APPENDIX 4: Laboratory Test Results

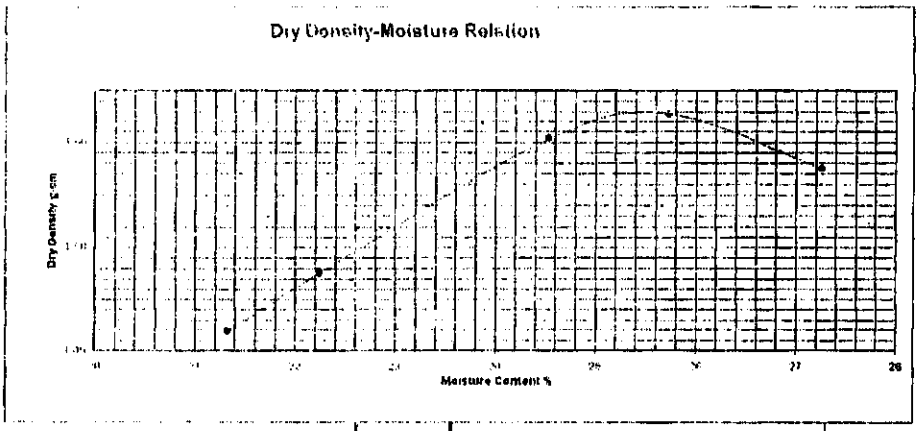
PROCTOR COMPACTION TEST - LABORATORY WORK SHEET

Client:	Geotech Limited	Job ref.	ML / S / 434
		Client ref.	
Project.:	Waste Disposal Site Matale		
		Sample No.	BH-01
Location:	BH-01		
Sample description:	Soil	Date	07.07.2003

Test Method ASTM-D 698

Compaction mould			Compacted by hand / machine		
Diameter	cm	15.24	Weight of Rammer	kg	2.5
Height	cm	11.64	Dropping Height	cm	30.5
Volume	cm	2123	Number of Layers		3
Weight	g	3045	Blows per Layer		56

Trial No		1	2	3	4	5
Wt. of wet soil + container	g	261.45	198.40	278.40	219.85	261.73
Wt. of dry soil + container	g	226.11	172.91	234.65	186.36	217.36
Wt. of container	g	60.35	58.30	56.35	56.23	54.64
Wt. of water	g	35.34	25.49	43.75	33.49	44.37
Wt. of dry soil	g	165.76	114.61	178.30	130.13	162.72
Moisture content	%	21.32	22.24	24.54	25.74	27.27
Wt. of mould + wet soil	g	6700	6875	7285	7390	7300
Wt. of mould	g	3045	3045	3045	3045	3045
Wt. of wet soil	g	3655	3830	4240	4345	4255
Bulk density	g/cm³	1.721	1.804	1.997	2.046	2.004
Dry density	g/cm³	1.419	1.476	1.603	1.627	1.575



Maximum Dry Density	1.630	g/cm³	Optimum Moisture content %	25.5

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ENGINEERING & LABORATORY SERVICES (PVT) LTD
62/3, Neelammahara Road, Katuwawala, Boralesgamuwa, Sri Lanka.
Telephone : 0094 01 517037 / 517365 / 519727, Fax : 0094 01 509806, E-Mail : els@lanka.ccom.

PROCTOR COMPACTION TEST - LABORATORY WORK SHEET

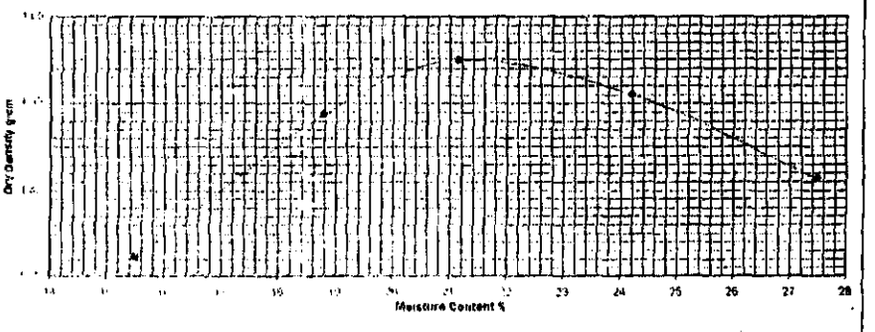
Client:	Geotech Limited	Job ref.	ML / S / 434
		Client ref.	
Project.:	Waste Disposal Site Matale		
		Sample No.	BH-03
Location:	BH-03		
Sample description:	Soil	Date	07.07.2003

Test Method ASTM-D 698

Compaction mould			Compacted by hand / machine		
Diameter	cm	15.24	Weight of Rammer	kg	2.5
Height	cm	11.64	Dropping Height	cm	30.5
Volume	cm^3	2123	Number of Layers		3
Weight	g	3045	Blows per Layer		56

Trial No.		1	2	3	4	5
Wt. of wet soil + container	g	378.87	336.78	327.93	329.37	322.76
Wt. of dry soil + container	g	335.99	292.00	280.11	276.00	265.58
Wt. of container	g	59.14	53.88	54.06	56.70	57.75
Wt. of water	g	42.88	44.78	47.82	53.37	57.17
Wt. of dry soil	g	276.85	238.12	226.05	220.30	207.83
Moisture content	%	15.49	18.81	21.15	24.23	27.51
Wt. of mould + wet soil	g	6410	6925	7160	7160	7005
Wt. of mould	g	3045	3045	3045	3045	3045
Wt. of wet soil	g	3365	3880	4115	4115	3960
Bulk density	g/cm^3	1.585	1.827	1.938	1.938	1.865
Dry density	g/cm^3	1.372	1.538	1.600	1.560	1.463

Dry Density-Moisture Relation



Maximum Dry Density	1.600	g/cm^3	Optimum Moisture content %	21.4

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PROCTOR COMPACTION TEST - LABORATORY WORK SHEET

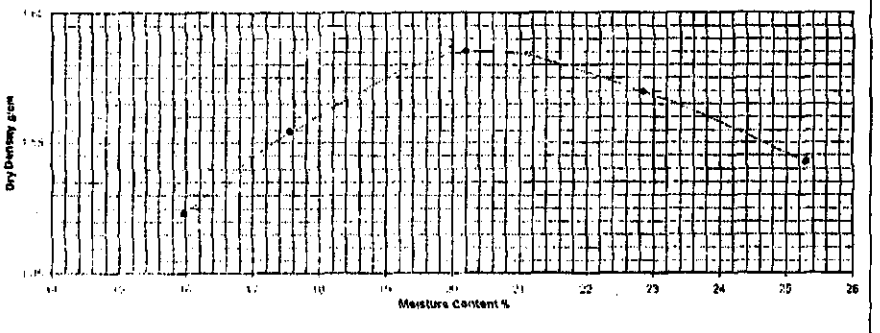
Client:	Geotech Limited	Job ref.	ML / S / 434
		Client ref.	
Project.:	Waste Disposal Site Matale		
		Sample No.	BH-04
Location:	BH-04		
Sample description:	Soil	Date	07.07.2003

Test Method ASTM-D 698

Compaction mould			Compacted by hand / machine		
Diameter	cm	15.24	Weight of Rammer	kg	2.5
Height	cm	11.64	Dropping Height	cm	30.5
Volume	cm^3	2123	Number of Layers		3
Weight	g	3045	Blows per Layer		56

Trial No.		1	2	3	4	5
Wt. of wet soil + container	g	345.10	321.19	341.23	328.59	351.91
Wt. of dry soil + container	g	303.94	281.59	293.77	279.01	293.43
Wt. of container	g	46.33	56.27	58.81	62.18	62.34
Wt. of water	g	41.16	39.60	47.46	49.58	58.48
Wt. of dry soil	g	257.61	225.32	234.96	216.83	231.09
Moisture content	%	15.98	17.58	20.20	22.87	25.31
Wt. of mould + wet soil	g	6730	6935	7180	7190	7130
Wt. of mould	g	3045	3045	3045	3045	3045
Wt. of wet soil	g	3685	3890	4135	4145	4085
Bulk density	g/cm^3	1.735	1.832	1.947	1.952	1.924
Dry density	g/cm^3	1.496	1.558	1.620	1.589	1.535

Dry Density-Moisture Relation



Maximum Dry Density	1.620	g/cm^3	Optimum Moisture content %	20.4

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GEOTECH TESTING SERVICES

Moisture Content

Location : OWALA , MATALE					Loc. No. :		
Sample No's : 09							
Relevant test :		Operator : P.A.E. GUNAKA.			Date started : 01 / 07 / 2005		
Sample No. & Ref. (AREA)		BH-01					
Container No.		01	02	03			
Wet soil & container	g	400	400	400			
Dry soil & container	g	321-78	320.80	319.16			
Container	g	41.18	33.54	33.46			
Dry soil	g	283.60	287.26	285.70			
Moisture loss	g	75.22	79.20	80.84			
Moisture Content	%	26.52	27.57	28.29			
Average Moisture	%						
Sample No. & Ref. (AREA)		BH-03					
Container No.		01	02	03			
Wet soil & container	g	400	400	400			
Dry soil & container	g	332.12	332.97	333.27			
Container	g	33.32	35.37	44.80			
Dry soil	g	298.80	297.60	288.47			
Moisture loss	g	67.88	67.03	66.73			
Moisture Content	%	22.71	22.52	23.13			
Average Moisture	%						
Sample No. & Ref. (AREA)		BH-04					
Container No.		01	02	03			
Wet soil & container	g	400	400	400			
Dry soil & container	g	344.32	346.38	342.52			
Container	g	34.31	43.23	30.44			
Dry soil	g	310.01	303.15	330.08			
Moisture loss	g	65.62	53.62	57.48			
Moisture Content	%	21.16	17.68	17.41			
Average Moisture	%						

	Remarks:	Operaters signature	
		Calculations	
		Passed	

GEOTECH TESTING SERVICES (PVT) LTD.

Liquid Limit and Plastic Limit Test	Project : GEOTECHNICAL SURVEY FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT AT OWALA, MATALE.		
Date : 01/07/2003	Hole No. BH-01 AREA	Sample No. -01	Sample Depth :

Description of soil : BROWNISH VERY FINE SANDY CLAY WITH DEBRIS

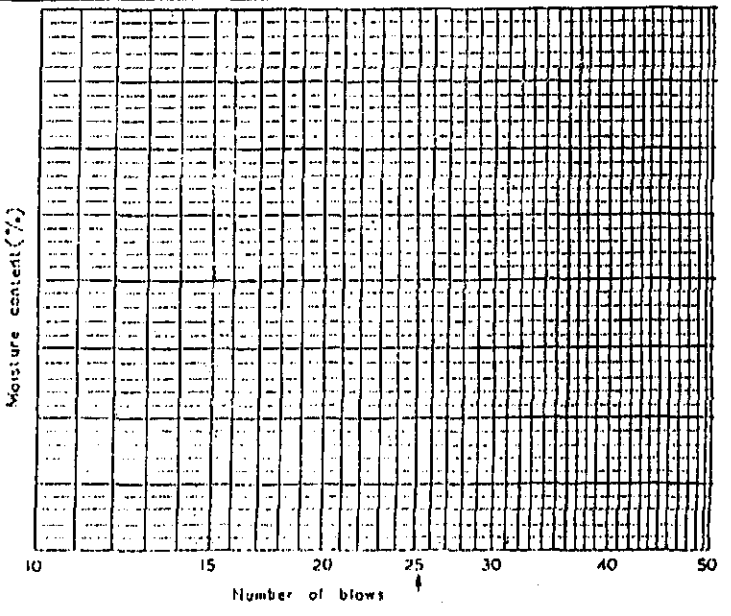
Test No.	1	2	3	4	5	6
Type of test						
No. of blows						

Moisture Content Determination

Can No.	M - 1	M - 2	M - 3	M - 4	M - 5	M - 6
Weight of Can (g)						
Weight of wet soil + Can (g)						
Weight of dry soil + Can (g)						
Weight of dry soil (g)						
Weight of water (g)						
Moisture content %						

Liquid limit = % | Plastic limit = % | PI = %

Remarks : CAN NOT BE RON



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GEOTECH TESTING SERVICES (PVT) LTD.

Liquid Limit and Plastic Limit Test	Project : GEOTECHNICAL SURVEY FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT AT OWALA, MATALE.		
Date : 01/07/2003	Hole No. BH-03-AREA	Sample No. - 01	Sample Depth :

Description of soil : BROWNISH VERY FINE TO MEDIUM CLAYEY SAND WITH GRAVEL

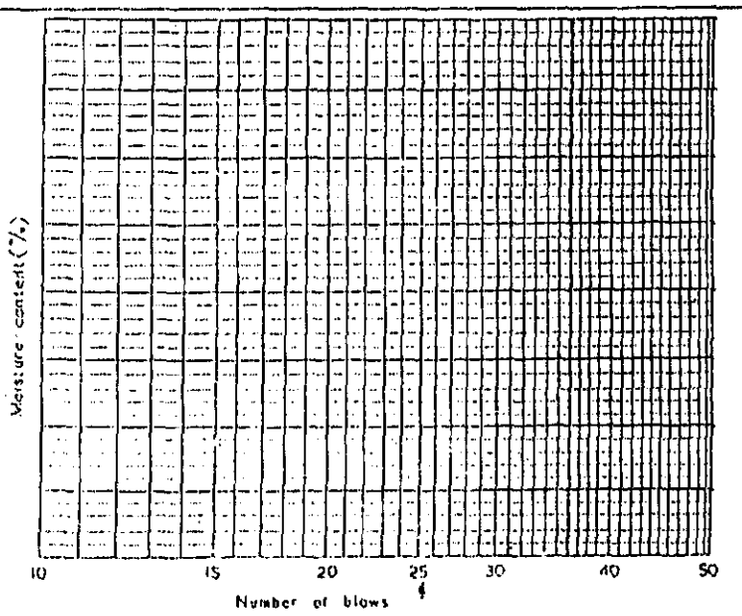
Test No.	1	2	3	4	5	6
Type of test						
No. of blows						

Moisture Content Determination

Can No.	M-1	M-2	M-3	M-4	M-5	M-6
Weight of Can (g)						
Weight of wet soil + Can (g)						
Weight of dry soil + Can (g)						
Weight of dry soil (g)						
Weight of water (g)						
Moisture content %						

Liquid limit = % | Plastic limit = % | PI = %

Remarks : CAN NOT BE DONE



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GEOTECH TESTING SERVICES (PVT) LTD.

Liquid Limit and Plastic Limit Test	Project : GEOTECHNICAL SURVEY FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT AT OWALA, MATALE		
Date : 01/07/2003	Hole No. BH-04 AREA	Sample No. - 01	Sample Depth :

Description of soil : BROWNISH VERY FINE TO MEDIUM CLAYEY SAND WITH GRAVEL.

