Waste Management Plaza

There is a plan to construct new facilities at the west side of the entrance of the disposal site to form the Waste Management Plaza. According to the plan, the facilities listed below will be the parts that make up the Waste Management Plaza (the existing compost plant and the material recovery facility that are under construction were included).

Table4-109: Plan for Karadiyana Waste Management Plaza

Project	Capacity	Remarks
Mass scale Compost Project	30 t/Day	
Recycling Project (MRF)	10 t/Day	
Waste to Energy Project (Thermochemical Transformation)	750 t/Day	(Fresh waste 500 + dumped waste 250)
Mass Scale Bio Methnization Plant (Biochemical Transformation)	95 t/Day	

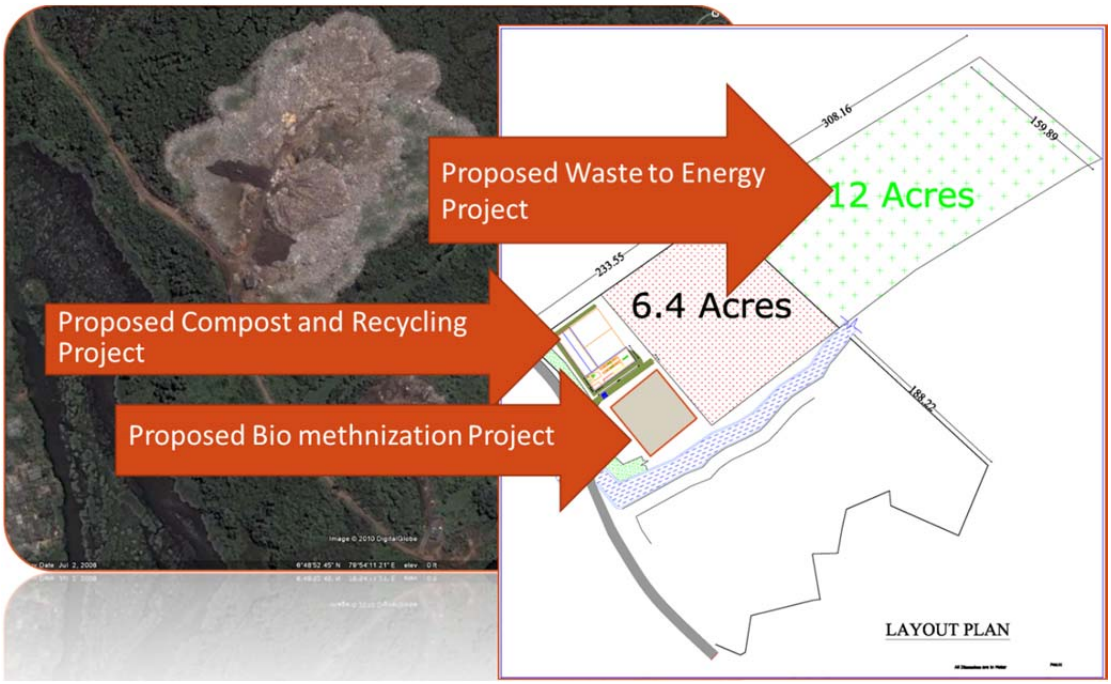


Figure 4-51: Plan of Karadiyana Waste Management Plaza

According to the WMA, these facilities will be constructed utilizing a Public-Private Partnership (PPP). If the plan is implemented, all waste to be received at the Karadiyana DS (600 to 650 ton/day) along with 250 tons of already landfilled waste will be treated daily at these facilities.

b.4.3 Final Disposal

(1) Disposal Amount

As mentioned above, seven local authorities located around the Karadiyana DS transport their waste to the site. The disposal amount of each local authority, compiled from the data provided by the WMA (from October, 2013 to August, 2015), is presented in the table below.

The disposal amounts of the Moratuwa MC for the years 2013 and 2014 occupy 1/4 of the total disposal amounts of the listed years. However, the total disposal amount of the MC decreased by roughly 15% since January 2015 due to the introduction of separate collection for organic and inorganic waste. The reason for the decrease was the delivery of the organic waste to the compost facility of the Karadiyana DS which was not registered as waste for landfilling.

Table 4-110: Amount of waste received at Karadiyana DS for final disposal

No	Benefited Institute	2013		2014			2015 (Jan - Aug)		
		Daily (ton/day)	Rate	Total (ton/year)	Daily (ton/day)	Rate	Total (ton/year)	Daily (ton/day)	Rate
1	Moratuwa M.C.	124.5	25.2%	43,738	119.8	23.1%	17,597	72.4	14.7%
2	Boralesgamuwa U.C.	27.3	5.5%	10,209	28.0	5.4%	7,183	29.6	6.0%
3	Kesbewa U.C.	48.9	9.9%	19,446	53.3	10.3%	13,480	55.5	11.2%
4	Dehiwala - Mount Lavinia M.C.	157.1	31.8%	60,332	165.3	31.9%	39,073	160.8	32.6%
5	Sri Jayewardenapura Kotte M.C.	37.3	7.5%	13,427	36.8	7.1%	9,285	38.2	7.7%
6	Maharagama U.C.	69.1	14.0%	27,244	74.6	14.4%	18,963	78.0	15.8%
7	Homagama P.S.	22.6	4.6%	11,102	30.4	5.9%	7,019	28.9	5.8%
8	Government Institution *1	0.9	0.2%	547	1.5	0.3%	1,843	7.6	1.5%
9	Government Institution *2	0.7	0.1%	2	0.0	0.0%	120	0.5	0.1%
10	Other	6.1	1.2%	3,207	8.8	1.7%	5,456	22.5	4.5%
	Total	494.3	100.0%	189,254	518.5	100.0%	120,018	493.9	100.0%

*1: General Sir John Kotelawala Defence University, *2: Provincial Road Development Authority
Data source: Waste Management Authority of the Western Province

The Study Team analysed the weighbridge data recorded from January 2015. As a result, it became known that the amount of total waste received at the Karadiyana DS (including organic waste and waste transported from generation sources directly to the site) was approximately 600 ton/day and the amount of waste transported from the target local authorities of this study occupied 64.7% of the total waste.

Table 4-111: Amount of waste received at the Karadiyana DS from January to August, 2015

Local authorities	Jan to Aug, 2015	Daily amount		Share in the total received waste
	(ton)	(ton/day)	Share	
Moratuwa M.C	25,681.68	105.69	100.0%	18.7%
MSW	14,752.85	60.71	57.4%	
Sorted organic waste	8,301.88	34.16	32.3%	
Other waste	2,626.95	10.81	10.2%	
Kesbewa U.C	15,025.59	61.83	100.0%	11.0%
MSW	14,595.14	60.06	97.1%	
Sorted organic waste	17.19	0.07	0.1%	
Other waste	413.26	1.70	2.8%	
Dehiwala-Mt Lavinia M.C	48,018.04	197.61	100.0%	35.0%
MSW	43,014.26	177.01	89.6%	
Sorted organic waste	17.54	0.07	0.0%	
Other waste	4,986.24	20.52	10.4%	
Total	137,013.56	563.84	100.0%	100%
MSW	118,310.68	486.88	86.3%	
Sorted organic waste	8,603.18	35.40	6.3%	
Other waste	10,099.7	41.56	7.4%	

Data source: Weighbridge data provided by WMA

(2) Landfill Operation

The disposal activity at the Karadiyana DS is considered as controlled dumping since the site

identifies received waste and regulates landfill by types of waste. The site is located in a swale area and the waste has been piled up on a peat layer. The waste is being covered by soil and no leachate collection and treatment facilities are installed. As the access road to the waste discharge area is not well-maintained, collection vehicles often get stuck in mud and suffer damage when it rains, according to local authorities.

According to the WMA, the Karadiyana DS is considered to be the only site in Sri Lanka where O & M is being implemented properly. According to their reports, the value of BOD calculated from the surrounding water is usually in the three digit range; and thus, the quality of the surrounding water is good. However, it is considered that the low value for BOD has been a result of dilution caused by rain water. There is also a possibility of groundwater pollution.

b.5 Issues of Technical System

The issues identified in the technical system of the Karadiyana DS can be summarized as follows:

(1) Insufficiency of basic infrastructures

The basic infrastructures of disposal sites (enclosing dam, access road, etc.) in the Karadiyana DS have not been sufficient. In order to control impacts on environments in surrounding areas, a disposal site must be isolated from the surrounding areas. As for the Karadiyana DS, access from the west side of the site is blocked by a water body. However, the site can be accessed easily from its east side since no water exists on its east side.

As the road in the disposal site is in bad condition, collection vehicles cannot reach to the landfill when it rains. It was also reported that collection vehicles are often damaged due to bad road conditions.

The Karadiyana DS is located in the southern part of the Colombo Metropolitan territory and the surrounding areas are being developed. Therefore, the disposal site has been required to implement stricter environmental considerations. It is advisable that the WMA create a model of an advanced final disposal management system in Sri Lanka based on the Karadiyana DS.

(2) Insufficiency of financial resources for implementation of proper landfill operation

The operation expenses of the Karadiyana DS are financed from the revenues collected as tipping fees. The tipping fee set by the WMA for MSW of the local authorities is 500 LKR/ton (around 3.5 USD, tax included). In order to promote waste reduction, the WMA decreased the fee to 250 LKR/ton (tax included) for separated organic waste.

However, the above fee is not sufficient for financing proper operation of the disposal site. At the same time, the disposal site fees must finance the operational expenses of the compost plant; and therefore, ensuring sufficient financial resources is essential for implementing a proper sanitary landfill.

(3) Sustainability of the intermediate treatment facilities

The WMA has been promoting separation collections of organic waste in local authorities to reduce the landfill amount through composting. To create an incentive for the local authorities, the WMA decreased the tipping fee by 50% for separated organic waste. However, operational costs of composting will be more than those of landfilling; and thus, the WMA is required to ensure sufficient financial resources in order to maintain the operation of the compost plant.

Moreover, the WMA has been expanding the capacity of the compost plant based on the expectation that the amount of separated organic waste would increase. However, distribution channels for compost to be produced at the plant have not been established and it has been an issue for sustainability of the compost plant.

c. Recycling Activities

c.1 Source Separation

The Moratuwa MC introduced source separation in all its areas in January, 2015 and has been implementing separate collection services. In relation to the introduction of source separation in Moratuwa, the WMA and the MC committed budgets of 2.25 million LKR and 7.55 million LKR respectively and purchased 45,000 buckets (with a capacity of 20 liters each) for storing organic waste. The buckets were distributed only to residents who actually paid their taxes. The MC decided not to collect waste if the waste is not discharged in these buckets. Therefore, the number of residents who is coming to the MC to pay their taxes is contributing to the increase of the tax collection rate.

c.2 Reduction of Organic Waste

The Moratuwa MC does not support dissemination of home composters. Moreover, the incentive to do home composting is considered to be low because the coverage area of waste collection services is high and it is a large commercial area.

c.3 Recycling Valuable Materials

According to interview surveys, five middleman shops that trade recyclables exist in the territory of Moratuwa on the way to the Karadiyana DS. The Study Team conducted an interview with one of these shops. As the interview reveals, most of the recyclables that the shop purchases are brought in by collection workers from the Moratuwa MC. The collection workers pick the recyclables while collecting waste. The results of the interview are summarized in the table below.

Table 4-112: Information of recyclable trading by the middleman shop

Types of recyclables	Amount (ton/day)	Purchasing price (LKR/kg)	Selling price (LKR/kg)	Destination	Remarks
Plastic	0.2	25	40	Recycler	
PET	0.06	10	15	Plastic Recycler(Piliandara)	
Polythene	0.02	10	15	Recycler@Moratuwa	
Metal 1	0.15	20	30	Middleman	Metals other than “Metal2”
Metal 2	0.2	10	15	Middleman	Cans
Glass	-	-	-		
Cardboard	0.35	10	16	Middleman	
Newspaper	-	-	-		
Paper	0.2	5	8	Middleman	Mainly used book
Coconut Shell	0.25	5	8	Middleman	

＊Based on the interview with Middleman Shop owner (2 November, 2015)

Photo: A middlemen shop near the Karadiyana DS

As mentioned above, collection workers earn additional income by collecting and selling recyclables. Since the tipping fee for separated organic waste is 50% cheaper than that for unseparated waste (but free of charge from November 2015), the MC started paying 100 LKR/day to each worker as an incentive for implementing separate collection from the cost saved after introduction of the separate collection (350,000LKR was already paid as an incentive at the time of the survey).

c.4 Issues of Recycling Activities

The Moratuwa MC is the only local authority in Sri Lanka that introduced separate collection services in all its areas. The manner and quality of waste separation at generation sources have been improving gradually. The distribution of buckets to residents for separating organic waste contributed to the establishment of a system that supports the residents in cooperating on implementation of source separation and separate collection services.

d. Public Awareness

d.1 Current Situation of Public Awareness Activities

In the Moratuwa MC, public awareness activities are being implemented to promote implementation of separate collection services in all its areas. The summary of these activities are presented in the following table.

Table 4-113: Outline of Public Awareness Activities in Moratuwa MC

Public Awareness Activities	
Execution body	The MC with support from the MSWMSC and the WMA
Title	Promotion of source separation
Source of Budget	MC
Approved Budget	
Implementation Methods	Explanation of source separation and monitoring of bucket utilization by visiting households during preventive activities for dengue fever to be implemented by the Dengue Control Unit (15 workers X 50 households/day). Distribution of leaflets Public announcements

In addition to above, the PHIs organize environmental education at schools such as organizing “School Health Activity” and awareness of waste separation in cooperation with the School Health Club.

d.2 Participation Level and Manners of Citizens

It can be considered that the degree of residents' awareness toward waste separation is relatively high in Moratuwa when compared to other local authorities since the MC introduced the separate collection services earlier. Complaints about residents' waste discharging manners are quite few in numbers.

d.3 Issues of Public Awareness Activities

The Moratuwa MC has already been implementing various awareness activities. However, it is necessary to strengthen public awareness activities to increase residents' cooperation on source separation and quality of the waste separation.

e. Finance

e.1 Financial Condition of the Municipal Council

The financial data of the Moratuwa MC for the past three years are presented in the table below. According to the table, the financial results of the municipal council have been positive for the years concerned and the difference between the total revenues and expenditures accounted for 11% of the annual revenues on average.

Table 4-114: Annual Revenues and Expenditures (Unit: Thousand LKR)

No	Category	2012	2013	2014	Annual Average 000 LKR	Annual Average %
1	Approved Budget	580,411	581,209	737,328	632,983	
2	Actual					
	Revenue	481,882	531,127	712,151	575,053	100.0%
	Own-source revenue	208,136	250,673	296,845	251,885	43.8%
	Grant	273,747	280,454	415,306	323,169	56.2%
	Expenditure	468,790	479,712	465,243	471,248	81.9%
	Recurrent	404,412	433,382	461,245	433,013	75.3%
	Capital	64,378	46,331	3,997	38,235	6.6%
	Profit or loss	13,093	51,414	246,908	103,805	18.1%

Source: Moratuwa MC, "Programme Budget: 2014 to 2016"

As the table below shows, the total amount of grants received from the central government and the provincial council for the last three years occupied more than 50% of the total annual revenues (56% on average) and the percentage of revenue that it obtains independently (hereinafter, own-source revenue) is relatively small. However, the majority of the grants were block grants received from the central government for financing salaries and allowances of municipal staffs (39% of the total municipal revenues on average); and therefore, the MC can be considered as a municipality that does not depend on government grants.

Although the capital grants increased to 170 million LKR in 2014, the amount in the previous two years was around one-third of the total grants.

Among the own-source revenues, the property tax and other revenues were the major types since they occupy 15% and 19% of the total municipal revenues respectively.

Table 4-115: Breakdowns of the Municipal Annual Revenues (Unit: thousand LKR)

No	Types of Revenues	2012	2013	2014	Annual Average 000 LKR	Annual Average %
1	Own-Source Revenues:					
	Rates & Taxes	94,492	84,716	82,163	87,124	15.2%
	Rents	12,126	13,064	11,016	12,069	2.1%
	License	17,699	13,810	12,832	14,780	2.6%
	Fees For Services	10,491	22,689	19,609	17,596	3.1%
	Warrant Costs And Fines	13,483	9,938	5,211	9,544	1.7%
	Other Income	59,844	106,456	166,014	110,772	19.3%
	Total Own-Source Revenues	208,136	250,673	296,845	251,885	43.8%
2	Grants:					
	Recurrent Grant:	208,520	224,785	240,983	224,763	39.1%
	Salaries	204,425	221,927	238,201	221,518	38.5%
	Council Members Allowances	2,354	2,415	2,470	2,413	0.4%
	Other Recurrent Grant	1,741	443	312	832	0.1%
	Capital Grants	65,227	55,668	174,322	98,406	17.1%
	Total Grants	273,747	280,454	415,306	323,169	56.2%
	Total	481,882	531,127	712,151	575,053	100.0%

Source: Moratuwa MC, "Programme Budget: 2014 to 2016"

The table below shows the dynamics of the annual expenditures of the Moratuwa MC. According to the table, the recurrent and capital expenditures account for 92% and 7% of the annual municipal expenditures on average.

Table 4-116: Breakdowns of the Municipal Annual Expenditures (Unit: Thousand LKR)

No	Types of Expenditures	2012	2013	2014	Annual Averages 000 LKR	Annual Averages %
1	Recurrent Expenditures:					
	Personnel Emoluments	279,015	284,331	322,940	295,429	62.7%
	Travelling	9,114	4,896	4,312	6,107	1.3%
	Requisites and Equipment	59,970	61,517	72,018	64,501	13.7%
	Repairs and Maintenance of Capital Assets	18,979	30,333	25,669	24,994	5.3%
	Transportation, Communication, Utility and Other services	30,692	27,599	27,951	28,747	6.1%
	Interest	2,754	20,311	3,962	9,009	1.9%
	Grants, Subsidies and Contributions	732	1,220	1,049	1,000	0.2%
	Pensions, retirements, benefits and gratuities	3,156	3,175	3,345	3,225	0.7%
	Other expenditures					0.0%
	Total Recurrent Expenditures	404,412	433,382	461,245	433,013	91.9%
2	Capital Expenditure	64,378	46,331	3,997	38,235	8.1%
	Total Expenditure	468,790	479,712	465,243	471,248	100.0%

Source: Moratuwa MC, "Programme Budget: 2014 to 2016"

Although the total capital expenditures equalled to 98% of the annual total grants received from the central government and the provincial council in 2012, the amount decreased to 83% in 2013 and 2.3% in 2014. This implies that the capital grants received in 2014 were not expended within the year; and therefore, it can be assumed that the difference between the total revenues and expenditures for the year (250 million LKR) included the amount of grants that had not been expended at the end of the year.

e.2 SWM Finance

As the table below shows, SWM expenditures in the Moratuwa MC exceeded the budgeted annual expenses and occupied 27 to 33% of the total municipal expenditures.

Table 4-117: The Annual Budgets and Actual Expenditures of SWM (Unit: Thousand LKR)

No	Types of Expenses	2012	2013	2014
A	Approved Budget	116,890	115,269	144,741
B	Actual SWM Revenues (Collected Waste Fees)	2,310	13,054	8,511
C	Actual SWM Expenditures:			
1	Personal Emoluments	91,082	92,920	108,423
2	Supplies And Material Expenditures:			
	Equipment For Disposing Garbage			
	Fuel And Lubricants	19,043	21,925	23,574
	Uniforms for Workers			
	Boots for Workers			
	Awareness Program			
	Other supplies	1,433	1,022	2,239
	Total Supplies and Materials Expenses	20,476	22,947	25,813
3	Repairs And Maintenance of Vehicles	10,144	1,875	603
4	Final Disposal Payment	19,243	9,327	15,713
5	Other Expenses	1,671	1,291	955
	Total SWM Expenditures	142,616	128,360	151,508
	Total Collection Costs	123,373	119,033	135,795
	Disposal Costs	19,243	9,327	15,713
	Collected waste (ton/year)	-	45,442.5	43,738.0
	SWM costs per ton (LKR/ton)	-	2,824.7	3,464.0
	Collection costs per ton (LKR/ton)	-	2,824.7	3,104.7
	Disposal costs per ton (LKR/ton)	-	205.2	359.3
	Share of Collected Fees in the Total Expenditure	1.6%	10.2%	5.6%

Source: Moratuwa MC, "Programme Budget: 2014 to 2016"

The amount of collected waste fees for all three years was low, with 2013 being the highest – equalling 10% of the SWM annual expenses for the year. – While the other two years amounted to less than 6% of the SWM annual expenses. As the amount of collected fees is usually small, the waste collection expenses are being paid from other revenues of the municipality.

The main reason for the low fee collection rates is that the municipality collects waste fees only from large-scale businesses despite implementing waste collection services to all generation sources. At the same time, the large-scale businesses are those that generate a daily amount of waste that is equal to half of a tractor trailer bed. In addition, the designation of what constitutes a "large-scale business" is usually decided based on the personal judgement of individual public health inspectors. Therefore, the number of businesses that are paying waste fees are very few (525 businesses were registered as payers as of the end of October 2015).

The list of waste fees that the municipality has been collecting from large-scale businesses is shown in the table below.

Table 4-118: List of Waste Fees (Tax* Included), Unit: LKR/load**

No	Types of Waste	With Tax
1	Municipal Solid Waste	1,368.00
2	Construction and Garden Waste	1,710.00
3	Slaughtering Waste	2,280.00
4	Industrial Waste	2,850.00
5	Industrial Chemical Waste	3,534.00
6	Soil and Dirt	3,534.00

*-Tax rates: Nation building tax-2%, VAT-12%; **-Load: a load of a tractor

e.3 Problems Identified in the SWM Financial System

The major problem identified in the SWM Financial System of the Moratuwa MC is the irrelevance between the waste collection expenses and the revenues from the waste fee. Like

other local authorities, the municipality focuses on the total amounts of expenditures and the own-source revenues only and does not consider the sustainability of individual public services such as waste collection. Therefore, efforts to increase the waste fee revenue are not sufficient.

Although large-scale businesses were defined as those that generate a daily amount of waste that is equal to half a tractor trailer, it is difficult to identify the actual amount of waste being discharged by the businesses. At the same time, waste collection fees are set for a tractor trailer load. Since the amount of waste fees that a business has to pay is difficult to identify, the municipality has to negotiate payments with businesses before collecting waste fees.

4.7.3 Waste Amount and Composition Survey

a. Waste Generation Amount

The waste generation amount was calculated based on the waste generation rate identified during SATREPS in November 2012 and the number of generation sources obtained through a survey conducted by local consultants. The results revealed that the generation rate of municipal solid waste (MSW) is 727 g/person/day.

Table 4-119: Waste Generation Amount of Moratuwa MC (2015)

Source		Generation rate		Generation sources	Generation (ton/day)
Residential	Collection	0.390	Kg/person/day	171,214	66.8
Commercial	Hotels (large)	1,000.00	Kg/(hotel)	0	0.0
	Hotels (middle & small)	56.00	Kg/(hotel)	99	5.5
	Restaurants (large)	200.00	Kg/(restaurant)	3	0.6
	Restaurants (middle)	112.50	Kg/(restaurant)	10	1.1
	Restaurants (small)	21.60	Kg/(restaurant)	131	2.8
	Organic-shops (large)	350.00	Kg/(shop)	0	0.0
	Organic-shops (middle)	20.00	Kg/(shop)	0	0.0
	Organic-shops (small)	4.76	Kg/(shop)	359	1.7
	Non-organic shops (large)	40.00	Kg/(shop)	44	1.8
	Non-organic shops (middle)	15.00	Kg/(shop)	123	1.8
	Non-organic shops (small)	1.69	Kg/(shop)	3,260	5.5
Institutions	Schools	12.50	Kg/(school)	78	1.0
	Hospitals	600.00	Kg/(hospital)	12	7.2
	Other institutions	9.17	Kg/(institution)	372	3.4
	Other educational institutions	8.00	Kg/(institution)	72	0.6
	Buddhist temples	5.15	Kg/(temple)	47	0.2
	Hindu temples	37.08	Kg/(temple)	3	0.1
	Mosques	1.50	Kg/(mosque)	2	0.0
	Churches	10.00	Kg/(church)	23	0.2
Market		3,000.00	Kg/(public market)	8	24.0
Industries		380.00	Kg/(industry)	0	0.0
Total					124.5

Source: Generation Rate of MSW – Reports of SATREPS; Waste Generation Sources – JICA Survey

b. Waste Composition

Results of a waste composition survey implemented by local consultants at the Karadiyana DS between 15 and 21 October under this study are presented in the table below.

Table4-120: Waste Composition of Moratuwa MC (2015)

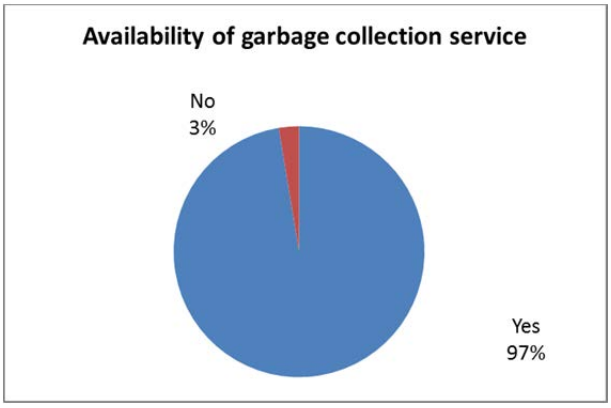
Category	Rate
Kitchen waste	52.5%
Paper	13.6%
Textiles	4.3%
Grass & wood	14.1%
Soft Plastics	9.1%
Hard Plastics	1.4%
Rubber & leather	0.6%
Metal	0.7%
Glass & bottles	1.2%
Stone & ceramic	2.3%
Other	0.1%
	100.0%

4.7.4 Results of Public Opinion Survey

97% of the surveyed households are Sinhalese, 1% is Muslims, 1% is Tamils and 1% other. Data on the average number of people per household and monthly income is set out in the table below.

Table4-121: Average and standard deviation values of income and family size

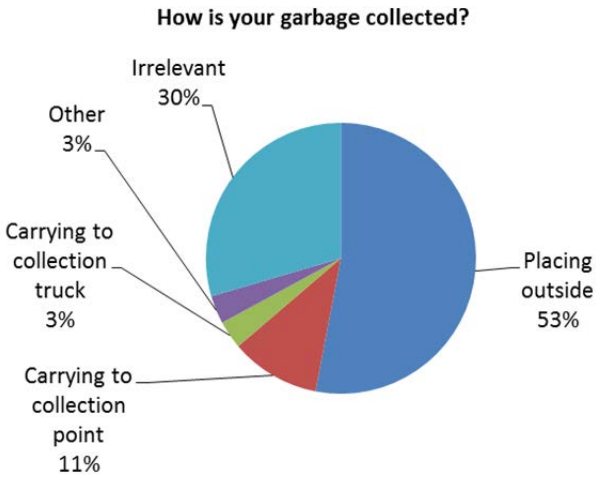
Category	Number of sample	Average of family members / employees	Income/Turnover (LKR/month)
High	50	4.5	85, 200
Middle	50	4.1	48, 375
Low	50	4.0	27, 140
Business	37	3.9	602, 200



Item	No.of Sample	%
Yes	147	97
No	3	3
Total	150	100

Figure 4-52: Availability of garbage collection service in the Moratuwa MC

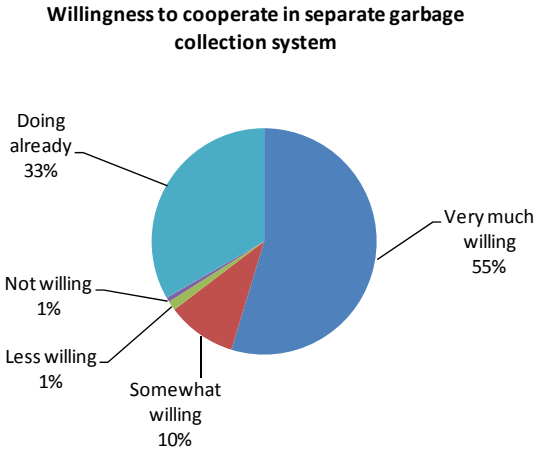
In Moratuwa MC, 100% of surveyed households are provided with a garbage collection service, of which 97% stated they use this service. Only 44% of surveyed households are “very satisfied” with the present SWM service provision, while 34% are “somewhat satisfied”.



Item	No.of Sample	%
Placing outside	80	53
Carrying to collection point	17	11
Carrying to collection truck	5	3
Other	5	3
Irrelevant	45	30
Total	150	100

Figure 4-53: Method of garbage discharge by residence in MMC area

- ✓ Households 'main methods of waste discharge are shown in upper Figure. The most common methods are discharging it outside their premises for house to house collection (53%) and carrying garbage to the collection truck (11%).
- ✓ Only 8% of surveyed households receive a daily garbage collection service while 62 % stated that they received the service 2-3 times a week. Similarly, 49% discharge their garbage 2-3 times per week, 22% as soon as it is generated and 28 % discharge their garbage daily.
- ✓ In general, adult females handle waste in about 73% of surveyed households.
- ✓ As shown in lower Figure, 33 % of households separate their garbage into organic and inorganic waste at the source of generation. Only 2% of surveyed households are not/less willing to cooperate with source separation for recycling. The rest of the households are very much willing (55%) and somewhat willing (10%) to cooperate in the source separated garbage collection system.
- ✓ Further, 84% of surveyed households stated that there are recyclable collectors or someone who comes to collect their reusable or recyclable materials. Hence, an informal recycling system is well established in the Moratuwa MC area.



Item	No.of Sample	%
Very much willing	83	55
Somewhat willing	15	10
Less willing	2	1
Not willing	2	1
Doing already	50	33
Total	150	100

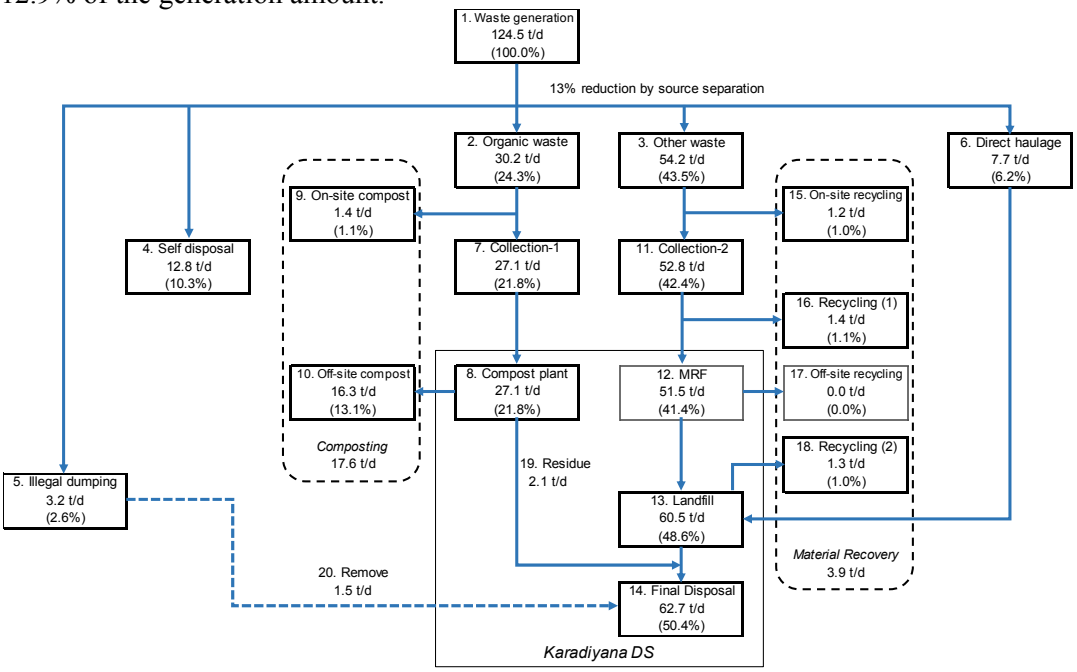
Figure 4-54: Willingness of residences to participate in the source separated garbage collection system in the Moratuwa MC

- ✓ Only 11% of surveyed households use kitchen/garden waste for composting and use the finished compost for their own garden.
- ✓ Not many surveyed households (70%) have never discussed proper garbage discharge methods at the community level.
- ✓ 80% of households stated that SWM awareness programmes are very necessary while 13% stated "somewhat necessary". Only 7% of surveyed households stated that awareness campaigns are not necessary or not needed at all.
- ✓ 61% of households do not like to pay for SWM services mainly because of the revenue tax they paid for MMC. The average WTP (willingness to pay) for improved SWM services is 50 ± 97 LKR/month per household.
- ✓ Out of all surveyed households, 31% stated that they sell/give-away glass & bottles for recycling and 30% of residences sell/give-away plastics for recycling. Also, 14% of households sell/ give-away cans & metal for recycling. Cardboard and paper recycling were 4% and 11% respectively.

4.7.5 Waste Flow

The current waste flow has been prepared by analysing the locally outsourced public opinion survey, statistical data collection and census results. It should be noted that the Moratuwa MC started separate collection services for organic and inorganic waste in January 2015 based on an order by the Mayor. Therefore, separate collection was considered in preparation of the waste flow.

According to the waste flow, the waste collection rate ([discharged amount + directly transported amount] / [generation amount]) is 71.0%. The recycling rates, estimated from the generation amount, are 14.1% for composting and 3.1% for material recovery. The total recycling rate is 17.3%. Although the indicator is relatively high when comparing to those of other local authorities, further improvements of waste treatment are necessary since the amounts of self-disposal such as burning waste at generation sources and illegally dumped waste account for 12.9% of the generation amount.



Recycling (1): Recyclables taken by the collection workers
Recycling (2): Recyclables taken by the waste pickers at landfill site

Figure 4-55: Waste Flow of Moratuwa MC (2015)

4.7.6 Current Situation of Other Waste Management

a. Current Situation of Industrial Waste Management

Waste that is considered as industrial waste is not generated in the territory of the Moratuwa MC. However, the MC collects general waste to be discharged from large-generators such as factories as long as it receives a request of collection from these generators.

b. Current Situation of Medical Waste Management

Collection service for medical waste is not implemented. Only general waste discharged by hospitals is being collected.

c. Current Situation of Night Soil Management

c.1 Generation Amount & Disposal Amount

The generation amount of night soil in the Moratuwa MC is 14.4 m3/day

c.2 Collection, Transportation and Disposal

Night soil is collected by two vacuum trucks with capacities of 1.8 m3 and 3.0 m3. Each truck conducts three trips daily.

c.3 Tipping Fee

Collected night soil is treated at a treatment plant operated by the National Water Supply and Drainage Board. The tipping fee is 450 LKR/load (tax excluded).

4.7.7 Solid Waste Management Needs

a. Improvement of Technical System

a.1 Establishment of Proper Solid Waste Management System

As the Moratuwa MC is an urbanized municipality located in the suburbs of the Colombo Metropolitan Area, illegal dumping and self-disposal of waste have great impacts on residents' living environment. Therefore, the current waste collection rate in the Moratuwa MC (74%) can be considered to be low. In addition, the amount of organic waste collected through separate collection services has not reached the expected level in spite of the introduction of separate collections in all areas of the MC.

It is necessary to improve the current SWM system by increasing collection efficiency and residents' participation in implementation of SWM activities.

a.2 Promotion of 3R

According to the results of WACS, the share of organic waste (kitchen waste and green waste) is 66.6% (82.9 ton/day) in the total generation amount. However, the amount of organic waste collected through separate collection services is 30.2 ton/day, which is less than half of the organic waste being generated in the MC. The share of collected recyclables in the total generation amount is small, usually equalling up to only 3.1%.

When considering the limited capacity of the Karadiyana DS and transportation costs, waste reduction is an inevitable objective for the MC.

b. Organizational and Institutional Improvement

b.1 Formulation of Solid Waste Management Plan

The SWM in the Moratuwa MC is struggling to maintain the current conditions. Therefore, no improvement plans were formulated and even budget implementation is conducted without any plans. As a SWM policy based on future predictions is required, the MC should prepare a master plan for its SWM.

Presently, the MC is transporting their waste to the Karadiyana DS operated by the WMA. However, the MC ought to recognize its responsibilities for the waste generated in its territories; and therefore, it is preferable that the MC makes clear its roles related to the operation of the disposal site when formulating its SWM Master Plan.

4.8 Kesbewa Urban Council in Western Province

4.8.1 Outline of the Local Authority

Kesbewa is a town in the Colombo District in the Western Province of Sri Lanka. It is situated south of Sri Lanka's largest city, Colombo, and east of Moratuwa. It is on the road that connects Horana to Colombo. The total area is 41 km^2. The urban council is located in Piliyandala Town.

Photo：Kesbewa Urban Council

The main industries of Kesbewa are the garment and agriculture industries (rice and rubber plantation)35.

The main ethnic and religious group of Kesbewa is Sinhala-Buddhist.

Colombo's climate is fairly temperate all throughout the year. From March to April the average maximum temperature is around 31 degrees Celsius. The only major change in Colombo's weather occurs during the monsoon seasons from May to August and October to January. This is the time of year where heavy rains can be expected. Colombo sees a relatively small diurnal temperature range, although this is more marked in the drier winter months, where minimum temperatures average 22 degrees Celsius. Rainfall in the city averages around 2,400 millimetres a year36.

The Kesbewa UC (Urban Council) has 55 GNs (Grama Niladhari –Village Officer) divisions and is constituted by exactly 55 Wards. The population trend from 2010-2015 of the Kesbewa UC is as follows.

