

They pay around 1,000Rs/mth to dispose of reject materials from the food/kitchen waste they collect. Piggery wastes from the farm are used as an organic manure. Their main problems are insects, especially flies.

1.10.5.2 Grand Hotel Farm Piggery

The Grand Hotel has its own 1.6ha piggery farm located about 700m from the hotel. This has been in operation for 12 years and employs 14 workers. It has about 95 pigs and 32 milking cows. About 500kg/d of source separated food/kitchen waste is collected from the Grand Hotel by the piggery for free using their own tractor.

Total monthly expenditure is about Rs200,000/month, major cost items being supplementary pig food (120,000Rs/mth), labour (36,000Rs/mth) and medicine (10,000Rs/mth).

They sell about 20 pigs/month, with three going to the Grand Hotel, while the other 17 are sold to the Tangerine Beach and Royal Farm Hotels (Kaluthara), Nilaweli Hotel (Trincomalee) and Lihiniya Surf Hotel (Bentota). Their net profit is about 400,000Rs/yr¹⁸. Estimated savings on pig food through using food/kitchen waste are about 50,000Rs/mth, meaning that the free supply of food/kitchen waste is important to the economic viability of the piggery.

Piggery wastes are dumped in a big pit, with the liquid and solid wastes subsequently being used as a manure.

1.10.6 Middlemen

Five middlemen operating within the NEMA were identified and interviewed as part of this study. General information on these businesses is set out below and summarised here.

Table 1-10: Middlemen General Information

Business Name	Manager/Owner, Address	Years of operation	Total Employees		Recyclables ³ (Rs/mth)	
			Total	FTE	Purchases	Sales
Not stated	Mr T Wijekumara, 14 Waterfield Dr, NE	30	2	1.4	21,400	29,250
Rilvan Brothers	Mrs ARM Sashika, 51 Queens St, NE	30	1	0.8	6,690	8,925
Not stated	Mr MRM Wimalasena, 47/1 Queens St, NE	12	5	2.5	16,545	21,788
Ameen Traders	Mr M Halimsa, 75/4 St Andrews Rd, NE	30	7	1.7	113,788	133,400
Gonny Kade	Mr Ariyadasa, 55 Ramathar Building, NE	20	1	1.2	22,650	28,275
Total			16	7.6	181,073	221,638

Note: The number of full-time equivalent (FTE) staff is based on a normal working month in the private sector of 8h/d x 26d/mth = 208h/mth.

¹⁸ This together with the stated expenditure suggests their monthly income is 233,300Rs/mth, which indicates a sales price per pig of over 10,000Rs, which is high. Possibly, the income and expenditure data may include the cow/milk component of farm operations.

Recyclable materials purchases and sales costs were calculated based on the average quantity of each item collected and sold per month and the average purchase and sales prices.

All of them are primarily involved in the collection and selling of recyclable materials, with four having been in business for 20 or more years and one for 12yrs. At least 16 people (managers/owners, full and part-time workers) are employed by these businesses, representing 7.6 full-time equivalent jobs.

Their estimated monthly expenditure on purchasing recyclable materials is 181,073Rs/mth, which shows that the scale of these operations is significant. Corresponding estimated monthly income from the sale of recyclable materials is 221,638Rs/mth, representing a markup of 22%. Respondents were generally reluctant to give total expenditure and income information, with the data obtained not being considered very reliable, particularly in four cases where stated income and/or expenditure were less than the corresponding recyclable purchases and sales figures. However, the overall net income quoted by businesses ranged from 5,000-20,000 Rs/mth, which is reasonably consistent with the income derived from sales and purchases data.

Most of the recyclable materials are brought to them by individuals (5) or collected by themselves or their own workers (3). Their demand for all recyclable materials is generally stable. The supply is generally less than or equal to the demand for plastics, approximately equal for newspapers (less than for two middlemen, greater than for two), greater than the demand for exercise books and cardboard and less than the demand for broken glass, glass, bottles, all metals and batteries. and greater variable for most other materials. Polythene (soft plastic) is not collected by any of the middlemen surveyed.

The main sources of most materials is set out in the following table and summarised here:

- Households are the main source of plastic and paper/cardboard and significant sources of broken glass, glass bottles, metals and batteries.
- Hotels are the main source of broken glass and glass bottles.
- Commercial enterprises are the main source of bags/sacks and batteries.
- Government offices are a significant source of paper/cardboard.
- Industries are a significant source of metals.
- Garages ("other" response) are a significant source of metals and batteries.

Table 1-11: Main Sources of Recyclable Materials

Item	Plastic	Bags/ sacks	Paper/ card-board	Broken glass	Glass Bottles	Metals	Batteries	Overall (within NEMC)
No collecting these items	3	4	4	3	5	5	4	5
No of responses	3	4	4	3	5	5	4	5
Households	98.8	2.0	45.9	23.6	24.8	39.7	16.2	24.8
Hotels	1.2	0.0	4.7	73.2	68.2	0.0	0.0	20.6
Commercial enterprises	0.0	98.0	14.2	3.2	3.1	0.0	63.7	21.6

Government offices	0.0	0.0	35.2	0.0	0.0	0.0	0.0	2.9
Industries	0.0	0.0	0.0	0.0	0.0	19.2	0.0	8.8
Other (mainly garages)	0.0	0.0	0.0	0.0	3.8	41.1	20.1	21.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes:

Above values are average percentages calculated from the survey data, taking into account the relative quantities of materials purchased by different middlemen.

The final column estimates the proportion of recyclable materials collected from different sources within NEMA only, assuming 100%, 100%, 90%, 87%, 85% of materials from hotels, government offices, commercial enterprises, industries and "other" are obtained from inside NEMA respectively, with the proportion of materials obtained from households calculated by difference so as to get an overall rate of 86% for materials collected within NEMA.

Around 86% of these materials are collected from within NEMA, 9% within the Nuwara Eliya district and 5% from other parts of Sri Lanka.¹⁹

The total quantities of materials recycled by these middlemen are summarised in the next table in terms of the material types adopted for this Study, amounting to 0.45T/d, while the table after that provides further details, including purchase and sale prices. Adjusting this total to allow for an estimated 86% of these materials being collected from within the NEMA gives a recycling amount of 0.38T/d, of which 0.095T/d is estimated to come from households.

Table 1-12: Total Quantities of Different Materials Recycled

Materials	Monthly Quantity	Daily Quantity (kg/d)	Comments
Plastics	1,020 containers and 15,660 bags/sacks = 1,566kg/mth	51.5	Containers are generally sold for reuse and consequently have not been included in the daily recycling amount. Bags are either sold for reuse or transported to factories for re-processing. Hence, they have been included in the recycling amount ; measured weight of 1 polysack = 0.1kg => 1,566kg.
Paper/ cardboard	955kg/mth	31.3	425kg newspaper, 500kg exercise books, 30kg cardboard boxes
Glass	1,250kg broken glass + 2,099kg bottles = 3,349kg/mth	110.1	Whole bottles are usually beer or arrack bottles; average measured weight = 0.66kg; 3,180 bottles = 2,099kg.
Metals	6,105kg/mth	200.7	5,300kg iron, 295kg copper/brass, 400kg aluminium and 110kg beer cans.
Old battery cases	1,570kg/mth	51.6	Battery cases are drained and then weighed, being recycled primarily for their lead content.
Total	13,545kg/mth	445.3	
Total collected within NEMA	11,590kg/mth	381.0	Adjusted total to account for 86% of these materials being collected from within NEMA.

Note: Refer next table for further details. These amounts were determined from survey interviews and no independent check was made on their accuracy. Daily quantities were calculated from monthly data by multiplying by 12/365.

All enterprises act as retail/wholesale outlets, onselling the recycled materials directly from their shops to individuals or commercial enterprises.

¹⁹ Percentages are weighted averages and account for the relative quantities of materials collected by different middlemen.

Table 1-13: Quantities of Recyclable Materials collected by Middlemen and Corresponding Purchase and Sales Prices

Material	Units	MM 1	MM 2	MM 3	MM 4	MM 5	Total			
							Quan- -tity	Purch- -ase price	Sales price	Units
Plastics										
Containers	No/mth	5	15	1,000	0	0	1,020	7-40	10-50	Rs ea
Various bags/sacks	No/mth	0	60	100	15,000	500	15,660	4-6	5-8	Rs ea
Paper										
Old newspaper	Kg/mth	25	100	100	0	200	425	14-20	17-22	Rs/kg
Old exercise books	Kg/mth	50	0	50	0	400	500	3-6	5-7.5	Rs/kg
Cardboard	Kg/mth	0	0	30	0	0	30	1.5	2.25	Rs/kg
Bottles										
Broken glass	Kg/mth	0	0	50	800	400	1,250	0.5-1.0	1.5-2.0	Rs/kg
Arrack, beer other bottles	No/mth	200	80	300	2,000	600	3,180	5.0	5.5-7.0	Rs ea
Metals										
Aluminium	Kg/mth	50	50	25	200	75	400	40-50	45-70	Rs/kg
Beer cans	Kg/mth	20	10	10	30	40	110	20-35	22-45	Rs/kg
Copper/brass	Kg/mth	50	10	40	115	80	295	50-70	60-90	Rs/kg
Ferrous	Kg/mth	2,000	300	500	2,000	500	5,300	4.0-5.5	6.5-8.0	Rs/kg
Old battery cases	Kg/mth	500	0	20	1,000	50	1,570	5-7	6-8	Rs/kg

The main costs incurred by these businesses in their recycling activities and the associated main problems are summarised below.