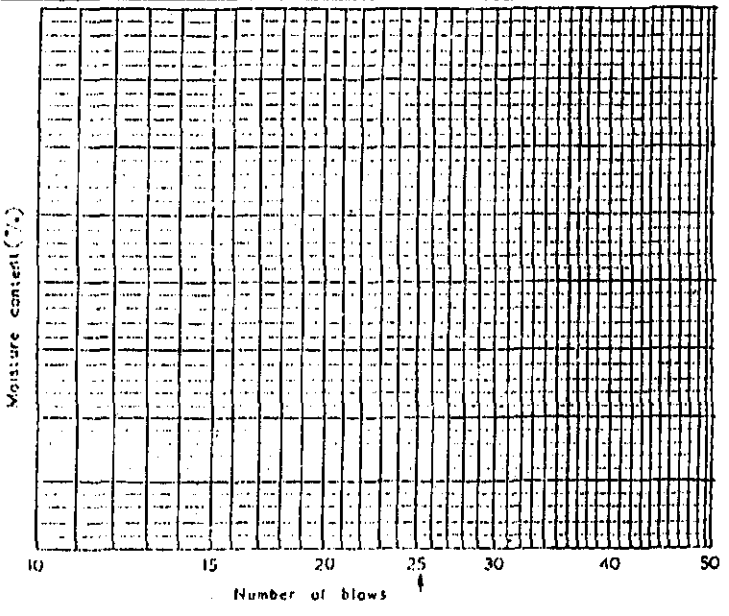
Test No.	1	2	3	4	5	6
Type of test						
No. of blows						

Moisture Content Determination

Can No.	M-1	M-2	M-3	M-4	M-5	M-6
Weight of Can (g)						
Weight of wet soil + Can (g)						
Weight of dry soil + Can (g)						
Weight of dry soil (g)						
Weight of water (g)						
Moisture content %						

Liquid limit = % | Plastic limit = % | PI = %

Remarks : CAN NOT BE DONE



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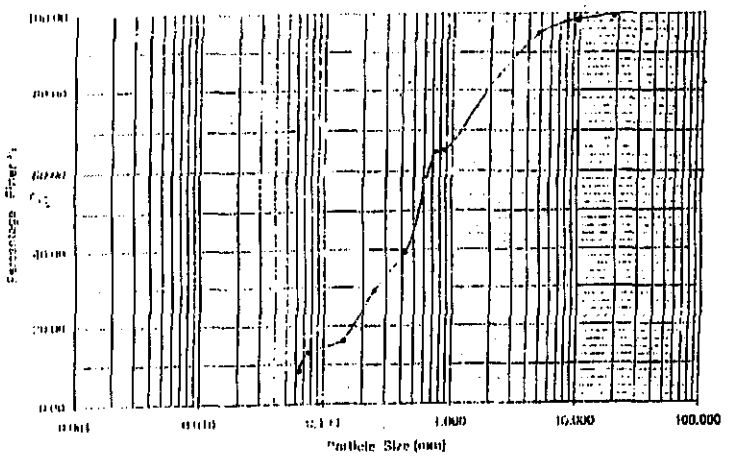
SIEVE ANALYSIS TEST RESULTS	PROJECT : Geotechnical Survey for Improvement of Solid Waste Management at Owala, Matale.	
Analysis Date : 01/07/2003	Location: BH-01 Area	Sample No: 01

Particle Size Analysis — Sieve Analysis

Total Mass Taken (g) = 400 g

Sieve Number	Sieve size (mm)	Mass of Soil (g)	Cumulative mass (g)	Percent retained (%)	Percent Finer (%)
1	19.000	-	-	0.00	100.00
2	9.500	7.88	7.88	1.97	98.03
3	4.750	9.33	17.21	4.30	95.69
4	0.850	121.56	138.77	34.69	65.30
5	0.710	0.35	139.62	34.90	65.09
6	0.425	100.60	240.22	60.05	39.94
7	0.250	39.96	280.18	70.04	29.95
8	0.150	52.14	332.62	83.15	16.84
9	0.075	13.80	346.42	86.60	13.39
10	0.063	21.10	367.52	91.88	8.12
11	Pan	32.35	399.87	99.96	0.03

Particle size Distribution



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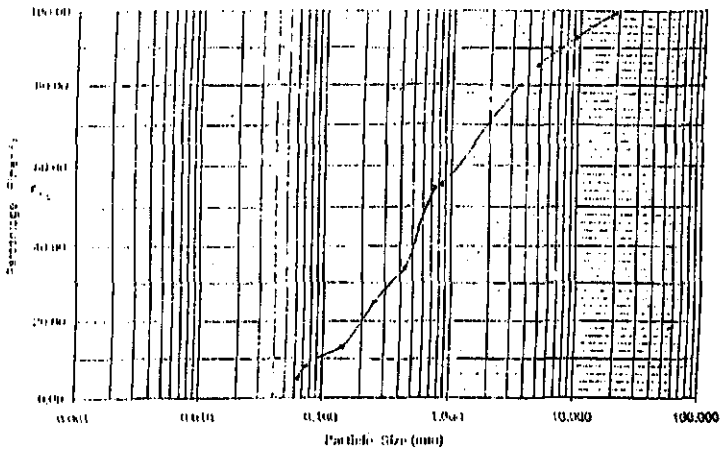
SIEVE ANALYSIS TEST RESULTS	PROJECT : Geological Survey for Improvement of Solid Waste Management at Owala, Matale.	
Analysis Date : 01/07/2003	Location: BH-03 Area	Sample No: 01

Particle Size Analysis — Sieve Analysis
Total Mass Taken (g) = 400 g

Sieve Number	Sieve size (mm)	Mass of Soil (g)	Cumulative mass (g)	Percent retained (%)	Percent Finer (%)
1	19.000	-	-	0.00	100.00
2	9.500	28.68	28.68	7.17	92.83
3	4.750	29.42	58.10	14.52	85.47
4	0.850	120.50	178.60	44.65	55.35
5	0.710	1.32	179.92	44.98	55.02
6	0.425	82.22	262.14	65.53	34.46
7	0.250	36.39	298.53	74.63	25.36
8	0.150	49.24	347.77	86.94	13.05
9	0.075	16.75	364.52	91.13	8.87
10	0.063	13.31	377.83	94.45	5.54
11	Pan	21.59	399.42	99.85	0.14

Particle size Distribution



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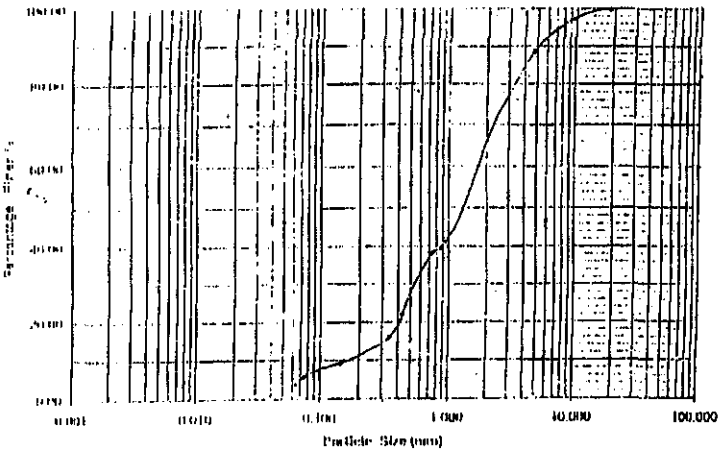
SIEVE ANALYSIS TEST RESULTS	PROJECT : Geotechnical Survey for Improvement of Solid Waste Management at Owala, Matale.	
Analysis Date : 01/07/2003	Location: BH 04 Area	Sample No: 01

Particle Size Analysis — Total Mass Taken (g) = 400 g — Sieve Analysis

Sieve Number	Sieve size (mm)	Mass of Soil (g)	Cumulative mass (g)	Percent retained (%)	Percent Finer (%)
1	19.000	-	-	0.00	100.00
2	9.500	11.28	11.28	2.82	97.18
3	4.750	34.59	45.87	11.46	88.53
4	0.850	195.54	241.41	60.35	39.64
5	0.710	0.66	242.07	60.51	39.48
6	0.425	66.06	308.13	77.03	22.96
7	0.250	25.09	333.22	83.30	16.69
8	0.150	29.50	362.72	90.68	9.32
9	0.075	10.63	373.36	93.34	6.66
10	0.063	9.15	382.62	95.70	4.29
11	Pan	16.30	399.62	99.90	0.09

Particle size Distribution



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Chapter 5

Matale Waste Stream Analysis

WACS Survey data

High	172	76,943	447.3
Middle	188	77,571	412.6
Low	180	73,279	407.1
Total	540	227,793	421.8

Average Waste Composition over 8 days - weights (g)

Matale WACS Results		food/ kitchen	paper	textile	Plastic	Grass & Wood	Leather & Rubber	metal	glass	Ceramic & Stone	other	Total	
	High	21,302	2,795	285	1,125	3,824	87	152	771	538	143	31,022	
	Middle	21,146	1,611	488	991	6,937	187	116	397	1,372	115	33,360	
	Low	21,594	2,276	524	1,345	4,409	111	89	87	1,369	184	31,988	
	Average Waste composition over 8 days - wt %												Wt (g)
	High	68.67	9.01	0.92	3.63	12.33	0.28	0.49	2.49	1.73	0.46	100.00	76,943
	Middle	63.39	4.83	1.46	2.97	20.79	0.56	0.35	1.19	4.11	0.34	100.00	77,571
	Low	67.51	7.12	1.64	4.20	13.78	0.35	0.28	0.27	4.28	0.58	100.00	73,279
	Wt avg	66.50	6.98	1.34	3.59	15.68	0.40	0.37	1.33	3.36	0.46	100.00	227,793

Household survey	Q3.1 garb disp		5.9 others														
(120 respondents)	Main	Other	behaviour	Weighted no of responses to different methods of waste disposal for different waste types												Wt avg	Rev'd	Rev'd %
LA colln	100	6	115		81.2	81.2	81.2	81.2	27	81.2	81.2	81.2	81.2	81.2	757.8	69.2	69.2	70.3
Self-disp	15	25	5		17	17	17	17	34	17	17	17	17	17	187	21.1	21.1	21.5
Compost	3	5	0	F/K Q4-9	3	0	0	0	6	0	0	0	0	0	9	3.3	2.6	2.7
Recycle	0	0	0	Q4-5-8	1	80	8	0		0	43	88	0	0	220	4.6	3.6	3.7
Open dump	2	4	3		2.4	2.4	2.4	2.4	0	2.4	2.4	2.4	2.4	2.4	21.6	1.9	1.9	1.9
Total	120	40			104.6	180.6	108.6	100.6	67	100.6	143.6	188.6	100.6	100.6	1195.4	100	98.4	100.0
Weight	0.8	0.2							Q3.9									

Notes:

1. Q5.9 generally supports Q3.1 results except for suggesting open dumping is less common. Q3.1 result used in analysis only, applying weights to main/other answers as shown
2. For compost and recycle options, use answers from other questions as indicated, rather than 3.1.
3. For those composting/recycling different materials, assumed 80 % of materials generated are recycled/composted - gives revised total shown in last column

WACS survey		Fd/Ki	Paper	Textile	Plastic	Gr/Wd	Le/Ru	Metal	Glass	Ce/St	other	Total	
	Wt avg	66.50	6.98	1.34	3.59	15.68	0.40	0.37	1.33	3.36	0.46	100.00	
(89 respondents)	Weighted no of responses to different methods of waste disposal for different waste types												
LA colln (A,B,C,D)		82	47	11	72	62	10	19	12	23	23		87.0
Self-disp (E,F)		6	6	0	8	14	2	0	0	1	1		8.4
Compost (H)		2	1	0	0	3	0	0	0	0	0		2.2
Recycle (G)		0	19	0	0	0	0	0	10	0	0		2.4
Open dump (I)		0	0	0	0	0	0	0	0	0	0		0.0
Total		90	73	11	80	79	12	19	22	24	24		100

Household survey data

2.1&2.2 Garbage coll'n	No	%
Have and use	107	89.2
Have but don't use	13	10.8
Don't have	0	0.0
Total	120	100.0

WACS survey data

2.1&2.2 Garbage coll'n		No	%
Have and use		26	86.7
Have but don't use		4	13.3
Don't have		0	0.0
Total		30	100.0

Household survey data

3.8 Garden waste	No	%
Yes	63	52.5
No	57	47.5
Total	120	100.0

Q4-5 to 4-8Recycling

Qns	Yes	No	Fd/Ki	Paper	Textile	Plastic	Gr/Wd	Le/Ru	Metal	Glass	Ce/St	other	Total
4.5/4.6 Individual collector	98	22	1	80	8	0	0	0	43	88	0	0	220
4.7/4.8 Take to shop	45	75	0	12	4	0	0	0	4	36	0	0	56
4.9 Comp ki &/or ga waste	9	111	3				6						9

Notes:

1. Household questionnaire listed paper and cardboard separately and "metal can" and "other metal" separately, whereas these items were a single category in WACS.
Hence, as more responses were obtained for paper compared with cardboard, it was assumed total paper = paper (not paper + cardboard)
Hence, as more responses obtained for metal can compared with other metal, it was assumed total metal = metal can (not metal can + other)
3. Assume same people are both giving/selling things to collectors and taking things to shops so that total doing some recycling is max no from these 2 questions, not sum
4. In Q3.9, 6 people said they compost garden waste - hence 3 must compost kitchen waste

Conclusions:

1. The household survey results are considered more realistic than the WACS survey results, based on field investigations within the city and being based on more samples.
2. It is also considered more realistic to assume that those composting/recycling do not do this for 100% of particular material.
For these reasons, household survey result's revised total in final column has been adopted.

Adjusted WDR = 0.422 kg/cap.d from WACS data
This represents discharge +open dumping + self-disposal = 93.6 % of total waste generation from below %s
Waste generation rate = 0.451 kg/cap.d

Both the household and WACS surveys were undertaken in areas where all households were provided with a garbage collection service, as indicated by Q2.1 & 2.2 responses.
Discussions with MMC staff indicated that the MMA service coverage is 85 % (approximately)
Hence, disposal method %s were adjusted to account for this as follows:

	Serviced	Unserviced	Total
MM Area (%)	85	15	100
LA collection	70.3	0	59.7
Self-disposal	21.5	72.1	29.1
Compost	2.7	9.1	3.6
Recycle	3.7	12.5	5.0
Open dump	1.9	6.3	2.6
	100.0	100.0	100.0

Notes:

1. Assume for areas not provided with garbage collection service, waste is disposed of by other methods in direct proportion to the above %s.
For example, self-disposal in unserviced area = 21.5/(21.5+2.7+3.7+1.9)*100% = 72.1%
2. Overall %s calculated as ((% serviced area) x (disposal method % in that area) + (% unserviced area) x (disposal method % in that area))/100%
e.g. self-disposal = (90*21.5+10*72.1)/100 = 26.5%

Collection worker recycling (data from collection worker survey)

Item	Total	
No of workers collecting items for recycling	10	
Total no of workers interviewed	33	
Average income(Rs/mth)	231	1 no response
% of those interviewed collecting recyclables	30	
Total no of SWM workers	109	
% interviewed/total workers	30	
Estimated total no of workers collecting recyclables	33	

Notes:

1. Collection workers indicated all recycables go to Nadar Kade
2. Total SWM workers = 104 labourers + 5 drivers

Collection worker - recycling quantities

Item	No collecting	Qty	Units	Price	Units	Corrected qty	Est total qty/mth	
Bottles	9	231	kg/mth	1 - 5	Rs ea	260	858	1 no response
Glass (broken)	1	50	kg/mth	4	Rs/kg	50	165	
Cardboard	0	0	kg/mth		Rs/kg	0	0	
Ferrous	8	225	kg/mth	2 - 5	Rs/kg	257	849	1 no response
Metal can	2	35	kg/mth	2 - 2.5	Rs/kg	35	116	
Aluminium	5	5	kg/mth	20 - 60	Rs/kg	6	21	1 no response
Brass	1	0.25	kg/mth	65	Rs/kg	0.3	1	1 no response - assume same as copper
Copper	*1*	*0.25*	*kg/mth*	*50*	*Rs/kg*	*0.3*	*1*	
Total quantity	10	546.5	kg/mth			609	2011	
Est. tot. qty collected by all labourers		1805	kg/mth			2011		

Notes:

1. *Average weight of bottles (mainly beer and arrack) = 0.66 kg ea (average weight, based on measurements of 5 arrack and 5 beer bottles)*
2. No of bottles collected per month = 350 bottles/mth, converted to kg/mth using above average weight
3. During time and motion study, the compactor crew of 6 indicated they collect:

a. broken glass = 200 kg/mth, sold at 1Rs/kg (jars are included in this category) = 33 kg/mth/labourer - comparable with qty in table
b. salmon tins = 300 kg/mth, sold at 2Rs/kg = 50 kg/mth/labourer - comparable with qty in table
c. Pepsi cans = NA kg/mth, sold at 20 Rs/kg (NA = no answer)
d. Bottles = NA kg/mth, sold at 0.50 (other bottles) to 5 Rs ea (beer/arrack bottles)
e. Each mth, they can earn around 2000 Rs/mth for crew of 6 = 333 Rs/mth/labourer - higher than amount indicated in collection worker survey but believed compactor truck crew can earn more than average labourer (richer pickings + > qty of waste collected)
f. Only clean cardboard is collected + they do not collect plastics/polythene/coconuts for recycling.
g. Handcart labourers also collect some items for recycling.

