



JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
Ministry of Home Affairs, Provincial Councils and Local Government  
Democratic Socialist Republic of Sri Lanka

**THE STUDY  
ON IMPROVEMENT  
OF SOLID WASTE MANAGEMENT  
IN SECONDARY CITIES  
IN SRI LANKA**

**ACTION PLAN FOR MATALE  
FINAL REPORT  
Volume V-5A  
MAIN REPORT**

DECEMBER 2003



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**ACTION PLAN FOR MATALE**

**FINAL REPORT**

**Volume V-5A**

**MAIN REPORT**

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***This is Action Plan for Matale, Main Report.***



In this report, the project cost is estimated using the September 2003 prices and at an exchange rate of  
1 US\$ = 117.02 Japanese Yen = 95.28 Rupees

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### **List of Abbreviations**

CDA	Community Development Assistant
CDO	Community Development Officer
CEA	Central Environmental Authority
DEO	Divisional Environmental Officer
DF/R	Draft Final Report
EIA	Environmental Impact Assessment
F/S	Feasibility Study
GDP	Gross Domestic Product
IC/R	Inception Report
IDP	Infectious Disease Prevention
IEE	Initial Environmental Examination
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
MMA	Matale Municipal Area
MMC	Matale Municipal Council
MOH	Medical Officer of Health
MGTP	Management Plan
M/M	Minutes of Meeting
MOHALG	Ministry of Home Affairs, Provincial Councils and Local Government
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
NGO	Non-Governmental Organisation
O&M	Operation and Maintenance
PDM	Project Design Matrix
PHI	Public Health Inspector
POS	Public Opinion Survey
P/R	Progress Report
SCP	Sustainable Cities Programme
SLILG	Sri Lankan Institute of Local Governance
S/W	Scope of Work
SWM	Solid Waste Management
WTP	Willingness to Pay

## Chapter 1 Background Conditions

### 1.1 Introduction

This plan was prepared by Matale Municipal Council (MMC) by itself with JICA's technical assistance. Any decisions in the Study were made by MMC.

### 1.2 Basic Fact Sheet

#### 1.0 General Data

1.1 Province	Central
1.2 District	Matale
1.3 Local Authority Status	Municipal Council
1.4 Location	Northern part of central highlands in centre of Sri Lanka.
1.5 Topography	Situated in a valley running south-west to north, with high hills on three sides. Altitude varies from 230-620m.
1.6 Matale Municipal Area (MMA)	860 ha
1.7 No. of Council Wards	13

#### 2.0 Socio-economic Data

2.1 Total Population (2001)	36,352 (2002 estimate = 36,696)
2.2 Daily Floating Population	9,500 (2001)
2.3 Average Population Density	42 persons per ha (2001)
2.4 Population Growth Rate	1.0% per year (average 1981-2001 compound growth rate)
2.5 Approximate No of Households	7,329 (2001)
2.6 Approximate Family Size	5.0

#### 3.0 Overall MMC Data

3.1 Total Cadre (2002)	Approved: 456
3.2 Total Rateable Properties	12,174 (30 Sep, 2001)
3.3 Property Rates (%)	Residential: 16%, Commercial: 32%
3.4 Total Budget Expenditure	61,303,500 (2002)

#### 4.0 Solid Waste Management (SWM)

4.1 Collection Amount	19.8 tonnes/day (7,227tonnes/year)
4.2 Budget Expenditure for SWM works	12,085,660 (2002)
4.3 Cadre for SWM works	Approved: 132
4.4 Ratio of SWM to all employees	28.9 %
4.5 Ratio of SWM to total expenditure	19.7 %
4.6 SWM expenditure per capita	329 Rs/person/year (2002)
4.7 SWM expenditure per tonne waste	1,672 Rs/T

### 1.3 Natural and Social Conditions

Matale's origins date back to the 18-19th centuries, where following the conquest of the Kandyan kingdom by the British rulers in 1818, Matale came under their control and they started cultivating tea, rubber and coffee in the area, as well as developing infrastructure facilities, including the road and rail networks. These developments stimulated Matale's growth as a commercial centre.

Today, Matale has grown into a small city that serves a substantial hinterland and acts as a collection centre for minor crops. It is also the district centre for education, health, judicial and administration services. Matale is also famous for its close proximity to the Buddhist temple of Aluvihare, with both



local and foreign visitors visiting this temple and other religious places in Matale on their way to visit the Cultural Triangle.

It has an average rainfall of 1,688mm/year, with September to December being the wettest months (1997-2001 data), while the temperature is relatively constant throughout the year, averaging 30.5°C.

Land use is tabulated below.

Category	1985		1997	
	Area (ha)	%	Area (ha)	%
Residential	498.3	57.94	526.76	61.60
Agriculture	193.3	22.51	171.00	20.00
Roads	49.14	5.71	43.00	5.00
Education	22.40	2.60	22.80	2.65
Religious	18.25	2.12	17.53	2.03
Commercial	19.78	2.30	18.43	2.14
Industrial	2.22	0.26	4.59	0.53
Recreational	14.62	1.70	14.63	1.70
Health	16.32	1.90	12.90	1.50
Public Buildings	12.47	1.45	12.47	1.45
Open spaces, cemeteries	8.60	1.00	8.60	1.00
Water bodies, reserved areas	4.30	0.50	4.30	0.50
Total	860.00	100.00	860.00	100.00

Source: Development Plan of Matale City, January 2001

## 1.4 Main Implications for SWM

The main implications of this background information on Matale for SWM are:

- SWM services should be of a high quality, due to Matale being a tourist/cultural city.
- Commercial waste generation can be relatively high due to Matale being a commercial and service centre.
- Garden waste generation can also be very high due to Matale's climate and the abundant vegetation, plants and trees throughout the city.
- It can be difficult to obtain the cooperation of the significant floating population in SWM.
- The surrounding steep topography and plentiful rainfall can generate a large amount of soil sediment that enters the city's drains requiring regular removal to avoid blockages.
- It may be very difficult to acquire new land for a landfill within the city limits due to the very narrow city area, its urbanized condition, hilly surrounding topography and existing religious places.

## Chapter 2 Current SWM Condition

### 2.1 SWM Basic Data

#### 2.1.1 Residential Waste Discharge Rates

The result of the waste discharge rate survey conducted in Matale are tabulated below. They show that high income residents discharge more waste than lower income residents. This is typical, as the waste discharge rate is generally related to the level of material consumption.

Table 2-1: Generation Amount of MSW

Residential category	Adopted Income range (Rs/month)	Waste discharge rate (g/person/day)
High income	over 6,693	447
Middle income	over 1,358 but less than 6,693	413
Low income	less than 1,358	407
Average		422

#### 2.1.2 Waste Composition Survey

##### 2.1.2.1 Waste Composition Survey Results

The results of the waste composition survey conducted in Matale are tabulated below.

Table 2-2: Composition and Physical Properties (wet base)

Waste Type	Residential waste				Market	Collection Vehicle
	High	Middle	Low	Average		
Kitchen	68.67%	63.39%	67.51%	66.45%	68.52%	61.29%
Grass & wood	12.33%	20.79%	13.78%	15.74%	11.61%	18.14%
Paper	9.01%	4.83%	7.12%	6.93%	10.72%	6.40%
Textile	0.92%	1.46%	1.64%	1.35%	1.51%	1.07%
Soft plastic	2.45%	2.46%	3.40%	2.77%	3.82%	3.94%
Hard plastic	1.18%	0.52%	0.80%	0.82%	0.28%	0.41%
Metal	0.49%	0.35%	0.28%	0.37%	0.18%	0.42%
Glass	2.49%	1.19%	0.27%	1.30%	0.47%	0.36%
Leather & rubber	0.28%	0.56%	0.35%	0.47%	0.36%	1.11%
Ceramic & stone	1.73%	4.11%	4.28%	3.40%	2.31%	6.60%
Other	0.46%	0.34%	0.58%	0.48%	0.22%	0.26%
Bulk density	0.32 kg/l	0.25 kg/l	0.31 kg/l	0.29 kg/l	0.36 kg/l	0.33 kg/l
Moisture content	47%	49%	52%	49%	47%	55%

**Notes:**

1. Market waste was collected from both the King St Central Market and Gongawela Market Area.
2. Collection vehicle waste samples were taken from the collection vehicle at the disposal site.

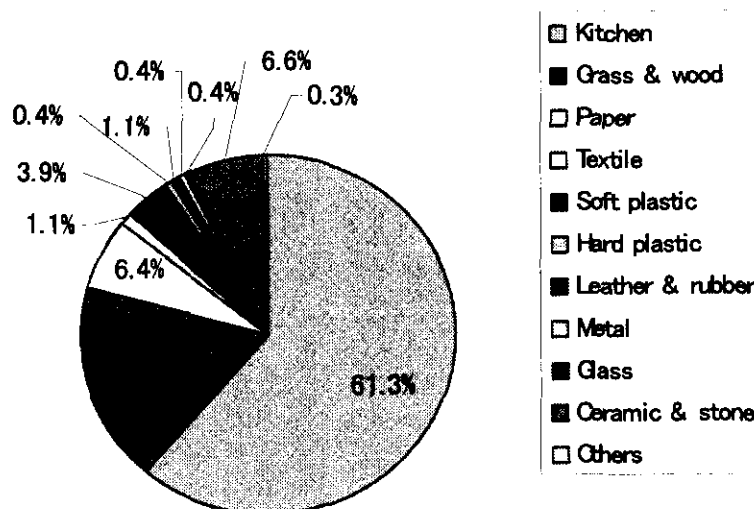


Figure 2-1: Physical Composition of Waste to Disposal (Collection Vehicle Data)

### 2.1.2.2 Analysis

The above table shows that residential, market and collection vehicle waste are very suitable for composting because they are highly organic (kitchen and grass/wood waste = 79-84%).

It also shows that the percentages of inorganic recyclables (paper, textiles, soft and hard plastic, metal and glass) range from 11-17% in residential/market/collection vehicle wastes. These percentages are very low compared with developed countries (typically 40-60%). In particular, the percentages of more profitable recyclable materials (hard plastic, metal, and glass) are very small (1-4%), while the percentages of less profitable materials (paper, soft plastic, textile) are much higher (9-16%). These results indicate that the necessity for introducing a source separation recycling system for residential wastes is currently not high. If MMC wants to introduce such a system, it should target commercial wastes.

## 2.2 Current Waste Stream

The "waste stream" refers to the "flow" of waste from generation to final disposal. It describes and quantifies the waste generated by different sources within the scope of this Study and quantifies the amounts of waste collected, recycled and disposed of by different means. Determination of the waste stream is one of the most important tasks to be completed in the formulation of a SWM Plan. Waste stream results (mid-2002) are summarised in this section, while additional details are given in the supporting report.

### 2.2.1 Waste Stream Terminology

The terms used in the waste stream model adopted for Matale are defined below.