Table 1-14: Main Costs

Main Costs	Rank				Wt. Avg.
	1	2	3	4	
Buying recyclable materials	5	0	0	0	12.5
Transportation	0	4	0	0	8.0
Land/building rental	0	1	2	0	5.5
Utilities	0	0	1	1	3.0
Labour	0	0	1	2	3.5

Table 1-15: Main Problems

Main Problems	Rank				Wt. Avg.
	1	2	3	4	
Utilities	4	0	1	0	11.5
High transportation costs	0	3	0	1	7.0
Shortage of Recyclable Materials	1	0	1	0	4.0
Loss of market	0	1	1	0	3.5
Difficulties in obtaining credit	0	1	0	1	3.0

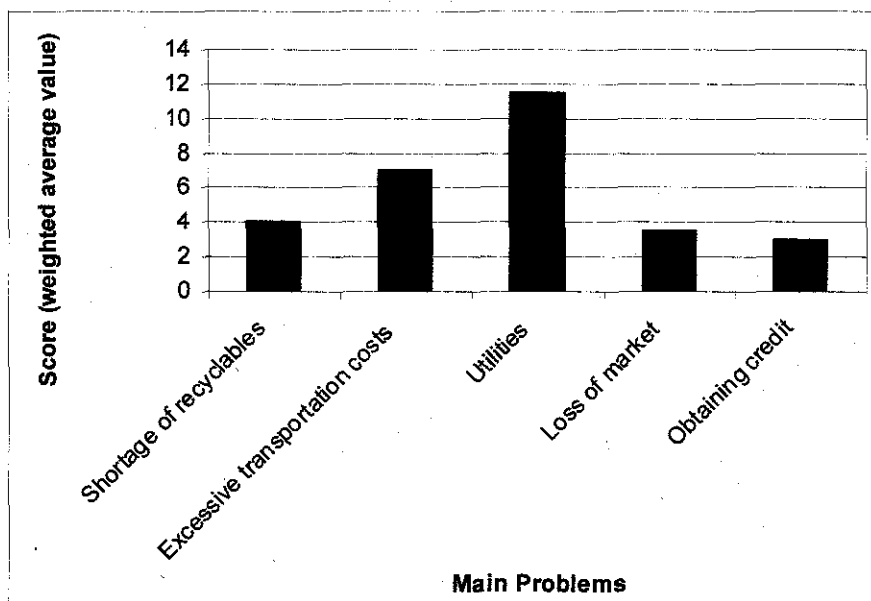


Figure 1-7: Main Problems Faced by Middlemen in Nuwara Eliya

Chapter 2
NEMC SWM System –
Additional Details

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Chapter 2 NEMC SWM System – Additional Details

2.1 Waste Management Equipment – Detailed Data

Table 2-1: Waste Management Vehicle Fleet and Supporting Equipment

Vehicles/ equipment	No	Use (Capacity)	Regis- tration	Regis- tration date	Cost	Approx. Life (yrs)
Handcarts	23	SWM collection, road sweeping, drain cleaning	N/a	N/a	5,200	2-3yrs
Four wheel tractors (4WT)	4	SWM	37-0959 49-9427 49-9428 49-9429	From IRDP 24/3/98 24/3/98 24/3/98	800,000 1,000,386 1,000,386 1,000,386	5-15yrs
4WT Trailers	6	SWM collection	46-3047 67-1064 67-1065 67-1067 67-2736 67-2738	3/8/90 10/12/97 10/12/97 10/12/97 12/5/99 12/5/99	80,000 96,000 96,000 96,000 96,000 96,000	4-8yrs
Tata lorry	1	SWM collection	27-4934	From IRDP	No data	8-12yrs
Compactor (reconditioned)	1	SWM collection	227-9058	11/6/2000	1,000,000	3-9yrs
Gully sucker (7,000L)	1	Public toilets/ septic tank emptying	42-7552	16/6/91	3,000,000	10-12yrs
JCB Backhoe	1	Disposal site + other tasks	49-8109	28/4/97	3,465,000	8-12yrs

Notes:

1. Handcarts have solid rubber "razor" (bearing) wheels (no tube) which last about 2-3 yrs, due to the wet weather in Nuwara Eliya which causes corrosion and dirt/grit problems.
2. One 4WT and the lorry were obtained from IRDP (Integrated Rural Development Programme). Hence, registration details are not known to NEMC, while the lorry capital cost is also not known.

2.2 Waste Collection/Disposal Fees

Gully bowser charges are summarized below while the table after that summarises gully sucker income for the first nine months of 2002.

Table 2-2: Gully Sucker Collection Charges

Location	Residential	Commer- cial	Government and Religious
Within city limits	2,250	4,300	2,250
Outside city limits	4,840	4,840	4,840

Notes:

1. Within city limits, the residential, government and religious charge is made up of 1,000Rs deposit, 1,000Rs gully sucker charge and 250Rs transport charge (total = 2,250Rs). If only one load is collected, the customer is refunded 750Rs (1,000Rs less 250Rs VAT charge). If two loads are collected, there is no refund.
2. Within city limits, the commercial charge is made up of 2,000Rs deposit, 2,000Rs gully sucker charge and 300Rs transport charge. If only one load is collected, the customer is refunded 1,540Rs (2,000Rs less 460Rs VAT). If two loads are collected, there is no refund.
3. Outside city limits, charges comprise the 4,300Rs standard fee (as per note 2) plus 540Rs (three labourers @ 180Rs ea.) plus 30Rs per km outside the city limits.

Table 2-3: Gully Sucker Income

Month (2002)	No of Trips	Gully Sucker Income (Rs/mth)
January	11	25,113
February	5	19,440
March	9	28,890
April	13	38,656
May	14	36,650
June	11	43,388
July	11	38,801
August	11	27,639
September	9	63,982
Total	94	322,559
Average	10.4	35,840

2.3 SWM Discharge/Collection – Additional Information

2.3.1 NEMC Garbage Discharge and Collection Details

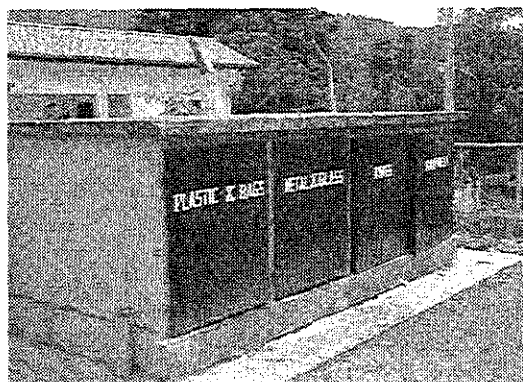
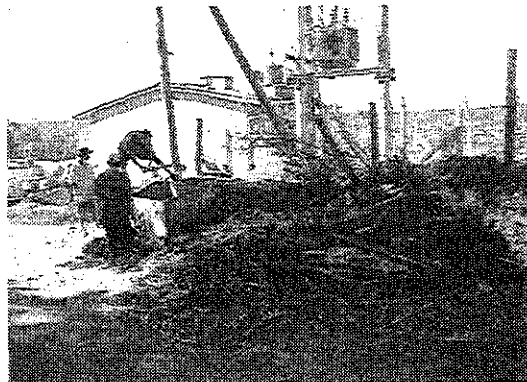
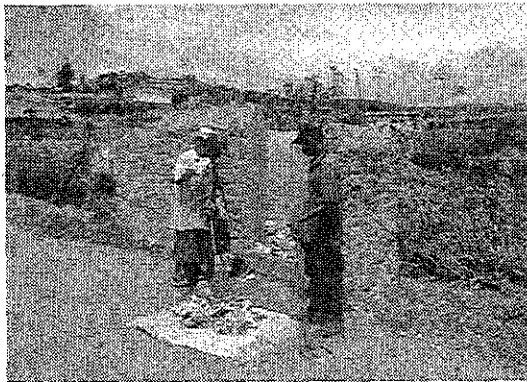
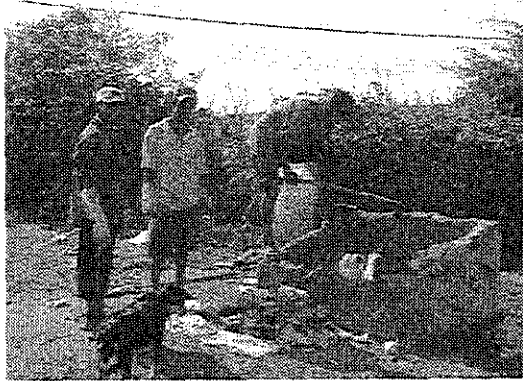
Table 2-4: NEMC SWM Collection Zones

Zone	Area
1	<ul style="list-style-type: none"> • Old Bazaar (central city) area, including Kandy Rd to Top Pass (city limits); 90% commercial; daily collection in over 90% of zone. • Large waste generators: Sunday Pola (~1,000 stalls); Safari, Food Lanka, Devon and Sulaiman local hotels, Cargills Ground stalls. • Busy congested area, poor public/trader cooperation; some commercial waste discharged into drains. • Most local hotels have garbage bins but many other shops do not. NEMC have requested traders to provide their own bins but very few places have complied with this request. • Four handcarts discharge their loads to stationary trailers (2) near the market; one to either a stationary trailer or tractor; one to concrete bins. • Additional labourers from other zones are also used for Pola cleaning.
2	<ul style="list-style-type: none"> • New Bazaar (central city) area; 80% commercial; daily collection. • Large waste generators: Kavithas building, Samurdhi stalls near bus stand, Lawson St, guesthouses on Park Rd, Bus stand. • Busy, congested area; poor public/trader cooperation; some garbage discharged next to stationary trailers (not inside) due to problems opening trailer doors. • Stationary trailers near market (2) and library (1) during daytime, while one trailer is parked near the Kavithas building at night-time.
3	<ul style="list-style-type: none"> • Area immediately surrounding racecourse, including the St Edwards to Nanuoya Rd area; mainly residential and tourist (many guesthouses). • Daily collection along most roads; alternate day collection along Unique View and Haddon Hill Rds; weekly handcart collection along half of road around racecourse. • Large waste generators: Grand Hotel, Glendower Hotel, many guesthouses. • Some steep areas (e.g. Unique View Rd, Haddon Hill Rd); guesthouse cooperation is generally good, with most guesthouses having dustbins or concrete bins and a handcart/tractor collecting directly from them. • Handcarts discharge their loads to bins in Nanuoya Rd, which is some distance away (or to tractor/lorry if met by chance); tractor collects from most bins except those along Badulla Rd which are done by the lorry.
4	<ul style="list-style-type: none"> • Mahagastota, Kelegala, Kalukele, Bonivista; mainly residential. • Daily collection in ~90% of area; alternate day collection elsewhere. • Large waste generators: small vegetable stalls in front of White House, Nesby Estate, garment and polythene factories (both factories' garbage is not collected by NEMC). • Poor public co-operation in Kalukele and Bonivista; large area with some steep roads; high garden waste generation; drain cleaning is difficult (long drain length, illegal septic tank/pit connections, cattle farm effluent discharges and silt/sediment runoff); unpopular zone with labourers (no perks). • Handcart primary collection in Kalukele, Mahagastota and Bonivista to bins or vehicle; 4WT collects from Kelegala, Kalukele and Bonivista bins; lorry collects from Mahagastota bins.