Table4-122: Population Trend of Kesbewa UC (2010-2015)

Year	2010	2011	2012	2013	2014	2015(Sept.)
Population	168,882	170,908	184,675	184,359	191,334	NA

Source: Divisional Secretariat, Kesbewa

4.8.2 Current Status and Problems of Solid Waste Management

a. Organization and Legal System

a.1 Legislation and Policy

The Kesbewa UC implements solid waste management and sewage treatment activities based on section 118-120 of the Urban Council Ordinance No. 61 (1939) and the Public Nuisance

[35] Based on the interview with CPHI of Kesbewa UC (October 22, 2015)
[36] World Meteorological Organization http://worldweather.wmo.int/en/city.html?cityId=227 (Viewed on November 15, 2015)

Ordinance (1863).

a.2 Solid Waste Management Plan

The UC has not formulated any master plan or action plan related to SWM.

a.3 Organization

In the Kesbewa UC, the Health Section is in charge of solid waste management. The head of the Health Section is the Chief Public Health Inspector (CPHI), which is assisted by the PHI and Supervisor. They supervise road sweeping and waste collection services in each zone. The role of the Health Section is as follows:

- Waste collection and transportation Service
- Public health activities (Dengue)
- Road sweeping
- Public awareness of waste separation

In the Kesbewa UC, there are neither Technical Officers (TO) nor Medical Officers of Health (MOH). Furthermore, there are no engineers as there is no workshop for collection vehicles.

The following figure shows the organizational structure and the staff of the Kesbewa UC.

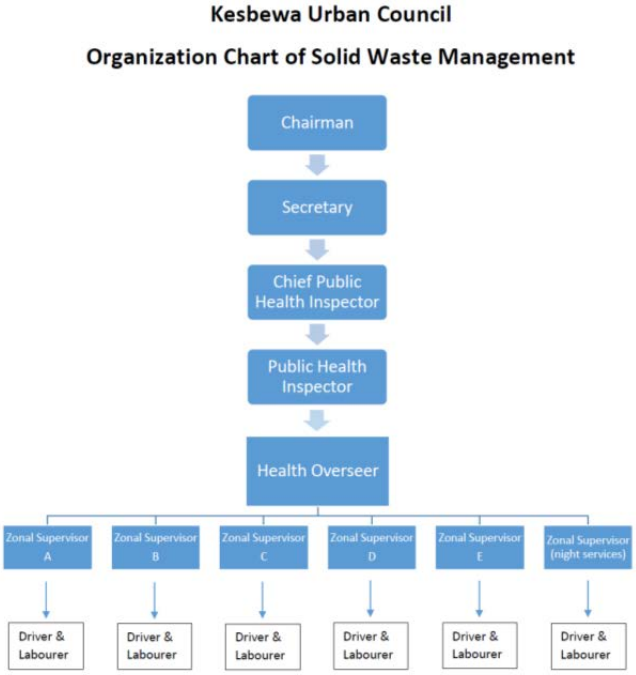


Figure 4-56: Organizational chart of SWM section in Kesbewa UC

Table4-123: Staff related to SWM in Kesbewa UC

Staff		Number	Remarks
Engineer		0	
TO(Technical Officer)		0	
MOH(Medical officer of health)		0	
PHI(Public health inspector)		3	
SV(Supervisor)	Permanent	7	
Collection workers	Permanent	64	
	Temporary	41	
Driver		14	
Total		129	

a.4 Issues of Organization and Legal System

The Kesbewa UC has not formulated any master plan or action plan related to SWM.

With regard to organization, the experienced CPHI has taken actual command of waste management and is working in close collaboration with the PHI and the SV. However, there are very few collection workers.

b. Technical System

b.1 Storage and Discharge

In the Kesbewa UC, the separate collection system was implemented with the support of the Waste Management Authority (WMA) in 13 GNs in 2012. However, when the WMA stopped the support, the participation rate decreased. Currently only 1 GN continues separate collection and only 6% of the population participates in waste separation.

Residents are instructed to put waste in plastic bag(s) and place it on the designated collection point(s) on the roadside on the designated collection day(s).

b.2 Collection and Transportation

The Kesbewa UC directly collects and transports waste from the households. Under the supervision of the PHI and the SV, 14 collection drivers and 105 collection workers (including temporary workers) collect waste.

b.2.1 Collection Method

In a separate collection area, waste is separated into organic and other waste. In the other area, waste is mixed. The collection area is divided into five zones and the night collection area as follows.

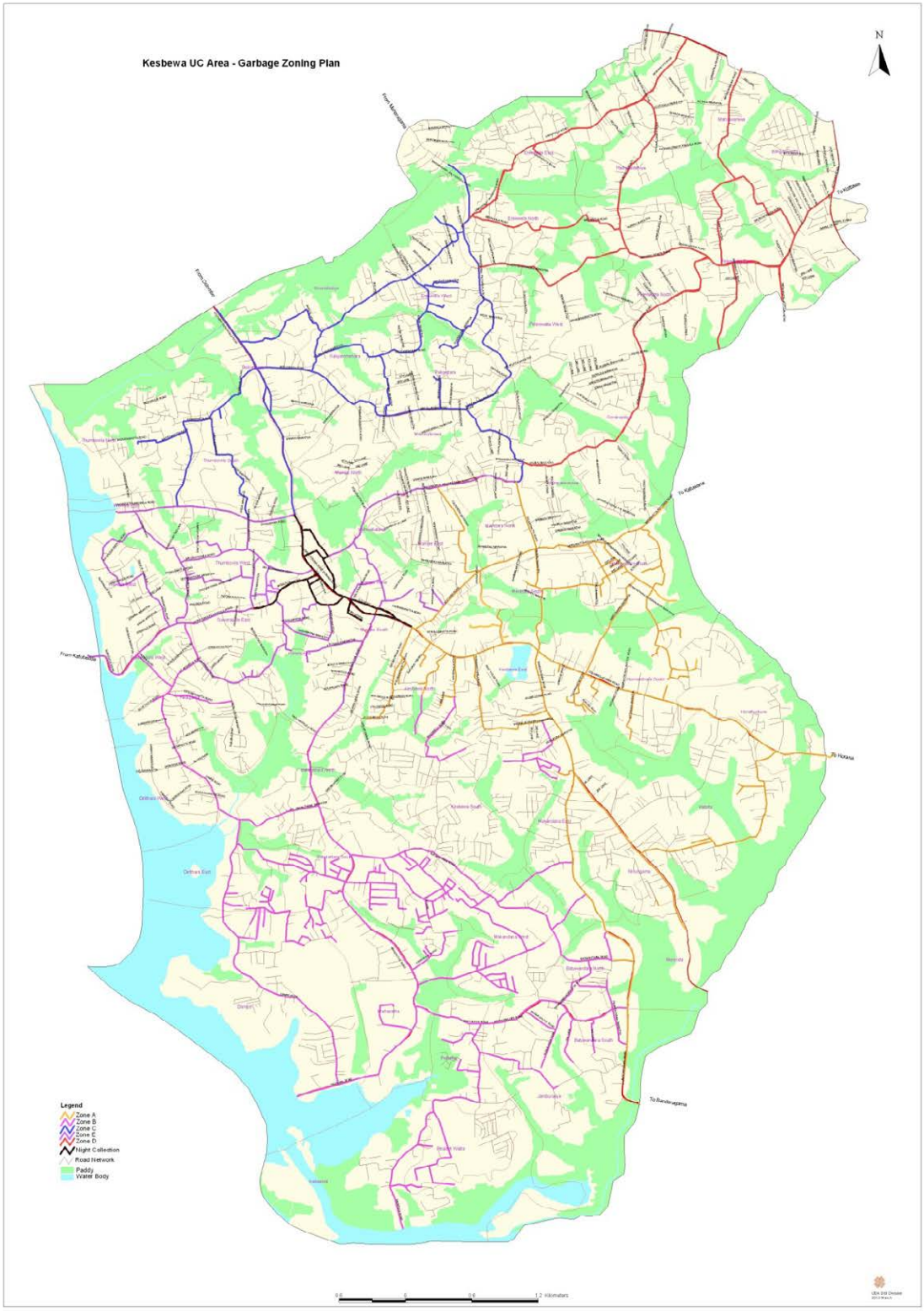


Figure 4-57: Collection area by zones in Kesbewa UC (as of Nov. 2015)

Collection coverage of the UC is 60% by area basis. The remaining 20% is on-site treatment and 20% is illegal dumping. The following table shows the collection method and frequency of waste.

Table4-124: Waste collection methods and frequency of Kesbewa UC

Area	Type of waste	Collection method	Frequency
Main road	Mixed waste	Collection point	Everyday
Other than main road	Mixed waste	Collection point	Once/week
Separate collection area	Organic waste	Collection point	Once/week
	Other waste	Collection point	Once/month

Photo：Waste collection by tractor

b.2.2 Collection Amount

Waste collected by the Kesbewa UC is transported to the Karadiyana DS, according to the truck scale installed in the DS (Disposal Site); collection volume is 54 ton/day.

b.2.3 Collection Fee

The Kesbewa UC does not collect any waste collection fees from households. On the other hand, they collect fees by volume from large waste generators depending on the type of waste.

Table4-125: Collection fee of Kesbewa UC

Target	Type of waste	Fee(LKR/ton)	Remarks
Household	General waste	Free	
Large generator	General waste	3,420	
Large generator	Bulky waste	4,560	Includes tire and debris etc.
Large generator	Textile waste	6,840	Collected from garment factory

b.2.4 Collection Vehicles

The following table shows the number of collection vehicles belonging to the UC.

Table4-126: Collection vehicles of Kesbewa UC

Type of vehicles	Number	Number not in operation (average)	Remarks
Compactor truck (12-14m3)	1	1	Currently broken down so the UC has to hire a compactor for 6,000LKR/day
Tractor with trailer	12	1	
2-wheel Tractor with trailer	3		
Hand cart	4		
Three wheeler	1		

One compactor (made in China in 2009) is currently broken down so the UC has to hire a compactor truck for 6,000LKR per day without fuel. The tractors with trailers were made between 1991 (oldest), and 2015 (newest)—donated by MoLG & PC)—while the others were manufactured about 10 years ago.

The UC keeps the driving record of each vehicle including mileage and collection areas covered.

b.2.5 Maintenance Methods of Collection Vehicles

The Kesbewa UC has neither workshop nor mechanical engineer, therefore it outsources repairs to an external repair shop. Regarding the approval process of purchasing spare parts and repair work, if the purchase or repair work costs less than 5,000 LKR, the approval of the secretary is needed. For purchase(s) or repair(s) less than 10,000 LKR, the chairman's approval is necessary, and for purchases over 10,000 LKR, the Council's approval is necessary.

Other than simple changing of tyres, tubes or spare parts, the aforementioned approval processes are required, which takes time. Therefore, it is most likely to interfere with waste collection service(s).

b.3 Intermediate Treatment

In the Kesbewa UC, there is one recycling center where recyclables are sorted and stored after being collected separately (source separation). The other waste collected from about 8,000 households in a separate collection area is transported here and valuable materials are selected by two sorting workers. Sorted valuables are purchased by a selected buyer through bidding every six months. They earn about 150,000LKR per year and 50% of sales go to the UC, the remaining 50% is shared among collection workers and sorting workers.

Table 4-127: Intermediate treatment facilities in Kesbewa UC

Type	Execution body	Address	Capacity (ton/day)	Year of establishment
Recycling Center	UC	SAMPATH KENDRAYA collecting center in Madapatha	1 two-wheel tractor load/day	2008

*Based on the interview with Officer of Kesbewa UC

Photo：Recycling Center

b.4 Final Disposal

Since the waste of the Kesbewa UC is transported and disposed in the Karadiyana DS, please refer to section b.4 Karadiyana DS of 4.7 Moratuwa MC.

b.5 Issues of Technical System

Regarding collection and transportation, collection workers and collection vehicles are insufficient with collection services covering only 60% (of the Kesbewa UC). The UC outsources the repair works of collection vehicles because there are neither engineers nor workshops. If collection vehicles have problems it will take a long time to go through the whole approval processes and this will affect the collection service.

As for the recycling facilities, it is necessary for the UC to recycle a larger amount of valuables by increasing the waste separation rate. The sorted valuables are currently stored for six months and sold to the recyclers but it is possible to increase the recycling rate if the storage space can be secured by increasing the frequency of sales.

c. Recycling Activities

c.1 Source Separation

In the Kesbewa UC, separate collection had been introduced in 13GNs out of all the 55GNs in 2012 but to date only 1GN still continues.

We did not find any community recycling systems or recycling activities initiated by NGOs.

c.2 Reduction of Organic Waste

The Kesbewa UC has distributed home compost bins (350L) for 5,000 households with a subsidy of 1,500LKR/pc (original cost 4,000LKR/pc) since 2008 for the purpose of stopping collection services of organic waste. However, the UC still continues to provide collection services due to political reasons.

c.3 Recycling Valuable Materials

There are some middleman shops that buy and sell valuable materials in the Kesbewa UC. We conducted an interview with one of these shops. The summary of the interview is shown below.

Table 4-128: Purchase of valuable materials at a Middleman Shop

Type of Valuables	Collection amount (ton/day)	Buying price (LKR/kg)	Selling price (LKR/kg)	Destination	Remarks
Plastic	0.2	20	40	Plastic Recycler(Piliandara)	
PET	0.1	10	15	PET Recycler	
Polythene	0.02	10	20	Recycler	
Metal 1	0.15	20	25	Middleman	
Metal 2	0.25	15	20	Middleman	
Glass	1	3	4	Ceylon glass company	
Cardboard	0.3	10	15	Middleman	
Paper	-	-	-	-	
Coconut Shell	0.25	5	10	Middleman	

＊Based on the interview with Middleman Shop owner

c.4 Issues of Recycling Activities

In the Kesbewa UC, separate collection was once introduced but failed. Currently expansion is again being planned. Firstly, it is important to encourage source separation, then to establish a system (effective, hygienic storage and discharge method, setting a separate collection date and time, providing reliable collection services, etc.) that can be easily understood and adopted by residents.

d. Public Awareness

d.1 Current Situation of Public Awareness Activities

In the Kesbewa UC, public awareness activities to promote source separation have been initiated by the WMA since 2009. At that time, the WMA promised not to collect tipping fees for organic waste. However, they still continued to collect tipping fees despite their promise, which discouraged people to participate in waste separation. Currently only 1 GN continues separate collection.

Table 4-129: Outline of Public Awareness Activities in Kesbewa UC

	Public Awareness Activities
Execution body	UC (Supported by the WMA and CEA)
Title	"Pivithurupura Waste Separation Project"（2009～） initiated by WMA
Budget source	UC
Budget amount	2000,000LKR（2015） *not only for SWM activities but for all public welfare activities
Methods	Public announcement Distribution of leaflet of waste separation Community meeting

d.2 Participation Level and Manners of Citizens

Only 6% of total residents participate in source separation so the level of cooperation is low. The UC receives many complaints from those who do not receive collection services and there are many requests for house-to-house collection services.

d.3 Issues of Public Awareness Activities

In the Kesbewa UC, the level of cooperation for waste separation is low. Therefore, it is

essential to set the discharging rules (target waste for separation, collection date, discharge point, and discharge method) in order for residents to easily understand. It is also necessary to implement environmental education in schools and public organizations.

e. Finance

e.1 Financial Condition of the Municipal Council

According to the table below, the difference between annual revenues and expenditures of the Kesbewa Urban Council (Kesbewa UC) has been positive for the past three years and its share in total annual revenues is 16% on average.

Table 4-130: Annual Revenues and Expenditures (Unit: Thousand LKR)

No	Category	2012	2013	2014	Annual Averages 000 LKR	%
1	Approved Budget	232,061	286,078	342,662	286,934	
2	Actual					
	Revenue	272,855	301,386	503,858	359,366	100.0%
	Own-source revenue	185,100	227,347	256,098	222,849	62.0%
	Grant	87,755	74,039	247,759	136,518	38.0%
	Expenditure	209,253	299,887	391,552	300,231	83.5%
	Recurrent	118,774	156,464	155,078	143,439	39.9%
	Capital	90,480	143,422	236,474	156,792	43.6%
	Profit or loss	63,602	1,499	112,306	59,135	16.5%

Source: Kesbewa UC, "Programme Budget: 2014～2015"

The own-source revenues occupy a relatively big share in the total municipal revenues (62% on average) and this amount exceeds that of the total recurrent expenditures. Therefore, the urban council can be considered as a local authority with a stable financial capability.

Table 4-131: Breakdowns of the Annual Revenues (Unit: thousand LKR)

No	Types of Revenues	2012	2013	2014	Annual Average 000 LKR	%
1	Own-Source Revenues:					
	Rates & Taxes	37,341	34,898	37,606	36,615	10.2%
	Rents	12,062	10,337	11,156	11,185	3.1%
	License	3,200	3,063	4,600	3,621	1.0%
	Fees For Services	16,959	15,134	15,376	15,823	4.4%
	Warrant Costs And Fines	3,601	2,474	1,574	2,550	0.7%
	Other Income	111,938	161,441	185,785	153,054	42.6%
	Total Own-Source Revenues	185,100	227,347	256,098	222,849	62.0%
2	Grants:					0.0%
	Recurrent Grant:	35,134	36,346	51,636	41,038	11.4%
	Salaries	33,319	34,934	50,332	39,528	11.0%
	Council Members Allowances	1,190	972	824	995	0.3%
	Other Recurrent Grant	625	441	480	515	0.1%
	Capital Grants	52,622	37,693	196,123	95,479	26.6%
	Total Grants	87,755	74,039	247,759	136,518	38.0%
	Total	272,855	301,386	503,857	359,367	100.0%

Source: Kesbewa UC, "Programme Budget: 2014～2015"

Among the total grants, the amount of the block grants received from the central government makes up less than 50% and the rest are capital grants.

On the other hand, the capital expenditure makes up more than 50% of the total expenditure (52% on average) and the amounts of the capital expenditures exceeded those of the capital grants for each year of the concerned period. According to sources at the urban council, the

difference between the above was paid from the own-source revenues and loans released by the Local Loan and Development Fund.

Table 4-132: Breakdowns of the Annual Expenditures (Unit: Thousand LKR)

No	Types of Expenditures	2012	2013	2014	Annual Average 000 LKR	Annual Average %
1	Recurrent Expenditures:					
	Personal Emoluments	44,613	54,020	53,600	50,744	16.9%
	Travelling	965	1,161	1,464	1,197	0.4%
	Requisites and Equipment	15,140	19,689	6,505	13,778	4.6%
	Repairs and Maintenance of Capital Assets	21,673	45,487	67,025	44,729	14.9%
	Transportation, Communication, Utility and Other services	31,311	25,950	16,804	24,688	8.2%
	Interest	1,128	3,213	3,680	2,674	0.9%
	Grants, Subsidies and Contributions	3,727	6,727	5,840	5,431	1.8%
	Pensions, retirements, benefits and gratuities	217	217	161	198	0.1%
	Other expenditures					
	Total Recurrent Expenditures	118,774	156,464	155,078	143,439	47.8%
2	Capital Expenditure	90,480	143,422	236,474	156,792	52.2%
	Total Expenditure	209,254	299,886	391,552	300,231	100.0%

Source: Kesbewa UC, "Programme Budget: 2014～2016"

According to financial data provided by the Kesbewa UC, the urban council has not been facing financial problems in implementing its daily activities. However, the financial capability of the urban council is insufficient for improving the quality of public services; and therefore, the council has to rely on external financial sources such as grants and Local Loan Development Fund for investments related to the improvement of service quality.

e.2 SWM Finance

The SWM expenses of the Kesbewa UC for the last three years are presented in the table below. The annual totals of the SWM expenses occupy 9% to 14% of the total expenditures of the urban council and this is a small amount in comparison with those of other local authorities.

Table 4-133: The Annual Budgets and Actual Expenditures of SWM (Unit: Thousand LKR)

No	Types of Expenses	2012	2013	2014
A	Approved Budget	36,081	38,281	42,987
B	Actual SWM Revenues (Collected Waste Fees)	372	1,226	3,043
C	Actual Expenditures:			
1	Personal Emoluments	8,329	10,359	14,318
2	Supplies And Material Expenditures:			
	Equipment For Disposing Garbage			
	Fuel And Lubricants	1,617	2,686	3,524
	Uniforms for Workers	4	250	
	Boots for Workers			
	Awareness Program			
	Other supplies	385	947	410
	Total Supplies and Materials Expenses	2,006	3,882	3,933
3	Repairs And Maintenance of Vehicles	1,818	2,498	2,956
4	Final Disposal Payment	5,217	6,251	
5	Other Expenses	11,774	5,051	19,956
	Total Expenditures	29,144	28,041	41,163
	Share of Collected Fees in the Total Expenditure	1.3%	4.4%	7.4%

Source: Kesbewa UC, "Programme Budget: 2014～2015"

The amount of total collected waste fees increased each year. In particular, the increase in 2014 was considerable, reaching double the amount of the previous year. However, the revenues from the waste fees is still at a level that cannot even finance 8% of the total SWM expenses; and therefore, the urban council has been financing the expenses from its other own-source revenues.

Like other local authorities, the waste fees are collected only from big-scale businesses and these businesses are identified based on the personal judgements of the public health inspectors of the urban council.

The table of fees is as follows.

Table 4-134: List of Waste Fees (Tax* Included), Unit: LKR/ton

No	Types of Waste	With Tax
1	Municipal Solid Waste	3420.00
2	Bulky Waste	4560.00
3	Slaughtering and Industrial Waste	6840.00

*Tax rates: Nation building tax-2%, VAT-12%

e.3 Problems Identified in the SWM Financial System

The major problem identified in the SWM financial system of the Kesbewa UC is the lack of relevance between the waste collection expenses and the revenues from the waste fee. Like other local authorities, the urban council focuses on the total amounts of expenditures and the own-source revenues only and does not consider the sustainability of individual public services such as waste collection. Therefore, it lacks in efforts to increase the revenues of waste fees.

The definition for big-scale businesses that have to pay waste fees is not officially determined. At the same time, no monitoring or examinations for identifying big-scale businesses are implemented so the actual fee collection rate is not known. The urban council does not put forth effort to increase the revenues of waste fees.

As waste collection fees are set per ton of discharged waste, the urban council has to negotiate the amounts of the actual payments since identifying the amount of discharged waste by each individual business is impossible.

4.8.3 Waste Amount and Composition Survey

a. Waste Generation Amount

The waste generation amount, of which the commercial source is revised, was calculated based on the waste generation rate obtained by SATREPS in November 2012 and waste generation units obtained by a locally outsourced survey. The results revealed that the municipal waste generation rate is 487g/person/day.

Table 4-135: Waste Generation Amount of Kesbewa UC (2015)

Source		Generation rate*1		Generation sources *2	Generation (ton/day)
Residential	Collection	0.390	Kg/person/day	188,350	73.5
Commercial	Hotels (large)	300.00	Kg/(hotel)	4	1.2
	Hotels (middle & small)	16.80	Kg/(hotel)	98	1.6
	Restaurants (large)	60.00	Kg/(restaurant)	42	2.5
	Restaurants (middle)	33.75	Kg/(restaurant)	0	0.0
	Restaurants (small)	6.48	Kg/(restaurant)	46	0.3
	Organic-shops (large)	105.00	Kg/(shop)	14	1.5
	Organic-shops (middle)	6.00	Kg/(shop)	73	0.4
	Organic-shops (small)	1.43	Kg/(shop)	1,175	1.7
	Non-organic shops (large)	12.00	Kg/(shop)	2	0.0
	Non-organic shops (middle)	4.50	Kg/(shop)	41	0.2
	Non-organic shops (small)	0.51	Kg/(shop)	1,689	0.9
Institutions	Schools	3.75	Kg/(school)	20	0.1
	Hospitals	180.00	Kg/(hospital)	1	0.2
	Other institutions	2.75	Kg/(institution)	384	1.1
	Other educational institutions	2.40	Kg/(institution)	137	0.3
	Buddhist temples	1.55	Kg/(temple)	0	0.0
	Hindu temples	11.12	Kg/(temple)	0	0.0
	Mosques	0.45	Kg/(mosque)	0	0.0
	Churches	3.00	Kg/(church)	0	0.0
Market		900.00	Kg/(public market)	2	1.8
Industries		76.00	Kg/(industry)	60	4.6
Total					91.8

*1： 30% of waste generation rate of SATREPS report（20% for commercial waste）
*2： Waste generation is based on JICA survey

b. Waste Composition

The results of the locally outsourced survey on waste composition conducted from 15 to 21 October at the Karadiyana Disposal Site are shown below.

Table 4-136: Waste Composition of Kesbewa UC (2015)

Category	Rate
Kitchen waste	52.5%
Paper	13.6%
Textiles	4.3%
Grass & wood	14.1%
Soft Plastics	9.1%
Hard Plastics	1.4%
Rubber & leather	0.6%
Metal	0.7%
Glass & bottles	1.2%
Stone & ceramic	2.3%
Other	0.1%
	52.5%

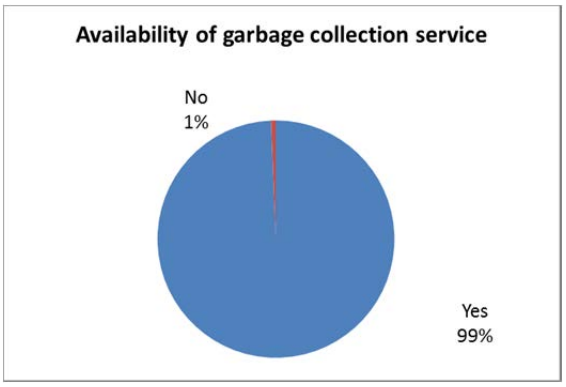
Source: WACS conducted by JICA at Karadiyana DS

4.8.4 Results of Public Opinion Survey

95% of the surveyed households are Sinhalese, and 5 % are Muslims. Data on the average number of people per household and monthly income is set out in the table below.

Table 4-137: Average and standard deviation values of income and family size

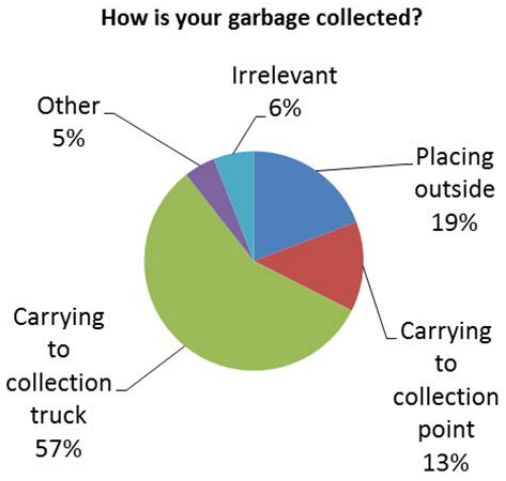
Category	Number of sample	Average of family members / employees	Income/Turnover (LKR/month)
High	51	4.1	219. 314
Middle	67	4.4	45, 224
Low	33	4.6	26, 167
Business	39	2.4	893, 590



Item	No. of sample	%
Yes	149	99
No	2	1
Total	151	100

Figure 4-58: Availability of garbage collection service in the Kesubewa UC

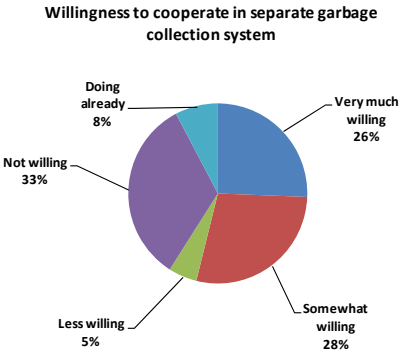
In the Kesbewa UC, 100 % of surveyed households are provided with a garbage collection service, and all of them use this service. Moreover, 64 % of surveyed households are "very satisfied" with the present SWM services provision, while 28 % are "somewhat satisfied".



Item	No. of sample	%
Placing outside	29	19
Carrying to collection point	20	13
Carrying to collection truck	85	57
Other	8	5
Irrelevant	9	6
Total	150	100

Figure 4-59: Method of garbage discharge by residence in KUC area

- ✓ Households' main methods of waste discharge are shown in upper Figure. The most common methods are carrying garbage to the collection truck (57%) and discharging it outside their premises for house to house collection (19 %).
- ✓ Only 33 % of surveyed households receive a daily garbage collection service and 26 % stated received the service 2-3 times/week while 36 % revived the service once in a week. However, 23 % discharge waste as soon as it generates, while 59% discharge their garbage daily and 18 % discharge 2-3 times per week.
- ✓ In general, adult male is responsible for waste discharge in 54 % surveyed households with 31 % adult female share from the rest.
- ✓ As shown in lower Figure, only 8 % of households separate their garbage into organic and inorganic waste at the source of generation. Furthermore, 38 % of surveyed households are not/less willing to cooperate with source separation for recycling. Rests of the household are either very much willing (26 %) or somewhat willing (28 %) to cooperate in the source separated garbage collection system.
- ✓ Further, 82 % of surveyed households stated that there are recyclable collectors or someone who comes to collect their reusable or recyclable materials. Hence, an informal recycling system is well established in the Kesbewa UC area.



Item	No. of sample	%
Very much willing	39	26
Somewhat willing	42	28
Less willing	8	5
Not willing	50	33
Doing already	12	8
Total	150	100

Figure 4-60: Willingness of residences to participate in the source separated garbage collection system in the Kesbewa UC

- ✓ None of the surveyed households use kitchen/garden waste for composting.
- ✓ Not many surveyed households (10 %) have ever discussed proper garbage discharge methods at the community level.
- ✓ 62 % households stated that SWM awareness programs are very necessary while 38 % stated "somewhat necessary". None of surveyed households stated that awareness campaigns are not necessary or not needed at all.
- ✓ Only 15 % of household do not like to pay for an improved SWM services. The average WTP (willingness to pay) for improved SWM services is 38 ± 52 LKR/month per household.
- ✓ Out of all surveyed households, 38 % stated that they sell/give away glass & bottles for recycling and 68 % of residences sell/give-away plastics for recycling. Also, 11 % of household sale/ give-off Tin/can for recycling. Cardboard and paper recycling were as high as 84 % and 35 % respectively.

4.8.5 Waste Flow

The current waste flow has been prepared by analysing the locally outsourced public opinion survey, statistical data collection, and the census results. The Waste Management Authority (WMA) encourages separate collection of organic waste and other waste to LAs that are using the Karadiyana disposal site, where organic waste is composted to reduce the overall volume of disposed waste. The Moratuwa MC has implemented separate collection since January 2015 and the other Local Authorities are following this trend. For this reason, it is assumed that waste flow is based on separation collection, the same as the Moratuwa MC.

According to the waste flow, the collection rate ((discharge amount + direct loading amount)/generation amount) is 68.5%. As for the recycling rate for the generation amount, compost is 7.1%, material recovery is 3.2%, and the total rate is 9.5%. On the other hand, the self-disposal amount is 25.7ton/day, which is 28.0% of the total generation amount.

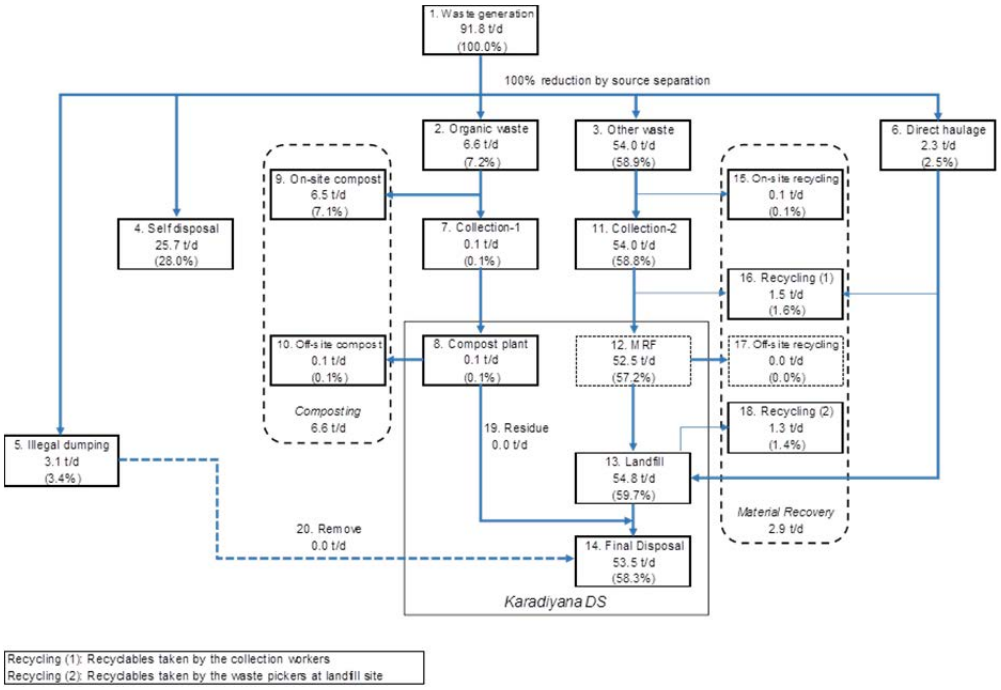


Figure 4-61: Waste Flow of Kesbewa UC (2015)

4.8.6 Current Situation of Other Waste Management

a. Current Situation of Industrial Waste Management

a.1 Generation Amount & Disposal Amount

The generation amount of general waste from businesses such as shops is 5 ton/day.

a.2 Collection, Transportation and Disposal

General waste from businesses is collected together with general municipal waste and discharged at the Karadiyana DS. The UC is not involved in the handling of the hazardous waste of industrial waste.

a.3 Tipping Fee

The tipping fee (gate fee) of industrial waste transported by a certified business entity itself or a private waste collection company entrusted by business entities is 2,389LKR/Mt while that of industrial sludge is 5,972LKR/Mt[37].

b. Current Situation of Medical Waste Management

b.1 Generation Amount & Disposal Amount

In the Kesbewa UC, there is one large base hospital and 17 small clinics and the total generation amount of general waste from these facilities is 0.9 tons/day.

b.2 Collection, Transportation and Disposal

General waste generated from the large base hospital is collected by the UC and transported to the Karadiyana DS. However, medical waste is disposed by the hospital itself and the UC is not involved. All kinds of waste generated by the small clinics are collected along with the regular collection service.

b.3 Tipping Fee

In large hospitals, medical waste, such as used syringes, is treated in the incineration facility within the hospital.

c. Current Situation of Night Soil Management

c.1 Generation Amount & Disposal Amount

The accurate amount of night soil is not recorded by the UC.

c.2 Collection, Transportation and Disposal

Night soil is collected by the Kesbewa UC and transported to the Water Board Pumping Plant located in the Dehiwala Mt. Lavinia MC, then discharged to the ocean.

c.3 Tipping Fee

Tipping fee for households is 2,200LKR/load and for businesses it is 5,700LKR/load.

4.8.7 Needs for Solid Waste Management

a. Improvement of Technical System

a.1 Improvement of Collection Service Rate

The Kesbewa UC is located in the suburbs of the Colombo metropolitan area (in recent years it has become a commuter town as the residential area has developed). However, the waste collection rate is as low as 68.5%, the self-disposal rate is 28.0%, and the illegal dumping rate is 3.4%. Improvement of the living environment is urgent and firstly there is a need to improve the collection rate.

[37] According to the interview with the Director of Karadiyana DS dated Oct. 26, 2015.

The Kesbewa UC currently uses one leased dump truck and 12 tractors for collections but the collection efficiency is low. For improvement of the collection service rate, modernization of collection equipment and optimization of collection methods are required.

a.2 Improvement of Recycling Rate

The recycling rate, which combined the composting rate of organic waste and the recovery rate of valuables for generation amount, is 10.3% in total. The Karadiyana disposal site—which is a cluster system—is located in an area in the region of the Kesbewa UC, and therefore the transportation distance is short, which is advantageous from the viewpoint of waste management. However, it is important for the UC to prolong the life span of the disposal site by reducing the disposal amount because its remaining capacity is limited. It is essential to promote waste reduction through the 3R activities.

The Kesbewa UC is eager to implement separate collection of organic waste recommended by the WMA as early as possible, but it is necessary to secure the know-how and equipment for that.

b. Improvement of Organization and Legislation

b.1 Strengthening the Financial System for Waste Management

The Kesbewa UC even has difficulty in providing the daily collection service due to the breakdown of old equipment. It is essential to establish a mechanism to secure the financial resources required for waste management.

b.2 Securing the Financial Resources for Equipment and Materials

Although there is a need for new procurement and updates of the collection equipment as described above, the UC is short of day-to-day administrative expenses. Therefore, it is necessary to secure investment costs for the time being.

4.9 Katunayake Seeduwa Urban Council in Western Province

4.9.1 Outline of the Local Authority

Katunayake Seeduwa is a town in the Gampaha District in the Western Province of Sri Lanka. It is a town in the suburb of Negombo city, the largest city in the Gampaha District and situated south of Negombo. It is the site of the Bandaranaike International Airport (also known as Colombo Airport), the primary international air gateway to Sri Lanka. With the introduction of the open economy policy in 1977 a large area was allocated to create a free trade zone (currently known as the Export Promotion Zone). The total area is 10.3 km2.

SriLankan Airlines is the flag carrier of Sri Lanka and is headquartered on the grounds of the airport in Katunayake. It is served by Sri Lanka Railways' Puttalam Line, with stations at Katunayake, Katunayake South, and the airport.