**Table 2-3: Waste Stream Terminology**

Term	Definition/Explanation
Generation	Production of all waste at source.
On-site disposal	Waste is disposed of by the generator within their property, usually by burial in a pit and/or burning of the waste or sometimes incineration (e.g. hospitals).
On-site composting	Organic waste is composted within the property of the generator itself in order to produce a useful product - compost.
Discharge	Part or all of the waste generated is put out for collection either within the property of the source itself (e.g. hotels, some institutions and industries), outside the property (e.g. in bins or in small piles at the roadside) or at an approved collection point (e.g. concrete bins located around the city).
Direct Haulage	Part or all of the waste generated by different sources is transported directly by them to the official disposal site.
Collection	Waste discharged by a source is collected by Matale Municipal Council (MMC) for transportation to the final disposal site.
Disposal	Waste collected by MMC is discharged at the final disposal site.
Recycling	Part or all of the waste generated is sold or given to an external person/shop/company, etc. for reuse or recycling. In this context, recycling generally refers to the recovery of inorganic and non-compostable waste materials, particularly plastics/polythene, paper <sup>1</sup> , glass, metals and some textile scraps. Recycling may take place at source, following discharge and collection, and from the final disposal site and illegal dumps.
Composting	Readily biodegradable waste (e.g. food/kitchen, garden, paper wastes) is collected and then decomposed aerobically in a controlled manner at a commercial compost facility run by MMC, NGO or the private sector. Composting may be carried out in order to reduce the weight, volume, and polluting strength of waste to be subsequently placed in the landfill and/or to produce a marketable product for sale.
Illegal dumping	Part or all of the generated waste is dumped outside the generator's property in an area where such behaviour is prohibited (e.g. open spaces, drains, canals, etc.).

### 2.2.2 Waste Sources

The main sources of municipal solid waste (MSW) considered in this Study are households, commercial enterprises, markets, institutions, industries and "other" (Public places, infectious disease prevention (IDP)). Each of these sources is briefly described below.

**Table 2-4: Main Waste Generation Sources**

Source	Description
Household	Waste generated from domestic activities, including food preparation, cleaning, fuel burning, sweeping, gardening and other miscellaneous household wastes (e.g. old clothing, appliances, etc.).
Commercial	Wastes generated by trade, service, processing and production enterprises, excluding markets and industries (covered separately).
Markets	Waste from markets selling a high proportion of vegetables, fruit, meat and/or fish (i.e. Central (King St) market, Gongawela Pola, licensed butchers).
Institutions	Wastes from schools, other education centres, hospitals, MMC, central/provincial government offices and religious institutions, including the Aluvihare Temple, Buddhist Centre and Widyandana Pirivena.
Industries	Wastes from Diana Chocolate Factory and sawmills (5).
Other (public places, IDP)	Public places: Wastes from public parks, cemeteries, sports and playgrounds (mainly V.T. Nanayakkara Park, Kiddies Paradise, Millenium Park). IDP: Wastes from IDP works relating primarily to drain weeding/cleaning.
Construction and demolition	Wastes originating from construction, rehabilitation and demolition activities, etc. These wastes are not usually handled by MMC but are dealt with by the contractors involved. Typically, they are used as clean fill on other sites or in low-lying areas. Hence, they are not considered further in this Study.
Hazardous (Special)	Hazardous wastes originating from various sources, including household items (e.g. batteries, spray cans, etc.). These are describe separately for each category as appropriate. The management of sharps, clinical, body parts and highly infectious wastes from hospitals is a major concern in Matale.

<sup>1</sup> Many types of paper may readily be composted, while other types are only slowly biodegradable or not suitable for composting (e.g. glossy magazines).

## 2.2.3 Waste Generation

Waste generation rates/amounts (see table below) were measured or estimated from a combination of quantitative and landfill trip data and interview surveys.

Table 2-5: Estimated Waste Generation Quantities (mid-2002)

Source	Waste Generation Data			Waste Generation		
	WGR	WGR Unit	No of Units	Amount (T/d)		%
Residential	0.451	Kg/person.d	36,696	16.54	16.54	51.1
Commercial	3.10	Kg/shop.d	2,090	6.47	6.47	20.0
Markets	15.5	Kg/stall.d	184	2.84	2.84	8.8
Institutions:						
Schools	0.091	Kg/(stud+staff).d	19,792	1.81		
Other Educ.	0.018	Kg/(stud+staff).d	4,337	0.08		
Hospitals	0.328	Kg/(pat+staff).d	2,122	0.70		
Govt offices	0.228	Kg/worker.d	1,643	0.37		
Religious	1.01	Kg/clergy.d	151	0.15	3.11	9.6
Industries:						
Diana Chocolate	0.250	Kg/worker.d	80	0.02		
Sawmills	ND	Kg/worker.d	ND	1.81	1.83	5.7
Other:						
V.T. Nanayakkara Park				0.29		
Other public places				0.15		
IDP				1.16	1.60	4.9
Total	0.88	Kg/person.d	36,696		32.39	100.0

Notes: ND = no or incomplete data, WGR = waste generation rate, stud = student, pat = patient.

This data shows:

- The average household waste generation rate of 0.45kg/cap.d is lower than other Sri Lanka data<sup>2</sup> for municipal councils (0.65 - 0.85kg/cap.d), but consistent with that for urban councils (0.45-0.65kg/cap.d). As Matale is the smallest municipal council in Sri Lanka, the low average household waste generation rate is considered reasonable.
- Commercial waste generation is 6.5T/d (20% of MSW), with a generation rate of 3.1kg/(trade licence).d. This is considered reasonable, being based on actual MMC waste collection records for the central city commercial area<sup>3</sup>.
- Market waste generation (2.8T/d, 8.8% of MSW) is based on interview survey data for the Central Market supported by MMC collection workers' information, scaled up to allow for the additional market waste generated by the daily Gongawela Pola and several licensed butchers.
- Household, commercial and institutional hazardous waste generation is relatively small, comprising typical everyday items (e.g. aerosol cans, toilet cleaners, batteries, fluorescent tubes, razor blades (hairdressers), etc.) which are disposed with normal garbage.
- Small quantities of healthcare hazardous wastes are produced by Matale Base Hospital, the Majan Medical Centre and KMP Nursing Home. Total healthcare hazardous waste generation is

<sup>2</sup> UNEP (2001), State of the Environment Sri Lanka 2001

<sup>3</sup> Trade licences are applied on an "activity" basis in Matale, meaning that one shop may have more than one trade licence. Hence, the number of shops is less than the number of trade licences.

estimated to be approximately 100kg/mth of clinical wastes, 13kg/mth of body parts/placentas, 115kg/mth of sharps and ~1kg/mth of highly infectious wastes.

- Total MSW generation is 32.4/d, equivalent to 0.88g/person.d. Waste generation by source is shown in Figure 2-2.

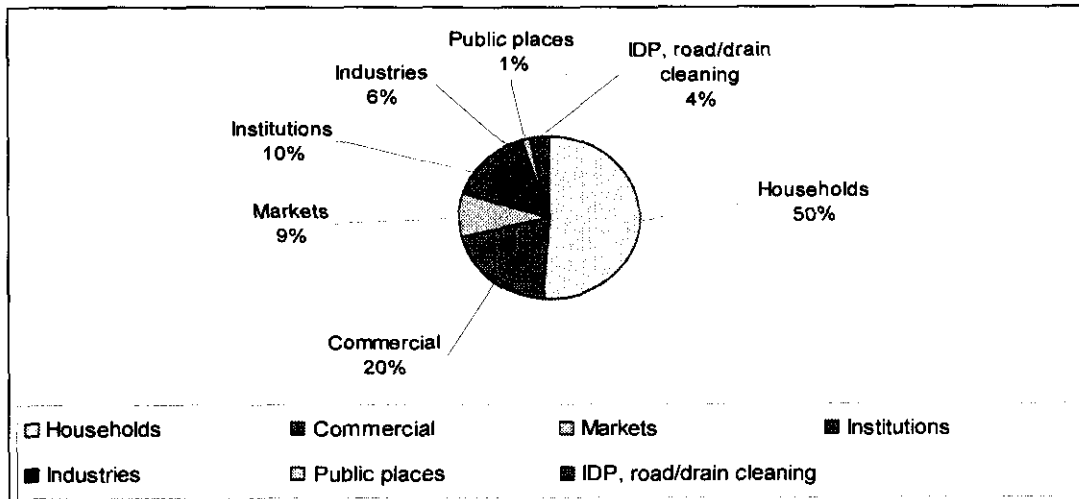


Figure 2-2: MMA Waste Generation by Source

The main factors affecting waste generation in Matale are summarised below:

- Waste generation from commercial enterprises, hotels and markets typically increases two times during festivals and other special occasions, particularly the Theru Festival in March each year.
- Similarly, waste generation from the Aluvihare Temple increases by two times during the Vesak, Posen and Asala festivals.
- Market waste generation also shows some seasonal and weekly variations (e.g. the Gongawela Pola generates a lot more waste on Sundays).

## 2.2.4 Waste Stream Breakdown

### 2.2.4.1 Field Investigation Results

Field investigation results on the proportions of waste being disposed of on-site, discharged for collection, directly hauled to landfill, composted on-site, recycled at source or illegally dumped are tabulated below.

Table 2-6: Waste Stream Field Investigation Results (mid-2002)

Source	Method (%)	Comments
Households	Discharge: 63.2% OSD: 26.5% Recycling: 4.6% Compost: 3.3% ID: 2.3%	Household public opinion survey results, modified to account for an estimated 85% garbage collection service coverage within MMA (by population).
Commercial	Discharge: 93.6%	Most commercial waste discharged for MMC collection.
	OSD: 5.4%	Some commercial places burn a lot of their waste (mainly paper).
	Recycling: 0.8%	Some recycling – mainly bags/sacks, plastic containers and tins.
	Compost: 0.1%	Rock House hotel composts about 20kg/month of garden waste.
Markets	Discharge: 100%	Almost all market waste is taken to landfill. Recycling is very small, comprising mainly bones and some meat off-cuts sold as pet food.
Schools	OSD: 78.7%	Five of six schools surveyed (48% of school population) burn/bury most, if not all of their garbage on site.
	Compost: 12.0%	Three schools compost most of their garden waste on-site.
	Discharge: 9.3%	Only one of the surveyed schools uses the MMC collection service.
Other Educational	Discharge: 68.8%	Three of five other educational institutes surveyed (>90% of other student population) use the MMC collection service.
	OSD: 27.8%	Two dispose of most of their waste on-site.
	Compost: 3.5%	One is believed to compost some garden waste.
Hospitals	Discharge: 97.1%	Almost all normal and some (small) hazardous waste collected by MMC for disposal to landfill.
	Recycling: 2.0%	Base Hospital recycles some of their used plastic and glass bottles/containers and tins.
	OSD: 0.9%	Two hospitals dispose of some of their hazardous wastes by burning/burial on-site. No hospitals have incinerators.
Government offices	Discharge: 95% OSD: 5%	Most waste generated by the four offices surveyed is discharged for MMC collection, the remainder being burned/buried on-site.
Religious places	Discharge: 80%	The three religious places surveyed dispose of their waste by on-site burning/burial or discharge it for MMC collection, except the Aluvihare temple stated it gets rid of some of its waste by open dumping.
	OSD: 10%	
	ID: 10%	
Diana Chocolate	Discharge: 100%	All chocolate factory waste is discharged for MMC collection.
Sawmills	Recycling: 64.2%	Most sawmill waste is given away for use as fuel or to mushroom farmers, while the rest is largely burned on-site, except for a small amount taken to the MMC disposal site (not independently verified).
	OSD: 22.1%	
	DH: 13.7%	
V.T. Nanayakkara Park	Compost: 90%	Around 15 tractor loads/mth of garden waste is produced from this 6-7ha park which is largely composted (~0.26T/d), while an estimated 33kg/d of inorganic waste is collected by MMC.
	Discharge: 10%	
Other public places	Compost: 72%	Waste from other public places (~8.5ha - cemetery, Kiddies Paradise, Millenium Park, some smaller parks and sportsgrounds) was estimated to be 0.11T/d of garden waste which is composted and 42kg/d of inorganic waste, collected by MMC, based on the V.T. Nanayakkara Park waste production data.
	Discharge: 28%	
IDP	Discharge: 100%	IDP wastes are collected and taken to the MMC disposal site.