5	<ul style="list-style-type: none"> • Hawa Eliya; mainly residential, including MC Quarters + Base Hospital. • Daily collection in ~50% of area, alternate day collection in other 50%. • Large waste generators: Base Hospital, City Junction stalls, MC line, other housing quarters. • Poor public cooperation, particularly in the MC line area (unpopular with labourers); stray dogs scattering waste; Base hospital waste sometimes contains needles/syringes and clinical waste. • Most waste collected from bins by lorry/tractor (only one handcart).
6	<ul style="list-style-type: none"> • From Hospital Junction to Boralanda Junction and surrounds, including Mahinda Mw; mainly residential; daily collection. • Large waste generators: PWD Quarters, Mahinda Mw¹, Eyelashes Factory, Interfashion (not collected by NEMC), Boralanda Junction stalls, Nazareth farm (self-disposal), Muththu Mari Amman Kovil. • Densely populated area, especially in Mahinda Mw.; poor public cooperation in PWD Quarters area; some steep areas where it is difficult for the tractor to turn; high periodic waste generation by Kovil (Fridays, weddings festivals). • Primary collection by handcarts to bins/vehicles; tractor/lorry collects from bins.

Notes: Current SWM system status as at October 2002.

2.3.2 Sample Photos



¹ Now called Nawagamgoda.

Some examples of Nuwara Eliya's waste discharge and collection system: Top and middle – some of the range of concrete garbage collection points within Nuwara Eliya, showing three bins that are difficult to empty (top and middle right) and one bin (middle left), constructed by a garment factory that is relatively easy to empty. Bottom left – some piles of garden waste and scrap metal discharged next to a concrete bin; bottom right – The Hill Club hotel bin with separate sections for different kinds of waste.

2.3.3 Garbage Collection Daily Routine

NEMC operates a 7d/wk, 8h/d garbage collection service. Labourers are expected to work a minimum of 5.5d/wk, with casual workers making up labourer numbers as required on a daily basis. The collection worker survey (30 workers) indicated labourers work an average of 6d/wk.

Normal working hours are from 8am-5pm (8h/d) on Monday-Friday and until 12noon (4h) on Saturday morning. Additional working hours are Saturday afternoon (4h) and Sunday (8h). Typically 65 labourers work for 8h on Saturday and 50-55 labourers work for 8h on Sunday, mainly in the town area. Permanent labourers working during Saturday afternoon and Sunday are paid overtime, while casual labourers are paid normal time. Permanent labourers are always assigned to the same collection route (other than for the night shift), while casual labourers are rotated as required.

A "night shift" operates from 5-8pm in the town area, involving four labourers only. Night shift labourers are paid 4 overtime/hours per shift, with labourers being rotated every 10 days.

Many permanent labourers like to work during the long weekends, as they get paid double time. The absentee rate is usually very low on such weekends. Labourers are allowed to work up to 60 overtime hrs/mth normally, but in the April Season, some labourers overtime hours may reach 100.

Each morning, a roll call (muster) is taken by the Senior Supervisor at the NEMC Office at 8am, following which drivers and labourers are assigned their work for the day, this being recorded on a route sheet which is given to the driver. A daily distribution chart is also filled out showing the routes and labourers assigned to each area. Actual collection work generally starts by 8:30am. Another muster is taken at 1pm, either in the field for some zones or else at the NEMC Office. A final muster is taken at 5pm, with the route sheet being checked/signed off by the Senior Supervisor at the end of the day. Night shift labourers attend the 5pm muster and also the morning muster.

All garbage collection vehicles and trailers are parked near the NEMC office, while handcarts are generally parked outside near their working areas.

Supervisors are expected to use their own transport (usually foot or personal bicycle) for inspecting their zones. They are not reimbursed for any work related bicycle expenses.

Vehicle trips are recorded at the final disposal site by the senior labourer in a book/separate sheet for each day, with the tractor registration number (but not trailer registration), time of arrival and departure and driver's signature being written down. Inspection of January-September monthly records for 2002

found no months with complete data. August had the most complete data record with 26 days, followed by March with 20 days, while records for most other months were less than 50% complete. April (the "Season") records were completely missing, apparently due to NEMC workers being too busy during this month to record this data.

Drivers must complete a "running chart" record book each day, including the date, journey description, start and finish odometer readings, trip distance (km), time in/out and fuel and oil purchases. These records are handed to the Transport Section and signed by the Technical Officer. Diesel is issued once per week.

Labourers are provided with an annual medical checkup and regular TAB vaccinations (for typhoid), these costs being paid by the Ministry of Health.

2.3.4 Time and Motion Data

JICA time and motion study results for a four wheel tractor and the lorry from 19 September 2002 are tabulated below.

Table 2-5: Time and Motion Study Summary

Item	Four Wheel Tractor	Lorry
Zone	Zone 3+4	Parts of zones 3-6
Vehicle Crew	1 driver, 3 labourers	1 driver, 3 labourers
Collection Area	Low density residential area and hotel area including Grand and Alpine Hotels	Low density population area (Lady McCallum Dr, round Lake Gregory) and Hill Club Hotel
Start Time	08:14	08:48
Time for 1 st collection round	2h24min	2h54min
Travel to landfill	24min	18min
Unloading at landfill	9min	17min
Return from landfill	24min (estimated)	18min
Time at end of 1 st round	11:35	12:35
Total 1 st round loading time	95min	122.5min
Total 1 st round time	201min	227min
1 st round loading time (% of total time)	47	54

Notes:

1. The four wheel tractor left NEMC at 8:14, going to the workshop where it connected to a trailer, leaving there at 8:21. The total round time included a 12min tea break.
2. The lorry was approximately 20min late leaving NEMC due to the JCB blocking the driveway preventing it from passing. The total round time included 2min waiting for the driver to return from a tea break. On leaving the landfill, the crew stopped at a nearby stream to wash the lorry, which they normally do every second day (~30-40min washing time). The washing time was not included in the collection round time.
3. During the lorry time and motion study (parts of zones 3-6), it was observed that most concrete bins were less than 25% full and contained mainly food/kitchen waste. The proportion of garden waste was relatively low, although there were some large isolated piles of garden waste. Bottles, plastics and tins also seemed to be present in relatively high proportions.
4. Loading of the lorry is more difficult than for the four wheel tractor due to its higher sides, while it must also be unloaded manually at the landfill, resulting in the unloading time being approximately double that of the tractor.

2.3.5 NEMC Collection Vehicle Unit Costs

NEMC collection vehicle unit costs were calculated for handcarts, tractors and the lorry using actual trips (September 12-18, 2002) and cost data supplied by NEMC, supplemented by data from other sources where necessary. These costs are tabulated below.

Table 2-6: NEMC Collection Vehicle Unit Costs

Item	Handcart		4WT	Lorry	Compactor
No of labourers	2	3	3	3	3
Driver	0	0	71,580	71,580	71,580
Labourers	134,400	201,600	201,600	201,600	201,600
Staff equipment	2,010	2,825	3,300	3,025	3,025
Diesel	0	0	62,244	133,952	87,640
Repair/maintenance	2,500	2,500	30,000	18,000	25,000
Tyres and tubes			35,550	41,630	26,460
Trailer maintenance	0	0	10,000	0	0
Insurance	0	0	8,252	8,520	11,880
Licence/ registration	0	0	300	4,800	2,800
Depreciation	1,733	1,733	110,585	57,570	166,667
Total (Rs/yr)	140,643	208,658	533,410	540,677	596,652
Average trips/d	3 – 5	3 – 5	2	0.86	2
Collection (T/yr)	112-187	112 - 187	1,033	821	1,334
Unit cost (Rs/T)	1,252-751	1,858- 1,115	517	659	447
Kandy MC (Aug 02)	1,342	1,983	496 (4Lr)	N/a	707 (4Lr)
Matale MC (Aug 02)	501	N/a	403 (4Lr)	N/a	451 (4Lr)
Negombo MC (Aug 02)	N/a	1,320-792 (3-5tr/d)	418 (3Lr)	N/a	N/a
Chilaw (Aug 02)	689-391 (2.8-5tr/d)	1,322-749 (2.8-5tr/d)	629 (3Lr)	772 (3Lr)	N/a
Gampaha (Aug 02)	1,482 (3tr/d)	2,185 (3tr/d)	799 (4Lr)	N/a	N/a
Badulla (Sep 02)	N/a	1,865-1,119 (3-5tr/d)	268-254 (3Lr)	N/a	390 (3Lr)

Notes:

1. Lr = labourer, tr = trips.
2. Average number of trips per day based on NEMC Sep 12-18, 2002 vehicle trip records for four wheel tractors (4WTs) and lorry and on NEMC estimates for the compactor.
3. Handcart garbage collection tonnage data based on 3-5 trips per day for 2-3 labourers, this being the typical range of daily trips completed by handcarts according to NEMC supervisors.
4. Repair/maintenance costs include oil.
5. Straight line depreciation has been included, based on the following capital costs and lifetimes: handcart = 5,200Rs, 3yrs; four wheel tractor = 950,290Rs, 10yrs (average capital cost of all NEMC SWM four wheel tractors), tractor trailer = 93,333Rs, 6yrs (average capital cost of all NEMC SWM trailers), lorry = 575,700Rs, 10yrs (average capital cost for a 1990 ELF 350 lorry from Chilaw UC, as NEMC has no capital cost data for their lorry); compactor = 1,000,000Rs, 6 yrs.
6. For tractors, 2.0 trips/d represents the average number of trips measured over the JICA seven day survey period for all four tractors. However, considering the different tractors separately, the tractor emptying the stationary trailers is able to complete an average of 3.4 trips/d, while other tractors are only able to complete 1.3-1.7trips/d. Hence, in reality, unit costs will be significantly lower for the tractor emptying the stationary trailers² and slightly higher for other tractors, compared with the average unit cost shown above.

2.4 Final Disposal

Results of an assessment of the current landfill site in Nuwara Eliya are given below.

Table 2-7: Assessment of Moon Plains Landfill

Item	Description
1. Name	Moon Plains Landfill
2. Location	Moon Plains, approximately 6km from Nuwara Eliya town centre

² Diesel, oil, tyres/tubes, tractor and trailer maintenance will be higher for this tractor due to the greater number of trips undertaken, but this will be outweighed by the significantly greater tonnage carried, giving a lower unit cost.

