

Chapter 5

Negombo Waste Stream Analysis

A. Household garbage collection service, garden waste and recycling/composting survey data

2.1&2.2 Garbage coll'n	No	%
Have and use	78	52.0
Have but don't use	66	44.0
Don't have	6	4.0
Total	150	100.0

3.8 Garden waste	No	%
Yes	121	80.7
No	29	19.3
Total	150	100.0

Q4-5 to 4-8 Recycling

Qns	Yes	No	Fd/Ki	Paper	Textile	Plastic	Gr/Wd	Le/Ru	Metal	Glass	Ce/St	Tyres	Total
4.5/4.6 Individual collector	67	83	1	34	12	0	0	0	24	57	0	2	130
4.7/4.8 Take to shop	42	108	0	8	0	1	0	0	1	38	0	0	48
4.9 Comp ki &/or ga waste	10	140	10				10						10

Notes:

- 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).
- 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.
- In Q4.9, 10 households stated they compost both kitchen & garden waste - this answer assumed more accurate than Q3.9, where 7 households stated they compost their garden waste.

B. Other household survey data and calculation of discharge/behaviour method %s for surveyed area

WACS Collection Vehicle Waste Composition over 8 days - wt %

	Fd/Ki	Paper	Textile	Plastic	Gr/Wd	Le/Ru	Metal	Glass	Ce/St	other	Total
Kandy	58.21	11.95	1.40	7.94	12.31	0.68	0.84	1.13	5.13	0.40	99.99
Matale	61.29	6.40	1.07	4.35	18.14	1.11	0.42	0.36	6.60	0.26	100.00
Negombo	45.57	8.85	3.50	4.74	24.72	0.94	0.45	0.82	8.41	2.00	100.00

Average Household waste composition over 8 days - wt %

	Fd/Ki	Paper	Textile	Plastic	Gr/Wd	Le/Ru	Metal	Glass	Ce/St	other	Total
Kandy	69.90	6.93	1.11	5.08	11.70	0.41	0.96	1.07	2.65	0.18	100.00
Matale	66.50	6.98	1.34	3.59	15.68	0.40	0.37	1.33	3.36	0.46	100.00
Negombo	52.08	7.39	3.58	3.47	22.44	0.45	0.46	1.90	4.31	2.20	98.29

H'hold wt avg WACS values

H'hold wt avg WACS values

See note 1

Household survey (150 respondents)	Q3.1 garb disp		5.9 others behaviour	Weighted no of responses to different methods of waste disposal for different waste types											Wt avg	Rev'd	Rev'd %
	Main	Other		Fd/Ki	Paper	Textile	Plastic	Gr/Wd	Le/Ru	Metal	Glass	Ce/St	other	Total			
LA colln	62	9	92	51.4	51.4	51.4	51.4	26	51.4	51.4	51.4	51.4	51.4	488.6	32.9	45.8	45.1
Self-disp (OSD)	72	35	49	64.6	64.6	64.6	64.6	91	64.6	64.6	64.6	64.6	64.6	672.4	51.7	41.5	40.8
Compost	3	5	1	10	0	0	0	10	0	0	0	0	0	20	5.6	4.8	4.8
Recycle	0	0	0	1	34	12	1	0	0	24	57	0	2	131	3.0	2.7	2.7
Open dump	13	6	15	11.6	11.6	11.6	11.6	2	11.6	11.6	11.6	11.6	11.6	106.4	6.7	6.7	6.6
Total	150	55	157	138.6	161.6	139.6	128.6	129	127.6	151.6	184.6	127.6	129.6	1418.4	100	101.5	100.0
Weight	0.8	0.2						Q3.9									

Notes:

- Negombo household weighted average composition data calculated for each waste type as Negombo VWC x 0.5 x (Kandy HHWC/Kandy VWC + Matale HHWC/Matale VWC) assuming:
 - variations in VWC between towns reflects variations in local conditions; and
 - the ratio of town HHWC/town VWC is approximately constant
- where VWC = vehicle waste composition and HHWC = household waste composition. The calculated %s are then be adjusted on a pro rata basis to give a total of 100%.

2. Q5.9 generally supports Q3.1 results except for suggesting LA coll'n is more common and OSD less common. Q3.1 result used in preliminary analysis, applying weights to main/other answers as shown

3. For compost and recycle options, use answers from other questions as indicated, rather than 3.1.

a. For those recycling different materials, assumed 90 % of materials generated are recycled - gives revised total shown in last column

b. For those composting food/kitchen and garden waste, assumed 86 % of materials generated are composted (from Q4-9) - gives revised total in final column

4. LA collection % considered to be too low based on observation, disposal site tonnages and Q5.9. Q5.9 LA coll'n % = 58.6 % - revise LA coll'n % to be avg of tabulated (32.9%) & this value

5. Self-disposal % considered to be too high based on observation, disposal site tonnages and Q5.9. Q5.9 OSD % = 31.2 % - revise OSD % to be avg of tabulated (51.7%) & this value

C. Extension of survey results to entire NMA area

Household waste stream results in final column of above table have been adopted as representative of surveyed areas. This survey was undertaken in areas where 96% of households receive a garbage collection service (see Q2.1 & 2.2). Discussions with NMC Supervisors indicated that the NMA service coverage is approx. 85 % in Negombo (80-90%) & 67.5 % in Kochchikade

(60-75% range). Negombo popn = 81001 & Koch popn = 40641 (2001 census). Hence, average service coverage = 79.2 %

only the Duwa area in Thaladena is provided with a garbage collection service (2 days/wk). Hence, disposal method %s were adjusted to account % (approx.) within Negombo/Kochchikade areas, while

Area	Negombo + Kochchikade			Thaladena		Total
	Sub-total	Unserviced	Serviced	Duwa	Other	
Population	121642			3198	19711	144551
Area (%)	79	21	100	100	0	
LA collection	45.1	0	35.7	45.1	0	31.0
Self-disposal	40.8	74.4	47.8	25.8	59.4	48.9
Compost	4.8	8.7	5.6	4.8	8.7	6.0
Recycle	2.7	4.9	3.1	2.7	4.9	3.4
Open dump	6.6	12.1	7.8	21.6	27.1	10.7
	100.0	100.0	100.0	100.0	100.0	100.0

Based on 2001 census data but OK to apply, as no population growth rate data available for different areas other than NMA as a whole + only using population data to adjust percentages.

Notes:

1. For Negombo and Kochchikade:

a. Assume for areas not provided with collection service, waste is disposed of by other methods in proportion to above %s.

For example, self-disposal in unserviced area = $40.8 / (40.8 + 4.8 + 2.7 + 6.6) * 100\% = 74.4\%$

b. Overall %s calculated as $((\% \text{ serviced area}) \times (\text{disposal method \% in that area}) + (\% \text{ unserviced area}) \times (\text{disposal method \% in that area})) / 100\%$

e.g. self-disposal = $(79 * 40.8 + 21 * 74.4) / 100 = 47.8\%$

2. For Thaladena, assume:

a. Duwa area - %s are as for serviced area in Negombo/Kochchikade, except open dumping increased by 15 % & self-disposal reduced by same amount to account for only 2 day/wk collection service, densely populated area meaning on-site disposal is less feasible and open dumping in the sea/lagoon being very common.

b. In other parts of Duwa, assume %s are as for unserviced area in Negombo/Kochchikade except open dumping and self-disposal altered as for Duwa for similar reasons.

3. Final %s obtained by multiplying disposal method %s in each area by population in that area and dividing by total population

4. Overall service coverage = 68.8 %

D. Waste Generation Rate (WGR) data

Town/city	Pop'n	WGR (kg/cap.d)	Ga waste Comp (%)
Kandy	110,049	0.545	11.70
Matale	36,331	0.451	15.68
Negombo	144,551		22.83

These are estimated WGRs based on measured waste discharge rates in Kandy and Matale.

Negombo and Kandy are similar sized cities. However, Negombo garden waste % is approx 2x that of Kandy, indicating a lot more garden waste is being generated and/or collected in Negombo, compared with Kandy. Increased garden waste generation may be due to the different climate & also due to many low income households using coconut palm thatched roofs in Negombo, which require regular replacement. Increased garden waste collection is consistent with WACS data and observation.

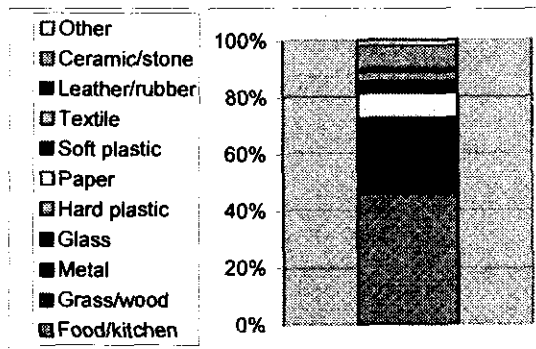
Based on these comments, Negombo WGR is estimated as follows:

- a. Adopt Kandy WGR, as Kandy and Negombo are similar sized cities = 0.545 kg/cap.d but adjust this to account for > garden waste collection in Negombo
- b. Kandy non-garden waste generation rate = $(100-11.70)/100 \times 0.545 = 0.481$ kg/cap.d = Negombo non-garden waste generation rate = $(100-22.83)/100 \times \text{WGR}$
- c. Negombo WGR = $(100-11.7)/(100-22.8) \times 0.545 = 0.624$ kg/cap.d = adopted value
- d. By comparison, Galle WGR = 0.749 kg/cap.d (Fraser Thomas study) -> Negombo value is reasonable.

5-3

Graphical Data

	Food/kitchen	Grass/wood	Metal	Glass	Hard plastic	Paper	Soft plastic	Textile	Leather/rubber	Ceramic/stone	Other	Total
Negombo	45.57	24.72	0.45	0.82	0.76	8.85	3.98	3.50	0.94	8.41	2.00	100.00



Collection worker recycling (data from collection worker survey)

Item	Total
No of workers collecting items for recycling	14
Total no of workers interviewed	33
Average income(Rs/mth)	130
% of those interviewed collecting recyclables	42
Total no of SWM workers	202
% interviewed/total workers	16
Estimated total no of workers collecting recyclables	86

Notes:

1. Collection workers indicated all recyclables go to Nadar Kade
2. Total SWM workers = 204 labourers + 15 drivers - 15 septic tank/toilet labourers - 2 disposal site labourers

Collection worker - recycling quantities

Item	No collecting	Qty	Units	Price	Units	Corrected qty (kg/mth)	Est total kg/mth	Est total kg/d	
Bottles	9	145	kg/mth	0.5 - 2.0	Rs ea	161	988	33	2 "don't know"
Paper	2	30	kg/mth		5 Rs/kg	30	184	6	
Ferrous	3	6	kg/mth		4 - 6 Rs/kg	18	110	4	2 "don't know"
Metal can	4	14	kg/mth		3 - 6 Rs/kg	14	86	3	
Aluminium	3	11	kg/mth		40 - 75 Rs/kg	11	67	2	
Copper	1	4	kg/mth		80 Rs/kg	4.0	24	1	
Total quantity	14	210.2	kg/mth			238	1459	49	
Est. tot. qty collected by all labourers		1287	kg/mth			1459			

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 = 220 bottles/mth, converted to kg/mth using above average weight
3. Corrected quantity accounts for any "don't knows"
4. Overall quantity recycled = 49 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.

Central City Transfer Station

During time and motion study, 2 people observed collecting cardboard from central city transfer station. From interview with one of them:

- a. About 20 people work here each day.
- b. He can collect about 50 kg/d of cardboard
- c. Assume average collection = 25 % of this.
- d. Total amount recycled = 250 kg/d

Final disposal site - recycling

- a. Neither of the two NMC labourers working at the disposal site are believed to collect recyclable materials.
- b. One person interviewed during disposal site survey collects ~ 50 kg/d of F/K waste for his 5 pigs, 3 cows and 5 goats.
- c. According to the CPHI, there are about 7 outsiders and 4-6 children who collect recyclable materials from the landfill. Some of these were approached but refused to be interviewed. Assume their recycling amounts to 12.5 kg/person.d (as per transfer station) from 7 people (neglecting children) = 87.5 kg/d
- d. Total landfill recycling = 137.0 kg/d

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

Population breakdown

a. Residential	Permanent		Floating		Neg	Koch.	Thal.	Total	Notes
	H'holds	People	H'holds	People					
July 2001 census	32122	144551			81001	40641	22909	144551	1,3
UDA/CPHI data on floating population				-12737					4
Estimated 1997 population (Divisional Secretariat)	26610	149531							2
Projected 2000 population		169075							2
Adopted	32122	144551	n/a	-12737	3536	177.4	100.0	631.0	

Notes:

- Provisional July 2001 census results; census breakdown into different areas also given based on GSD census data
- UDA Draft Development Plan for Negombo (1999)
- Negombo MC limits were increased in April 2002 to include Thalahaena - quoted 2001 census population includes this new area
- UDA Development Plan states labour force = 56,710, of which 82% are employed with 30% working in fishing industry while 80% of employed population not working in fishing/tourism work away from Negombo. PHI said ~20% of fishermen spend 6mths outside NMC/yr (fishing off-season) doing other work, while ~20% of other workers work outside the city each day.
 Floating population = 20% of fishermen for 50% of year = $0.5 \times 0.2 \times (0.3 \times 0.82 \times 56,710) = 1395$ plus 20% of other workers = $0.2 \times 56,710 = 11342$ giving total of 12737
 This represents the floating population leaving the city each day.
- Projected 2000 population from UDA Development Plan, based on growth rate of 4.18% (Negombo identified as growth centre in Colombo Metropolitan Plan)
- H'holds = housing units + collective living quarters
- Population growth:
 - Census data - 1981 population = 71018 (from UDA Draft Development Plan). This relates to Negombo only as Kochchikade was added to the MC in 1988
 - Negombo Census 2001 pop'n = 81001 (Negombo only)
 - Compound pop'n growth rate = 0.66 %
 - It seems reasonable that areas around Negombo (i.e. Kochchikade and Thalahaena) will have grown at a faster rate over this time, as they have become more urbanised.
 - From 2001 census, national average annual growth rate = 1.2 % but Gampaha district has average annual growth rate of 2.0 %, which is consistent with comment (b).
 - Negombo has also been identified as a growth centre in Colombo Regional Structure Plan with designated growth rate of 4.18% (UDA Draft Development plan).
 - Taking these factors into consideration, a growth rate of 1.6 % has been adopted for Negombo, midway between the national average and Gampaha district values.
 - Estimated 2002 population = 145084 - adopted for this study as current 2002 population

General Notes on Shading

- Yellow indicates waste generators surveyed/interviewed during this study.
- Blue relates to specific notes described under relevant items.
- Purple shows data used in waste stream calculations
- Brown indicates cells affected by changes in collection tonnages

Abbreviations

- Waste type codes: F = food/kitchen, G = garden, Hz = hazardous, P = paper/cardboard, Pl = plastic, M = metal, M/F = meat/fish, R = rubber/leather, In = inert, T = textile
- Disposal method codes: A-D = LA collection; E-F = on-site disposal, G = recycling, H = composting, I = illegal dumping, J = other
- Waste stream codes: OSD = on-site disposal, comp = composting, LA colln = NMC collection, Recy = recycling, ID = illegal dumping, DH = direct haulage
- Other: WDR = waste discharge rate; WGR = waste generation rate; SW = solid waste

2. COMMERCIAL & INDUSTRIAL SECTOR - DETAILED INFORMATION

a. General

Category	Name	Address	Relevant Data		SW gen (kg/d)	Main 3 wastes	Disposal		OSD	Comp	LA colln	Recy	ID	Total	Notes	
			No staff	Type			Main	other								
Small																
SW1	National Saving Bank	St Joseph St, Negombo	26	Bank	10	P>Pl>F	B	G	0	0	2	8	0	10		
SW13	Arpico	14 Station Rd, Negombo	12	Plastic goods	5	Pl>F>P	C		0	0	5	0	0	5		
SW7	Blue Moon Nursery	64 St Joseph St, Negombo	3	Plants	10	G>F>Pl	A		0	0	10	0	0	10		
SW6	Abans	109 St Joseph St, Negombo	5	Electric items	1.5	F>P	A		0	0	1.5	0	0	1.5		
SW7	Negombo bus stand PO	Sub. PO, Neg Bus Stand	1	Post office	1	P>Pl>Hz	A		0	0	1	0	0	1		
SW9	Shamel Salon	St Joseph Rd, Negombo	3	Salon	2	In>Hz>Pl	C		0	0	2	0	0	2		
SW9	Premart Shop	St Joseph Rd, Negombo	2	Grocery	2.5	P>Pl	A		0	0	2.5	0	0	2.5		
SW10	Nipuna stores	284 Main St, Negombo	3	Retail shop	1.5	P>F/K	A		0	0	1.5	0	0	1.5		
SW11	New Colombo Stores	306A Main St, Negombo	4	Stationery	3	Pl>P>F	B		0	0	3	0	0	3		
SW12	Monika grinding mills	18 Croos Rd, Negombo	2	Spices	1.5	P>Pl>F	B		0	0	1.5	0	0	1.5		
SW13	Central Medical Stores	45D Croos Rd, Negombo	5	Pharmacy	3	P>F>Pl	B		0	0	3	0	0	3		
SW16	New Centre Café	Custom Rd, Negombo	4	Foods	5	F>P>Pl	C		0	0	5	0	0	5		
SW17	Corination Salon	81 Croos Rd, Negombo	7	Salon	3	In>F>P	B	G	0	0	2.9	0.1	0	3		
SW18	Preshanithi Furniture	37, Joseph St, Negombo	5	Furniture	1.5	M>Pl>P	C		0	0	1.5	0	0	1.5		
SW19	Jagath Janatha Textiles	31 Station Rd, Negombo	15	Textiles	10	Pl>P>F	C		0	0	10	0	0	10		
SW20	Sri Shoes Palace	39 Shopping Complex, Neg	3	Shoes	1.6	Pl>P	A		0	0	1.6	0	0	1.6		
SW21	Arsath Tailors	3D, Shopping Complex, Neg	2	Tailoring	3	T>Pl	A		0	0	3	0	0	3		
SW22	Shehan Communication	69 St Joseph St, Negombo	2	Commun.	0.15	P>F	B		0	0	0.15	0	0	0.15		
Large																
LW31	Main Post Office	Negombo	125	Post office	12	P>F>G	A	F	4.2	0	7.8	0	0	12	Assume 35 % OSD	
LW38	Rodrigo Stores	542 Colombo Rd, Kurana, N	1	Animal food sales	1	Pl>P	A		0	0	1	0	0	1		
SW4	Thisara enterprises	65 St Joseph Street, Negom	4	Tire sale & repair	165	R>Pl>F	A		0	0	165	0	0	165		
SW14	Thaufik hotel	191 Main Street Negombo	NA	Café/hotel	40	F>In>P	B	J	0	0	40	0	0	40	T&M study: 1HB/d	
SW15	Calton Sweet House	228A Greens Rd Negombo	NA	Café/hotel	96	F>P>Pl	D	G	0	0	96	0	0	96	T&M: 5 bl pl bags	
SW2	Kaushalya hotel	75 Rajapakha Broadway Rd	NA	Café/hotel	30	F>P>Pl	B		0	0	30	0	0	30		
LW22	Sherree Land Restaurant	74 Ethukala, Negombo	10	Café/hotel	80	F>G>Pl	C, F	G	24	0	54	2	0	80	Assume 30 % OSD	
SW3	New Selwaraj Cafe	141 Greens Rd, Negombo	13	Café/hotel	100	F>P>Pl	D	G	0	0	88.3	11.7	0	100	T&M study: 3-4HB/d	
SW9	Hotel Pasgorasa	65 Kroose Rd, Negombo	8	Café/hotel	20	F>P>Pl	D		0	0	20	0	0	20		
SW40	Green Land Hotel	28 Old Halawatha Rd, Neg	8	Café/hotel	30	F>P>Pl	D		0	0	30	0	0	30		
SW1	Alagappa Hotel	1513 T. Kroose Rd, Negom	3	Café/hotel	10	P>F>In	D	G	0	0	7	3	0	10		
SW3	Hotel Renuka	10 Greens Rd, Negombo	8	Café/hotel	20	P>F	D		0	0	20	0	0	20	T&M study: 1HB/d	
	Total				669.25		0		28.2	0.0	616.3	24.7	0.0	669.3		
									Disp %	4.2	0.0	9.3	3.7	0.0	100.0	