Notes: DH = direct haulage, ID = illegal dumping, OSD = on-site disposal.

#### 2.2.4.2 Recycling at Other Points of the Waste Stream

In addition to recycling at source, recycling occurs at other points of the waste stream. The quantities of recyclable materials collected at these places was estimated as follows:

- **Following discharge**, individuals (scavengers) may sift through discharged waste prior to collection, recovering items of value to them for reuse/recycling. The amount of recyclables recovered in this manner is assumed to be negligible due to the large number of individual collectors collecting recyclables directly from households (82% of surveyed households) and other places (i.e. at source), rather than following discharge; the widespread practice of households

taking recyclable materials to shops (38% of surveyed households), and very few people being observed doing this.

- **During collection**, some MMC garbage collection labourers salvage bottles, broken glass and metals from the discharged waste for sale. About 67kg/d of materials are recovered in this manner, based on survey interviews with 30% of MMC garbage collection workers.
- **At the disposal site**, the five MMC labourers working there and at least one other person collect about 19kg/d of materials for recycling, mainly comprising bottles and metals.
- **From illegal dumping sites**, it is assumed that a similar proportion of materials as at the final disposal site is recovered amounting to 2kg/d.

This gives a total quantity of materials recycled at places other than at source of 88kg/d (0.3% of total waste generation). Some materials are taken directly to middlemen for recycling by individual collectors and MMC labourers. Based on interviews with six middlemen in the city, the total amount of materials recovered in this manner from within MMA is estimated to be 0.45T/d. As most of the materials purchased by the middlemen are obtained from households, this amount is assumed to have been already accounted for in the household recycling figure of 0.75T/d. The materials recovered from different points of the waste stream are tabulated below.

Table 2-7: Summary of Recycling Data

Material	Household survey (120 houses)		Recycling Quantities (kg/d)		
	No of households giving to individual collectors	No of households taking to shop	During collection	At disposal site	Collected by middlemen
Food/kitchen waste	1	0	0	0	0
Paper/cardboard	80	12	0	0	7.4
Plastic	0	0	0	0	5.3
Glass	88	36	34	4.6	127.3
Metal	43	4	33	14.4	276.4
Textile	8	4	0	0	0
Batteries	0	0	0	0	33.7
<b>Total</b>			<b>67</b>	<b>19.0</b>	<b>450</b>

Note: Glass is largely made up of bottles (average weight of 1 arrack/beer bottle = 0.66kg (measured)). Iron is by far the most common type of metal collected, with aluminium, copper and brass being the main other metals.

#### 2.2.4.3 Collection and Disposal Quantities

Current disposal quantities were determined from Kaludewala landfill records of the number of vehicle trips to the landfill over the periods: September 1999 – March 2000 and January – June 2002 inclusive. This data was converted to tonnes, as tabulated below, using measured tractor, trailer and compactor vehicle capacities (m<sup>3</sup>), filling factors based on observations made during the study and local experience and appropriate density data.

The current collection quantity was estimated from the MMA disposal amount (19.6T/d), adjusting for the minor recycling that occurs during collection, giving a collection amount of 19.7T/d. The difference between the amount of waste discharged for collection (21.4T/d) and the amount actually collected is 1.7T/d, equivalent to about 79% of a tractor load. This amount is assumed to represent waste that is illegally dumped (in addition to that already counted), waste that is discharged for collection but never



collected, or waste that is collected and then disposed of at places other than the MMC landfill. It has been added to the illegal dumping amount.

Table 2-8: MMC SWM Vehicle Volume and Tonnage Data

Vehicle	Volume (m <sup>3</sup> )	Density (kg/m <sup>3</sup> )	Fill factor (%)	Tonnage (T)	Equivalent 4WT loads
Handcart	0.40	330	95	0.12	0.055
Two Wheel Tractor (2WT)					
Normal	2.44	330	90	0.72	0.33
Meat/fish	0.32	330	100	0.11	0.050
Average	1.38	330	91	0.42	0.19
Four Wheel Tractor (4WT)	6.59	390	85	2.18	1.0
Small lorry (41-9452)	1.98	330	90	0.74	0.34
Large lorry (26-3501)	5.71	330	90	1.70	0.78
Small compactor	3.68	608	100	2.24	1.03
Large compactor	7.50	501	100	3.76	1.72

**Notes:**

1. Actual vehicle dimensions are given in the attached spreadsheet in the supporting report.
2. Density data, based on WACS survey data for collection vehicles (330kg/m<sup>3</sup>) and collection vehicle weighbridge data measured in Colombo during July-August 2002 (4WT: 390kg/m<sup>3</sup>, 4m<sup>3</sup> compactor: 608kg/m<sup>3</sup>, 8m<sup>3</sup> compactor: 501kg/m<sup>3</sup>).
3. MMC currently converts trip data into an equivalent number of 4WT loads, based on one compactor load = three 4WT loads and one 2WT load = 0.33 4WT loads. The compactor conversion factor needs adjusting.

## 2.2.5 Waste Stream

Waste stream data for Matale is tabulated and illustrated below.

Table 2-9: Waste Stream Breakdown (mid-2002)

Source	On-site disposal	On-site compost	Dis-charge	Recycl-ing	Illegal Dump-ing	Direct Haulage	Generat-i on
Household	4.80	0.60	9.88	0.83	0.42	0.00	16.54
Commercial	0.35	0.01	6.06	0.05	0.00	0.00	6.47
Markets	0.00	0.00	2.84	0.00	0.00	0.00	2.84
Institutions:							
Schools	1.42	0.22	0.17	0.00	0.00	0.00	1.81
Other Educ.	0.02	0.00	0.06	0.00	0.00	0.00	0.08
Hospitals	0.01	0.00	0.68	0.01	0.00	0.00	0.70
Govt offices	0.02	0.00	0.36	0.00	0.00	0.00	0.37
Religious	0.00	0.00	0.12	0.00	0.02	0.00	0.15
Industries:							
Diana Chocolate	0.00	0.00	0.02	0.00	0.00	0.00	0.02
Sawmills	0.40	0.00	0.00	1.16	0.00	0.25	1.81
Other:							
V.T. Nanayakkara Park	0.00	0.26	0.03	0.00	0.00	0.00	0.29
Other public places	0.00	0.11	0.04	0.00	0.00	0.00	0.15
IDP	0.00	0.00	1.16	0.00	0.00	0.00	1.16
Sub-total	7.04	1.20	21.40	2.06	0.44	0.25	32.39
<b>Collection</b>							
Recycling at discharge			-0.00	+0.00			0.00
Adjust to account for actual collection			-1.73		+1.73		0.00
Recycling during coll'n			-0.07	+0.07			0.00
Adjusted sub-totals	7.04	1.20	19.60	2.13	2.17	0.25	32.39
<b>Disposal</b>							
Recycling at landfill			-0.02	+0.02			0.00
Recycling at ID sites				+0.00	-0.00		0.00
Total	7.04	1.20	19.58	2.15	2.17	0.25	32.39
%	21.7	3.7	60.5	6.6	6.7	0.8	100.0

Notes: ID = illegal dumping.

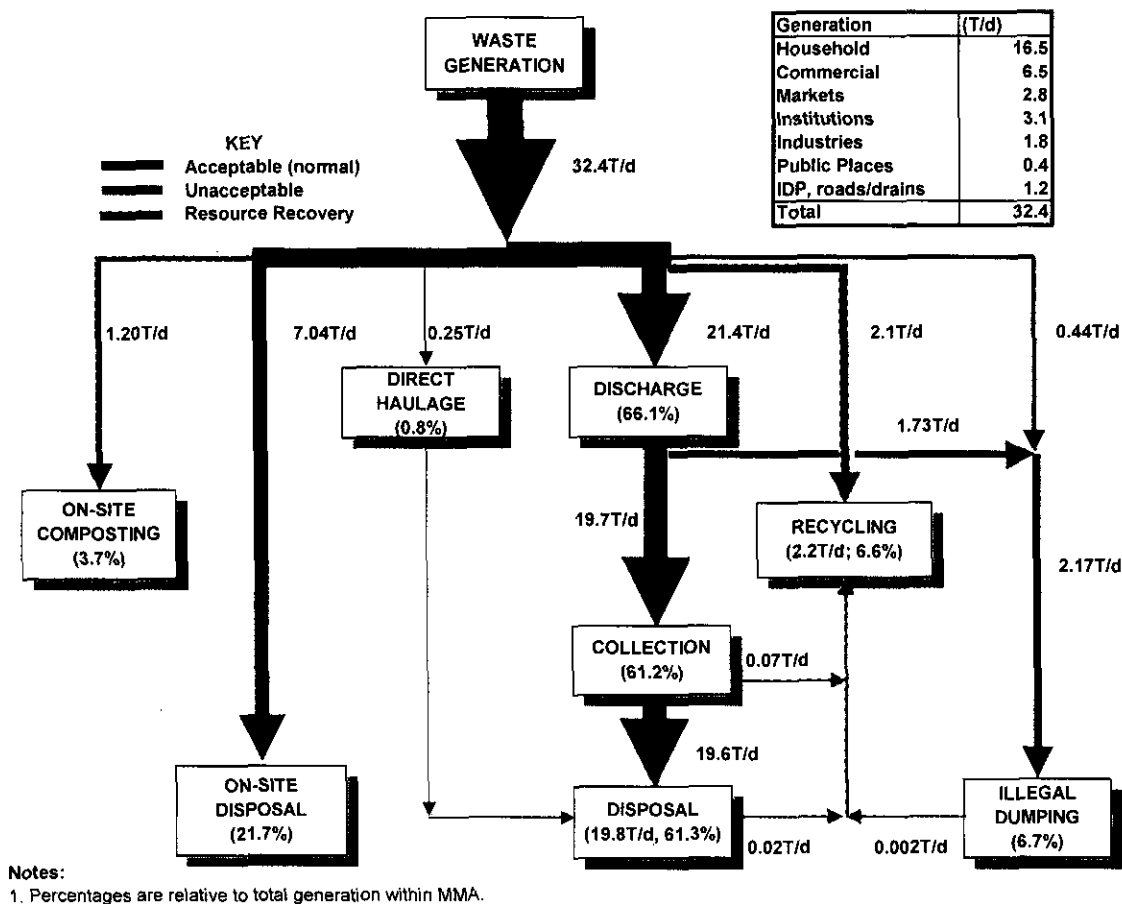


Figure 2-3: MMA – Current Waste Stream (mid-2002)

The waste stream shows us:

- Most waste (21.4T/d, 66%) is discharged for MMC collection and disposal, with 19.8T/d being disposed of to landfill.
- On-site disposal is the second most common disposal method (7.0T/d, 22%). This is appropriate in some parts of Matale (e.g. houses with large properties, institutions).
- Illegal dumping is also very common (2.2T/d, 6.7%). This should be eliminated in the future.
- Resource recovery, via on-site composting (1.2T/d, 3.7%) and recycling (2.2T/d, 6.6%) are both significant. They should be promoted further in the future.