2. Overall quantity recycled = 87 kg/d, which is relatively small. However, household survey indicates lot of recyclables collected at discharge + MM survey indicates very few middlemen receive recyclables from collection workers. Assume correct.

Final disposal site - recycling

According to the PHI, the landfill labourers also store recyclable items at the same place as the collection workers.
Final disposal recycling quantity calculated as follows:

a. No of landfill labourers = 5
b. From collection data, avg qty of recyclables collected per labourer involved in recycling = 54.65 kg/worker/mth
c. Average quantity collected per mth at landfill, assuming all landfill labourers active = 273.25 kg/mth
d. Average qty collected per day = 9.0 kg/d, assuming made up of 51 % glass and the remainder metals (same proportions as for collection).

In addition, disposal site survey found 1 person out of 50 collecting 10 kg/d of metals which they sell daily to middlemen @ 1Rs/kg Total quantity = 19.0 kg/d

This is considered reasonable, being consistent with observations made at the landfill site of there being relatively few recyclables left in the incoming waste.

1. WASTE STREAM HOUSEHOLD, COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL DATA

a. Residential	Permanent		Floating		Total		Notes
	H'holds	People	H'holds	People	H'holds	People	
July 2001 census		36352					1
Matale Divisional Secretariat	7329	36331		9500			2
Budget 2002		38,016					4
MMC 1995 records	5773						5
MMC 2000 records	5900						
Adopted	5900	36331	n/a	9500			

H'holds = housing units + collective living quarters

Notes:
1. July 2001 census results are provisional.
2. Matale Divisional Secretariat; floating population estimate by UDA
3. Trade license stats give a total population for MMC in 1993 of 32013
4. Budget 2002 lists 12174 properties paying assessment tax - believe this is higher than no of residences
5. From Matale Development Plan, Vital Statistics
6. Estimated 2002 population = 36696 based on average 1981-2001 compound growth rate of 1.00 %

b. Commercial	Non-market trade licences	Markets (excl Pola)	Total	Notes
Matale MC Trade licence data			2147	1
Central Province Trade licence data			1486	2
Central Province Trade licence data		57	Not checked	
Adopted	2090	57	2147	

Notes:
1. In Matale, one shop may have more than one trade licence - hence trade licence data is an over-estimate of the actual no.
2. See supporting information

c. Industrial	No of industries				Notes
	Small	Medium	Large	Total	
Sawmills		3	2	5	
Lime kilns	4			4	1
Chocolate factory			1	1	
IDB Industrial Estate		9		9	2
Adopted		3	3	6	

Notes:
1. Preliminary investigation showed they produced very little waste - excluded from further study.
2. Not included in study as outside MMA.

d. Institutional	No of institutes						Note
	Govt	Schools	Other Ed	Hospital	Religious	Total	
JICA Research	42	17	8	3	34	104	
Adopted	42	17	8	3	34	104	

General Notes on Shading
1. Yellow indicates waste generators surveyed/interviewed during this study.
2. Blue or green relate to specific notes described under relevant items. or
3. Purple shows data used in waste stream calculations
4. Orange indicates cells affected by changes in collection tonnages

2. COMMERCIAL & INDUSTRIAL SECTOR - DETAILED INFORMATION

a. General

Category	Name	Address	Relevant Data				SW data survey(kg/d)	Disposal Main	other	OSD	Comp	LA colln	Recy	ID	Total	Notes
Small																
Pharmacy	Thoma & Company (	39, King St, Mathale,	3	staff	45	area (m2)	1	D				1			1	
Pharmacy	Tissa Pharmacy	90, Darmapala St, Ma	2	staff	20	area (m2)	5	D				5			5	
Furniture Sale	Sri Lanka Furnishing	245, Trincomalee St,	30	staff	46	area (m2)	1	B				1			1	
Communicatio	Pubudu Communica	74A, Dharmapala St,	2	staff	33	area (m2)	0.5	D				0.5			0.5	
Jewelry shop	Subramanium Jewel	268, Main St, Matale	5	staff	77	area (m2)	2	D				2			2	
Tailoring	Chandru Tailors	523C, Main St, Matal	2	staff	10	area (m2)	1	D				1			1	
Communicatio	World Net Communi	143A, King St, Matale	2	staff	6	area (m2)	0.5	C				0.5			0.5	
Salon	Raja Salon	143, Kings St, Matale	3	staff	23	area (m2)	2	B				2			2	
Stationery	Malaka Traders	55,57, Main St, Matal	24	staff	270	area (m2)	15	C				15			15	
Aluminium Tra	Thilini Aluminium Ho	80C, Kings St, Matale	1	staff			0.5	A				0.5			0.5	
Restaurant	Hotel De Rio	30, Main St, Matale	6	staff	200	customers/d	20	B				20			20	
Book shop	Hulangamuwa and c	71 Main St, Matale	3	staff			1.5	A				1.5			1.5	
Tailoring	Kariel Tailors	11 Station Rd, Matale	3	staff			1	F	A	0.75		0.25			1	Assume 75% F
Banking	Rural Bank	*20 Bandaranayake st*	*10*	*staff*			4	F		4					4	
Large																
Comm	Main Post Office	Matale	123	staff			10	F		10					10	
Comm	CWE	Gongawela Rd, Mata	4	staff			10	F	G			9.73	0.27		10	
Hotel/	Rock House	17/16A Hulangamuw	4	staff	17.5	avg guests/d	10	F	H	9.3	0.7				10	Comp 20kg/mth ga
guesthouse	Thilanka Rest House	Matale	21	staff	15	avg guests/d	70	D				70			70	
Restaurant	Royal Hotel	Main St, Matale	12	staff	300	customers/d	50	D				50			50	
Restaurant	Arunaloka Hotel	27 Kumara St, Matale	80	staff	500	customers/d	50	A	G			48.75	1.25		50	Note 4a
Restaurant	Vinro	99/A Raja Veediya, M	15	staff	350	customers/d	100	A	G			99.5	0.5		100	Note 4b
Rest/bakery	Raise hotel/bakery	Gongawela Rd, Mata	15	staff	1000	customers/d	35	A				35			35	
Rest/bakery	Salgadu hotel/bakery	45 Main St, Matale	16	staff			25	C	G			24.9	0.1		25	Note 4c
Butcher	Meat stall	3A Gongawela Market, Matale					30	D	J			28.5	1.5		30	Assume 5% recycled
							445			24.1	0.7	416.6	3.7	0.0	445.0	
									Disposal %	5.4	0.1	93.6	0.8	0.0	100.0	

Notes: *A-D= LA collection; E-F = on-site disposal, G = recycling, H = composting, I = illegal dumping, J = other*

1. According to the PHI, there are 65 restaurants/small hotels within MMA, with a total of 400 tables and average of 250 customers/d - however, our survey data suggests customer nos are considerably higher than this.
2. According to the PHI, there are a total of 4 guesthouses in Matale, with 30 staff and avg of 50 guests/d
3. Other sources of hotel and guesthouse data = Lonely Planet, Sri Lanka Tourist Guide (1999)
4. Recycling data (from small and large waste generator surveys):

a. Arunaloka Hotel recycles about 5 plastic containers/mth, 450 tins/mth and 100 bags/mth, assumed equivalent to 5x1 + 450/20 + 1(37.5 kg/mth or 1.25 kg/d

b. Vinro recycles 150 polysack and sugar bags per mth = 15 kg/mth or 0.5 kg/d

c. Salgadu recycles 40 polysacks, sugar bags and gunny bags per mth = 4 kg/mth or 0.13 kg/d

d. CWE recycles 200 polythene bags/mth and 30 gunny bags/mth = 8 kg/mth or 0.27 kg/d (assuming polythene bags are 25% wt of gunny bags)

Middleman survey gave total of 4500 polysacks/mth collected (15kg/d) from comm. area but did not mention any other materials - assume recycling % calculated above covers this amount - check WG x recycling % = 53.1 kg/d - OK

5. Commercial waste generation estimated as follows:

a. Kandy commercial waste discharge = 9.87 kg/shop.d x 3178 shops = 31.4 T/d from perm popn of 110049 and floating popn of 112500 (avg of 100000 & 125000)

b. On a pro rata basis, Matale commercial waste disch from perm popn of 36331 and floating popn of 30000 is 9.35 T/d, equivalent to 947 shops based on Kandy shop WDR

c. Night tractor collects 1.92 trips/d @ 2.18 T/load = 4.19 T/d, from commercial area, which includes some residential premises.

d. During day time, waste collected from commercial area by mixture of handcarts, tractors and compactors - hence, very difficult to estimate commercial waste based on daytime trips. However compactor truck labourer said ~ 35 HC loads/d discharged at Gongawela mkt bin, mainly from comm. area (8 HC loads discharged within 1h20min period during T&M study -> quoted is reasonable) - equiv. to 4.20 T/d

Subtracting Gongawela pola waste gives total to Gongawela mkt bin of 2.28 T/d

Combining these two figures gives 6.47 T/d, which will include some resid/inst waste, but not comm waste collected by tractors in this area or from shops in other parts of the city - figure < that estimated based on Kandy data

e. Hotel/restaurant waste generation based on 65 restaurants/small hotels @ avg SW gen'n = 46.7 kg/d = 3.03 T/d - likely to be considerable proportion of total commercial waste.

f. Conclusion - *Kandy figure is considered too high - use other figure, assuming extra resid/inst waste makes up for missing comm waste - i.e. comm WG = 6.47 T/d or 3.10 kg/trade licence.d*

(In Matale, no of trade licences is much greater than no of shops, due to trade licences being issued on an activity basis rather than shop basis, so that one shop may have more than one trade licence)

b. Markets

Name	No of stalls Budget 2002	No of stalls JICA	Stall breakdown Meat+Fish	Vege+Fruit	Goods	Hotels	Other	SWM Gen (T/d)	WGR (kg/stall.d)	Comments
King St (Central market)	54	54	8	12	31		3	0.82	15.1	
Pola (Gongawela Rd) - Sun	300	250	5	185	30	0	0			Daily fair (vegetables and fruit) - nos obtained from JICA field survey
Pola (Gongawela Rd) - Other days		106	5	84	17	0	0			Counted by JICA on weekday (MMC Revenue officer said ~100 stalls other days)
Pola average		127						1.92	15.1	Avg stalls = (6d@106+250)/7; waste generation based on WGR for Central mkt
Fish/meat/poultry offal		3	3	(three licensed butchers - others already counted)				0.11		2WT second load - from 2 licensed butchers and markets
Total markets		184						2.84	15.5	
Mainly retail										
Gongawela Mkt	31	25	2	4	19		3	0.12		Includes Gongawela shopping complex (vege/fruit stalls only)
Dharmapala Mw	40	Not checked								PHI said these are more MMC owned shops rather than a market
Others	12	Not checked								
Total public	437									

Notes:

1. Market stalls include King St market, Gongawela Pola and fish/meat/poultry offal/wastes
2. Former slaughterhouse is now site for new police station; MMC currently have no slaughterhouse - instead, they have issued licences to 3 butchers, renewable on a monthly basis.
3. Waste generation: Central market = 0.375 4WT/d @ 2.18 T/load
   Gongawela mkt = 1 HC/d x 0.12 T/HC
4. Gongawela Pola waste and market waste goes to Gongawela mkt bin - hence must subtract Gongawela pola waste from Gongawela mkt bin to get more realistic estimate of commercial waste.

c. Industries

Name	Location	Main 3 wastes	Avg no of workers	SW Data Survey	Waste disposal Main	Other	Waste disposal OS-disp	Comp	LA colln	Recy	Ill dump	Total
Diana Chocolate Factory	Pulleyar Kovil Rd	Pa>F/K>Ga	80	20	D		0.0	0.0	20.0	0.0	0.0	20
Sawmills					SD	WC/bark			Dir Haul			
Chandrarathne Sawmill	1070 Aluvihare	SD/WC	Not asked	551	E/G	G	185	0	0	366	0	551
Mandandawala Sawmill	791 Trincomalee St	SD/WC/bark	Not asked	122	E	G	16	0	0	105	0	122
Jamaldeen Sawmill	786 Trincomalee St	SD/WC	Not asked	232	G	G	0	0	0	232	0	232
Abeyrathna Mills	161 Nagolla Rd	SD/WC/bark	Not asked	493	E/G	I/G	197	0	0	296	0	493
Sampath Mills	28 Sangananda Mw	SD/WC/bark	Not asked	415	I/G	E/G/I	2	0	249	164	0	415
Other				1812		Sum	401	0	249	1163	0	1812
Lime kilns	No = 4; not investigated as part of this study					Disposal %	22.1	0.0	13.7	64.2	0.0	100.0
IDB Industrial Estate	Not investigated as part of this study as lies outside MMA											

Notes:

1. Codes for waste types: F = food, G = garden, T = textile, P = paper, Pl = plastic, M = metal, Gl = glass, I = inert (dust, dirt, etc.), O = other; SW = sawdust, WC = woodchips
2. Code for waste disposal: A-D = LA collection, E/F = burn/bury, G = recycle, H = compost, I = open dump, J = other
3. Assumptions for sawmill waste disposal (based on survey responses):
a. Chandrarathne Mills - assumed 50% sawdust given away, 50% burnt
b. Abeyrathna Mills - assumed 50% sawdust given away, 50% burnt; woodchips disposed of on site; bark given away
c. Sampath Mills - assumed 0.5T sawdust given away per mth, remainder taken to MMC disposal site; 50% woodchips burnt, 50% taken to MMC disposal site.
4. There used to be a textile mill in the city but this has now closed.
5. The State Timber Corporation, Matale Depot is a sales depot located on IDH Rd (on the road to the landfill site).