Katunayake is at the northern end of the Colombo-Katunayake Expressway which connects the city of Colombo and the airport. This Expressway is also connected to the A1 highway at Peliyagoda. Katunayake is currently served by the A3 highway from Colombo to Negombo.

Photo：Katunayake Seeduwa Urban Council

The main industries of Katunayake Seeduwa are the garment industry, hotel services, and the food and beverage processing industry, etc[38]. The main religious group of Katunayake Seeduwa is Catholic (Christian).

Colombo's climate is fairly temperate all throughout the year. From March to April the average maximum temperature is around 31 degrees Celsius. The only major change in Colombo's weather occurs during the monsoon seasons from May to August and October to January. This is the time of year where heavy rains can be expected. Colombo sees a relatively small diurnal temperature range, although this is more marked in the drier winter months, where minimum temperatures average 22 degrees Celsius. Rainfall in the city averages around 2,400 millimetres a year[39].

The Katunayake Seeduwa UC (Urban Council) has 16 GN (Grama Niladhari –Village Officer) divisions. The population trend from 2010-2015 of Katunayake Seeduwa UC is as follows.

Table 4-138: Population Trend of Katunayake Seeduwa UC (2010-2015)

Year	2010	2011	2012	2013	2014	2015
Population	NA	48,271	61,228[40]	NA	63,243	NA

Source: Divisional Secretariat, Katunayake Seeduwa

[38] Based on the interview with CPHI of Katunayake Seeduwa UC (October 29, 2015)
[39] World Meteorological Organization http://worldweather.wmo.int/en/city.html?cityId=227 (Viewed on November 15, 2015)
[40] http://www.citypopulation.de/SriLanka-Cities.html?cityid=1585

4.9.2 Current Status and Problems of Solid Waste Management

a. Organization and Legal System

a.1 Legislation and Policy

The Katunayake Seeduwa UC implements solid waste management and sewage treatment activities based on section 118-120 of the Urban Council Ordinance No. 61 (1939), the Public Nuisance Ordinance (1863), and the Waste Management Statute No 01 of 2007 of the Western Province Council.

a.2 Solid Waste Management Plan

The UC has not formulated any master plan or action plan related to SWM.

a.3 Organization

In the Katunayake Seeduwa UC, the Health Section is in charge of solid waste management. The head of the Health Section is the Chief Public Health Inspector (CPHI), which is assisted by the PHI and the Supervisor. They supervise road sweeping and waste collection service in each zone. The role of the Health Section is as follows:

- Waste collection and transportation Service
- Public health activities (dengue fever prevention)
- Road sweeping
- Public awareness on waste separation
- Disposal of animal body

In the Katunayake Seeduwa UC, there are no Engineers, Technical Officers (TO) nor Medical Officers of Health (MOH). The following figure shows the organizational structure and the staff of the Katunayake Seeduwa UC.

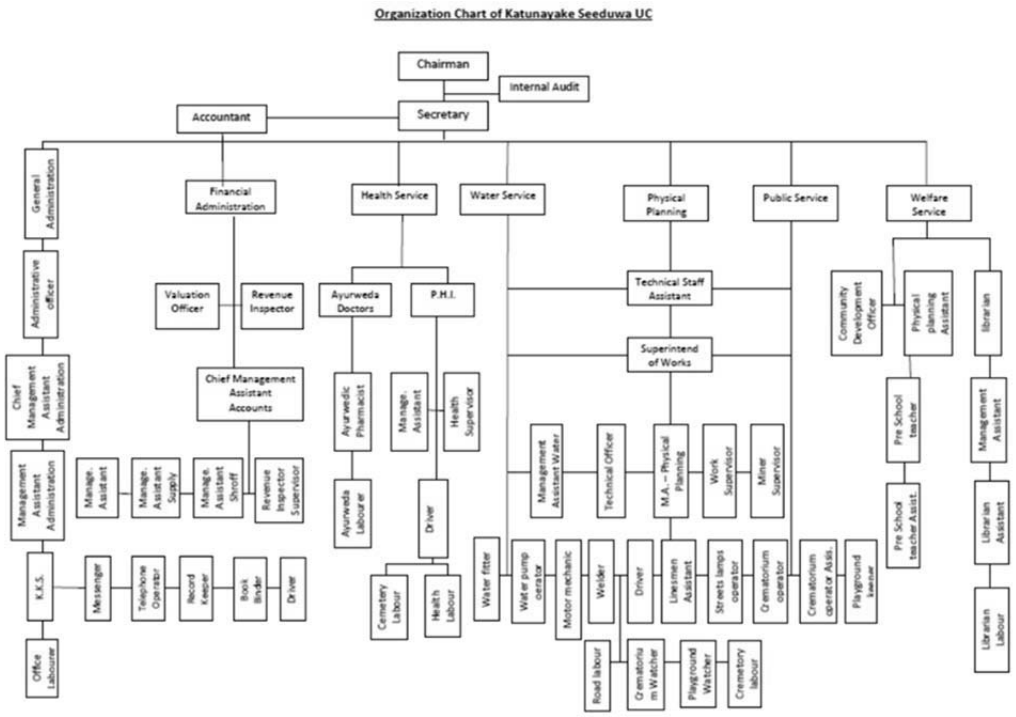


Figure 4-62: Organizational chart of Katunayake Seeduwa UC

Table 4-139: Staff related to SWM in Katunayake Seeduwa UC

Staff		Number	Remarks
Engineer		0	
TO(Technical Officer)		0	
MOH(Medical officer of health)		0	
PHI(Public health inspector)		4	
SV(Supervisor)	Permanent	2	
	Acting	3	
Collection workers	Permanent	54	
	Temporary	13	(11+2 substitute)
Driver	Permanent	6	
	Temporary	5	(1 substitute + 4 acting)
Disposal site workers	Permanent	1	
Total		88	

a.4 Issues of Organization and Legal System

The Katunayake Seeduwa UC has not formulated any master plan or action plan related to SWM.

With regard to organization, the experienced CPHI has taken actual command of waste management and is working in close collaboration with the PHI and the SV. However, the amount of collection workers are scant.

b. Technical System

b.1 Storage and Discharge

In the Katunayake Seeduwa UC, mixed collection is being conducted and residents are

instructed to put mixed waste in plastic bag(s) and place it on the roadside in the morning of the designated collection day.

However, the UC is planning to implement separate collection from the end of November, 2015 and to distribute three different kinds of polisacks to enable 200 households to store glass, paper, and plastic individually. The WMA is also planning to distribute buckets for separated organic waste.

b.2 Collection and Transportation

The Katunayake Seeduwa UC directly collects and transports waste from the households. Under the supervision of the PHI and the SV, 11 collection drivers and 67 collection workers (including temporary workers) collect waste.

b.2.1 Collection Method

In areas where wise is collected separately, waste is separated into organic and other waste. In other areas, waste is mixed. The collection area is divided into five zones and a night collection area as follows.

The Katunayake Seeduwa UC is roughly divided into 11 zones. However, since there are only nine collection tractors and one tractor is responsible for one road, it is divided into nine main roads in total. On the main roads, the house-to-house collection is being conducted in one area, the kerbside collection in the other area. In the sub roads, there are three collection points that were created by residents naturally, and the primary collection is conducted by hand carts. Waste collected by the primary collection is transported to the temporary collection point and collected by tractors.

In the airport area, nocturnal collection is conducted.

GND CODE	GND NAME
150	Air Force Camp
149	Evariwatta
142B	Kurana Katunayaka Central
142	Kurana Katunayaka North
142A	Kurana Katunayaka South
143	Katunayaka North
143A	Katunayaka South
144A	Liyanagemulla North
148	Amandoluwa
144	Liyanagemulla South
147	Seeduwa
145A	Mookalangamuwa East
145B	Mookalangamuwa West
145C	Bandarawatta East
145	Bandarawatta West
146	Ambalammulla

POINT	NAME
BT	Buddhist Temple
CB	Cemetry Building
CH	Church
CO	Custom Office
COB	Commercial Building
H	Hospital
PO	Post Office
POS	Police Station
RS	Railway Station
RTS	Radio Transmission Station
S	School
SB	School for Blind
SPO	Sub Post Office
TH	Town Hall
TTC	Technical Training Centre

Figure 4-63: Collection area in Katunayake Seeduwa UC (as of Nov. 2015)

Collection coverage of the UC is 100% by area basis. The following table shows the collection method and frequency of waste collection.

Table 4-140: Waste collection methods and frequency of Katunayake Seeduwa UC

Area	Type of waste	Collection method	Frequency
Residential area	Mixed waste	House-to-house collection or kerbside collection	Everyday
Nonresidential area	Mixed waste	House-to-house collection or kerbside collection	Once every other day
Village	Mixed waste	House-to-house collection	Once/week

Note that after the introduction of separate collection, organic waste will be collected six days per week (Monday to Saturday), and other waste will be collected once a week (Sunday).

b.2.2 Collection Amount

Waste collected by the Katunayake Seeduwa UC is transported to the Pilapitiya Kumbura DS. As there is no truck scale in the DS, the accurate collection amount is not recorded. However, if it is estimated from the number of truck loads (1load ≒ 1.5ton), which is 20-23 loads/day, the collected amount is about 30-35ton/day. This amount also includes 1 load/day from the Prima Chicken Farm, 1 load/week from the Logistic Company, 2 loads/day from the Sri Lankan Catering Company and 1 load/day from the Sri Lanka Air Line.

b.2.3 Collection Fee

The Katunayake Seeduwa UC does not collect any waste collection fees from households. On the other hand, they collect fees from some of the large waste generators depending on the type of waste. They do not collect fees from business entities in the Export Promotion Zone.

Table4-141: Collection fee of Katunayake Seeduwa UC

Target	Type of waste	Collection fee	Remarks
Household	General waste	Free	
Logistics Co., Ltd.	General waste	1,710 LKR/Load	
Sri Lankan Catering Co., Ltd.	General waste	2,500 LKR/Day	Directly brought to the DS
Prima Chicken Farm	General waste	1,140 LKR/Load	Directly brought to the DS
Large generator	Green waste	1,500 LKR/Load	
Large generator	Construction waste	Free	Reused for filling of the lands(Collection amount is 5-10Load /month)

b.2.4 Collection Vehicles

The Katunayake Seeduwa UC has nine tractors which are in charge of nine different routes for waste collection. The following table shows the number of collection vehicles belonging to the UC.

Table4-142: Collection vehicles of Katunayake Seeduwa UC

Type of vehicles	Number	Number not in operation (average)
Tractor with trailer	9	1
2-wheel Tractor with trailer	2	
Hand cart	10	
Three wheeler	2	

The UC keeps the driving record of each vehicle including mileage and collection areas covered.

b.2.5 Maintenance Methods of Collection Vehicles

The Katunayake Seeduwa UC has a workshop but no engineer. Therefore some simple repair work can be done by the repair and solder specialist there but for other repair work an engineer(s) from other municipalities (Ja Ela) come to recommend which workshop the UC should outsource the repairs to.

The vehicle approval process for repairs and purchase of components is as follows: for one repair, or if the purchase is 10,000 rupees or less, it is necessary to get the recommendation of the Superintendent of Works (SW) and the approval of the chairman; repair(s) or purchase(s) of 25,000 rupees or less, the SW recommendation and the approval of the council is necessary;. repair(s) or purchase(s) exceeding 25,000 rupees requires a recommendation from the mechanical engineer and the Council's approval.

Regarding the approval process of purchasing spare parts and repair work, if the purchase or repair work costs less than 10,000 LKR, the recommendation of the Superintendent of Works (SW) and the approval of the chairman is needed. For purchase(s) or repair(s) less than 25,000 LKR, the recommendation of the Superintendent of Works (SW) and the approval of the Council are needed. And for purchase(s) or repair(s) exceeding 25,000 LKR, the recommendation of a mechanical engineer and the approval of the Council are necessary.

Excluding simple repair works, all these approval processes are required, which takes time. Therefore, it is most likely to interfere with waste collection service(s).

Photo：Workshop in the back of the Katunayake Seeduwa Urban Council

b.3 Intermediate Treatment

In the Katunayake Seeduwa, there is one recycling center where recyclables are sorted and stored. Although the center was established in 2009, it is not working at present. However, it will be resumed after the introduction of separate collection at the end of November, 2015.

Table 4-143: Intermediate treatment facilities in Katunayake Seeduwa UC

Type	Execution body	Address	Capacity (ton/day)	Year of establishment	Remarks
Recycling Center	UC	Kasagaha watta in Liyanagemulla	0.5	2009	Failed in 2013 due to political issues but will be resumed after introduction of separate collection

b.4 Final Disposal

The Pilapitiya Kumbura disposal site in the Katunayake Seeduwa UC is in Ambalammula village which is located 2.7km southwest from the UC. Waste has been dumped into this wetland, which is sandwiched between the highway and the southern end of the Negombo lagoon, since 1900. The total area is 10 acres (about 4ha).

One council official resides in the disposal site to check the transported waste. According to the data, collection tractors of the UC make roughly 20 trips (about 30 tons) per day.

The UC had been levelling and compacting the landfill using the leased bulldozer until March 2015 to secure the passage for when collection vehicles have difficulty entering. However, the UC decided to outsource the landfill operation because the operation is too complicated. They selected a construction company through bidding and left the operation to them from April 2015. The landfill equipment placed at the disposal site consists of only one D4-class bulldozer and is used for daily levelling.

Although each vehicle loading is recorded as described above, the boundary of the disposal site itself is not clear and waste is dumped wherever there is available space, which is referred to as an open dump.

Near the landfill entrance

Tractor of UC transporting waste to the DS

At the disposal site, the cement company called HOLCIM once planned to make organic waste into compost and inorganic waste into RDF, and then reuse them in the cement factory in Puttalam in the North Western Province. However the preparatory geological survey found that the cost to do the foundation work of the facility would be substantial because the disposal site was located on a peat layer. Therefore the plan was aborted. The fences in the above photo are those that the company set-up in order to identify the planned construction site.

b.5 Issues of the Technical System

Regarding collection and transportation, collection vehicles and engineers who do maintenance works are insufficient; therefore the UC outsources the repair works of collection vehicles. In addition, it takes time to go through the approval process for repairs within the UC, which affects the collection service once collection vehicle(s) have some problems. It also results in many cases of illegal dumping.

As for the intermediate treatment, although the UC has a plan to introduce separate collection of organic waste, scenarios for the compost facilities or the material recovery facilities of inorganic waste after collecting waste have not been considered. The absence of a long-term plan to establish an appropriate waste management system including the improvement of the collection rate is a problem.

The final disposal site is an open dump where waste has been dumped and spread in the mangrove haphazardly, which causes a bad odor and scattering of waste. It is also considered to be one of the causes of water pollution of the lagoon and there is a high possibility of mass creation of pests and fires. There is a need for urgent measures for such cases.

c. Recycling Activities

c.1 Source Separation

In the Katunayake Seeduwa UC, source separation has not been realized due to mixed collection being conducted. We did not find any community recycling systems or recycling activities initiated by NGOs.

c.2 Reduction of Organic Waste

The Katunayake Seeduwa UC has distributed home compost bins with a subsidy (cost after subsidy is 1,000LKR/pc) for 250 households since 2000. The UC will provide another 40 compost bins in the future.

c.3 Recycling Valuable Materials

There are 4-5 middleman shops that buy and sell valuable materials in the Katunayake Seeduwa UC. Main valuable materials are cardboard, PET, metal, hard plastic, and glass. The collection workers extract these valuable materials from mixed waste during the waste collection and sell them on the way to the disposal site.

c.4 Issues of Recycling Activities

In the Katunayake Seeduwa UC, separate collection will be introduced in the future. Firstly, it is important to encourage source separation, then to establish a system (effective and hygienic storage and discharge method, setting the separate collection date and time, providing reliable collection services, etc.) that can be easily understood and adopted by residents.

d. Public Awareness

d.1 Current Situation of Public Awareness Activities

In the Katunayake Seeduwa UC, public awareness activities to promote source separation are being prepared as they plan to introduce separate collection from the end of November 2015. The following table shows the outline.

Table 4-144: Outline of Public Awareness Activities in Katunayake Seeduwa UC

Public Awareness Activities	
Execution body	UC (supported by the WMA & NNSWMSC)
Title	Promotion for source separation
Budget source	UC, WMA
Budget amount	50,000LKR （2015）
Methods	Announcement through house-to-house visit Community meeting Multimedia presentation Distribution of leaflet of waste separation

d.2 Participation Level and Manners of Citizens

The level of participation in source separation has not been evaluated as the separate collection has not been implemented yet. There are no complaints from residents on waste discharging manners.

d.3 Issues of Public Awareness Activities

The UC has already prepared public awareness activities for source separation but first of all, it is essential to set the discharging rules (target waste for separation, collection date, discharge point, and discharge method) in order for residents to easily understand. It is also necessary to implement environmental education in schools as well as households.

e. Finance

e.1 Financial Condition of the Municipal Council

The financial data of the Katunayake Seeduwa Urban Council (Katunayake Seeduwa UC) for the past three years are presented in the table below. According to the table, the financial results of the urban council were negative (deficit) in 2012 and positive in the latter two years. The amount of the differences between the revenues and the expenditures accounted for 14% of the annual revenues on average.

Table 4-145: Annual Revenue and Expenditure of Katunayake Seeduwa UC (Unit: Thousand LKR)

No	Category	2012	2013	2014	Annual Averages 000 LKR	%
1	Approved Budget	153,646	153,238	175,428	160,771	
2	Actual					
	Revenue	123,323	160,950	191,526	158,599	100.0%
	Own-source revenue	84,885	117,561	148,984	117,144	73.9%
	Grant	38,438	43,389	42,541	41,456	26.1%
	Expenditure	134,651	131,739	140,402	135,597	85.5%
	Recurrent	88,246	101,371	138,280	109,299	68.9%
	Capital	46,405	30,368	2,122	26,299	16.6%
	Profit or loss	-11,328	29,211	51,124	23,002	14.5%

Source: Katunayake Seeduwa UC, "Programme Budget: 2013-2015"

The share of own-source revenues in the total revenues is 74% on average while that of the grants is only 26%. Based on this, it is considered that the financial condition of the urban council is relatively stable since the amount of own source revenues is sufficient for financing the recurrent expenditures of the urban council.

Table 4-146: Breakdowns of the Municipal Annual Revenue of Katunayake Seeduwa UC (Unit: thousand LKR)

No	Types of Revenues	2012	2013	2014	Annual Average 000 LKR	%
1	Own-Source Revenues:					
	Rates & Taxes	55,991	63,922	94,771	71,561	45.1%
	Rents	6,722	14,375	9,941	10,346	6.5%
	License	2,112	2,394	3,251	2,586	1.6%
	Fees For Services	3,775	7,304	6,941	6,007	3.8%
	Warrant Costs And Fines	423	624	389	478	0.3%
	Other Income	15,863	28,942	33,691	26,165	16.5%
	Total Own-Source Revenues	84,885	117,561	148,984	117,144	73.9%
2	Grants:					
	Recurrent Grant:	23,767	43,389	40,205	35,787	22.6%
	Salaries	23,105	42,874	39,338	35,105	22.1%
	Council Members Allowances	412	515	867	598	0.4%
	Other Recurrent Grant	250	0	0	83	0.1%
	Capital Grants	14,670	0	2,337	5,669	3.6%
	Total Grants	38,438	43,389	42,541	41,456	26.1%
	Total	123,323	160,950	191,526	158,599	100.0%

Source: Katunayake Seeduwa UC, "Programme Budget: 2013-2015"

Considering the grants, the share of capital grants is small, accounting for only 3.6% of the total municipal revenues; and therefore, the majority of the grants are constituted from the block grants received from the central government for salaries and allowances of the council staff. On the other hand, the total of the capital expenditures occupies around 20% of the total expenditures of the urban council.

Based on this, it was considered that the majority of the capital expenditures were financed from the own-source revenues of the urban council or external funds such as bank loans and funds

released by the Local Loan and Development Fund.

Table 4-147Breakdown of the Annual Expenditure of Katunayake Seeduwa UC (Unit: Thousand LKR)

No.	Types of Expenditure	2012	2013	2014	Annual Average 000 LKR	Annual Average %
1	Recurrent Expenditure:					
	Personnel Emoluments	48,116	53,196	70,304	57,206	42.2%
	Travelling	158	82	100	113	0.1%
	Requisites and Equipment	10,254	14,574	22,516	15,781	11.6%
	Repairs and Maintenance of Capital Assets	12,121	15,581	22,998	16,900	12.5%
	Transportation, Communication, Utility and Other services	14,584	16,754	19,246	16,861	12.4%
	Interest	2,081	459	0	846	0.6%
	Grants, Subsidies and Contributions	560	427	689	559	0.4%
	Pensions, retirements, benefits and gratuities	371	299	2,426	1,032	0.8%
	Other expenditures					0.0%
	Total Recurrent Expenditures	88,246	101,371	138,280	109,299	80.6%
2	Capital Expenditure	46,405	30,368	2,122	26,299	19.4%
	Total Expenditure	134,651	131,739	140,402	135,597	100.0%

Source: Katunayake Seeduwa UC, "Programme Budget: 2013-2015"

Based on the above findings, it was considered that the Katunayake Seeduwa is a local authority with an average financial capability. According to the information provided by the urban council, the annual totals of revenues and expenditures are at the same levels. Although the urban council does not face difficulties in financing expenses of daily public services, the capability of the council is not sufficient for improving the quality of services since it requires additional investments.

e.2 SWM Finance

The table below shows the SWM expenditures of the Katunayake Seeduwa UC in the past three years. The annual SWM expenditures account for 20 to 30% of the total expenditures of the urban council.

Table 4-148: The Annual Budget and Actual Expenditure on SWM at Katunayake Seeduwa UC (Unit: Thousand LKR)

No.	Types of Expense	2012	2013	2014
A	Approved Budget	25,175	30,309	34,644
B	Actual SWM Revenue (Collected Waste Fees)	1,211	1,067	1,692
C	Actual SWM Expenditure:			
1	Personnel Emoluments	18,539	20,869	20,490
2	Supplies And Material Expenditures:			
	Equipment For Disposing Garbage			
	Fuel And Lubricants	4,998	7,507	13,269
	Uniforms for Workers		1	
	Boots for Workers			
	Awareness Program			
	Other supplies	801	602	261
	Total Supplies and Materials Expenses	5,799	8,110	13,530
3	Repairs And Maintenance of Vehicles	3,287	5,547	6,710
4	Final Disposal Payment	0	0	0
5	Other Expenses	826	851	204
	Total Expenditures	28,451	35,378	40,934
	Share of Collected Fees in the Total Expenditure	4.3%	3.0%	4.1%

Source: Katunayake Seeduwa UC, "Programme Budget: 2013-2015"

As the table shows, the amount of the total collected waste fees is not sufficient to finance even 5% of the total SWM expenses. Therefore, the urban council spends funds from other sources of revenue for financing the SWM expenses.

According to sources at the Katunayake Seeduwa UC, there are three companies that pay waste collection fees and tipping fees. Among the three, two companies (Sri Lankan Airport Catering Co., Ltd and Prima Co., Ltd) transport their waste directly to the disposal site managed by the urban council. Therefore, they pay only the tipping fee. Logistics Co., Ltd, the remaining company, receives collection services that the urban council provides. Therefore, the company pays the waste collection fee. All other generation sources such as households and businesses receive collection services for free of charge.

The waste collection fee and the tipping fee paid by the above three companies are presented in the table below.

Table 4-149: List of Waste Fees (Tax Included)

No	Types of Waste	Type of Fee	Unit	Tariff
1	Logistics Co., Ltd.	Waste fee	LKR/Load	1710.00
2	Sri Lankan Airport Catering Co., Ltd.	Tipping fee	LKR/Day	2500.00
3	Prima chicken farm	Tipping fee	LKR/Load	1140.00

Source: Katunayake Seeduwa UC (results of interview surveys)

e.3 Problems Identified in the SWM Financial System

The problem found in the SWM financial system of the Katunayake Seeduwa UC is the implementation of waste collection service for free of charge.

4.9.3 Waste Amount and Composition Survey

a. Waste Generation Amount

The waste generation amount was calculated and revised with 2015 estimations based on the waste generation rate of Kandy City obtained by SATREPS in November 2012 and waste generation units obtained by a locally outsourced survey. The results revealed that the municipal waste generation amount is 57.6 ton/day and waste generation rate is 929g/person/day.

Table 4-150: Waste Generation Amount of Katunayake Seeduwa UC

Source		Generation rate		Generation sources	Generation (ton/day)
Residential	Collection	0.41	Kg/person/day	61,986	24.2
Commercial	Hotels (large)	600.00	Kg/(hotel)	7	4.2
	Hotels (middle & small)	56.00	Kg/(hotel)	12	0.7
	Restaurants (large)	200.00	Kg/(hotel)	14	2.8
	Restaurants (middle)	112.50	Kg/(restaurant)	9	1.0
	Restaurants (small)	21.60	Kg/(restaurant)	0	0.0
	Organic-shops (large)	350.00	Kg/(restaurant)	3	1.1
	Organic-shops (middle)	20.00	Kg/(shop)	72	1.4
	Organic-shops (small)	4.76	Kg/(shop)	88	0.4
	Non-organic shops (large)	40.00	Kg/(shop)	5	0.2
	Non-organic shops (middle)	15.00	Kg/(shop)	18	0.3
	Non-organic shops (small)	1.69	Kg/(shop)	468	0.8
Institutions	Schools	12.50	Kg/(school)	11	0.1
	Hospitals	300.00	Kg/(hospital)	4	1.2
	Other institutions	9.17	Kg/(institution)	53	0.5
	Other educational institutions	8.00	Kg/(institution)	4	0.0
	Buddhist temples	5.15	Kg/(temple)	9	0.0
	Hindu temples	37.08	Kg/(temple)	15	0.6
	Mosques	1.50	Kg/(mosque)	0	0.0
	Churches	10.00	Kg/(church)	0	0.0
Market		1,500.00	Kg/(public market)	7	10.5
Industries		190.00	Kg/(industry)	40	7.6
Total					57.6

b. Waste Composition

Waste composition applies the results of the waste composition survey conducted by the Waste Management Authority of the local authorities in the Western Province in 2013 and it is revised for 2015. As a feature, the proportion of sawdust and paddy husk from the sawmill is as high as 22.6%. The organic waste including kitchen waste is 75%. The recyclable waste is 19.7%.

Table 4-151: Waste Composition of Katunayake Seeduwa UC

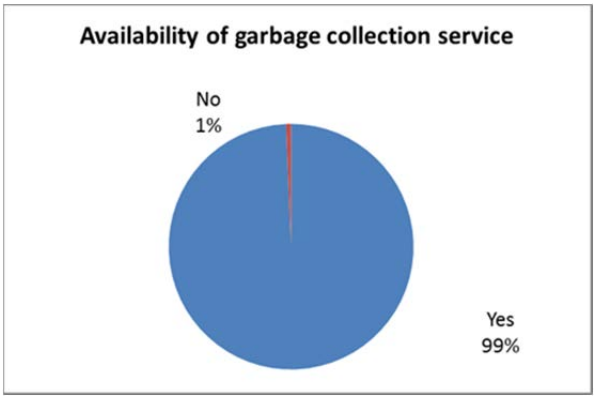
Category	Rate
Kitchen waste	52.4%
Paper	8.8%
Textiles	4.3%
Sawdust/paddy husk	22.6%
Polythene/Plastic & Plummer	4.1%
Metal	0.6%
Glass & bottles	1.9%
Street sweeping waste	4.3%
Other	0.9%
	100.0%

4.9.4 Results of Public Opinion Survey

99% of the surveyed households are Sinhalese, and 1% is Muslims. Data on the average number of people per household and monthly income is set out in the table below.

Table 4-152: Average and standard deviation values of income and family size

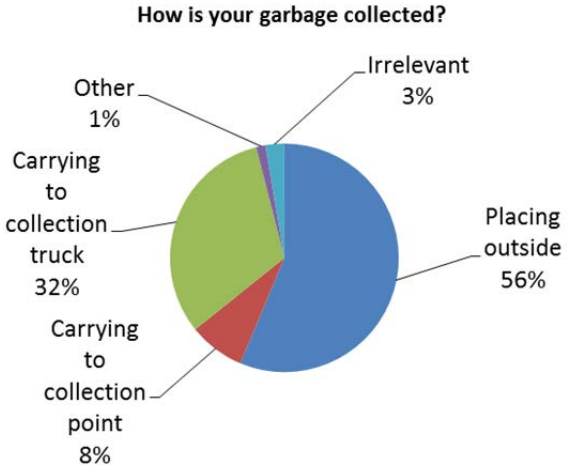
Category	Number of sample	Average of family members / employees	Income/Turnover (LKR/month)
High	46	5.5	184, 348
Middle	59	4.0	75, 237
Low	46	4.5	33, 957
Business	42	2.3	927, 619



Items	No. of sample	%
Yes	149	99
No	2	1
Total	151	100

Figure 4-64: Availability of garbage collection service in the Katunayake-Seeduwa MC

In the Katunayake-Seeduwa UC, 99% of surveyed households are provided with a garbage collection service, of which 93% stated they use this service. Only 48% of surveyed households are "very satisfied" with the present SWM services provision, while 33% are "somewhat satisfied". About 19% of surveyed households are either "not satisfied at all" or "less than satisfied".



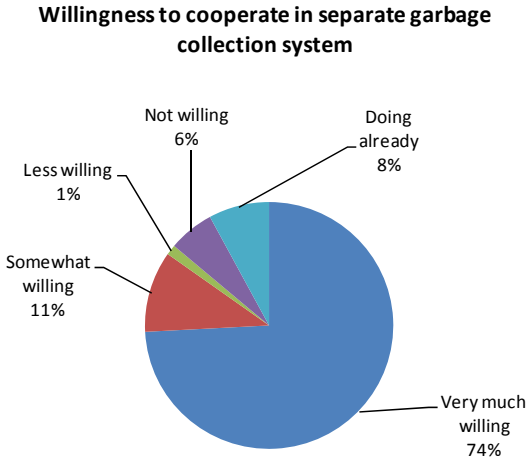
Items	No. of sample	%
Placing outside	84	56
Carrying to collection point	12	8
Carrying to collection truck	48	32
Other	2	1
Irrelevant	5	3
Total	151	100

Figure 4-65: Method of garbage discharge by residence in KSUC area

- ✓ Households' main methods of waste discharge are shown in upper Figure. The most common methods are discharging it outside their premises for house to house collection (56%) and carrying garbage to the collection truck (32%).
- ✓ Only 26% of surveyed households receive a daily garbage collection service, 30% stated

that they received the service 2-3 times/week and 20% receive the service once in a week. Similarly, 48% discharge their garbage daily, 12% discharge their garbage 2-3 times per week, and 23% as soon as it is generated.

- ✓ In general, adult females handle waste in about 77% of surveyed households.
- ✓ As shown in lower Figure, only 8% of households separate their garbage into organic and inorganic waste at the source of generation. Only 7% of surveyed households are not/less willing to cooperate with source separation for recycling. Rests of the household are very much willing (74%) and somewhat willing (11%) to cooperate in the source separated garbage collection system.
- ✓ Further, 70% of surveyed households stated that there are recyclable collectors or someone who comes to collect their reusable or recyclable materials. Hence, an informal recycling system is well established in the Katunayake-Seeduwa UC area.



Items	No. of sample	%
Very much willing	111	74
Somewhat willing	17	11
Less willing	2	1
Not willing	9	6
Doing already	12	8
Total	151	100

Figure 4-66: Willingness of residences to participate in the source separated garbage collection system in the Katunayake-Seeduwa MC

- ✓ Only22% of surveyed households use kitchen/garden waste for composting and also used the finished compost for their own garden.
- ✓ Not many surveyed households (79%) have ever discussed proper garbage discharge methods at the community level.
- ✓ 85% of households stated that SWM awareness programmes are very necessary while 12% stated “somewhat necessary”. Only 3% of surveyed households stated that awareness campaigns are not necessary or not needed at all.
- ✓ 66% of household do not like to pay for SWM services mainly because of the revenue tax they paid for KSUC. The average WTP (willingness to pay) for improved SWM services is 64 ± 127 LKR/month per household.
- ✓ Out of all surveyed households, 42% stated that they sell/give away glass & bottles for recycling and 56% of residences sell/give-away plastics for recycling. Also, 28% of household sell/ give-away cans & metals for recycling. Cardboard and paper recycling were 28% and 41% respectively.

4.9.5 Waste Flow

The Current waste flow has been prepared by analyzing the locally outsourced public opinion

survey, statistical data collection, and the census results.

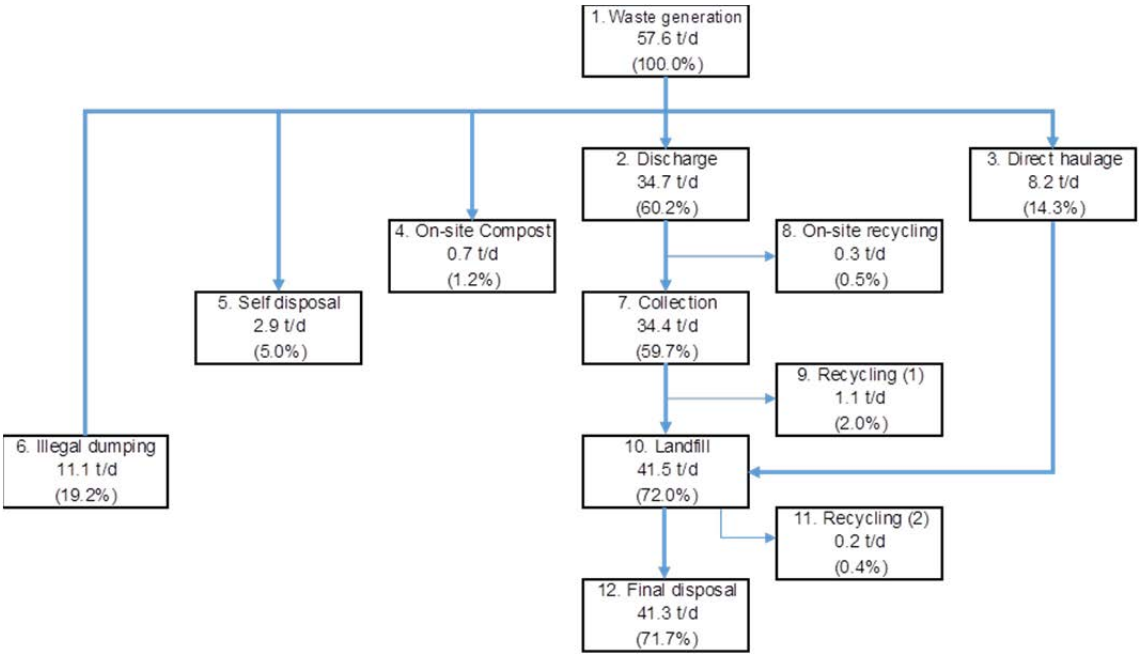


Figure 4-67: Waste Flow of Katunayake Seeduwa UC

According to the waste flow, the collection rate ((discharge amount + direct loading amount)/generation amount) is 74.5%, self-disposal such as burning and burying on site is 5.0%, and illegal dumping is 19.2%. The total recycling rate including compost and recycling activities is as low as 4.1%.

4.9.6 Current Situation of Other Waste Management

a. Current Situation of Industrial Waste Management

a.1 Generation Amount & Disposal Amount

The generation amount of general waste from businesses such as shops is collected together with general municipal waste, therefore the generation and disposal amount of industrial waste are not recorded. As waste generated from the Export Promotion Zone is controlled by the Board of Investment (BOI), the UC is not involved.

a.2 Collection, Transportation and Disposal

General waste from businesses is collected together with general municipal waste and discharged at the Pilapitiya Kumbura DS. The UC is not involved in the handling of the hazardous waste of industrial waste.

a.3 Tipping Fee

The tipping fee (gate fee) of industrial waste collected with general municipal waste is free of charge.

b. Current Situation of Medical Waste Management

b.1 Generation Amount & Disposal Amount

In the Katunayake Seeduwa UC, there is only one small hospital and the generation amount of general waste from this hospital is not recorded as it is collected with general municipal waste.

b.2 Collection, Transportation and Disposal

General waste generated from this hospital is collected by the UC and transported to the Pilapitiya Kumbura DS. However, medical waste is disposed by the hospital itself and the UC is not involved.

b.3 Tipping Fee

The tipping fee (gate fee) of medical waste collected with general municipal waste is free of charge.

c. Current Situation of Night Soil Management

c.1 Generation Amount & Disposal Amount

The accurate amount of night soil is not recorded by the UC.

c.2 Collection, Transportation and Disposal

Night soil is collected by the Katunayake Seeduwa UC and transported to the National Water Supply and Drainage Board Treatment Plant located at Ekala. The tipping fee being charged at the plant is 856LKR/load.

c.3 Tipping Fee

The tipping fee for households within the city limit is 1700LKR/load, for government institutions it is 750LKR/load, and for commercial entities it is 4,500LKR/load (excluding VAT). On the other hand, outside the city limit, for households it is 2,500LKR/load + transport (60LKR/km), and for commercial entities it is 6,000LKR/load + transport (60LKR/km) (excluding VAT).