Notes:

- Recycling data (from small and large waste generator surveys):
 - a. SW1 (National Savings Bank) recycles ~ 275 kg/mth of paper = 9.0 kg/d = 90% of SW1 waste generation - too high - assume paper recycling = 80 % of generation
 - b. SW17 recycles 2kg/mth of bottles = 0.07 kg/d
 - c. SW18 recycles 4 tins mthly - assumed negligible
 - d. LW22 recycles 10 pl containers & 20 pl bottles/mth; 25kg/mth gl bottles - assume 60kg/mth total = 2 kg/d
 - e. LW34 gives away 350kg/mth of food/kitchen waste for animal food = 11.7 kg/d
 - f. LW41 gives away 90kg/mth of food/kitchen waste for animal food = 3 kg/d
- Commercial waste generation calculated as follows:
 - a. From survey data, WGRs= 3.6 kg/shop.d (SWGS); 59.3 kg/enterprise.d (LWGS, comm); 47.3 kg/enterprise.d (hotels); overall avg = 22.3 kg/enterprise.d
 - b. Total no of business licences = 2086
 - less markets = 562 (excluding Lellama Fish market as this is a cooperative which is assumed to have one business licence)
 - less tourist hotels = 25
 - Less industries 139
 - No of comm enterprises not covered by other categories 1360
- From business licence data:
 - No of bakeries, pastry shops, hotels, cafeterias, restaurants = 123 @ 47.3 kg/enterprise.d = 5.82 T/d
 - No of very large enterprises with high WGR as per survey = 40 @ 59.3 kg/enterprise.d = 2.37 T/d
 - Supermarket, Greens Rd (see survey data below) = 184 @ 8.7 kg/stall.d = 1.60 T/d
 - No of small enterprises = remaining places 1013 @ 3.6 kg/enterprise.d = 3.67 T/d
- Tractor load data indicates an average of 9 4WT loads/d from Bazaar I + II areas and 3 from Kochchikade area = 12 4WT loads/d = 19.2 T/d
 - Subtracting market waste in these areas of 3.04 T/d (Bandula mkt, Dudley Senanayake Central mkt, Kochchikade central mkt) gives a total of 16.16 T/d
 - Assuming the non-market garbage from these areas contains 50 % commercial waste, comm waste generation = 8.08 T/d
- Adopting the higher of these two estimates gives comm waste generation = 13.47 T/d or 8.4 Tr loads/d, equivalent to a WGR of 9.60 kg/business.d (if average is taken, commercial waste as % of total waste is only 8%, while using the higher value gives comm waste % of 10%, which is considered more reasonable)

b. Markets

ID	Name	Address	No of stalls				Stalls			WD (kg/d)	WDR kg/stall.d	Main wastes	Recy	LA colln	ID	Notes
			Meat/Fish	Veg/Fruit	Goods	Other	Retail	W/sale	Total							
Fish/meat and vegetable																
MN1	Lellama Fish Market	Negambo South Fisheries	400	0	0	0	300	100	400	2000	5.00	M/F > PI	100	0	2000	1-3T/d disposed into lagoon
MN2	Bandula Market	237/1, Main St, Negambo	79	80	7	1	NA	NA	167	640	3.83	F>CB>P	3	640	0	
MN3	Dudley Senanayake Central Mkt	Negombo	0	100	60	4	NA	NA	164	800	4.88	F>CB>P	0	800	0	
MN5	Fish Market	Wella Veediya, Neg	125	30	3	15	NA	NA	173	20	0.12	M/F>PI	0	5	15	
MN6	Kochchikade Central Market	Kochchikade	24	11	8	15	NA	NA	58	1600	27.59	F>M/F	0	1600	0	
	Sub-total		628	221	78	35	300	100	962	5060	5.26					
Pola																
							Stalls	kg/pola.d	Eq no	Eq WG						
MN7	Kamachchodae pola	Negombo	23	300	300	5	628	6400	179	1829	10.19	F>M/F>CB	0	1829	0	Sun/Wed
	Green Rd (night pola)	Greens Rd, Neg	0	100	350	0	450	4000	64	571	8.89		0	571	0	Sat: 8am-11pm
	Kochchikade Pola	Kochchikade					325	3200	46	457	9.85		0	457	0	Sun: 4am-2pm
	Munnakkaraya Pola	Munnakkaraya		10			10	99	10	99	9.91		0	99	0	Small, daily
	Aliya pola	Munnakkaraya		23			23	528	23	528	23.47		0	528	0	Daily, fish/vege
	Sub-total		23	433	650	5	1436	14227	323	3484	10.80					Total
			651	654	728	40			1285	8544	6.65		103	6529	2015	8647
	Retail										%		1.19	75.61	23.30	100
MN4	Super Market	Greens Rd, Negombo	0	0	116	68	NA	NA	184	1600	8.70	PI>CB>P	5	1595		Mainly retail - excl from above

Notes: In this case, FK = vegetable/fruit waste/leaves, coconut shells, etc.

Overall WGR = 6.73 kg/stall.d

1. NMC slaughterhouse is very small, with only 1-2 people slaughtering animals here daily (most meat is brought into the city from outside). Hence, slaughterhouse waste generation is assumed negligible.

2. Blue shaded data from supervisor interview survey or from NMC PHIs

Estimating waste discharge:

a. Bandula mkt - survey waste disch. = 0.25 Tr/d but during T&M, WD = 0.33 Tr/d and NMC lab'rs said usually >, sometimes as high as 1 Tr/d + there is also another CP on the other side of the mkt where some mkt waste is discharged. For these reasons, assume 0.4 Tr/d @ 1.6 T/load

b. Supermarket, Greens Rd: 1 Tr/d @ 1.6 T/load = 1.6 T/d

c. Kochchikade Central mkt: 1 Tr/d @ 1.6 T/load = 1.6 T/d

d. Kamachchodae pola: 4 Tr/d @ 1.6 T/load = 6.4 T/pola on 2 d/wk = 1.83 T/d (avg)

e. Green Rd night pola: 2.5 Tr/d @ 1.6 T/load = 4.00 T/pola on 1 d/wk = 0.57 T/d (avg)

f. Kochchikade pola: 2 Tr/d @ 1.6 T/load = 3.20 T/pola on 1 d/wk = 0.46 T/d (avg) for average of 325 stalls (300-350)

g. Munnakkaraya Pola: assume WG = stalls x avg pola WGR @ 9.91 kg/stall.pola gives 0.10 T/pola on 7 d/wk = 0.10 T/d

(calculated from average pola WGR = 14128 kg/pola from 1426 stalls) 7 d/wk = 0.53 T/d for average of 22.5 stalls (20-25)

h. Aliya pola: Sup'r 0.5Tr/d reduced to 0.33 Tr/d @ 1.6 T/load = 0.53 T/pola on

i. Average mkt WGR based on normal markets + pola stalls, where pola stalls and WG expressed in terms of equiv no of stalls/d and kg/d, based on no of days/wk of operation

3. Recycling based on:

a. Lellama mkt recycles 3000 kg/mth of fish waste = 100 kg/d for animal feed (mainly crab farm)

b. Bandula mkt - a piggery farmer comes to the market 4-5 times per mth to collect pig food - approx 50kg/mth = 2.5 kg/d

c. Super Market recycles 150 kg/mth of c/board = 5 kg/d

c. Hotels

No	Hotel	Address	Avg no of staff	Avg Guests	WG (kg/d)	WGR (kg/G+St)	Waste Types	Disposal methods		Waste Stream Data							
								Main	Other	OSD	Comp	LA colln	Recy	ID	DH	Total	
LW1	Rani Holiday Inn	154/9 Porutota Rd, Palagatara, Koch.	35	40	50	0.67	F>G	D, F	G	20.1	0.0	23.3	6.8	0.0	0.0	50	
LW2	Romantic Garden	232/2 Kudapaduwa, Negombo	8	12	30	1.50	F>G>GI	G	C	0.0	0.0	18.7	11.3	0.0	0.0	30	
LW3	Golden Star	163 Lewis Pl, Negombo	70	10	500	6.25	G>F>PI	G, J	D	0.0	0.0	123.0	12.3	0.0	364.7	500	
LW4	Camelot Beach	345 Lewis Pl, Negombo	80	40	500	4.17	F>G>PI	G	D	0.0	0.0	351.9	148.1	0.0	0.0	500	
LW5	Sunset Beach Hotel	5 Caron Pl, Negombo	38	10	100	2.08	F>PI>G	G, J	D	0.0	0.0	21.9	78.1	0.0	0.0	100	
LW6	Ice Bear Guesthouse	103/2 Lewis Pl, Negombo	4	2	15	2.50	G>F	C	H	0.0	0.2	14.8	0.0	0.0	0.0	15	
LW7	Windmill Beach Hotel	70 Ethukala, Negombo	10	10	30	1.50	F>P>G	D	G	0.0	0.0	27.8	2.2	0.0	0.0	30	
LW8	Browns Beach Hotel	175 Lewis Pl, Negombo	200	43	600	2.47	F>G>Hz	G, J	F, H	174.0	1.2	323.2	101.7	0.0	0.0	600	
LW9	Sunflower Beach Hotel	289 Lewis Pl, Negombo	70	40	80	0.73	F>G>P	G	C	0.0	0.0	30.0	50.0	0.0	0.0	80	
LW10	Blue Oceanic	Porutota Rd, Ethukala, Negombo	200	60	700	2.69	G>F>P	G, J	C, F, H	133.6	15.5	133.6	150.0	0.0	267.2	700	
LW11	Royal Oceanic	31 Porutota Rd, Negombo	190	50	600	2.50	G>F>P	G, J	C, E	112.5	0.0	112.5	150.0	0.0	225.0	600	
LW12	Oasis Beach Hotel	31 Porutota Rd, Negombo	8	30	60	1.50	F>P>PI	D	G	0.0	0.0	60.0	0.0	0.0	0.0	60	
LW13	Sea Garden Hotel	31 Porutota Rd, Negombo	30	10	60	1.50	G>F>P	G, J	C, H	0.0	1.3	12.6	22.6	0.0	23.4	60	
LW14	Ocean View Guesthouse	104 Lewis Pl, Negombo	3	4	10	1.43	G>F>PI	C	G	0.0	0.0	10.0	0.0	0.0	0.0	10	
LW15	Goldi Sands Hotel	Ethukala, Negombo	80	70	125	0.83	F>G	C	G, J	0.0	0.0	16.3	100.0	0.0	8.8	125	
LW16	Star Beach	83/3 Lewis Pl, Negombo	8	5	5	0.38	G>F	C	G	0.0	0.0	5.0	0.0	0.0	0.0	5	
LW17	Topaz Beach Hotel	21 Porutota Rd	20	20	60	1.50	F>G	J	D	0.0	0.0	21.0	0.0	0.0	39.0	60	
LW18	Hotel Silver Sands	229 Lewis Pl, Negombo	11	10	20	1.19	G>F>P	D	G	0.0	0.0	13.3	11.7	0.0	0.0	25	
LW19	Beach Villa	2/3 Senevirathna Rd, Negombo	6	5	10	0.91	F>G>PI	D	G	0.0	0.0	9.9	0.1	0.0	0.0	10	
LW20	Deepani Guesthouse & Hotel	189/15 Lewis Pl	12	6	10	0.56	F>G>PI	C	E, G	2.3	0.0	4.3	3.3	0.0	0.0	10	
LW21	Hotel Catamaran	209 Lewis Pl, Negombo	35	4	15	0.38	F>G>PI	C, J	G	0.0	0.0	10.0	5.0	0.0	0.0	15	
Sub-total			1118	481	3585	2.24	Waste stream %s (survey)				44.3	18	134.3	85.3	0	928	3585
							Waste stream %s (survey)				12.3	0.5	37.5	23.8	0.0	25.9	100
1	Interline Beach Hotel	Lewis Pl, Neg	13	35	54	1.12				6.6	0.3	20.2	12.8	0.0	13.9	54	
2	Silva's Beach Hotel	16, Ethukala, Neg	30	20	56	1.12				6.9	0.3	21.0	13.3	0.0	14.5	56	
3	Club Seaspray	Porutota Rd, Palugatare, Koch	20	35	62	1.12				7.6	0.3	23.1	14.7	0.0	16.0	62	
4	Seashells Hotel	Porutota Rd, Palugatare, Koch	95	40	303	2.24				32.8	1.4	99.7	100.0	0.0	68.9	303	
Total			1276	611	4059					49.7	2.0	150.7	99.4	0	104.1	4059	
Notes:			Total guests + staff =		Guests+staff/d		waste stream %s										
			Average WGR =		kg/(guests+staff).d												

- Total no of hotels = 25
- Oceanic Garden Hotel has now been renamed Club Seaspray
- Waste stream %s based on main/other disposal methods, additional survey data (LWGS, piggery) & estimated hotel waste composition (see table to right) as follows:
 - Rani Holiday Inn recycles 300 bottles/mth @ 0.66 kg ea = 6.6 kg/d
Assume all ga/pa waste goes to OSD, calculated from comp'n data: OSD = (37.4+7.8)/(100-2.3) x (50-6.6); residual = LA coll'n
 - Romantic Garden gives unspecified amt of food/kitchen waste for animal feed - assume 85 % of F/K waste in accordance with adjusted comp'n
 - Golden Star recycles 10 pl bottles/mth & 100 glass bottles/mth (~70kg or 2.3kg/d) & gives 10kg/d of F/K waste for animal food (piggery survey)
NMC said they collect 1 HC/d or _____ kg/d; remainder is direct haulage by Hotel Assn tractor
 - Camelot Beach recycles 350 plastic bottles/mth, 80kg/mth of metal and unspecified amt of food/kitchen wastes as animal feed.
Assume pl/me recycling = 350*0.1+80 = 115kg/mth or 3.8kg/d, while 65 % of F/K waste goes to animal feed in accordance with adjusted composition
 - Sunset Beach recycles 500 pl bott/mth & 1200 gl bott/mth (500x0.1+1200*0.66kg/mth) & 50kg/d of F/K waste as animal feed (piggery survey); residual = LA coll'n (see note 4)
 - Icebear Guesthouse composites 6kg/mth of food/kitchen waste = 0.2 kg/d
 - Windmill Beach hotel recycles 100 gl bottles/mth = 2.2 kg/d
 - Browns Beach recycles unspecified amt of PI (assume 50kg/mth, as per Sunset Beach), 100kg/d of F/K waste for animal feed (piggery survey), composites 30-40kg/mth of ga waste; assume Other - LA colln (see note 4) = 65 % & OSD = remainder, as per main/other disp. answers (probably, other ga+pa waste burnt on-site)
 - Sunflower beach hotel gives 50kg/d of food/kitchen waste for animal feed (piggery survey)
 - Blue Oceanic gives 150kg/d of F/K waste for animal feed (piggery survey); composites 5% F/K waste; for other, assume DH = 50 % (note 4), LA & OSD = 25 % ea
 - Royal Oceanic gives 150kg/d F/K waste for animal feed (piggery survey); for other waste, assume DH = 50 % (note 4); OSD & LA = 25 % ea
 - Sea Garden gives unstated amt of F/K waste for animal feed - assume 85 % of F/K waste as per adjusted comp'n; it also composites 5 % of F/K waste
For residual waste, assume DH = 65 % & LA coll'n = remainder, as per main/other disposal options
 - Goldi Sands gives 100kg/d of F/K waste for animal feed (piggery survey); for residual waste, assume LA = 65 % & DH = difference (see note 4)
 - Topaz - assume DH = 65 % & other = LA colln
 - Silver Sands recycles 475kg/mth of plastics, > than 15kg/d waste gen'n - increase gen'n to 25 kg/d, to be consistent with main and other disposal methods & reduce plastics recycling to 350kg/mth
 - Beach Villa recycles 20 pl bott/mth = -2kg/mth - negligible
 - Deepani GH recycles 150kg/mth of plastics = 50% of stated waste gen'n - reduce to 100kg/th & assume for other waste, LA colln = 65 %, OSD = remainder
 - Catamaran gives 5kg/d of food/kitchen waste for animal feed (piggery survey), with residual being taken by NMC to landfill
 - Seashells gives 100kg/d of F/K waste for animal feed (piggery survey) - other as per avg hotels
- For unsurveyed hotels, assume 50% of avg WGR for small hotels and avg WGR for large hotel (i.e. Seashells) + average waste stream %s except for Seashells where some data from piggery survey is available
- For LW5,8,9,10,11,21 & No 4, J = piggery farm vehicle takes residual waste to NMC collection point.
- Average no of hotel association tractor trips/d = 0.86 trips/d x _____ T/trip = 1.37 T/d; above qty = 65 % - reasonable as hotel tractor collects from 4 large hotels outside NMA and collects beachside litter/garbage. Assume remaining hotel assn tractor tonnage comprises 1HC/d of beach litter = 12.3 kg/d & 20.4 kg/d from hotels outside NMA