3. INSTITUTIONS - DETAILED INFORMATION

a. Schools

No	Name	Address	Type	Students	Teachers	Total	National School	Hostel Facilities	Env Educ Activity	Env Society	Contact
1	St Thomas		1AB	1800	87	1887	National	?	High		Mr HDS Dayarathna, T 066 22523
2	Ismalia		2	342	17	359				Yes	
3	Wariyapola		3	95	6	101	Junior			Yes	
4	Hulangamuwa V		2	113	19	132	Junior		Low	Yes	Mrs Chandanee, Mrs JPMK Vijerathna
5	Dodamdaniya V		2	43	12	55	Junior		Low	Yes	
6	S Bandaranayake		3	400	12	412	Junior			Yes	
7	Sujatha B		1AB	436	25	461			High	Yes	Mr LC Gunarathna, T 066 34194
8	Hindu V		1AB	1452	53	1505	National		Low		Mr B Ruddadarasa, T 066 23801
9	Vijayapela V		1AB	1586	91	1677	MV		Low		Mr HKWS Chithraranjan, T 066 22747
10	Sri Sanghamitta Balika		1AB	3000	124	3124	National	24	High	Yes	Mrs A Disanayake, Ms AM Nadeera, T 066 22402
11	Amina		1AB	1489	59	1548	National		High	Yes	Mr VG Karunarathna, Ms ARM Misiriya; T 066 23214
12	St Thomas Girls		1AB	700	36	736					
13	Christ Church		1AB	2367	100	2467			Middle	Yes	Mr J Banda, Mrs GK Wijayakoon, T 066 22050
14	Vijaya		1AB	1626	75	1701			High	Yes	Mr G Sumarasekara, Ms I Jayathunga,T 066 22312
15	Zahira		1AB	1456	66	1522	National				
16	Pakya		1AB	1400	48	1448			Middle	Yes	Ms I Rihana, Mr S Yogambal, T 066 22453
17	Science College		1C	624	33	657					
	Total			18929	863	19792					

Notes:

1. Data from MMC PHI - no of different types of schools is correct + PHI identified which schools were of which type based on his existing knowledge.
2. Schools are classifed as: Type 1AB = years 1-13 (sometimes 6-13) with A level Science/commerce/arts; Type 2 = Years 1-11, up to O-level; Type 1C = years 1-13 (sometimes 6-13) with A level commerce/arts; Type 3 = Years 1-5 (sometimes 9) primary
3. Matale Development Plan states that almost 50% of student population is coming from the suburbs, as there are 4 popular schools in the town centre.
4. District Environmental Commissioner = Mr G Samarakoon (Vijaya); Zonal Environmental Commissioner = Mrs A Disanayake (Sanghamitta)

JICA survey results

	SW Gen(kg/d)	Main	Other	Assumptions	St + stud	OS-disp	Comp	LA colln	Recy	Ill dump	Total
St Thomas College	20	F	H (Ga)	80% ga waste composted	1887	16.3	3.7	0.0	0.0	0.0	20.0
Kristhudewa Vidyalaya (Christchurch	300	F			2467	300.0					300.0
Vijayapela V	50	F	H (Ga)	80% ga waste composted	1677	40.8	9.2	0.0	0.0	0.0	50.0
Sanghamitta	500	F	D/H (Ga)	80% ga comp'd; 80% rest =	3124	326.4	92.0	81.6	0.0	0.0	500.0
S Bandaranayake	5	F			412	5.0	0.0	0.0	0.0	0.0	5.0
	875			Total	9567	688.5	104.9	81.6	0.0	0.0	875.0
				Disposal method %		78.7	12.0	9.3	0.0	0.0	100.0

Notes:

1. Codes: A-D = LA/contr'r colln; E/F = burn/bury, G = recy, H = comp, J = other
2. Total staff + students surveyed = 48 % of all schools - hence results are considered to be reasonably representative
3. Survey data represents waste generation (i.e. total) - average waste generation rate = 0.091 kg/(staff+students).d
4. Waste stream calculated using survey information and school waste composition data

School + other educ institutes - waste comp'n

	Galle wt %	Matale WAR	Adj-usted
Fd/ki	34.2	18	34.2
Ga/wd	3	16.5	23
pa/cd	26.6	20	26.6
glass	0	1	0
plastic	13.7	0.5	3.7
metals	0	0	0
textile	1.5	0	1.5
inerts	20.9	5	10.9
Total	99.9		99.9

Notes:

1. Galle data from ERM study
2. From comp'n of ranks:

increase ga/wd by	20
decrease inerts by	10
decrease plastic by	10

b. Other Educational Institutes

No	Name	Location	Students	Teachers	Total	Boarders	SW Gen(kg	Main	Other	OS-disp	Comp	LA colln	Recy	Ill dump	Total	Notes
1	Technical College (ATI)	MC Rd, by Matale Tourist GH	100	42	142	0	12	F	J (put trees)	9.24	2.76	0	0	0	12.0	5
2	Royal International School	33 Somasundara Rd, Matale	900	32	932		13	F		13.0					13.0	
3	Cambridge International School	Hulanganuwa Rd	350	30	380		20	C				20.0			20.0	
4	Matale International School	Hulanganuwa Rd			Small											
5	Panhinda Tuition Centre	40 Kachcheriya Rd	2000	15	2015		30	D				30.0			30.0	
6	Wasair Tuition Centre	7 King St	850	18	868		5	C				5.0			5.0	
7	BBA International School	Kandy Rd			Small											
8	Institution of Education	MC Rd, by Matale Tourist GH			Small											
Total			4200	137	4337		80									
										22.2	2.8	55.0	0.0	0.0	80.0	
										27.8	3.5	68.8	0.0	0.0	100.0	

Notes:

1. Codes: A-D = LA/contr'r colln; E/F = burn/bury, G = recy, H = comp, J = other
2. Total staff + students surveyed believed to be > 90 % of all institutes - hence results are considered to be reasonably representative
3. Survey data represents waste generation (i.e. total) - average WGR = 0.018 kg/(staff+students).d
4. Waste stream calculated using survey information and school/other ed waste composition data
5. Assume for Tech College (+ Affiliated Training Institute), J = composting of garden waste
6. Contribution to total student nos from three additional small other educational institutes mentioned assumed negligible.

c. Hospitals

Name	Location	Type	No of beds	Bed Occup. (%)	Avg no per day		Staff	Patients + Staff	SW (kg/d) survey	WDR (kg/(P+S).d	Notes
					Out-patients	Clinical patients					
Base Hospital	Base Hospital Matale	govt	520	90	704	292	632	2096	668	0.319	
Majan Medical Centre	65/2, Gongawela road, Matale	private	6	100	1	0	3	10	2	0.200	
KMP Nursing Home	72, King Street Matale	private	9	100	1	0	6	16	5	0.319	
Total			535			292	641	2122	675	0.318	

Notes:

1. Only one govt hospital in Matale (base hospital) and two private hospitals
2. Base Hospital SW generation = 1 4WT loads/d @ 2.18 T/load = 2.18 T/d, according to survey data - this is considered too high.
Additional info from Matale PHI: 22.5 big dustbins/d @ 90 L ea x 330 kg/m3 = 668 kg/d
3. WDR = 0.318 kg/(patients+staff)/d - c.f. Kandy = 0.374 & Galle = 0.28 - OK

JICA survey + KMC data

	Main + Other	HH	Notes/assumptions	OS-disp	Comp	LA colln	Recy	Ill dump	Total	Notes
Base Hospital	D, G (bottles/containers)	F		5.2	0	668.25	13.7	0	687.2	3
Majan Medical Centre	D	F		1.1	0.0	2.0	0.0	0.0	3.1	
KMP Nursing Home	C	C		0.0	0.0	5.0	0.0	0.0	5.0	
			Total	6.3	0.0	675.3	13.7	0.0	695.3	
			Disposal method %	0.9	0.0	97.1	2.0	0.0	100.0	

Notes:

1. Codes: A-D = LA/contr'r colln; E/F = burn/bury, G = recy, H = comp, I = incinerate J = open dump, K = other
2. JICA survey data assumed to represent normal waste generation (i.e. excluding healthcare hazardous wastes)
3. Base Hospital recycling estimated from Peradeniya Hospital recycling where 22.4 kg/d were recycled from 3,426 staff+patients/d
On a pro rata basis, Base hospital recycling = 0.6 x 22.4 = 13.7 kg/d x 0.5 = 6.9 kg/d
(factor used as less materials are recycled at Matale Base Hospital than at Peradeniya hospital).
4. Hospital waste generation rate = 0.328 kg/(patients+staff).d
5. From hospital survey, estimated hazardous health care waste generation is:
a. Assumed HH waste put out for LA coll'n already included in above qtys.
b. Add OSD qty to above table.

HH waste	Total	LA Colln	OSD	
Base	5.6	0.4	5.2	kg/d
Majan	1.1	0	1.1	kg/d
KMP	0.87	0.87	0	kg/d
	7.57	1.27	6.3	kg/d

d. Government Institutions

Central Government		Address	Avg no of workers	Main 3 wastes	SW Gen (kg/d)	Disposal methods Main	Disposal methods Other	OS-disp	Comp	LA colln	Recy	Illegal dump	Total	Notes
1	Divisional Secretariat	Kubiyangoda Rd, by large park	121	Pa>F/K>Ga	30	A	F	12	0	18	0	0	30	Note 6
2	District Magistrates Office		55											
3	Tea Smallholding Authority	Malwatta Rd	4											
4	Paswita Samurdhi Bank Society	Malwatta Rd	12											
5	Road Development Authority	Malwatta Rd	37											
6	Liquor Tax Station	Kachcheri Complex	16											
7	Liquor Tax Authority	Kachcheri Complex	4											
8	Central Environmental Authority	Kachcheri Complex	9											
9	Agriculture and Grain Service	Kachcheri Complex	11											
10	Land Registration Office	Kachcheri Complex	16											
11	District Survey Office	Kachcheri Complex	22											
12	Dept of Census and Statistics	Kachcheri Complex	17											Incl. 11 field workers
13	District Election Office	District Secretary's Office	13											
14	District Samurdhi Office	District Secretary's Office	25											
15	Land Reform Board	District Secretary's Office	15											
16	Post Office	District Secretary's Office	3											
17	Coconut Growing Board Regional Office	Kachcheri Complex	20											
18	National Housing Development Authority	Kachcheri Complex	70											
19	National Youth Service Society	Kachcheri Complex	26											Incl. 12 field workers
20	District Forest Conservation Department	MC Rd	83											Incl. 64 field workers
21	Forest Office	MC Rd	3											
22	Irrigation Dept Divisional Office	MC Rd	38											
23	Agricultural Development Authority	MC Rd	7											
	Sub-total		627											
Provincial Council														
1	Assist. Commissioners Office (local govt)	Kachcheri Complex	17											
2	Dept of Coop. Development (District office)	Kachcheri Complex	56											
3	Dept of Probation and Save the Children	Kachcheri Complex	4											
4	Sports Dept, Matale District Office	Kachcheri Complex	16											13 PC, 3 CG
5	Deputy Provincial Health Director	MC Road, Matale	62											Incl. 10 field workers
6	Regional Health Director's Office, Matale	MC Road, Matale	27											
7	Deputy Agricultural Directors Office	MC Road, Matale	25											
8	Carpentry Training Institute (Small Ind Dep	MC Road, Matale	17											Incl. 15 students
9	Housing Rental Board	Kachcheri Complex	3											
10	Veterinary Office	MC Road, Matale	7											
11	District Planning Office	District Secretary's Office	22											
12	Audit Department	District Secretary's Office	8											
13	Forest Conservation Dept	Wana Viyapitiya, Diyabubula	5											
14	Milco Milk Factory	Kandy Rd	5											
15	District Office of Labour	Kandy Rd	30											
16	Zonal Education Office	Matale	87	Pa>F/K>Ga	1	F		1	0	0	0	0	1	
17	Regional Anti-malaria campaign Office/Lab	Kandy Rd, Matale	38											
	Sub-total		429											
	MMC		437	Pa>F/K>Ga	30	A		0	0	30	0	0	30	Note 7
	Police		150	F/K>Ga>Pa	200	D		0	0	200	0	0	200	Note 4
Total			1643				Total	13	0	248	0	0	261	
							Disposal %	5	0	95	0	0	100	

Notes:

1. MMC PHI said there were 25 CG and 19 PC offices within MMA (preliminary estimate)
2. Map shows IDB, State Gem Corpn, Sales Centre Handloom dept in area where busstand is now being built - shifted.
3. Public and semi-govt worker census being done Jul 1-15, 2002 - results may be useful at later stage.
4. No Forces (i.e. Army, Navy) and no prison in Matale, other than small lockup (2 cells) which is only used to hold people prior to court appearance - hence Police included under govt
5. Waste generation rate based on data from 4 places = 261 kg/d from 1145 workers = 0.228 kg/worker.d, compared with Kandy = 0.245 kg/worker.d - OK
6. For Divisional Secretariat, assume 60% A, 40% F
7. Cadre = 503, currently 66 vacancies

e. Religious Institutes

Name	Location	No	No of "workers"	No of visitors/day Avg	No of visitors/day Peak	Main 3 wastes	SW Gen (kg/d)	Disposal methods Main	Disposal methods Other	Assumptions	OS-disp	Comp	LA coln	Recy	Ill dump	Total
Buddhist		13	36													
- Aluvihare Temple	Aluvihare	1	5	100	5000	Ga>F/K>Pa	25	I	D/F	60% I, 20%D, 20%F	5	0	5	0	15	25
- Widyananda Pirivena	Wihara Para, Matale	1	10	120		F/K>Ga>Pa	12.5	A	F	80%A, 20% F	2.5	0	10	0	0	13
- Buddhist Centre	127 Main St, Matale	1	40	250	1000	Pa>F/K>Pl	18	A			0	0	18	0	0	18
Hindu		6	28													
Mosques		8	20													
Churches		4	12													
Total		34	151				55.5				7.5	0	33	0	15	56
										Other workers / WGR						
										96 / 1.0	8		89			97
										Total (kg/d)	15	0	122	0	15	152
										Disposal (%)	10	0	80	0	10	100

Avg WGR = 1.01 kg/resid.d; c.f. Kandy 2.8 kg/resid.d - OK

Notes:

1. Codes for waste types: F = food, G = garden, T = textile, P = paper, Pl = plastic, M = metal, Gl = glass, I = inert (dust, dirt, etc.), O = other
2. For religious institute waste stream,:

a.. Assume Buddhist total does not include Aluvihare Temple, Widyananda Pirivena and Buddhist Centre worker nos

b. Assume all other places have same WGR as calculated here.

c. Assume all other places follow same disposal practices as Widyananda Pirivena and Buddhist Centre (i.e. assuming illegal dumping by religious institutes not common)

Based on these assumptions, waste generation and disposal qtys estimated for other religious places as shown, with overall totals calculated.

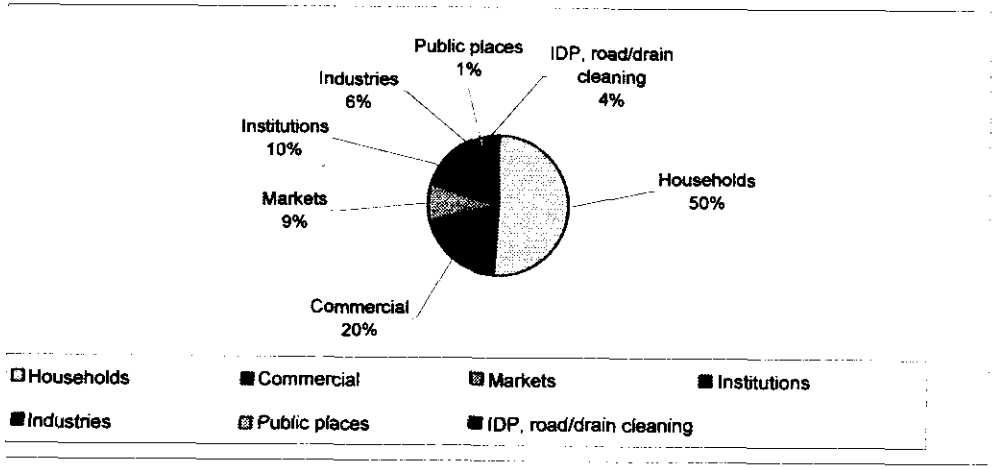
4. OTHER WASTE

Other wastes	No	Location
Parks	3	V.T Nanayakkara Park Kiddies Paradise Millenium Park
Streets	10	Main St Kings St Kumara Veediya Rosa Veediya Mosque Veediya Station Rd H.J. Rd *Godapola Rd* Meezah Terrace
Canals	2	Brahmana Ela Godapola Ela

Note: There are other smaller drains in addition to these two main drains.