## 2.2.6 Breakdown of Waste Discharge Amount

The amounts of different waste being disposed of to landfill are tabulated below. This shows:

- The amount of organic materials that can be composted is 15.5T/d, excluding paper.
- Higher value recyclables (glass, hard plastic and metal) amount to only 71, 80 and 82kg/d. respectively, indicating most of these items are already being recycled.
- Lower value recyclables (paper, textiles, soft plastic) are presenting much larger quantities (1,250, 210 and 770kg/d respectively) indicating the recycling rates of these items are relatively low. Of these materials, paper has the most (but still limited) potential for increased recycling, particularly

if it can be sorted at source and collected separately. Otherwise, once mixed with other garbage, it becomes contaminated and is much more difficult and expensive to recycle.

Table 2-10: Amount of Waste to Disposal (2002)

Waste Type	Waste Physical Composition	Amount to Disposal
Kitchen	61.29 %	12,135 kg/day
Grass & wood	18.14 %	3,592 kg/day
Glass	0.36 %	71 kg/day
Paper	6.40 %	1,267 kg/day
Textile	1.07 %	212 kg/day
Soft plastic	3.94 %	780 kg/day
Hard plastic	0.41 %	81 kg/day
Leather & rubber	1.11 %	220 kg/day
Metal	0.42 %	83 kg/day
Ceramic & stone	6.60 %	1,307 kg/day
Others	0.26 %	51 kg/day
Total	100.00 %	19,600 kg/day

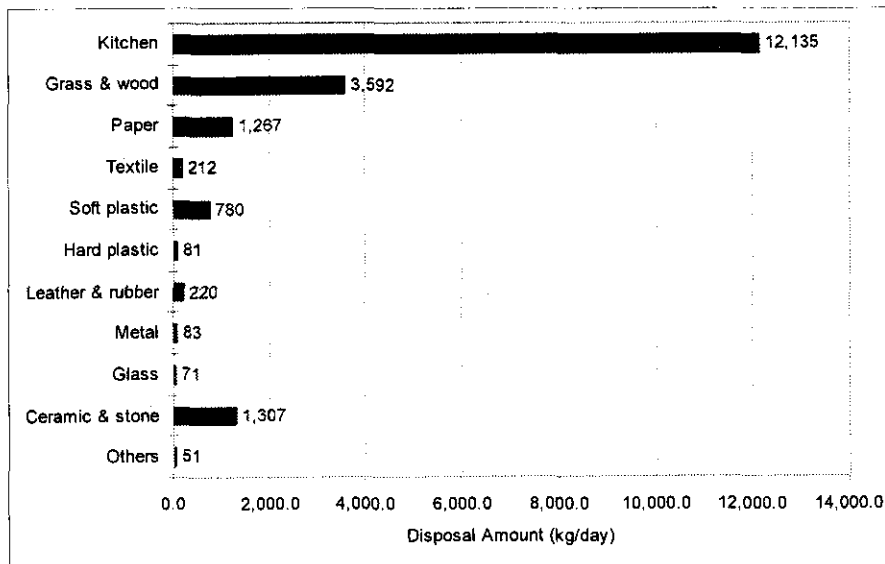


Figure 2-4: Daily Amount to Disposal (2002)

### 2.3 Waste Management Institutional Setting

The Health Department of MMC is responsible for the following waste management works:

- Collection of MSW within MMA and transport to the final disposal site, including the planning of collection routes and daily scheduling of garbage collection vehicles.
- Collection of public market waste.
- Infectious Disease Prevention (IDP) services.
- Septic tank and toilet emptying services.
- Operation and management of the final disposal site.
- Enforcement of local ordinances and national laws related to SWM.
- Implementation of policies relating to waste minimization, public education/awareness, etc.

The Works Department is responsible for waste management within the city's public spaces (parks, cemetery, playgrounds, etc.).

### **2.3.1 Organisational Structure**

The current SWM organizational structure (mid-2002) is illustrated below. The Medical Officer of Health (MOH) is in charge of MMC's Health Department. The MOH is a "Loan Officer", meaning his salary is paid by the Ministry of Health.

The city is divided into three zones (eastern, western and southern zones) for health management purposes, with a PHI being responsible for health matters in each zone. One of these, the Eastern zone PHI (Senior PHI, SPHI), has overall responsibility for all of MMC's waste management activities, including SWM. The Western and Southern Zone PHIs are required to report SWM related issues in their zones to the SPHI for action, but are not responsible for addressing these problems themselves.

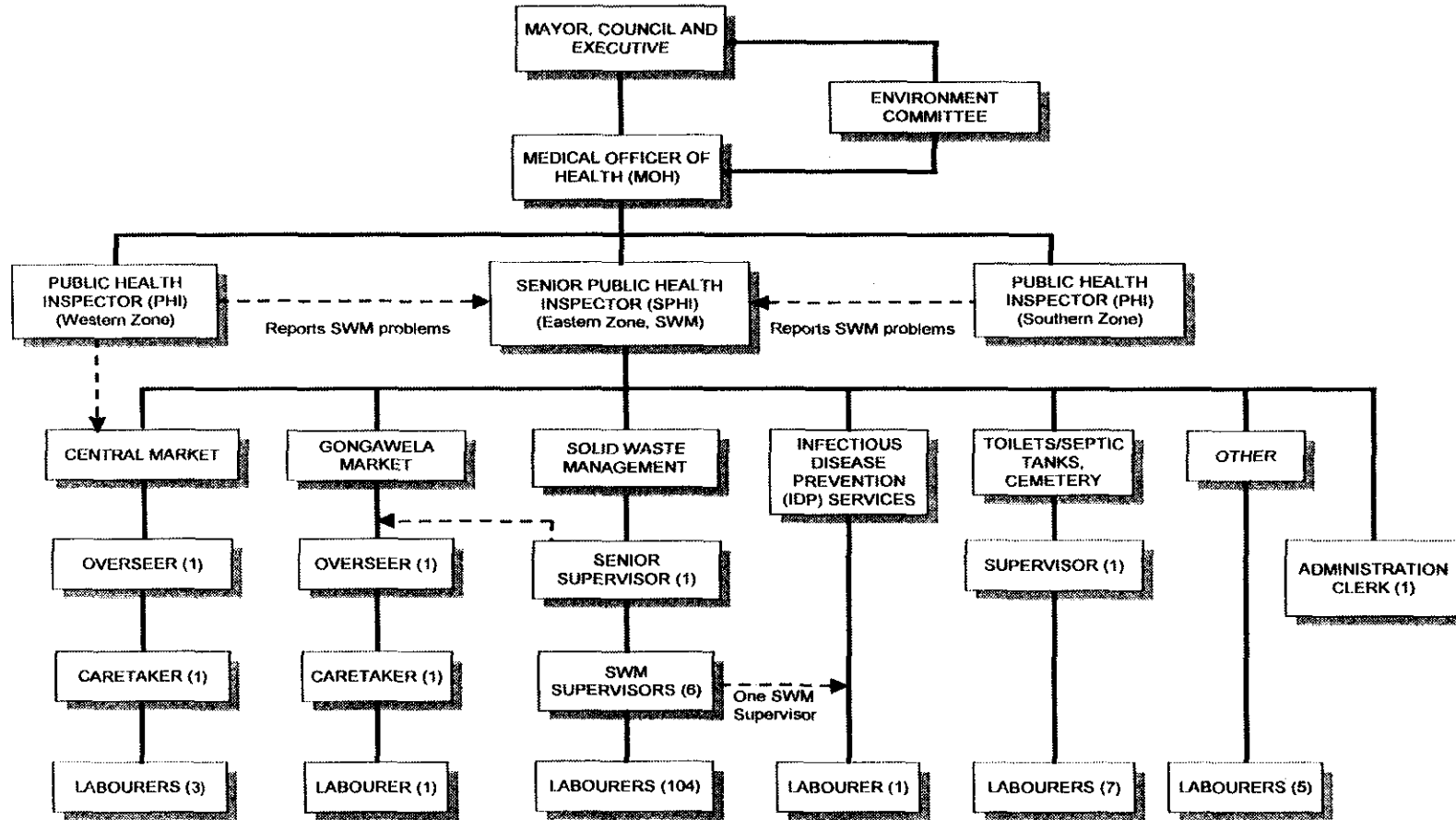
Beneath the SPHI, there is one senior supervisor, 11 supervisors, seven drivers and 121 labourers (109 permanent and 12 casual<sup>4</sup>), who are assigned to different areas and activities as shown in the following table. There is also one administration clerk.

MMC's allocated cadre for supervisors and labourers is 11 and 121 (114 waste + seven for septic tanks/toilets/cemetery) respectively.

The Environment Committee meets monthly to discuss environmental issues, including SWM.

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<sup>4</sup> A pool of 29 casual labourers is available but a maximum of 12 may be employed at any one time.



**Notes:**

1. PHI (Western Zone) is also responsible for the Central Market under the SPHI.
2. Senior Supervisor is also responsible for the Gongawela Market under the SPHI.
3. One of the SWM Supervisors is also responsible for IDP Services.
4. Other includes cleaning of MMC buildings (Council Chambers, library, Commissioner Quarters, etc.), looking after MMC's three ponies, cleaning the Children's Park being assigned to the Mayor's House.