	Galle Wt %	Negomb WAR	Adj'd Comp
F/K	93.4	48.5	44.4
Ga/Wd	2.4	43.5	37.4
Pa/Cd	2.8	18.5	7.8
PI	0.4	18.5	7.4
GI	0.3	6	2.3
Me	0.3	0.5	0.3
Te	0.2	0	0.2
In	0.2	0.5	0.2
Total	100		100

- Notes:
- WAR = weighted average rank based on survey data with a "Y" answer being allocated a score of 0.5
 - Adjusted comp'n based on:
 - Reduce F/K by 49 %
 - Incr Ga/Wd by 35 %
 - Increase Pa by 5 %
 - Increase PI by 7 %
 - Increase GI by 2 %

d. Industries

1. Surveyed Industries (excluding sawmills)

Surveyed Industries	Address	Type	No of Staff	SW Gen (kg/d)	Main 3 wastes	Waste disposal		Waste disposal					Total	
						Main	Other	OSD	Comp	LA colln	Recy	ID		
LW35 St Regis Packing Factory	173 Walihena Rd, Daluwak	Paper bag manuf	200	110	P>M>F	G	E	43.3	0	0	66.7	0	110.0	
LW36 Enrich Electrical Industry	50 St Lazaras Rd, Negomb	Bulb covers manuf	10	3	Pl>G>I>G	C	G	0	0	2.6	0.4	0	3.0	
LW37 Monara Tile Factory	950, Kattuwa, Kochchikade	Tile manuf	35	70	In>F=G	J	F,G	70	0	0	0	0	70.0	
LW38 Lanka Ice Factory (Pvt.)	Baseline Rd, Daluwakotuwa	Ice manuf	28	20	G>F>P	F		20	0	0	0	0	20.0	
LW43 Viva Lanka Pvt Ltd	640/44 Colombo Rd, Kurani	Bags manuf	200	150	T>R>F	G		0	0	0	150	0	150.0	
LW44 Niantha Metlin Industry	50/20 Gamini Rd, 2nd Kurani	Welding work	8	140	M	G		0	0	0	140	0	140.0	
LW45 Metro Industries	Kochchikade	Spare parts manuf	35	120	Pl>G>F	G	A,F	10	0	10	100	0	120.0	
LW46 Silver Land Coir Mill	548/145 Colombo Rd, 2 Kurani	Coir manuf	18	5	G>F	E	F	5	0	0	0	0	5.0	
LW47 Neil Marine Boatyard	70A St Jude Rd, Negombo	Boat manuf	350	100	Gl>P>Pl	J	F,G	84.2	0.0	0.0	15.8	0	100.0	
LW48 Elsuma	Baseline Rd, Daluwakotuwa	Elec. circuits	750	1071	P>Pl>F	D	G,H	0.0	4.6	1027.9	38.5	0	1071.0	
LW49 K.M. Export Lobsters	5 Nevil de Silva Mw	Lobster exporters	4	7	Pl>G>F	A		0.0	0.0	7.0	0.0	0	7.0	
LW50 Lakray Apparels Pvt Ltd	Lake Garden, Ethukala, Negomb	Garment	40	60	T>F>P	F		60.0	0.0	0.0	0.0	0	60.0	
LW51 Asfa Garment	62 Chilaw Rd, Negombo	Garment	105	25	T>F>P	D	G	0.0	0.0	23.8	1.2	0	25.0	
LW52 T. Fernando Prawn farm	8 Milepost, Dungalpitiya, TH	Prawn farming	3	30	In>G>F	H	F,G	11.9	17.9	0.0	0.2	0	30.0	
LW53 Belden Industry	283 Kapungoda, Pamunug	Glove manuf	80	15	R>Pl>G	G	F	3.5	0	0	11.5	0	15.0	
LW54 Drycast Co	130 St Lazaras Rd, Periyam	Pellets manuf	3	25	T>P>F	J		0	0	0	0	25	25.0	
LW55 Emica Combined Pvt Ltd	160 Colombo Rd, Negombo	Plastic manuf	11	7	F>Pl>P	D	G	0	0	7	0	0	7.0	
LW56 Jerod International	Ferwood, Daluwakotuwa, K	Charcoal manuf	13	3	G>F	J		3	0	0	0	0	3.0	
LW57 B. R. Engineering	583 Pawsiya Waththe, Thalga	Plastic parts manuf	54	83	Pl>P>G	F	F,G	80.2	0.0	0.0	2.8	0	83.0	
MW6 Speed Pellets	50 Archbishop Nicholas Ma	Plastics recycling	18	5	Pl & Pa	F		5.0	0.0	0.0	0	0	5.0	
								1965	2049					
								396.1	22.5	1078.3	527.1	25.0	2049.0	

Notes:

- Codes for waste types: F = food, G = garden, T = textile, P = paper, Pl = plastic, M = metal, Gl = glass, I = inert
- Code for waste disposal: A-D = LA collection, E/F = bury/burn, G = recycle, H = compost, I = open dump, J = other
- Elsuma generates 2 tractor loads per day (small trailer) - assume 2.1 m³ vol x 300 kg/m³ = 535.5 kg/d, assuming 85 % full x 2 = 1071 kg/d
- Waste stream data, particularly recycling/composting based on:
 - LW35 recycles 15 plastic barrels/mth and 2000kg/mth of paper = 66.7 kg/d (excluding plastic barrels - reused)
 - LW36 recycles 2kg/mth of plastics & 10kg/mth of metals = 0.4 kg/d
 - LW37 recycles 5000kg/mth of broken tiles = 167 kg/d; exceeds generation - these are used to make new tiles - hence being reused - ignore
 - LW43 recycles 240kg/mth of animal feed & 3000kg/mth of text/rubb. = 108 kg/d - slightly less than generation but assume all recycled as per Q1.6 answer
 - LW44 recycles 140kg/mth of metals = 4.7 kg/d - much less than generation but as all metal waste, assume all recycled as per Q1.6 answer
 - LW45 recycles 3000kg/mth of metals = 100 kg/d - slightly less than generation - OK, assume remaining waste = 50.50 split between A & F
 - LW47 give their waste to a private contractor at about 6mth intervals for disposal at an unknown place (classified as OSD for purposes of this study) and recycle 35 plastic containers/mth, 100kg/mth of polythene bags, 100kg/mth of cardboard, 275kg/mth metal & 100 metal barrels/mth. Assuming pl and metal containers/barrels are reused, qty recycled = 15.8 kg/d; assume 75% of remaining waste is incinerated (also OSD), 25% OSD
 - LW48 recycle 1 lorry load of cardboard/mth, 0.33kg/mth metals, 400kg/mth food/kitchen waste for animal feed & compost 5-6 gunny bags/mth of garden waste + 35kg/mth other. One gunny bag is 85cm x 55cm x ~40cm (when full) = 0.187 m³. Weight of one bag = 18.7 kg, using garden waste density of 100 kg/m³ (Tchobanoglous et al) - seems reasonable. Assume large ELF lorry, measured vol = 5.71 m³ (Matale data), capable of carrying 756 kg/load, using 1.5x c/board waste density of 76 kg/m³ (Tchobanoglous; 1.5 factor added to a/c for some compaction in vehicle) & assuming lorry is 175 % full; this qty gives selling price of 2.9 Rs/kg, which is within typical range of 2-4Rs/kg - assume estimated quantity is reasonable. Total qty recycled = 38.5 kg/d; total qty composted = 4.6 kg/d
 - LW51 recycles 35kg/mth of food/kitchen wastes as animal feed = 1.2 kg/d
 - LW52 recycles 5kg/mth of food/kitchen waste for their own use (Prawn food) = 0.17 kg/d and composts unspecified quantity of piggery wastes and prawn farm ash/soil. Assume composted waste = 60% of non-recycled waste, with remainder going to OSD
 - LW53 recycles 45kg/mth of polythene bags & 300kg/mth of leather = 11.5 kg/d
 - LW54 burn their waste in another place outside their property - assume this is illegal dumping
 - LW55 recycle 1500 lids/mth, sending them to factory for remanufacture - assume this is reuse rather than recycling
 - LW57 give their waste to a private contractot at about 5yr intervals for disposal at an unknown place (classified as OSD for purposes of this study) and recycles 84 pl containers/mth & 84kg/mth of metals = 2.8 kg/mth (assuming pl containers reused); some waste is also burned on site- included in OSD amt (i.e. OSD = private contractor collection and burning)
- Total industrial waste (excluding sawmill waste) calculated as follows:
 - Total no of industries = 139 less 10 sawmills = 129 industries, including 72 welding/lathe works
 - No of industries surveyed = 20 with avg WGR of 102.5 kg/industry.d or 1.043 kg/worker.d
 - If Elsuma excluded, avg WGR = 51.5 kg/industry.d or 0.805 kg/worker.d
 - Excluding Elsuma (special case), total industrial waste generation = 3398 kg/d from 129 industries

2. Sawmills

No	Name	Location	Avg no workers	SW gen (kg/d)	Survey notes	Waste disposal					Total	
						OSD	Comp	LA colln	Recy	ID		
1	St Annes Sawmill	610 Colombo Rd, Kurana	4	135	SD burnt/sold; WC sold	38	0	0	0	98	0	135
2	St Anthonys Sawmill	225 Chilaw Rd, Kottuwa	10	195	SD/WC/B given away or sold	0	0	0	0	195	0	195
3	St Saviours Sawmill	1079 Chilaw Rd, Daluwakotuwa, Koch	9	140	SD/WC sold	0	0	0	0	140	0	140
4	Jayakodi Sawmill	140 Chilaw Rd, Kottuwa, Neg	8	280	SD/WC sold	0	0	0	0	280	0	280
5	City Timber Dealers	16 Juma Majid Rd, Periyamulla	6	75	SD given away	0	0	0	0	75	0	75
6	S. N. Sawmill	145 St Joseph St, Neg	4	143	SD/WC given away	0	0	0	0	143	0	143
7	Ranil Sawmill	2 Mingama Rd	5	415	See note 3	0	15	0	0	400	0	415
Total			46	1383		38	15	0	0	1331	0	1383.3
Disposal %						2.7	1.1	0.0	0.0	96.2	0.0	100

Notes:

- Main wastes are sawdust (SD) and woodchips (WC) with some sawmills also producing some bark (B).
- For No1, assume 50% SD (2.25T/mth) burnt (= OSD), 50% sold
- For No7, 7.5T/mth of sawdust is burnt, 4.5T/mth of woodchips are used as furnace fuel for tile making or sold (both classified as recycling); 0.45 T/mth of bark is composted
- Average sawmill waste generation = 198 kg/sawmill d or 30.1 kg/worker.d

Other known sawmills:

1	NTEC Fernando	740 Colombo Rd, Neg
2	St Annes Sawmill	229 Chilaw Rd, Kottuwa, Neg
3	St Annes Sawmill	Parakrama Rd, Kurana

Assume total sawmill waste gen'n = 282 kg/sawmill.d (10/7 x surveyed waste generation)

Assume Waste stream breakdown percentages as calculated above.

3. Summary

Name	No	Workers	WGR	Units	SW gen (kg/d)	Main 3 wastes	Waste disposal (%)					Total
							OSD	Comp	LA colln	Recy	ID	
Elsama	1	62	1.2	kg/worker	1071	P>PI>F	0.0	0.0	0.0	0.0	0.0	100.0
Sawmills	>46	>46	30.1	kg/worker	2823	SD,WC,B	2.7	1.1	0.0	0.0	96.2	100.0
Other industries	1	Unknown	0.0	kg/ind.d	6589	F>G>PI	0.0	0.0	0.0	0.0	0.0	100.0
Total	139				10483							

3. INSTITUTIONS - DETAILED INFORMATION

a. Schools

Schools	Location	Students	Teachers	Total	Hostel	Type	Notes
1 Newstead Girls School		2605	94	2699	45	1AB	1
2 Kamachchoda Muslim College		143	11	154		3	
3 Vijayarathnam Hindu College		2200	67	2267		1AB	LW25
4 St. Nicola MV, Munnakkare		1016	37	1053		2	
5 St. Marys College		2400	92	2492		1AB	LW24
6 St. Sebastian College	Wellavediya	1272	47	1319		2	
7 Bolawalana MV		1353	50	1403		1C	
8 St. Annes College	Kurana	930	36	966		1C	
9 Hanschandra MV		3937	125	4062		1AB	1
10 Vidyalkara Vidyalaya		788	25	813		2	
11 St. Josephs College		802	30	832		2	
12 Ave Maria Girls School		2875	90	2965		1AB	SG
13 St. Peters College		2480	87	2567		1AB	SG,LW26
14 Maris Stella College		2345	123	2468	30	1AB	1, SG,LW23
15 Kudapaduwa College		306	15	321		2	
16 Al Hilal College		1729	75	1804		1AB	
17 St Marys Mix College		2527	784	3311		2	
18 Kochchikade MV		567	23	590		1C	
19 Pallansena Primary School		577	21	598		3	
20 Duwana Mix School		161	10	171		3	
21 Al Farial Muslim Vidyalaya		1410	52	1462		1C	
22 Palangathure MV		196	12	208		3	
23 Eththukala Mix School		304	15	319		2	
24 St Anthonys	Daluwakotuwa	969	38	1007		1C	
25 Dalupatha MV		1167	49	1216		2	

Schools	Location	Students	Teachers	Total	Hostel	Type	Notes
26 Kottuwa Primary		123	9	132			3
27 St. Annes MV	Daluwakotuwa	894	29	923			3
28 Loyala Vidyalaya		1499	66	1565		1C	SG
29 Pitipana MV	Thalahena	1305	54	1359		1AB	LW27
30 St. Anthonys College	Mankuliya	233	13	246			2
31 Tillanduwa Primary		503	17	520			2
32 Thalahena	Thalahena	415	17	432			2
33 Duwa Primary	Thalahena	415	18	433			2
34 Baisawatta Primary	Thalahena	379	17	396			2
35 Kapungoda Primary	Thalahena	152	8	160			2
36 Dungalpitya Primary	Thalahena	217	12	229			2
37 Kapungoda Catholic PV		166	5	171			3
Total		41360	2273	43633			

Notes:

1. SP: Speed Pallets were approached by three schools asking them to teach their students about recycling.
2. Zonal Education Office data - July 2002 (teachers = recommended no)
3. SG = semi-government

Survey Results	Students	Staff	St + St	SW (kg/d)	Waste Types	Disposal		Waste Stream Data						
						Main	Other	OSD	Comp	LA colln	Recy	ID	Total	
1 Vijayarathnam Hindu College	2200	67	2267	16	P>F>G	F		15.0	0.0	0.0	0.0	0.0	0.0	15.0
2 St. Marys College	2400	92	2492	204	F>G>P	C		0.0	0.0	204.0	0.0	0.0	0.0	204.0
6 Harischandra MV	3937	125	4062	229		LA colln		0.0	0.0	228.6	0.0	0.0	0.0	228.6
2 St. Peters College	2480	87	2567	268	G>P>F	B	H	0.0	53.6	214.2	0.0	0.0	0.0	267.8
4 Maris Stella College	2345	123	2468	250	G>F>P	A	F	87.5	0.0	162.5	0.0	0.0	0.0	250.0
5 Pitipana MV	1305	54	1359	76.5	Pl>P>G	F	G	76.5	0.0	0.0	0.0	0.0	0.0	76.5
Total	14667	548	15215	1042				179	54	809	0	0	0	1042
Notes:	WGR = 0.0711 kg/(students+staff) d			Waste stream %				17.2	5.1	77.7	0.0	0.0	0.0	100.0

Notes:

1. Surveyed schools indicated in yellow + some information obtained from NMC for Harischandra College - hence included above
2. These schools represent 35 % of total NMC school + student population
3. Waste generation data:
 - a. St Marys College (JICA survey data) = 4 barrels/d @ 200 L/barrel x 300 kg/m³ = 204 kg/d (assuming 85 % full)
 - b. Harischandra MV & Stella Maris College (NMC Sup'r data) = 1 4WT/awk @ 200 L/trip = 229 kg/d - compare with survey data for Maris Stella = 250kg/d - OK - use survey data
 - c. St Peters College = 0.5 4WT/d = 2.1 m³ x 300 kg/m³ x 85 % full = 268 kg/d (assuming small trailer)
 - d. Pitipana MV = 3 HB/d @ 100 L/barrel x 300 kg/m³ = 76.5 kg/d, assuming 85 % full
4. Waste stream data
 - a. St Peters college compost an unspecified amount of their waste - as garden waste is their most common waste type, assume 20 % of all waste composted
 - b. Maris Stella - assume LA colln = 65 %, with residual waste being burnt on site (probably mainly paper and garden waste)
 - c. Pitipana recycles 3.3kg/mth of paper - negligible
5. Application of survey results to all schools
 - a. Assume calculated waste stream %s are applicable to all schools in Negombo and Kochchikade and Duwa primary school
 - b. For schools in Thalahena, other than Duwa, these do not receive a garbage collection service and hence waste disposal is entirely by OSD.