Data for Waste Generation by source graph

Waste Source	Generation (T/d)
Households	16.54
Commercial	6.5
Markets	2.8
Institutions	3.1
Industries	*1.8*
Public places	0.44
IDP, road/drain cleaning	1.16
Total	32.39



5. WASTE STREAM ESTIMATION

Waste Source	Waste Generation Rate (WGR)			Gen'n	Sub-total		On-site	On-site	Discharge	Recycle	Illegal	Direct	Total	Notes
	WGR	Units	No	(T/d)	(T/d)	(%)	Disp	comp	for coll'n		dumping	Haul	(check)	
Households	0.451	kg/cap.d	36696	16.54	16.54	51.1	4.80	0.60	9.88	0.83	0.42	0.00	16.54	1
Commercial	3.10	kg/trade licence.d	2090	6.47	6.47	20.0	0.35	0.01	6.06	0.05	0.00	0.00	6.47	2
Markets	15.5	kg/stall.d	184	2.84	2.84	8.8	0.00	0.00	2.84	0.00	0.00	0.00	2.84	3
Institutions														
a. Schools	0.091	kg/(students+staff).d	19792	1.81			1.42	0.22	0.17	0.00	0.00	0.00	1.81	4
b. Other Educ Inst.	0.018	kg/(students+staff).d	4337	0.08			0.02	0.00	0.06	0.00	0.00	0.00	0.08	5
c. Hospitals	0.328	kg(patients+staff).d	2122	0.70			0.01	0.00	0.68	0.01	0.00	0.00	0.70	6
d. Govt offices	0.228	kg/worker.d	1643	0.37			0.02	0.00	0.36	0.00	0.00	0.00	0.37	7
e. Religious	1.01	kg/clergy.d	151	0.15	3.11	9.6	0.02	0.00	0.12	0.00	0.02	0.00	0.15	8
Industries														
a. Diana Chocolate Factory	0.250	kg/worker.d	80	0.02			0.00	0.00	0.02	0.00	0.00	0.00	0.02	9
b. Sawmills	NA	kg/worker.d	Not known	1.81	1.83	5.7	0.40	0.00	0.00	1.16	0.00	0.25	1.81	10
Other														
a. V.T Nanayakkara Park	0.29	T/d		0.29			0.00	0.26	0.03	0.00	0.00	0.00	0.29	11
b. Other public places	0.15	T/d		0.15			0.00	0.11	0.04	0.00	0.00	0.00	0.15	12
b. IDP, road/drain cleaning	1.16	T/d		1.16	1.60	4.9	0.00	0.00	1.16	0.00	0.00	0.00	1.16	13
Total	0.88	kg/cap.d	36696	32.39	32.39	100.0	7.04	1.20	21.40	2.06	0.44	0.25	32.39	
Recycling from discharge									0.00	0.00				14a
Recycling from collection									-0.07	0.07				14b
Adjusted totals					Adjust =	1.73	7.04	1.20	21.33	2.13	0.44	0.25	32.39	
Disposal to landfill from within MMA (from landfill records)									19.60		1.73			15
Recycling from final disposal									-0.02	0.02				14c
Recycling from illegal dumps										0.00	0.00			14d
Revised total				32.39	32.39		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	
						Method	OS-disp	Comp	Disch	Recy	Ill dump	Dir haul	Total	
						%	29.1	3.6	59.7	5.0	2.6	0.0	100.0	

% details on separate sheet

Notes:

1. Household WGR was determined using Matale WACS data while disposal methods were determined using household survey data, which gave the following % of households using different methods:
2. Commercial waste generation calculated from interview survey results and other data collected.
3. Market waste generation calculated from interview survey results and other data collected - see details above; recycling is very small (mainly bones + some meat sold as pet food) -assumed negligible
4. School's waste stream data calculated from interview survey results - see calculations under school staff and students data - assumed recycling figure includes recycling going to middlemen
5. Other educational institutes waste stream data calculated from interview survey results - see calculations under institute data
6. Hospital waste stream data calculated from interview survey results -see calculations under hospital data; assumed recycling figure includes recycling going to middlemen
7. Govt offices calculated based on no of workers and estimated WGR (obtained using limited data); includes police as no separate Forces category in this case.
8. All religious institutes treated together.
9. Chocolate factory data obtained from JICA interview survey.
10. Sawmills waste estimated from survey interview data - sawdust is either burnt on site, transported to landfill, or given away (e.g. mushroom farmers), while woodchips are given away/sold, disposed of on site or taken to landfill - see separate table
11. V.T. Nanayakkara Park waste gen'n estimated from interview survey data - area = 6.5ha (6-7 ha), garden waste gen'n = 15Tr loads/mth; c.f. Kandy Botannical Gdns - 60ha, gdn waste gen = 150Tr/mth - OK (10% of size - 10% of garden waste ger
Based on Kandy data again, garden waste generation = 0.1 x 2.6 T/d = 0.26 T/d - which is largely composted
Using Kandy data again, inorganic waste generation = 0.1 x 0.33 T/d = 0.033 T/d (33kg - seems reasonable) - which is discharged for collection by MMC
The 10 % figure is not based on the relative areas but assuming visitors to the Matale Park are 10% of visitors to Botannical Gdns, Kandy
12. Other public places (parks, playground, cemetery) occupy total land area 8.3 ha, c.f. 6.5 ha for V.T. Nanayakkara Park - assume garden waste gen'n from other public places is proportional to area x 33 %
to account for other places being much more open than V.T. Nanayakkara Park (I.e. fewer trees - less leaf waste) and same disposal method %s apply. Hence, gdn waste generation = 0.110 T/d
Assume inorganic waste generation directly related to area - gen = 0.042 T/d, discharged for collection by MMC
13. IDP waste tonnage estimated from Kandy IDP data of 3.5 T/d, pro rating this figure based on relative populations = 0.330 factor (similar climate and topography) = 1.16 T/d - considered reasonable
as PHI said they do about 29 cleaning programmes/mth = ~1/d and this tonnage is equivalent to about 60% of a tractor load/d (Works tractor with IDP density (1000kg/m3))
14a. Recycling at discharge: 0.00 T/d, assumed negligible due to large amount of at source recycling (individual waste collectors/direct to shops) + very few scavengers seen collecting recyclables following discharge
14b. Recycling during collection: 0.067 T/d, from collection worker's survey data
14c. Recycling at landfill: 0.019 T/d, from PHI comments
14d. Recycling from illegal dumps: 0.002 T/d, pro rata from illegal dumping amt/total waste disposal to landfill
15. *Illegal dumping amount adjusted to account for difference between estimated collection+direct haul amount and measured landfill disposal amounts*

6. SUPPORTING INFORMATION

Distribution of licensed enterprises in the trade sector by sub-sector and D.S. division (Matale MC)

Sector	Activity	No of enterprises	Tax Revenue (Rs)	Total no of enterprises	Tax Revenue (Rs)
Trade	Food/agro products	311	96235		
	Chemical/natural based products	94	14220		
	Mineral based products	101	64900		
	Hardware/electrical products	102	35450		
	Wood/paper. Etc. products	86	38820		
	Textile/leather/synthetic products	85	85700		
	General retail	15	10525		
	General wholesale trade	1	300	795	346150
Service	Hotel/restaurant	80	50275		
	Repair service	118	49855		
	Finance/information service	49	33690		
	Transport	11	9100		
	Construction	2	260		
	Health	61	32410		
	Entertainment	42	21990		
	Other	0	0	363	197580
Processing & production	Agro/food based industry	106	38050		
	Mineral based industry	24	8025		
	Metal based industry	35	14500		
	Wood based industry	52	22550		
	Textile/garment based industry	98	39340		
	Other	13	5750	328	128215
Total		1486	671945	1486	671945

Notes:

1. Source: Analysis of 1994 Trade Licence Records in the Central Province, Joint Inventory
2. Trade Licence data for Matale MC gives total no of enterprises in 1994 of 1,486, at an avg tax rate of 452 Rs per enterprise, giving total 1994 tax amount of 671,945 Rs, as per above table with there being 109 different kinds of enterprises.
3. Matale MC pop'n = 32013 while Matale rural pop'n = 25773 in 1994
4. Matale Dev. Plan states that 1994 labour force was 15,174, of which 11,059 (73%) were employed and 4,115 (27%) unemployed.

ID No	Activity	No of enterprises	Avg tax rate per entreprise	Total tax revenue
9	Animal foodshop	6	700	4200
13	Antiseptic trade	1	120	120
14	Architect	2	130	260
17	Asbestos	6	566.67	3400.02
24	Bakery	23	454.35	10450.05
26	Bank	1	3000	3000
29	Battery charging	6	316.67	1900.02
44	Bicycle repair	13	188.46	2449.98
45	Bicycle sale	3	450	1350
49	Book shop	15	203.33	3049.95
51	Boutique	41	297.68	12204.88
54	Brass item production	2	400	800
60	Brick and tiles	2	237.5	475
63	Broker	4	332.5	1330
65	Brush production	2	200	400
75	Café	44	233.52	10274.88
83	Carpentry workshop	5	640	3200
93	Cement store	28	451.79	12650.12
96	Ceramic goods	5	250	1250
98	Cereal	3	433.33	1299.99
100	Charcoal sale	3	266.67	800.01
108	Cigar production	32	398.28	12744.96

ID No	Activity	No of enterprises	Avg tax rate per entreprise	Total tax revenue
112	Cinema	2	2000	4000
116	Clock repair	1	225	225
120	Cocoa	11	409.09	4499.99
123	Coconut	11	240.91	2650.01
127	Coconut oil centre	27	263.15	7105.05
134	Coir products	20	163.75	3275
142	Communication centre	7	785.71	5499.97
146	Concrete work	5	430	2150
150	Cool spot	10	656	6560
152	Copra	5	250	1250
159	Cushion workshop	4	212.5	850
175	Driving school	1	600	600
185	Electrical goods repair	26	492.31	12800.06
205	Fertiliser Shop	9	355.56	3200.04
208	Filling Station	3	1000	3000
212	Firewood seller	14	151.43	2120.02
215	Fish stall	7	457.14	3199.98
218	Florist	3	633.33	1899.99
222	Footwear and leather goods	33	442.42	14599.86
226	Frozen food	31	307.26	9525.06
231	Fruit stall	21	145.24	3050.04
235	Furniture products	48	613.54	29449.92
241	Gas cylinder	3	866.67	2600.01
247	Gem centre	10	2150	21500
249	Glass works	3	300	900
264	Grocery	57	403.51	23000.07
265	Guesthouse	5	2250	11250
273	Hardware shop	24	277.08	6649.92
279	Hotel	10	960	9600
286	Icecream seller	4	375	1500
299	Jewelry shop	54	510.19	27550.26
304	Kerosene oil sale	58	130.86	7589.88
313	Laundry	7	132.14	924.98
320	Lime kiln	5	410	2050
328	Lottery agent	4	780	3120
330	Loudspeaker rental	2	270	540
341	Medical centre	14	1561.43	21860.02
346	Metal quarry	35	319.29	11175.15
350	Milk Board	19	639.47	12149.93
361	Motor spare parts	13	684.62	8900.06
366	Mutton stall	3	400	1200
368	Newspaper agent	1	3000	3000
371	Notary public	1	3000	3000
374	Nursing home	1	1200	1200
384	Optician	3	316.67	950.01
390	Paint & varnish	32	301.56	9649.92
394	Paper collecting	1	300	300
401	Pawning centre	15	1040	15600
405	Pharmacy	22	397.5	8745
406	photocopy service	12	375	4500
407	photo framing	4	243.75	975
413	Plastic good seller	29	300	8700
424	Pottery	12	52.92	635.04
425	Poultry farm	6	325	1950
432	Printing press	11	486.36	5349.96

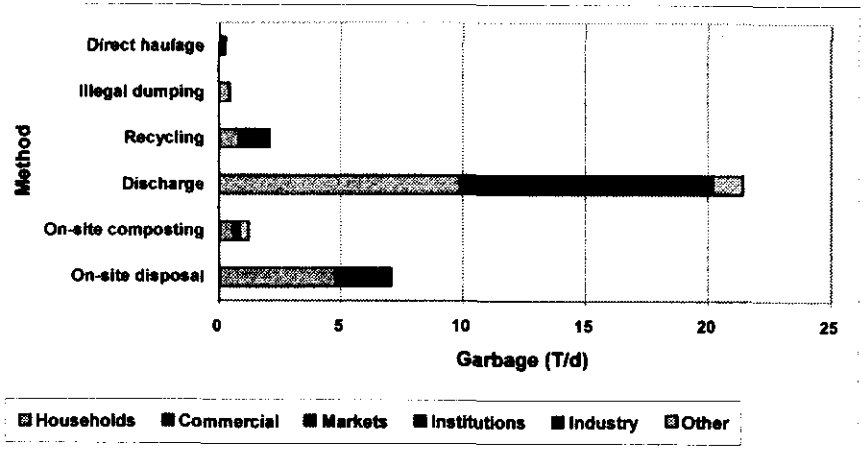
ID No	Activity	No of enterprises	Avg tax rate per entreprise	Total tax revenue
441	Quarry	4	300	1200
444	Radio repair	23	463.04	10649.92
448	Ready made garment	27	342.59	9249.93
449	Reception Hall	4	525	2100
450	Record Bar	23	151.3	3479.9
461	Rubber mill	3	350	1050
465	Saloon	36	207.64	7475.04
471	Sawmill	8	900	7200
484	Sewing centre	3	2400	7200
507	Soft toys	13	403.08	5240.04
523	Sports club	2	2675	5350
483	Stationery	1	200	200
534	Studio	5	680	3400
537	Surveyor	1	360	360
539	Sweet house	1	200	200
543	Tailor shop	54	444.44	23999.76
545	Tavern	2	3500	7000
552	Tea kiosk	65	203.46	13224.9
569	Textile shop	51	1335.29	68099.79
579	Tinkering workshop	6	566.67	3400.02
598	Transport agent	1	1200	1200
603	Tutor	14	335.71	4699.94
606	Tyre and tube vulcanising	11	190.91	2100.01
615	Tyre, tube vulcanising	5	222	1110
618	Used cloths	1	75	75
624	Vegetable stall	46	206.96	9520.16
633	Watch repair	4	243.75	975
634	Water pump and generator	4	425	1700
638	Welding workshop	27	381.48	10299.96
641	Wholesale dry items	14	746.43	10450.02
646	Wine store	1	2000	2000
	Total	1486		671944.45

Notes:

1. Source: Analysis of 1994 Trade Licence Records in the Central Province, Joint Inventory
2. As total agrees with previous table total, this implies above data is for Matale MC area

7. Whose waste goes where?

Source	On-site disposal	On-site composting	Discharge	Recycling	Illegal dumpin	Direct haulage
Households	4.80	0.60	9.88	0.83	0.42	0.00
Commercial	0.35	0.01	6.06	0.05	0.00	0.00
Markets	0.00	0.00	2.84	0.00	0.00	0.00
Institutions	1.49	0.22	1.38	0.01	0.02	0.00
Industry	0.40	0.00	0.02	1.16	0.00	0.25
Other	0.00	0.37	1.23	0.00	0.00	0.00
Total	7.04	1.20	21.40	2.06	0.44	0.25



Chapter 6

Matale Waste Collection Analysis

Sep-99

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	No-te
	Day	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th							
4WT	37-9103	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	2	2	3	3	3	0	3	2	2	3	3	3	3		81	2.18	176.9	5.9	
	49-9957	3	3	3	3	3	3	3	3	3	3	2	2	3	3	2	3	3	2	2	3	3	3	2	3	2	2	3	3	3	3		82	2.18	179.1	6.0	
	5345-Dr1	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		61	2.18	133.2	4.4	1.0
	5345-Dr2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0		58	2.18	126.7	4.2	1.0
Total		10	11	10	10	10	10	10	10	10	10	8	8	10	10	9	10	10	8	8	10	10	10	6	10	8	8	10	10	10	8		282		615.9	20.5	

Note: Some vehicles are used for two different shifts each day - indicated by Dr1 and Dr2 for driver 1 and 2 respectively.