Figure 2-5: MMC Current Waste Management Organisational Structure (mid-2002)

Table 2-11: Matale Municipal Council – Breakdown of SWM Staff and Equipment

Area	PHIs	Supervisors	Labourers			Hand-carts	Vehicles	Public Toilets	
			Perman-ent	Casual	Total				
Eastern	SPHI (Eastern zone) + S Sup'r (2 other PHIs: reporting role only in western and southern zones)	2	102 for waste mgmt and 7 for septic tanks/ toilets and cemetery	12 allocated to various tasks as needed	33	5	2 C, 2 4WT	3	
Western		2			33	5		2	
Southern		2			33	5		1	
Kaludewala disposal site		0			5		None		
Septic tanks/ Toilets and cemetery	SPHI	1				7		2 GS	
IDP	SPHI	One of 6 SWM Sup'rs				1		SWM 4WT used	
Central Market	PHI (Western Zone)	1 Overseer, 1 Caretaker				3		SWM vehicles used	
Gongawela Market	S Sup'r	1 Overseer 1 Caretaker				1		SWM vehicles used	
Other	SPHI	0		5		None			
Total	1 SPHI 1 S Sup'r	11	109	12	121	15	6		
Allocated cadre		11			121				

**Notes:**

1. (S)PHI = (Senior) Public Health Inspector, S Sup'r = senior supervisor or overseer, C = compactor, GS = gully sucker, 4WT = four wheel tractor..
2. Drivers come under the Transport Department and are not listed above.
3. Septic tanks, toilets and cemetery labourers includes five labourers and two crematorium operators.
4. "Other" labourers are allocated to various duties including cleaning of MMC buildings (Council building, library, Commissioner Quarters, toilets, etc.), looking after the Council's three ponies, cleaning of the Children's Park and assignment to the Mayor's house.

## 2.3.2 Waste Management Equipment

Current waste management vehicle fleet and supporting equipment details are tabulated below, together with estimated vehicle lifetimes, based on discussions with the MMC Transport Officer.

Table 2-12: Waste Management Vehicle Fleet and Supporting Equipment

Vehicles/equipment	No	Use	Life (yrs)
Handcarts (0.40m <sup>3</sup> )	15	SWM collection, road/ drain cleaning	2
Four wheel tractors (4WT); (MF240)	3	2 – SWM collection; 1 – Works Dept	8
4WT Trailers (6.6m <sup>3</sup> )	4	1 – SWM collection; 3 – out of service	5-10
Reconditioned Compactors	2	SWM collection: large (7.5m <sup>3</sup> ); small (3.7m <sup>3</sup> )	3-6
Gully suckers (1 x 7,000 L, 1 x 5,000 L)	2	Septic tank/public toilets emptying	5-10

## 2.3.3 MMC Waste Management Services Labour Force and Equipment

### 2.3.3.1 SWM (Garbage) Collection

MMC's SWM collection labour force and equipment comprises:

- 15 handcarts, two four wheel tractors (4WTs), and two (3.7m<sup>3</sup> and 7.5m<sup>3</sup>) compactor trucks.
- Seven Supervisors, including the Senior Supervisor (Overseer), one other Overseer and five Sub-Overseers (all referred to as supervisors).
- Five drivers (for 4WTs and compactors).
- 104 labourers of whom 99 are assigned for collection works, the other five being assigned to the disposal site.

The Senior Supervisor comes under the SPHI and has overall responsibility for supervision of SWM labourers in all three zones and at the final disposal site. The six other Supervisors are assigned to different zones (two per zone). Collection crew and labourer equipment details are tabulated below.

Table 2-13: Vehicle Labourer and Equipment Details

Vehicle	Labourers	Equipment
Handcart	1	Hoes (mamoti), cane baskets and in addition, gloves since June 2002. No collection workers are provided with gumboots.
Four wheel tractor	4	
Compactors	4	

**Note:** Several workers commented that the cane baskets are not very useful and they don't use them, preferring instead to use old polysacks, placing the garbage on these and then throwing it into the collection vehicle.

This gives a total of 33 collection vehicle labourers. Other SWM labourers work at the final disposal site (5), as street sweepers (~40-45), drain cleaners (~15) or are assigned for IDP programmes or for some of the other waste management tasks outlined in Table 2-11. Normally, around 15% of labourers are absent per day.

### 2.3.3.2 Market Waste

The city's two public markets (Central market, Gongawela market) are managed by two market Overseers (one per market) under whom there are two market caretakers (one per market) and four labourers (three at Central Market, one at Gongawela market). Their duties include market cleaning and SWM collection.

### 2.3.3.3 Infectious Disease Prevention (IDP) Services

Infectious disease prevention (IDP) services cover:

- Drain cleaning and weeding.
- Mosquito control, including house to house visits doing site inspections to identify problem areas and undertaking disease surveys.
- Transportation of sediment, weeds, etc. removed from drains to the disposal site.

IDP work generally covers special programmes, tackling problem areas, rather than day to day drain cleaning. Most IDP programmes are carried out on Saturdays, using some of the SWM labourers and SWM four wheel tractor.

One of the seven SWM Supervisors is also responsible for IDP services, particularly mosquito control. One labourer is permanently assigned for IDP work.

The number of IDP programmes conducted each month during 2001 ranges from 15 to 41, with an average of 29 programmes per month, where a single programme may involve cleaning of up to 2km of roads. Typically, around four programmes may be completed on Saturdays, with other programmes being carried out during the week.

### 2.3.3.4 Septic Tank/Toilet Emptying Services and Cemetery Management

These services include:

- Cleaning of public toilets.
- Public toilets and septic tank emptying.
- Management of the city's cemetery, which includes a crematorium.

The septic tank/toilet emptying services equipment and labour force comprises:

- Six public toilets, two of which were constructed with ADB funding in March 2001.
- Two gully suckers of 7,000L and 5,000L capacity. The smaller gully sucker was acquired with ADB funding in May 2002 and has yet to be used (as of July 2002).
- One supervisor, two gully sucker drivers and seven labourers (two of these operate the crematorium).

## 2.3.4 SWM Costs

MMC's 2002 budget costs, tabulated below, show that 19.7% of MMC's budgeted expenditure was allocated to SWM. This is mainly due to the high number of MMC employees engaged in SWM works (29% of total). These results are comparable with other Councils covered by this study, with SWM expenditure accounting for an average of 22.0% (range = 13-35%) of local authority budgeted expenditure and SWM workers an average of 29% (range = 22-37%) of all Council workers, by cadre.



Table 2-14: MMC Budget SWM Costs and Employees (2002)

Item	SWM	MMC Total	SWM as % of Total
Budget Expenditure (million Rs)	12.1	61.3	19.7
MMC Employees (by cadre)	132	456	29.0

### 2.3.5 Waste Collection/Disposal Fees

MMC does not receive any income from SWM collection services. There is no separate garbage collection tax and no commercial, institutional or industrial enterprises pay for garbage collection. Although garden waste collection is charged at 100 Rs/4WT load, very few, if any, people pay this fee.

Gully sucker charges range from 1,250-3,000Rs per trip. The average number of monthly trips in 2001 was 25 (range = 16-38), while average income was 42,300Rs/mth (range = 25,350-66,900Rs/mth).

It is worth noting that informal payments to garbage collection workers are relatively common and include:

- 34% of 120 households surveyed pay an average of 94Rs/yr “small allowance” or 90Rs/yr “reward”.
- 14 (31%) of commercial/industrial and institutional places surveyed pay an average of 2,098Rs/yr (range = 15-12,000Rs/yr).

### 2.3.6 SWM By-laws

Standard Sri Lankan SWM by-laws are in place. By-law enforcement is poor with many people following illegal practices.

### 2.3.7 Workshop

The MMC Workshop is managed by the MMC Transport Officer and is provided with very basic facilities. It employs one mechanic and one labourer and only undertakes minor repairs of MMC’s 45 vehicles. Major repairs are undertaken at a government approved garage/workshop in Matale, the Metal Level Engineering Institute. This comprises a reasonably basic workshop with a vehicle ramp, gas welding, lathe, electrical and air conditioning repair facilities.

The spare parts procurement system varies according to the repair cost:

- For repairs up to 10,000 Rs, the MMC Engineer can give direct approval.
- For repairs from 10,000 to 15,000 Rs, the Municipal Commissioner can give direct approval, with the spare parts being ordered through the supply accountant, which involves obtaining quotes from a number of suppliers.
- For repairs over 15,000 Rs, these must be approved by the Council and Finance Committee, a process which can take over one month. Prior approval process exists for urgent repairs.

From MMC vehicle collection cost data, it is estimated that about 0.28M Rs of the workshop budget is spent on the maintenance of waste management vehicles.

## 2.4 SWM System Components

### 2.4.1 Discharge, Collection and Transportation

#### 2.4.1.1 SWM Discharge System

Most waste generators discharge their mixed waste at the roadside for primary collection by handcart followed by transportation to a temporary or permanent collection point, except in:

- Malwatte ward and the southern section of Harasgama ward, where primary collection is by compactor truck (“heap by heap”).
- North along Trincomalee St from the King St junction, where primary collection is by two wheel tractor or compactor (different sections).
- Along Rattota Rd, where primary collection is by four wheel tractor.

Often, garbage is discharged directly onto the ground, although some residents do use plastic bags or dustbins.

Street sweepers and drain cleaners usually make small heaps of “sweepings/cleanings”, which are collected by handcart or, in the case of drain cleanings, more commonly by collection vehicle.

There are approximately 29 garbage collection points located throughout the city (26 permanent bins, three temporary places). These include:

- A large three-sided concrete bin with open front, along Kubiyangoda Rd. Three handcarts bring waste to this bin (~9 loads/d).
- A large collection point behind Gongawela Market (Gongawela market bin), which comprises a flat concrete platform. About seven handcarts discharge their waste at this area (~35 handcarts/d).
- Small (~0.5m<sup>3</sup>), largely disused concrete tanks at most of the other collection points<sup>5</sup>.

These practices result in lots of scattered garbage and mini-dumps, creating poor sanitary conditions, due to animals – goats, cows, dogs, etc. – looking amongst the garbage for food.

Large amounts of garden waste are produced in the city and are typically discharged illegally outside peoples’ properties or at community collection points, relying on friendships with MMC labourers or political favours for its collection. Often, garden waste is burnt at such places, while building waste is also commonly present. Many drains often contain garbage or are blocked by it, creating nuisance and health problems.

These observations show that there is an urgent need to improve the current discharge system.

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<sup>5</sup> These tanks were donated by UNICEF and were originally intended for use in low income areas. However, political intervention resulted in them being placed at garbage collection points instead. 34 tanks were constructed, of which 24 now remain, the other 10 having largely being demolished by nearby residents. The remaining tanks are largely disused, due to their poor design as it is very difficult to remove garbage from them.

#### 2.4.1.2 SWM Collection System

##### a. Collection System

Investigations and discussions with MMC staff indicate that the MMC garbage collection service covers 80-90% of the city on a population basis. An average figure of 85% has been adopted here.

SWM collection routes are based more on practical considerations, rather than the three city “health zones”.

Garbage is collected from these informal and formal collection points on a daily basis by tractor or compactor throughout most of the city except along the western section of Hulanganuwa Rd, on the western hilly side of this road, and along the northern section of Trincomalee St where waste is collected every second day (Kumbiyangoda ward, western section of Maligatenna ward).