Based on these assumptions, final waste stream data is presented below:

Schools	Students + Staff			WGR (kg/S+S d)	WG (kg/d)	Waste Stream								
	Students	Staff	Total			OSD	Comp	LA colln	Recy	Ill dump	Total			
All Negombo + Koch schools + Duwa primary	38892	2165	41057	0.071	2916	501	150	2265	0	0	0	0	0	2916
All other schools in Thalahena	2468	108	2576	0.071	183	183	0	0	0	0	0	0	0	183
Total	41360	2273	43633	0.071	3099	684	150	2265	0	0	0	0	0	3099
Waste stream %s						22.1	4.8	73.1	0.0	0.0	0.0	0.0	0.0	100.0

b. Other Educational Institutes

No	Name	Location	Students	Teachers	Total	Boarders	SW gen (kg/d)	Main 3 wastes	Waste Stream						Total	Notes		
									Main	Other	OSD	Comp	LA colln	Recy			ID	
1	Don Bosco Technical college	Ethukala, Negombo	450	150	600	200	30	F>G>P	E	F, G	20	0	0	0	10	0	30.0	LW59
2	Kitunana High Education Institute	100 Main St, Negombo	600	26	626	0	25	G>F>P	A	F	8.8	0.0	16.3	0.0	0.0	0.0	25.0	LW60
3	Adventist International School	Koppera jn, Neg	400	30	430	0	8	P>G	F		8.0	0.0	0.0	0.0	0.0	0.0	8.0	
4	Science College	Thaladuwa	2000	60	2060	0	100	F>G>P	A-D		0.0	0.0	100.0	0.0	0.0	0.0	100.0	
5	Dalupotha International School	Dalupotha	200	20	220	0	2	F>G>P	F		2.0	0.0	0.0	0.0	0.0	0.0	2.0	
6	World Educational Institute	Main St, Neg	14	3	17	0	2	G>P	F		2.0	0.0	0.0	0.0	0.0	0.0	2.0	
7	Jayani Educational Institute	Neg	NA	NA	75	0	8	F>P	E/F		8.0	0.0	0.0	0.0	0.0	0.0	8.0	
8	Quikway Private School	Ave Mana Rd, Neg	70	3	73	0	5	F>G>P	C		0.0	0.0	5.0	0.0	0.0	0.0	5.0	
Total			3734	292	4026	0	180				48.8	0.0	121.3	10.0	0.0	0.0	180.0	
Notes:												27.1	0.0	67.4	4.6	0.0	0.0	100.0

- Total staff + students surveyed = 100 % of all institutes for waste stream results only - those institutes who did the complete survey shaded in yellow (Montessoris excluded)
- No of staff and students at Jayani estimated based on waste generation to be 75
- Survey data represents waste generation (i.e. total) - average WGR = 0.004 kg/(staff+students).d
- Waste stream data:
 - Don Bosco Technical College gives 300kg/mth of F/K waste for animal feed.
 - Kitunana - assume LA coll'n = 65 %, other = OSD

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))	Main waste types	Notes
					Out-patients	Clinical patients						
AMH	Ave Maria Hospital	1 Ave Maria Rd, Neg	Pvt	40	90	87	30	40	193	175	0.907	P>F>GI
DPH	Dissanayake Pvt Hospital	Negombo	Pvt	20	90	12	0	50	80	54	0.675	PI>P>G
MANH	Manthri Nursing Home	98 Chilaw Rd Neg	Pvt	9	98	120	1.7	25	156	10	0.064	P>PI>F/G
CDT	Govt Central Dispensary	Thalahena	Govt	4	0	70	100	4	174	10	0.057	G>PI>P
BHN	Base Hospital	Negombo	Govt	437	89	804	325	355	1873	509	0.272	F>PI>P
Total				510	89	1093	457	474	2473	758	0.306	

Notes:

- WDR = 0.306 kg/(patients+staff)/d - c.f. Kandy = 0.374 & Galle = 0.28 - OK

JICA survey data

Name	Main/Other	All waste (normal + HH)					Healthcare hazardous (HH) waste generation and disposal					Assumptions	
		OSD	Comp	LA coll'n	Recy	ID	Total	HH	Total	LA Coll'n	OSD		
AMH	Ave Maria Hospital	D/F	17.5	0.0	157.5	0.0	0.0	175.0	D,E	Small	small	small	Assume negligible
DPH	Dissanayake Pvt Hospital	F	54.0	0.0	0.0	0.0	0.0	54.0	E,F	0.5	0	0.5	Assume already included in OSD qty
MANH	Manthri Nursing Home	D	0.6	0.0	10.0	0.0	0.0	10.6	D,E,F	1.1	0.5	0.6	Add OSD: assume LA already counted
CDT	Govt Central Dispensary	F/E	10.0	0.0	0.0	0.0	0.0	10.0	E,F	0.1	0	0.1	Assume already included in OSD qty
BHN	Base Hospital	D	90.0	0.0	509.3	33.2	0.0	632.5	F	90	0	90	Add OSD
Total			172.1	0.0	676.8	33.2	0.0	882.1		91.2	0.5	90.7	
	Waste stream %		19.1	0.0	77.4	3.8	0.0	100.0					

Notes:

- Codes: A-D = LA/contr'r coll'n; E/F = burn/bury; G = recy; H = comp; I = incinerate; J = open dump; K = other
- Waste stream assumptions:
 - For AMH, LA coll'n = 90 % (consistent with observations made during T&M study); other = OSD; brown gl bottles put to one side for weekly collection but not recycled
 - BHN recycles an additional 997kg/mth of plastics, cardboard, glass bottles, metals and coconut shells
 - From hospital survey, estimated hazardous healthcare waste generation and disposal is summarised in right hand side of above table
- Hospital WGR = 0.306 kg/(patients+staff).d

d. Government Institutions

No	Name	Address	Avg workers	Main 3 wastes	SW Gen (kg/d)	Disposal methods		OSD	Comp	LA coll'n	Recy	ID	Total	Notes
						Main	Other							
1	Divisional Secretariat		58	G>F>P	6	F		6	0	0	0	0	6	LW61
2	Zonal Educational Office	Negombo	92	G>P>F	5	A	F	1.75	0	3.25	0	0	5	LW32
3	Veterinary Service Office	Udayathoppuwa Rd, Neg	8										6	Perm, 2 temp
4	Fisheries Extension Office	Thaladuwa Rd, Neg	30											
5	Court Complex	Negombo	155	G>P>F	10	F	D	6.5	0	3.5	0	0	10	LW33, Note 1
6	Sri Lanka Customs Office	Beach Rd, Neg	12											
7	Negombo Multi-purpose Coop Soc	558 Main St, Neg	220											
8	District Land Registration Office	Main St, Neg	28											
9	Probation Office	Main St, Neg	9											
10	Local Revenue Office	Main St, Neg	40											
11	Coconut Development Board	Negombo	30											Incl 17 field
12	Fisheries Training Centre	Beach St, Neg	25											
13	NSWDB	Kimbulapitiya Rd, Neg	55											Incl 10 field
14	MC Main Office, Negombo		489	G>F>P	100	B	F	35	0	65	0	0	100	LW30 Incl in Negombo staff
15	MC Sub-Office, Kochchikade	Kochchikade												
16	MC Sub-Office, Thalahaena	Thalahaena	6											
17	Peoplised Transport Service	St Lazarus Rd, Neg	120											
18	Police Superintendent Office	Thelwatta Jn, Neg	50	P>F>G	5	F		5	0	0	0	0	5	
19	Excise Office	Colombo Rd, Neg	17											
20	Labour Office	Old Chilaw Rd, Neg	40											
21	RDA	Lewis Pl, Neg	150											
22	Provincial RDA	Lewis Pl, Neg	27											Incl 10 field
23	Regional Engineering Office	Lewis Pl, Neg	20											
24	Police Station	Negombo	242	G>F>P	35	F		35	0	0	0	0	35	LW28
25	Police Station	Kochchikade	45	F>P>G	10	A-D	G	0	0	6	4	0	10	Also 7 inmates
	Sub-total		1998		171			89	0	78	4	0	171	
26	Prison	Main St, Negombo	260	F>G>In	536	G		62.2	0.0	46.8	2.3	0.0	100	LW29, 116 inmates

Notes:

1. Worker numbers obtained from individual places, either by telephone or survey
2. Court complex includes high, district, labour, family and primary courts
3. Waste stream data
 - a. For Zonal Education office, assume LA coll'n = 65 %; other waste = OSD
 - b. Court complex - assume OSD = 65 %; other waste = LA coll'n
 - c. MC Main Office, assume LA coll'n = 65 %; other waste = OSD
 - d. Kochchikade police station gives its F/K waste to a piggery - assume 40 % of total waste
 - e. Prison generates around 1T/d of garbage = 0.536 T/d from 250 workers & 115 inmates, all of which it gives away to a farmer. avg WGR = 1.47 kg/(staff+inmates) d
 - f. Prison tonnage calculated as 2.1 m3 (small trailer) x 300 kg/m3 x 85 % full = 536 kg
 - f. Total no of workers at surveyed places = 1131 or 58 % of total. This gives a WGR of 0.151 kg/worker.d
 - g. Total estimated waste generation = 297 kg/d

e. Religious Institutes

Name	No	No of "workers"
Buddhist	6	30
Hindu	3	9
Mosques	4	12
Churches	22	86
Total	35	137

Notes:

1. Waste stream data based on:
 - a. buddhist institutes - average of 4 monks @ 5 places + 10 @ Sri Madanakara seminary
 - b. Hindu kovil - average of 3 clergy at each place
 - c. Mosque - average of 3 clergy at each place
 - d. Churches - average of 3 clergy at each place + 20 at misc places due to predominantly christian nature of Negombo
2. Assume average WGR = 1.01 kg/clergy.d, with OSD = 20 % and LA coll'n = 40 %, based on data for Matale and Kandy
3. NMC Supervisors indicated that church waste generation is only significant on festival occasions.

4. OTHER WASTE

Other	Location	SW (kg/d)	Notes
Parks	Rajapaksha Udyanaya	246	Area = 2ha; MC (Works) clean - 1 Sup'r, 7 Labr's; 2HC/d to Kochchikade disposal site
	Beach Park	123	Area = 0.2ha; Constructed by UDA - handed over to MC 26/8/02; MC (Works) clean - 1 Sup'r, 3 Labrs
	Total		
Roads and Drain Cleaning		Length (km)	
Roads		116	1139
Drains		105	1139

Notes:

- Waste stream data based on:
 - Rajapaksha Park - 2HC/d @ ██████████ kg/HC to final disposal site
 - Beach Park - assume 1HC/d, based on Rajapaksha Park data, as although this park is much smaller, a lot of people visit it, especially during the evenings, weekends and holidays
 - Estimated total length of roads = 101 km in Negombo + Kochchikade (NMC Roads, Drains and Bridges Summary + 15 km in Thalahaena) (12km long main road + allow for another 3km mainly in Duwa area)
 - Average road sweeping waste estimate = 49.1 kg/km.d from three other JICA studies in Poland, Honduras and Dar-es-salaam
 - Assuming that 20 % of all roads are swept daily, total waste gen'n = 1139 kg/d
 - Estimated total length of drains = 98 km in Negombo + Kochchikade (NMC Roads, Drains and Bridges Summary + 7 km in Thalahaena) (based on partial drainage along 12km long main road + allow for another 3km mainly in Duwa area)
 - Assuming drain cleanings are of similar magnitude to road sweepings = 1139 kg/d
 - In comparison, Kandy IDP waste = 3.5 T/d, based on recorded data: Negombo total = 2.3 T/d or 19 HC/d, each HC doing 0.77 km/d
- This is considered reasonable as Kandy has a lot more labourers dedicated to IDP works, while Negombo has only 30 handcarts which are used for garbage collection, drain and street cleaning (Topography in Kandy is also more hilly + higher rainfall, probably resulting in more sediment being produced)

5. WASTE STREAM ESTIMATION

Waste Source	Waste Generation Rate (WGR)		No	Gen'n (T/d)	Sub-total		OSD Disp	Comp	LA colln	Recycle	ID	DH	Total (check)	Notes
	WGR	Units			(T/d)	(%)								
Households	0.624	kg/cap.d	146864	91.58	91.58	67.3	44.80	5.47	28.41	3.07	9.82	0.00	91.58	1
Commercial	9.90	kg/business.d	1360	13.47	13.47	9.9	0.57	0.00	12.40	0.50	0.00	0.00	13.47	2
Markets	6.73	kg/stall.d	1285	8.65	8.65	6.4	0.00	0.00	6.53	0.10	2.02	0.00	8.65	3
Hotels	2.15	kg/(guests+staff).d	1887	4.06	4.06	3.0	0.50	0.02	1.51	0.99	0.00	1.04	4.06	4
Institutions														
a. Schools	0.071	kg/(students+staff).d	43633	3.10			0.68	0.15	2.27	0.00	0.00	0.00	3.10	5
b. Other Educ inst.	0.044	kg/(students+staff).d	4101	0.18			0.05	0.00	0.12	0.01	0.00	0.00	0.18	6
c. Hospitals	0.356	kg/(patients+staff).d	2475	0.88			0.17	0.00	0.68	0.03	0.00	0.00	0.88	7
d. Govt offices + Police	0.151	kg/worker.d	1966	0.30			0.16	0.00	0.14	0.01	0.00	0.00	0.30	8
e. Prison	1.467	kg/(worker+inmate).d	365	0.54			0.00	0.00	0.00	0.54	0.00	0.00	0.54	9
f. Religious	1.01	kg/clergy.d	137	0.14	5.13	3.8	0.03	0.00	0.11	0.00	0.00	0.00	0.14	10
Industries														
a. Eisuma	1.428	kg/worker.d	750	1.07			0.00	0.00	1.03	0.04	0.00	0.00	1.07	11
b. Sawmills	282.3	kg/sawmill.d	10	2.82			0.08	0.03	0.00	2.72	0.00	0.00	2.82	12
c. Other industries	51.5	kg/industry.d	128	6.59	10.48	7.7	2.67	0.12	0.34	3.29	0.17	0.00	6.59	13
Other														
a. Parks	0.37	T/d		0.37			0.00	0.00	0.37	0.00	0.00	0.00	0.37	14
b. Hotel Association beach litter	0.12	T/d		0.12			0.00	0.00	0.00	0.00	0.00	0.12	0.12	15
c. Road and drain cleaning	2.28	T/d		2.28	2.77	2.0	0.00	0.00	2.28	0.00	0.00	0.00	2.28	16
Total	0.93	kg/cap.d	146864	136.13	136.13	100.0	49.70	5.79	56.18	11.30	12.01	1.16	136.13	
Recycling from discharge									0.00	0.00				17a
Recycling from collection									-0.05	0.05				17b
Recycling from central city transfer station									-0.25	0.25				17c
Adjusted totals					Adjust =	2.95	49.70	5.79	55.88	11.59	12.01	1.16	136.13	
Direct haulage to landfill from outside NMA	0.20	T/d		0.20	0.20		0.00	0.00	0.00	0.00	0.00	0.20	0.20	18
Adjustment to final disposal amount									-2.95		2.95			19
Disposal to landfill from within and outside NMA (labourer survey data)									52.93			1.37		20
Recycling from final disposal									-0.14	0.14				17d
Recycling from illegal dumps									0.04	-0.04				17e
Revised total				136.34	136.34		49.70	5.79	52.79	11.77	14.92	1.37	136.34	

Notes:

- Household WGR was determined from Kandy, Matale & Negombo WACS data while waste stream %s were calculated using household survey data and taking into account service coverage, which gave the following %s:
- Commercial waste generation calculated from interview survey results and other data collected.
- Market waste generation calculated from interview survey results and other data collected - see details above.
- Hotel waste stream data calculated using interview and piggery survey results - see calculations under hotel data.
- 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
- Other educational institutes waste stream data calculated from interview survey results - see calculations under institute data
- Hospital waste stream data calculated from interview survey results - see calculations under hospital data; assumed recycling figure includes recycling going to middlemen
- Govt offices + Police calculated based on no of workers and estimated WGR (obtained using limited data); includes police as no separate Forces category in this case.
- Prison specified as separate category due to high waste generation - see details under Govt offices + police.
- All religious institutes treated together.
- Elsuma specified separately as it has by far the highest waste generation amount.
- Sawmills waste estimated from survey interview data - see separate table.
- Other industries comprise a wide range of industries of which a representative cross-section were surveyed - see industry and supporting data.
- Parks waste comes from two parks with total waste generation estimated to be 3 HC/d - see details above.
- Hotel Association tractor beach litter estimated to be 1HC/d - see details under hotels.
- Road and drain cleaning estimated based on approx. total length of roads/drains, data from other studies, and approx. distance one HC can cover per day - see details above.
- 17a. Recycling at discharge: 0.00 T/d, assumed negligible due to high at source recycling (collectors/direct to shops) + very few scavengers seen collecting recyclables after discharge
- 17b. Recycling during collection: 0.049 T/d, from collection worker's survey data
- 17c. Recycling from transfer station: 0.250 T/d, from interviews with one scavenger at transfer station during time and motion study
- 17d. Recycling at landfill: 0.138 T/d, from disposal site survey, CPHI comments and estimated recycling rates.
- 17e. Recycling from illegal dumps: 0.038 T/d, pro rata from illegal dumping amt/total waste disposal to landfill
- Direct haulage to landfill from outside NMC relates to the Hotel Association tractor collecting garbage from 4 hotels outside NMA.
- Illegal dumping amount adjusted to account for difference between estimated collection+direct haul amount and measured landfill disposal amounts
- NMC Labourer landfill survey gave a total of 52.93 T/d by NMC tractors