Days in mth 30

Oct-99

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	No-te
	Day	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S						
4WT	37-9103-Dr1	3	2	2	2	3	2	3	3	2	2	3	3	3	3	2	2	2	2	2	3	3	3	2	2	3	3	3	3	3	2	2	78	2.18	170.3	5.5	1
	49-9957	3	2	2	2	3	2	3	3	2	2	3	3	3	3	2	2	2	2	2	3	3	3	2	2	3	3	3	3	3	2	2	78	2.18	170.3	5.5	
	5345-Dr1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	58	2.18	126.7	4.1	1.0
	2491			2																													2	2.18	4.4	0.1	
	5345-Dr2	2	2	2	2	2	2	2	2	2	2	2	2	2	2																		28	2.18	61.1	2.0	1
	37-9103-Dr2															2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	34	2.18	74.3	2.4	1
Total		10	8	10	8	10	8	10	10	8	8	10	10	10	10	8	8	8	8	8	10	10	10	8	8	10	10	10	10	10	6	6	278		607.1	19.6	

Note: Some vehicles are used for two different shifts each day - indicated by Dr1 and Dr2 for driver 1 and 2 respectively.

Days in mth 31

Nov-99

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	No-te
	Day	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T							
4WT	37-9103-Dr1	3	3	3	3	3	3	2	2	3	3	3	3	2	2	2	3	2	3	3	2	2	2	3	3	2	3	2	2	3	3		78	2.18	170.3	5.7	1
	49-9957-Dr1	3	3	3	3	3	3	2	3	3	3	3	3	2	2	2	2	2	3	3	2	2	2	3	3	2	3	2	2	3	3		78	2.18	170.3	5.7	1
	5345	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		60	2.18	131.0	4.4	
	37-9103-Dr2	3	3	3	3	3																											15	2.18	32.8	1.1	1
	49-9957-Dr2						2	2	2	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		53	2.18	115.7	3.9	1
Total		11	11	11	11	11	10	8	9	11	11	11	10	8	8	8	9	8	10	10	8	8	8	10	10	8	10	8	8	10	10		284		620.2	20.7	

Note: Some vehicles are used for two different shifts each day - indicated by Dr1 and Dr2 for driver 1 and 2 respectively.

Days in mth 30

Dec-99

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	No-te
	Day	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F						
4WT	37-9103	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	3	2	3	0	2	0	2	0	0	0	0	3	3	2	2	66	2.18	144.1	4.6	
	49-9957-Dr1	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	3	2	3	3	2	2	2	2	2	3	3	3	3	2	2	81	2.18	176.9	5.7	1
	5345	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	69	2.18	150.7	4.9	
	49-9957-Dr2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	63	2.18	137.6	4.4	1
Total		11	12	11	11	11	11	11	10	10	10	8	8	8	8	10	10	10	8	10	7	8	6	8	6	6	7	7	10	10	8	8	279		609.3	19.7	

Note: Some vehicles are used for two different shifts each day - indicated by Dr1 and Dr2 for driver 1 and 2 respectively.

Days in mth 31

Jan-00

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	No-te
	Day	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M						
4WT	37-9103	2	2	3	2	3	4	3	2	2	3	3	3	4	4	2	2	4	4	4	3	4	3	2	3	3	3	3	1	2	2	3	88	2.18	192.2	6.2	
	49-9957-Dr1	2	2	3	2	3	3	3	2	2	3	3	3	3	3	2	2	3	3	3	2	3	3	4	3	4	4	3	2	2	2	3	85	2.18	185.6	6.0	1
	5345	2	2	2	2	2	2	3		2																							17	2.18	37.1	1.2	
	2491								2		3												2					3	2	2	2	3	19	2.18	41.5	1.3	
	49-9957-Dr2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	62	2.18	135.4	4.4	1
Total		8	8	10	8	10	11	11	8	8	11	8	8	9	9	6	6	9	9	9	7	9	10	8	8	9	9	11	7	8	8	11	271		591.8	19.1	

Note: Some vehicles are used for two different shifts each day - indicated by Dr1 and Dr2 for driver 1 and 2 respectively.

Days in mth 31

Feb-00

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	Note
	Day	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T							
4WT	37-9103	3	3	3	3	2	2	3	2	3	2	3	2	2	2	3	3	3	3	2	2	3	3	3	3	2	2	2	3	3			75	2.18	163.8	5.6	
	49-9957-Dr1	3	3	3	3	3	4	3	2	3	2	3	2	2	2	3	3	3	3	3	3	3	2	3	3	2	2	3	3	3			80	2.18	174.7	6.0	1
	5345																																0	2.18	0.0	0.0	
	2491	3	3	3	3	2	2	2	2	0	2	2	2	2	2	3	3	3	3	2	2	3	3	3	3	2	4	2	3	2			71	2.18	155.1	5.3	
	49-9957-Dr2	2	2	2	2	2	2	2	2	2		2	2		2	3	2	2	2	2	2	2	2	2	3	3	3	2	2	2			58	2.18	126.7	4.4	1
Total		11	11	11	11	9	10	10	8	8	6	10	8	6	8	12	11	11	11	9	9	11	10	11	12	9	11	9	11	10			284		620.2	21.4	
L'fill arrival time (first load)																								9:45	9:10	9:30	9:50	10:00	9:30	9:30							
L'fill departure time (last load)																								15:15	15:15	15:30	13:30	13:15	15:25	15:20							

Notes:

1. Some vehicles are used for two different shifts each day - indicated by Dr1 and Dr2 for driver 1 and 2 respectively.
2. Times in and out do not include Dr2 tractor

Days in mth	29

Mar-00

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	Note
	Day	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F						
4WT	37-9103	3	2	3	2	2	3	3	1	2	2	2	1	3	3	2	3	2	2	2	1	2	2	2									50	2.18	109.2	4.7	
	49-9957-Dr1	3	4	3	2	3	3	1	1	3	2	2	1	3		1			1	1	1	3	2	3									43	2.18	93.9	4.1	1
	Unnamed														1	1			2			2											6	2.18	13.1	0.6	
	2491	2	2	2	2	2	2	4	1	2	2			2	2	2	2	2	2	1	1		2	2									39	2.18	85.2	3.7	
	49-9957-Dr2	2	2	2		2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1									43	2.18	93.9	4.1	1
Total		10	10	10	6	9	11	10	5	9	8	6	4	10	8	8	7	6	9	6	4	9	8	8	0	0	0	0	0	0	0	0	181		395.3	17.2	
L'fill arrival time (first load)		8:30	9:30	9:30	9:30	8:50	8:45	9:10	9:15	9:30	9:30	10:00	12:00	9:30	10:00	9:30	8:15	10:30	9:45	9:45	9:15	10:15	9:15	9:10													
L'fill departure time (last load)		15:45	14:30	15:15	13:00	12:45	15:15	15:00	15:00	14:00	14:15	13:00	12:30	15:45	15:00	14:00	13:15	15:15	14:15	12:45	15:00	13:45	12:45	14:15													

Notes:

1. Some vehicles are used for two different shifts each day - indicated by Dr1 and Dr2 for driver 1 and 2 respectively.
1. Times in and out do not include Dr2 tractor
2. Record stops at 23 Mar 2000

Days in mth	23

Jan-02

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	Note
	Day	T	W	TH	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th						
2WT	75-1798												1	1	2	3	2	2				3	2			2	2	2	2	3	2	2	31	0.41	12.9	0.6	
4WT	37-9103												1			3	2	2	2	2	2	2	2	2	2	2	1			2	2	2	31	2.18	67.7	3.4	
	49-9957												1	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2	2	2	2	37	2.18	80.8	4.0	
4WT (night)													1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	38	2.18	83.8	4.2	4
Isuzu truck	26-3501												2			2	2	1	1	2		2	2	2	2	2	2			2		2	26	1.70	44.1	2.2	3
	41-9452																			2				2	2	2				2			10	0.59	5.9	0.3	3
Compactor	227-6727																																0	3.76	0.0	0.0	2
	GI-1602																																0	2.24	0.0	0.0	2
4WT (Works)	49-6824												2	2													2	2					8	0.74	5.9	0.3	3
Private	36-0805																													1			1	2.18	2.2	0.1	1
Total SW													8.9	6.9	5.9	11.9	9.9	8.9	6.9	9.9	5.9	10.9	9.9	9.9	9.9	11.9	10.9	5.9	5.9	13.9	7.9	9.9	182		303.3	15.2	
Gully sucker	42-7553												2					2						3	2	2	1				2	1	15	7.00	105.0	m3	
Total													10.9	6.9	5.9	11.9	9.9	10.9	6.9	9.9	5.9	10.9	9.9	12.9	11.9	13.9	11.9	5.9	5.9	13.9	9.9	10.9	197				
L'fill arrival time (first load)													9:30	9:35	10:00	10:00	9:45	9:30	10:45	10:00	10:00	9:00	9:30	9:00	10:00	10:00	9:00	9:30	9:00	9:15	9:10	10:00					
L'fill departure time (last load)													12:45	12:35	12:35	13:45	13:00	13:00	14:45	13:25	12:30	13:00	13:30	13:20	13:45	13:35	12:45	13:00	12:15	14:00	13:45	13:30					

Notes:

1. Assume private vehicle carries same tonnage as normal 4WT
2. Both compactors were out of action from Dec 2001 till Apr/May 2002 due to a hiatus between the national and local elections, when no one was willing to take responsibility for getting the compactors repaired.
The green compactor (227-6727) had a clutch plate and washers problem, while the white compactor (GI-1602) had an auto-circuit breakdown. After the LA elections in March 2002, the compactors were repaired.
3. The Works tractor and MMC Isuzu trucks were used for garbage collection during this time to make up for the out of action compactors.
4. Night time 4WT data added based on average no of loads per day - no actual data available
5. Data record started 12 Jan - incomplete mth

Days in mth	20

Feb-02

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	No-te
	Day	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th									
2WT	75-1798	2	2	2		2	2	2		2		2	2	2	2	2	2		3	2	2	2	2	2	2	3	2	1	2				49	0.41	20.3	0.7	
4WT	37-9103	2	2		1	2	2	2		2	2	2	2	2	2	2		2	2	2	2	2	2		2	2	2	2	3				48	2.18	104.8	3.7	
	49-9957	2	2	2	2	3	2	3	3	3	3	2	3	3	3	3	1	3	4	3	3	3	3	3	3	3	3	2	2				75	2.18	163.8	5.8	
4WT (night)		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9				54	2.18	117.4	4.2	3
Isuzu Truck	26-3501	2	1	2		2	2	2	1	2		2	2	2	2		2		2		2	1	2			2	2	1	3				39	1.70	66.2	2.4	2
	41-9452		2			2			2															1									7	0.59	4.1	0.1	2
Compactor	227-6727																																0	3.76	0.0	0.0	1
	GI-1602																																0	2.24	0.0	0.0	1
4WT (Works)	49-6824					1			1								3	2						1	2	1		1					12	0.74	8.9	0.3	2
Total SW		9.9	10.9	7.9	4.9	13.9	9.9	10.9	8.9	10.9	6.9	9.9	10.9	10.9	10.9	8.9	9.9	8.9	12.9	8.9	10.9	9.9	10.9	8.9	10.9	12.9	10.9	8.9	11.9				284		485.5	17.3	
Gully sucker	42-7553	2																															2	7.00	14.0	m3	
Total		11.9	10.9	7.9	4.9	13.9	9.9	10.9	8.9	10.9	6.9	9.9	10.9	10.9	10.9	8.9	9.9	8.9	12.9	8.9	10.9	9.9	10.9	8.9	10.9	12.9	10.9	8.9	11.9				286				
L'fill arrival time (first load)		9:30	10:30	9:30	9:30	8:00	9:30	9:30	8:30	8:30	8:30	9:30	8:45	9:00	8:50	8:45	9:00	8:30	9:00	8:45	8:30	8:30	8:45	8:30	8:45	8:30	8:30	8:00	9:30								
L'fill departure time (last load)		13:45	13:30	13:30	13:30	13:30	13:00	13:30	13:45	12:40	12:00	14:00	13:45	13:30	13:30	13:00	12:00	12:30	14:50	13:00	13:30	13:00	13:35	13:30	13:30	13:15	13:00	12:30	15:45								

Notes:

1. Both compactors were out of action from Dec 2001 till Apr/May 2002 due to a hiatus between the national and local elections, when no one was willing to take responsibility for getting the compactors repaired.
The green compactor (227-6727) had a clutch plate and washers problem, while the white compactor (GI-1602) had an auto-circuit breakdown. After the LA elections in March 2002, the compactors were repaired.
2. The Works tractor and MMC Isuzu trucks were used for garbage collection during this time to make up for the out of action compactors.
3. Night time 4WT data added based on average no of loads per day - no actual data available

Days in mth	28

Mar-02

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	No-te
	Day	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S						
2WT	75-1798	3	2	1	3	2	2	2	3	2	1	3	1	3	2						2	3	2	2				3		2	3	2	49	0.41	20.3	0.7	1
4WT	37-9103	3	2		2	2	3	2	2	1	2	2	1	2	2	2	1	2	2	2	1	1	2	1	1	2	2	2	2	3	1		53	2.18	115.7	3.7	
	49-9957	4	3	4	3	3	3	3	2	1	2	3	2	2	2	2	2	2	2	2	1	1	2	1	2	2	2	2	1	1	3		65	2.18	142.0	4.6	1
4WT (night)		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	60	2.18	129.9	4.2	5
Isuzu Truck	26-3501	3	1		2	2	2	2	2	1				1	2	2	2		1	2		2	2			2	2	2					35	1.70	59.4	1.9	3
	41-9452		2		3	2	2																										9	0.59	5.3	0.2	3
Compactor	227-6727																																0	3.76	0.0	0.0	2
	GI-1602																																0	2.24	0.0	0.0	2
4WT (Works)	49-6824									1		2											1									2	6	0.74	4.4	0.1	3
	47-6495											1																					1	0.74	0.7	0.0	3
Total SW		14.9	11.9	6.9	14.9	12.9	13.9	10.9	10.9	7.9	6.9	12.9	5.9	9.9	9.9	7.9	6.9	5.9	6.9	7.9	5.9	8.9	10.9	5.9	4.9	7.9	7.9	10.9	4.9	7.9	8.9	5.9	278		477.8	15.4	
Gully sucker	42-7553																																0	7.00		m3	4
Total		14.9	11.9	6.9	14.9	12.9	13.9	10.9	10.9	7.9	6.9	12.9	5.9	9.9	9.9	7.9	6.9	5.9	6.9	7.9	5.9	8.9	10.9	5.9	4.9	7.9	7.9	10.9	4.9	7.9	8.9	5.9	278				
L'fill arrival time (first load)		9:20	9:00	8:00	9:00	10:00	9:30	9:00	9:00	9:00	9:00	9:00	10:00	9:00	9:30	9:45	9:30	9:30	9:30	9:30	9:30	9:00	7:30	9:00	9:30	10:00	9:45	9:00	10:30	9:00	9:00	9:30					
L'fill departure time (last load)		16:10	13:00	14:30	14:45	16:00	16:15	15:30	13:30	12:00	12:10	14:30	12:30	13:30	15:30	15:00	12:30	12:00	13:35	13:35	12:00	12:20	13:25	12:30	12:30	13:30	13:00	13:00	12:15	12:30	12:45	12:30					