4.9.7 Needs for Solid Waste Management

a. Improvement of Technical System

a.1 Improvement of Collection Service Rate

According to the waste flow, the collection service rate of the Katunayake Seeduwa UC is 74.5% but 19.2% out of total waste generation amount is illegal dumping. Therefore, further improvement of the collection rate is desired.

a.2 Improvement of Final Disposal Site

In the Pilapitiya Kumbura disposal site, waste has been dumped in the wetland for many years. It is said that the total area is 10 acres (about 4ha) but the boundary of the disposal site itself is not clear and landfilling is randomly conducted wherever it's accessible. The disposal site is located in the sea side across the highway, but it is assumed that waste will be scattered and spontaneous combustion will occur if the current situation continues as it is. As a result, there will be a traffic problem connecting the airport and Colombo city. There is an urgent need for improvement of the final disposal site.

b. Improvement of Organization and Legislation

b.1 Optimization of Collection Service Fee

The Katunayake Seeduwa UC has sources of large-scale waste generation such as the Katunayake International Airport and the Export Promotion Zone. Waste generated from these sources is collected and transported by the UC under a contract basis, however, the UC is forced to provide the collection service at an unreasonably low fee. Proper waste disposal requires the necessary costs to be covered, therefore an appropriate waste collection and disposal fee for large waste generators needs to be introduced.

b.2 Optimization of Disposal Site Management

The landfill management of the final disposal site has been outsourced to a local construction company since 2015. However, the specifications of the landfilling operation and its management system are not sufficient because of the limited budget. Therefore, it is desirable to optimize specification, price, and management system in relation to landfill operation.

4.10 Dehiwala Mt. Lavinia Municipal Council in Western Province

4.10.1 Outline of the LA

Dehiwala Mt. Lavinia is the city of the Colombo District in Western Province, Sri Lanka. It is situated immediately south of Sri Lanka's largest city Colombo and has strong ties with the capital city as a suburb of Colombo. It includes the most urbanized center of Dehiwala and the beach resort of Mount Lavinia. The total area is 20.19Km2.

The Dehiwala district is located on the border to Colombo. Due to its rapid industrialization and urbanization in recent years, the cheaper land has resulted in a real estate boom with hyper-markets, department stores and apartment complexes dotting its skyline. It is also home to Sri Lanka's National Zoological Gardens which remains one of Asia's largest. Dehiwala has become an attractive location for holiday accommodation facilities for both business travelers and holiday makers as a result of its close proximity to Colombo and Mount Lavinia beach. The town has also suffered extensive pollution as a result of uncontrolled growth and heavy congestion.

Mount Lavinia district, located in the southern part of the city, is mostly residential suburb. It has beach resorts and restaurants and has been a hot spot for tourism and laid back nightlife.

Colombo's climate is fairly temperate all throughout the year. From March to April the temperature averages around 31 degrees Celsius maximum.The only major change in the Colombo weather occurs during the monsoon seasons from May to August and October to January. This is the time of year where heavy rains can be expected. Colombo sees little relative diurnal range of temperature, although this is more marked in the drier winter months, where minimum temperatures average 22 degrees Celsius. Rainfall in the city averages around 2,400 millimetres a year.

The Dehiwala Mt. Lavinia MC has 29 GN divisions and is constituted by exactly 29 Wards. Population trend in 2010-2015 of Dehiwala Mt. Lavinia MC is as follows.

Table 4-153: Population Trend of Dehiwala Mt. Lavinia MC (2010-2015)

Year	2010	2011	2012	2013	2014	2015(Sept.)
Population	NA	NA	182,996	NA	185,235	NA

Source: Divisional Secretariat, Dehiwala & Divisional Secretariat, Ratmalana

4.10.2 Current Status and Problems of Solid Waste Management

a. Organization and Legal System

a.1 Legislation and Policy

Dehiwala Mt. Lavinia MC implements solid waste management and sewage treatment activities based on the section 129-131 of the Municipal Council Ordinance (1947) and the Public Nuisance Ordinance (1863).

In 2001, "Solid Waste Management Policy of Dehiwala Mt. Lavinia MC" has been formulated, which stipulates rough guidelines of SWM of MC. However, the update is under consideration as the content is too old.

a.2 Solid Waste Management Plan

MC has not formulated any master plan or action plan related to the SWM.

a.3 Organization

Dehiwala Mt. Lavinia MC has Solid Waste Management & Environment Protection Standing Committee which is assisted by Solid Waste Management Department (SWMD). Deputy Commissioner is supposed to concurrently serve as the head of SWMD but it's position is currently vacant as of October 2015. The role of SWMD is as follows:

- Waste collection and transportation Service
- Public health activities (Dengue)
- Road sweeping
- Public awareness on waste separation

Furthermore under the SWMD, there is Refuse Collection & Disposal Division where Chief Public Health Inspector (CPHI), PHI, and Health Supervisor are allocated. They are responsible for cleaning services and waste collection and transportation of each Ward. Health Education Officer (the counterpart of JOCV/Environmental Education) carries out public awareness programs for waste seprataion. Environment Asst. (vacant as of Oct. 2015) implements other environmental protection programs. While Mechanical Engineers in the Transport & Engineering Division are in charge of maintenance, repair, and inspection of the collection vehicle such as tractors and trailers.

In Dehiwala Mt. Lavinia MC, Technical Officer (TO) does not exist, but 2 MOHs exist but they are not actively involved in SWM activities.

The following figure shows the organizational structure and the staffs of Dehiwala Mt. Lavinia MC.

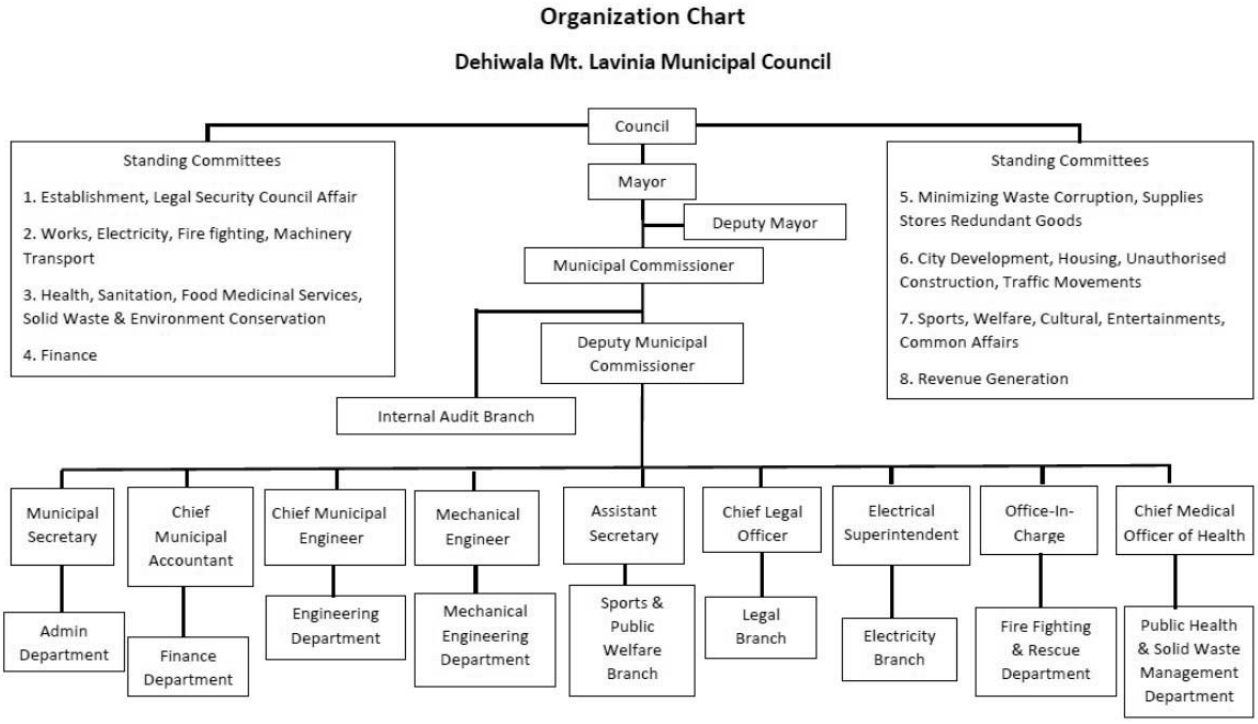


Figure 4-68: Organizational chart of Dehiwala Mt. Lavinia MC

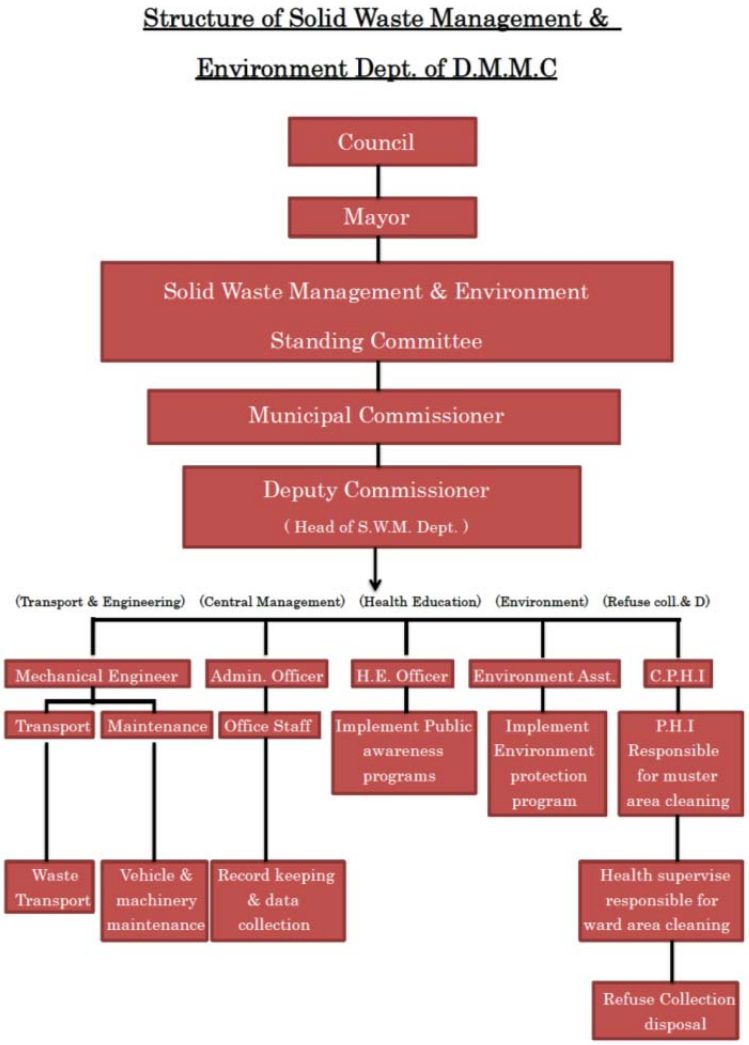


Figure 4-69: Organizational chart of SWM section in Dehiwala Mt. Lavinia MC

Table4-154: Staff related to SWM in Dehiwala Mt. Lavinia MC

Staff		Number	Remarks
Engineer		1	
TO(Technical Officer)		0	
Health Education Officer		1	Counterpart of JOCV/Environmental Education
MOH(Medical officer of health)		2	Not involved in SWM
PHI(Public health inspector)		13	
SV(Supervisor)		35	
Collection workers	Permanent	443	Including road sweepers
	Temporary	0	
Driver	Permanent	52	
	Temporary	0	
Disposal site workers	Permanent	―	
Other (Compost yard)	Permanent	―	
Total			

a.4 Issues of Organization and Legal System

MC has not formulated any master plan or action plan related to SWM. Existing"Solid Waste Management Policy of Dehiwala Mt. Lavinia MC"had been formulated more than 15 years ago so it is already outdated. MC should update it and upgrade to the SWM master plan based on this policy.

b. Technical System

b.1 Storage and Discharge

In Dehiwala Mt. Lavinia MC, the separate collection systems has been implemented in some area in the end of October 2015. However, containers for separated organic waste have not been distributed yet to each households (currently asking WMA for providing containers for waste separation). Therefore, residents have been instructed to discharge separated organic waste and other waste in a different plastic bag. Since the door-to-door collection is provided by MC, residents put waste on the roadside in the morning of the designated collection day.

b.2 Collection and Transportation

Dehiwala Mt. Lavinia MC directly collects and transports waste from the households. Under the supervision of PHI and SV, 52 collection drivers and 443 collection workers (including road sweepers) collect waste.

b.2.1 Collection Method

In the separate collection area, waste is separated into organic and other waste. From the end of October 2015, firstly separate collection system has been implemented in Ward # 16 ~ 29 of Rathmalana district on pilot basis, and it will be extended to all other MC including Ward # 1 ~ 15 of Dehiwala district within two months.

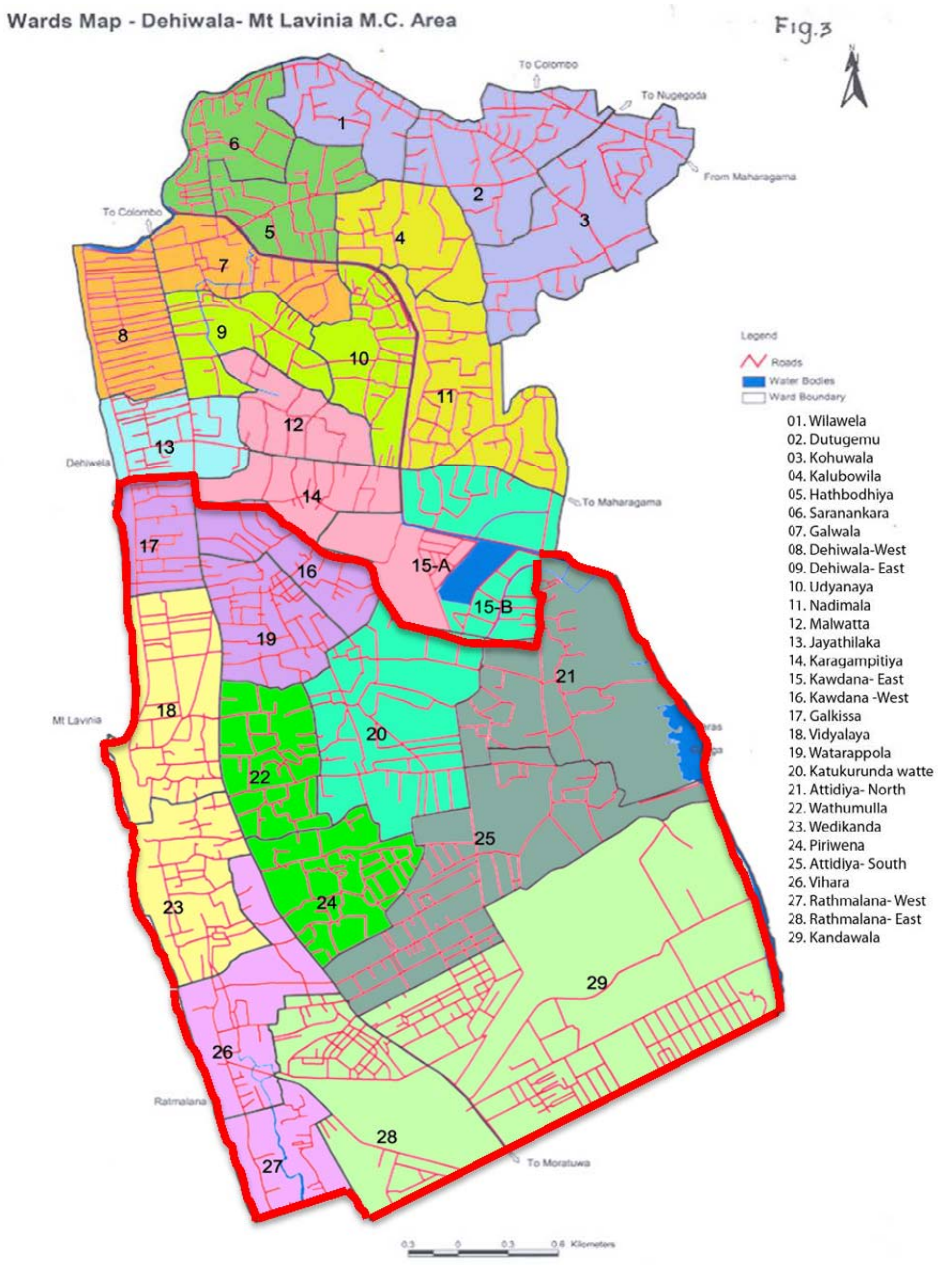


Figure 4-70: Separate collection is in Dehiwala Mt. Lavinia MC (as of Nov. 2015)

Collection coverage of MC is 100% on area basis. The following table shows collection method and frequency of waste.

Table4-155: Waste collection methods and frecuency of Dehiwala Mt. Lavinia MC

Area	Type of waste	Collection method	Frecuency	Remarks
Ward # 1－15	Mixed waste	House-to-house collection	3 times/week	Planning to implement bell collection system in the future
	Organic waste	House-to-house collection	Twice/week	
Ward # 16－29	Other waste	House-to-house collection	Once/week	

b.2.2 Collection Amount

Waste collected by Dehiwala Mt. Lavinia MC is transported to the Karadiyana DS, according to the truck scale installed in the DS, collection volume is 170 ton/day.

b.2.3 Collection Fee

Dehiwala Mt. Lavinia MC does not collect any waste collection fee from household. On the other hand, they collect fee by truck load from large waste generators (more than 500kgs/day) depending on the type of waste. Currently they collect fee from approximately 900 large waste generators. They do not issue the trade licence if those large waste generators do not pay the collection fee.

Table4-156: Collection fee of Dehiwala Mt. Lavinia MC

Target	Type of waste	Fee(LKR/load)	Collection method
Household	General waste	Free of charge	―
Large generator	General waste	1,900	Pay cash or cheque to
Large generator	Green waste	2,200	MC each month

b.2.4 Collection Vehicles

The MC has sufficient collection vehicles to provide a collection service to the entire MC. Also hand carts are used for primary collection in order to provide collection service in the inaccessible areas. The following table shows the number of collection vehicles number.

Table4-157: Collection vehicles of Dehiwala Mt. LaviniaMC

Type of vehicles	Number	Number not in operation(average)	Remarks
Compactor truck (6-8m3)	15	3－5	
Skip hoist	2		One is kept for emergency
Dump truck (6m3)	8		
Tractor with trailer	25		
Hand cart	45		Used for primary collection & road sweeping

However, most of the collection vehicles are getting old and breakdown can be found frequently. The following table shows the manufactured year of each collection vehicle.

Table4-158: Manufactured year of collection vehicles in Dehiwala Mt. Lavinia MC

Type of vehicle	Capacity	Registration No.	Manufactured year
Dump truck	6 ㎥	LK-2685	2012
Dump truck	6 ㎥	226-2046	1998
Dump truck	6 ㎥	226-2048	1998
Dump truck carrier	8 ㎥	226-2011	1998
Dump truck		226-2061	1998
Compactor	8 ㎥	226-2010	1998
Compactor	4 ㎥	226-2039	1998
Tractor	5 ㎥	RC-8865	2012

Type of vehicle	Capacity	Registration No.	Manufactured year
Compactor	4 ㎥	LD-6732	1996
Tractor	5 ㎥	RD-1607	2012
Tractor	5 ㎥	RA-9804	2007
Compactor	6 ㎥	LA-1053	2004
Compactor	8 ㎥	226-2008	1998
Tractor	5 ㎥	RC-8465	2012
Tractor	5 ㎥	49-6543	1996
Tractor	5 ㎥	RC-8872	2012
Compactor	4 ㎥	LG-3667	1996
Tractor	5 ㎥	49-6548	1997
Compactor	4 ㎥	226-2035	1998
Tractor	5 ㎥	49-6523	1996
Tractor	5 ㎥	HC-2492	2003
Compactor	8 ㎥	226-2014	1998
Tractor	5 ㎥	49-6529	1996
Tractor	5 ㎥	HC-2481	2003
Tractor	5 ㎥	RA-9803	2007
Tractor	5 ㎥	49-6549	1996
Tractor	5 ㎥	RG-9174	2012
Tractor	5 ㎥	49-6550	1996
Compactor	4 ㎥	226-2042	1998
Compactor	4 ㎥	226-2040	1998
Tractor	5 ㎥	RA-9798	2008
Tractor	5 ㎥	RC-0031	2012
Tractor	5 ㎥	49-6519	1995
Dump truck	6 ㎥	LK-2681	2012
Dump truck	6 ㎥	LK-2677	2012
Dump truck	6 ㎥	LK-2679	2012
Compactor	6 ㎥	LK-2683	2012
Compactor	6 ㎥	226-2041	1998
Compactor	4 ㎥	226-2037	1998
Tractor	4 ㎥	RA-1769	2005
Tractor	5 ㎥	49-6525	1996
Compactor	5 ㎥	LA-1052	2004
Tractor	6 ㎥	RA-9807	2007
Tractor	5 ㎥	RA-9812	2007
Tractor	5 ㎥	RA-9799	2008
Compactor	8 ㎥	226-2012	1998
Dump truck	6 ㎥	226-2049	1998

Furthermore, the MC keeps the driving record including mileage and collection areas covered by each vehicle.

b.2.5 Maintenance Methods of Collection Vehicles

Dehiwala Mt. Lavinia MC has it's own workshop in their compound where most of the maintenance and repar works are done. Regarding the approval process of purchase of spare parts and repair work, if the purchase or repair work costs less than 15,000 LKR, only need the approval of chief engineer. For more than 15,000 LKR of purchase or repair needs the Council's approval. The approval process goes smoothly without any pending case, it is less likely to interfere with waste collection service.

Photo：Workshop of Dehiwala Mt. Lavinia MC

b.3 Intermediate Treatment

In Dehiwala Mt. Lavinia, there are one small-scale biogas facilities and two recycling facilities where recyclables are going to be sorted and stored after implementation of separate collection.

Recycling facilities are planned to reuse the existing resource center. At present, valuable materials are taken out by the collection workers during the collection and sold to the middleman shop on the way to DS but after implementation of waste separation, other waste including valuable materials are going to be transported and sorted in the recycling facilities. Waste to be received in this facility includes not only waste collected by MC but also waste brought by neighbouring residents.

However, since the capacity of the facility is limited, not all other waste is transported to the facility. It is planned to target neighbouring areas of the facility such as Ward 15 (Kawduna-east) and Ward 20 (Katukrunda watte) first. Then if it goes successfully, it will be expanded to Ward 21 (Attidiya-north) and to Ward 25 (Attidiya-south).

Valuable materials sorted by type will be sold to recyclers and income from the sale will be shared among collecting workers.

Table4-159: Intermediate treatment facilities in Dehiwala Mt. Lavinia MC

Type	Execution body	Address	Capacity (ton/day)	Year of establish ment	Remarks
Biogas	Established by HELPO(NGO) & maintained by MC	Bodavita	0.5	2010	Biogas is supplied for the 4 households.
Recycling Center 1	Established by NGO & maintained by MC	Bodavita	—	2003	Facility was established by the NGO as a resource center, but failed. It expected to be utilized as material recovery facility after implementation of separate collection.
Recycling Center 2	Established by NGO & maintained by MC	Bodavita	—	2006	

*Based on the interview with Officer of Dehiwala Mt. Lavinia MC

Photo：Recycling Center

b.4 Final Disposal

Since the waste of Dehiwala Mt. Lavinia MC is transported and disposed in Karadiyana DS, please refer the section of b.4 Karadiyana DS of 4.7 Moratuwa MC.

b.5 Issues of Technical System

Regarding the issue of collection and transportation, any kind of container for separated organic waste is not distributed to the residents, therefore it is inefficient for collection workers to open the plastic bag to check whether it is organic waste or other waste each time of the loading. In order to make it more efficient and hygienic, container for separate collection should be distributed to the residents.

Since the collection vehicle is too old, new vehicles shall be replaced.

As for the intermediate facility, the two existing Resource Center has been decided to be operated as a recycling facility after the implementation of separate collection. Several issues should be considered such as collection management system of other waste, sorting system and operating system of the facility and data management systems etc. In addition, these recycling facilities are located in residential areas, therefore sufficient environmental measures against such offensive odors and flies are also required.

c. Recycling Activities

c.1 Source Separation

In some areas of Dehiwala Mt. Lavinia MC in 2013, buckets for separated organic waste were distributed by WMA to residents. However, residents used them for cooking or washing at home as the public awareness activities were not fully implemented.

Any community recycling system or recycling activities initiated by NGO was not found in this MC.

c.2 Reduction of Organic Waste

Dehiwala Mt. Lavinia MC does not subsidise any home compost bins. Since the MC has large commercial area and also collection service coverage is high, incentive for home compost bins is low.

c.3 Recycle of Valuable Materials

It is said that approximately 50-60 middleman shops that buy and sell valuable materials exist in Dehiwala Mt. Lavinia MC. According to the interview with one of these shops (registered), about 60% of valuable materials is collected by collection workers employed by middleman shop or by informal collection workers, about 10% is collected by collection workers of MC, about 30% is collected by residents. The summary of the interview is shown below.

Table4-160: Purchase of valuable materials at Middleman Shop

Type of valuables	Collection amount (ton/month)	Buying price (LKR/kg)	Selling price (LKR/kg)	Destination	Remarks
Plastic	0.5	20	25	Plastic Recycler(Piliandara)	
PET	0.15	10	15	PET Recycler	
Polythene	0.2	20	25	Recycler	
Metal 1	2.5	20	25	Melters	Other than Metal2
Metal 2	0.5	15	20	Melters	Fish can etc.
Glass	1.5	3	4	Ceylon glass company	
Cardboard	3	10	15	Exporter to India	
Paper	1	5	7	Exporter to India	Mainly used book

＊Based on the interview with Mideleman Shop owner

Photo：Middleman shop in the city

c.4 Extraction of Valuable Materials by Collecting Worker

In Dehiwala Mt. Lavinia MC, valuable materials are taken out by MC collection workers during the waste collection and the recovered amount has been recorded by the MC. The average recovery rate from April 2014 to March 2015 is 0.88%. The following table shows collection amount of valuables by collection workers.

Table4-161: Collection amount of valuables by collection workers（Apr. 2014～Mar. 2015）

Recyclable items		2014 Apr	May	Jun	Jul	Aug	Sep
Plastic	Kg/month	11,856.00	8,808.00	8,238.40	7,852.60	6,515.64	7,396.56
PET	Kg/month	17,784.00	13,211.00	12,357.60	11,778.90	12,669.30	13,149.44
Metal	Kg/month	8,299.20	6,165.00	5,766.80	5,496.80	3,619.80	4,931.04
Glass	Kg/month	11,856.00	8,808.00	8,238.40	7,067.30	7,601.58	9,040.24
Coconut shell	Kg/month	592.80	440.00	411.90	392.60	723.96	410.92
Cardboard & paper	Kg/month	8,892.00	6,606.00	6,178.80	6,674.70	5,067.72	6,163.80
Total	Kg/month	59,280.00	44,038.00	41,191.90	39,262.90	36,198.00	41,092.00
Total	ton/month	59.28	44.04	41.19	39.26	36.20	41.09
Disposal amount	ton/month	4,339.52	5,057.87	5,471.02	5,255.46	5,140.59	5,318.76
Collection amount	ton/month	4,398.80	5,101.91	5,512.21	5,294.72	5,176.79	5,359.85
Recycling rate		1.3%	0.9%	0.7%	0.7%	0.7%	0.8%

Recyclable items		2014 Oct	Nov	Dec	2015 Jan	Feb	Mar
Plastic	Kg/month	7,517.00	7,530.84	8,493.00	6,908.40	6,674.10	7,280.25
PET	Kg/month	10,351.00	13,388.16	12,101.00	16,119.60	15,572.90	16,987.25
Metal	Kg/month	4,656.00	5,020.56	3,665.04	5,526.72	5,339.28	5,824.20
Glass	Kg/month	7,255.00	9,204.36	7,273.50	9,211.20	8,898.80	9,707.00
Coconut shell	Kg/month	395.00	418.38	385.00	460.56	444.94	485.35
Cardboard & paper	Kg/month	6,398.00	6,275.70	7,220.00	7,829.52	7,563.98	8,250.95
Total	Kg/month	36,572.00	41,838.00	39,137.54	46,056.00	44,494.00	48,535.00
Total	ton/month	36.57	41.84	39.14	46.06	44.49	48.54
Disposal amount	ton/month	4,885.86	5,142.54	5,800.33	4,347.24	3,909.01	4,605.13
Collection amount	ton/month	4,922.43	5,184.38	5,839.47	4,393.30	3,953.50	4,653.67
Recycling rate		0.7%	0.8%	0.7%	1.0%	1.1%	1.0%

c.5 Issues of Recycling Activities

In Dehiwala Mt. Lavinia MC, separate collection has been just implemented in some area so firstly source separation should be thoroughly encouraged. It is necessary to establish the system (effective and hygienic storage and discharge method, setting the separate collection date and time, providing the reliable collection services etc.) in order for residents to understand easily.

The MC has recorded recovery amount of valuables by collection workers. Furthermore, it is

necessary to keep records in order to quantitatively verify the change after implementation of separate collection.

d. Public Awareness

d.1 Current Situation of Public Awareness Activities

In Dehiwala Mt. Lavinia MC, separate collection has been implemented in some area (Rathmalana District) and public awareness activities to promote source separation have been carried out. In order to expand separate collection throughout the MC in the future, currently Health Education Division is preparing leaflets that show collection date and collection point by each Ward. Outline of public awareness activities including the future plans are shown below.

Table4-162: Outline of Public Awareness Activities in Dehiwala Mt. Lavinia (including future plans)

Public Awareness Activities	
Execution body	MC (Supported by WMA and NSWMSC)
Title	Source separation activities
Budget source	MC (part of Environmental improvement budget)
Budget amount	?
Methods	House-to-house visit by SV and PHI Public announcement Distribution of leaflet of waste separation Demonstration of waste separation Complaints and request received through Face Book Call for separation cooperation through mobile phone SMS in collaboration with the mobile company

d.2 Participation Level and Manners of Citizens

Cooperation level of residents for source separation is unknown because separate collection has just started. Many of the complaints that the MC receives from residents are related to poor waste discharge manners.

d.3 Issues of Public Awareness Activities

In Dehiwala Mt. Lavinia MC, Health Education Officer is now planning a variety of educational activities in accordance with source separation, it is essential to set the discharging rules (target waste for separation, collection date, discharge point, and discharge method) in order for residents to understand easily. It is also necessary to implement environmental education in schools and activities to improve discharge manners at the same time.

e. Finance

e.1 Financial Condition of the Municipal Council

The financial data of Dehiwala Mt.Lavinia MC for the past 3 years are presented in the table below. As the total revenues exceed the expenditures in the last 2 years in row, Dehiwala Mt. Lavinia MC can be considered to be in good financial condition.

Table4-163: Annual Revenues and Expenditures (Unit: Thousand LKR)

No	Category	2012	2013	2014	Annual Average 000 LKR	%
1	Approved Budget	1,020,881	1,151,707	1,299,906	1,157,498	
2	Actual					
	Revenue	817,359	1,224,447	1,425,264	1,155,690	100.0%
	Own-source revenue	449,964	816,021	816,652	694,213	60.1%
	Grant	367,395	408,426	608,611	461,478	39.9%
	Expenditure	901,662	964,544	1,221,134	1,029,113	89.0%
	Recurrent	847,653	868,969	1,157,655	958,092	82.9%
	Capital	54,009	95,575	63,479	71,021	6.1%
	Profit or loss	-84,303	259,903	204,130	126,577	11.0%

Source：Dehiwala Mt. Lavinia MC、『Programme Budget：2014～2016』

According to the annual averages, the total of own-source revenues accounts for 60% in the total municipal revenues and the grants from the central government and the provincial council occupy 40%.

The own-source revenues are categorized into (1) Rates/Taxes constituted mainly by the property taxes, (2) Rents of facilities and other municipal properties, (3) License fees, (4) Fees for municipal services, (5) Warrant costs and fines, (6) Other revenues. Among the own-source revenues, the property taxes (Rates/Taxes) and other revenues are the major types since the share of these revenues accounts for 25% and 24% in the total municipal revenues respectively.

Although the grants occupies 40% in the total municipal revenues, the most of the amount is the block grant (36% in the total municipal revenues) released by the central government as salary and allowances for the municipal staff. The share of the capital grant is small accounting for 3.6% in the total revenues.

Table4-164: Breakdowns of Annual Revenues of Dehiwala Mt. Lavinia MC (Unit: thousand LKR)

No	Types of Revenues	2012	2013	2014	Annual Average 000 LKR	%
1	Own-Source Revenues:					
	Rates & Taxes	155,387	381,996	339,880	292,421	25.3%
	Rents	16,243	18,342	16,973	17,186	1.5%
	License	15,237	26,428	39,027	26,898	2.3%
	Fees For Services	39,576	55,111	63,545	52,744	4.6%
	Warrant Costs And Fines	26,337	31,347	33,614	30,433	2.6%
	Other Income	197,184	302,797	323,613	274,531	23.8%
	Total Own-Source Revenues	449,964	816,021	816,652	694,213	60.1%
2	Grants:					0.0%
	Recurrent Grant:	367,235	408,327	483,287	419,616	36.3%
	Salaries	364,297	405,611	479,687	416,532	36.0%
	Council Members Allowances	2,568	2,275	3,260	2,701	0.2%
	Other Recurrent Grant	370	441	340	384	0.0%
	Capital Grants	160	98	125,324	41,861	3.6%
	Total Grants	367,395	408,426	608,611	461,478	39.9%
	Total	817,359	1,224,447	1,425,264	1,155,690	100.0%

Source：Dehiwala Mt. Lavinia MC、『Programme Budget：2014～2016』

The table below shows the dynamics of the annual expenditures of Dehiwala Mt. Lavinia MC. According to the table, the shares of recurrent and capital expenditures in the annual average of the total expenditures are 93% and 7% respectively.

Table4-165: Breakdowns of Total Expenditures (Unit: Thousand LKR)

No	Types of Expenditures	2012	2013	2014	Annual Average 000 LKR	Annual Average %
1	Recurrent Expenditures:					
	Personal Emoluments	493,915	497,999	649,467	547,127	53.2%
	Travelling	5,086	6,957	6,094	6,046	0.6%
	Requisites And Equipment	74,196	92,594	98,983	88,591	8.6%
	Repairs And Maintenance Of Capital Assets	98,244	108,369	247,495	151,369	14.7%
	Transportation, Communication, Utility And Other Services	140,718	128,450	120,609	129,925	12.6%
	Interest	5,361	6,853	7,362	6,525	0.6%
	Grants, Subsidies And Contributions	16,686	13,049	8,982	12,905	1.3%
	Pensions, Retirements, Benefits And Gratuities	11,479	9,201	10,263	10,314	1.0%
	Other Expenditures	1,969	5,498	8,401	5,289	0.5%
	Total Recurrent Expenditures	847,653	868,969	1,157,655	958,092	93.1%
2	Capital Expenditure	54,009	95,575	63,479	71,021	6.9%
	Total Expenditure	901,662	964,544	1,221,134	1,029,113	100.0%

Source：Dehiwala Mt. Lavinia MC、『Programme Budget：2014～2016』

As interview results reveal, the municipal council possesses sufficient own-sources for financing its recurrent expenses; and thus, the municipality does not face financial difficulties in conducting its daily activities. Since the own-source revenues are not sufficient for improving the quality of public services, the municipality has been dependent on external sources such as bank loans, loans from Local Loan Development Fund (LLDF) and grants from the central government and the provincial council for implementation of necessary investments.

e.2 SWM Finance

The financial condition of SWM sector in Dehiwala Mt. Lavinia Municipal Council is summarized in the table below.

Each year, the actual total of SWM expenditures reached to the level of the total expenditures budgeted for the year and accounts for around 23 to 26% in the total municipal expenditures.

On the other hand, the collection rates of the waste fees are extremely low accounting for less than 6% in the annual totals of the SWM expenditures. The main reason for these low rates is the implementation of waste collection service for free of charge for households and small/middle-scale businesses and collection of fees only from big-scale businesses. According to the municipality, the big-scale businesses are those generating an amount of waste that equals to a half of a tractor trailer daily and usually decided based on personal judgements of public health inspectors. Therefore, the number of businesses that are paying the waste fee are very few (900 businesses were registered as payers at the end of October, 2015).

Table4-166: The Annual Budgets and Actual Expenditures of SWM (Unit: Thousand LKR)

No	Types of Expenses	2012	2013	2014
A	Approved Budget	297,892	265,500	298,687
B	Actual SWM Revenues (Collected Waste Fees)	3,208	11,715	14,883
C	Actual Expenditures:			
1	Personal Emoluments	152,298	166,368	192,457
2	Supplies And Material Expenditures:			
	Equipment For Disposing Garbage	454	226	211
	Fuel And Lubricants	29,219	33,916	35,176
	Uniforms For Workers	589	597	123
	Boots For Workers	21	26	83
	Awareness Program	339	151	176
	Other Supplies	0	2,435	1,971
	Total Supplies And Materials Expenses	30,623	37,350	37,742
3	Repairs And Maintenance Of Vehicles	12,178	11,965	12,874
4	Final Disposal Payment	25,489	29,048	32,523
5	Other Expenses	16,411	5,285	5,739
	Total Expenditures	236,999	250,015	281,334
	Share of Collected Fees in the Total Expenditure	1.4%	4.7%	5.3%

Source：Dehiwala Mt. Lavinia MC、『Programme Budget：2014～2016』（Programme-2/Project-5：Solid waste management）

Based on the above circumstances, the municipality has been financing the SWM expenditures from its other types of own-source revenues.

e.3 Problems Identified in the SWM Financial System

The major problem identified in the SWM Financial System of Dehiwala Mt. Lavinia MC is the waste collection expenses and revenues from the waste fee are not linked. In other words, the municipality focuses on the total amounts of expenditures and the own-source revenues only and does not consider sustainability of public services such as waste collection.