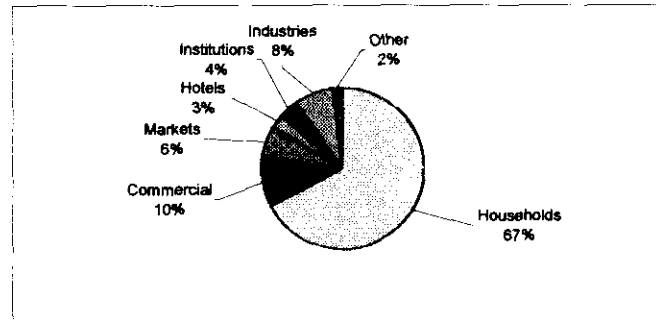
%	36.5	4.2	36.7	8.6	10.9	1.0	100.0
Method	OSD	Comp	Disch	Recy	ID	DH	Total
%	48.0	6.0	31.0	3.4	10.7	0.0	100.0

% details on separate sheet

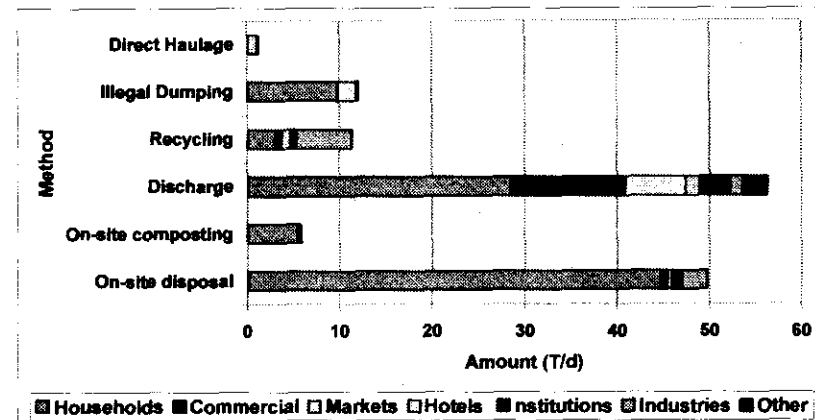
S15

Data for Waste Generation by source graph

Waste Source	Generation (T/d)
Households	91.6
Commercial	13.5
Markets	8.6
Hotels	4.1
Institutions	5.1
Industries	10.5
Other	2.8
Total	136.1



Waste Source	On-site disposal	On-site comp	Discharge	Recycling	Illegal Du	Direct Haul	Total
Households	44.80	5.47	28.41	3.07	9.82	0.00	91.58
Commercial	0.57	0.00	12.40	0.50	0.00	0.00	13.47
Markets	0.00	0.00	6.53	0.10	2.02	0.00	8.65
Hotels	0.50	0.02	1.51	0.99	0.00	1.04	4.06
Institutions	1.09	0.15	3.31	0.59	0.00	0.00	5.13
Industries	2.75	0.16	1.37	6.05	0.17	0.00	10.48
Other	0.00	0.00	2.65	0.00	0.00	0.12	2.77
Total	49.70	5.79	56.18	11.30	12.01	1.16	136.13
%	36.5	4.3	41.3	8.3	8.8	0.9	100.0



Business Centres within NMC

No	Type	Original	Revised				Adopted
			Neg	Koch	Thal	Tot	
1	Tea or coffee shops	22	77	32		109	109
2	Cool drinks	10	28		1	29	29
3	Rice shops	17	13	4	2	19	19
4	Bakery	10	23	12		35	35
5	Groceries	37	85	24		109	109
6	Motor work shop	1	1			1	1
7	Jewelry	1	2			2	2
8	Laundry	9	11	2		13	13
9	Television/radio repair	7	13		2	15	15
10	Battery service centres	5	4			4	5
11	Lime kilns	4				0	4
12	Gas stores	12	14		4	18	18
13	Blasting chemicals storage	6				0	6
14	Salons	26		19		19	26
15	Video centres	23	21			21	23
16	Local/foreign liquor wholesale	3				0	3
17	Plastic shops	11	9			9	11
18	Ice cone production	7			1	1	7
19	Boat engines	4				0	4
20	Tyre, tube vulcanizing	5	10			10	10
21	Pastry shops	15	33	3		36	36
22	3wheeler/motorcycle service	3				0	3
23	Retail goods	2	270	153	130	553	553
24	Vehicle Repairs	1				0	1
25	Injector pump repairs	1	1			1	1
26	Fish exporters/sales	1			1	1	1
27	Vehicle gas	1				0	1
28	Iron grill work	5				0	5
29	Hardware	9	44	9		53	53
30	Vehicle electric works	2	1			1	2
31	Air condition works	4	4			4	4
32	Confectionery	1	1	2		3	3
33	Coconut oil stores	3	3			3	3
34	Dessicated coconut prod'n	1	1	1		2	2
35	Tobacco stores	13	7			7	13
36	Cigarette wholesale dealers	1	1			1	1
37	Cigar production	1			1	1	1
38	3wheeler/motorcycle repairs	16		11		11	16
39	Vehicle service centres	5		2		2	5
40	Welding works	4	29	19		48	48
41	Printers (manual)	1				0	1
42	Printers (machinery)	15				0	15
43	Ironworks (blacksmith)	2				0	2
44	Boat manuf./boatyard	3	3			3	3
45	Electric items	12	12	6		18	18
46	Paint shops	9	8	2		10	10
47	Recycling places	7	4	3		7	7
48	Timber depot	17		4	3	7	17
49	Firewood	3	5	1		6	6
50	Sawmills	1		3		3	3
51	Coir products	3	3			3	3

Cafeterias

No	Name	Address
1	A.S.M. Hamsir	No 28, Chilaw Rd Negambo
2	K. Jude Rodney Fernando	No 11, Ave Maria Rd, Negambo
3	Anita Malani Fernando	No 84, St. Joseph St Negambo
4	A.W.M. Elliyar	No 49/A, Mirigama Rd Negambo
5	K. Selvaraj	No 141, Green St Negambo
6	Sampath Perera	No 3349/B, Main St, Negambo
7	Ajith Abeygunawardena	No, 115 Rajapakse Broadway, Neg
8	U.L. Nisam	No 400, Main St, Negambo
9	Siril Fernando	No 374, Main St, Negambo
10	J.G. Wikramaratne	No 12, Leo de Croos Rd, Negambo
11	A.G.S.S. Gunaratne	No 215, A.N.M. Mawatha
12	M.A. Asis	No 191, Main St, Negambo
13	Ovithalage Magrethami	No 193, Thaleduwa Rd, Negambo

Suspension

EO list had 12 - 16 OK

No	Type	Original	Revised			Tot	Adopted	
			Neg	Koch	Thal			
52	Studios	6	6	5		11	11	
53	Loudspeaker hire	1	1			1	1	
54	Ceramic goods production	1				0	1	
55	Pharmacies	33	30	8	1	39	39	EO list had 1 - OK
56	Eastern medicine	6	5	1		6	6	
57	Metal crusher	1	1			1	1	EO list had 10 - OK
58	Cooldrink Store(WS)	2				0	2	
59	Carpentry shops	10		2	4	6	10	
60	Radio shop	1				0	1	
61	Ceramic sellers	5	3			3	5	
62	Old tyres & tube storage	2				0	2	
63	New tyres & tubes storage	2				0	2	
64	Tailors	41	46		1	47	47	
65	Construction items	6				0	6	
66	Vehicle painters	12	7			7	12	
67	Garment	5				0	5	EO/PHI lists give total of 44 - OK
68	Tourist hotels		9			9	9	
69	Guest houses & cafeterias		41	3		44	44	
70	Restaurants		2	2	4	8	8	
71	Animal Foods		4	2		6	6	
72	Printers		17	2		19	19	
73	Boat repairing		10			10	10	
74	Wholesale food items		8	1		9	9	
75	Pvt Hospitals		3			3	3	
76	Pantry Cupboards		5			5	5	
77	Coop/self service institutes		10			10	10	
78	Meat/chicken shops		18	3	1	22	22	
79	Footware/Leather products		7	5		12		
80	Garage		51	5	1	57		EO list had 20
81	Furniture		15	14	1	30	30	
82	Grinders		18			18	20	
83	Fibreglass products		3	2	1	6	6	
84	Bicycle repairs		24	10	5	39	39	
85	Lathe works		22		2	24	24	
86	Communication		9			9	9	
87	Nursing homes		4			4	4	
88	Diesel/kerosene oil sales		8			8	8	
89	Poultry		8	7		15	15	
90	Funeral service		3	2		5	5	
91	Cement bricks		1			1	1	
92	Mirror		1			1	1	
93	Ice production		3	2	3	8	8	
94	Bicycle shops		1			1	1	
95	Piggery		14 (>10)		1	1	1	
96	Artificial flowers		5			5	5	
97	Vegetables and fruits		11	2	2	15	15	
98	Tea leaves		2			2	2	
99	Salt packets		1		2	3	3	
100	Fridge repairing		4			4	4	
101	Prawn breeders		3		4	7	7	
102	Prawn buying				2	2	2	
103	Supermarkets		1			1	1	
103	Markets		2			2	2	
104	Milk bar		2			2	2	
105	Cattle farm		1			1	1	

No	Type	Original	Revised				Adopted
			Neg	Koch	Thal	Tot	
106	Petrol shed		2	2		4	4
107	Electricians		1			1	1
108	Ice sellers		1			1	1
109	Three wheeler garage		3	11		14	14
110	Consultant Medical service		4			4	4
111	Iron tools manuf		4			4	4
112	Motor garage		3		1	4	4
113	Kerosene oil sellers		1		1	2	2
114	Soap producers		1			1	1
115	Iron & tin product sellers		3			3	3
116	Peanut shops		5			5	5
117	Newspapers		1			1	1
118	Cement grill producers		1	2		3	3
119	Chicken breeders		1		1	2	2
120	Bags		3			3	3
121	Chilli mills			6		6	6
122	Tiles and bricks			2		2	2
123	Cement shops			2		2	2
124	Lead sinkers (fishing)			1		1	1
125	Canteens			20		20	20
126	Bridal dress			3		3	3
127	Fisheries tools				4	4	0
128	Western medical centres				4	4	0
129	Sinhala medical centres				1	1	0
130	Dry fish				11	11	0
131	Bar				1	1	0
132	Crab collection				1	1	0
133	Fabric painting				1	1	0
134	Fish packing (in ice)				2	2	0
135	Factory				1	1	0
	Total	516	1212	439	209	1833	1884

Notes: CPHI - total = Adopted total

1. EO list had total of 53 for mechanical workshops, lathes and welding works < above total - OK

Chapter 6

Negombo Waste Collection Analysis

Jan-02

No	Vehicle	Date	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	Tot	Avg	CF	Tonnage		
		4WT Reg	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th		trips/d	T/trip	T/mth	T/d	
1	4WT	270-3228	T-19563&T-5082	4	4	4	4	2	2	4	4	4	4	2	2	2	4	4	4	4	2	2	4	4	4	4	4	2	2	2	4	4	4	104	3.4	1.89	349	6.33	
2	4WT	49-8545	T-16614&BBB	3	3	3	3	2	0	3	3	3	3	2	0	0	3	3	3	3	2	0	3	3	3	3	3	3	0	0	3	3	3	72	2.3	1.84	167	4.27	
3	4WT	270-3151	T-17027	4	4	4	4	2	2	4	4	4	4	2	2	2	4	4	4	4	2	2	5	4	4	4	4	2	2	2	4	4	4	105	3.4	1.55	356	5.25	
4	4WT	GB 4094	T-10809	3	3	3	3	2	0	3	3	3	3	2	0	0	3	3	3	3	2	0	3	3	3	3	3	2	0	0	3	3	3	71	2.3	1.45	163	3.32	
5	4WT	37-4509	T-19564	3	3	3	3	2	1	3	3	3	3	1	1	2	3	3	3	3	2	2	3	3	3	3	3	2	2	1	3	3	3	79	2.5	2.17	201	5.54	
6	4WT	49-8542	T-9662&AAA	3	3	3	3	2	0	3	3	3	3	3	1	0	0	3	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	74	2.4	1.37	177	3.27	
7	4WT	270-3152	T-13929&CCC	3	3	3	3	2	0	3	3	3	3	3	2	0	0	3	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	74	2.4	1.93	177	4.60	
8	4WT	49-8544	T-17025	3	3	3	3	2	2	3	3	3	3	2	2	2	3	3	2	2	3	3	2	2	3	3	3	3	2	2	3	3	3	83	2.7	1.55	222	4.15	
9	4WT	49-6733	T-10808	3	4	3	3	2	0	3	3	3	3	3	2	0	2	3	3	3	3	2	0	3	3	3	3	3	2	3	3	3	3	80	2.6	1.18	206	3.04	
10	Hire 4WT	37-5105	T-16615,67-806,DDD	3	3	3	3	2	0	3	3	3	3	3	2	0	0	3	3	3	3	2	0	3	3	3	3	3	2	2	3	3	3	76	2.5	1.45	186	3.55	
11	Hire 4WT	37-4543	Large trailer	3	3	3	3	2	0	3	3	3	3	3	2	0	0	3	3	3	3	2	0	3	3	3	3	3	2	2	3	3	3	76	2.5	2.17	186	5.33	
12	4WT	49-6734	T-16615	3	3	3	3	2	0	3	3	3	3	3	2	2	2	3	3	3	3	2	2	3	3	3	3	3	2	2	2	3	3	83	2.7	1.66	222	4.45	
13	4WT	37-1234	T-17026	3	3	3	3	2	0	3	3	3	3	3	2	0	0	2	3	3	3	2	0	3	3	3	3	3	2	0	0	3	3	3	70	2.3	1.52	158	3.43
14	4WT	270-3150	T-10806	3	3	3	3	2	0	3	3	3	3	3	2	0	0	3	3	3	3	2	0	3	3	3	3	3	2	0	0	3	3	3	71	2.3	1.25	163	2.85
15	4WT	270-3227	T-19680	3	3	3	3	2	2	3	3	3	3	3	2	2	2	3	3	3	2	2	3	3	3	3	3	3	2	2	2	3	3	81	2.7	2.15	222	5.75	
	Total			47	48	47	47	30	11	47	47	47	47	47	29	11	14	46	47	46	46	31	12	48	47	47	47	47	32	18	27	47	47	1201	38.7		3155	65.1	

Note: Conversion factor takes into account the trailer volume, fill factor and garbage density.

Days 31

Feb-02

No	Vehicle	Date	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	Tot	Avg	CF	Tonnage				
		Reg No	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th		trips/d	T/trip	T/mth	T/d			
1	4WT	270-3228	T-19563&T-5082	4	4	2	4	5	4	4	4	2	2	4	4	4	5	4	2	2	5	4	4	5	4	2	2	4	5	2	4			101	3.6	1.89	364	6.80
2	4WT	49-8545	T-16614&CCC	3	2	0	2	3	3	3	2	0	3	3	3	3	2	0	3	3	3	3	3	3	2	0	3	3	0	3			64	2.3	1.84	146	4.20	
3	4WT	270-3151	T-17027	4	2	2	2	5	4	4	4	2	2	4	4	4	4	4	2	2	4	4	4	4	4	2	2	4	4	2	2			91	3.3	1.55	296	5.03
4	4WT	GB 4094	T-10809	3	2	0	0	3	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3	3	0	0	3	3	0	3			60	2.1	1.45	129	3.11
5	4WT	37-4509	T-19564	3	2	2	2	3	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3	3	0	2	3	3	2	3			68	2.4	2.17	165	5.28
6	4WT	49-8542	T-9662&AAA	3	2	0	2	3	3	3	3	2	2	3	3	3	3	2	2	3	3	3	3	3	3	2	3	3	3	2	3			73	2.6	1.37	190	3.57
7	4WT	270-3152	T-13929&DDD	3	2	2	0	3	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3	3	2	2	3	3	2	3			68	2.4	1.93	165	4.68
8	4WT	49-8544	T-17025	3	2	2	2	3	3	4	3	2	2	3	3	3	3	3	2	2	3	3	3	3	3	2	2	3	3	3	3			76	2.7	1.55	206	4.20
9	4WT	49-6733	T-10808	3	2	2	0	3	3	3	3	2	0	3	3	3	3	3	2	2	3	3	3	3	3	2	0	3	3	2	3			68	2.4	1.18	165	2.86
10	Hire 4WT	37-5105	T-16615,67-806,EEE	3	2	2	0	3	3	3	3	2	2	3	3	3	3	3	2	2	3	3	3	3	3	2	2	3	3	2	3			72	2.6	1.45	185	3.72
11	Hire 4WT	37-4543	Large trailer	3	2	2	2	3	3	3	3	2	2	3	3	3	3	2	2	3	3	3	3	3	3	2	2	3	3	2	3			74	2.6	2.17	196	5.75
12	4WT	49-6734	T-16615	4	4	2	2	4	4	4	4	4	2	2	3	4	3	3	2	2	4	3	4	3	4	2	2	3	3	2	3			87	3.1	1.66	270	5.16
13	4WT	37-1234	T-17026	3	3	0	2	3	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3			68	2.4	1.52	165	3.69
14	4WT	270-3150	T-10806	3	2	0	0	3	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3			65	2.3	1.25	151	2.89
15	4WT	270-3227	T-19680	3	2	2	4	3	3	3	3	2	2	3	3	4	3	2	2	3	4	3	3	3	3	2	2	4	3	2	3			78	2.8	2.15	217	5.98
	Total			48	35	20	22	51	48	49	48	32	16	47	48	47	49	47	30	18	49	48	48	48	48	26	21	48	48	29	45			1113	39.8		3011	66.9

Note: Conversion factor takes into account the trailer volume, fill factor and garbage density.