Item		Description					
3. Start of landfilling		1996					
4. Land ownership		Forest Department					
5. General site description and topography		Landfilling is taking place within a valley of a plantation forest reserve, outside NEMA. The valley runs from the north-east to south-west and is approximately 400m long and 30-40m in depth. The valley catchment extends upgradient of the landfill to meadow lands owned by the Agricultural Department. There is a stream situated about 500m below the landfill at the bottom of the valley, which flows into the Bomuraella reservoir from which water is being extracted for potable and irrigation use.					
7. Surrounding land use		Agricultural and tea estate lands surround the forest reserve.					
6. Plantation forest data		Forest Code: B/SB02/003 Plantation year: 1975 Tree species: E. grandis Total plantation forest area: 22.2 ha					
7. Area		Total catchment area: 5.8 ha Landfill area: 2.0 ha Plantation forest: 2.9 ha Agricultural land: 0.9 ha					
8. Disposal details	Method	Open dumping with no environmental protection measures being taken.					
9. Waste discharge	Municipal waste	MSW collected by NEMC; daily average: 15.9 T/day (477 T/month)					
	Healthcare waste (HCW)	Most healthcare waste (0.49T/d) is discharged for NEMC collection, comprising mainly MSW but also including small quantities of clinical waste from the Base and Ideal hospitals.					
	Industrial waste	Mainly Inter-Fashion Garment Factory and Winter World Discharge amount: 0.52T/d.					
	Gully sucker waste (1 x 7,000L tanker)	Gully sucker waste is discharged to pits excavated near the landfill site; daily average: 1 trip/day (7.0 m ³ /day).					
10. Environmental impact	Odour	Strong odour throughout the year mainly due to no soil cover.					
	Pests	Many pests throughout the year mainly due to no soil cover.					
	Dogs	Many dogs throughout the year mainly due to no soil cover.					
	Fire & Smoke	Fire and smoke almost always present from burning waste.					
	Leachate	Leachate generation is relatively small, but it is flowing due to the lack of cover soil and leachate treatment facilities.					
	Gully sucker waste	Gully sucker waste often overflows from the pits in which it is discharged, damaging the nearby forest.					
11. Facilities	General	One hut (control house); no gate, fence, weighbridge or buffer zone					
	Leachate treatment	None					
	Utilities	No electricity supply, water supply or telephone line					
12. Operation and Maintenance (O&M)	Responsibility	Nuwara Eliya Municipal Council					
	Equipment	Backhoe loader (JCB): one unit, owned by NEMC. It normally works for about 4hr/day at the landfill. O&M cost, excluding labour = diesel @ 30,000 Rs/month, lubricant @ 12,000 Rs/month and insurance @ 30,515 Rs/year					
	Staff allocation	Position	Duty	No.	Salary (Rs/mth)	Work hours	
		Supervisor	Supervision	1	7,929	8:00 - 17:00	
		Assistant supervisor	Supervision	1	7,523	8:00 - 17:00	
		Labourer	Waste unloading	4	7,340	8:00 - 17:00	
Backhoe Operator		Backhoe operation	1	6,000	2 hours in day shift		
13. O&M cost	Item	Unit	Unit rate	Time spent on SWM	Qty	Cost (Rs/yr)	Remarks
	Supervisor	Rs/yr	95,148	100%	1	95,148	7,929 Rs/mth
	Assistant supervisor	Rs/yr	90,281	100%	1	90,281	7,523 Rs/mth

Item		Description						
	Labourer	Rs/yr	88,080	100%	4	352,320	7,340 Rs/mth	
	Backhoe operator	Rs/yr	72,000	50%	1	36,000	6,000 Rs/mth	
	JCB (3CX SIDE- SHIFT)	Diesel	Rs/month	30,000	50%	12	180,000	Work hrs (normal): 4 hrs/day
		Lubricant	Rs/month	12,000	50%	12	72,000	
		Insurance	Rs/yr	30,515	50%	1	15,257	
	Total cost						841,006	
	Total disposal amount		Tonne/yr			6,059	N/a	16.6T/day
Unit O&M cost						138.8	Rs/T	
14. Surround- ing villages	Moon Plains Village	About 150 mainly middle and low income households (farmers).						
	Wajirapura Village	About 350 high, middle and low income households.						
	Bullu Ella Village	About 80 households.						

Chapter 3
Nuwara Eliya
Field Surveys

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Chapter 3 Field Survey

3.1 Public Opinion Survey for household in Nuwara Eliya

Findings from Public Opinion Survey for Household in Nuwara Eliya

A questionnaire survey was conducted among 120 households in Nuwara Eliya Municipal Areas, to gather;

- A basic socio-economic profile of inhabitants of Nuwara Eliya.
- An appreciation of public attitude to the provision of solid waste collection services.
- An appreciation of desired improvement in solid waste management services.
- An indication of willingness to pay for improved solid waste collection services.

Period of survey: 18th to 24th September 2002

Sample size: 120 (40 each from high, middle and low income areas)

Sampling areas: *High income areas are Waterfield Drive and Piyathissapura.

*Middle income areas are Mahinda

Mawatta and Gamurupura Rd.

*Low income areas are MC line

(Hawaeliya) and PWD line (Kandy Rd.).

1. General Questions

Q1-1 Ethnicity

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Sinhala	4	10%	30	75%	19	48%	53	44%
2 Muslim	0	0%	1	3%	4	10%	5	4%
3 Tamil	36	90%	8	20%	14	35%	58	48%
4 Other	0	0%	1	3%	3	8%	4	3%
Total	40	100%	40	100%	40	100%	120	100%

Note: Other means "Malay" and "foreigners."

Q1-2 Religion

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Buddhist	4	10%	28	70%	14	35%	46	38%
2 Islam	0	0%	2	5%	5	13%	7	6%
3 Hindu	34	85%	8	20%	10	25%	52	43%
4 Christian	2	5%	2	5%	11	28%	15	13%
5 Other	0	0%	0	0%	0	0%	0	0%
Total	40	100%	40	100%	40	100%	120	100%

Q1-3 Household information

(person)	Low	Middle	High	Total
Avg. number of household members	5.2	5.5	4.7	5.1
(Rs.)	Low	Middle	High	Total
Avg. household income	6,614	11,469	16,800	11,628
(Rs.)	Low	Middle	High	Total
Income per person	1,272	2,085	3,613	2,272

Q1-4 How much is the total expenditure of your household per month on average?

(Rs.)	Low	Middle	High	Total
Avg. household expenditure	4,725	7,913	12,800	8,479

(Rs.)	Low	Middle	High	Total
Expenditure per person	909	1,439	2,753	1,657

Q1-5 Please specify the priority for your daily life regarding the improvement of the following aspects? (Fill all three priorities)

	Low	Middle	High	Total
1 First	Other (housing and toilet problems)	Garbage collection	Garbage collection	Garbage collection
2 Second	Storm water drainage	Water supply	Waste water collection	Waste water collection
3 Third	Waste water collection	Waste water collection	Water supply	Water supply

2. Questions on Garbage Collection Services in Your Area

Q2-1 Are there garbage collection services in your area?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	40	100%	35	88%	40	100%	115	96%
2 No	0	0%	5	13%	0	0%	5	4%
Total	40	100%	40	100%	40	100%	120	100%

Q2-2 Do you use these services?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	38	95%	32	80%	36	90%	106	88%
2 No	2	5%	3	8%	4	10%	9	8%
99 Irrelevant	0	0%	5	13%	0	0%	5	4%
Total	40	100%	40	100%	40	100%	120	100%

Q2-3(a) How is your garbage collected?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Placing garbage outside the property for collection	0	0%	1	3%	0	0%	1	1%
2 Carrying garbage to a specified collection point	38	95%	27	68%	33	83%	98	82%
3 Carrying garbage to a collection truck directly	0	0%	4	10%	3	8%	7	6%
4 Others	0	0%	0	0%	0	0%	0	0%
99 Irrelevant	2	5%	8	20%	4	10%	14	12%
Total	40	100%	40	100%	40	100%	120	100%

Q2-3(b) (Only for those who choose 2 or 3 in question Q2-3) How far do you have to walk to reach this point?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 1 - 25m	22	55%	13	33%	8	20%	43	36%
2 26 - 50m	15	38%	6	15%	4	10%	25	21%
3 51 - 100m	1	3%	3	8%	9	23%	13	11%
4 100 - 250m	0	0%	9	23%	12	30%	21	18%
5 Over 250m	0	0%	0	0%	3	8%	3	3%
99 Irrelevant	2	5%	9	23%	4	10%	15	13%
Total	40	100%	40	100%	40	100%	120	100%

Q2-4 How often is your garbage collected?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Daily	11	28%	6	15%	7	18%	24	20%
2 More than four times per week	7	18%	11	28%	3	8%	21	18%
3 Two to three times per week	19	48%	15	38%	20	50%	54	45%
4 Once a week	1	3%	0	0%	3	8%	4	3%
5 Less than once per week	0	0%	0	0%	0	0%	0	0%
6 Irregular	0	0%	0	0%	3	8%	3	3%
98 Don't know	0	0%	0	0%	0	0%	0	0%
99 Irrelevant	2	5%	8	20%	4	10%	14	12%
Total	40	100%	40	100%	40	100%	120	100%

Q2-5 Is the garbage collection service done at a fixed time on the collection day?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	29	73%	11	28%	6	15%	46	38%
2 No	9	23%	21	53%	29	73%	59	49%
98 Don't know	0	0%	0	0%	1	3%	1	1%
99 Irrelevant	2	5%	8	20%	4	10%	14	12%
Total	40	100%	40	100%	40	100%	120	100%

Q2-6 Have you ever given small allowance such as New Year's allowance and other seasonal allowance, including the reward to the extra work for you, to garbage collectors?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	0	0%	2	5%	1	3%	3	3%
2 No	38	95%	30	75%	35	88%	103	86%
99 Irrelevant	2	5%	8	20%	4	10%	14	12%
Total	40	100%	40	100%	40	100%	120	100%

Q2-7 How much is the total amount of (1) small allowance and (2) the reward you gave over the last one year?

(1) Small allowance

(Rs.)	Low	Middle	High	Total
Average annual small allowance	-	20	100	47

Note: No. of effective answers on this question is 3.