Notes:

1. Two entries for March 5th (1798, 9957) included at end of Jan record. Not sure if actual or false records - have included one of these, based on typical no of trips around this time (i.e. 9957 2 -> 3), 1798 remains same
2. Both compactors were out of action from Dec 2001 till Apr/May 2002 due to a hiatus between the national and local elections, when no one was willing to take responsibility for getting the compactors repaired.
The green compactor (227-6727) had a clutch plate and washers problem, while the white compactor (GI-1602) had an auto-circuit breakdown. After the LA elections in March 2002, the compactors were repaired.
3. *The Works tractors and MMC Isuzu trucks were used for garbage collection during this time to make up for the out of action compactors.*
4. Gully sucker continues to dispose its loads at the disposal site but no trips data was recorded.
5. Night time 4WT data added based on average no of loads per day - no actual data available

Days in mth	31

Apr-02

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	No-te
	Day	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T							
2WT	75-1798		2	3	2	2	2	1	3	2	2	4	2	2	2	2	2	3	2	2	1	2	2	2	2	2	2	2	2	2	3		62	0.41	25.7	0.9	
4WT	37-9103	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	1	1	2	2	1	2	1	2	2	2			53	2.18	115.7	3.9	
	49-9957	2	2	2	2	2	1	1	2	2	2	2	2	2	1	1	2	2	2	2	2		2	2	2	1	1	2	2	2	2		52	2.18	113.6	3.8	
4WT (night)		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		58	2.18	125.8	4.2	4
Isuzu Truck	26-3501	1											1																				2	1.70	3.4	0.1	3
	41-9452																																0	0.59	0.0	0.0	3
Compactor	227-6727	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2		58	3.76	217.9	7.3	2
	GI-1602																																0	2.24	0.0	0.0	1
4WT (Works)	49-6824																							1									1	0.74	0.7	0.0	3
Total SW		8.9	9.9	10.9	9.9	9.9	7.9	7.9	10.9	9.9	9.9	11.9	10.9	9.9	7.9	8.9	9.9	10.9	9.9	9.9	7.9	6.9	9.9	9.9	8.9	8.9	7.9	9.9	9.9	9.9	8.9		286		602.8	20.1	
Gully sucker	42-7553																																0	7.00		m3	3
Total		8.9	9.9	10.9	9.9	9.9	7.9	7.9	10.9	9.9	9.9	11.9	10.9	9.9	7.9	8.9	9.9	10.9	9.9	9.9	7.9	6.9	9.9	9.9	8.9	8.9	7.9	9.9	9.9	9.9	8.9		286				
L'fill arrival time (first load)		10:30	9:00	9:00	9:30	9:30	9:30	9:30	9:15	9:00	9:00	9:00	9:00	9:00	9:00	9:00	9:00	9:00	9:30	9:00	9:00	9:30	9:00	9:00	9:00	9:00	9:30	9:00	9:30	9:45	9:00						
L'fill departure time (last load)		13:45	14:00	13:45	13:45	13:30	12:30	13:00	13:30	13:15	13:20	13:30	13:15	13:30	13:00	13:30	13:15	13:15	13:15	13:00	12:45	13:00	13:30	13:15	13:15	13:45	12:00	13:00	12:45	12:45	14:00						

Notes:

1. GI-1602 compactor still out of action (auto-circuit breakdown), while 227-6727 is back in action.
2. Works tractor and MMC Isuzu trucks continued to be used for garbage collection but much less frequently than preceding months.
3. Gully sucker continues to dispose its loads at the disposal site but no trips data was recorded.
4. Night time 4WT data added based on average no of loads per day - no actual data available

Days in mth	30

May-02

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	No-te
	Day	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F						
2WT	75-1798	1	3	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	3	3	2	2	2	2	2	2	3	2	2	3	67	0.41	27.8	0.9	
4WT	37-9103	2	2	2	2	4	2	2	2	3	2	2	2	2	2	2	1	2	2	2	2		2	2	2					2	2	2	54	2.18	117.9	3.8	
	49-9957		2	2	2	3	2		2	3	4	2	2	3	3	3	3	3	4	2	1	3	2			2	2		2				57	2.18	124.5	4.0	
4WT (night)		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	60	2.18	129.9	4.2	5
Isuzu Truck	26-3501																																0	1.70	0.0	0.0	3
	41-9452									1		2																					3	0.59	1.8	0.1	3
Compactor	227-6727	2	2	2	2	2	2	2	2	3	3	2	2	3	2	3	2	3	2	2	3	2	2	3	3	2	2	2	3	2	3	2	72	3.76	270.4	8.7	
	GI-1602																				2	2	2	2	2	2		2	2	2	2	2	22	2.24	49.3	1.6	2
4WT (Works)	49-6824					2							1							1		4						2					10	0.74	7.4	0.2	3
Colombo MC	48-7263					2	2	3	1																								8	6.01	48.1	1.6	1
Colombo MC	48-7337					2	2	3	1																								8	6.01	48.1	1.6	1
UPC Matale	49-3854					2																											2	2.18	4.4	0.1	1
Total SW		6.9	10.9	9.9	9.9	20.9	13.9	13.9	11.9	13.9	12.9	11.9	10.9	12.9	10.9	11.9	9.9	11.9	11.9	10.9	12.9	15.9	11.9	10.9	10.9	9.9	7.9	9.9	11.9	9.9	10.9	10.9	363		829.5	26.8	
Gully sucker	42-7553																																0	7.00		m3	4
Total		6.9	10.9	9.9	9.9	20.9	13.9	13.9	11.9	13.9	12.9	11.9	10.9	12.9	10.9	11.9	9.9	11.9	11.9	10.9	12.9	15.9	11.9	10.9	10.9	9.9	7.9	9.9	11.9	9.9	10.9	10.9	363				
L'fill arrival time (first load)		9:30	9:00	9:30	9:00	9:30	10:00	9:30	9:30	9:00	9:30	9:30	9:30	9:00	9:30	9:15	9:10	9:00	9:00	9:30	9:30	9:30	9:15	9:00	9:30	9:30	9:30	9:00	9:30	10:00	9:00	9:30					
L'fill departure time (last load)		12:15	13:00	13:00	12:30	14:45	14:20	20:00	14:00	15:35	14:15	13:30	13:00	13:30	13:45	14:00	14:00	14:15	13:30	13:45	14:00	ns	14:00	14:00	13:30	14:00	12:45	13:15	13:45	13:45	14:45	14:00					

Notes:

1. Accumulated heaps of garbage removed during May 5-8 using two additional compactors from CMC (larger than MMC's large compactor) and one 4WT.
2. GI-1602 compactor still out of action (auto-circuit breakdown) till May 20.
3. The Works tractor and MMC Isuzu trucks were occasionally used for garbage collection.
4. Gully sucker continues to dispose its loads at the disposal site but no trips data was recorded.
5. Night time 4WT data added based on average no of loads per day - no actual data available

Days in mth	31

Jun-02

Vehicle	Reg'n No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum	C.F.	Wt (T/mth)	Wt (T/d)	Note
	Day	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S	M	T	W	Th	F	Sa	S							
2WT	75-1798	2	2	3	2	1	2		2	2	3	2	2	3	2	1	2	3	2	2	2	2	2	2	1	3	2	2	2	2	2		60	0.41	24.9	0.8	
4WT	37-9103	2	1	2	2	2	1	2	2	2	2	2	1	2	2	1	2	2	2	2	2	2	1	1			2	2	2	2	2		50	2.18	109.2	3.6	
	49-9957								3		6												1		1								11	2.18	24.0	0.8	1
4WT (night)		*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*	*1.9*		*58*	*2.18*	*125.8*	*4.2*	*5*
Isuzu Truck	26-3501																																0	1.70	0.0	0.0	
	41-9452																																0	0.59	0.0	0.0	
Compactor	227-6727	2	2	3	2	2	2	2	2	2	2	2	2	2	3	2		2	2	2	2	2	2	2	2	2	2	2	2	2			58	3.76	217.9	7.3	
	GI-1602	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	1	1	2	2	2	2	2	2		55	2.24	123.1	4.1	
4WT (Works)	49-6824	2							1		8																				2		13	0.74	9.6	0.3	1
Private	226-5259														1																		1	2.18	2.2	0.1	
Total SW		*11.9*	*7.9*	*11.9*	*9.9*	*8.9*	*8.9*	*7.9*	*13.9*	*9.9*	*24.9*	*9.9*	*8.9*	*10.9*	*11.9*	*7.9*	*5.9*	*10.9*	*9.9*	*9.9*	*9.9*	*9.9*	*9.9*	*7.9*	*6.9*	*8.9*	*9.9*	*9.9*	*9.9*	*9.9*	*9.9*		*306*		*634.4*	*21.1*	
Gully sucker	42-7553																																0	7.00		m3	2
Total		11.9	7.9	11.9	9.9	8.9	8.9	7.9	13.9	9.9	24.9	9.9	8.9	10.9	11.9	7.9	5.9	10.9	9.9	9.9	9.9	9.9	9.9	7.9	6.9	8.9	9.9	9.9	9.9	9.9	9.9		306				
L'fill arrival time (first load)		9:45	9:30	9:30	9:00	9:30	9:00	9:45	9:30	9:00	9:00	9:00	9:45	9:30	9:30	9:30	9:30	9:30	9:30	9:40	9:45	9:40	10:00	9:30	9:30	9:30	9:15	10:00	10:00	9:45	9:30						
L'fill departure time (last load)		13:00	12:15	14:00	13:30	14:00	12:15	13:45	13:30	13:45	15:55	13:45	14:00	14:15	14:30	13:25	13:00	13:45	13:45	14:30	13:45	14:00	13:15	13:30	ns	13:30	13:30	13:45	13:50	13:35	13:45						

Notes:

1. Additional loads on Jun 10th associated with JCB cleaning roadside accumulated soil, sediment, drain cleanings which were taken to the landfill and used as cover soil.
2. Gully sucker continues to dispose its loads at the disposal site but no trips data was recorded.

Days in mth	30

Night time trip records - 49-9957

Mth	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Sum
Sep-00															3	3	3	3	3	3	3	3	3	3	3	3			3	3		42
Oct-00	3	3	3		3	3	3	3	4	3	3	2	3	3	3	3																45
Jan-01	4				3	3	2	3	3			3	3	2	3	4		3	3	3	2	3	3		2	3	3	2	2	3		65
Feb-01	3	3	2	2	2	4	3	3	3		2	3	2		2	2	2	2			3	3	3	3	3	0	2					57
Mar-01		2	3	2	3	3	3	4	3	4	3	2	3		3	3	3	3	3				3	3	3	3	3			3	3	71
Apr-01	3	3	3	3		3	3	4	4	4	4	4	2	2	2	2				3	3	3				3	3	3	3	3		70
Nov-01	3		3	2	3	2	3			3	2		3	2	2		2	2	3	2	3			3	3		3		3	3		55

Total trips	405
Total days	211
Average trips/d	1.92

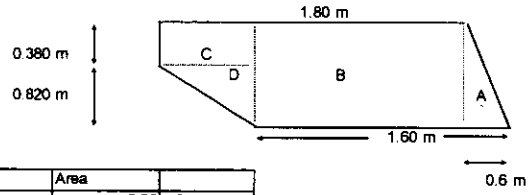
Notes:

1. Data record began in mid Sep 00 and finished in mid Dec 01 -1st and last mth data recorded, together with some intermediate months
2. MMC PHI stated on average 2-3 trips/night - trips records indicates closer to 2 trips/night

Dimensions:

1. MMC small compactor (white, GI-1602)

Measured at MMC workshop based on internal dimensions on 2 July 2002

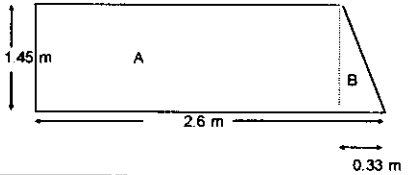


	Area	
A	0.36	m2
B	1.20	m2
C	0.30	m2
D	0.328	m2
Total	2.19	m2

Width =	1.68 m
Vol =	3.68 m3
Density =	608 kg/m3 (from weighbridge data)
Tonnage =	2.24 T

2. MMC large compactor (green, 227-6727)

Measured at MMC workshop based on internal dimensions on 2 July 2002



	Area	
A	3.77	m2
B	0.24	m2
Total	4.01	m2

Top width =	1.7 m
Bottom width =	2.04 m
Average width =	1.87 m
Vol =	7.50 m3 Truck baseplate states capacity = 6.6m3 - use measured capacity
Density =	501 kg/m3 (from weighbridge data)
Tonnage =	3.76 T

3. All vehicles

Vehicle	Length (m)	Width (m)	Height (m)	Vol (m3)	Density (kg/m3)	Fill factor (%)	Tonnage (T)	Notes
Handcart	1.22	0.76	0.43	0.40	330	95.00	0.12	4ft x 2.5ft x 1.4ft
MMC 2WT	1.6	1.05	1.45	2.44	330	90.00	0.72	Dimensions measured @ MMC; WACS measured collection vehicle density
MMC 4WT	3.0	1.8	1.22	6.59	390	85.00	2.18	Dimensions measured @ MMC; density from weighbridge data
Works tractor	2.98	1.72	0.41	2.10	390	90.00	0.74	Assumed dimensions based on KMC Works tractor; density from weighbridge data
Isuzu lorry (26-3501)	4.29	1.88	0.71	5.71	330	90.00	1.70	Dimensions measured @ MMC; WACS measured collection vehicle density
Isuzu lorry (41-9452)	3.10	1.60	0.40	1.98	330	90.00	0.59	Dimensions measured @ MMC; WACS measured collection vehicle density
Small compactor (GI-1602)				3.68	608	100.00	2.24	Measured @ MMC
Large compactor (227-6727)				7.50	501	100.00	3.76	Measured @ MMC
CMC Compactors				12	501	100.00	6.01	Assumed 12m3

Notes:

1. Fill factors estimated.
2. Densities from WACS study for collection vehicle and weighbridge data - lower values used for 2WT and lorries due to lower filling height, especially in the case of the lorries.
3. PHI said 2WT should do 2 loads/d - the first is a normal garbage collection round, while the second involves collecting meat, fish and poultry offal/wastes from the central city area and the city's public markets. Hence, to convert 2WT trip data to tonnage, the following assumptions are made:

a. 50 % of 2WT loads are for normal garbage, 50 % for fish/meat/poultry offal/wastes

b. For offal round, assume 4 bins of 80 L capacity with density of 330 kg/m3 = 105.6 kg/load

c. Total tonnage for 2 loads = 0.829 T or 0.415 T/load - this figure used as conversion figure for trips to tonnes for 2WT

4 bins allows for one from Central Market (large bin, at least 80L capacity) + 3 from 3 licensed butchers & other sources - I think no is consistent with observations of 2WT + more importantly, consider the total quantity of waste to be approximately correct.