The compactors and one four wheel tractor all operate during the day time, while the second four wheel tractor collects garbage from the central city area at night time (5:30pm – 2:30am). Both the four wheel tractors use the same trailer, the other three trailers being out of service.

Time and motion studies, undertaken by the JICA Study Team on 20 June 2002 for the four wheel tractor and large compactor, show both vehicles are able to complete one collection round within 2.3-2.9 hours, while loading makes up 61-64% of the total working time for both vehicles.

##### b. MMC Collection Vehicle Unit Costs

MMC garbage collection vehicle unit costs were calculated for handcarts, tractors and compactors using actual cost data supplied by MMC. These costs are illustrated below.

This data shows:

- Handcarts are the most expensive means of collecting garbage, with the unit costs shown here representing moderately good performance (i.e. one labourer doing 4 loads/d). Any increase in the number of labourers assigned to a handcart or decrease in the number of loads collected per day will result in a significant increase in the handcart unit costs.
- Compactor and tractor unit costs are considered slightly-moderately high.

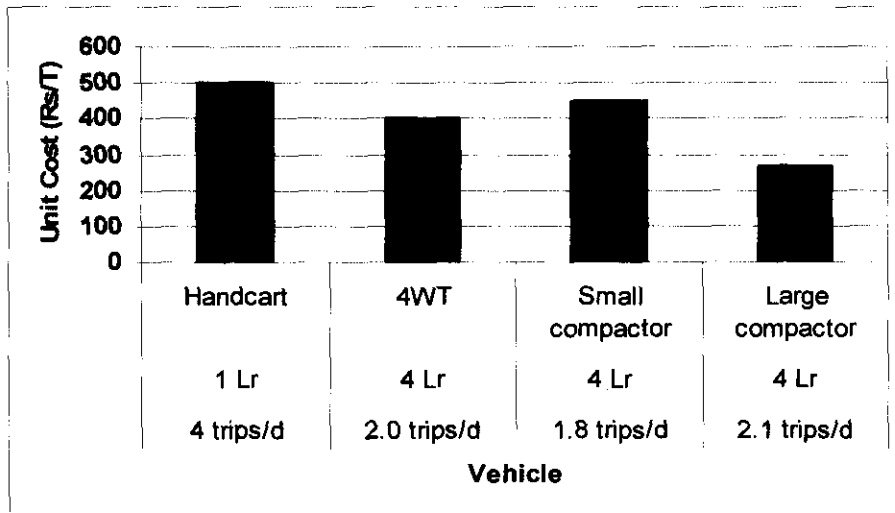


Figure 2-6: Current SWM Collection Unit Costs

**c. Assessment**

The present garbage collection system involves a lot of wasted effort. Many handcarts are used for primary collection, discharging their loads of garbage to many collection points, from where they are loaded into collection vehicles by tractor/compactor labourers. Many collection points are also poorly designed. This system results in garbage being double handled, loading taking a long time, while both handcarts and collection vehicles often traverse the same routes.

Another major problem is that many of the SWM collection vehicles are relatively old and require frequent maintenance. Vehicle repairs/maintenance often takes a long time, especially for compactors due to delays in obtaining spare parts.

The high unit costs indicate there is considerable potential for reducing handcart, tractor and compactor unit costs by decreasing the number of labourers, increasing the number of daily trips, and improving the collection efficiency. In particular, handcart garbage collection should be restricted to essential places, while compactor unit costs need to be reduced.

JICA studies indicate that both MMC tractor/trailers (6.6m<sup>3</sup>) and the small compactor (3.7m<sup>3</sup>) carry about the same amount of garbage to landfill (2.2T/d), while the larger compactor (7.5m<sup>3</sup>) carries about 3.8T/d (1.7 tractor loads). This is due to the different volumes of each vehicle and the high bulk density of Matale waste (0.33kg/L), meaning that compactors can only achieve small-moderate waste compaction, compared to developed countries where the waste is much “lighter” (e.g. Japan - 0.15kg/L). Compactors have other advantages over tractors, being more manoeuvrable, easier to load, enclosed (resulting in less waste scattering than from open trailers) and faster, reducing travel times during collection and to and from the landfill. However, compactors are more difficult and expensive to maintain. Overall, both tractor/trailers and compactors are considered suitable for Matale.

## 2.4.2 Processing and Treatment

None of the garbage collected by MMC is currently taken for processing/treatment.

## 2.4.3 Final Disposal

### 2.4.3.1 Kaludawela Disposal Site

MMC used the Kaludawela disposal site from 1963 until recently. This site is situated on the banks of the Sudu Ganga, just outside MMA, ~2.5-3km from the city centre. Final disposal was by open dumping, with no cover soil being applied and leachate seeping directly into the Sudu Ganga, resulting in serious adverse social and environmental impacts, with nearby residents experiencing odour, pest and fire/smoke problems. MMC stopped using this site around late 2002, following strong protests from nearby residents.

### 2.4.3.2 Temporary Disposal Sites

MMC have used a number of temporary sites since then, only dumping at each for a short period before public protests force them to find somewhere else, as summarised below.

Table 2-15: Temporary Disposal Site Details

Period of Use	Description
Early 2003 - July 2003	Small area near school and squatter houses within Matale. Garbage was dumped around the squatters' houses, while smoke from burning garbage blew towards the school and other nearby houses.
mid-late July 2003	Proposed long term landfill site, Rattota Pradeshiya Sabha (PS). Vegetated site in rural, low population density area, but with many houses located along the access road.
Late July – early Aug 2003	Old quarry, on private land at Oya Pahala, Matale. Dumping initiated with owner's consent.
Early Aug 2003 - current	Temporary landfill site, Matale PS. Dumping operations were transferred here with the approval of the PS, who will also use this site. Protests in early September 2003 led to dumping stopping here for 1-2 days, during which time a meeting was held to discuss public concerns and MMC's proposed landfilling operations, after which dumping was resumed.

## 2.5 Resource Recovery

### 2.5.1 General

Resource recovery is relatively common, with there being a strong informal recycling sector operating within Matale, as summarised below.

Table 2-16: Summary of Resource Recovery Initiatives in Matale

Sector	Comments
Reuse	Many shops selling items for re-use (e.g. shoes, bicycles, umbrellas, mobile phones, paper bags, etc.).
Recycling at source	Very common. 82% of households are visited by someone to collect/buy their reusable/recyclable materials, while 38% of households take some reusable/recyclable items to shops for refund/sale.
Recycling by SWM Labourers	30% of MMC labourers involved, collecting about 67kg/d of glass bottles, broken glass and metals, earning "tea money" (231 Rs/labourer.mth).
Recycling at landfill	MMC disposal site labourers and very few nearby residents collect about 19kg/d of recyclables.
Middlemen	Interview surveys held with 6 middlemen shops found: <ul style="list-style-type: none"> <li>- Established businesses: all over 3yrs old; 5 over 15yrs.</li> <li>- Creating jobs: employ at least 24 people.</li> <li>- Recycling wastes: 1.3T/d, 36% from within MMA (0.45T/d).</li> <li>- Generating income: purchases (&gt;317,000Rs/mth) vs sales of &gt;383,000Rs/mth.</li> <li>- Mainly buy high value recyclables: newspapers/exercise books, glass bottles, sacks and plastic containers for reuse; metals, broken glass and battery cases for recycling. They don't buy cardboard or polythene.</li> <li>- Mainly sell these items locally or to other middlemen 30-40km away.</li> <li>- Main problems: obtaining credit &gt; shortage of recyclables &gt; high land/building rental costs &gt; high transportation costs.</li> </ul>

Refer supporting report for further details.

### 2.5.2 Home Composting

Home composting barrels were supplied to around 300 households at a cost of 350Rs each in December 1999. These barrels are old tar barrels (metal construction) and are provided with a hinged cover, which can be half opened to load the bin. A survey was conducted in July 2002 of 76 households to whom compost barrels had been distributed.

Overall, the survey results indicated that the home composting programme has been moderately successful and that some important lessons can be learned for any future expansion of this programme (refer supporting report for details). Most importantly, any future programme should:

- Consider the use of a non-rusting, better designed composting system (e.g. barrel/bin or other).
- Not force householders into getting a compost barrel, unless they really want one.
- Provide education/training to households particularly over the first 3-6 months, with ongoing support being available to households requesting it.
- Consider providing compost barrels to households for free or at a subsidized rate – the latter option is considered more appropriate.

### 2.5.3 Source Separation Pilot Scheme

Sevenatha, as part of the SCP programme, have recently started a source separation garbage discharge/collection pilot programme in the MC Rd area of Matale. Participating residents are required to separate their wastes into two categories: recyclables and non-recyclables, with these wastes being collected separately by MC workers. Non-recyclable wastes are taken for disposal, while recyclable wastes are taken to a community centre for sorting, storage and eventually sale.

## 2.6 Social Aspects

### 2.6.1 Household Surveys and Focus Group Discussions

#### 2.6.1.1 Household Public Opinion Survey Results

A household public opinion survey was conducted in June/July 2002 within the MMA in order to prepare a basic socio-economic profile of Matale's residents and to gain an appreciation of public attitudes towards the current provision of SWM services, desired improvements to those services and their willingness to pay for improved services. The household survey covered 120 households, comprising forty households from each of two high income (Widuhal Place, Malwatte), two middle income (Kotuwegedera, Dole Para) and two low income areas (Mahadevata, Higgolla).

56% of the surveyed households are Sinhalese, 27% Muslim and 18% Tamil. Data on the average number of people per household and monthly income is tabulated below.

Table 2-17: General Household Data

Item	Low income	Middle income	High income	Overall
Average number of people per household	5.4	5.6	5.6	5.5
Average monthly household income (Rs/household)	5,733	11,908	36,330	
Average monthly income (Rs/person)	1,062	2,155	6,546	

Key results related to SWM are summarised here:

- All surveyed households are provided with a garbage collection service by MMC, of whom 89%<sup>6</sup> stated they use this service. 33% of surveyed households are very satisfied with present SWM service provision, while 39% are somewhat satisfied. Area-wise data shows less satisfaction in middle income areas. The overall satisfaction rate is higher than that for most other municipal/urban councils surveyed in this study (refer figure below). However, 13% of surveyed households have complained about SWM to MMC, indicating that some residents are very frustrated with the present situation.

<sup>6</sup> Does not quite tally with "main waste discharge" method data, due to some people saying they use the MMC service but then later saying they open dump their waste outside their premises.

- Households' main methods of waste discharge are shown below (second figure). The most common method (57%) is discharging their garbage outside their house for MMC collection.
- Although only 55% of surveyed households receive a daily collection service, 64% of households discharge their garbage daily and 12% discharge their garbage as soon as it is generated, the gap between discharge and collection being biggest in the middle income group and smallest in the high income group. The discrepancy between these figures explains the large amount of discarded waste present on many streets in Matale.