(2) Reward

(Rs.)	Low	Middle	High	Total
Average annual reward	-	-	-	-

Q2-8 Are you satisfied with the collection service?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Very satisfied	24	60%	5	13%	6	15%	35	29%
2 Somewhat satisfied	11	28%	22	55%	23	58%	56	47%
3 Less than satisfied	3	8%	5	13%	6	15%	14	12%
4 Not satisfied at all	0	0%	0	0%	1	3%	1	1%
99 Irrelevant	2	5%	8	20%	4	10%	14	12%
Total	40	100%	40	100%	40	100%	120	100%

Q2-9 If you chose 2, 3 or 4, what are the reasons? (Choose one or more)

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Garbage collection / sweeping is not properly done	12	20%	24	33%	23	28%	59	28%
2 Garbage collection / sweeping frequency is too low	11	18%	9	13%	15	19%	35	16%
3 Garbage collection / sweeping is irregular	6	10%	8	11%	10	12%	24	11%
4 Garbage collection time is too early or to late or irregular	1	2%	4	6%	5	6%	10	5%
5 Behavior of garbage collection workers is bad	2	3%	0	0%	0	0%	2	1%
6 Garbage collection workers demand small allowance	0	0%	0	0%	0	0%	0	0%
7 Garbage collection small allowance is expensive	0	0%	0	0%	0	0%	0	0%
8 Collection service is not fair	2	3%	0	0%	0	0%	2	1%
9 Garbage collection point is too far	0	0%	12	17%	17	21%	29	14%
10 Other	0	0%	2	3%	1	1%	3	1%
99 Irrelevant	26	43%	13	18%	10	12%	49	23%
Total	60	100%	72	100%	81	100%	213	100%

Note: Other means "bulky wastes remain on the street", "dirty drainage" and "not proper supervision".

Q2-10 Have you ever complained about the garbage collection service to the authorities in the last three years?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	3	8%	13	33%	12	30%	28	23%
2 No	35	88%	19	48%	24	60%	78	65%
99 Irrelevant	2	5%	8	20%	4	10%	14	12%
Total	40	100%	40	100%	40	100%	120	100%

Q2-11 **(Only for persons who chose "NO" in question Q2-1)** Do you want to receive a garbage collection service?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	0	0%	5	13%	0	0%	5	4%
2 No	0	0%	0	0%	0	0%	0	0%
99 Irrelevant	40	100%	35	88%	40	100%	115	96%
Total	40	100%	40	100%	40	100%	120	100%

3. Questions on Waste Discharge from Your Premises

Q3-1 How do you dispose of garbage generated in your premises?

	Low		Middle		High		Total	
	Main	Other	Main	Other	Main	Other	Main	Other
1 Discharge it outside of the house for the house to house collection	0	0	1	0	0	0	1	0
2 Discharge it at the specified place for the collection service	36	2	27	2	34	1	97	5
3 Open dumping outside of the house	2	6	2	0	0	0	4	6
4 Ask the relevant authority to send garbage collectors	0	0	0	1	0	0	0	1
5 Self-dispose	1	0	3	9	3	8	7	17
6 Composting (producing fertilizer from waste)	1	2	2	2	2	7	5	11
7 Give for recycling	0	0	0	0	0	0	0	0
8 Other	0	0	5	3	1	1	6	4
Total	40	10	40	17	40	17	120	44

	Low		Middle		High		Total	
	Main	Other	Main	Other	Main	Other	Main	Other
1 Discharge it outside of the house for the house to house collection	0%	0%	3%	0%	0%	0%	1%	0%
2 Discharge it at the specified place for the collection service	90%	20%	68%	12%	85%	6%	81%	11%
3 Open dumping outside of the house	5%	60%	5%	0%	0%	0%	3%	14%
4 Ask the relevant authority to send garbage collectors	0%	0%	0%	6%	0%	0%	0%	2%
5 Self-dispose	3%	0%	8%	53%	8%	47%	6%	39%
6 Composting (producing fertilizer from waste)	3%	20%	5%	12%	5%	41%	4%	25%
7 Give for recycling	0%	0%	0%	0%	0%	0%	0%	0%
8 Other	0%	0%	13%	18%	3%	6%	5%	9%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Note: Other means "directly to the collection trucks" and "to a dust bin on the main road, which is located far from their houses".

Q3-2 How often do you dispose of garbage generated in your premises?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 As soon as waste arises	1	3%	0	0%	1	3%	2	2%
2 Once daily	21	53%	20	50%	22	55%	63	53%
3 Once every 2 or 3 days	16	40%	18	45%	17	43%	51	43%
4 Less frequently	2	5%	2	5%	0	0%	4	3%
Total	40	100%	40	100%	40	100%	120	100%

Q3-3 Who mainly handles wastes at home?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 An adult male member	1	3%	1	3%	4	10%	6	5%
2 An adult female member	39	98%	38	95%	29	73%	106	88%
3 Servant	0	0%	1	3%	7	18%	8	7%
4 Others	0	0%	0	0%	0	0%	0	0%
Total	40	100%	40	100%	40	100%	120	100%

Q3-4 (Only for persons who chose 2 in question Q3-1) Who mainly brings the wastes to a specific collection point?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 An adult male member	2	5%	3	8%	14	35%	19	16%
2 An adult female member	36	90%	25	63%	12	30%	73	61%
3 Child	0	0%	0	0%	1	3%	1	1%
4 Servant	0	0%	1	3%	8	20%	9	8%
5 Others	0	0%	0	0%	0	0%	0	0%
99 Irrelevant	2	5%	11	28%	5	13%	18	15%
Total	40	100%	40	100%	40	100%	120	100%

Q3-5 What type of container do you use for carrying garbage to a collection point or for placing the garbage outside of your house? (Choose one or more)

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Plastic bag	33	72%	36	64%	35	59%	104	65%
2 Paper bag	0	0%	2	4%	0	0%	2	1%
3 Metal/plastic/wood garbage bin	4	9%	12	21%	20	34%	36	22%
4 Box	0	0%	0	0%	0	0%	0	0%
5 Basket	5	11%	0	0%	1	2%	6	4%
6 None-place directly	4	9%	6	11%	3	5%	13	8%
7 Others	0	0%	0	0%	0	0%	0	0%
Total	46	100%	56	100%	59	100%	161	100%

Q3-6 Why do you use it? (Choose one or more)

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 It is clean after collection work	4	6%	11	15%	14	21%	29	14%
2 It prevents foul odors	0	0%	9	12%	2	3%	11	5%
3 It is easy handling	35	50%	36	48%	38	57%	109	51%
4 It keeps away pests such as flies	5	7%	3	4%	4	6%	12	6%
5 It is cheap or easy to get	26	37%	16	21%	9	13%	51	24%
6 Other	0	0%	0	0%	0	0%	0	0%
Total	70	100%	75	100%	67	100%	212	100%

Q3-7 ***(Only for those who did not choose 2 in Q3-1)*** If you are requested to carry your garbage to a specified garbage collection point, would you cooperate to do so?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes, if it is located within 25m distance (30 sec to walk)	2	5%	5	13%	3	8%	10	8%
2 Yes, if it is located within 50m distance (1 min to walk)	0	0%	3	8%	0	0%	3	3%
3 No, I do not prefer the collection system mentioned above anyway	0	0%	3	8%	2	5%	5	4%
4 Others	0	0%	0	0%	0	0%	0	0%
98 Don't know	0	0%	0	0%	0	0%	0	0%
99 Irrelevant	38	95%	29	73%	35	88%	102	85%
Total	40	100%	40	100%	40	100%	120	100%

Q3-8 Do you have garden wastes (fallen leaves and branches or grass and weeds)?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	3	8%	28	70%	21	53%	52	43%
2 No	37	93%	12	30%	19	48%	68	57%
Total	40	100%	40	100%	40	100%	120	100%

Q3-9 How do you discharge your garden wastes generally?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Discharge it at the collection point with the other wastes for collection	1	3%	10	25%	0	0%	11	9%
2 Discharge it outside of my premises with the other wastes for collection	0	0%	0	0%	0	0%	0	0%
3 Ask the relevant authorities to send garbage collectors	0	0%	0	0%	0	0%	0	0%
4 Self-dispose	1	3%	15	38%	10	25%	26	22%
5 Composting (producing fertilizer from waste)	1	3%	2	5%	11	28%	14	12%
6 Give for composting	0	0%	1	3%	0	0%	1	1%
7 Others	0	0%	0	0%	0	0%	0	0%
99 Irrelevant	37	93%	12	30%	19	48%	68	57%
Total	40	100%	40	100%	40	100%	120	100%

Note: Other means "direct to the collection vehicles."

Q3-10 ***(Only for those who chose 3 in Q3-1)*** Where do you dispose of your garbage by open dumping?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 On banks of or in stream / river	8	20%	0	0%	0	0%	8	7%
2 On vacant land	0	0%	2	5%	0	0%	2	2%
3 In a gully	0	0%	0	0%	0	0%	0	0%
4 In the sea	0	0%	0	0%	0	0%	0	0%
5 Others	0	0%	0	0%	0	0%	0	0%
99 Irrelevant	32	80%	38	95%	40	100%	110	92%
Total	40	100%	40	100%	40	100%	120	100%

4. Questions on Recycling and Waste Reduction

Q4-1 Recycling of waste is most effective if the waste can be sorted into different categories by the household. If the relevant authorities such as municipal councils and urban councils introduce a separate garbage collection system, you will be requested to separate your wastes into a number of categories, for example, such as i.) compostable waste such as food waste, paper and garden waste ii.) recyclable waste such as metals, glass, plastics, paper and iii.) other wastes. Are you willing to cooperate with this type of system?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Very much willing to cooperate	17	43%	26	65%	28	70%	71	59%
2 Somewhat willing to cooperate	8	20%	8	20%	5	13%	21	18%
3 Less willing to cooperate /somewhat unwilling to cooperate	7	18%	6	15%	5	13%	18	15%
4 Not willing to cooperate at all	8	20%	0	0%	1	3%	9	8%
5 Am doing already	0	0%	0	0%	1	3%	1	1%
Total	40	100%	40	100%	40	100%	120	100%

Q4-2 If you answered either 1 or 2 and 5, why do you think recycling is important? (Choose one or more)

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Recycling would reduce the amount of waste going to landfill	6	10%	17	26%	21	34%	44	23%
2 Recycling would help to protect environment	21	34%	34	52%	33	54%	88	47%
3 Recycling would allow you to earn some money	19	31%	9	14%	1	2%	29	15%
4 Others	0	0%	0	0%	0	0%	0	0%
99 Irrelevant	15	25%	6	9%	6	10%	27	14%
Total	61	100%	66	100%	61	100%	188	100%

Q4-3 If you answered either 1 or 2 and 5, how many categories would you be willing to separate your wastes into?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Two	10	25%	23	58%	24	60%	57	48%
2 Three	14	35%	8	20%	6	15%	28	23%
3 More than that	1	3%	3	8%	4	10%	8	7%
99 Irrelevant	15	38%	6	15%	6	15%	27	23%
Total	40	100%	40	100%	40	100%	120	100%