At the same time, big-scale businesses were not clearly defined; and therefore, no official methods and procedures for identification of big-scale businesses are being used. Therefore, it would be difficult to increase the waste fee revenues by identifying new big-scale businesses.

4.10.3 Waste Amount and Composition Survey

a. Waste Generation Amount

Waste generation amount was calculated based on the waste generation rate obtained by SATREPS in November 2012 and waste generation units obtained by locally outsourced survey. As a result, municipal waste generation amount is 175.2 ton/day and waste generation rate is 933g/person/day.

Table4-167: Waste Generation Amount of Dehiwala Mt. Lavinia MC

Source		Generation rate		Generation sources	Generation (ton/day)
Residential	Collection	0.390	Kg/person/day	187,684	73.2
Commercial	Hotels (large)	1,000.00	Kg/(hotel)	11	11.0
	Hotels (middle & small)	56.00	Kg/(hotel)	130	7.3
	Restaurants (large)	200.00	Kg/(restaurant)	79	15.8
	Restaurants (middle)	112.50	Kg/(restaurant)	18	2.0
	Restaurants (small)	21.60	Kg/(restaurant)	29	0.6
	Organic-shops (large)	350.00	Kg/(shop)	25	8.8
	Organic-shops (middle)	20.00	Kg/(shop)	67	1.3
	Organic-shops (small)	4.76	Kg/(shop)	142	0.7
	Non-organic shops (large)	40.00	Kg/(shop)	78	3.1
	Non-organic shops (middle)	15.00	Kg/(shop)	186	2.8
	Non-organic shops (small)	1.69	Kg/(shop)	179	0.3
Institutions	Schools	12.50	Kg/(school)	39	0.5
	Hospitals	600.00	Kg/(hospital)	22	13.2
	Other institutions	9.17	Kg/(institution)	125	1.1
	Other educational institutions	8.00	Kg/(institution)	12	0.1
	Buddhist temples	5.15	Kg/(temple)	0	0.0
	Hindu temples	37.08	Kg/(temple)	0	0.0
	Mosques	1.50	Kg/(mosque)	0	0.0
	Churches	10.00	Kg/(church)	0	0.0
	Public park	100.00	Kg/(park)	2	0.2
Market		3,000.00	Kg/(public market)	8	24.0
Industries		380.00	Kg/(industry)	24	9.1
Total					175.2

b. Waste Composition

The results of the locally outsourced survey on waste composition conducted from 15 to 21 October in Karadiyana Disposal Site is shown below.

Table4-168: Waste Composition of Dehiwala Mt. Lavinia MC

Category	Rate
Kitchen waste	52.5%
Paper	13.6%
Textiles	4.3%
Grass & wood	14.1%
Soft Plastics	9.1%
Hard Plastics	1.4%
Rubber & leather	0.6%
Metal	0.7%
Glass & bottles	1.2%
Stone & ceramic	2.3%
Other	0.1%
	100.0%

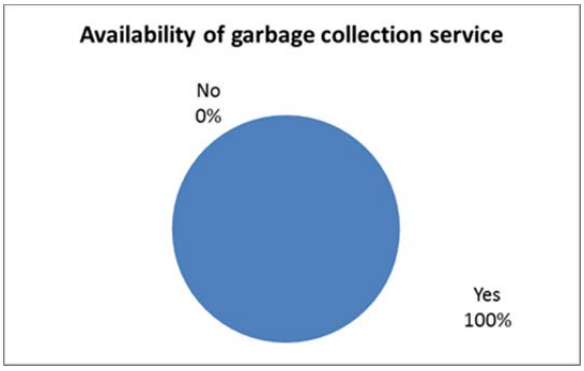
4.10.4 Results of Public Opinion Survey

87% of the surveyed households are Sinhalese, 7% are Muslims and 6% Tamils. Data on the

average number of people per household and monthly income is set out in the Table below.

Table4-169: Average and standard deviation values of income and family size

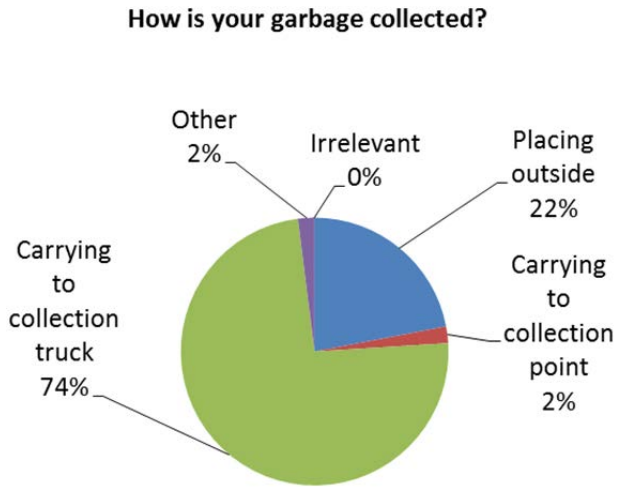
Category	Number of sample	Average of family members / employees	Income/Turnover (LKR/month)
High	50	4.1	129, 740
Middle	50	4.7	62, 360
Low	50	5.4	28, 560
Business	43	5.0	21, 644, 884



Item	No.of sample	%
Yes	150	100
No	0	0
Total	150	100

Figure 4-71: Availability of garbage collection service in the DMMC

In the Dehiwala Mt. Lavinia MC, 100% of surveyed households are provided with a garbage collection service, of which 97% stated they use this service. Only 24% of surveyed households are "very satisfied" with the present SWM service provision, while 51% are "somewhat satisfied".



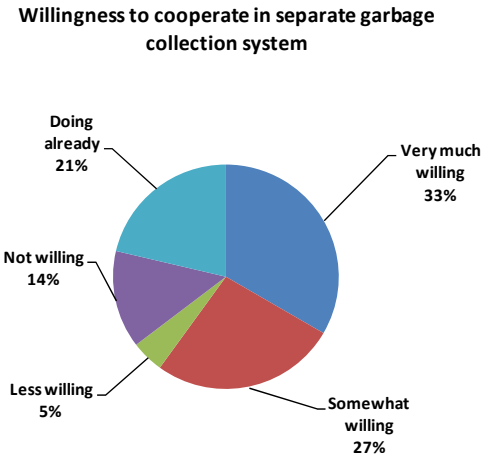
Item	No.of sample	%
Placing outside	33	22
Carrying to collection point	3	2
Carrying to collection truck	111	74
Other	3	2
Irrelevant	0	0
Total	150	100

Figure 4-72: Method of garbage discharge by residences in the DMMC area

- ✓ Households' main methods of waste discharge are shown in upper Figure. The most common methods are carrying garbage to the collection truck (74%) and discharging it outside their premises for house to house collection (22%).
- ✓ Only 9% of surveyed households receive a daily garbage collection service while 47% stated that they received the service 2-3 times/week. Similarly, 23% discharge their garbage 2-3 times per week, but 39% as soon as it is generated and 34% discharge their

garbage daily.

- ✓ In general, adult females handle waste in about 63% of surveyed households and the duty is covered by servants in 19% of households. In high income households, servant contribution is as high as 32%.
- ✓ As shown in lower Figure, on average 21% of households separate their garbage into organic and inorganic waste at the source of generation but only 4 % of high-income households are doing so. About 19% of surveyed households are not/less willing to cooperate with source separation for recycling. Further, 33% are very much willing and 10% are somewhat willing to cooperate in the source separated garbage collection system.
- ✓ Also, 79% of surveyed households stated that there are recyclable collectors or someone who comes to collect their reusable or recyclable materials. Hence, an informal recycling system is well established in the Dehiwala Mt. Lavinia MC area.



Item	No.of sample	%
Very much willing	49	33
Somewhat willing	40	27
Less willing	8	5
Not willing	21	14
Doing already	32	21
Total	150	100

Figure 4-73: Willingness of residences to participate in the source separated garbage collection system in the Dehiwala Mt. Lavinia MC

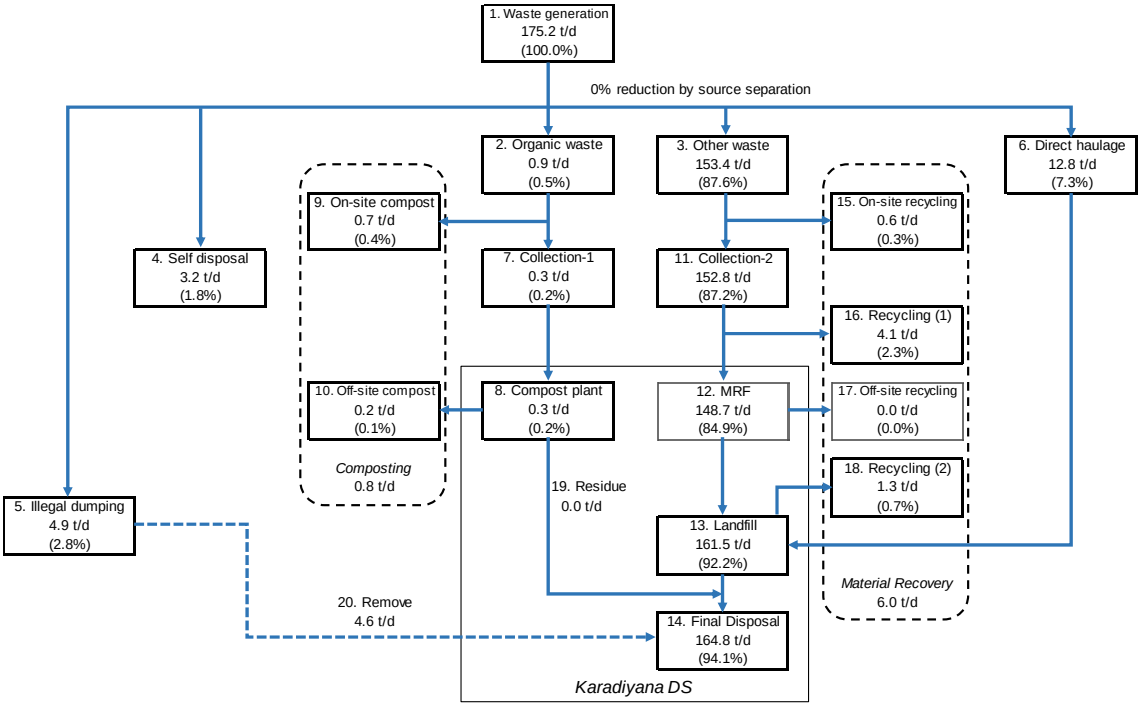
- ✓ Only 3% of surveyed households use kitchen/garden waste for composting and also use the finished compost for their own garden.
- ✓ Not many surveyed households (87%) have never discussed proper garbage discharge methods at the community level.
- ✓ 73% of households stated that SWM awareness programmes are very necessary while 25% stated “somewhat necessary”. Only 2% of surveyed households stated that awareness campaigns are not necessary or not needed at all.
- ✓ 60% of households do not like to pay for SWM services mainly because of the revenue tax they paid for DMMC. The average WTP (willingness to pay) for improved SWM services is 75 ± 132 LKR/month per household.
- ✓ Out of all surveyed households, 35% stated that they sell/give-away glass & bottles for recycling and 35% of residences sell/give-away plastics for recycling. Also, 14% of households sell/ give-away cans & metals for recycling. Cardboard and paper recycling were 6% and 21% respectively.

4.10.5 Waste Flow

Current waste flow has been prepared by analysing the locally outsourced public opinion survey,

statistical data collection, and the results of census. It should be noted that Dehiwala Mt. Lavinia MC has not started separate collection as of November 2015 but it will be implemented in some area within this year. For this reason, it is assumed that waste flow is based on separation collection as same as Moratuwa MC.

According to waste flow, collection rate ((discharge amount + direct loading amount)/generation amount) is 95.40%. As for recycling rate for generation amount, compost is



Recycling (1): Recyclables taken by the collection workers
Recycling (2): Recyclables taken by the waste pickers at landfill site

0.5%, material recovery is 3.4%, and the total rate is lower than 3.9%, which is lower than the other surrounding municipalities. On the other hand, final disposal rate for generation amount has reached to 94.1%, which has become a burden on the Karadiyana disposal site

Figure 4-74: Waste Flow of Dehiwala Mt. Lavinia MC (2015)

4.10.6 Current Situation of Other Waste Management

a. Current Situation of Industrial Waste Management

a.1 Generation Amount & Disposal Amount

Since general waste generated by businesses such as shops other than industrial waste is collected together with general municipal waste, the generation amount and the disposal amount of industrial waste are not identified.

a.2 Collection, transportation and Disposal

General waste from businesses is collected together with general municipal waste and discharged in Karagiyana DS. being carried to Karadiyana disposal site. The UC is not involved in handling of hazardous waste of industrial waste.

a.3 Tipping Fee

Tipping fee of industrial waste transported by certified business entity itself or private waste collection company entrusted by business entities is 2,389LKR/Mt and that of industrial sludge is 5,972LKR/Mt[41].

b. Current Situation of Medical Waste Management

b.1 Generation Amount & Disposal Amount

In Dehiwala Mt. Lavinia MC, there are one large hospital and several small clinics and the total generation amount of general waste from these facilities is 2 ton/day.

b.2 Collection, Transportation and Disposal

General waste generated from the large hospital is collected by MC and transported to Karadiyana DS. However, medical waste is disposed by hospital itself and the MC is not involved. All kinds of waste generated by the small clinics are collected along with the regular collection service.

b.3 Tipping Fee

In the large hospital, medical waste such as used syringes is treated in the incineration facility within the hospital.

c. Current Situation of Night Soil Management

c.1 Generation Amount & Disposal Amount

The accurate amount of night soil is not recorded by MC.

c.2 Collection, Transportation and Disposal

Night soil is collected by the Dehiwala Mt. Lavinia MC and transported to the Water Board Pumping Plant located in the MC, then discharged to the ocean.

c.3 Tipping Fee

Tipping fee for households is 1,965LKR/load, for government agencies is 4,474LKR/load, and for business is 5,606LKR/load.

4.10.7 Needs for Solid Waste Management

a. Improvement of Technical System

a.1 Promotion of 3R

The level of waste management of Dehiwala Mt. Lavinia MC is considered high due to its high collection rate. However, it is also a fact that the final disposal rate has reached to 94.1%, which has become a big burden on the Karadiyana disposal site. Therefore it is highly desirable to make more efforts towards waste reduction.

MC is planning to implement separate collection of organic waste in some area within this year and to expand gradually. Even in Moratuwa MC where separate collection was introduced about one year earlier, organic waste is not yet completely separated. Therefor it is also essential to conduct software activities such as public awareness and improvement of waste discharge manners. It is desirable to implement project aiming to promote 3R activities

b. Improvement of Organization and Legislation

b.1 Formulation of Solid Waste Management Plan

[41] According to the interview with the Director of Karadiyana DS dated Oct. 26, 2015.

The level of waste management of Dehiwala Mt. Lavinia MC is considered high compared to the other municipalities. To establish the current management system, MC has made various improvements based on the plan 10 years ago. However, there is no future plans. There is a need for the development of solid waste management master plan, since it is essential to formulate waste policy for the future,

Dehiwala Mt. Lavinia MC is currently using the Karadiyana disposal site operated by WMA but the MC should be responsible for waste generated by its own wards. Therefore, it is desirable for MC to identify its own role for the operation of final disposal site within the master plan.

5 Projection of Waste Generation Amount and Waste Composition

5.1 Population Projection

The population of Sri Lanka was projected for the year 2015 by each District based on the census data of 2012 and the population data up to 2014 that were obtained from the Department of Statistics. In addition, the total population was estimated based on the population growth rate from 2015 to 2024 projected by the United Nations Population Division, Department of Economic and Social Affairs. Accordingly, the growth rate of the total population up to 2024 was applied to the growth rate of each District from 2012 to 2015 to figure out the future population of the target local authorities.

Table5-1: Population projections for 2015

District	2012*	2013*	2014*	'12-'13	2015(estimated)
Sri Lanka	20,359,439	20,513,923	20,705,287	0.85%	20,880,619
Colombo	2,324,349	2,335,322	2,351,284	0.58%	2,364,868
Gampaha	2,304,833	2,316,801	2,331,761	0.58%	2,345,343
Kalutara	1,221,948	1,228,931	1,237,908	0.65%	1,245,966
Kandy	1,375,382	1,384,352	1,397,308	0.79%	1,408,402
Matale	484,531	488,511	493,485	0.92%	498,024
Nuwara-Eliya	711,644	720,602	729,560	1.25%	738,686
Galle	1,063,334	1,070,316	1,079,294	0.75%	1,087,364
Matara	814,048	821,023	827,997	0.85%	835,062
Hambantota	599,903	607,875	616,844	1.40%	625,493
Jaffna	583,882	587,874	591,867	0.68%	595,900
Kilinochchi	113,510	115,501	117,493	1.74%	119,536
Mannar	99,570	100,566	102,557	1.49%	104,084
Vavuniya	172,115	173,110	176,095	1.15%	178,119
Mullaitivu	92,238	93,241	94,243	1.08%	95,262
Batticaloa	526,567	529,559	533,548	0.66%	537,073
Ampara	649,402	656,374	664,342	1.14%	671,941
Trincomalee	379,541	383,526	389,503	1.30%	394,581
Kurunegala	1,618,465	1,627,434	1,639,393	0.64%	1,649,959
Puttalam	762,396	769,372	777,345	0.98%	784,929
Anuradhapura	860,575	869,539	879,500	1.09%	889,118
Polonnaruwa	406,088	409,081	414,070	0.98%	418,120
Badulla	815,405	823,380	832,351	1.03%	840,956
Monaragala	451,058	457,032	464,002	1.42%	470,613
Ratnapura	1,088,007	1,098,967	1,110,923	1.05%	1,122,561
Kegalle	840,648	845,634	852,615	0.71%	858,662

* Source: Registrar General's Department
Note: Mid-year Population estimates were revised based on the final results of the Census of Population and housing 2012. District level figures are given on the basis of usual residence.

Table 5-2: Population Projection from 2015 to 2024

Year	Estimated population (thousand)	Annual growth rate
2015	20,715	1
2016	20,811	0.46%
2017	20,905	0.45%
2018	20,996	0.44%
2019	21,081	0.40%
2020	21,157	0.36%
2021	21,224	0.32%
2022	21,283	0.28%
2023	21,334	0.24%
2024	21,378	0.21%

Source: United Nations Population Division Department of Economic and Social Affairs

The future population of the target local authorities is shown in the following page.

Table5-3: Population Projection from 2015 to 2024

District	Local Authority	2012	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Colombo	Dehiwala-Mt. Lavinia MC	184,468	187,684	188,552	189,409	190,234	191,002	191,693	192,300	192,830	193,290	193,693
Colombo	Moratuwa MC	168,280	171,214	172,006	172,787	173,540	174,241	174,871	175,424	175,908	176,328	176,695
Colombo	Kesbewa UC	185,122	188,350	189,221	190,080	190,909	191,679	192,372	192,981	193,513	193,976	194,379
Gampaha	Katunayake Seeduwa UC	60,915	61,986	62,273	62,556	62,828	63,082	63,310	63,510	63,686	63,838	63,971
Nuwara Eliya	Nuwara-Eliya MC	23,804	24,709	24,823	24,936	25,045	25,146	25,237	25,317	25,386	25,447	25,500
Jaffna	Jaffna MC	80,829	82,493	82,875	83,251	83,614	83,952	84,255	84,522	84,755	84,957	85,134
Trincomalee	Trincomalee UC	48,351	50,268	50,500	50,729	50,951	51,156	51,341	51,504	51,646	51,769	51,877
Kurunegala	Kurunegala MC	24,833	25,317	25,434	25,549	25,661	25,764	25,857	25,939	26,011	26,073	26,127
Polonnaruwa	Thamankaduwa PS	82,426	84,869	85,261	85,648	86,022	86,369	86,681	86,956	87,195	87,404	87,586
Moneragala	Katharagama PS	18,220	19,010	19,098	19,185	19,269	19,346	19,416	19,478	19,532	19,578	19,619

5.2 Projection of Waste Generation Amount

5.2.1 Waste Generation Rate

The waste generation rate is estimated for 2015 based on the existing survey results.

Table5-4: Survey Results Applied for the Waste Generation Rate

Target local authorities	Survey results applied
1.Uv Kataragama PS	SATREPS-Hambantota MC report p80
2.North-CentralThamankaduwa PS	SATREPS-Hambantota MC report p80
3.NorthernJaffna MC	Akkarapattu MC report p7
4.EasternTrincomalee UC	Akkarapattu MC report p7
5.North-WesternKurunegala MC	NSWMSC Action Plan
6.CentralNuwara Eliya MC	SATREPS-Kandy MC report p56
7.WesternKatunayake Seeduwa UC	SATREPS-Kandy MC report p56
8.WesternMoratuwa MC	SATREPS-Kandy MC report p56
9.WesternKesbewa UC	SATREPS-Kandy MC report p56
10.WesternDehiwela Mt. Lavinia MC	SATREPS-Kandy MC report p56

Only the waste generation rate of households was assumed to increase in the future based on the actual results from 1965 to 1970 in Japan; the waste generation rate was calculated for 2015 by assuming that the increase in the rate of generation amount corresponds to 55% of the GDP growth rate (similar to Japan from 1965 to 1970).

It should be noted that the generation rate of Kandy Town shown in the SATREPS could not be applied to the Kesbewa UC and the Katunayake Seeduwa UC because it was too large. In those local authorities, the generation rate of commercial entities and offices is assumed to be 30% and that of hospitals, markets, and industry is assumed to be 50%.

5.2.2 Waste Generation Unit

The waste generation unit was obtained from the registration data and the statistical data given by the local authorities in the outsourced survey. The numbers obtained were classified into each generation source that are considered in the generation amount rate.

The future generation unit was calculated on the assumption that commercial and industrial waste is proportional to the GDP growth rate and that the office and market waste is proportional to the population growth rate.

5.2.3 Generation Amount

Based on the generation rate and generation unit obtained above, the total waste generation amount of the target local authorities was calculated.

Table5-5: Projection of Waste Generation Amount of Target LAs

Province	2015	2020	2024
1.Uva Katharagama PS	13.7	15.0	16.1
2.North-Central Thamankaduwa PS	88.2	88.7	93.2
3.Northern Jaffna MC	105.8	121.6	138.0
4.Eastern Trincomalee UC	62.1	71.4	80.8
5.North-Western Kurunegala MC	48.1	53.9	59.4
6.Central Nuwara Eliya MC	32.0	33.0	37.4
7.Western Katunayake Seeduwa UC	57.6	62.8	69.0
8.Western Moratuwa MC	124.5	137.9	150.0
9.Western Kesbewa UC	91.8	97.5	102.7
10.Western Dehiwala Mt. Lavinia MC	175.2	196.2	215.4

5.3 Projection of Waste Composition

The waste composition of target local authorities applies the results of WACS in the survey and the existing survey results as follows.

Table5-6: Survey Results Applied for the Waste Composition

Target local authorities	Survey results applied
1.Uva Kataragama PS	WACS by JICA
2.North-Central Thamankaduwa PS	WACS by JICA
3.Northern Jaffna MC	WACS by JICA
4.Eastern Trincomalee UC	NSWMSC KinnyaUC 2010
5.North-Western Kurunegala MC	NSWMSC Action Plan
6.Central Nuwara Eliya MC	SATREPS-Kandy MC p57
7.Western Katunayake Seeduwa UC	Waste Management Authority 2013
8.Western Moratuwa MC	WACS by JICA @ Karadiyana DS
9.Western Kesbewa UC	WACS by JICA @ Karadiyana DS
10.Western Dehiwela Mt. Lavinia MC	WACS by JICA @ Karadiyana DS

5.3.1 Basis for Prediction

a. Method of Projection of Future Waste Composition

For the future waste compositon, the classified waste shown in the table below is set to increase based on the assumptions below. The proportion of each type of waste is estimated by adjusting the generation amount obtained in the previous section.

Table5-7: Proportion Applied for Future Generation Amount

Type of waste	Future generation amount
Kitchen waste	Status quo
Paper	In proportion to the GDP growth rate
Textiles	In proportion to the GDP growth rate
Grass & wood	Status quo
Soft Plastics	In proportion to the GDP growth rate
Hard Plastics	In proportion to the GDP growth rate
Rubber & leather	Status quo
Metal	In proportion to the GDP growth rate
Glass & bottles	Status quo
Stone & ceramic	Status quo
Other	Status quo

b. Population Growth Rate and GDP Growth Rate Applied

Although the applied rate of economic growth in the future estimates are the same in all target local authorities, the population growth rate is different in each target local authority.

Table5-8: Population Growth Rate and Economic Growth Rate Adopted in Future Estimates

Items	2015	2020	2024	Note
Population growth rate	1.425%	0.361%	0.208%	Katharagama PS
	0.978%	0.361%	0.208%	Thamankaduwa PS
	0.681%	0.361%	0.208%	Jaffna MC
	1.304%	0.361%	0.208%	Trincomalee UC
	0.644%	0.361%	0.208%	Kurunegala MC
	1.251%	0.361%	0.208%	Nuwara-Eliya MC
	0.582%	0.361%	0.208%	Katunayake Seeduwa UC
	0.578%	0.361%	0.208%	Moratuwa MC
	0.578%	0.361%	0.208%	Kesbewa UC
	0.578%	0.361%	0.208%	Dehiwala-Mt. Lavinia MC
GDP growth rate	5.000%	5.000%	5.000%	Common rate for all

* : Population growth rate of Moratuwa MC
Source: United Nations Population Division Department of Economic and Social Affairs

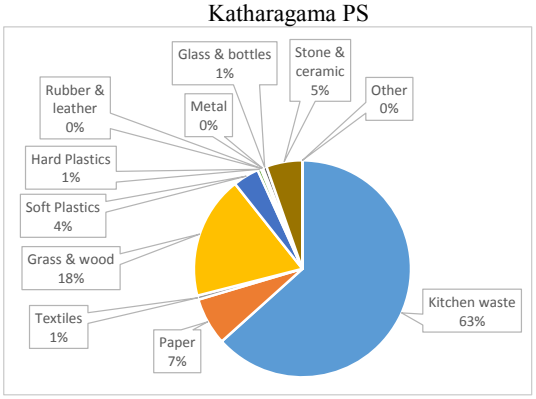
5.3.2 Future Waste Composition

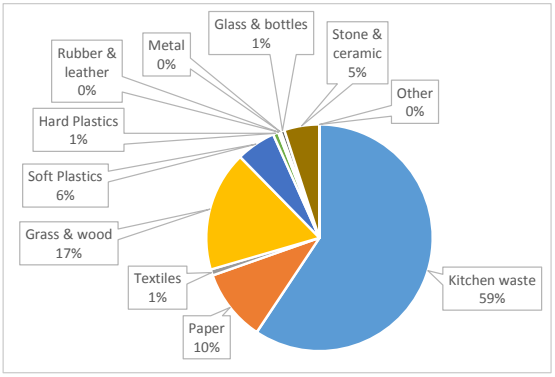
Current status (2015) and predicted future status (2024) of waste composition of the target local authorities are shown below.

Current（2015）

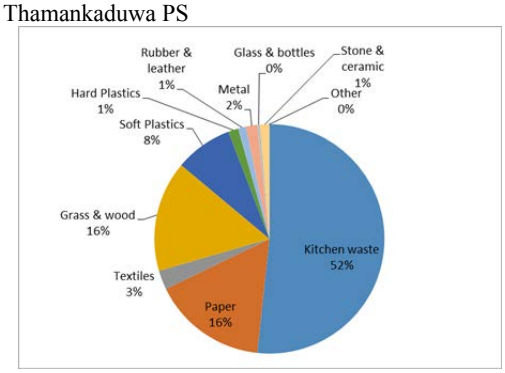
Future（2024）

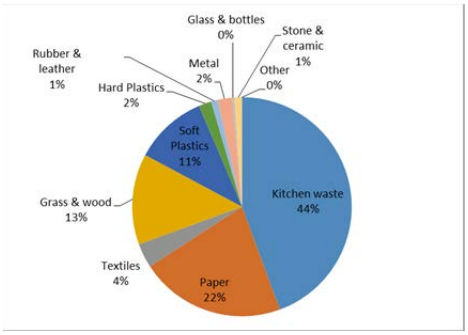
Katharagama PS



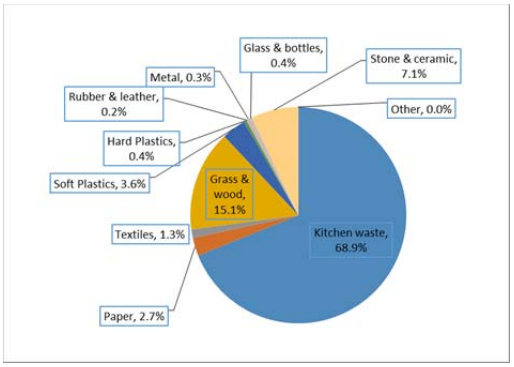


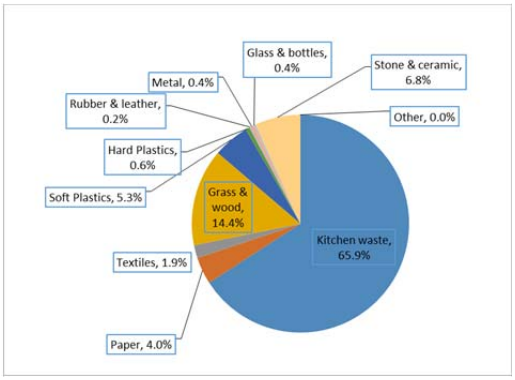
Thamankaduwa PS



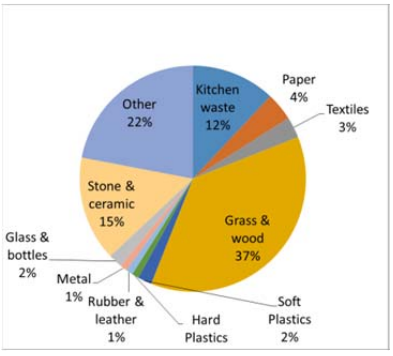


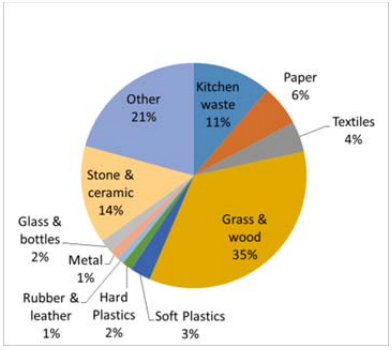
Jaffna MC



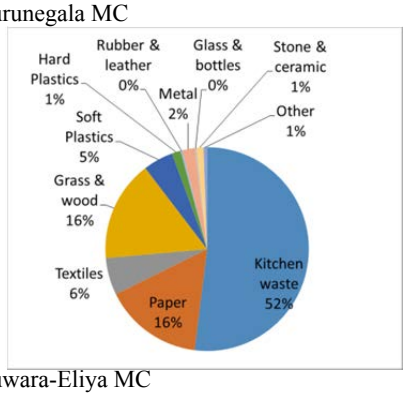


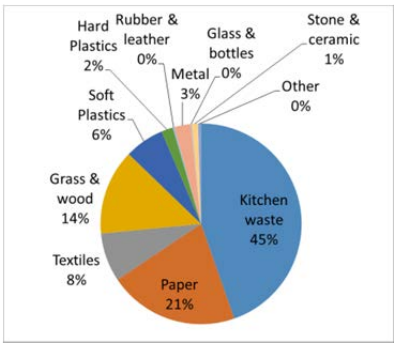
Trincomalee UC



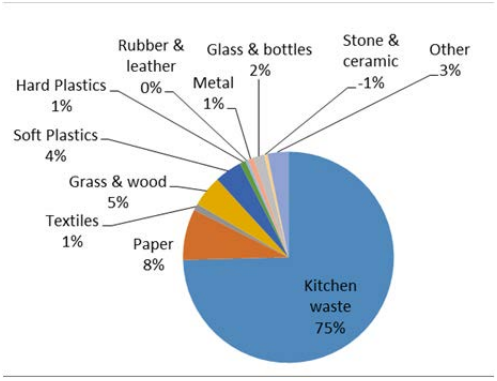


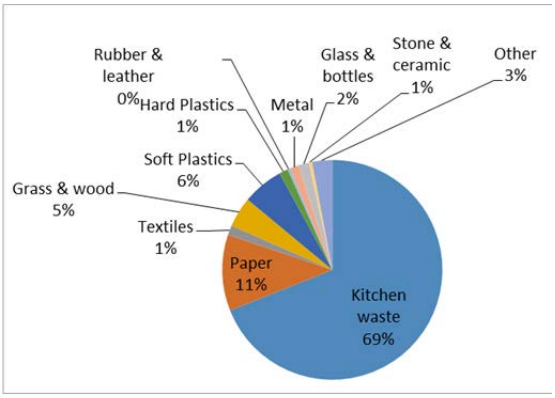
Kurunegala MC



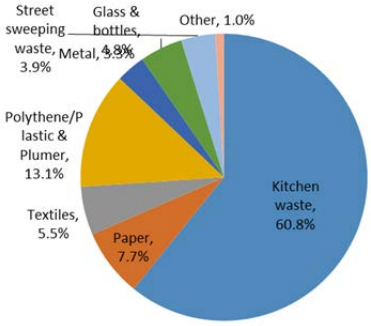


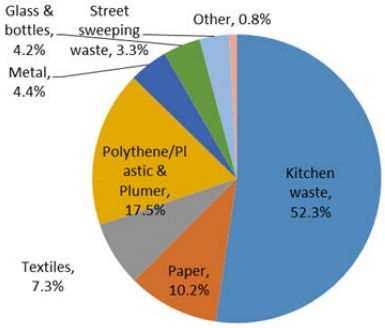
Nuwara-Eliya MC



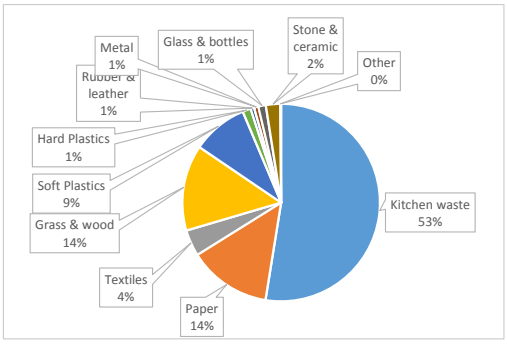


Katunayake Seeduwa UC





Moratuwa MC, Dehiwala Mt. Lavinia, Kesbewa UC



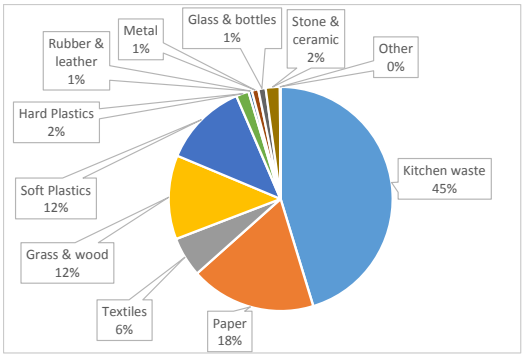


Figure 5-1：Current and Predicted Future Waste Composition of the Target LAs

6 Possibility of Support for Solid Waste Management

6.1 Issues and needs

The summary of issues and needs at ten priority local authorities according to the results of the survey are shown in the table below.

Table 6-1: The summary of issues and needs at ten priority local authorities

Items	Issue	Need
Discharge/ collection/ transportation	・ Collection vehicles are too old and malfunction	・ Replacement of old vehicles to brand new ones
	・ Lack of human resource, vehicle and equipment for SWM and maintenance	・ Ensure human resource, vehicle and equipment for SWM and maintenance
	・ Collection service rate is low	・ Making the collection system more efficient such as improving the collection rules
Intermediate treatment	・ Existing compost plant does not function properly	・ Improving operation of the existing compost plant
	・ Existing and new valuable material recovery facility does not function properly	・ Improving and formulating the operation system for valuable material recovery facility
Disposal	・ Open dumping of waste has an adverse impact on surrounding environment	・ Improving existing disposal site and establishing a new sanitary disposal site
	・ Some leachate treatment facilities do not work properly	・ Establishing a monitoring system and improving leachate treatment facility
	・ Wild elephants, which scavenge the discharged waste disturb the proper operation of disposal site(s)	・ Finding an effective solution to deal with elephants
	・ Life time of existing disposal site is limited	・ Introducing the intermediate treatment facility to extend the life time of disposal site(s) is need
3Rs	・ Waste reduction at generation source is not carried out	・ Promoting an effective 3Rs programme
	・ Existing compost plant and valuable material recovery facility do not function properly	
Financial system	・ Budget for SWM is insufficient due to lack of revenue source(s)	・ Introducing the “Polluter Pays Principle”
		・ Establishing sufficient subsidies for SWM from central government

The details of issues and needs at ten priority local authorities are described in the table below.