Days 28

6-1

Mar-02

No	Vehicle	Date	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	Tot	Avg	CF	Tonnage		
	Reg No	Trailer No	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	trips/d	T/trip	T/mth	T/d		
1	4WT	270-3228	T-19563&T-5082	5	2	3	4	4	5	4	4	2	3	5	2	4	4	2	2	5	4	4	4	4	2	2	5	4	4	2	2	5	2	108	3.5	1.89	376	6.57	
2	4WT	49-8545	T-16614&CCC	3	2	0	3	3	3	3	2	0	3	2	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	2	2	2	0	70	2.3	1.84	158	4.15	
3	4WT	270-3151	T-17027	4	3	3	4	5	4	5	4	2	3	5	2	4	4	4	2	3	4	4	4	4	4	2	2	4	4	4	2	4	2	107	3.5	1.55	369	5.35	
4	4WT	GB 4094	T-10809	3	2	2	3	3	3	3	3	2	2	4	2	3	3	3	2	2	4	4	3	3	3	2	2	3	3	3	0	2	2	79	2.5	1.45	201	3.70	
5	4WT	37-4509	T-19564	3	2	0	3	3	3	3	3	2	0	4	2	3	3	3	2	0	4	3	3	3	3	2	0	3	3	3	3	2	2	75	2.4	2.17	181	5.26	
6	4WT	49-8542	T-9662&AAA	3	2	2	3	3	3	3	3	2	2	3	2	3	3	3	2	2	3	3	3	3	3	2	2	3	3	3	0	2	2	76	2.5	1.37	186	3.35	
7	4WT	270-3152	T-13929&DDD	3	2	0	3	3	3	3	3	2	2	3	2	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	2	2	2	74	2.4	1.93	177	4.60	
8	4WT	49-8544	T-17025	3	2	2	3	3	3	3	3	2	0	3	2	3	3	3	2	2	3	3	3	3	3	2	2	3	3	3	2	2	2	78	2.5	1.55	196	3.90	
9	4WT	49-6733	T-10808	3	2	0	3	3	3	3	3	2	2	3	2	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	2	0	2	70	2.3	1.18	158	2.66	
10	Hire 4WT	37-5105	T-16615,67-806,EEE	3	2	2	4	4	4	4	4	2	2	3	2	3	3	3	2	2	0	3	3	3	3	2	0	3	3	3	2	2	2	78	2.5	1.45	196	3.64	
11	Hire 4WT	37-4543	Large trailer	3	2	2	3	3	3	3	3	2	2	3	2	3	3	3	2	2	3	3	3	3	2	0	3	3	3	3	0	2	2	76	2.5	2.17	186	5.33	
12	4WT	49-6734	T-16615	3	3	2	4	3	4	3	3	2	3	3	2	3	3	3	2	2	3	3	3	3	3	3	2	3	4	4	2	2	2	87	2.8	1.66	244	4.66	
13	4WT	37-1234	T-17026	3	2	0	3	3	3	3	3	2	0	3	2	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	0	2	2	68	2.2	1.52	149	3.34	
14	4WT	270-3150	T-10806	3	2	0	3	3	3	3	3	2	0	3	2	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	2	2	3	73	2.4	1.25	172	2.93	
15	4WT	270-3227	T-19680	3	3	2	3	3	3	3	3	2	2	3	2	4	3	3	2	2	3	3	3	3	3	2	2	3	3	3	2	2	2	82	2.6	2.15	217	5.68	
Total				48	33	20	49	49	50	49	48	30	23	51	30	48	47	47	30	19	47	48	47	47	47	31	14	48	48	48	23	28	36	18	1201	38.7		3168	65.1

Note: Conversion factor takes into account the trailer volume, fill factor and garbage density.

Days 31

Apr-02

No	Vehicle	Date	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	Tot	Avg	CF	Tonnage			
	Reg No	Trailer No	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	trips/d	T/trip	T/mth	T/d			
1	4WT	270-3228	T-19563&T-5082	5	4	4	4	4	2	2	4	4	4	4	2	4	4	4	4	4	4	2	2	4	4	4	4	2	2	2	5	4		104	3.5	1.89	361	6.54	
2	4WT	49-8545	T-16614&CCC	3	3	3	3	3	2	0	3	3	3	0	0	3	3	3	3	3	3	2	0	3	3	3	3	0	2	0	3	3		69	2.3	1.84	159	4.23	
3	4WT	270-3151	T-17027	4	4	4	4	4	2	2	5	4	4	4	4	2	2	5	4	4	4	4	2	2	4	4	4	4	2	2	2	3	3		102	3.4	1.55	347	5.27
4	4WT	GB 4094	T-10809	3	3	3	3	3	2	2	3	3	3	3	0	0	3	3	3	3	3	2	2	3	3	3	3	0	2	2	3	3		75	2.5	1.45	188	3.63	
5	4WT	37-4509	T-19564	3	3	3	3	3	2	2	3	3	3	3	2	2	3	3	3	3	3	3	2	0	3	3	3	3	2	2	2	3	3		79	2.6	2.17	208	5.73
6	4WT	49-8542	T-9662&AAA	3	3	3	3	3	2	0	3	3	3	3	3	2	2	3	3	3	3	3	2	2	3	3	3	3	0	2	0	3	3		75	2.5	1.37	188	3.42
7	4WT	270-3152	T-13929&DDD	3	3	3	3	3	2	2	3	3	3	3	0	0	3	3	3	3	3	3	2	0	3	3	3	3	2	2	0	3	3		73	2.4	1.93	178	4.69
8	4WT	49-8544	T-17025	3	3	3	3	3	2	0	3	3	3	3	0	0	3	3	3	3	3	2	2	3	3	3	3	2	2	2	3	3		75	2.5	1.55	188	3.87	
9	4WT	49-6733	T-10808	3	3	3	3	3	2	0	3	3	3	3	3	0	0	3	3	3	3	3	2	0	3	3	3	3	0	2	2	3	3		71	2.4	1.18	168	2.78
10	Hire 4WT	37-5105	T-16615,67-806,EEE	3	3	3	3	3	2	0	3	3	3	3	3	1	0	3	3	3	3	3	3	2	3	3	3	3	3	2	2	3	3		78	2.6	1.45	203	3.76
11	Hire 4WT	37-4543	Large trailer	3	3	3	3	3	2	2	3	3	3	3	2	0	3	3	3	3	3	3	2	2	3	3	3	3	3	3	2	3	3		81	2.7	2.17	219	5.87
12	4WT	49-6734	T-16615	4	4	4	4	4	2	2	4	4	4	4	4	2	2	4	4	4	4	4	2	2	4	3	4	4	2	2	2	4	4		101	3.4	1.66	340	5.59
13	4WT	37-1234	T-17026	3	3	3	3	3	2	0	3	3	3	3	0	0	3	3	3	3	3	3	2	0	3	3	3	3	0	2	0	3	3		69	2.3	1.52	159	3.50
14	4WT	270-3150	T-10806	3	3	3	3	3	2	0	3	3	3	3	0	0	3	3	3	3	3	3	2	0	3	3	3	2	0	2	0	3	3		68	2.3	1.25	154	2.82
15	4WT	270-3227	T-19680	4	4	4	4	4	2	2	3	3	3	3	0	2	3	3	3	3	3	3	2	2	3	3	3	3	2	2	2	3	3		84	2.8	2.15	235	6.01
Total				50	49	49	49	49	30	16	49	48	48	48	13	12	49	48	48	48	48	31	18	48	47	48	47	20	31	20	48	47		1204	40.1		3292	67.7	

Note: Conversion factor takes into account the trailer volume, fill factor and garbage density.

Days 30

6-2

May-02

No	Vehicle	Date	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	Tot	Avg	CF	Tonnage		
	Reg No	Trailer No	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F	Sa	Su	M	Tu	W	Th	F		trips/d	T/trip	T/mth	T/d	
1	4WT	270-3228	T-19563&T-5082	2	5	4	2	2	4	4	4	4	4	2	2	4	5	4	4	4	2	2	4	4	4	4	2	2	2	2	4	4	4	4	106	3.4	1.89	362	6.45
2	4WT	49-8545	T-16614&CCC	0	3	3	3	0	3	3	3	3	3	0	0	3	3	3	3	3	2	0	3	3	3	3	3	0	0	0	3	3	3	3	68	2.2	1.84	149	4.03
3	4WT	270-3151	T-17027	2	4	4	2	2	4	4	4	4	5	2	2	4	4	4	4	4	2	2	4	4	4	4	4	2	2	2	4	4	4	4	105	3.4	1.55	356	5.25
4	4WT	GB 4094	T-10809	2	3	3	2	2	3	3	3	3	3	2	2	3	3	3	3	3	2	2	3	3	3	3	3	2	0	2	3	3	3	81	2.6	1.45	212	3.79	
5	4WT	37-4509	T-19564	0	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3	3	2	3	3	3	3	3	3	2	2	2	3	3	3	78	2.5	2.17	196	5.47	
6	4WT	49-8542	T-9662&AAA	2	3	3	2	2	3	3	3	3	3	2	2	3	3	3	3	3	2	2	3	3	3	3	3	1	0	2	3	3	3	80	2.6	1.37	206	3.53	
7	4WT	270-3152	T-13929&DDD	0	3	3	2	2	3	3	3	3	3	2	2	3	3	3	3	3	2	0	3	3	3	3	3	2	2	2	3	3	3	79	2.5	1.93	201	4.91	
8	4WT	49-8544	T-17025	2	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3	3	2	2	3	3	3	3	3	2	2	2	3	3	3	79	2.5	1.55	201	3.95	
9	4WT	49-6733	T-10808	0	3	3	2	0	3	3	3	3	3	2	2	3	3	3	3	3	2	2	3	3	3	3	3	2	2	2	3	3	3	79	2.5	1.18	201	3.00	
10	Hire 4WT	37-5105	T-16615,67-806,EEE	2	3	3	3	0	3	3	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3	3	2	2	3	0	3	3	76	2.5	1.45	186	3.55	
11	Hire 4WT	37-4543	Large trailer	0	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3	3	2	2	3	3	3	3	3	0	2	0	3	3	3	73	2.4	2.17	172	5.12	
12	4WT	49-6734	T-16615	2	4	4	2	2	4	4	4	4	4	2	2	4	4	4	4	4	2	2	4	4	4	4	4	2	2	2	4	4	4	104	3.4	1.66	349	5.57	
13	4WT	37-1234	T-17026	0	3	3	2	0	3	3	3	3	3	2	1	3	3	3	3	3	2	0	3	3	3	3	3	2	0	0	3	3	3	72	2.3	1.52	167	3.53	
14	4WT	270-3150	T-10806	2	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3	3	2	0	3	3	3	3	3	0	2	0	3	3	3	73	2.4	1.25	172	2.93	
15	4WT	270-3227	T-19680	2	3	4	2	2	4	4	4	4	4	2	2	4	4	4	4	4	2	2	4	4	4	4	4	2	2	2	4	4	4	103	3.3	2.15	342	7.13	
Total				18	49	49	32	14	49	49	49	49	50	28	17	49	50	49	49	49	30	21	49	49	49	49	49	26	20	25	43	49	49	49	1256	40.5		3474	68.2

Note: Conversion factor takes into account the trailer volume, fill factor and garbage density.

Days 31

Landfill survey			13 Aug - Tues				14 Aug - Wed					15 Aug - Thu					16 Aug - Fri					17 Aug - Sat				18 Aug - Sun				19 Aug - Mon							
Tractor reg	Trailer reg	Trailer chassis	1st	2nd	3rd	4th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th				
270-3152	CCC	CCC	1.25	1.25	1							1					1.25	1.25							1.25	1			1.00				1.25	1			
270-3152	46-9342		1.25				1.3	1.25	1			1	1	1			1.25	1							1				1				1.25				
67-2727	(Hotel Assn)		1									1	1				1								1								1				
36-0099	46-4136	T-10807	0.5	0.75								0.75																									
270-3227	GB-6773	T-19680	1	1.25	1.3	1	1.3	1.25	1	0.5	0.5	1.25	1	1.25			1	1.25	1.25	1	1	1	1	1	1	1	1.25	1	1	1	1	1	1.25	1	1	1	
GB-4094	46-4140	T-10809	1.25				1	1.25				1.25													1.25								1.5	0.75			
37-1234	67-0857	T-17026	1.25				1	1	1			1	1				1	1.25	1					1	1							1	1.25	1			
49-8545	57-0854	T-16614	1				1.3					1	1				1							0.75								1	1	1			
49-8544	67-0856	T-17025	1.25	1.25			1	1				1	1				1	0.75						1.25								1.25					
270-3150	46-4123	T-10806	1.25	1.25			1.5	1	1			1.25	1	1			1	1	1	1				1.25	0.75							1.25	1	1.25			
49-6733	46-4137	T-10808	1.25	1	1		1					1.25	1.3	1			1							1.25	1							1.25	1.25	0.5			
270-3288	44-0871	T-5082	1.25				1					1.25					1	1	1					1								1	1.25	1.25			
37-5105	67-0855	T-16615	1.25	1			1.3	1				1.25	1.3				1.25							1								1	1.25	1.25			
	67-806		1.5				1.5	1				1.5					1.25	1					1.25	0.75							0.5		1	1			
270-3151	67-0858	T-17027	1	1			1	1				1.25	1	1			1.25	0.75					1.5	1							1	1	1.25				
	46-3139	T-9661	1	1	0.8		1	1				1.25	1	1			1.25	1	1				1	1.25	1	1	1.25	1	1	1.25	1	1	1	1	1		
270-3228	GB-6776	T-19563	1.25	1.25			1	1.25	1.25			1.25	1.25	1.25	1	1.25	1.25	1.25	1				1.25									1.00		1.00	1.25	1	
49-8542	46-3138	T-9662	1.25				1										1	1					1								0.75		1	1			
	44-2802											1																				0.5					
	43-2806																																	1			

Landfill survey			Aug 13 - Tue				Aug 14 - Wed				Aug 15 - Thu				Aug 16 - Fri				Aug 17 - Sat				Aug 18 - Sun				Aug 19 - Mon				Total			Avg trips/d			Avg				
Tractor reg	Trailer reg	Vol (m3)	Tot trips	Avg FF	Act trips	T/d	Tot trips	Avg FF	Act trips	T/d	Tot trips	Avg FF	Act trips	T/d	Tot trips	Avg FF	Act trips	T/d	Tot trips	Avg FF	Act trips	T/d	Tot trips	Avg FF	Act trips	T/d	Tot trips	Avg FF	Act trips	T/d	Tot trips	Avg FF	Act trips	Tot	Act	T/d					
270-3152	CCC	6.13	3	1.17	3.50	6.87	2	1.13	2.25	4.41	1	1.00	1.00	1.96	2	1.25	2.50	4.91	2	1.13	2.25	4.41	1	1.00	1.00	1.96	2	1.00	1.00	1.96	2	1.13	2.25	4.41	13.0	14.8	1.13	1.9	2.1	4.13	
270-3152	46-9342	4.60	1	1.25	1.25	1.84	3	1.17	3.50	5.15	3	1.00	3.00	4.42	2	1.13	2.25	3.31	1	1.00	1.00	1.47	1	1.00	1.00	1.47	1	1.00	1.00	1.47	1	1.25	1.25	1.84	12.0	13.3	1.10	1.7	1.9	2.79	
67-2727	(Hotel Assn)	4.98	1	1.00	1.00	1.60	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0.00	0.00	0	1.00	1.00	1.60	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	1.00	1.00	1.60	6.0	6.0	1.00	0.9	0.9	1.37	
36-0099	46-4136	3.79	2	0.63	1.25	1.52	0	0.00	0.00	0	0.75	0.75	0.91	0	0.00	0.00	0	0.00	0.00	0	1.00	1.00	1.21	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	4.0	3.0	0.75	0.6	0.4	0.52
270-3227	GB-6773	6.36	4	1.13	4.50	9.17	5	0.90	4.50	9.17	4	1.13	4.50	9.17	5	1.10	5.50	11.21	4	1.06	4.25	8.66	2	1.00	2.00	4.08	4	1.06	4.25	8.66	28.0	29.5	1.05	4.0	4.2	8.59					
GB-4094	46-4140	3.92	1	1.25	1.25	1.57	2	1.13	2.25	2.82	1	1.25	1.25	1.57	1	1.00	1.00	1.25	1	1.25	1.25	1.57	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	1.13	2.25	2.82	8.0	9.3	1.16	1.1	1.3	1.66
37-1234	67-0857	4.51	1	1.25	1.25	1.80	3	1.00	3.00	4.33	2	1.00	2.00	2.89	3	1.08	3.25	4.69	2	1.00	2.00	2.89	0	0.00	0.00	0	0.00	0.00	0	3	1.08	3.25	4.69	14.0	14.8	1.05	2.0	2.1	3.04		
49-8545	57-0854	4.53	1	1.00	1.00	1.45	1	1.25	1.25	1.81	2	1.00	2.00	2.90	1	1.00	1.00	1.45	1	0.75	0.75	1.09	1	1.00	1.00	1.45	2	1.00	2.00	2.90	9.0	9.0	1.00	1.3	1.3	1.86					
49-8544	67-0856	4.53	2	1.25	2.50	3.62	2	1.00	2.00	2.90	2	1.00	2.00	2.90	2	0.88	1.75	2.54	1	1.25	1.25	1.81	1	1.00	1.00	1.45	1	1.25	1.25	1.81	11.0	11.8	1.07	1.6	1.7	2.43					
270-3150	46-4123	3.51	2	1.25	2.50	2.81	3	1.17	3.50	3.93	3	1.08	3.25	3.65	3	1.00	3.00	3.37	2	1.00	2.00	2.25	0	0.00	0.00	0	3	1.17	3.50	3.93	16.0	17.8	1.11	2.3	2.5	2.85					
49-6733	46-4137	3.41	3	1.08	3.25	3.55	1	1.00	1.00	1.09	3	1.17	3.50	3.82	1	1.00	1.00	1.09	2	1.13	2.25	2.46	0	0.00	0.00	0	3	1.00	3.00	3.28	13.0	14.0	1.08	1.9	2.0	2.18					
270-3288	44-0871	4.00	1	1.25	1.25	1.60	1	1.00	1.00	1.28	1	1.25	1.25	1.60	2	1.00	2.00	2.56	1	1.00	1.00	1.28	1	1.00	1.00	1.28	3	1.17	3.50	4.49	10.0	11.0	1.10	1.4	1.6	2.01					
37-5105	67-0855	4.53	2	1.13	2.25	3.26	2	1.13	2.25	3.26	2	1.25	2.50	3.62	1	1.25	1.25	1.81	1	1.00	1.00	1.45	1	1.00	1.00	1.45	3	1.17	3.50	5.07	12.0	13.8	1.15	1.7	2.0	2.85					
	67-806	5.48	1	1.50	1.50	2.63	2	1.25	2.50	4.39	1	1.50	1.50	2.63	2	1.13	2.25	3.95	2	1.00	2.00	3.51	1	0.50	0.50	0.88	2	1.00	2.00	3.51	11.0	12.3	1.11	1.6	1.8	3.07					
270-3151	67-0858	4.52	2	1.00	2.00	2.89	2	1.00	2.00	2.89	3	1.08	3.25	4.70	2	1.00	2.00	2.89	2	1.25	2.50	3.61	2	1.00	2.00	2.89	1	1.25	1.25	1.81	14.0	15.0	1.07	2.0	2.1	3.1					
	46-3139	4.50	3	0.92	2.75	3.96	2	1.00	2.00	2.88	3	1.08	3.25	4.68	3	1.08	3.25	4.68	3	1.08	3.25	4.68	3	1.08	3.25	4.68	3	1.08	3.25	4.68	20.0	21.0	1.05	2.9	3.0	4.32					
270-3228	GB-6776	6.30	2	1.25	2.50	5.04	3	1.17	3.50	7.06	5	1.20	6.00	12.10	3	1.17	3.50	7.06	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	3	1.08	3.25	6.55	16.0	18.8	1.17	2.3	2.7	5.4			
49-8542	46-3138	4.40	1	1.25	1.25	1.76	1	1.00	1.00	1.41	0	0.00</																													