Q4-4 ***If you choose 2, 3, or 4 in Q4-1, what are the reasons? (Choose one or more)***

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 It is inconvenient and difficult	20	27%	9	17%	10	20%	39	22%
2 It may increase financial burden regarding to the discharging cost	5	7%	7	13%	0	0%	12	7%
3 It will take much time	3	4%	2	4%	4	8%	9	5%
4 Needs for the recycling system is not clear	10	14%	2	4%	1	2%	13	7%
5 Benefits of the recycling system is not clear	3	4%	3	6%	1	2%	7	4%
6 There may be poor contribution from household members	15	21%	3	6%	5	10%	23	13%
7 Others	0	0%	0	0%	0	0%	0	0%
98 Don't know	0	0%	0	0%	0	0%	0	0%
99 Irrelevant	17	23%	26	50%	29	58%	72	41%
Total	73	100%	52	100%	50	100%	175	100%

Q4-5 Is there someone who comes around to collect or buy your reusable or recyclable materials?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	33	83%	39	98%	30	75%	102	85%
2 No	7	18%	1	3%	10	25%	18	15%
Total	40	100%	40	100%	40	100%	120	100%

Q4-6 Which materials do they collect or buy from you?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Glass	13	28%	24	52%	20	39%	57	40%
2 Cardboard	0	0%	0	0%	0	0%	0	0%
3 Paper	1	2%	2	4%	9	18%	12	8%
4 Metal can	3	7%	0	0%	2	4%	5	3%
5 Other metal	2	4%	4	9%	0	0%	6	4%
6 Kitchen waste	0	0%	0	0%	0	0%	0	0%
7 Garden waste	0	0%	0	0%	0	0%	0	0%
8 Plastics	0	0%	0	0%	1	2%	1	1%
9 Textiles (e.g. clothes)	0	0%	2	4%	0	0%	2	1%
10 Leather, rubber	0	0%	0	0%	0	0%	0	0%
11 Wood / Timber	0	0%	0	0%	0	0%	0	0%
12 Tyres	0	0%	0	0%	0	0%	0	0%
13 Others	0	0%	0	0%	0	0%	0	0%
98 Not selling	20	43%	13	28%	9	18%	42	29%
99 Irrelevant	7	15%	1	2%	10	20%	18	13%
Total	46	100%	46	100%	51	100%	143	100%

Q4-7 Do you take for recyclable materials to shops for refund or sale?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	7	18%	16	40%	10	25%	33	28%
2 No	33	83%	24	60%	30	75%	87	73%
Total	40	100%	40	100%	40	100%	120	100%

Q4-8(a) Which materials do you return or sell to shops?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Glass	7	17%	14	35%	8	20%	29	24%
2 Cardboard	0	0%	0	0%	0	0%	0	0%
3 Paper	1	2%	2	5%	2	5%	5	4%
4 Metal can	0	0%	0	0%	0	0%	0	0%
5 Other metal	0	0%	0	0%	0	0%	0	0%
6 Kitchen waste	0	0%	0	0%	0	0%	0	0%
7 Garden waste	0	0%	0	0%	0	0%	0	0%
8 Plastics	0	0%	0	0%	0	0%	0	0%
9 Textiles (e.g. clothes)	0	0%	0	0%	0	0%	0	0%
10 Leather, rubber	0	0%	0	0%	0	0%	0	0%
11 Wood / Timber	0	0%	0	0%	0	0%	0	0%
12 Tyres	0	0%	0	0%	0	0%	0	0%
13 Others	0	0%	0	0%	0	0%	0	0%
99 Irrelevant	33	80%	24	60%	30	75%	87	72%
Total	41	100%	40	100%	40	100%	121	100%

Q4-8(b) (*Only for those choosing Yes in either Q4-5 or Q4-7*) What are the major materials collected from you or returned / sold to shops, and how much do you sell these for per month?

	Low	Middle	High	Total
1 First	Bottle (17)	Bottle (28)	Bottle (22)	Bottle (67)
2 Second	Aluminum (4)	Paper (4)	Paper (10)	Paper (16)
3 Third	Paper (2)	Metals (4)	Metals (2)	Aluminum (6)

Note: Bracketed figures show the number of households that sell these materials.

(Rs.)	Low	Middle	High	Total
Avg. monthly income from recycling	19	28	75	43

Note: Number of effective answers is 41.

Q4-9(a) Are you using kitchen and/or garden waste for compost?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	3	8%	5	13%	12	30%	20	17%
2 No	37	93%	35	88%	28	70%	100	83%
Total	40	100%	40	100%	40	100%	120	100%

Q4-9 (i) If yes to the previous question, how much of these wastes do you compost per month?

Kitchen Wastes	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Less than half	0	0%	1	3%	5	13%	6	5%
2 Half	3	8%	0	0%	1	3%	4	3%
3 More than half	0	0%	2	5%	2	5%	4	3%
4 All	0	0%	2	5%	2	5%	4	3%
5 Irrelevant	37	93%	35	88%	30	75%	102	85%
Total	40	100%	40	100%	40	100%	120	100%

Garden Wastes	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Less than half	0	0%	1	3%	0	0%	1	1%
2 Half	1	3%	1	3%	1	3%	3	3%
3 More than half	0	0%	1	3%	1	3%	2	2%
4 All	1	3%	2	5%	10	25%	13	11%
5 Irrelevant	38	95%	35	88%	28	70%	101	84%
Total	40	100%	40	100%	40	100%	120	100%

(ii) How much compost do you produce per month?

(Kg.)	Low	Middle	High	Total
Monthly compost production	6.0	3.4	114.3	62.9

Note: No. of effective answers are 15. One person produces about 800kg per month.

(iii) What do you do with it?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Sell	1	3%	0	0%	0	0%	1	1%
2 Own use	2	5%	5	13%	12	30%	19	16%
3 Irrelevant	37	93%	35	88%	28	70%	100	83%
Total	40	100%	40	100%	40	100%	120	100%

Q4-10 Hazardous waste refers to items like dead batteries, used spray cans, old medicines, old household chemicals, solvents, paints, etc. Considering all the solid waste produced by your household, how many hazardous waste items would you dispose of per month?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 None	26	65%	14	35%	20	50%	60	50%
2 One to two	11	28%	16	40%	13	33%	40	33%
3 Three to five	3	8%	7	18%	3	8%	13	11%
4 Six to ten	0	0%	1	3%	4	10%	5	4%
5 More than ten	0	0%	2	5%	0	0%	2	2%
Total	40	100%	40	100%	40	100%	120	100%

Q4-11 Suppose that you are satisfied with the service of Municipal solid waste management, either as is or as a result of improvement. Think for a moment about the largest amount of money that your household would be willing to pay each month as a garbage collection fee. (Important: If the garbage collection fee is more than this amount, your household will not be able to afford to pay and will not be able to use the garbage collection service.)

(Rs.)	Low	Middle	High	Total
Avg. amount of WTP (willingness to pay)	33	34	98	55

5. Public cooperation / Community participation

Q5-1 Now, we would like to ask about the community you live. In your community, do you have any community-based organizations to solve not only the waste problems but also other community problems?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	15	38%	35	88%	14	35%	64	53%
2 No	22	55%	3	8%	19	48%	44	37%
98 Don't know	3	8%	2	5%	7	18%	12	10%
Total	40	100%	40	100%	40	100%	120	100%

Q5-2 If yes, when did the community-based organization start functioning?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Within five years	2	5%	10	25%	5	13%	17	14%
2 Between six to ten years	4	10%	4	10%	1	3%	9	8%
3 More than eleven years ago	0	0%	8	20%	0	0%	8	7%
98 Don't know	9	23%	13	33%	8	20%	30	25%
99 Irrelevant	25	63%	5	13%	26	65%	56	47%
Total	40	100%	40	100%	40	100%	120	100%

Q5-3 How is the leader of this community chosen?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Democratically elected	7	18%	26	65%	6	15%	39	33%
2 Appointed by elders	0	0%	0	0%	0	0%	0	0%
3 Appointed by administration	0	0%	1	3%	1	3%	2	2%
4 Inherited	0	0%	0	0%	0	0%	0	0%
5 Others	0	0%	0	0%	0	0%	0	0%
98 Don't know	8	20%	8	20%	7	18%	23	19%
99 Irrelevant	25	63%	5	13%	26	65%	56	47%
Total	40	100%	40	100%	40	100%	120	100%

Q5-4 How often do you have the meetings?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 More often than once a month	3	8%	8	20%	2	5%	13	11%
2 Once in two months to five months	3	8%	12	30%	4	10%	19	16%
3 Once in six months	0	0%	1	3%	1	3%	2	2%
4 Once in seven to eleven months	0	0%	0	0%	0	0%	0	0%
5 Less often than once in a year	0	0%	2	5%	0	0%	2	2%
6 No meeting	0	0%	3	8%	0	0%	3	3%
98 Don't know	9	23%	9	23%	7	18%	25	21%
99 Irrelevant	25	63%	5	13%	26	65%	56	47%
Total	40	100%	40	100%	40	100%	120	100%

Q5-5 Have you ever discussed the methods of proper garbage handling and discharge at the meetings?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	2	5%	3	8%	1	3%	6	5%
2 No	3	8%	24	60%	5	13%	32	27%
98 Don't know	10	25%	8	20%	8	20%	26	22%
99 Irrelevant	25	63%	5	13%	26	65%	56	47%
Total	40	100%	40	100%	40	100%	120	100%

Q5-6 Have you ever been taught methods of proper garbage handling and discharge?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	15	38%	26	65%	25	63%	66	55%
2 No	25	63%	14	35%	15	38%	54	45%
Total	40	100%	40	100%	40	100%	120	100%

Q5-7 If "Yes" to the previous question, who taught these to you? (Choose one or more)

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Parents	3	6%	1	2%	6	11%	10	6%
2 Community leaders	0	0%	0	0%	0	0%	0	0%
3 School teachers	9	18%	15	29%	12	23%	36	23%
4 Local government	11	22%	18	35%	5	9%	34	22%
5 Central government	1	2%	0	0%	1	2%	2	1%
6 NGOs	0	0%	1	2%	1	2%	2	1%
7 Others	1	2%	2	4%	13	25%	16	10%
99 Irrelevant	25	50%	14	27%	15	28%	54	35%
Total	50	100%	51	100%	53	100%	154	100%

Note: Other means "mass media".