Table 6-2: The detail of issues and needs at ten priority local authorities

No.	Province	Local Authority	Discharge/ collection/ transportation		Intermediate treatment		Disposal		3Rs	
			Issues	Needs	Issues	Needs	Issues	Needs	Issues	Needs
1	Uva	Kataragama PS	Waste collection service rate is as low as 65.7% and one fourth of waste generation amount is self-disposed Large annual fluctuation of waste generation amount.	Increasing the collection service rate to reduce self-disposal. Centralization of treatment of waste collected at several remote areas.	Barrel for the collection of organic waste taken to the compost plant is not distributed.	Proper collection of organic waste system Improvement of operation of exiting compost plant.	There are three disposal sites which become open dumping, waste scattering and leachate leaking and this causes a serious environmental issues.	Unification of three disposal sites is needed to carry out proper operations	None.	Promotion of proper 3Rs program
2	North Central	Thamankaduwa PS	Waste collection service does not run on schedule Waste collection service rate is as low as 18%.	Increasing the waste collection service rate through procurement of collection vehicles.	The compost plant owned by PS was started operation again since 2015. Separated valuable waste includes much residue and it is requires some more sorting by workers.	Improvement of operation of exiting compost plant is need. Proper waste separation system .	Disposal site causes serious environmental impacts to the surrounding areas Wild elephants scavenge the disposed waste & disturb the operations of the disposal site.	Improvement of existing disposal Find an effective solution to deal with elephants	Valuable material is not separated properly.	Promotion of proper 3Rs program
3	Northern	Jaffna MC	Although the waste collection rate is 75.7%, the waste collection service does not run on schedule due to malfunction of old collection vehicles .	Enhancement of waste collection capacity by replacement of old collection vehicles to new ones.	The garden compost plant and MRF are not functioning properly due to lack of technology and management.	Promotion of proper waste separation of organic waste Improvement of operation of exiting compost plant	The disposed waste is scattered and expanded. There is no orderly function of design of new land fill site. Some surrounding LAs have issues with the landfill site.	Improvement of existing disposal site Construction of new sanitary landfill site. Establishment of regional landfill site	Although promotion of 3Rs is carried out, the activity is insufficient	Promotion of proper 3Rs program
4	Eastern	Trincomalee UC	Although the waste collection rate is 62.9%, the waste collection service does not run on schedule due to malfunction of old collection vehicles	Enhancement of waste collection capacity through replacement of old collection vehicles to brand new ones	None	None	Open dumping causes environmental issues to the surrounding area Wild elephants scavenge the disposed waste & disrupt the operation of the disposal site	Improvement of existing disposal site Find an effective solution to deal with elephants	No activity of 3Rs is carried out.	Promotion of proper 3Rs program
5	North-Western	Kurunegala MC	Although the waste collection rate is 80.4%, the waste collection service does not run on schedule due to malfunction of old collection vehicles.	Enhancement of waste collection capacity by replacement from old collection vehicles to new ones	The existing compost plant is not functioning properly due to lack of technology and management	Improvement of operations for the existing compost plant	Although the disposed waste is regularly moved by heavy machinery, the covering soil is not properly carried out and this causes environmental issues to the surrounding area.	Improvement of existing disposal site	Organic waste for the compost plant is separated at generation source in some areas,, but the amount of separated organic waste is not enough	Promotion of proper 3Rs program

No.	Province	Local Authority		Discharge/ collection/ transportation		Intermediate treatment		Disposal		3Rs	
				Issues	Needs	Issues	Needs	Issues	Needs	Issues	Needs
6	Central	Nuwara Eliya	MC	Although the waste collection rate is 78.2%, the absence of waste collection workers sometimes causes the delays or disruptions of the collection duty There is a lot of waste scattered at stationed collection points	Solution for worker absence, such as improvement of contract, instruction of proper family finance, etc. Stationed collection points are abandoned and start kerbside collection.	The material recovery facility will be established from 2016.	Establishment of proper operations for new material recovery facility	The leachate treatment facility seems to be malfunctioning and might cause water pollution downstream.	Establishment of proper monitoring Improvement of leachate treatment facility.	The material recovery facility will be established from 2016.	Promotion of proper 3Rs program
7	Western	Moratuwa	MC	The waste collection rate (74%) can be considered low because of great impacts on residents' living environment. The waste collection service does not run on schedule due to malfunction of old collection vehicles, with 80% of all collection vehicles under repair.	Making an efficient collection system Enhancement of waste collection capacity by replacement of old collection vehicles to new ones.	Operation costs of the Karadiyana compost plant are higher than the tipping fees The material recovery facility will be established from 2016	Improvement of the Karadiyana compost plant Establishment of proper operations for material recovery facility	The basic infrastructure at the Karadiyana disposal site is insufficient. The capacity of the disposal site is limited (expectation is 3years)	Improvement of the Karadiyana disposal site Introduction of a new intermediated facility	Although the composition of organic waste at generation source is 66.6%, the collection rate of this is less than 50%. The collection rate of valuable material is quite low at 3.1%	Introduction of source separation programme Promotion of proper 3Rs program
8	Western	Kesbewa	UC	The waste collection rate (68.5%) in residential areas can be considered low and self-disposal (28%), illegal dumping (3.4%) are high. The waste collection service does not run on schedule due to malfunction of old collection vehicles	Making an efficient collection system Enhancement of waste collection capacity by replacement of old collection vehicles to new ones	Ditto	ditto	Ditto	ditto	The recycling rate of organic waste and valuable material is low (10.3%).	Introduction of source separation programme Promotion of proper 3Rs program
9	Western	Dehiwala Mt. Lavinia	MC	Although the waste collection rate is 95.4%, the waste collection service does not run on schedule due to malfunction of old collection vehicles.	Enhancement of waste collection capacity by replacement of old collection vehicles to new ones	ditto	ditto	Ditto	ditto	The rate of final disposal reached 94.1% and this causes a heavy burden on the final disposal site.	Promotion of proper 3Rs program
10	Western	Katunayake Seeduwa	UC	Although the waste collection rate is 74.5%, the illegal dumping rate is high (19.2%) The waste collection service does not run on schedule due to malfunction of old collection vehicle.	Enhancement of waste collection capacity by replacement of old collection vehicles to new ones.	The material recovery facility does not work.	Rehabilitation of the material recovery facility	Open dumping causes environmental issues to the surrounding area.	Improvement of existing disposal site	No 3R activities are carried out.	Promotion of proper 3Rs program.

6.2 Assistance in accordance with the inter-municipal treatment for Western Province

6.2.1 Current situations and issues of solid waste management in Western Province

a. Status of technical system and issues

The Western Province consists of three districts; Gampaha, Colombo and Kalutara from the north. The population is 5.85 million which corresponds to 28.5 percent of the total population of Sri Lanka in an area of 3,685km2, which corresponds to 5.6% of the country according to the 2012 census. The Colombo district, which is a centre of the politics and economics in Sri Lanka, has a population of 2.32 million people and is the most densely populated.

Table6-3: Population and population density of the Western Province in 2012

District	Population (person)	Area (km2)	Population density (persons/km2)
Colombo	2,324,349	699	3,325
Gampaha	2,304,833	1387	1,662
Kalutara	1,221,948	1598	765
Total	5,851,130	3,684	1,588

Source: Department of Census and Statistics

The Western province has 3 districts with a population of 5.9 million people which was forecasted for the year 2015 based on the results of Population Census-2012. The waste generation amount in 2015 is estimated to be 3,363 ton/day.

There are two regional final disposal sites - the Meethotamulla DS for the Colombo MC and Coronnawa UC and the Karadiyana DS for seven municipalities - in the Colombo district, the Western province. Other four municipalities are reducing the waste volume by composting, however, each municipality disposes the collected waste and the residual waste from composting to the vacant lot (Kaduwela MC's land has been identified as a disposal site), and all of these vacant lots are open dumps.

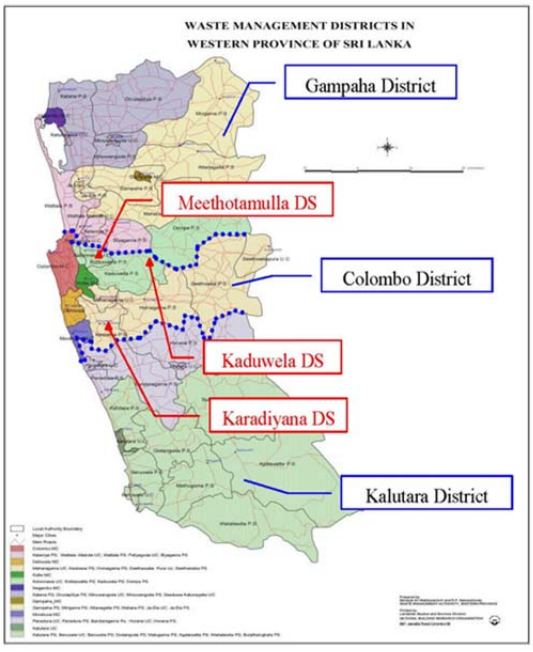
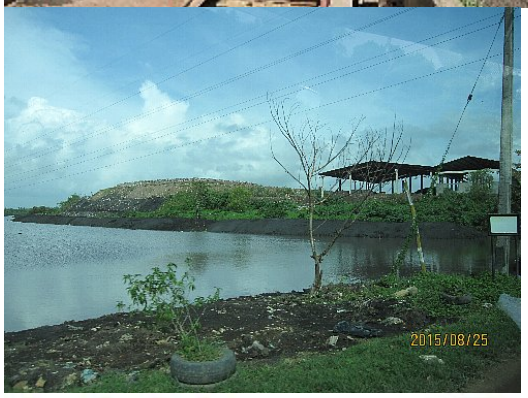


Figure 6-1：Location of Meethotamulla, Karadiyana, Kaduwela final disposal site



Above: The Meethotamulla disposal site
Although the Colombo MC operates this disposal site, the truck scale at the entrance is out of order.

Left: The Karadiyana disposal site
The disposal site used by seven municipalities is operated by the WMA.

Compost plant of the Kaduwela MC

Compost plant of the Bulathsinghala PS

Compost plant of the Kotikawatha PS

Compost plant of the Agalawatha PS

Photo provided by Waste Management Authority

The Meethotamulla disposal site is an open dump located in the wetlands. Since this disposal site is already full, and there is no land to expand, the Colombo MC has no choice but to pile up about 700 tons of waste every day. Under such circumstances, the Colombo MC was considering a plan to transport the collected waste to Puttalam, located in the northwest, about 130 km away, by train. Since the plan was deadlocked by the opposition of local people, the Colombo MC has continued the landfill at the existing disposal sites. Since the environmental impact on the surrounding areas caused by stench, waste scattering and the outflow of leachate

is serious, calls have been growing by the nearby residents to close down the disposal sites. Urgent measures are desired.

The Karadiyana disposal site, which is also located in the wetlands, receives about 600 tons of waste per day as of now. Details of the Karadiyana disposal site are as described in the Moratuwa MC in Chapter 4.

For waste management in the Colombo Province, ensuring the final disposal site of a large amount of waste generated in its overcrowded jurisdiction is the biggest challenge.

b.Financial conditions and issues

Among the three districts of the Western Province, the waste related problems in Colombo and Gampaha districts are the most serious as both of the districts have been unable to secure land for waste disposal facilities. Therefore, financial information of local authorities in the two districts were collected during the 3rd field survey in order to identify the financial capabilities of the local authorities.

According to the data collected during the survey, it can be considered that the financial capabilities of the local authorities in the Colombo and Gampaha districts are relatively low. The reasons for the conclusion are as follows:

- Operating profits at 9 out of the 13 local authorities in Colombo Districts and 14 out of the 19 local authorities in Gampaha district were positive in 2014. However, the profits in most of these local authorities were resulted by the grants allocated by the central government. On the other hand, allocation of capital grants is highly dependent on the financial condition of the central government; and thus, the amount of the allocated capital grants should be neglected in order to identify the stability of the financial conditions of local authorities. If the capital grants were neglected, operating profits would be positive in 2 local authorities in Colombo (Dehiwala Mt. Lavinia MC and Moratuwa MC) and 5 local authorities in Gampaha (Ja-Ela UC, Miniuvangoda UC, Katunayake Seeduwa UC, Biyagama PS and Dompe PS) only. Therefore, the financial conditions in most of the local authorities are not stable.
- Regarding the SWM finances, the amounts of collected waste fees in 8 out of 11 local authorities of the Colombo district (number of total local authorities that presented relevant data) and 13 out of 15 local authorities of the Gampaha district do not reach 10% of the SWM expenses. Even 2 local authorities in Colombo (Boralasgamuwa UC and Seethawaka PS) and 8 local authorities in Gampaha (Negambo MC, Paliyagoda UC, Attanagalla PS, Kalaniya PS, Mahara PS, Meerigama PS, Wattala PS and Miniuvangoda PS) do not collect waste fees/tipping fees or the amounts of the collected waste fees/tipping fees account for less than 1% of the SWM expenses. Therefore, it can be concluded that sustainability of SWM activities has not been considered in all of the local authorities.

The financial information of the local authorities is shown in the tables below.

Table 6-4: Financial information of local authorities in Colombo District for the fiscal year 2014 (Unit: thousand Rp)

No	Financial Indicators	Colombo MC	Sri Jayawardenapura Kotte MC	Kaduwela MC	Dehiwala Mt. Lavinia MC	Moratuwa MC	Kesbewa UC	Kolannawa UC	Maharagama UC	Boralasgamuwa UC	Seethawakapura UC	Seethawaka PS	Homagama PS	Kotiwatta-Mulleriyawa PS	Max	Min	Ave.
1	Total Assets	13,842,006.06	645,095.55	1,041,573.51				278,173.72	645,436.77	348,570.15	138,901.29	212,186.38	869,079.32	267,765.38			
2	Working Capital	135,818.72	(162,854.15)	616,624.29				40,782.29	306,201.13	129,355.88	(71,089.83)	36,332.25	161,524.21	17,742.59			
3	Long-term Debt	82,914.50	19,818.71	41,751.10				2,221.54	4,210.66	0.00	164,082.63	20,888.03	5,099.28	0.00			
4	Retained Earnings and Equity	8,376,293.05	139,547.37	777,619.97				114,445.19	453,711.50	247,723.56	188,911.17	53,936.95	334,479.83	99,670.18			
5	Revenues:																
5.1	Own-source revenues:																
	Rates & Taxes	2,823,982.38	198,368.91	137,544.10	339,880.35	82,163.41	37,606.04	66,099.69	84,256.35	27,982.25	13,125.79	13,613.20	52,615.43	49,942.72			
	Rents	219,744.01	23,202.86	11,995.82	16,973.41	11,016.26	11,156.42	13,538.71	20,671.48	2,107.06	24,834.93	16,965.80	10,307.19	13,638.72			
	Licenses	0.00	5,479.09	13,531.39	39,027.19	12,831.57	4,600.47	973.53	832.99	512.57	1,142.75	1,487.03	3,339.48	398.66			
	Fees for Services	553,315.18	58,296.95	61,208.30	63,544.54	19,608.93	15,376.37	6,748.61	56,123.29	5,848.68	6,810.97	8,645.19	17,060.62	11,170.17			
	Warrant Costs, Fines and Penalties		13,682.20	9,916.24	33,613.73	5,210.66	1,574.28	5,743.48	6,258.32	807.89	1,847.18	16,355.76	23,108.89	1,252.88			
	Other Income	136,111.03	224,730.38	331,523.62	323,612.89	166,014.31	185,784.73	12,522.05	120,463.41	24,339.07	6,564.17	43,647.61	90,443.10	101,011.72			
	Sales of Capital Assets										23,019.42		2,087.12				
	Total Own-Source Revenues	3,733,152.60	523,760.39	565,719.49	816,652.11	296,845.15	256,098.32	105,626.07	288,605.83	61,597.50	77,345.21	100,714.59	198,961.83	177,414.88			
5.2	Grants																
	Recurrent Grant (Block Grant)	2,566,246.69	247,959.13	146,909.98	483,287.03	240,983.40	51,635.73	95,291.07	69,457.14	37,499.79	45,831.36	51,021.63	94,882.70	44,285.30			
	Capital Grant	974,491.08	61,694.63	228,617.62	125,324.45	174,322.42	196,123.47	51,182.77	123,125.59	100,023.29	30,812.89	87,457.34	325,255.80	102,029.07			
	Total Grants	3,540,737.77	309,653.76	375,527.60	608,611.48	415,305.82	247,759.21	146,473.84	192,582.73	137,523.08	76,644.25	138,478.98	420,138.49	146,314.37			
5.3	Total Revenues	7,273,890.38	833,414.16	941,247.09	1,425,263.58	712,150.96	503,857.52	252,099.91	481,188.57	199,120.59	153,989.46	239,193.57	619,100.33	323,729.26			
6	Expenditures:																
6.1	Recurrent Expenditures:																
	Personal Emoluments	3,011,347.96	335,253.98	171,465.70	649,466.84	322,940.25	53,599.61	124,698.15	101,239.83	44,194.29	59,388.31	70,889.47	71,260.28	89,900.80			
	Travelling Expenses	0.00	5,718.43	1,911.60	6,094.45	4,312.08	1,464.13	632.61	3,969.11	366.24	342.62	897.99	1,025.46	365.18			
	Supplies & Requisites	1,054,317.30	107,013.10	79,623.41	98,983.05	72,017.55	6,504.59	14,072.32	45,606.84	7,976.61	9,468.58	14,411.96	22,039.47	12,549.85			
	Repairs & Maintenance of Capital Assets	716,238.81	7,551.08	31,160.17	247,494.83	25,669.30	67,025.09	17,702.66	97,304.27	6,534.20	16,273.03	17,608.98	44,632.21	10,057.86			
	Transportation, Communication, Utility and Other Services	0.00	180,487.38	82,194.81	120,608.63	27,950.53	16,804.36	8,038.98	53,577.25	14,846.52	9,686.16	17,923.63	23,085.10	25,749.85			
	Payments, Dividends and Bonuses	0.00	4,385.06	625.61	7,361.93	3,962.09	3,679.68	129.57	122.24	78.98	3,113.22	1,635.11	1,422.43	0.00			
	Grants, Contribution & Subsidies	465,537.79	19,007.50	18,107.21	8,981.69	1,049.05	5,840.02	8,480.31	7,842.78	1,370.56	1,387.92	4,484.08	3,116.56	4,256.06			
	Retirement Benefits and Grati	0.00	2,740.63	1,946.22	10,262.94	3,344.55	160.69	1,173.02	313.79	0.00	1,620.01	1,520.56	688.62	385.50			
	Other Recurrent Expenditures	984,453.08	0.00	0.00	8,400.59			0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	Total Recurrent Expenditures	6,231,894.94	662,157.16	387,034.73	1,157,654.94	461,245.38	155,078.17	174,927.62	309,976.11	75,367.39	101,279.85	129,371.78	167,270.13	143,265.09			
6.2	Capital Expenditures	2,434,756.96	363,219.59	461,974.63	63,478.89	3,997.49	236,473.62	63,272.04	324,980.08	103,826.27	51,832.74	109,423.75	484,103.85	163,056.65			
6.3	Total Expenditures	8,666,651.90	1,025,376.75	849,009.36	1,221,133.83	465,242.87	391,551.79	238,199.65	634,956.19	179,193.66	153,112.59	238,795.53	651,373.97	306,321.73			
7	Profit/Loss	-1,392,761.53	-191,962.60	92,237.73	204,129.76	246,908.09	112,305.73	13,900.26	-153,767.63	19,926.92	876.87	398.03	-32,273.65	17,407.52			
8	Population (psn)	1,047,100	121,831	248,023	233,290	198,693	166,191	55,285	180,112	64,491	31,779	129,582	240,565	130,000			
9	Revenue per capita (Rps/Psn)	6,947	6,841	3,795	6,109	3,584	3,032	4,560	2,672	3,088	4,846	1,846	2,574	2,490	6,947	1,846	4,903
10	Expenditure per capita (Rps/Psn)	8,277	8,416	3,423	5,234	2,342	2,356	4,309	3,525	2,779	4,818	1,843	2,708	2,356	8,416	1,843	5,276
11	Profit/Loss per capita (Rps/Psn)	-1,330	-1,576	372	875	1,243	676	251	-854	309	28	3	-134	134	1,243	-1,576	-373

Source: (1) Financial Data: Department of Local Government (Western Province); (2) Population: Results of Census-2012

Table 6-5: SWM finance of local authorities in Colombo District for the fiscal year 2014

No	Indicators	Unit	Colombo MC	Sri Jayawardenapura Kotte MC	Kaduwela MC	Dehiwala Mt. Lavinia MC	Moratuwa MC	Kesbewa UC	Maharagama UC	Boralasgamuwa UC	Kolannawa UC	Seethawaka PS	Homagama PS	Max	Min	Ave.
1	SWM Revenues:															
1.1	Collected Waste Collection Fees	000 Rps	22,139.40	12,380.00	9,412.70	14,882.89	8,511.30	3,043.07	5,475.50	0.00	1,800.00	117.00	251.70			
1.2	Collected Tipping Fees	000 Rps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.90	0.00	0.00	0.00			
	Total SWM Revenues	000 Rps	22,139.40	12,380.00	9,412.70	14,882.89	8,511.30	3,043.07	5,475.50	28.90	1,800.00	117.00	251.70			
2	SWM Expenditures:															
2.1	Expenses of Final Disposal	000 Rps	121,244.10	8,550.10	32,202.00	32,522.55	15,712.71			4,262.60	1,700.00	0.00	2,780.70			
2.2	Other Expenses (Collection)	000 Rps	1,171,482.90	107,460.10	36,182.50	248,811.08	135,794.83	41,163.50	17,146.20	20,228.90	6,000.00	21,588.70	12,809.30			
	Total SWM Expenditures	000 Rps	1,292,727.00	116,010.20	68,384.50	281,333.63	151,507.54	41,163.50	17,146.20	24,491.50	7,700.00	21,588.70	15,590.00			
3	Profit/Loss of SWM Activities	000 Rps	-1,270,587.60	-103,630.20	-58,971.80	-266,450.74	-142,996.23	-38,120.43	-11,670.70	-24,462.60	-5,900.00	-21,471.70	-15,338.30			
4	Collection Amount	ton/year	255,500	36,500	23,725	54,750	45,442	16,425	18,250	10,220	10,950	3,285	9,125			
5	Average Revenue	Rps/ton	87	339	397	272	187	185	300	3	164	36	28	397	3	161
6	Unit cost	Rps/ton	5,060	3,178	2,882	5,139	3,334	2,506	940	2,396	703	6,572	1,708	6,572	703	4,209
6.1	Unit collection cost	Rps/ton	4,585	2,944	1,525	4,544	2,988	2,506	940	1,979	548	6,572	1,404	6,572	548	3,756
6.2	Unit disposal cost	Rps/ton	475	234	1,357	594	346			417	155		305	1,357	155	452

Note: SWM financial data of two municipalities (Kotiwatta-Mulleriyawa PS and Seethawakapura UC) are not included.
Source: (1) Financial Data: Department of Local Government (Western Province); (2) Collected Waste: Waste Management Authority (Western Province), 2013

Table 6-6: Financial information of local authorities in Gampaha District for the fiscal year 2014 (Unit: thousand Rp)

No	Financial Indicators	Gampaha MC	Negambo MC	Ja-ela UC	Paliyagoda UC	Miniuvangoda UC	Wattala Mabola UC	Katunayake Seeduwa UC	Attanagalla PS	Biyagama PS	Dompe PS	Gampaha PS	Ja-ela PS	Kalaniya PS	Mahara PS	Meerigama PS	Wattala PS	Divulapitiya PS	Katana PS	Miniuvangoda PS	Max	Min	Ave.
1	Total Assets	516,457.12	644,450.38	112,698.86	116,225.96	93,936.15	201,480.53		899,927.77	246,255.13	446,243.81	485,781.92	772,790.01	487,211.69	362,744.29	358,580.85	449,209.98	445,807.25	587,087.39	633,398.63			
2	Working Capital	91,868.47	303,872.58	27,748.54	(97.91)	37,953.71	89,355.95		92,466.63	75,232.32	94,972.13	85,225.53	6,789.31	23,035.93	37,357.99	17,780.19	6,649.50	(215,308.15)	(232,915.75)	(315,890.64)			
3	Long-term Debt	90,957.18	126,642.08	1,412.55	1,412.55	14,978.10	1,500.83		22,281.67	1,412.77	5,717.12	1,909.64	538.08	30,331.13	0.00	2,115.05	21,706.20	7,967.07	1,412.55	42,172.79			
4	Retained Earnings and Equity	239,256.90	343,209.87	62,198.86	29,473.48	60,095.84	118,204.23		656,535.29	171,611.27	424,007.55	293,692.58	364,617.20	332,995.67	157,554.53	196,956.42	216,117.95	(37,501.62)	77,793.77	52,822.55			
5	Revenues:																						
5.1	Own-source revenues:																						
	Rates & Taxes	61,574.40	147,149.90	16,201.60	39,889.20	10,394.80	54,984.20	94,771.22	18,647.20	63,204.80	8,255.90	17,175.30	38,752.50	58,209.50	9,619.30	8,160.30	78,183.20	10,215.90	34,604.30	21,665.50			
	Rents	23,425.70	17,799.60	6,423.20	2,281.20	16,683.80	11,395.30	9,941.28	10,710.00	3,301.40	8,939.90	5,789.70	12,908.60	10,090.10	2,876.00	13,866.80	9,266.70	5,386.00	1,023.20	3,383.90			
	Licenses	3,869.50	28,557.00	511.50	823.30	1,152.40	2,371.40	3,251.10	2,138.90	730.40	1,595.00	785.50	4,407.60	7,093.40	2,403.90	1,100.90	2,938.20	521.60	926.90	1,690.10			
	Fees for Services	18,774.80	25,933.60	2,439.80	1,702.20	4,206.90	584.30	6,941.16	7,319.90	8,654.90	16,267.10	6,184.90	8,213.90	127,861.70	9,146.40	3,150.70	5,976.10	4,340.40	6,438.70	5,378.50			
	Warrant Costs, Fines and Penalties	10,861.50	8,702.70	1,852.50	2,469.80	601.30	12,491.80	388.88	628.40	5,778.70	1,807.70	7,622.00	7,002.40	5,251.10	906.80	2,513.90	9,470.80	9,501.10	15,722.80	2,094.20			
	Other Income	49,075.20	150,097.10	22,267.90	8,066.70	4,893.10	56,704.70	33,690.72	116,000.20	3,926.10	50,307.90	3,641.50	4,876.10	1,168.50	3,174.40	1,705.70	115,038.70	3,234.50	1,692.90	4,704.90			
	Sales of Capital Assets	37,131.30	0.00	0.00	0.00	0.00	0.00		147.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,093.90	0.00			
	Total Own-Source Revenues	204,712.40	378,239.90	49,696.50	55,232.40	37,932.30	138,531.70	148,984.36	155,592.30	85,596.30	87,173.50	41,198.90	76,161.10	209,674.30	28,126.80	30,498.30	220,873.70	33,199.50	61,502.70	38,917.10			
5.2	Grants																						
	Recurrent Grant (Block Grant)	87,535.00	165,350.30	32,357.50	32,215.90	25,618.00	48,320.60	40,204.92	68,795.70	162,358.40	56,622.40	121,484.30	191,616.70	60,813.90	161,535.00	102,907.70	45,799.00	99,006.70	185,069.60	87,479.50			
	Capital Grant	79,330.40	89,696.10	894.00	9,265.40	5,724.10	28,252.10	2,336.53	355,145.60	0.00	10,757.90	207,447.40	280,376.80	68,188.20	292,089.80	216,600.60	219,503.00	252,314.80	164,621.10	257,917.20			
	Other Capital Revenues	0.00	0.00	0.00	0.00	3,355.50	0.00		9,986.50	7,252.40	6,982.80	0.00	0.00	0.00	0.00	1,793.40	0.00	0.00	0.00	0.00			
	Total Grants	166,865.40	255,046.40	33,251.50	41,481.30	34,697.60	76,572.70	42,541.45	433,927.80	169,610.80	74,363.10	328,931.70	471,993.50	129,002.10	453,624.80	321,301.70	265,302.00	351,321.50	349,690.70	345,396.70			
5.3	Total Revenues	371,577.80	633,286.30	82,948.00	96,713.70	72,629.90	215,104.40	191,525.82	589,520.10	255,207.10	161,536.60	370,130.60	548,154.60	338,676.40	481,751.60	351,800.00	486,175.70	384,521.00	411,193.40	384,313.80			
6	Expenditures:																						
6.1	Recurrent Expenditures:																						
	Personal Emoluments	101,400.70	213,663.90	39,343.60	43,019.70	32,958.70	57,245.60	70,304.18	88,021.50	65,456.00	64,510.30	53,690.30	65,209.20	82,425.90	62,479.30	57,814.50	68,969.80	69,629.80	64,495.50	39,630.10			
	Travelling Expenses	4,070.30	5,438.00	253.10	1,945.30	818.70	1,856.40	99.65	1,474.20	615.40	435.10	719.00	3,163.40	3,038.30	697.60	1,350.70	794.00	858.50	4,743.20	1,056.40			
	Supplies & Requisites	21,760.50	39,949.00	4,145.40	4,837.80	6,468.40	5,643.30	22,515.94	26,024.70	14,437.10	13,664.00	14,668.20	21,569.00	24,684.00	15,294.00	10,393.80	21,044.80	15,890.00	21,940.50	9,676.50			
	Repairs & Maintenance of Capital Assets	25,381.10	14,954.90	3,398.30	12,402.00	13,967.80	74,693.50	22,998.23	50,289.00	94,766.80	16,446.60	13,871.10	37,548.80	139,405.40	40,361.70	16,790.00	91,528.80	5,597.20	66,115.90	22,393.40			
	Transportation, Communication, Utility and Other Services	45,244.90	123,788.90	12,493.40	11,679.80	6,703.80	11,510.10	19,246.34	19,198.90	44,646.00	5,179.30	15,962.70	29,456.30	22,516.70	27,774.40	12,829.10	15,383.80	5,498.90	2,519.40	8,428.10			
	Payments of Interests, Dividends and Bonuses	11,468.60	17,855.00	2,341.70	2,253.00	1,326.10	622.70	0.00	2,332.30	0.00	624.70	640.20	488.80	2,437.20	623.90	74.20	3,048.20	1,129.10	8,744.80	2,199.80			
	Grants, Contribution & Subsidies	4,144.30	24,247.40	397.50	151.30	456.90	3,766.80	689.31	5,813.50	2,221.90	1,460.70	7,363.20	7,118.80	15,277.50	189.90	1,229.80	3,858.20	796.50	3,347.80	6,113.30			
	Pensions, retirements, benefits and gratuities	565.30	1,512.20	503.10	427.00	745.60	719.70	2,426.14	617.30	226.50	482.50	455.50	2,689.90	861.10	590.60	772.30	1,507.30	2,069.50	602.20	102.10			
	Other Recurrent Expenditures	0.00	0.00	0.00	0.00	465.80	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	Total Recurrent Expenditures	214,035.70	441,409.30	62,876.10	76,715.90	63,911.80	156,058.10	138,279.79	193,771.40	222,369.70	102,803.20	107,370.20	167,244.20	290,646.10	148,011.40	101,254.40	206,134.90	101,469.50	172,509.30	89,599.70			
6.2	Capital Expenditures	156,355.40	233,889.20	13,698.80	17,076.00	1,375.40	32,653.80	2,122.21	390,873.80	19,728.30	11,106.60	275,334.70	327,962.30	83,861.40	338,786.30	243,507.10	224,464.30	294,824.80	222,078.80	276,040.10			
6.3	Total Expenditures	370,391.10	675,298.50	76,574.90	93,791.90	65,287.20	188,711.90	140,402.00	584,645.20	242,098.00	113,909.80	382,704.90	495,206.50	374,507.50	486,797.70	344,761.50	430,599.20	396,294.30	394,588.10	365,639.80			
7	Profit/Loss	1,186.70	-42,012.20	6,373.10	2,921.80	7,342.70	26,392.50	51,123.82	4,874.90	13,109.10	47,626.80	-12,574.30	52,948.10	-35,831.10	-5,046.10	7,038.50	55,576.50	-11,773.30	16,605.30	18,674.00			
8	Population (psn)	63,260	155,000	35,734	34,568	9,283	29,937	97,196	175,795	177,841	150,385	118,206	226,093	117,005	184,441	166,945	148,192	146,203	233,616	160,763			
9	Revenue per capita (Rps/Psn)	5,874	4,086	2,321	2,798	7,824	7,185	1,971	3,353	1,435	1,074	3,131	2,424	2,895	2,612	2,107	3,281	2,630	1,760	2,391	7,824	1,074	2,644
10	Expenditure per capita (Rps/Psn)	5,855	4,357	2,143	2,713	7,033	6,304	1,445	3,326	1,361	757	3,238	2,190	3,201	2,639	2,065	2,906	2,711	1,689	2,274	7,033	757	2,560
11	Profit/Loss per capita (Rps/Psn)	19	-271	178	85	791	882	526	28	74	317	-106	234	-306	-27	42	375	-81	71	116	882	-306	84

Source: (1) Financial Data: Department of Local Government (Western Province); (2) Population: Results of Census-2012

Table 6-7: SWM finance of local authorities in Gampaha District for the fiscal year 2014

No	Indicators	Unit	Gampaha MC	Negambo MC	Ja-ela UC	Paliyagoda UC	Miniuvangoda UC	Wattala Mabola UC	Katunayake Seeduwa UC	Attanagalla PS	Biyagama PS	Dompe PS	Gampaha PS
1	SWM Revenues:												
1.1	Collected Waste Collection Fees	000 Rps		567.53	556.50	34.00	12.85	10.06	1,692.45	107.00			17.38
1.2	Collected Tipping Fees	000 Rps		0.00	0.00	0.00	0.00	1,038.80		0.00			0.00
	Total SWM Revenues	000 Rps		567.53	556.50	34.00	12.85	1,048.86	1,692.45	107.00			17.38
2	SWM Expenditures:												
2.1	Expenses of Final Disposal	000 Rps			0.00	0.00	914.21	2,487.24	0.00	7,200.00			406.25
2.2	Other Expenses (Collection)	000 Rps			21,166.30	3,288.01	32.84	155.94	40,933.85	11,188.39			0.00
	Total SWM Expenditures	000 Rps		92,189.50	21,166.30	3,288.01	947.06	2,643.18	40,933.85	18,388.39			406.25
3	Profit/Loss of SWM Activities	000 Rps		-91,621.98	-20,609.80	-3,254.01	-934.20	-1,594.32	-39,241.41	-18,281.39			-388.87
4	Collection Amount	ton/year		27,375	7,300	5,475	1,643	5,475	14,600	5,475			3,650
5	Average Revenue	Rps/ton		21	76	6	8	192	116	20			5
6	Unit cost	Rps/ton		3,368	2,899	601	577	483	2,804	3,359			111
6.1	Unit collection cost	Rps/ton			2,899	601	20	28	2,804	2,044			
6.2	Unit disposal cost	Rps/ton				0	557	454	0	1,315			111

No	Indicators	Unit	Ja-ela PS	Kalaniya PS	Mahara PS	Meerigama PS	Wattala PS	Divulapitiya PS	Katana PS	Miniuvangoda PS	Max	Min	Ave.
1	SWM Revenues:												
1.1	Collected Waste Collection Fees	000 Rps	361,715.45	14.50	0.00	0.00	0.00	185.09	580.04	0.00			
1.2	Collected Tipping Fees	000 Rps	295.29	43.80	31.72	0.00	0.00	0.00	0.00	0.00			
	Total SWM Revenues	000 Rps	362,010.74	58.30	31.72	0.00	0.00	185.09	580.04	0.00			
2	SWM Expenditures:												
2.1	Expenses of Final Disposal	000 Rps		9,297.18	10,348.40	4,184.57	2,799.50	0.00	3,885.07	0.00			
2.2	Other Expenses (Collection)	000 Rps		38,969.08	4,529.80	12,243.92	9,906.32	314.09	10,594.37	8,544.95			
	Total SWM Expenditures	000 Rps	34,097.50	48,266.26	14,878.20	16,428.49	12,705.82	314.09	14,479.44	8,544.95			
3	Profit/Loss of SWM Activities	000 Rps	327,913.24	-48,207.96	-14,846.49	-16,428.49	-12,705.82	-129.00	-13,899.41	-8,544.95			
4	Collection Amount	ton/year		12,775	4,380	3,650	12,410	2,190	4,563	3,650			
5	Average Revenue	Rps/ton		5	7	0	0	85	127	0	192	0	3,201
6	Unit cost	Rps/ton		3,778	3,397	4,501	1,024	143	3,174	2,341	4,501	111	2,877
6.1	Unit collection cost	Rps/ton		3,050	1,034	3,354	798	143	2,322	2,341	3,354	20	1,412
6.2	Unit disposal cost	Rps/ton		728	2,363	1,146	226	0	852	0	2,363	0	362

Note: (1) Data of Gampaha MC, Biyagama PS and Dompe PS are not included. (2) Data of Ja-ela PS were neglected due to its odd value for collected waste fees.
Source: (1) Financial Data: Department of Local Government (Western Province); (2) Collected Waste: Waste Management Authority (Western Province), 2013

6.2.2 Future generation amount of municipal solid waste in the Western province

The future generation amounts in the Western province for 10 years from 2015 to 2024 are estimated as follows.

a. Population forecast

The population of 2015 was estimated using the population growth rate estimated by the Register General's Department and the results of the census conducted in 2012. The forecasted values for the years 2016 and 2024 was estimated based on the data of population forecasted by the United Nations Department of Economic and Social Affairs.