Average Number of Trips - Summary

Tractor	Trailer	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Aug 13-19
270-3228	T-19563&T-5082	3.4	3.6	3.5	3.5	3.4	3.7
49-8545	T-16614&CCC	2.3	2.3	2.3	2.3	2.2	1.3
270-3151	T-17027	3.4	3.3	3.5	3.4	3.4	2.0
GB 4094	T-10809	2.3	2.1	2.5	2.5	2.6	1.1
37-4509	T-19564	2.5	2.4	2.4	2.6	2.5	
49-8542	T-9662&AAA	2.4	2.6	2.5	2.5	2.6	1.1
270-3152	T-13929&DDD	2.4	2.4	2.4	2.4	2.5	3.6
49-8544	T-17025	2.7	2.7	2.5	2.5	2.5	1.6
49-6733	T-10808	2.6	2.4	2.3	2.4	2.5	1.9
37-5105	T-16615,67-806,EEE	2.5	2.6	2.5	2.6	2.5	3.3
37-4543	Large trailer	2.5	2.6	2.5	2.7	2.4	
49-6734	T-16615	2.7	3.1	2.8	3.4	3.4	
37-1234	T-17026	2.3	2.4	2.2	2.3	2.3	2.0
270-3150	T-10806	2.3	2.3	2.4	2.3	2.4	2.3
270-3227	T-19680	2.7	2.8	2.6	2.8	3.3	4.0
36-0099	T-10807						0.6
	T-9661						2.9
	44-2802						0.3
	43-2806						0.1
67-2727	Hotel Assn						0.9
Total		38.7	39.8	38.7	40.1	40.5	32.6

Average trips/4WT/d (Jan-May 02) = 2.6
 Average trips/4WT/d (Aug 13-19) = 2.4
 (ignoring T-10807, 44-2802 & 43-2806 as being abnormally low +
 not including hotel association tractor (not NMC))

Average trips Jan-May = 39.6
 c.f WACS data = 32.6
 Jan-May trips are 1.22 times >

Average Tonnage - Summary

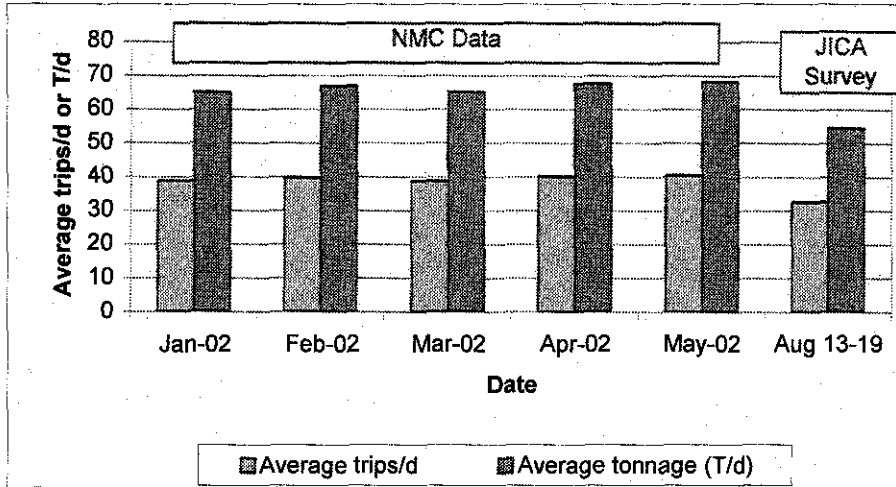
Tractor	Trailer	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Aug 13-19
270-3228	T-19563&T-5082	6.33	6.80	6.57	6.54	6.45	7.41
49-8545	T-16614&CCC	4.27	4.20	4.15	4.23	4.03	1.86
270-3151	T-17027	5.25	5.03	5.35	5.27	5.25	3.10
GB 4094	T-10809	3.32	3.11	3.70	3.63	3.79	1.66
37-4509	T-19564	5.54	5.28	5.26	5.73	5.47	
49-8542	T-9662&AAA	3.27	3.57	3.35	3.42	3.53	1.61
270-3152	T-13929&DDD	4.60	4.68	4.60	4.69	4.91	6.92
49-8544	T-17025	4.15	4.20	3.90	3.87	3.95	2.43
49-6733	T-10808	3.04	2.86	2.66	2.78	3.00	2.18
37-5105	T-16615,67-806,EEE	3.55	3.72	3.64	3.76	3.55	5.92
37-4543	Large trailer	5.33	5.75	5.33	5.87	5.12	
49-6734	T-16615	4.45	5.16	4.66	5.59	5.57	
37-1234	T-17026	3.43	3.69	3.34	3.50	3.53	3.04
270-3150	T-10806	2.85	2.89	2.93	2.82	2.93	2.85
270-3227	T-19680	5.75	5.98	5.68	6.01	7.13	8.59
36-0099	T-10807						0.52
	T-9661						4.32
	44-2802						0.32
	43-2806						0.21
67-2727	Hotel Assn						1.37
Total		65.11	66.92	65.11	67.70	68.21	54.32

Average tonnes/4WT/d (Jan-May 02) = 4.4
 Average tonnes/4WT/d (Aug 13-19) = 4.0
 (ignoring T-10807, 44-2802 & 43-2806 as being abnormally low +
 not including hotel association tractor (not NMC))

Average tonnes Jan-May = 66.6
 c.f WACS data = 54.3
 Jan-May tonnes are 1.23 times >
 Jan-May data does not include hotel assn tractor (0.9trips/d, 1.37T/d)

Graphical data

Date	Average tri	Average tonnage (T/d)
Jan-02	38.7	65.11
Feb-02	39.8	66.92
Mar-02	38.7	65.11
Apr-02	40.1	67.70
May-02	40.5	68.21
Aug 13-19	32.6	54.32



A. General Notes

Negombo MC

1. SWM Staff Salary + allowance costs

Item	Salary	Allowance	Total	Adopted
Driver	3990	2200	6190	6,190
Labourer	3640	2200	5840	5,840

Notes:

- There are 3 classes of driver - middle class (mid income) is paid 3,990Rs/mth with annual increase of 110Rs/yr (NMC Revenue section)
- There are 3 classes of labourer - middle class (mid income) is paid 3,640Rs/mth with annual increase of 80Rs/yr (NMC Revenue section) (lowest class of driver is paid 3765 Rs/mth and labourer 3400Rs/mth)
- Collection worker survey gave average salary of 5,745 Rs/mth, including allowances; or 3,545 Rs/mth basic salary
- Use middle class labourer and driver salaries

B. SWM Vehicles - Current Costs

Handcart - 2 labourers	Rate	Unit	No	Amt (Rs)	Notes
Labourers	5840	Rs/mth	24	140160	Labrs = 2
Protective gear/equipment	2480	Rs/yr	1	2480	
Oil	0	Rs/mth	12	0	
Wheel set (2)	1440	Rs/yr	1	1440	1,800Rs/set @ 1-1.5yr/set
Maintenance	1000	Rs/yr	1	1000	
Insurance	0	Rs/yr	1	0	
Rev Licence	0	Rs/yr	1	0	
Depreciation	3167	Rs/yr	1	3167	
Total				148247	
			Case A		Case B
Avg no of trips per day		trips/d	3		5
Avg amt collected per mth		T/mth	9.4		15.6
Average amount collected per yr		T/yr	112		187
Unit cost		Rs/T	1320	Rs/T	792

Notes:

1. Staff protective equipment based on NMC equipment data and current prices:

- | | | | | | |
|---------------|------------------|--------------|-------------|-------------------|-----------------------------|
| a. Gloves | 2 labourers/HC x | 2 sets/yr @ | 50 Rs ea = | 200 Rs/yr | CPHI - min 2 sets/yr |
| b. Uniforms | 2 labourers/HC x | | 0 Rs/yr = | 0 Rs/yr | No uniforms |
| c. Rake | 1 rake/HC | 12 sets/yr @ | 100 Rs ea = | 1200 Rs/yr | CPHI - 1mth life |
| d. Ekel broom | 1 broom/HC x | 12 sets/yr @ | 35 Rs ea = | 420 Rs/yr | Assumed 1mth life |
| e. Baskets | 1 basket/HC x | 12 sets/yr @ | 55 Rs ea = | 660 Rs/yr | Assumed 1mth life; 40-70 Rs |
| | | | | 2480 Rs/yr | |

Total labourer protective equipment costs

- Assume, handcart does average of 3-5 trips/d - consider both cases for avg handcart tonnage of 0.12 T/load

Case A - No of trips/d =	3	Average tonnage per HC per d =	0.36 T/HC.d or	9.36 T/HC.mth, based on	26 working days/mth
Case B - No of trips/d =	5	Average tonnage per HC per d =	0.6 T/HC.d or	15.6 T/HC.mth, based on	26 working days/mth
- Capital cost = 9,500 Rs with estimated lifetime of 3 yrs (NMC Mechanical foreman)
- Depreciation = 3166.7 Rs/yr (straight line method)

Handcart - 3 labourers	Rate	Unit	No	Amt (Rs)	Notes
Labourers	5840	Rs/mth	36	210240	Labrs = 3
Protective gear/equipment	2580	Rs/yr	1	2580	
Oil	0	Rs/mth	12	0	
Wheel set (2)	1440	Rs/yr	1	1440	1,800Rs/set @ 1-1.5yr/set
Maintenance	1000	Rs/yr	1	1000	
Insurance	0	Rs/yr	1	0	
Rev Licence	0	Rs/yr	1	0	
Depreciation	3167	Rs/yr	1	3167	
Total				218427	
			Case A		Case B
Avg no of trips per day		trips/d	3		5
Avg amt collected per mth		T/mth	9.4		15.6
Average amount collected per yr		T/yr	112		187
Unit cost		Rs/T	1945	Rs/T	1167

Notes:

1. Staff protective equipment based on NMC equipment data and current prices:

- | | | | | | |
|---------------|------------------|--------------|-------------|-------------------|-----------------------------|
| a. Gloves | 3 labourers/HC x | 2 sets/yr @ | 50 Rs ea = | 300 Rs/yr | CPHI - min 2 sets/yr |
| b. Uniforms | 3 labourers/HC x | | 0 Rs/yr = | 0 Rs/yr | No uniforms |
| c. Rake | 1 rake/HC | 12 sets/yr @ | 100 Rs ea = | 1200 Rs/yr | CPHI - 1mth life |
| d. Ekel broom | 1 broom/HC x | 12 sets/yr @ | 35 Rs ea = | 420 Rs/yr | Assumed 1mth life |
| e. Baskets | 1 basket/HC x | 12 sets/yr @ | 55 Rs ea = | 660 Rs/yr | Assumed 1mth life; 40-70 Rs |
| | | | | 2580 Rs/yr | |

Total labourer protective equipment costs

- Assume, handcart does average of 3-5 trips/d - consider both cases for avg handcart tonnage of 0.12 T/load

Case A - No of trips/d =	3	Average tonnage per HC per d =	0.36 T/HC.d or	9.36 T/HC.mth, based on	26 working days/mth
Case B - No of trips/d =	5	Average tonnage per HC per d =	0.6 T/HC.d or	15.6 T/HC.mth, based on	26 working days/mth
- Capital cost = 9,500 Rs with estimated lifetime of 3 yrs (NMC Mechanical foreman)
- Depreciation = 3166.7 Rs/yr (straight line method)

Four Wheel Tractor	No	Rate	Unit	Total	Notes
Driver	12	6,190	Rs/mth	74280	No of labourers = 3
Labourers	36	5,840	Rs/mth	210240	
Protective gear/equipment	LS	4690	Rs/yr	4690	
Diesel	12	6767	Rs/mth	81204	
Oil	12	469	Rs/mth	5628	
Tyres and tubes	LS	15000	Rs/yr	15000	
Tractor Maintenance	12	2000	Rs/mth	24000	
Trailer Maintenance	LS	10000	Rs/yr	10000	
Insurance	LS	8790	Rs/yr	8790	
Licence	LS	150	Rs/yr	150	
Depreciation	LS	86243	Rs/yr	86243	
Total				520225	
Avg no of trips/d (13-19 Aug 02)		trips/d		2.36	
Avg amt collected 13-19 Aug 02		T/d		4.0	T/d
Average amount collected per yr		T/yr		1246	
Unit cost		Rs/T		418	Rs/T

Notes:

- Staff protective equipment based on NMC equipment data and current prices:

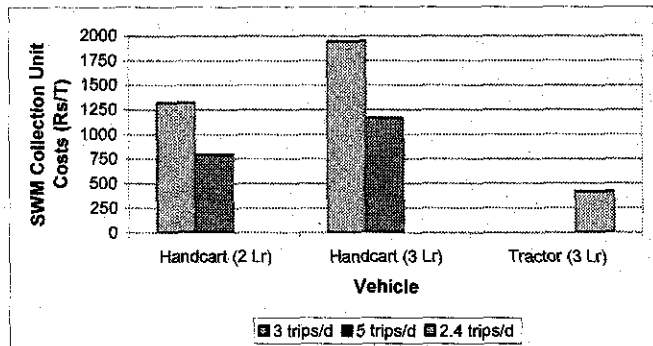
a. Gloves	3 labourers/4WT x	2 sets/yr @	50 Rs ea =	300 Rs/yr	CPHI - min 2 sets/yr
b. Gumboots	1 Set/4WT x	1 sets/yr @	1100 Rs/yr =	1100 Rs/yr	CPHI - 1 set/yr
c. Rake	1 rake/4WT	12 sets/yr @	100 Rs ea =	1200 Rs/yr	CPHI - 1mth life
d. Fork	1 fork/4WT x	1 sets/yr @	350 Rs ea =	350 Rs/yr	CPHI - 1yr life
e. Ekel broom	1 ekel broom/4WT x	12 sets/yr @	35 Rs ea =	420 Rs/yr	Assumed 1mth life
d. Baskets	2 baskets/4WT x	12 sets/yr @	55 Rs ea =	1320 Rs/yr	Assumed 1mth life; 40-70 Rs
Total labourer protective equipment costs				4690 Rs/yr	
- Capital cost data: tractor = 420357 with estimated lifetime of 17.5 yrs (15-20yrs as per KMC)
 Straight line deprec'n = 24020 Rs/yr. much higher than NMC's estimate of 5,000Rs/yr - suspect this is arbitrary estimate - use calculated value
- Capital cost data: trailer = 560,000 with estimate lifetime of 9 yrs (8-10yrs)
 Straight line deprec'n = 62222 Rs/yr
 (For both tractor and trailer, capital cost based on average cost of all units currently in use for SWM)
- Annual tonnage based on avg T/d x 26 working days/mth x 12 mth/yr

Summary

Item	SW Amt (T/yr)	Cost (Rs/yr)	Unit cost (Rs/T)
Current situation			
HC1 (2 Lr, 4 trips/d)	150	148247	990
HC2 (3 Lr, 4 trips/d)	150	218427	1459
Tractor (3Lr, 2.4 trips/d)	1246	520225	418
Total	1246	886898	712

C. Graphical Data

	Unit costs (Rs/T)		
	3 trips/d	5 trips/d	2.4 trips/d
Handcart (2 Lr)	1320	792	
Handcart (3 Lr)	1945	1167	
Tractor (3 Lr)			418



D. SWM Vehicles - Improved Costs

1. Handcart - current costs based on 4 trips/d

Handcart - 3 labourers	Rate	Unit	No	Amt (Rs)	No	Amt (Rs)	Notes
Case		A =	2	Labrs	B =	3	Labrs
Labourers	5840	Rs/mth	24	140160	36	210240	
Protective gear/equipment	2480	Rs/yr	1	2480	1	2580	Slightly different unit cost for 2-3 labrs
Oil	0	Rs/mth	12	0	12	0	
Wheel set (2)	1440	Rs/yr	1	1440	1	1440	1,800Rs/set @ 1-1.5yr/set
Maintenance	1000	Rs/yr	1	1000	1	1000	
Insurance	0	Rs/yr	1	0	1	0	
Rev Licence	0	Rs/yr	1	0	1	0	
Depreciation	3167	Rs/yr	1	3167	1	3167	
Total				148247		218427	
			Case A		Case B		
Avg no of trips per day		trips/d	4		4		
Avg amt collected per mth		T/mth	12.5		12.5		
Average amount collected per yr		T/yr	150		150		
Unit cost		Rs/T	980	Rs/T	1459	Rs/T	