No of Loads

Mth	2WT	4WT	Truck Small 41-9452	Truck Large 26-3501	Compactor Small GI-1602	Compactor Large 227-6727	Works	Other	Total	G/S	Days	Average Trips/d	Notes
Sep-99	0	282	0	0	0	0	0	0	282	NA	30	9.4	
Oct-99	0	278	0	0	0	0	0	0	278	NA	31	9.0	
Nov-99	0	284	0	0	0	0	0	0	284	NA	30	9.5	
Dec-99	0	279	0	0	0	0	0	0	279	NA	31	9.0	
Jan-00	0	271	0	0	0	0	0	0	271	NA	31	8.7	
Feb-00	0	284	0	0	0	0	0	0	284	NA	29	9.8	
Mar-00	0	181	0	0	0	0	0	0	181	NA	23	7.9	incomplete month
Jan-02	31	106	10	26	0	0	8	1	182	15	20	9.1	incomplete month
Feb-02	49	177	7	39	0	0	12	0	284	2	28	10.1	
Mar-02	49	178	9	35	0	0	7	0	278	NA	31	9.0	
Apr-02	62	163	0	2	0	58	1	0	286	NA	30	9.5	
May-02	67	171	3	0	22	72	10	18	363	NA	31	11.7	
Jun-02	60	119	0	0	55	58	13	1	306	NA	30	10.2	
Sum													
Sep99-Mar00	0	1859	0	0	0	0	0	0	1859	NA	205	9.1	
Jan-Jun 02	318	912	29	102	77	188	51	20	1697	NA	170	10.0	

Tonnage

	2WT	4WT	Truck Small 41-9452	Truck Large 26-3501	Compactor Small GI-1602	Compactor Large 227-6727	Works	Other	Total	G/S	Days	MSW Avg T/d		For graph Avg
Sep-99	0	616	0	0	0	0	0	0	616	NA	30	20.5		19.8
Oct-99	0	607	0	0	0	0	0	0	607	NA	31	19.6		19.8
Nov-99	0	620	0	0	0	0	0	0	620	NA	30	20.7		19.8
Dec-99	0	609	0	0	0	0	0	0	609	NA	31	19.7		19.8
Jan-00	0	592	0	0	0	0	0	0	592	NA	31	19.1		19.8
Feb-00	0	620	0	0	0	0	0	0	620	NA	29	21.4		19.8
Mar-00	0	395	0	0	0	0	0	0	395	NA	23	17.2	incomplete month	19.8
Jan-02	12.9	232	5.9	44.1	0.0	0.0	5.9	2.2	303	105.0	20	15.2	incomplete month	19.6
Feb-02	20.3	386	4.1	66.2	0.0	0.0	8.9	0.0	485	14.0	28	17.3		19.6
Mar-02	20.3	388	5.3	59.4	0.0	0.0	5.2	0	478	NA	31	15.4		19.6
Apr-02	25.7	355	0.0	3.4	0.0	218	0.7	0	603	NA	30	20.1		19.6
May-02	27.8	372	1.8	0.0	49.3	270	7.4	101	830	NA	31	26.8		19.6
Jun-02	24.9	259	0.0	0.0	123	218	9.6	2.2	637	NA	30	21.2		19.6
Sum														
Sep99-Mar00	0	4060	0	0	0	0	0	0	4060	NA	205	19.8		
Jan-Jun 02	*132*	*1992*	*17*	*173*	*172*	*706*	*38*	*105*	*3336*	NA	170	19.6		

Average no of 4WTs used during Jan-Jun 2002 (for unit cost calculations)

Vehicle		Days in use during mth						
		Jan	Feb	Mar	Apr	May	Jun	Tot
4WT	37-9103	16	24	29	29	26	28	152
	49-9957	19	28	30	29	23	4	133
4WT (night)		20	28	31	30	31	30	170
Tot tractor-days		55	80	90	88	80	62	455
Total days		20	28	31	30	31	30	170
Avg tractors/d		2.75	2.86	2.90	2.93	2.58	2.07	**2.68**

MMC Monthly Records

Month	Rd cleaning dist (km)	Drain cleaning dist (km)	IDP No of cleaning programs	Gully sucker trips Resid + business	Public toilets	Total	Gully sucker income (Rs)	Notes
Jan-01	1230	750	22	20	0	20	25350	
Feb-01	1200	750	24	37	1	38	66900	
Mar-01	1200	800	40	25	1	26	32750	1
Apr-01	1100	750	35	20	1	21	25700	
May-01	1200	800	33	27	0	27	55050	
Jun-01	1300	800	41	16	0	16	38400	
Jul-01	1250	800	35	21	0	21	48450	
Aug-01	1300	850	27	30	1	31	35950	
Sep-01	1200	800	20	17	1	18	45250	
Oct-01	1300	800	25	20	0	20	36700	
Nov-01	1250	800	25	26	0	26	45650	
Dec-01	1250	800	15	31	0	31	51400	
Total	n/a	n/a	342	290	5	295	507550	
Avg	1232	792	29	24	0.4	25	42296	

Notes:

1. Two new public toilets constructed during March 2001
2. Road and drain cleaning are regular monthly activities. In contrast, the IDP works relate to special programmes to tackle problem areas, usually carried out on Saturdays.

A. General Notes **Matale MC**

1. SWM Staff Salary + allowance costs

Item	Salary	Allowance	Total	Adopted
Driver	4500	2200	6700	6,551
Labourer	4000	2200	6200	6,051

Notes:
a. Basic salary data from PHI - budget gives 6,600,000 salaries + overtime budget for 129 staff = 4,264Rs/mth
b. Collection worker survey gave average salary of 5,641 Rs/mth, including allowances, or 3,441 Rs/mth basic salary
c. Paysheet for Kandy gave avg salary of 3,847Rs/mth for 103 labourers, or total of 6,047Rs/mth with allowances
d. *Average basic salary =* 3851 *Rs/mth from above 3 sources - add on 500 for driver + 2,200 allowance to get* adopted values shown above.

2. Data shaded in from MMC PHI

B. SWM Vehicles - Current Costs

Handcart	Rate	Unit	No	Amt (Rs)	Notes
Labourers	6051	Rs/mth	12	72612	1 labourer x 12mths
Protective gear/equipment	250	Rs/yr	1	250	
Oil		Rs/mth	12	0	
Tyres and tubes	2000	Rs/yr	1	2000	
Maintenance	500	Rs/yr	1	500	
Insurance	0	Rs/yr	1	0	
Rev Licence	0	Rs/yr	1	0	
Depreciation	2750	Rs/yr	1	2750	
Total				78112	
Avg no of trips per day		trips/d		4.00	
Avg amt collected per mth		T/mth		13	
Average amount collected per yr		T/yr		156	
Unit cost		Rs/T		501	Rs/T

Notes:
1. 3 HCs working in the area serviced by the large compactor do a total of 12 trips/d (MMC)
Average trips per handcart = 4 trips/HC.d
From MC collection data, average tonnage per HC = 0.12 T/load
Average tonnage per HC per d = 0.50 T/HC.d
Allowing for 26 working days/mth gives a total of 13.0 T/HC.mth
2. Capital cost = 11,000 Rs with estimated lifetime of 4 yrs as KMC (3-5yrs)
Depreciation = 2750 Rs/yr (straight line method)
SPHI did not include any allowance for depreciation in handcart unit costs

Two wheel tractor	Rate	Unit	No	Amt (Rs)	Notes
Driver	*6551*	*Rs/mth*	*12*	*78612*	
Labourers	6051	Rs/mth	24	145224	2 labourers x 12mths
Protective gear/equipment	500	Rs/yr	1	500	
Diesel	1860	Rs/mth	12	22320	
Oil	100	Rs/mth	12	1200	
Tyres and tubes	1650	Rs/mth	12	19800	
Maintenance	500	Rs/mth	12	6000	
Insurance	1974	Rs/yr	1	1974	
Rev Licence	150	Rs/yr	1	150	
Depreciation	8286	Rs/yr	1	8286	
Total				284066	
Avg no of trips per day		trips/d		1.87	
Avg amt collected Jan-Jun02		T/6mth		132	T/6mths
Average amount collected per yr		T/yr		264	
Unit cost		Rs/T		1077	Rs/T

Note:
1. Capital cost data: tractor = 145000 with estimated lifetime of 17.5 yrs (15-20yrs as per KMC)
Straight line deprec'n = 8286 Rs/yr or 690 Rs/mth - higher than SPHI's estimate of 610 Rs/mth
SPHI's estimate was based on a 20yr lifetime - JICA figures considered more realistic and have been adopted.
2. This figure is high because one trip is spent collecting normal garbage (87% of daily total and near vehicle trailer capacity), while the second is spent collecting fish/meat/poultry offal/waste (13% of daily total and trailer capacity only utilised to small extent).

Four wheel tractor	Tractor 1				Tractor 2				Avg	
Item	Rate	Unit	No	Amt (Rs)	Rate	Unit	No	Amt (Rs)	Tot (Rs)	Notes
Driver	6551	Rs/mth	12	78612	6551	Rs/mth	12	78612	78612	
Labourers	6051	Rs/mth	48	290448	6051	Rs/mth	48	290448	290448	4 Lr x 12 mths
Protective gear/equipment	3000	Rs/yr	1	3000	3000	Rs/yr	1	3000	3000	
Diesel	6200	Rs/mth	12	74400	7750	Rs/mth	12	93000	83700	
Oil	1060	Rs/mth	12	12720	780	Rs/mth	12	9360	11040	
Tyres and tubes	4520	Rs/mth	12	54240	4520	Rs/mth	12	54240	54240	
Vehicle Maintenance	1500	Rs/mth	12	18000	1500	Rs/mth	12	18000	18000	
Trailer repair	20000	Rs/yr	1	20000	0	Rs/mth	0	0	10000	Shared trailer
Insurance	572	Rs/yr	1	572	3050	Rs/yr	1	3050	1811	
Rev Licence	150	Rs/yr	1	150	150	Rs/yr	1	150	150	
Depreciation	40952	Rs/yr	1	40952	56095	Rs/yr	1	56095	48524	
Total		Rs/yr		593095				605955	599525	Per 4WT
Average No of 4WT used/d		No/d							2.68	(Jan-Jun 2002)
Average no of trips per 4WT.d		trips/d							2.01	Per 4WT
Avg amt collected Jan-Jun02/4WT		T/6mth							744	
Average amount collected per yr		T/yr							1489	
Unit cost		Rs/T							403	Rs/T

Notes:

1. Capital costs: tractor 1 = 600000 ; tractor 2 = 865000 with est. life of 17.5 yrs (15-20yrs as per KMC)
Trailer capital cost = 120000 with avg life of 9 yrs (8-10yrs as per KMC) - 50% trailer deprec'n allocated to each 4WT
St line deprec'n (Tr 1) = 40952.381 Rs/yr or 3413 Rs/mth - much higher than SPHI's estimate of 2500 Rs/mth
St line deprec'n (Tr 2) = 56095.238 Rs/yr or 4675 Rs/mth - much higher than SPHI's estimate of 3600 Rs/mth
SPHI's estimate based on 20yr lifetime and did not include trailer - JICA figures considered more realistic and have been adopted.
2. Trailer repair cost based on Galle MC data

Small Compactor	Rate	Unit	No	Amt (Rs)	Notes
Driver	7051	Rs/mth	12	84612	Increase salary by 500 c.f. 4WT
Labourers	6051	Rs/mth	48	290448	4 labourers x 12 mths
Protective gear/equipment	3000	Rs/yr	1	3000	
Diesel	12400	Rs/mth	12	148800	
Oil	860	Rs/mth	12	10320	
Tyres and tubes	2500	Rs/mth	12	30000	
Maintenance	2000	Rs/mth	12	24000	
Insurance	16321	Rs/yr	1	16321	
Rev Licence	2800	Rs/yr	1	2800	
Depreciation	56250	Rs/yr	1	56250	
Total				666551	
Avg no of trips per day		trips/d		1.83	
Average amt collected in Jun02		T/mth		123	T/mth
Average amount collected per yr		T/yr		1478	
Unit cost		Rs/T		451	Rs/T

Notes:

1. Capital cost = 450000 with estimated lifetime of 8 yrs (KMC estimate for well maintained recond. compactors)
St line depreciation = 56250 Rs/yr or 4688 Rs/mth - much higher than SPHI's estimate of 1875 Rs/mth
SPHI's estimate was based on a 20yr lifetime - JICA figures considered more realistic and have been adopted.

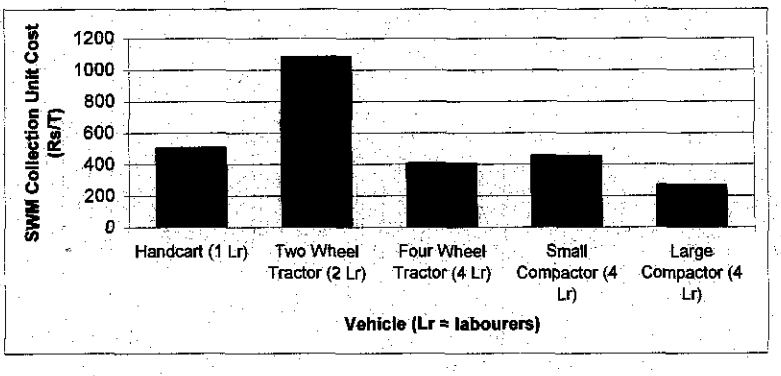
Large Compactor	Rate	Unit	No	Amt (Rs)	Notes
Driver	7051	Rs/mth	12	84612	Increase salary by 500 c.f. 4WT
Labourers	6051	Rs/mth	48	290448	4 labourers x 12 mths
Protective gear/equipment	3000	Rs/yr	1	3000	
Diesel	15500	Rs/mth	12	186000	
Oil	1060	Rs/mth	12	12720	
Tyres and tubes	2570	Rs/mth	12	30840	
Maintenance	2000	Rs/mth	12	24000	
Insurance	16321	Rs/yr	1	16321	
Rev Licence	2825	Rs/yr	1	2825	
Depreciation	100000	Rs/yr	1	100000	
Total				750766	
Avg no of trips per day		trips/d		2.07	
Avg amt collected Apr-Jun 02		T/3mths		706	T/3mths
Average amount collected per yr		T/yr		2825	
Unit cost		Rs/T		266	Rs/T

Notes:

1. Capital cost = 800000 with estimated lifetime of 8 yrs (KMC estimate for well maintained recond. compactors)
St line depreciation = 100000 Rs/yr or 8333 Rs/mth - much higher than SPHI's estimate of 3500 Rs/mth
SPHI's estimate was based on a 20yr lifetime - JICA figures considered more realistic and have been adopted.

C. Graphical Data

Vehicle	Cost (Rs/yr)	Tonnage (T/yr)	Unit cost (Rs/T)
Handcart (1 Lr)	78112	156	501
Two Wheel Tractor (2 Lr)	284066	264	1077
Four Wheel Tractor (4 Lr)	599525	1489	403
Small Compactor (4 Lr)	666551	1478	451
Large Compactor (4 Lr)	750766	2825	266



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