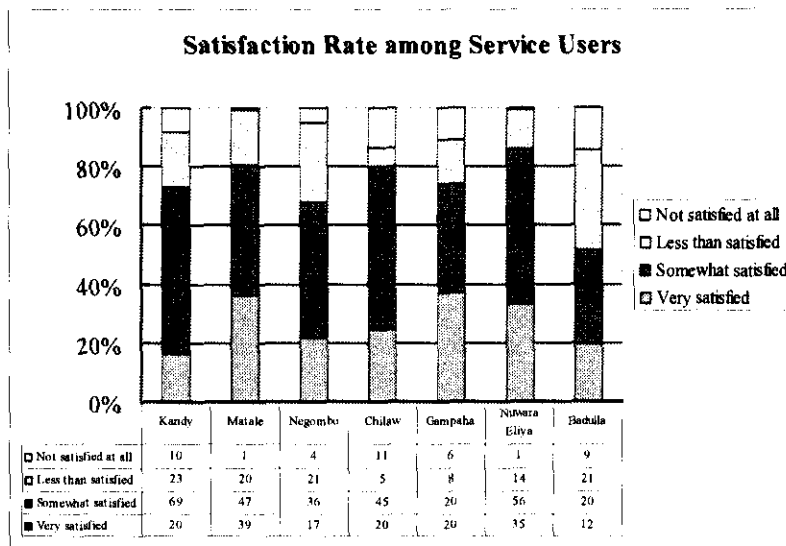


Figure 2-7: Waste Collection Service Users' Satisfaction Rate

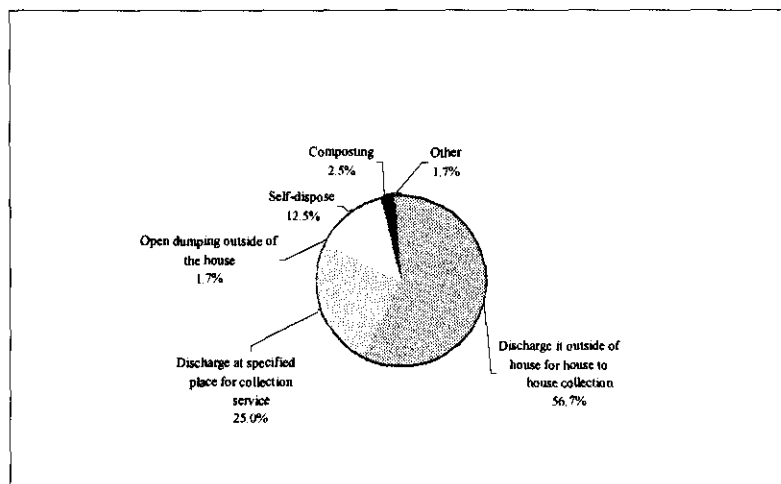


Figure 2-8: Common Waste Discharge Methods

- In general, adult females handle waste in 79% of surveyed households.
- Almost 90% of surveyed households are willing to cooperate with source separation for recycling, with the middle income group showing the strongest support and the low income group the least support. However, 82% of surveyed households are called on by someone who comes to collect their reusable or recyclable materials. Hence, an informal source separation recycling system is already very active.



- Not many surveyed households have ever discussed proper garbage discharge methods at the community level.
- Almost all households appreciate the necessity for SWM awareness programmes.
- The average WTP (willingness to pay) for improved SWM services is 89Rs/month per household.

#### 2.6.1.2 Findings from Focus Group Discussions

Two focus group discussions were held in early July 2002 in the Dole Rd and Malwatte areas<sup>7</sup> to gain a deeper appreciation of the public attitude to SWM provision. These found that both communities are somewhat frustrated with present SWM conditions (e.g. animals scattering waste, unsanitary condition of public bins) and are willing to cooperate with MMC to improve the situation. In particular, most female participants are very willing to follow any waste discharge rules once they are properly established by MMC. In relation to possible improvements in the collection system, most people favoured a bell collection system rather than the public bin system, considering bell collection to be more practical, provided the collection service is done to schedule.

#### 2.6.2 Commercial/Industrial and Institutional Survey Results

Interview surveys were conducted with 45 commercial/industrial and institutional places within MMA during May-July 2002. Key survey results are summarised below:

- 34 (76%) places are provided with a garbage collection service by MMC. 33 (73%) use this service, 16 (45%) of whom are not satisfied with it. The main reasons for dissatisfaction relate to the discharge system being poor and garbage collection/sweeping being irregular or not properly done. The Base Hospital is also concerned with the handling/disposal of hazardous healthcare wastes.
- The four most desired improvements to garbage collection and disposal are a shorter distance to collection points followed by an improved collection frequency, greater recycling/composting and an improved discharge system. Improved collection and disposal of healthcare hazardous waste was also of great concern to two hospitals, with the Base Hospital specifically requesting the provision of an incinerator.
- Eight (18%) places supported the introduction of an individual garbage collection fee, with nine places indicating an average WTP of 312Rs/mth (range = 100 to over 5,000Rs/mth).
- 45 (100%) places believe recycling is necessary, with 32 (71%) places being either very willing (30) or somewhat willing (2) to cooperate in separating their garbage at source.
- Five (11%) places are willing to undertake on-site composting, while five are doing so already. However, the majority (34, 76%) of places are not in favour, mainly due to a lack of space on site (29) and it taking too much time (11).

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<sup>7</sup> These two areas were also chosen as sampling areas for the household public opinion survey. Refer to the supporting report for more detailed information on the focus group discussions.

- 44 (98%) places consider a campaign to raise peoples' awareness for maintaining a cleaner city and environment is either somewhat necessary (43) or very necessary (1).

The most common additional comments received related to public education/awareness raising being vital (10); polythene should be banned (7), recycling is good/important (6), and legal action should be taken for inappropriate waste handling/disposal (3).

### **2.6.3 Attitudes of Waste Collection Workers**

#### **2.6.3.1 Present MMC Labour Force**

As of May 2002, there were 114 cleansing workers in MMC, 33 permanent workers each for the south, east and west zones and 15 casual labourers. 94% of all labourers are tamil, while 65% are male. Those workers are controlled by so-called "supervisors". In MMC, there are 11 supervisors, categorised in two ways: Overseers (Paripalaka) (4) and Sub-overseers (Upa Paripalaka) (7). One of the Overseers and two of the Sub-overseers were promoted from labourers to these positions.

#### **2.6.3.2 Findings from the Cleansing Worker Survey**

A questionnaire survey was conducted among 33 MMC cleansing workers in June/July 2002, in order to obtain a basic socio-economic profile of these workers and an appreciation of their working conditions. Analysis of the survey data shows:

- 94% of the sample population is Tamil and 6% are Sinhalese.
- The average number of members per household is 5.9 persons.
- The average monthly income is 9,802Rs per household and 1,650Rs per person. This is a little higher than the average low income figure, but less than the average middle income figure found in the household public opinion survey.
- The average number of years of work is 17.5 years.
- Either the mother or father of 85% of surveyed workers also was a waste collection worker.
- Difficulties and dissatisfactions with their work are as follows:
  - First: Insufficient wage
  - Second: Not enough tools for collection work
  - Third: Lack of protective clothing such as glove, boots, etc.
  - Fourth: Health problems
  - Fifth: Improper discharge of waste by people
  - Sixth: Unsanitary waste such as human waste is mixed with other waste

Among these six issues, the second, fifth and sixth ones seem to be genuine difficulties directly affecting their work. Addressing these issues may help to improve SWM service provision.

- When work related difficulties arise, all of them talk to a supervisor first. None of the workers directly talk to either the PHI or MOH.

### 2.6.3.3 Findings from the Labour Line Survey

A questionnaire survey was conducted among 50 households at the Municipal Labour Line in Higgolla<sup>8</sup> in order to gather a socio-economic profile of the residents in Higgolla who are assumed to be descendants of Tamil immigrant labourers from the colonial period. Analysis of the survey data shows the following:

- 100% (50) of surveyed households are Tamil.
- 98% (49) of surveyed households are Hindu and 2% (1) are Christian.
- The average number of members per household<sup>9</sup> is 5.1 persons, which is lower than the average figure of 5.5 persons obtained in the household public opinion survey.
- The average monthly income is 8,205Rs/household and 1,603Rs/person, higher than the average low income figures but less than the average middle income figures obtained in the household public opinion survey.
- The average number of people who work in each household is 1.92 persons.
- As many as 58 persons (60% of those who have some income source) work as MMC cleansing workers, this being the most common income source among surveyed households.
- 70% (35) of surveyed households live in single line rooms, 18% (9) live in back-to-back line rooms and 12% (6) live in separate houses.
- 32% (16) of surveyed households have lived there for between 15-20years and 30% (15) have lived there for more than 20 years.

These findings illustrate that MMC garbage collection work is historically and now dominated by Tamil labourers, this being their traditional work, with little change in their working conditions.

### 2.6.4 Awareness Programmes and Environmental Education

Currently, the MMC Health Department, NGOs and schools are the main groups undertaking SWM awareness and environmental education programmes.

MMC's community-based activities, including awareness programmes, are functioning very well. As in Kandy, the current organizational arrangement for these activities grew out of UNICEF's Urban Basic Service Programme, which began in the early 1990's. At present, twelve Community Development Assistants (UCDAs)<sup>10</sup>, supervised by a PHI, work in all types of activities requiring community participation. These UCDAs regularly visit 20 CBOs and children's clubs in different areas, acting as a link between MMC and the communities.

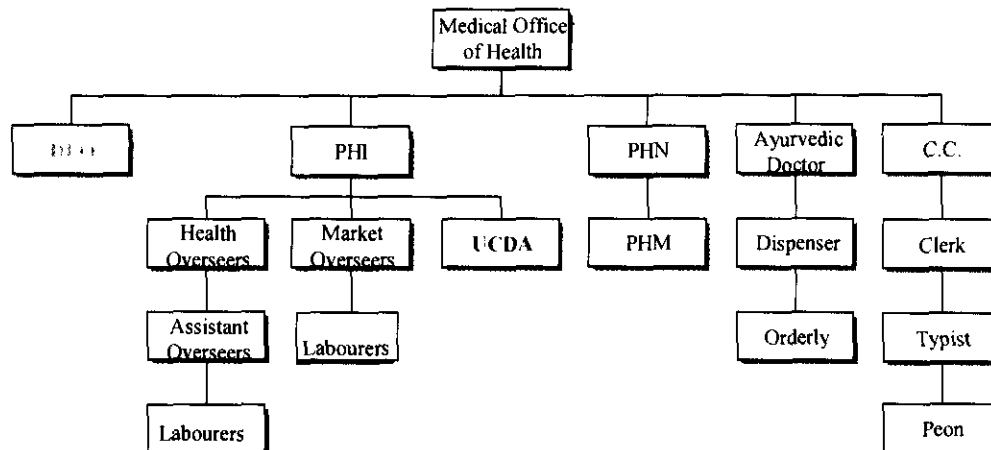
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<sup>8</sup> About 50 MMC houses (25 double lines) and 80 families here, plus about 90 families in 80 unauthorised houses built in the surrounding area by family and relatives of Higgolla residents (source: SPHI).