Notes:

1. Staff protective equipment based on NMC equipment data and current prices:

a. Gloves	2 labourers/HC x	2 sets/yr @	50 Rs ea =	200 Rs/yr	CPHI - min 2 sets/yr
b. Uniforms	2 labourers/HC x		0 Rs/yr =	0 Rs/yr	No uniforms
c. Rake	1 rake/HC	12 sets/yr @	100 Rs ea =	1200 Rs/yr	CPHI - 1mth life
d. Ekel broom	1 broom/HC x	12 sets/yr @	35 Rs ea =	420 Rs/yr	Assumed 1mth life
e. Baskets	1 basket/HC x	12 sets/yr @	55 Rs ea =	660 Rs/yr	Assumed 1mth life; 40-70 Rs
Total labourer protective equipment costs				2480 Rs/yr	

For Case B, staff protective equipment costs = 2580 Rs/yr

2. Assume, handcart does average of 4 trips/d - moderate performance, based on

Avg trips per day = 4 Average tonnage per HC per d = 0.48 T/HC.d or 12.48 T/HC.mth, based on 0.12 T/load 26 working days/mth

3. Capital cost = 9,500 Rs with estimated lifetime of 3 yrs (NMC Mechanical foreman)

Depreciation = 3167 Rs/yr (straight line method)

2. Improved tractor costs (3 trips/d, 2 labourers, large trailer)

Four Wheel Tractor	No	Rate	Unit	Total	Notes
Driver	12	6,190	Rs/mth	74280	
Labourers	24	5,840	Rs/mth	140160	No of labourers = 2
Protective gear/equipment	LS	2730	Rs/yr	2730	
Diesel	12	9228	Rs/mth	110733	Increased diesel costs by 3.0/2.2 = 1.36
Oil	12	640	Rs/mth	7675	Increased as for diesel
Tyres and tubes	LS	20455	Rs/yr	20455	Increased as for diesel
Tractor Maintenance	12	2727	Rs/mth	32727	Increased as for diesel
Trailer Maintenance	LS	13636	Rs/yr	13636	Increased as for diesel
Insurance	LS	8790	Rs/yr	8790	(increases to account for increased no of trips)
Licence	LS	150	Rs/yr	150	
Depreciation	LS	86243	Rs/yr	86243	
Total				497578	
Avg no of trips/d		trips/d		3.00	
Avg amt collected		T/d		6.1	T/d
Average amount collected per yr		T/yr		1907	
Unit cost		Rs/T		261	Rs/T

Notes:

1. Staff protective equipment based on NMC equipment data and current prices:

a. Gloves	2 labourers/4WT x	2 sets/yr @	50 Rs ea =	200 Rs/yr	CPHI - min 2 sets/yr
b. Gumboots	1 Set/4WT x	1 sets/yr @	1100 Rs/yr =	1100 Rs/yr	CPHI - 1 set/yr
c. Rake	0 rake/4WT	12 sets/yr @	100 Rs ea =	0 Rs/yr	CPHI - 1mth life
d. Fork	1 fork/4WT x	1 sets/yr @	350 Rs ea =	350 Rs/yr	CPHI - 1yr life
e. Ekel broom	1 ekel broom/4WT x	12 sets/yr @	35 Rs ea =	420 Rs/yr	Assumed 1mth life
d. Baskets	1 baskets/4WT x	12 sets/yr @	55 Rs ea =	660 Rs/yr	Assumed 1mth life; 40-70 Rs
Total labourer protective equipment costs				2730 Rs/yr	

2. Capital cost data: tractor = 420357 with estimated lifetime of 17.5 yrs (15-20yrs as per KMC)

Straight line deprec'n = 24020 Rs/yr, much higher than NMC's estimate of 5,000Rs/yr - suspect this is arbitrary estimate - use calculated value

3. Capital cost data: trailer = 560,000 with estimate lifetime of 9 yrs (8-10yrs)

Straight line deprec'n = 62222 Rs/yr

(For both tractor and trailer, capital cost based on average cost of all units currently in use for SWM)

3. Annual tonnage based on avg T/d x 26 working days/mth x 12 mth/yr for large trailer @ 6.36 m3/load with a fill factor of 1.0 gives 2.04 T/load (based on density of 320 kg/m3 but density could be > due to > filling height)

Summary

Item	SW Amt (T/yr)	Cost (Rs/yr)	Unit cost (Rs/T)	
Improved situation	Tractor (2 Lr, 3 trips/d, large trailer)	1907	497578	261

Improved Situation - Unit Costs graph

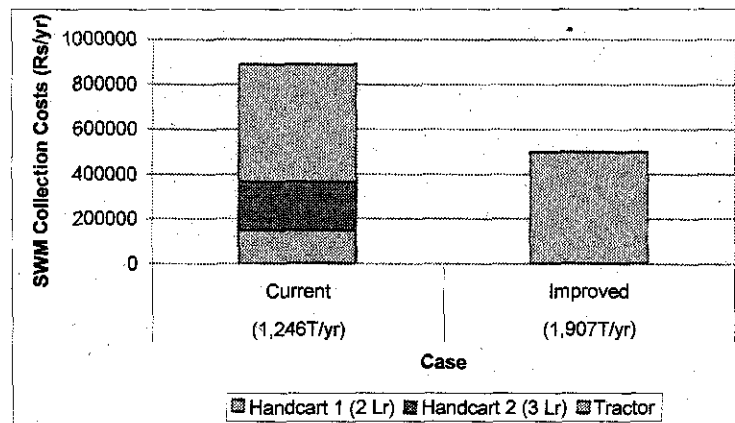
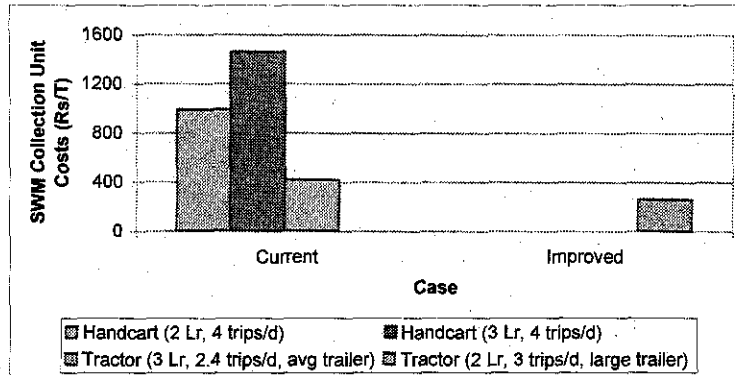
	Current	Improved
Handcart (2 Lr, 4 trips/d)	990	
Handcart (3 Lr, 4 trips/d)	1459	
Tractor (3 Lr, 2.4 trips/d, avg trailer)	418	
Tractor (2 Lr, 3 trips/d, large trailer)		261
Combined	712	

3. Improved Situation - Costs graph

SW Tonnage (T/yr)	(1,246T/yr)	(1,907T/yr)
Costs (Rs/yr)	Current	Improved
Handcart 1 (2 Lr)	148247	
Handcart 2 (3 Lr)	218427	
Tractor	520225	497578

Notes:

1. if tonnages change, must change SW tonnages manually in above table



NMC Supervisor Interview Survey Results

Area	Basic SWM Data	Problems	Ideas for Improvement
Bazaar I	<ul style="list-style-type: none"> Vehicles: 1 4WT, 2 trailers, 6 HC CPs: 3 perm; 1 temp (trailer) LWG: None 4WT L/d: 4 (M-Tu), 3 (W-F), 2 (Sa-Su) HC L/d: 55 (M), 20 (Su) – 45 (other) 	<ul style="list-style-type: none"> Poor public cooperation. Large amount of tree cuttings discharged by residents at roadside. Construction waste. Drain blockages – repair needed. Political interference. 	<ul style="list-style-type: none"> Public education. Introduce scheduled collection times.
Bazaar II	<ul style="list-style-type: none"> Vehicles: 2 4WT, 4 trailers, 6 HC CPs: 6 perm; 5 temp LWG: Pola (Vistar Rd), Dudley market 4WT L/d: 6 HC L/d: 30-60 (M-Sa), 75 (Su) 	<ul style="list-style-type: none"> Poor public cooperation, particularly in the Sea St/St Sebastian Rd area (people don't use CPs). Drain blockages (common in some seasons, caused by tides). Very high waste generation during festival season. Poor handcart quality – long delays for repairs. No medical facilities for labourers. 	<ul style="list-style-type: none"> Introduce scheduled collection times. Night shift for Bazaar area.
Mummakaraya	<ul style="list-style-type: none"> Vehicles: 1 4WT, 1 trailer, 2 HC CPs: 1 perm; 3 temp (also a number of half barrels) LWG: Aliya Pola 4WT L/d: 3 except 2.5 on Th-F HC L/d: not stated 	<ul style="list-style-type: none"> Poor public cooperation. Lack of labourers (small area but very high population density). Shortage of handcarts. Narrow roads in some areas, where tractors can not turn around. Poor vehicle maintenance and long delays during repairs. Poor handcart and equipment (rake, hoe, shovels) quality. Many people throw their waste into the lagoon. 	<ul style="list-style-type: none"> Public education. New SWM methods (e.g. compactor). Introduce scheduled collection times. Improve CPs (e.g large wheeled bins). Place spare trailer at 3 main CPs. Introduce garbage bags to households (~5,000 in area).
Periyamulla I	<ul style="list-style-type: none"> Vehicles: 1 4WT, 1 trailer, 3 HC CPs: 8-9 perm LWG: Ravmana Rd Housing scheme (8HC/d), Keels Supermarket (3 WB/d), Cargills Food City (4 WB/d) 4WT L/d: 4 (M-Tu), 3 (W-F), 2 (Sa-Su) HC L/d: 20 	<ul style="list-style-type: none"> Poor public cooperation. Large amounts of tree cuttings discharged by residents (sometimes 2-3 loads) at roadside. Labourers (poor health, drunkenness). Political interference. 	<ul style="list-style-type: none"> Public education. Introduce scheduled collection times.
Periyamulla II	<ul style="list-style-type: none"> Vehicles: 1 4WT, 1 trailer, 2 HCs CPs: 7-10 temp LWG: None 4WT L/d: 3 HC L/d: 20 (M), 16 (other) 	<ul style="list-style-type: none"> Poor public cooperation along Prajaseva Rd, with people discharging their waste anywhere. Labourer absenteeism (20%), resulting in insufficient labourers to do drain cleaning. Rubbish falls into drains from some temporary CPs. 	<ul style="list-style-type: none"> Another tractor needed. Permanent bins needed.

Area	Basic SWM Data	Problems	Ideas for Improvement
Kudapaduwa	<ul style="list-style-type: none"> Vehicles: 2 4WT (1 hired), 2 trailers, 2 HC CPs: 5 perm, 5-7 temp (also >12 half barrels) LWG: Browns Beach, Sunflower Beach and Gold Star Hotels 4WT L/d: 6 HC L/d: 14 	<ul style="list-style-type: none"> Poor public cooperation along Anderson Rd, Peter Mendis Rd, Cemetery Rd and some areas along Lewis Pl and Kirithisinge Rd, where residents discharge their waste shortly after the MC tractor has passed. High garden waste generation and discharge, especially during the rainy season. Labourer absenteeism (~50% on M-Tu), resulting in labourer shortage. Poor tractor maintenance. Poor quality handcart. 	<ul style="list-style-type: none"> Proper maintenance of vehicles. Adequate number of labourers. Adequate supply of collection/cleaning equipment. Public education. Introduce scheduled collection times.
Kurana I	<ul style="list-style-type: none"> Vehicles: 1 4WT, 2 trailers (1 for hospital), 3HC CPs: 4 perm, 8 temp LWG: Base Hospital, Harischandra MV, Maris Stella College 4WT L/d: 3 HC L/d: 15 	<ul style="list-style-type: none"> Poor public cooperation, with many people discharging their waste onto vacant land (e.g. tree cuttings), including others from outside the area who bring it by vehicle. People from Katana P.S. also discharge their waste to one permanent CP near the MC limits. Drain blockages – repair needed. 	<ul style="list-style-type: none"> Public education. Introduce scheduled collection times. Introduce measures to stop tree cuttings being discharged at the roadside.
Kurana II	<ul style="list-style-type: none"> Vehicles: 1 4WT, 1 trailer, 3 HC CPs: 4 perm, 10 temp LWG: None 4WT L/d: 3 HC L/d: 15-22 	<ul style="list-style-type: none"> Poor public cooperation, with people discharging waste anytime. Poor handcart wheel quality (bush type). Delays with tractor and handcart repair. Drains need repair. Large amount of tree cuttings discharged at roadside. One tractor is insufficient. 	<ul style="list-style-type: none"> Public education. Introduce scheduled collection times.
Kadolkale	<ul style="list-style-type: none"> Vehicles: 1 4WT, 1 trailer, 3 HC CPs: 5 perm, 6 temp LWG: Housing schemes 4WT L/d: 3 HC L/d: 20-22 	<ul style="list-style-type: none"> Large amounts of tree cuttings discharged at roadside. Poor public cooperation in some areas. No proper system for unloading HCs at permanent CP, where ~12 HCs discharged daily (in World Vision project area along St. Judes Pl). 	<ul style="list-style-type: none"> Provide tractor for the area where World Vision is working. Construct transfer station at permanent CP along St Judes Pl. Place additional trailers at specific places (~3) where a lot of waste is discharged.
Kochchikade	<ul style="list-style-type: none"> Vehicles: 1 4WT, 1 trailer CPs: 2 temp LWG: Kochchikade market, housing scheme (75 houses), Private market 4WT L/d: 3 (normal) – 5 (tree cuttings) 	<ul style="list-style-type: none"> Narrow roads (Christopher Lane, School Lane, Marshals Rd) – only wide enough for one vehicle. Poor public cooperation. Insufficient resources – tractors, trailers, labourers. 	<ul style="list-style-type: none"> More resources – spare trailers, labourers and drivers. Give bins to households.

Area	Basic SWM Data	Problems	Ideas for Improvement
Porutota	<ul style="list-style-type: none"> • Vehicles: 1 4WT, 1 trailer • CPs: 2 perm, 4 temp • LWG: Blue Oceanic, Royal Ocean and Sea Garden Hotels. • 4WT L/d: 4 (max = 6 on church feast days, in tourist season) 	<ul style="list-style-type: none"> • Poor public cooperation, especially along Thakkiya Rd and Jayamaratha – high muslim population with 2-3 families in some houses sharing same toilet, resulting in some faeces being discharged with normal garbage. • Some outsiders bring their waste by vehicle and dump it in this area, including some poultry waste. • Most people discharge their waste in bags along Thakkiya Rd and waste scattering by goats is a problem. • Some narrow roads (e.g. Thisera Watta) – difficult for 4WT to turn. • Insufficient labourers and labourer health problems. • Very difficult for women to work in tractors wearing saris. 	<ul style="list-style-type: none"> • Extra tractor and/or trailer, another five labourers and extra driver for all four Kochchikade areas. • Faster repair of vehicles. • Cover all tractors during haulage to disposal site. • Annual medical check for labourers • Provide trousers for women workers. • Provide labourers with gloves and soap for washing hands.
Dalupotha	<ul style="list-style-type: none"> • Vehicles: 1 4WT, 1 trailer • CPs: 10-20 temp • LWG: • 4WT L/d: 4 (5 on church feast days) 	<ul style="list-style-type: none"> • Once a week collection is insufficient. • Insufficient labourers. • Insufficient equipment, with equipment often being misplaced. • Some narrow, gravel roads (e.g. Fatima Watta) – difficult for 4WT to turn – not provided with garbage collection. • Some people throw waste onto private land along Prison Rd – fences and roadside drain make it difficult for MC to collect this waste. 	<ul style="list-style-type: none"> • Additional tractor, in order to provide a better service. • Provide bags to low income area to encourage good cooperation.
Daluwakotuwa	<ul style="list-style-type: none"> • Vehicles: 1 4WT, 1 trailer • CPs: 4 temp • LWG: None • 4WT L/d: 3 	<ul style="list-style-type: none"> • Labourer/driver absenteeism, with no official temporary or extra drivers. • Vehicles have to be sent to NMC for repairs/ maintenance – long delays. • Waste is scattered from all NMC tractors as they pass through Kochchikade on way to landfill. • Labourer health problems. • Very difficult for women to work in tractors wearing saris. 	<ul style="list-style-type: none"> • Extra tractor and/or trailer, another five labourers and extra driver for all four Kochchikade areas. • Faster repair of vehicles. • Cover all tractors during haulage to disposal site. • More recycling and sanitary landfilling. • Annual medical check for labourers • Provide trousers for women workers.
Thalahena	<ul style="list-style-type: none"> • Vehicles: 1 x 4WT (from Negombo) • CPs: several • LWG: None • 4WT L/d: (~1, twice per week) 	<ul style="list-style-type: none"> • Poor public participation, with many people discharging waste into the sea. • No garbage collection service provided for most of Thalahena. 	<ul style="list-style-type: none"> • Gradual expansion of garbage collection service throughout Thalahena.

Notes:

1. CP = collection point; HC = handcart, LWG = large waste generators, L/d = loads/day, WB = wheeltie bin; M = Monday, Tu = Tuesday, W = Wednesday, Th = Thursday, F = Friday, Sa = Saturday, Su = Sunday.

2. Total number of 4WT trips amounts to 46.9 trips/d, which is significantly greater than the average number of 32.6 trips recorded during the JICA survey on 13-19 August 2002.