Table 6-8: The population growth rate for the Western province

Years	Sri Lanka	Colombo	Gampaha	Kalutara
2012	1	1	1	1
2013	0.76%	0.47%	0.52%	0.57%
2014	0.93%	0.68%	0.65%	0.73%
2015	0.85%	0.58%	0.58%	0.65%
2016	0.46%	0.46%	0.46%	0.46%
2017	0.45%	0.45%	0.45%	0.45%
2018	0.44%	0.44%	0.44%	0.44%
2019	0.40%	0.40%	0.40%	0.40%
2020	0.36%	0.36%	0.36%	0.36%
2021	0.32%	0.32%	0.32%	0.32%
2022	0.28%	0.28%	0.28%	0.28%
2023	0.24%	0.24%	0.24%	0.24%
2024	0.21%	0.21%	0.21%	0.21%

Source of 2012 - 2015: Registrar General's Department
Note: Mid-year Population estimates were revised based on final results of the Census of Population and housing 2012. District level figures are given on the basis of usual residence.
Source after 2015: United Nations, Department of Economic and Social Affairs, Population Division (2015). World Population Prospects: The 2015 Revision

Table 6-9: The future population of the Western province

District	Western Province	Colombo	Gampaha	Kalutara
2012	5,851,130	2,324,349	2,304,833	1,221,948
2013	5,881,054	2,335,322	2,316,801	1,228,931
2014	5,920,953	2,351,284	2,331,761	1,237,908
2015	5,956,176	2,364,868	2,345,343	1,245,966
2016	5,983,724	2,375,805	2,356,190	1,251,729
2017	6,010,901	2,386,595	2,366,891	1,257,414
2018	6,037,107	2,397,001	2,377,210	1,262,896
2019	6,061,475	2,406,676	2,386,806	1,267,994
2020	6,083,382	2,415,374	2,395,432	1,272,576
2021	6,102,648	2,423,023	2,403,018	1,276,606
2022	6,119,475	2,429,704	2,409,644	1,280,126
2023	6,134,085	2,435,505	2,415,397	1,283,183
2024	6,146,854	2,440,575	2,420,425	1,285,854

b. Future waste generation amounts

The future waste generation rates were estimated using the following data: (1) The current generation rate of the Colombo district identified in the Chapter 4 of this report, (2) Generation rate calculated from the waste generation amounts in Gampaha and Kalutara districts in 2013 provided by the WMA and the population data of respective districts, and (3) The estimated economic growth rates.

The future waste generation rates for the Western province are shown in the table below.

Table 6-10: Estimated future waste generation rates for the Western province (Unit: g/person/day)

District	Colombo*1	Gampaha*2	Kalutara*2	Western
2015	708	480	452	565
2016	719	493	464	577
2017	730	507	477	589
2018	741	521	490	602
2019	753	535	503	615
2020	764	550	517	628
2021	778	565	531	642
2022	791	581	546	657
2023	805	597	561	672
2024	819	613	576	687

*1 : The rates for the Colombo districts were estimated based on the generation rates of Dehiwala Mt. MC, Moratuwa MC and Kesbewa UC.

*2 : The rates for the Gampaha and Kalutara districts were estimated by multiplying the current generation rates, which was calculated from the waste generation amount in the districts in 2013 provided by the WMA and the population data of the respective districts in the year, by a calculation factor that equals to 55% of GDP growth rate (please refer to 5.2.1 for detailed information).

Using the above generation rates, the waste generation amounts for the years from 2015 to 2024 were estimated. As a result, the waste generation amount in the Western province is expected to increase by 25.6% for the following 10 years from the current 3,363 ton/day of 2015 to 4,223 ton/day. In addition, the generation amount in the Colombo district accounts for 49.8% of the total amount of the province in 2015, the share is expected to decrease to 47.3% by 2024 due to the expected increase of the generation amounts in the Gampaha and Kalutara districts.

Table 6-11: Future waste generation amounts for the Western province (unit: ton/day)

Years	Colombo	Gampaha	Kalutara	Western
2015	1,674	1,126	563	3,363
2016	1,708	1,162	581	3,451
2017	1,742	1,200	600	3,542
2018	1,776	1,239	619	3,634
2019	1,812	1,277	638	3,727
2020	1,845	1,317	658	3,821
2021	1,885	1,358	678	3,921
2022	1,922	1,400	699	4,021
2023	1,961	1,442	720	4,122
2024	1,999	1,484	741	4,223

Source: JICA Study

6.2.3 Study on the intermediate treatment in Colombo District

a. Target waste amount of the intermediate treatment

Among the treatment facilities planned by the WMA (, the design capacities of the three facilities being planned in the Colombo district were compared with the waste generation amounts estimated above. The results of the comparison are shown in the table below. In the facility planning in Japan, its treatment capacity is determined by using the predicted value of the 7 to 10 years later. Therefore, 2024 estimates are targeted here.

Table6-12: Disposal amount of three sites in Colombo District (Unit: ton/day)

Disposal site	Plan	2015	2020	2024
Meethotamulla DS	695	570	637	698
Karadiyana DS	595*	769	842	909
Kaduwela DS	560	335	365	392
Total	1,850	1,674	1,845	1,999

*: It doesn't include the incineration amount of landfilled waste (250 ton/day).

The total capacity of the intermediate treatment facilities that the WMA plans is 1,850 tons / day. Since it is equivalent to 93% of the 2024 generation amount, it is roughly speaking a reasonable scale. However, the processing capacity of the facility planned for the Karadiyana DS is 81% short of the target amount of waste, while the facility of the Kaduwela DS exceeds the target amount by up to 78 percent. Therefore it is necessary to reset the respective treatment capacities according to the location of the assumed facilities, the distance from the municipalities that use the facility and the waste amount.
On the other hand, treatment facilities such as incineration plants that enable drastic reduction of waste are indispensable considering the existence of many local authorities also in Gampaha district that have been experiencing final disposal problems and the expected increase in the waste generation by 2024 (1,500 ton/day). For this reason, the UDA plan for intermediate treatment facilities can be considered appropriate as it will cover the Gampaha district.

Based on the above, it is preferable that the processing capacity of intermediate treatment facilities should be sufficient for treating all waste to be generated in the Colombo district (2,000 ton/day) along with a half of the waste to be generated in the Gampaha district (750 ton/day).

b. Waste characteristics for intermediate treatment

It is indispensable to understand the characteristics of waste when examining the intermediate treatment facilities. The waste amount and composition survey, which used municipal waste that had been carried from the Moratuwa MC, was conducted from October 15 to the 21st in the Karadiyana disposal site as mentioned above. In order to examine incineration and composting as an intermediate treatment method, the three components and the C / N ratio were obtained by chemical analysis of the samples on the 16th, 19th and 20th of October 2015 which was carried out as part of the survey.

b.1 Low calorific value

(1) Waste composition analysis
As a result of the physical composition analysis, the physical composition of the object waste was as shown in the table below.

Table6-13: Physical composition of object garbage

Category	Rate
Kitchen waste	52.55%
Paper	13.56%
Textile	4.32%
Grass & wood	14.06%
Soft plastic	9.15%
Hard plastic	1.37%
Rubber & leather	0.57%
Incombustible	4.28%
Others	0.14%
Total	100.00%

(2) Ash

The weight after it dried and after strong heating was measured, excluding nonflammable items among the nine compositions of the above table, and the mineral was calculated by the following formula:.

(kg) × weight (kg)/after ..mineral (%) of each composition = (.. ..strong.. heating100 in weight before ..strong.. heating

(%) ..mineral.. = of $\sum_{i=1}^{6}(Ai \cdot Bi) / \sum_{i=1}^{6} Ai$ dry garbage

Ai: Weight ratio of each composition (%)

Bi: Mineral (%) of each composition i (Nonflammable things are assumed to be 100.)

Ash contents of garbage (%) = Dried garbage × ((100-moisture (%)) /100)

(3) Combustibles contents

Combustibles contents were calculated by the following formula:

Combustibles contents (%) =100-moisture (%) –Ash contents of garbage

(4) Low calorific value

The low calorific value of garbage was presumed by the following formula:

HI = 4,500V - 600W

HI : Low calorific value of garbage (kcal/kg)
V: Combustibles contents (%) of garbage...
W: Moisture contents of garbage (%)

The result of the analysis by using the above-mentioned calculating formula is shown in the table below.

Table6-14: Calculation of low calorific value

Sample	Moisture (%)	Dry garbage mineral (%)	Garbage mineral (%)	..garbage combustion.. (%)	Lower heating value (Kcal/kg)	(kJ/kg)
October 16	52.24	24.13	11.53	36.24	1,317	5,514
October 19	55.83	22.76	10.05	34.12	1,200	5,024
October 20	43.54	14.75	8.33	48.13	1,905	7,973

Based on the results of the incineration facilities in Japan, it is understood that the self-sustaining combustion limit is about 900kcal/kg, 1200kcal/kg is necessary for a stable operation. Power generation limit is said to be 1500-1600kcal / kg or more. From the fact that all low calorific values that had been calculated exceeded the self-sustaining combustion limit, the characteristic of solid waste generated in the Colombo District can be incinerated in a stable manner without using a supplementary fuel.

Since the WMA is promoting the separate collection of organic waste, other waste will be the target incineration waste. Power generation is possible because the low calorific value of the other waste is calculated as 2,280kcal/kg.

b.2 C/N ratio

The ratio of carbon (C) content (%) and nitrogen (N) content (%) in the organic material is the C / N ratio. The C / N ratio takes different values depending on the type of organic matter; it is an important indicator for evaluating such difficulties as microbial degradation of organic matter, ease of appearance of fertilizer effects and ripening conditions of compost. In general, 20-30 is said to be the best C/N ratio for making compost. .

The average value of the C / N ratio of organic waste is as shown in the table below. It was confirmed that the organic waste in the solid waste generated in the Colombo District is suitable for composting.

Table6-15: C/N ratio of organic garbage

Organic garbage	C/N ratio
Kitchen dirt garbage	25.3
Plant	48.8

Source: JICA investigation

b.3 Recyclables contents

From the results of the waste amount and composition survey (WACS), it was confirmed that recyclables which can be targeted as material recovery total 16.9%, as shown in the table below in the municipal solid waste generated in the Colombo District.

An important thing for recycling is to avoid mixing impurities and to collect it by a uniform material. For this reason, it is necessary to establish a mechanism of separate collection and thorough separation at generation sources. The source separation of organic waste and other waste and the separate collection corresponding to it has been started in the Moratuwa MC from January 2015. And the same system is scheduled for introduction in the Dehiwala-Mt Lavinia MC in 2016. This aims to exclude organic waste from the municipal waste to be landfilled through composting. At the same time, source separation of organic waste prevents the contamination of organic matter into the recyclable waste. Therefore, introduction of MRF (Material Recovery Facility) is also a valid system for material recovery.

Table6-16: Possibility of the middle processing seen from refuse composition

Classification	Composition rate		Use
Kitchen waste	52.5%	66.6%	Compost, Biogas, etc.
Grass & wood	14.1%		
Paper	13.6%	16.9%	Material recovery
Hard Plastics	1.4%		
Metal	0.7%		
Glass & bottles	1.2%		
Soft Plastics	9.1%	14.0%	Thermal recycle
Textiles	4.3%		
Rubber & leather	0.6%		
Stone & ceramic	2.3%	2.5%	Residue
Other	0.1%		
Total	100.0%		

c. Intermediate treatment in Japan

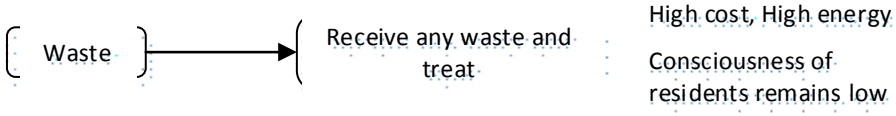
Based on the results of the chemical analysis and the waste composition survey, it has been understood that incineration + power generation, compost, and material recovery are technically possible and effective as the intermediate treatment of solid waste in the Colombo district.

Therefore, we would like to introduce the current situation and the study on trend towards the material cycle society in Japan that the advanced technology of the intermediate treatment has established, and the statistical documentation of facilities for examination to introduce the intermediate treatment facilities.

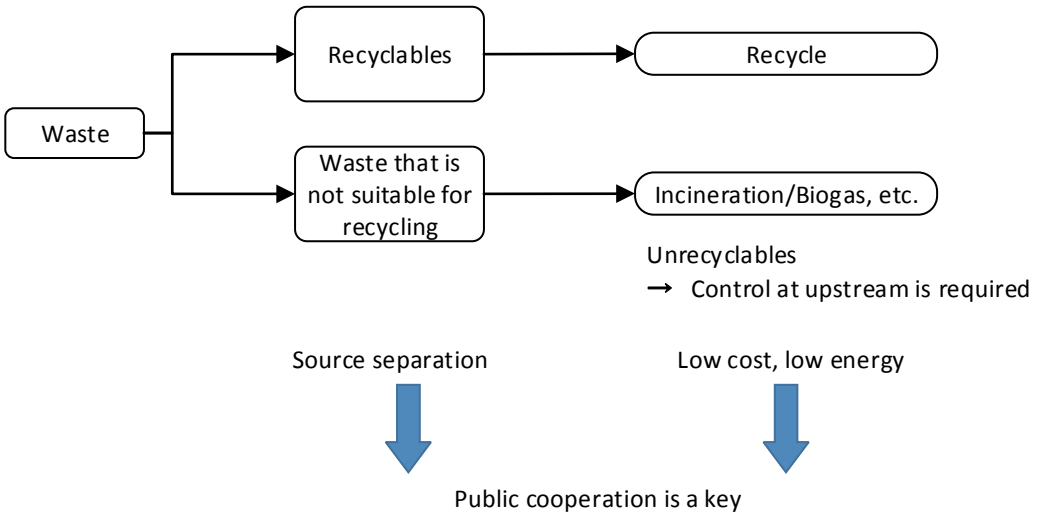
c.1 Research by Japan Society of Material Cycles and Waste Management Experts

The incineration research subcommittee analyzed the current tendency for disorderly approaches to intermediate treatment of municipal waste in a research debate organized by the Japan Society of Material Cycles and Waste Management in May 2005. According to the report, the way of intermediate treatment aiming to establish a material cycle society should take a soft approach over a hard overemphasis.

(1) Tendency of current hard overemphasis



(2) Emphasis on a soft approach in the future



There are various options in the intermediate treatment of municipal waste, and the best treatment method should be selected taking into consideration the particular characteristics of the waste stream.

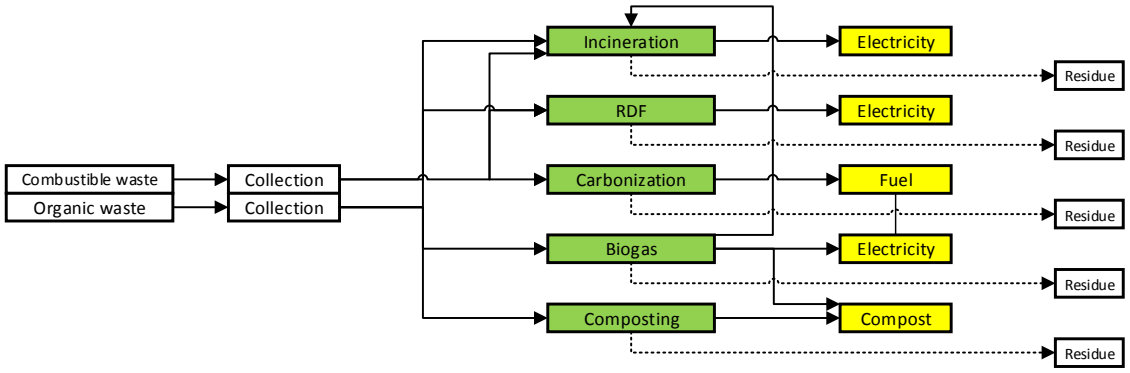


Figure 6-1: A variety of intermediate treatment methods of municipal solid waste

The experts forecasted the future waste composition, classified the intermediate treatment methods shown in the table below and examined from the viewpoint of the cost, energy, CO2, the disposal amount and hazardous matter.

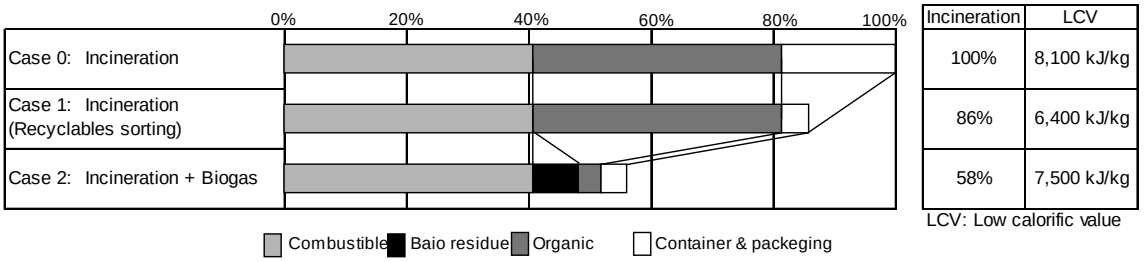
The separation of container and packaging means that the local authority selects the target recyclables among the ten kinds of recyclable materials which the central government has determined according to the Containers and Packaging Recycling Law, and makes the separate collection plan and executes it.

Table6-17: Case study

	Object waste	Collection form	Mode of processing	Facilities scale Incineration	Facilities scale Biogas
Case 0	Present waste	Mixed collection	Incineration (ash melt)	100	-
Case 1	Future waste scenario1 (sorting packaging and containers progresses)	Mixed collection	Incineration (ash melt)	86	-
Case 2	Future waste scenario2 (sorting packaging and containers progresses)	Organic waste is separated at source and collected separately	Incineration + Biogasification	58	28

*In Case1~2: All municipalities execute the separated waste collection to the container wrapping, and the rate of public cooperation is assumed as 80%.
*In Case 2, Public cooperation rate for organic waste separation is assumed as 90%.

The figure below shows the change of waste for incineration to mixed waste to the separation of the recyclable waste and the separation of organic waste. Comparing Case0 and Case1, the waste amount decreases by separation of container and packaging, however, the low calorific value decreases. When Case1 is compared with Case2, it is understood that the low calorific value is regained through extraction of organic waste. Moreover, it is understood that the waste amount for incineration can be reduced to about 60% by the separation of a container and packaging materials and organic garbage.



Incineration	LCV
100%	8,100 kJ/kg
86%	6,400 kJ/kg
58%	7,500 kJ/kg

LCV: Low calorific value

Figure 6-2: Forecast of quality of garbage for incineration

The total for the initial investment and operating costs are compared in the report. The cost of Case0 was assumed to be a 100%, Case1 91% and Case2 about 94%. Moreover, the unit treatment cost of the targeted waste is shown in the table below. Case0 increases the amount of treatment for the total amount of incineration of mixed waste, the total cost is the highest. In Case 2, the initial investment and operation cost of intermediate treatment facilities is reduced because the target treatment amount is reduced by separation. However, since the cost for separate collection is high, the total unit cost is the highest.

Table6-18: Cost of each case

Case	Cost per ton
Case 0	24,257 ¥/ton
Case 1	25,655 ¥/ton
Case 2	26,437 ¥/ton

The debate has looked at the viewpoints of cost, energy, CO2, disposal amount, and the hazardous substance (Lead and chlorine) as follows, and it was concluded that there is superiority in Case2 (incineration + biogas).

- In each item of the cost energy and CO_2, the combination of incineration (ash melt) and biogas is advantageous.
- There is no difference in the disposal amount of Case1 and 2.
- The load of the reclamation of chlorine by the bio gasification.

c.2 Incinerators

As of 2013, 1,199 incinerators were running in Japan, and among these, 587 had a treatment capacity of 100 ton/day or more. These breakdowns are shown in the table below. Among furnace type of incinerators with less than 500 ton/day of treatment capacity, 68% are stoker type incinerators and 22% are fluidized bed type incinerators. As the treatment capacity increased, stoker type incinerators also increased. All incinerators with a capacity of 1000 ton/day or more adopt stoker furnaces. Most of the incinerators with a treatment capacity of 500 ton/day or more operate continuously and utilize residual heat to generate power.

Since securing final disposal sites are extremely difficult in Japan, the ash, which is the residue of incineration, is melted in a melting furnace which was annexed to the incinerator and is re-used as an aggregate of concrete (Shaft type incinerator continuously treats the waste from incineration to melting). However, since the cost of melting is high, installation of melting furnaces tend to be on the decline in recent years..

Table6-19: Number of incinerators by capacity in Japan

Incineration method	100 - 499 ton/day	500 - 999 ton/day	> 1000 ton/day
Mechanical stoker type (movability)	355	59	6
Shaft-furnace type	35	3	
Flow floor type	112	1	
Rotary	11		
Others	5		
Total	518	63	6

Source: Municipal waste processing investigation of actual conditions result of the Ministry of the Environment, 2013

c.3 Bio gasification

There were six bio-gasification plants running in Japan in 2013. The breakdown is as shown in the table below.

Table6-20: Number of bio-gasification plants in Japan

	Treatment capacity	Use first year
For power generation	80 ton/day	2006
For power generation/fuel	65 ton/day	2013
For power generation	36 ton/day	2013
For power generation	22 ton/day	2003
For fuel	17 ton/day	2011
For power generation	Seven ton/day	2006

Source: Municipal waste processing investigation of actual conditions result of the Ministry of the Environment, 2013

d. Validity of development plan of intermediate treatment facilities in Colombo District

d.1 Considerations related with the current development concept

(1) Differences between the UDA and WMA plans regarding treatment of the Colombo MC waste

- The UDA is planning to compact the CMC waste, put it into containers and transport to the sanitary landfill site planned in Muthurajawella.
- As for the WMA, it is considering to process the organic part of the CMC waste at the biogas plant of Muthurajawella and incinerate the remaining inorganic part at the incineration plant to be constructed in Muthurajawella. According to this plan, only ash will be transported to the Puttalam disposal site.

Although both concepts planned to construct the final disposal site in Puttalam, the treatment method for municipal solid waste of the CMC differs.

Considering the efficiency of volume reduction near generation sources, the WMA plan is preferable. However, it is doubtful to promote intermediate treatment facility projects relying on private finances while the construction of a sanitary landfill site in Puttalam has not been decided completely.

As mentioned above, the basic principle of waste treatment of the municipal solid waste to be collected in the Colombo MC differs between the plans of the concerned authorities; however, neither of them revealed a concrete plan about waste treatment for the Colombo MC.

(2) Response by the Colombo MC

- The Colombo MC has been waiting for the results of the projects that the UDA is promoting.
- However, the project needs at least two years to be implemented; and therefore, the Colombo MC is intending to obtain additional land located at the Meethothamulla disposal site to secure the disposal of waste during the following two years. Since there are many households resided (illegally) in the area planned for this purpose, the MC intends to pay compensations for relation of these residents.
- At the same time with observing the plans by the UDA and the WMA, the Colombo MC is intending to select a contractor for to dig out the landfilled waste at the Meethothamulla disposal site in order to extend the lifetime of the site. After digging, the extracted waste will be used for burying the wetlands owned by residents around the Meethothamulla disposal site.

(3) About initial investments and O & M costs required for intermediate treatment facilities

- The UDA, the WMA and the Colombo MC are aware that intermediate treatment facilities such as incineration and biogas plants require huge investments and expensive O & M costs. Therefore, government organizations are expecting utilization of private finances for construction of these kinds of facilities instead of public investments.
- Local authorities collect waste fees only from business entities. Although officials in charge of SWM at local authorities are aware of the necessity to collect waste fees from households in order to ensure financial resources for implementation of a proper waste treatment, they do not try commencement of fee collection from all generation sources as they think politicians do not approve the idea.
- Although necessities of intermediate waste treatment facilities for solving waste management problems in the Western province have recognized at all level of governance, development of intermediate treatment facilities by public initiatives have not been realized.

d.2 Validity of the current development concepts

(1) Conclusion

As mentioned above, it was confirmed that the quality of the municipal solid waste, which was sampled at the Karadiyana disposal site, meets the incineration and composting processes. Also, as in the study of the Japan Society of Material Cycles and Waste Management, the superiority of a combination of incineration and biogas is shown as a way of intermediate treatment toward a material-cycles society.

The intermediate treatment facility development plan of the WMA is to construct combined facilities of an incinerator and a biogas plant at existing disposal sites; and thus, it is considered as a technically reasonable solution.

In western province, officials in charge of SWM at all levels of government are aware of necessity of drastic waste reduction through an intermediate treatment such as incineration. The Sri Lankan side has been relying on private investments for introduction of this kind of facilities due to the insufficiency of SWM financial capabilities of local authorities. However, a municipal solid waste treatment system that is solely dependent on private investments results in high burden on residents when it tries to regain the initial investments. As a proper allocation of roles and responsibilities between public and private sectors is indispensable to establish a sound SWM system, it is necessary that the government should prepare a

long-term plan and select a set of priority projects. Moreover, it is also necessary to select the most appropriate waste treatment method among various possibilities taking the local conditions into account and implement feasibility studies in order to formulate a financial system that could cover initial investments and O & M costs of the proposed facilities.

(2) Consensus building among stakeholders

In the Western province, municipalities are responsible for waste charge, collection and transportation, WMA is responsible for the operation of the final disposal. Intermediate treatment facility development plan of WMA is based on the premise that it be located in the existing disposal site. Intermediate treatment facility development plan of WMA is based on the premise that it be located in the existing disposal site. According to the experience of SWM in Tokyo, the citizen had refused to be forced to receive the waste generated in other place, and opposed the cluster disposal facility which the Metropolitan Government had developed. Consequently, the principle that the waste should be treated within the area the waste generated was established. Referring these experiences, it is necessary to make consensus among stakeholders about the followings to develop the intermediate treatment facilities.

(1) Regional treatment or individual treatment
(2) Securing the site for the facility
(3) Mechanism of cost sharing in case of regional treatment
   - ✓ Initial investment cost (subsidy from central government and burden of local authorities)
   - ✓ Operation cost (Share of municipality that uses it)

(3) Implementation

Since the targeted intermediate treatment facilities in the plan are not in Sri Lanka, there is a need to develop a detailed plan under the technical assistance from countries with proven track record on this field such as Japan. When the Sri Lankan side will request a technical assistant, consensus building among stakeholders is a prerequisite as mentioned above.

Since there are a number of options in the facility, it is recommended to conduct a pre-feasibility study in order to select the most appropriate treatment method. It is important that the agreement among the stakeholders including the residents is made after each stakeholder grasps the scale of the cost burden based on the results of pre-feasibility study. Then full-scale feasibility study is carried out, specific implementation steps toward commercialization is determined.

6.3 Assistance for Local Authorities in other than Western Province

6.3.1 Issues of Solid Waste Management of local authorities in other than Western Province

a. Issues of technical system

The local authorities in other than Western Province are divided into two categories as follows in accordance with the issues of solid waste management.

Category A: There are issues of discharge, collection, transportation and/or issue of disposal of waste.

Category B : There are issues of waste volume reduction, material recycling, intermediate treatment, 3Rs and so on, although the discharge, collection, transportation are moderately managed.

The category and issues of solid waste management of priority local authorities in other than Western Province are described in the table below.

Table 6-21: Category and Issues of Solid Waste Management of priority local authorities in other than Western Province

	No.	Province	Local Authority	Discharge, collection, transportation	disposal	Intermediated treatment	3Rs
Category A	1	Uva	Kataragama PS	Waste collection service rate is as low as 65.7% and one fourth of waste generation amount is self-disposed. Large annual fluctuation of waste generation amount.	There are three disposal sites which become open dumping, waste scattering and leachate leaking and this causes a serious environmental issues	Barrel for the collection of organic waste taken to the compost plant is not distributed.	None.
				Good	Not good	Not good	Not good
	2	North Central	Thamankaduwa PS	Waste collection service does not run on schedule Waste collection service rate is as low as 18%.	Disposal site causes serious environmental impacts to the surrounding areas Wild elephants scavenge the disposed waste & disturb the operations of the disposal site.	The compost plant owned by PS was started operation again since 2015. Separated valuable waste includes much residue and it is requires some more sorting by workers.	Valuable material is not separated properly.
				Not good	Not good	Good	Not good
	3	Northern	Jaffna MC	Collection rate is 75.7%, the waste collection service does not run on schedule due to malfunction of old collection vehicles	The disposed waste is scattered and expanded. There is no orderly function of design of new land fill site. Some surrounding LAs have issues with the landfill site.	The garden compost plant and MRF are not functioning properly due to lack of technology and management.	Although promotion of 3Rs is carried out, the activity is insufficient
				Good	Not good	Not good	Not good
	4	Eastern	Trincomalee UC	Although the waste collection rate is 62.9%, the waste collection service does not run on schedule due to malfunction of old collection vehicles	Open dumping causes environmental issues to the surrounding area Wild elephants scavenge the disposed waste & disrupt the operation of the disposal site	None	No activity of 3Rs is carried out.
				Good	Not good	Not good	Not good
Category B	5	North-Western	Kurunegala MC	Although the waste collection rate is 80.4%, the waste collection service does not run on schedule due to malfunction of old collection vehicles.	Although the disposed waste is regularly moved by heavy machinery, the covering soil is not properly carried out and this causes environmental issues to the surrounding area.	The existing compost plant is not functioning properly due to lack of technology and management	Organic waste for the compost plant is separated at generation source in some areas,, however the amount of separated organic waste is not enough
				Excellent	Good	Not good	Not good
	6	Central	Nuwara Eliya MC	Although the waste collection rate is 78.2%, the absence of waste collection workers sometimes causes the delays or disruptions of the collection duty There is a lot of waste scattered at stationed collection points	The leachate treatment facility seems to be malfunctioning and might cause water pollution downstream.	Not yet managed, however the material recovery facility will be established from 2016.	Not yet managed, however the material recovery facility will be established from 2016.
				Excellent	Good	Not good	Not good

6.3.2 Improvement of SWM at local authorities in other than Western Province

The local authorities belonging to category A are required to carry out a) optimization of SWM, b) introducing of intermediated treatment and c) promotion of 3Rs, while the category B are mainly required to carry out b) introducing of intermediated treatment and c) promotion of 3Rs.

a. Improvement of SWM at local authorities beglonging to category A

The following improvements are required at the local authorities beglonging to category A to solve the sanitary issue caused by improper discharge and collection of waste.

a.1 Optimization of SWM

(1)Storage/discharge
- Dissemination of proper self-disposal method,
- Establishment and dissemination of proper discharge rule

(2)Collection/transfer:
- Improvement of collection and transter rute
- Enhancement of capacity of maintenance for collection vehicles and so on.

(3)Disposal of waste:
- Improvement of existing disposal site with experience of the results of SATREPS/ improvement and application of leachate treatment facility at Nuwara Eliya
- establishment of management system of new sanitary landfill site

(4)Data base system of solid waste managment
- Formulation of quantatib solid waste management system

(5)Optimization of SWM finance system

(6) Formulation of Solid Waste Management Master Plan and optimization of by-law

b. Improvement of SWM at local authorities beglonging to category A and category B

The following improvements are required at local authorities beglonging to category A and category B to expand the lifetime of disposal site, solve the environmental issue and promotion of material recovery.

b.1 Introducing of intermediated treatment

(1) Establishment of proper intermediate treatment facility
- Treatment of organic waste : optimaization of existing / new compost plant facility
- Material recover : Optimization of existing / new MRF

b.2 Promotion of 3Rs

(1)3Rs activity at generation source
- Distribution of home compost barrel and instruction of proper useage of it by manual
- Supporting the current waste separation activity of loal authority

(2)Introducing the community based collection system of valuable material
- Studying the sustainability of introduce of Japanese community based collection sysytem

(3)Introducing and dissemination of the separation and collection of waste

6.4 Financial System

6.4.1 Public Financial System in Sri Lanka

In accordance with the 13th Amendment to the Constitution of Sri Lanka of 1987, the Provincial System was introduced, and a part of the political, administrative and financial powers the Government of Sri Lanka (GOSL) were implementing was devolved to the nine provinces established based on the amendment to the Constitution.

The contents of powers for national and subnational levels were indicated in the 9th schedule of the 13th Amendment with its three lists for the roles and functions to remain with the GOSL and those to be devolved to the provincial councils and implemented concurrently by the two. The amendment also indicated financial sources for the provinces.

In relation to the implementation of the 13th Amendment to the Constitution and the decentralization above, the Finance Commission (FC) was established as an independent organization for accomplishing reforms in the public financial system, implementing balanced apportionment of financial resources among provinces and local authorities and improving efficiency of government expenditures.

Under the new system, the FC identifies financial needs of the provinces, prepares an apportionment proposal and negotiates with the GOSL and the provincial councils on proposed allocations before transferring financial resources from the national to the subnational level. Based on the apportionment proposal of the FC, the General Treasury transfers allocated funds to the provinces. Part of the allocation is transferred to local authorities (LA) by respective provincial councils.

This section examines the public financial system of Sri Lanka by introducing the financial autonomy of and own-sources devolved to the provinces and local authorities under the 13th Amendment to the Constitution, government grants and fund allocation to the subnational levels based on the information obtained during the 2nd field survey.

a. Decentralization

As mentioned above, the 13th Amendment to the Constitution divides roles and functions of governance to the national and subnational levels with the three lists. The contents of the lists are presented in the table below.

Table 6-22: Lists of Roles and Functions for National and Subnational Governments

No	Provincial List (Provincial Councils) (List-1)	Concurrent List (List-2)	Reserved List (Central Government) (List-3)
1	Planning and implementation of provincial economic plans	Planning	National policy on all subjects and functions
2	Education	Higher education	Defense and national security
3	Local government	National housing and construction	Foreign affairs
4	Housing and construction	Acquisition and requisitioning of property	Posts and telecommunications
5	Roads	Social services and rehabilitation	Finance in relation to national revenue, monetary policy and external resources; customs
6	Social services and rehabilitation	Agricultural and agrarian services	Foreign trade; inter-province trade and commerce
7	Agriculture and agrarian services	Health	Ports and harbors
8	Rural development	Co-operatives	Aviation and airports
9	Health and indigenous medicine	Irrigation	National transport
10	Land	Fisheries	River and waterways; shipping and navigation
11	Irrigation	Employment	Minerals and mines
12	Probation and child care	Tourism	Immigration, emigration, and citizenship

No	Provincial List (Provincial Councils) (List-1)	Concurrent List (List-2)	Reserved List (Central Government) (List-3)
13	Livestock	Trade and commerce	Elections including presidential, parliamentary, provincial councils and local authorities
14	Transport	Price control	Census and statistics
15		Drug and poisons	Professional occupations and training
16		Protection of the environment	National archives; archeological activities and sites and antiques declared by or under any law made by Parliament to be of national importance
17			All other subjects and functions not specified in the provincial council list and the concurrent list

Within the territories of the Provincial List, the provincial councils are authorized to formulate and implement by-laws and regulations. At the same time, the list also contains the sources of revenue to finance the expenditures of the devolved functions of the provincial councils.

On the other hand, local authorities – Municipal Councils, Urban Councils and Pradeshiya Sabhas[42] – implement the following functions under supervision of the provincial councils.

Table 6-23: Roles and Functions of Local Authorities

	Municipal and Urban Councils	Pradeshiya Sabha
1	Maintenance and cleaning all public streets and open spaces vested in the councils or committed to their management	Providing services related with public health, public utilities and public thoroughfares.
2	Enforcing the proper maintenance, cleanliness and repairs of all private streets	Protection and promotion of the comfort, convenience and welfare of the public.
3	Supervising growth and development of their area of jurisdiction by planning and widening streets, Reservation of open spaces, and Execution of public improvements	Provision of all amenities within their area.
4	Abating all nuisances	
5	Establishing and maintaining (subject to the extent of its resources) any public utility services which are authorized to be maintained under LA Ordinances and required for welfare, comfort and convenience of the public	
6	Promoting public health, welfare and convenience, and developing sanitation and amenities in the council areas.	

Departments of Local Government in Provincial Councils supervise activities of local authorities. However, human resource affairs of local authorities are supervised by the Provincial Public Service Commissions that belong directly to Provincial Governors.

The legislations of local authorities (Municipal Council Ordinance, Urban Council Ordinance and Pradeshiya Sabha Act) allow any local authority to establish a local authority fund to finance its needs. The fund empowers local authorities to initiate revenue generation activities according to their needs. Local authorities are authorized to change public service charges and set unit rates for public utilities, fees and local taxes.

b. Finances of Provincial Councils and Local Authorities

b.1 Revenues of Provincial Councils and Local Authorities

The revenues of provincial councils and local authorities consists of (1) Own-source revenues formed by local taxes, service charges and public service fees imposed and set by the

[42] There were 23 Municipal Councils, 41 Urban Councils and 271 Pradeshiya Sabhas in Sri Lanka as of the end of 2013.

provinces and the local authorities, and rents or revenues of public facilities; (2) Government grants and (3) Other funds such as loans, donations and assistance obtained from other external sources.

Detailed information about each of the sources is as follows.

b.1.1 Own-source Revenues

The own-source revenues of provincial councils and local authorities are indicated by the Constitution and legislation of local authorities (Municipal and Urban Council Ordinances and Pradeshiya Sabha Act) as mentioned earlier.

According to the 13th Amendment to the Constitution of Sri Lanka, the own-source revenues of provincial councils consist of 20 types of sources such as local taxes, license fees and service charges. As for local authorities, the own-source revenues can be categorized into six categories to be formed from local taxes, fees, service charges and property rents.

The detailed list is presented in the table below.