Q5-8 Does anyone in your family or your servant clean the side of the road or adjacent public area in front of your premises?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes, almost everyday	24	60%	11	28%	17	43%	52	43%
2 Yes, sometimes	9	23%	17	43%	17	43%	43	36%
3 No	7	18%	12	30%	6	15%	25	21%
Total	40	100%	40	100%	40	100%	120	100%

Q5-9 Here please tell me about the behavior of your community population, **and not yours**. What are **the most common** methods to dispose of the garbage in this community?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Picked up by garbage collection service	37	90%	35	85%	39	74%	111	82%
2 Burnt	0	0%	3	7%	1	2%	4	3%
3 Thrown in the open space or rivers	3	7%	3	7%	12	23%	18	13%
4 Just dumped on the yard / in the garden	1	2%	0	0%	1	2%	2	1%
5 Buried on the yard / in the garden	0	0%	0	0%	0	0%	0	0%
6 Others	0	0%	0	0%	0	0%	0	0%
98 Don't know	0	0%	0	0%	0	0%	0	0%
Total	41	100%	41	100%	53	100%	135	100%

Q5-10 Has anyone in this household, including children, received any health and environmental education or information relating to solid waste?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Yes	31	78%	37	93%	39	98%	107	89%
2 No	9	23%	3	8%	1	3%	13	11%
Total	40	100%	40	100%	40	100%	120	100%

Q5-11 If yes, where did this information come from? (Choose one or more)

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Parents	0	0%	0	0%	3	3%	3	1%
2 School	21	23%	28	31%	32	28%	81	27%
3 Medical worker /center / hospital	5	5%	6	7%	4	3%	15	5%
4 Community organization/ NGOs	1	1%	1	1%	2	2%	4	1%
5 Newspaper	4	4%	9	10%	23	20%	36	12%
6 Radio program	18	20%	8	9%	13	11%	39	13%
7 TV program	16	17%	24	27%	30	26%	70	23%
8 Local government	17	18%	11	12%	5	4%	33	11%
9 Central government	1	1%	0	0%	1	1%	2	1%
10 Others	0	0%	0	0%	2	2%	2	1%
99 Irrelevant	9	10%	3	3%	1	1%	13	4%
Total	92	100%	90	100%	116	100%	298	100%

Note : Other means "from working places."

Q5-12 Do you think a campaign to raise awareness of people for maintaining the cleaner city and environment is necessary?

	Low		Middle		High		Total	
	Number	%	Number	%	Number	%	Number	%
1 Very necessary	33	83%	31	78%	32	80%	96	80%
2 Somewhat necessary	5	13%	7	18%	8	20%	20	17%
3 Not very necessary	2	5%	2	5%	0	0%	4	3%
4 Not necessary at all	0	0%	0	0%	0	0%	0	0%
Total	40	100%	40	100%	40	100%	120	100%

3.2 Commercial/Industrial and Institutional Waste Generator Survey Results

Commercial/industrial and institutional interview survey results for 68 samples within NEMA are summarized in this section.

3.2.1 Garbage Discharge and Collection

The following table sets out the main interview survey results relating to garbage discharge and collection. Some key points are summarized below:

- (a) 51 (75%) enterprises are provided with a garbage collection service by NEMC, with 50 (74%) of these using this service.
- (b) 17 (25%) enterprises pay garbage collection workers informally, the average payment being 3,025Rs/yr (range = 120 to 14,400Rs/yr). In addition, St Andrews Hotel is believed to give garbage collection workers 50Rs/worker every two days (from JICA time and motion study).
- (c) 21 (42%) of the 50 enterprises using the garbage collection service are satisfied with it. The main reasons for dissatisfaction are:
 - Poor garbage discharge system (23).
 - Garbage collection/sweeping is not done properly (18).
 - Garbage collection/sweeping frequency is too low (16).
 - Garbage collection/sweeping is irregular (15).

The Base Hospital is also concerned about the handling and disposal of hazardous healthcare wastes.

- (d) 10 (15%) enterprises have complained to NEMC about the garbage collection service at least once in the last 3 years.

Table 3-1: Survey Results - Garbage Discharge and Collection

Item	Small Waste Gen'rs	Large Waste Generators			Total
		Comm./ industrial	Other Inst'ns	Hospitals	
No of respondents	12	35	18	3	68
Q1.5 - Garbage storage within premises (main method) - No of responses^{2,3}					
a. Plastic bag	1	2	0	0	3
b. Open container	8	13	11	2	34
c. Container with lid	1	16	4	1	22
d. Place on ground/floor	2	4	3	0	9
e. Direct disposal CHECK					
Q1.6 - Main method of garbage disposal - No of responses³					
a. Place outside for collection	0	1	1	1	3
b. Carry to collection vehicle	8	8	0	0	16
c. Take to collection point	3	11	6	2	22
d. Labourers collect from premises	0	4	2	0	6
e. Bury on site	0	3	3	0	6
f. Burn on site	0	5	5	0	10
g. Recycle	1	2	1	0	4
h. Compost	0	1	0	0	1
i. Open dumping	0	0	1	0	1
j. Other	0	1	1	0	2
Q1.8 - Walking distance to garbage collection point - No of responses (only if chose Q1.6c)					
a. 0-25m	3	8	3	2	16
b. 25-50m	1	1	3	0	5
c. 50-100m	0	1	0	0	1
d. 100-250m	0	1	1	0	2
Q1.12 to 1.13 - Provision and use of garbage collection service - No of responses					
Provided	12	26	10	3	51
Not provided	0	9	8	0	17
Use	12	25	10	3	50
Want	N/a	5	5	0	10
Q1.14 - Garbage discharge and collection frequency - No of responses					
Discharge at least once daily	12	24	7	3	46
Collection at least daily	12	19	4	1	36
No response	0	0	0	1	1
Q1.15 to 1.17 - Garbage collection worker payment⁴					
No giving payments	0	15	1	1	17
Average payment (Rs/yr)	N/a	3,725	2,400	600	3,025
Range (Rs/yr)	N/a	120-14,400	N/a	N/a	120-14,400
Total (Rs/yr)	N/a	48,420	2,400	600	51,420
Q1.18 - Satisfaction with existing garbage collection service					
Satisfied (no)	6	10	4	1	21
Dissatisfied (no)	6	15	5	2	28
No response	0	0	1	0	1
Reasons for dissatisfaction:					
a. Poor discharge system	6	13	4	0	23
b. Collection point too far away	2	5	4	1	12
c. Coll'n/sweep. not done properly	4	8	4	2	18
d. Collection/sweeping is irregular	4	8	2	1	15
e. Coll'n/sweep. frequency too low	3	9	3	1	16
f. Collection time is too early/late	1	7	1	0	9
g. Garbage workers behave badly	0	0	0	0	0
h. labourers demand payment	0	1	0	0	1
i. LA garbage fee is too high	0	1	1	0	2
j. Lack of recycling	0	8	1	2	11
k. Other	2	2	0	0	4
l. Problems handling hazardous healthcare waste	N/a	N/a	N/a	1	1
Q1.19 - Complaints to NEMC in last 3 years - No of responses					
a. None	11	19	8	2	40
b. Once only	1	2	0	0	3
c. Several times	0	2	1	1	4
d. More than 5 time	0	2	1	0	3

Notes: Hospital garbage storage and disposal results apply to normal garbage; N/a = not applicable.

3.2.2 Improvements to Garbage Collection and Disposal

The following table sets out the main interview survey results relating to desired improvements to garbage discharge and collection. Some key points are summarized below:

(a) The five most desired improvements to garbage collection/disposal in descending order are:

- Improved discharge system (Weighted average rank, WAR = 60.0).
- Public education (WAR = 40.0).
- Greater recycling/composting (WAR = 25.0).
- Shorter distance to collection point (WAR = 22.0).
- Improved garbage collection frequency (WAR = 14.5).

Improved hazardous healthcare waste management is also of concern to all three hospitals.

(b) Most enterprises thought that NEMC (58, 85%) or the Central government (3, 4%) or Provincial Council (3, 4%) should pay for improved garbage collection and disposal. However, 11 (16%) supported the introduction of an individual garbage collection fee.

(c) 32 (47%) enterprises indicated a willingness to pay (WTP) a garbage collection fee while 13 were not willing to pay anything, giving an average WTP of 518Rs/mth (range = 25 to 2,000Rs/mth). 23 enterprises did not respond to this question. The non-respondents are mainly hotels and institutions, the main reason being the survey respondent wanted to refer this question to higher authorities for a decision (e.g. owner/manager; provincial/central government).

Table 3-2: Survey Results – Improvements to Garbage Collection and Disposal

Item	Small Waste Gen'rs	Large Waste Generators			Total
		Comm./ industrial	Other Inst'ns	Hospitals	
No of respondents	12	35	18	3	68
Q2.1 - Desired improvements to garbage collection/disposal – weighted average rank					
a. Improved discharge system	11.5	32.5	9.0	7.0	60.0
b. Closer collection point	5.0	12.5	3.0	1.5	22.0
c. More reliable service	3.5	8.5	0.5	4.0	16.5
d. Improved collection frequency	3.5	8.0	3.0	0.0	14.5
e. Greater recycling/composting	1.5	15.5	6.0	2.0	25.0
f. Improve landfill operation	2.0	1.5	3.5	0.0	7.0
g. Public education	9.0	22.0	8.0	1.0	40.0
h. Other	0.0	4.5	1.5	0.0	6.0
i. Improved collection/disposal of hospital hazardous waste	N/a	N/a	N/a	5.5	5.5
Q2.2 – Who should pay for improved garbage collection/disposal – No of responses					
a. Central government	1	2	0	0	3
b. Provincial Council	0	0	3	0	3
c. Local authority	10	31	14	3	58
d. Individual garbage fee	1	8	2	0	11
e. Other	0	3	3	0	6
Q2.3 - Willingness to pay for improved garbage collection/disposal					
Willing to pay (no)	11	18	3	0	32
Not willing to pay (no)	0	5	5	3	13
No response (no)	1	12	10	0	23
Willingness to pay (Rs/mth)	198	826	269	0	518

Notes: N/a = not applicable

3.2.3 Recycling and Possible Source Separation Collection System

The following table sets out the main interview survey results relating to recycling and a possible source separation collection system. Some key points are summarized below:

- (a) 67 (99%) enterprises believed recycling is necessary, with 57 (84%) enterprises being either very willing (55) or somewhat willing (2) to cooperate in separating their garbage at source, while three are doing this already. Those not willing to cooperate said this is because it is inconvenient/difficult (5) or takes too much time (4), while those willing to cooperate gave the main reasons as recycling protects the environment (56), followed by it reduces the amount of waste to disposal (16). 34 of these respondents are willing to sort their wastes into three (21) or more (11) categories. The preferred source separation system is either coloured plastic bags or permanent containers, collected from outside their premises.
- (b) Eight enterprises were willing to pay for permanent containers, while 13 were not willing to pay anything, giving an average WTP of 67Rs. There were 39 non-responses mainly from hotels and institutions, for the reasons described above.