<sup>9</sup> Household members mean those who live together in one household and share the living expenses. It doesn't necessarily mean family members.

### 2.6.4.1 Involvement of Matale Municipal Council

The organisational structure of MMC's Health Department (excluding SWM details) is shown below.



DEO: Divisional Environmental Officer  
 PHI: Public Health Inspector  
 UCDA: Community Development Assistants  
 introduced under the UNICEF programme

PHN: Public Health Nurse  
 PHM: Public Health Midwife  
 C.C.: Chief Clerk

Figure 2-9: MMC Health Department Organisation Chart

In addition to this work, each UCDA has been assigned several Grama Niladari Divisions to work in so that they cover the entire MMA between them. These UCDA's are well experienced in communicating not only with poor communities but also with middle and high income communities. In fact, it seems that over 90% of all households in Matale have been visited by their respective UCDA's at least once. The experience gained from such grass-root activities throughout the MMA is a valuable asset to MMC which can be utilised for future community based programmes, including those on SWM.

MMC also has one Divisional Environmental Officer (DEO)<sup>11</sup>, who is involved in a wide range of environmental activities, including organizing school education programmes (see below). He has also initiated an Environment Committee based on CEA guidelines that meets monthly.

It is also worth noting that several community development activities have been carried out by JOCVs dispatched by JICA since July 1998.

### 2.6.4.2 Involvement of NGOs and Other Organizations

MMC has limited experience in working with NGOs. However, it seems to actively communicate with some organizations (e.g. Lions, Rotary Club) and there is one NGO (Sithuwama<sup>12</sup>), located just behind the MMC building. The chairpersons of these organizations are members of the Environment Committee.

<sup>10</sup> UCDA: U indicates CDAs introduced under same UNICEF programme.

<sup>11</sup> The Central Environmental Authority (CEA) has appointed "Divisional Environmental Officers" to each district and division and selected local authorities. MMC received one DEO in 1997.

The UNHCS (Habitat) Sustainable Cities Programme (SCP) began work in Matale in June 2003. This programme aims at improving urban settlements (environmental improvement, city beautification) and good governance by local authorities. Under this programme, Sevanatha (an NGO) has been appointed as a facilitator between MMC and local communities, with all stakeholders working together to implement the SCP programme.

Matale should also be starting a "Green City" programme soon, with funding from the International Centre for Sustainable Cities, Canada, focusing on drainage improvements and greening of the city.

#### 2.6.4.3 School Environmental Education Programme

Environmental education is an important means of eliciting long term changes in the attitude of the public to environmental issues including SWM. Environmental education programmes have been developed by the CEA since its establishment in 1980. CEA has introduced two nationwide school programmes, namely the "Environmental Pioneer Brigade (EPB)" programme for secondary schools in 1984 and "Eco Clubs" for primary schools in 2001.

In Matale, the EPB programme is much more active than the Eco Club programme. The EPB programme is voluntary and involves organizing school children into groups of twenty-five, who undertake activities based on a five-tier badge system: pioneer, green, silver, gold and presidential badges. At present, 16 schools are participating in the EPB programme in the MMA, with Sujatha Balika, Hindu College, Sri Sangamitta Balika, Amina, Christ Church, Vijaya, Parkyam schools being active.

The CEA has also appointed "Commissioners", by selecting some teachers to be Environment Commissioners and Assistant Environment Commissioners in each district. In Matale, the District Environmental Commissioner is from Vijaya College and the Divisional Environmental Commissioner from Sri Sangamitta Balika.

This experience and resources (both schools and teachers) should be fully utilised for any future environmental educational programmes focusing on SWM.

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<sup>12</sup> For more detailed information of Sithuwama, refer to the supporting report.

## **Chapter 3 Assessment of the Current SWM Condition**

### **3.1 Healthy Aspects**

#### **3.1.1 Good Performance by MMC in Some Areas**

MMC's SWM performance is good in a number of areas, including:

- Good SWM "service coverage" of 80-90%.
- Good service usage by waste generators (89%).
- Most household users are somewhat or very satisfied with the MMC collection service (80%).
- Reasonable collection vehicle performance and costs.
- Moderately successful home composting programme.

#### **3.1.2 Resource Recovery is Working Well**

Many resource recovery initiatives are currently operating within Matale, most of which are based on traditional values/approaches and represent important social capital. These include:

- "Aparade" is in common use, but requires promotion.
- Many people involved in reuse activities (e.g. shoe repairs, umbrella repairs, etc.).
- An excellent traditional recycling system, involving households and other waste generators, individual collectors (Bothal pathara karaya) and middlemen. Most high value recyclables (metals, glass bottles, battery cases, plastic containers, newspapers/exercise books) are recovered via this system, leaving mainly low value recyclables in the garbage taken to disposal. However, both the individual collectors and the middlemen operate largely on their own and do not currently have any close contact with MMC.
- On-site composting accounts for about 1.2T/d (3.7%) of generated waste which is significant.
- A small scale, source separation scheme in the MC Rd area, coordinated by Sevenatha under the SCP programme.

These initiatives should be supported while additional measures should be implemented to further promote waste minimisation.

### **3.2 SWM Issues**

#### **3.2.1 Very Serious Issues**

##### **3.2.1.1 Institutional and Organisational Strengthening Urgently Needed**

The main institutional and organisational issues related to SWM within Matale are:

- The current SWM management structure does not reflect the significance of SWM within MMC. It should be much stronger, with more authority being given to the responsible people and adequate human, facilities and financial resources allocated for SWM works because many MMC employees are engaged in SWM works, while MMC spends a lot of its budget on SWM (e.g. 2002 budget:

29% of MMC staff (over 130 employees) working in SWM by cadre; 12.1M Rs allocated to SWM (20% of total budget)).

- A shortage of senior staff dedicated to SWM works, while the inter-disciplinary nature of SWM makes it difficult for one person to handle SWM alone.
- A lack of short, medium and long term development plans. Goals, objectives and associated measures for improving SWM are not discussed, approved and implemented, resulting in a system where most staff focus on addressing day to day issues and activities are uncoordinated, often leading to confusion and poor motivation.
- Poor labourer management, with absenteeism running at around 15%, while some labourers go home early, some suffer from poor health and/or work under the influence of alcohol. The close relationship between supervisor and workers (refer collection worker survey) suggests that improved supervision is the key to improving labourers' work efficiency.
- Poor cooperation from other departments involved indirectly in SWM (e.g. long delays for vehicle repairs).
- Poor public-LA relations, characterised by a lack of clear instructions to the public detailing citizens' responsibilities, waste discharge rules, fines, etc. Existing by-laws need to be strengthened and vigorously enforced, while political intervention is also a problem.
- High SWM expenditure.
- Difficulties in finding out how much money is actually spent on SWM and the SWM cost breakdown (e.g. administration, collection, disposal, etc.).

### 3.2.1.2 Inadequate Final Disposal

Proper final disposal is the most important component required to establish the reliability of SWM works. Since stopping dumping at the Kaludawela landfill, MMC has used at least four temporary dumping sites for short periods, shifting from one to the next as a result of public protests. Hence, MMC has a very urgent need to locate and procure a new landfill site, developing and operating it in a proper manner, whilst at the same time engaging in active public consultation with residents and other relevant stakeholders to get their approval and support for the new landfill.

### 3.2.1.3 Improvements to Technical System Needed

Current waste discharge and storage is characterised by:

- A lack of public cooperation with many people discharging garbage in any container or none, at any time and any place, resulting in lots of garbage discharged at the roadside, or at public collection points, causing waste scattering and creating mini-dumps.
- Many animals (goats, dogs, cows, crows, etc.) search for food amongst the garbage, further scattering waste and creating poor sanitary conditions.
- Many public bins are poorly designed, being difficult to empty.

- Lots of garden and building waste is discharged at the roadside, collection points or on vacant land. Often, the garden waste is burnt.

The establishment of a proper discharge and storage system is vital.

Collection and transportation is inefficient and unreliable, being characterised by:

- Many handcarts and collection points.
- Double handling and long loading times.
- Garbage collection by handcart and two wheel tractor is expensive.
- Many vehicles are getting old.
- Vehicle breakdowns and long delays for repairs, especially for compactors and repair jobs over 15,000Rs.
- Low number of vehicle trips per day.

These problems, particularly vehicle breakdowns, make it difficult for MMC to keep to scheduled garbage collection times, routes and frequencies.

### **3.2.2 Serious Problems**

#### **3.2.2.1 Lack of Centralised Processing/Treatment Facilities**

The main objectives of any processing/treatment technology are to reduce the final amount of waste to disposal. There are currently no centralised garbage processing/treatment (recycling or composting or biogas) facilities within Matale. Considering that the composition of Matale waste is very suitable for composting and the problems MMC is having securing a suitable and publicly acceptable final disposal site, MMC should seriously investigate the feasibility of introducing medium-large scale composting/biogas facilities.

#### **3.2.2.2 Increase Public Cooperation through Education/Awareness**

Presently, public cooperation with MMC in SWM activities is poor, with many people still discharging their garbage and litter to public places. MMC is partly to blame for this, due to the collection service being unreliable and a lack of ongoing and systematic waste education, public promotion and information dissemination efforts.

Household surveys/interviews conducted during this study indicate that a proper discharge rule has not yet been established and Matale's citizens are currently frustrated with the present SWM condition and eager for its improvement. They have also realized the importance of public awareness raising and many people are keen on beautifying the city.

Observations of the central city area suggest that the number of food outlets and restaurants maintaining good sanitary conditions is increasing, which shows that citizens' attitudes towards waste and cleanliness are changing.



Responses from the commercial/institutional and industrial enterprises survey show that there is considerable room for improvement in SWM service provision to these sectors, with stakeholders being willing to cooperate with MMC in this regard, with quite a lot of places indicating a willingness to pay a garbage collection fee.

These observations suggest that immediate education/awareness programmes combined with introduction of waste discharge rules, conducted in cooperation with schools and NGOs should be highly effective both to increase peoples' understanding of the SWM issues facing Matale and to encourage public participation in SWM.

It may be possible to utilise MMC's UCDA's in this work, particularly activities involving social mobilization at the community level (e.g. awareness raising for improving residents' waste discharge practices).

### **3.2.3 Less Serious Problems**

Less serious problems are listed below:

- Stationary trailer collection points are generally of poor design. In particular, the Gongawela market transfer point needs improvement.
- The hilly topography around the western and north-eastern perimeters of the city makes garbage collection difficult in these areas, some of which are not provided with a garbage collection service by MMC. However, most of these places have low population densities, with properties comprising large sections, so that most households can dispose of their waste on site in an acceptable manner.
- Difficulties encountered by middlemen in gaining access to credit.
- Difficulties encountered in properly disposing of hazardous healthcare waste, particularly from the Base Hospital.