Table 6-24: Own-source Revenues of Provincial Councils and Local Authorities

No	Provincial Councils	No	Local Authorities
1	Turnover taxes on wholesale and retail sales within such limits and subject to such exemptions as by law made by Parliament	1	Local taxes
2	Betting taxes and taxes on prize competitions and lotteries other than national lotteries and lotteries organized by the Government of Sri Lanka		● Property tax
3	License taxes, arrack, toddy rents, tapping license fees and liquor license fees		● Motor vehicle tax
4	Motor vehicle license fees within such limits and subject to such exemptions as may be prescribed by law made by Parliament		● Trade tax
5	Dealership license taxes on drugs and other chemicals		● Event tax
6	Stamp duties on transfer of properties such as lands and motor cars	2	Fines and penalties
7	Fees imposed by courts		● Fines on traffic rule violations
8	Fees charged under the Medical Ordinance	3	Service fees
9	Fees charged under the Motor Traffic Act		● Land registration fee
10	Department fees in respect of any of the matters specified in this list		● Registration and certificate fees
11	Fees under the Fauna and Flora Protection Ordinance		● Business license fees
12	Fees on lands alienated under the Land Development Ordinance and Crown Lands Ordinance		● Fees for construction permit
13	Court fees including stamp fees on documents produced in court	4	Rents and revenues of public facilities
14	Regulatory charges under Weights and Measures Ordinance		● Rents on markets
15	Land revenue including assessment and collection of revenue and survey and maintenance of land records for revenue purposes		● Rent of public facilities
16	Taxes on land and buildings including the property of the state to the extent permitted by law made by Parliament		● Parking fees
17	Taxes on mineral rights within such limits and subject to such exemptions as may be prescribed by law made by Parliament		● Revenues of workshops and other local properties
18	Licensing fees on the possession, transport, purchase and sale of intoxicating liquors	5	Public Service Charges
19	Other taxation within the province in order to raise revenue for Provincial purposes to the extent permitted by or under a law made by Parliament		● Waste collection fee
20	Others		● Water fee
		6	Others

In addition to the above, stamp duties and court fines are included in the own sources of the local authorities. All revenues except the stamp duties and court fines are collected by relevant departments and organizations of provincial councils and local authorities. As for the stamp duties and the court fines, collection rights lay with the Land Registration Agency of the central government and the court office. Therefore, these organizations are obliged to transfer the relevant part of the collected stamp duties and court fines to each provincial council. The provincial councils, in turn, transfer a certain amount of these assigned revenues to their local authorities based on invoices submitted by the local authorities.

In the table below, the most important revenues of local authorities are listed. The revenues are picked from the own-sources of some of the target municipalities of this study. In each of the selected municipalities, the top five types, in terms of their shares in the total amount of own-source revenues, were selected.

Table 6-25: Major Own-source Revenues of Local Authorities

No	Major Types of Own-source Revenues	Dehiwala MC		Moratuwa MC		Kesbewa UC		Katunayake Seeduwa UC		Katharagama PS	
		Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank
1	Property tax	41.6%	1	33.9%	2	14.5%	2	59.7%	1	6.0%	4
2	Stamp fees on land sales	34.7%	2	39.9%	1	65.1%	1	12.2%	2		
3	Court fines	4.3%	3	3.6%	3					6.4%	3
4	Interest on fixed deposits	2.9%	4					1.9%	5		
5	Trade tax	1.8%	5	2.7%	5						
6	Waste collection fee			3.2%	4						
7	Rent of markets and trade centers					3.3%	4	7.4%	4		
8	Land permission fees					3.6%	3			29.7%	1
9	Land tax					1.8%	5				
10	Water fees							7.5%	3		
11	Parking fees									18.4%	2
12	Public advertising fees									5.5%	5

Although the major sources of revenues differ across local authorities, in most cases the most important types of own-source revenues are usually those included in the table above.

b.1.2 Grants

The GOSL allocates three types of grants to the provinces and local authorities; (1) Block Grants for financing recurrent expenditures, (2) Capital Grants for financing capital expenditures and (3) Other subsidies.

Block Grant (BG) is released to finance the recurrent needs of provincial councils and local authorities such as personnel emoluments (salaries, wages, overtime and other allowances), supplies, maintenance of fixed assets and utilities. The personnel emoluments in the BG are paid only to the permanent staff approved by the Department of Management Service, the Ministry of Finance. The remaining part of the grant, designated for financing other recurrent expenditures, is estimated based on the difference between the actual needs of the provinces and the own source revenues expected to be utilized for the same purpose. This grant is transferred to provincial councils in bulk amounts and the provincial councils are obliged to transfer relevant parts of the grant to their local authorities.

The amounts of the BG released to the provinces from 2010 to 2013 are summarized in the table below (transfers to local authorities are included)

Table 6-26: Amounts of Block Grant Released from 2010 to 2013 (Unit: million LKR)

No	Category	2010	2011	2012	2013
1	Allocated Amount by Treasury	85,000	90,000	94,877	102,800
2	Actually Released Amount*	85,299	94,602	91,552	108,801
3	Released Amount / Allocation	100.4%	105.1%	96.5%	105.8%

*-Additional appropriations are included.

Source: Finance Commission, 2014, "Annual Report-2013"

On the other hand, the Capital Grant is released for financing the capital expenditures and classified into the Criteria-based Grant (CBG) and the Provincial Specific Development Grant (PSDG).

The CBG is a type of capital grant designated for reduction of regional disparities; and therefore, must be spent on developmental activities to improve the socio-economic status of residents. In relation to allocation and utilization of this grant, provincial councils are required to adhere to relevant guidelines issued by the Finance Commission.

The PSDG provides financing for the capital expenditures of provincial councils and local authorities and is classified into three categories; (1) Sectorial allocation for financing infrastructure development projects in the provinces, (2) Funds of special projects for balanced regional development and (3) Funds of foreign and locally-financed projects designed by and agreed on at the national level. Detailed information about each of the category is as follows:

- The funds released under the sectorial allocation are decided for each of the target sectors; and thus, the provincial councils are not allowed to spend the amount in other sectors or for other purposes. The target sectors are (1) economic infrastructures (segments are roads and transport), (2) Social infrastructure and services (segments are education, Health including SWM in local authorities, probation and child care and social services) and (3) production sector (segments are agricultural development, rural development and tourism).
- Funds of special project for balanced regional development are the funds for projects formulated for achieving the government objectives set for balanced regional development. These projects are usually implemented for one to three years.
- Designated funds for implementing foreign and locally-financed projects are also part of the PSDG.

The PSDG is only released to provincial councils. However, the provincial councils either transfer parts of the grant to local authorities in relation to the projects being implemented in their territories or their own expenditures on behalf of the local authorities.

There are also occasions that a flexible allocation is included in the PSDG, considering the possibility of insufficient funds for financing all the target expenditures.

The amounts of the PSDG released to the provinces from 2010 to 2013 are summarized in the table below.

Table 6-27: Amounts of PSDG Released from 2010 to 2013 (Unit: million LKR)

No	Category	2010	2011	2012	2013
1	Treasury Allocations for Capital Grants:				
	For CBG	3,075	4,460	3,025	2,390
	For PSDG	19,480	23,457	24,714	24,564
	Total Allocation	22,555	27,917	27,739	26,954
2	Actual Released Grants:				
	Released CBG	2,612	3,855	2,859	2,264
	Released PSDG	16,404	11,199	6,961	7,773
	Total Released Grants	19,016	15,054	9,820	10,037
3	Released Amount / Allocation	84.3%	53.9%	35.4%	37.2%

Source: Finance Commission, 2014, "Annual Report-2013"

The other subsidies are divided into following four major categories:

- **Revenues to be allocated to provincial councils instead of Business Turnover Tax (BTT)**. The BTT was abolished in 2011. As the tax was the major own-source revenue for provincial councils, the GOSL started sharing part of the government revenues formed from the collection of the Nation Building Tax (NBT), Motor vehicle registration fees and Stamp duties. The amounts to be allocated to the provinces are 70% of total NBT revenues, 33% of collected motor vehicle registration fees and 70% of the collected stamp duties. The fund is allocated to provincial councils based on their socio-economic conditions and needs.
- **Subsidies to lagging local authorities.** Local authorities with own-source revenues less than 10 million LKR are considered as lagging local authorities and all of them are Pradeshiya Sabhas. The GOSL subsidizes these local authorities under a special support system for lagging local authorities. In 2014, the central government released 1.4 billion LKR to 245 Pradeshiya Sabhas. Local authorities that meet the condition must apply for the subsidy through the Ministry of Local Governments and Provincial Councils.
- **Fund of decentralized budget.** The Ministry of Finance allocates a certain amount of funds to parliament members for financing development activities in their elected local authorities. This fund is considered a decentralized budget and transferred to local authorities through the District Secretariats.
- **Projects funds by line-ministries.** The funds that are used as expenditures for projects that line-ministries implement in territories of local authorities are also considered a part of grant(s).

b.1.3 Other Funds

Other funds include financial resources procured by or provided to provincial councils and local authorities such as loans, contributions, donation and assistance.

As for local authorities, the most commonly used external source was the low-interest loan of the Local Loan and Development Fund (LLDF), a foundation under the Ministry of Local Governments and Provincial Councils.

b.2 Expenditures of Provincial Councils and Local Authorities

Expenditures of provincial councils and local authorities are categorized into Recurrent and Capital Expenditures. Detailed information about each category is as follows.

b.2.1 Recurrent Expenditures

According to the Annual Report-2013 by the Finance Commission, recurrent expenditures accounted for 70 to 80% of the total expenditures of provincial councils and local authorities. The majority (70 to 80%) of the recurrent expenditures were personnel emoluments (salaries and allowances). The other recurrent expenditures such as O & M expenses of fixed assets, office supplies, communication costs and utilities expenses occupied 20 to 30%.

The recurrent expenditures of provinces and local authorities from 2010 to 2013 were summarized in the table below.

Table 6-28: Recurrent Expenditures of Provinces and LAs (Unit: million LKR)

No	Expenditures	2010	2011	2012	2013
A	Personnel Emoluments:				
1	Salaries and Wages	66,481	71,753	68,660	71,143
2	Overtime and Holiday Pay	4,134	4,652	4,999	6,761
3	Other Allowance	21,434	24,535	33,092	39,416
	Total Personnel Emoluments	92,049	100,940	106,751	117,320
B	Other Recurrent Expenditures:				
4	Travelling	1,022	1,125	1,187	1,245
5	Supplies	2,879	3,683	3,600	4,070
6	Maintenance	3,224	3,778	3,958	4,303
7	Contractual Services	2,457	2,855	3,133	3,440
8	Transfers	11,762	12,240	13,441	12,935
9	Grants	4,739	4,314	5,833	11,051
10	Subsidies	175	690	983	67
11	Other Expenditures	609	730	495	1,096
	Total Other Recurrent Expenditures	26,869	29,416	32,631	38,208
C	Total Recurrent Expenditures	118,918	130,356	139,381	155,528
D	Ratios:				
	Share of Personnel Emoluments	77.4%	77.4%	76.6%	75.4%
	Share of Other Recurrent Expenditures	22.6%	22.6%	23.4%	24.6%

Source: Finance Commission, 2014, "Annual Report-2013"

The comparison of the recurrent expenditures and the amount of released block grants to the provinces (local authorities are included) is presented in the table below.

Table 6-29: Recurrent Expenditures and Block Grant (Unit: million LKR)

No	Category	2010	2011	2012	2013
1	Recommended Amount by Finance Commission for Block Grants	85,000	90,000	94,877	102,800
2	Allocated Amount by Treasury	85,000	90,000	94,877	102,800
3	Actually Released Amount*	85,299	94,602	91,552	108,801
4	Actual Recurrent Expenditures	118,918	130,356	139,381	155,528
	Financed from Block Grants	71.7%	72.6%	65.7%	70.0%
	Financed from own-sources	28.3%	27.4%	34.3%	30.0%

*-Additional appropriations are included.
Source: Finance Commission, 2014, "Annual Report-2013"

According to the tables, the amount of recurrent expenditures increased continuously and more than 75% of the annual recurrent expenditures were personnel emoluments. On the other hand, the amount of block grants released to the provinces each year accounts for around 70% of the total recurrent expenditures on average. Therefore, it can be concluded that the block grants cover only personnel emoluments among the recurrent expenditures. However, it should be considered that the part in the block grant that corresponds to personnel emoluments targets only those for permanent staff approved by the Department of Management Service, the Ministry of Finance.

All expenses related with the contract-based staff and other recurrent expenditures are being financed from own-source revenues of provincial councils and local authorities.

b.2.2 Capital Expenditures

Capital expenditures are expenditures related with the extension of existing assets (including fixed assets and infrastructure facilities) or creation of new assets in order to achieve socio-economic development. In Sri Lanka, expenditures on human resource development are also considered as part of capital expenditures.

Amounts of capital expenditures of the provinces and the capital grants released by the central government from 2010 to 2013 are compared in the table below.

Table 6-30: Capital Expenditures of Provinces and Released Capital Grants (Unit: million LKR)

No	Category	2010	2011	2012	2013
1	Treasury Allocations for Capital Grants:				
	For CBG	3,075	4,460	3,025	2,390
	For PSDG	19,480	23,457	24,714	24,564
	Total Allocation	22,555	27,917	27,739	26,954
2	Actual Released Grants:				
	Released CBG	2,612	3,855	2,859	2,264
	Released PSDG	16,404	11,199	6,961	7,773
	Total Released Grants	19,016	15,054	9,820	10,037
3	Actual Capital Expenditures:				
	Expenditures in PSDG target sectors	16,830	12,493	11,351	13,578
	Expenditures in other sectors	7,744	6,902	10,045	8,130
	Total Expenditures	24,574	19,395	21,396	21,708
4	Ratios:				
	Released Grants/Allocation	84.3%	53.9%	35.4%	37.2%
	Released Grants/Expenditures	77.4%	77.6%	45.9%	46.2%

Source: Finance Commission, 2014, "Annual Report-2013"

As the table shows, the annual allocation of the grants was more than 22.5 billion LKR and the amount was maintained at a level of 27 billion for the latest three years. However, the actual released grants decreased annually and the amount was less than 50% of the allocated amounts for the latest two years.

For two years (2012 and 2013), only 45% of the total capital expenditures of the provinces were covered by the government grants and the remaining parts were financed from the own funds of the provinces.

c. Grant Allocation and Transfer

c.1 Allocation of Grants

Although the Ministry of Finance announces the total amount of grants to be released to provinces and local authorities, apportionment of the funds is made by the Finance Commission.

According to the Finance Commission, the structure of the Block Grant is as follows: 80% of funds are for personnel emoluments and 20% of funds are for other recurrent expenditures. The needs of provinces and local authorities for personnel emoluments are determined based on the number of permanent staff approved by the Department of Management Service of the Ministry of Finance. Based on the results, the funds for other recurrent expenditures are estimated.

The Commission identifies provincial needs for capital grants by comparing Annual Development Action Plans (to be prepared under Provincial Midterm Development Plans) and budget proposals submitted by the provinces with the Midterm Agency Results Framework that was formulated for respective provinces based on the National Development Policy Framework and the National Midterm Development Plan. At this stage, the Finance Commission prepares an apportionment proposal considering the socio-economic conditions of each province such as population, poverty and potential of own-source revenues. In addition, the commission also considers the sustainability of projects implemented in the provinces and the efficiency or effectiveness of the project expenditures. After preparation of

the apportionment proposal, the commission informs the provinces about the results, starts negotiations and submits the results to the Ministry of Finance as a recommendation.

Provincial councils are obliged to revise their budget proposals based on the recommendations and resubmit them to the commission for its approval. The Ministry of Finance releases grants based on the provincial budgets approved by the Finance Commission.

c.2 Transfer of Grants

The Ministry of Finance transfers all types of grants to the Ministry of Local Government and Provincial Councils (MLGPC) as a bulk amount. The Accounting Department of the MLGPC allocates the amount to each province based on the apportionment and releases this apportioned amount to the Chief Secretary Office of each Provincial Council.

As for the grants earmarked to local authorities, Provincial Treasury Departments transfer the grants through the Departments of Local Governments (DLG). The DLG is a department established within the Local Government Ministry of each provincial council. It coordinates between local authorities and the central government/the provincial council, supervises activities of local governments and verifies their financial conditions and accounting processes. All grants to local authorities, except the funds under decentralized budget, are transferred through the DLG.

d. SWM Finance

SWM activities are financed by own-source revenues of local authorities. According to the results of the 2nd field survey, SWM expenses accounted for 10 to 30% of total expenditures of local authorities; and thus, waste collection service is one of the major public services in the local authorities.

However, the amount of revenues collected by waste fees did not even reach 10% of the total SWM expenses in all of the local authorities targeted during the field survey. The main reason for the low collection rate is that the local authorities conduct waste collection services to all households and businesses in their territories, but collect waste fees only from large-scale businesses.

The table below shows relevant data provided by some of the target municipalities.

Table 6-31: SWM Finance in Some Local Authorities (Unit: Thous.LKR)

No	Types of Expenditures	Dehiwala MC	Moratuwa MC	Kesbewa UC	Katunayake Seeduwa UC
1	Total Municipal Expenditures	1,221,134	465,243	391,552	140,402
2	SWM Expenditures	281,334	151,508	41,163	40,934
3	Collected Waste Fees	14,883	8,511	3,043	1,692
4	Ratios:				
	SWM Expenditures / Total Expenditures	23.0%	32.6%	10.5%	29.2%
	Collected Fees / SWM Expenditures	5.3%	5.6%	7.4%	4.1%

On the other hand, one of the priority sectors for PSDG is the health sector, which includes SWM in local authorities. According to the National Solid Waste Management Support Center (NSWMSC) of the MLGPC, the central government allocated 90 million LKR under PSDG in 2015 for improvement of SWM in local authorities. As of the end of October 2015, around 75% of the allocated grant was already spent for technical assistance such as training and procurement of tools and equipment for the local authorities.

At the same time, the Waste Management Authority (WMA) of the Western Province has been implementing technical and physical assistance on improvement of SWM in local authorities of the province by means of organizing training for SWM staff and provision of

tools and equipment. These activities of the WMA are financed from the central government grant provided under PSDG to the province. The annual budget is usually up to 100 million LKR, according to the WMA.

However, the Finance Commission emphasized less priority for allocation of grants to investments in the SWM sector based on the reason that the sector does not have a direct impact on national development,

6.4.2 Possibilities of Financing SWM Improvement Projects

a. Possibility of Investments by Local Authorities

The most commonly used external source for local authorities to finance their investment needs is the low-interest loan by the Local Loan and Development Fund (LLDF) supervised by the Ministry of Local Governments and Provincial Councils.

If SWM improvement projects have to be financed by local authorities, there is a high possibility that the local authorities will apply for the LLDF loans.

a.1 Summary of LLDF

The LLDF is a public financial organization that belongs to the Ministry of Local Governments and Provincial Councils. It was established by the Ministry of Finance in order to support local authorities to finance their financial needs for infrastructure development.

The LLDF commenced its operation with the long-term loans provided by the Ministry of Finance and later received project funds (both grant(s) and soft loan(s)) from the Asia Development Fund (ADB) and the World Bank (WB). As the Ministry of Finance stopped financing the LLDF in 2008, the organization has been financing its operational expenses from the earnings generated from the loan interests, fixed deposits and government bonds.

According to the balance sheet of the LLDF, the total assets in 2013 were 7.3 billion LKR. The current assets accounted for only 6.7% of the total assets (Cash and cash equivalents-2.5%, short term interest receivables-4.2%) and the rest was non-current assets (fixed assets-0.5%, bonds held to maturity-40% and long term loan receivables-59.5%). The majority of the assets (94%) were procured from long term loans (loans from the Ministry of Finance and project funds of other donor organizations) and 4% was short term payables (interest payments to the creditors for the loans provided).

As the income statement shows, the amount of total revenues in 2013 was 335 million LKR while that of the total expenditures was 329 million LKR. The net earnings after tax for the year were estimated at 5.6 million LKR.

The LLDF is a foundation that releases development loans only to public organizations (including local authorities). In accordance with the Local Loan and Development Ordinance and the Local Loan and Development (Amendment) Act of 1993, the LLDF releases low interest loans for 12 types of projects which are implemented by local authorities. The interest rates are stable and much lower in comparison with those of commercial banks. According to the LLDF, the interest rates have not been changed for eight years (from 2006 to August 2014). The current rates are compiled in the table below.

Table 6-32: Annual Interest Rates of LLDF Loans

No	Project Types	Loan Rates
1	SWM	5.5%
2	Development of Eco-tourism	9.0%
3	Improvement of Weekly Fair	6.5%
4	Water Supply and Sewerage	7.0%
5	Construction of Libraries	7.0%
6	Construction of Crematorium	6.5%
7	Purchase of Equipment designated for Road Maintenance and Sanitation (Waste Collection)	9.0%
8	Construction of Office Building	7.0%
9	Construction of Market Complex	9.0%
10	Development of Rural Road	6.0%
11	Other Revenue Generating Projects	9.0%

a.2 Current Conditions of Loan Utilization

The number of loans released by the LLDF for the past 10 years is as follows.

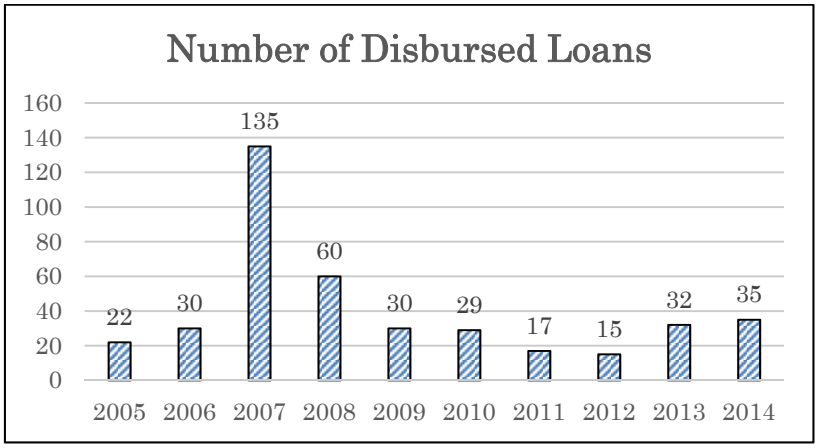


Figure 6-3: Number of Loans Released by LLDF

According to the figure, the LLDF released loans 30 times a year on average (not including loans released in 2007).

The information of loans released to local authorities is shown in the table below.

Table 6-33: Information of Loans Released to Local Authorities

Province	No of Projects	Loan Amount (LKR)	Share
Central	46	219,484,800	8.9%
Northcentral	13	188,069,000	7.7%
Northwestern	53	504,977,500	20.6%
Sabamagamuwa	32	233,300,000	9.5%
Southern	50	327,410,000	13.3%
Uva	20	127,690,000	5.2%
Western	59	702,774,800	28.6%
Eastern	14	95,420,000	3.9%
Northern	7	57,000,000	2.3%
Total	294	2,456,126,100	100.0%
Average: Loan per Project		8,354,170	

According to the table, the LLDF released loans to 30 projects implemented by local authorities in a year. The total amount of loans released to local authorities for the 10 years reached to 2.5 billion LKR and half of the amount was received by local authorities of Western and North-western Provinces (28.6% and 20.6% of the total amount, respectively).

The average amount per project was estimated as 8.4 million LKR.

The amount of loans received by local authorities for the past 10 years were compiled by their purposes (by types of projects) and reflected in the following figure.

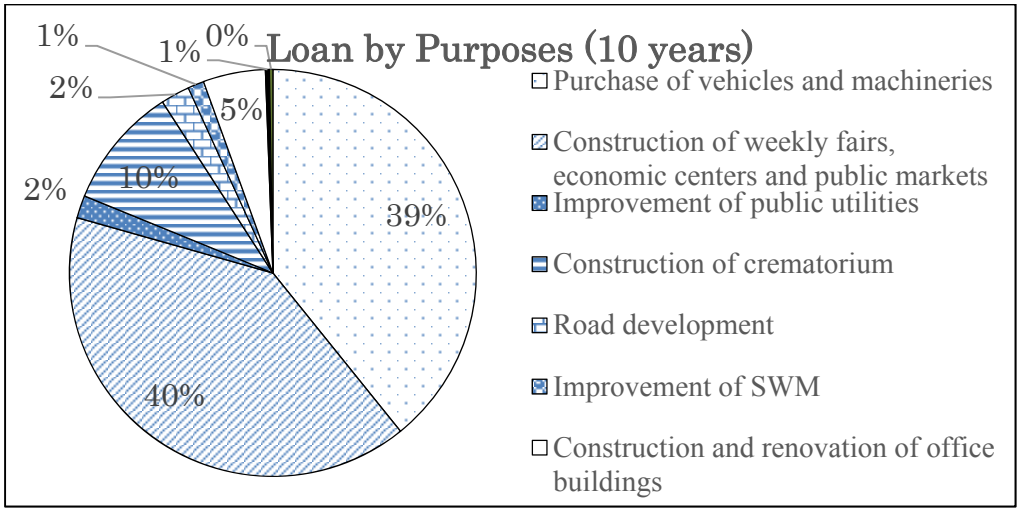


Figure 6-4: Loans Compiled by Project Types (Total=2.5 Billion LKR)

According to the figure, 80% of the total loans released to local authorities were used for construction of markets/trade centres and procurement of vehicles and machinery. Expenditures for improvement of SWM occupy only 1% of the grand total.

a.3 Considerations

According to the information provided by the LLDF, the loan recovery rate is around 70%. As for the target local authorities of this study, 7 out of 10 local authorities have received loans from the LLDF. Only three local authorities – the Katharagama PS, the Trincomalee UC and the Moratuwa MC – have never received a loan from the foundation.

The total loans received by the seven local authorities were 640 million LKR and 40% were already repaid and the amount of arrears accounted for only 0.1% (640,352 LKR). Based on this result, the repayment rate of the LLDF loans was considered sufficient.

Table 6-34: Loan Repayment Conditions by seven Target Local Authorities (Unit: LKR)

	Released Total	Repaid Loan	Arrears	Amount within Schedule
1	638,340,292	241,934,366	688,352	395,717,574
2	100%	37.9%	0.1%	62.0%

According to the information obtained during the 2nd field survey, the major external source for local authorities to finance their investments is the LLDF. As the loan repayment rate was relatively high, it can be assumed that the LLDF is in relatively good financial condition.

However, judging from its financial statements of 2013, the amount of working capital accounts for 2.7% of its total assets (current assets-6.7% and current liabilities-4%) and is equal to only 190 million LKR (total assets-7.3 billion; share of working capital-2.7%). It is believed that the small amount of working capital had resulted from the longer periods set for the loans released to local authorities.

Therefore, there is a high possibility that the LLDF loans cover only small-scale projects such as procurement of tools and equipment that can be repaid in shorter periods. However, the amount of funds available for release changes depending on actual implementation of loan repayment schedules by the LLDF in the future.

In addition to the above, the LLDF examines the sustainability of individual projects and financial capabilities of local authorities when evaluating loan applications. Therefore, local authorities that receive loans from the fund might be limited to those with sufficient own-source revenues and higher financial capabilities.

b. Possibility of Investing from Government Grant

According to the results of the 2nd field survey, most of the local authorities are struggling to finance their daily activities. Since local authorities are unable to improve the quality of public services to a sufficient level due to their limited financial capabilities, the government grant is essential for improving regional and local SWM capacities.

b.1 Possibility of Grant Allocation

From the fact that SWM is included in the target sectors of the PSDG, it is possible that the GOSL will release grants for SWM projects under the PSDG in the future. However, the Finance Commission, the key organization for approval of provincial budgets and apportionment of grants, has been considering that the costs of these projects should be financed by user local authorities.

Therefore, it might be necessary to reconfirm the priority of SWM in the national development policies and to amend relevant contents of the Midterm Development Plan of Sri Lanka in order to ensure sufficient allocation of grants for the SWM sector.

b.2 Target Projects for Grants and Local Own-sources

The government grant should be utilized for financing projects that provinces and local authorities cannot afford from their own funds such as extensive replacement of collection vehicles, expansion of existing SWM facilities or improvement of their processing capacities and construction of regional-level landfill sites and intermediate treatment facilities. However, the operation and maintenance costs of such equipment and facilities should be financed by user local authorities.

Funds required for small-scale projects in local authorities such as expansion of existing local facilities, construction of new local facilities and procurement of instruments will be affordable for local authorities. For these projects, local authorities can also utilize the low interest loan of the LLDF.

b.3 Considerations

If all expenses of SWM improvement projects are financed by domestic sources, extensive SWM improvements might not be implemented due to possible limitations of funds.

In addition, local authorities that will be able to receive loan(s) from the LLDF will also be limited due to low financial capacities. It will be necessary to promote participation of low-income local authorities by such means as lowering interest rates using part of the grants.

c. Possibility of External Sources (Soft Loan)

In order to implement extensive improvements in the SWM sector, it is necessary to involve external funds. Utilization of foreign soft loans was considered as follows.

c.1 Roles of the Central Government and Local Authorities

Considering the financial situation of local authorities, government participation is necessary when repaying the principal amount of the soft loan with its interest. In relation to the repayment, the central government should bear the following expenses; (1) full amount of interest expenses, (2) amounts used for investments in regional-level facilities such as construction or expansion of

regional landfill sites and ITFs and (3) full amount of project operation costs.

In this case, repayment of funds invested in small-scale local projects for construction of local facilities and procurement of equipment (without interest) and O&M expenses for all facilities and equipment to be constructed or procured during the project could be financed through revenues from tipping fees and waste collection fees collected by relevant local authorities.

c.2 Project Organization

It is possible to form a project implementation organization (PIO) based on the NSWMSC of the MLGPC with participation of provincial councils. In this case, regional large-scale projects will be implemented by the PIO directly. As for local small-scale projects, the PIO will conduct technical support to local authorities on implementation of the projects. Financing these local projects will be conducted through the LLDF with participation of the PIO.

In this case, part of the loan fund should be managed by the LLDF and released to local authorities. The LLDF will undertake releasing of loans and loan contract management.

The LLDF possesses sufficient experience in implementing loan components of donor funded projects. Currently, the foundation has been implementing loan components of the Urban Development and Low Income Housing Project (UDLIHP) of the ADB, the Local Government Infrastructure Improvement Project (LGIIP) and the Perennial Crop Development Project (PCDP).

d. Items to Consider

One of the top priorities in the SWM sector of Sri Lanka is improvement of the SWM financial system. Due to lack of enough budget of SWM, the serious issues of SWM have happned such as poor operation of final disposal site, the adverse environmental and wilf life impact at disposal site caused by inadequate anti-wild elephant's countermeasure at some local authorities.

SWM activities are implemented mainly by local authorities and relevant expenses are paid from their own funds. The local authorities focus on the balance of total revenues and expenditures only, and do not pay sufficient attention to sustainability of individual activities such as waste collection service(s). Although the local authorities conduct waste collection services to all households and businesses in their territories, the waste collection fees is charged from large-scale businesses only. Furthermore, the rule of charging system of waste collection fee is not clear among local authorities. This results in a low waste collection rate and insufficient operation of local landfill sites in low-income local authorities such as the Katharagama PS.

The pre-requisite conditions for the effectiveness of any SWM improvement project will be the sustainability of waste collection service and SWM activities that can be achieved by (1) improving service efficiency or reducing operational costs and (2) reforming the current waste collection fee system to charge fee from not only large scale business but also middle ans small scale business. Regarding on the charging the waste collection fee to residents, the possibility of it should be studied and discussed among stakholders well because there many difficulties such as collection system, making consensus of residents and so on.

6.5 Improvement of SWM

6.5.1 Schedule of improvement of SWM in short term and mid term

The schedule of improvement of SWM in the short-term and mid-term to solve the issue of SWM in Sri Lanka is described in the figure below.

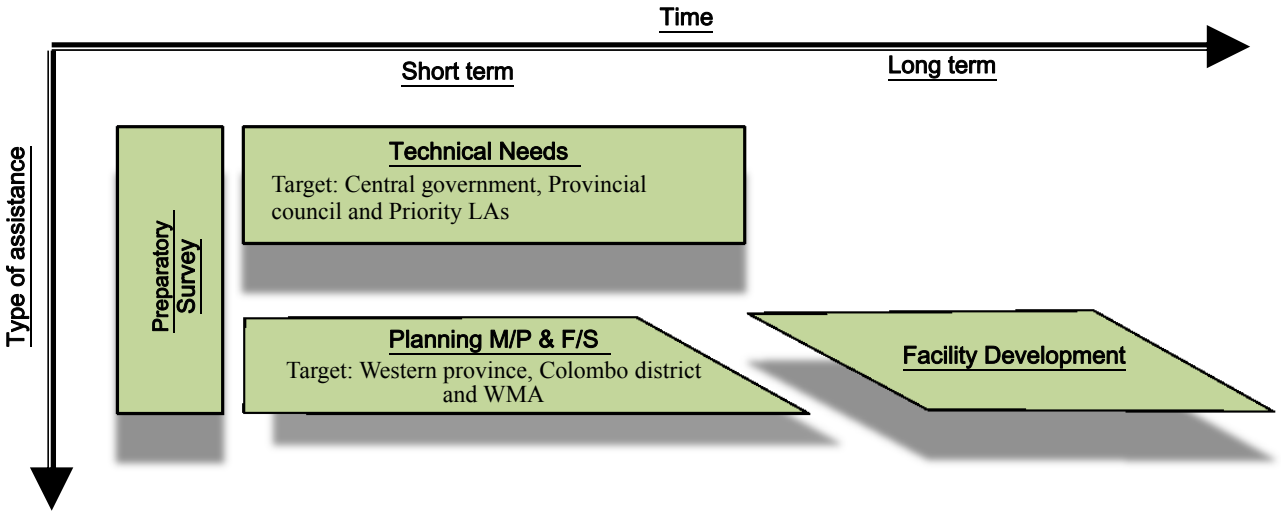


Figure 6-5: The schedule of improvement of SWM in short-term and mid-term

The following shall be undertaken by the Sri Lankan side if there is any project and / or assistance from a donor agency

- Selection of execution body of project
- Making consensus of project from stakeholders such as central government ministry or agency, LAs, citizens and so on.
- Land acquisition of project site
- Securing financial source of operation of facility

The details of assistance are explained as follows.

6.5.2 Technical Needs

The objective of technical needs assistance is to appropriate the SWM system among the central government, provincial government, and local authorities.

a. Optimization of SWM system among Central government (CEA and NSWMSC) and Provincial government

The roles, responsibilities and support system of SWM among the NSWMSC, provincial government and local authorities are optimized. Furthermore, the monitoring capacity of the CEA in terms of SWM is enhanced during the technical cooperation project.

b. Optimization of SWM of Local Authorities

The technical system and organization of SWM of local authorities are optimized. Moreover, the 3Rs are introduced properly during the technical cooperation project.

b.1 Optimization of technical system

The technical systems of storage, discharge, collection, transfer and disposal of waste are optimized as follows:

- Storage/discharge: Dissemination of proper self-disposal method, establishment and

dissemination of proper discharge rule
- Collection/transfer: Enhancement of capacity of maintenance for collection vehicles and so on.
- Disposal of waste: Improvement of existing disposal site with experience of the results of SATREPS/ improvement and application of leachate treatment facility at Nuwara Eliya/ establishment of management system of new sanitary landfill site
- Data base system: Introducing database system of SWM

b.2 Optimization of organization

The roles, responsibilities and support system such as human resources, facility, equipment and funds of SWM of local authorities are optimized.

c. Introduction of 3Rs

The 3Rs are introduced to promote the reduction of waste at generation source and to properly improve the operation of the compost plant and material recovery facility.

- 3Rs at generation source: Introduce the compost barrels and prepare the instruction manual
- Introduction of collection of recyclable material by community base: Study the availability of the Japanese group collection system
- Introduce and disseminate separate collection
- Rehabilitation of intermediate treatment facility: Improve and develop existing / new planned compost plant
- Rehabilitation of material recovery facility: Improve and develop existing / new planned material recovery facility

d. Optimization of SWM finance system

The SWM finance system is introduced in the SWM master plan and the management of finance system is supported by the technical cooperation project.

6.5.3 Planning M/P &F/S

The “planning master plan (M/P) and feasibility study (F/S)” of the project, which requires large initial costs, is carried out to solve the issue of SWM in the Colombo district in the Western Province.

a. Review of SWM master plan of WMA

The SWM master plan of the WMA is reviewed to improve SWM in the Colombo district in the Western province as follows:

- Review of SWM including the Colombo MC
- Recommendation of intermediate treatment facility (incinerator, bio gas and high rate composting) based on the Japanese system
- Recommendation of improvement / development of final disposal site.
- Recommendation of improvement of waste collection capacity
- Formulation or review of SWM master plan at priority local authority

b. Feasibility study of priority project

- Outline design and feasibility study of the intermediate treatment facility
- Outline design and feasibility study of the final disposal site

6.5.4 Facility development

Since there are a number of options in the facility, it is recommended to conduct a pre-feasibility study in order to select the most appropriate treatment method. It is important that the agreement among the stakeholders including the residents is made after each stakeholder grasps the scale of the cost burden based on the results of pre-feasibility study. Then full-scale feasibility study is carried out after making consensus among stakeholders about the followings.

(1) Regional treatment or individual treatment
(2) Securing the site for the facility
(3) Mechanism of cost sharing in case of regional treatment
   - ✓ Excution body
   - ✓ Initial investment cost (subsidy from central government and burden of local authorities)
   - ✓ Operation cost (Share of municipality that uses it)
   - ✓