Table 3-3: Survey Results – Recycling and Possible Source Separation System

Item	Small Waste Gen'rs	Large Waste Generators			Total
		Comm./ Industrial	Other Inst'ns	Hospitals	
No of respondents	12	35	18	3	68
Q2.4 – Recycling – No of responses					
Necessary	12	34	18	3	67
Q2.5 - Willingness to cooperate in separating wastes at source – No of responses					
a. Very willing	8	30	15	2	55
b. Somewhat willing	1	0	1	0	2
c. Less/somewhat unwilling	0	1	1	0	2
d. Not willing at all	3	2	1	0	6
e. Already sort	0	2	0	1	3
Q2.6 – Reasons for not being willing to cooperate – No of responses (only if chose Q2.5c or d)					
a. Increased financial burden	0	0	0	0	0
b. Inconvenient/difficult	3	1	1	0	5
c. Takes too much time	0	2	2	0	4
d. Needs/benefits not clear	1	1	0	0	2
Q2.7 – Reasons for being willing to cooperate – No of responses (only if chose Q2.5a, b or e)					
a. Reduces waste to landfill	2	8	4	2	16
b. Protects environment	8	30	16	2	56
c. Earn some extra money	0	3	2	0	5
Q2.8 – No of categories willing to separate waste into – No of responses (only for Q2.5a,b or e)					
a. Two	8	8	10	0	26
b. Three	1	15	3	2	21
c. More than three	0	7	3	1	11
d. No response	0	2	0	0	2
Q2.9 – Preferred separate collection system – Weighted average rank (only for Q2.5a,b or e)					
a. Coloured plastic bags collected from outside premises	7.5	20.5	7.5	4.0	39.5
b. Permanent coloured containers collected from outside premises	4.5	15.0	13.5	2.5	35.5
c. Own bags/containers collected from outside premises	1.5	7.0	4.5	5.0	18.0
d. Own bags/containers taken to public collection point	0.0	4.5	0.0	0.0	4.5
Q2.10 – Willingness to pay for permanent containers for source separation system – (only for Q2.5a,b or e)					
Willing to pay (no)	3	3	2	0	8
Not willing to pay (no)	0	7	6	0	13
No response (no)	6	22	8	3	39
Willingness to pay (Rs)	50	75	62.5	N/a	66.7

3.2.4 On-site Composting

The following table sets out the main interview survey results relating to on-site composting. Some key points are summarized below:

- (a) Ten (15%) enterprises are willing to undertake on-site composting, while nine are doing so already. However, the majority (49, 72%) of enterprises are not in favour, mainly due to a lack of space on site (27) and it taking too much time (11). Only five enterprises indicated a WTP for a compost container, giving an average WTP of 600Rs. However, this is not considered representative due to the low number of responses. Another three enterprises did not respond to this question.
- (b) 36 (53%) enterprises were willing to store their organic wastes for up to one day, if they were to be collected for composting at a centralized facility.

Table 3-4: Survey Results – On-site Composting

Item	Small Waste Gen'rs	Large Waste Generators			Total
		Comm./ industrial	Other Inst'ns	Hospitals	
No of respondents	12	35	18	3	68
Q2.11 – Willing to compost – No of responses					
a. Already compost	0	7	2	0	9
b. Willing	0	5	3	2	10
c. Not willing	12	23	13	1	49
Q2.12 – Willingness to pay for compost system – (only if chose Q2.11b)					
Willing to pay (no)	Not asked	3	2	Not asked	5
Not willing to pay (no)		0	0		0
No response (no)		2	1		3
Willingness to pay (Rs)		833	250		600
Q2.13 – Reasons for not being willing to compost – No of responses (only if chose Q2.11c)					
a. Not enough space on site	Not asked	17	10	Not asked	27
b. Takes too much time		9	2		11
c. LA/contractor should do		0	0		0
d. No equipment		0	1		1
e. Lack of knowledge		0	0		0
f. Concern about smell/pests		2	0		2
g. Not interested		4	3		7
h. Other		2	3		5
i. No response		4	1		5
Q2.14 – Factors that would encourage on-site composting (only if chose Q2.11b or c)					
a. Free compost container	Not asked	1	3	Not asked	4
b. Availability of cheap, easy to use, nuisance free system		0	2		2
c. Reduction in LA taxes		0	0		0
d. Education/training		22	0		22
e. Earning extra money		0	0		0
f. No response		4	0		4
Q2.15 – Willingness to store organic wastes between collection – No of days					
a. Half a day	1	3	1	1	6
b. One day	5	17	6	2	30
c. Two days	4	9	4	0	17
d. Three days	0	1	4	0	5
e. More than 3 days	1	3	1	0	5
f. No response	1	2	2	0	5

3.2.5 Environmental Education and General Cleanliness

The following table sets out the main interview survey results relating to environmental education and general cleanliness. Some key points are summarized below:

- (a) 27 (40%) enterprises indicated they have received some health/environmental education related to SWM. Most people had received this training as part of their work, including vocational training (e.g. hospitals), on the job training (e.g. hotels) and seminars.
- (b) 68 (100%) enterprises consider a campaign to raise peoples' awareness for maintaining a cleaner city and environment is very necessary.

Table 3-5: Survey Results – Environmental Education and General Cleanliness

Item	Small Waste Gen'rs	Large Waste Generators			Total
		Comm./ industrial	Other Inst'ns	Hospitals	
No of respondents	12	35	18	3	68
Q3.1 to 3.2 – Receipt of Health/environmental education/knowledge about SWM					
No of responses	1	16	10	0	27
Source:					
a. School	0	3	0	0	3
b. Leaflets/posters, etc.	0	2	0	0	2
c. Health worker/centre	0	0	0	0	0
d. Community organization/NGO	0	3	0	0	3
e. Newspaper	0	0	0	0	0
f. Radio programme	0	4	3	0	7
g. TV programmes	0	4	3	0	7
h. Local authority	1	3	7	0	11
i. Local authority contractor	0	0	9	0	9
j. Central government/MOH	1	4	7	0	12
k. Other	0	11	3	0	14
Q3.2 – Necessity for campaign to raise peoples' awareness of need for cleaner city/environment					
a. Very necessary	12	35	18	3	68
b. Somewhat necessary	0	0	0	0	0
c. Not very necessary	0	0	0	0	0
d. Not necessary at all	0	0	0	0	0

Note: MOH = Ministry of Health

3.2.6 Other Comments

Other comments covered a broad range of issues and are summarized below. The most common comments relate to:

- (a) A need for public education/awareness raising (13)
- (b) Widespread support for recycling (12).
- (c) Improve the existing SWM system (5).
- (d) Start recycling programmes/project/facility (5).

Table 3-6: Survey Results – Other Comments

Comments	Small Waste Gen'r's	Large Waste Generators			Total
		Comm./ Indust.	Other Inst'ns	Hosp -itals	
Five or more comments					
Public education/awareness raising, including of local tourists (2) and especially during the season (1)	4	4	5	0	13
Supports recycling (2 said can earn an income from it)	0	11	0	1	12
Improve present SWM collection system	1	3	1	0	5
Start recycling programmes/project/facility	0	5	0	0	5
Three or four comments					
Take legal action especially against misbehaviours	0	2	2	0	4
Implement suggestions from Q2.1	1	3	0	0	4
Introduce alternative for polythene	0	0	3	0	3
Prohibit polythene	0	3	0	0	3
Take legal action against inappropriate waste disposal	2	0	0	1	3
Install new collection bins, including bins that are easily accessible (1)	1	2	0	0	3
Proper SWM supervision	1	1	1	0	3
Two comments					
Daily collection	0	1	1	0	2
SWM workers should do their duties properly	1	1	0	0	2
One comment					
Reduce hotel waste generation by legal action	0	0	1	0	1
Regulate reduced polythene usage	0	0	1	0	1
Current laws are inadequate	1	0	0	0	1
Stop polythene imports	0	1	0	0	1
Control stray animals	0	0	1	0	1
Continue present system	0	0	1	0	1
Introduce good waste management system	0	0	1	0	1
New SWM technology	0	1	0	0	1
Increase collection frequency	0	1	0	0	1
Form special committee to protect environment during the season	0	1	0	0	1
MC and citizens should cooperate in disposing of waste properly	0	1	0	0	1
Wants more than once daily collection	0	1	0	0	1
School collection, drain and toilet cleaning service	0	0	1	0	1
Cover collection vehicles	0	1	0	0	1
Clean more in April than other months	0	0	1	0	1
Continue informal recycling system	1	0	0	0	1
Start recycling at regional level	0	1	0	0	1
Separate area for middleman shops	0	1	0	0	1
Base hospital needs incinerator, covered trailer and new bin (existing one inadequate)	0	0	0	1	1
Improve landfill site	0	1	0	0	1
Landfill site should be remote from human dwellings	0	0	1	0	1
Other comments					
Proper toilet facilities	3	0	1	0	4
Concrete slabs to cover drains	1	0	0	0	1
Control illegal construction works	1	0	0	0	1
School water supply	0	0	1	0	1
Drain cleaning	0	2	0	0	2
Pest control	0	1	0	0	1
Repair school toilets	0	0	1	0	1
Place for vegetable washing	0	0	1	0	1

3.3 Cleansing Workers Survey

Findings from Cleansing Workers Survey in Nuwara Eliya

A questionnaire survey was conducted among 30 municipal cleansing workers, in order to gather;

- A basic socio-economic profile of cleansing workers.
- An appreciation of working condition of municipal cleansing workers.

Period of survey: 24th, 25th, 26th September and 8th October, 2002

Sample size: 30

1. General Questions

Q1-1 Gender

		Nuwara Eliya	
		Number	%
1	Male	17	57%
2	Female	13	43%
Total		30	100%

Q1-2 Ethnicity

		Nuwara Eliya	
		Number	%
1	Sinhala	5	17%
2	Muslim	0	0%
3	Tamil	25	83%
4	Other	0	0%
Total		30	100%

Q1-3 Religion

		Nuwara Eliya	
		Number	%
1	Buddhist	5	17%
2	Islam	0	0%
3	Hindu	22	73%
4	Christian	3	10%
5	Other	0	0%
Total		30	100%

Q1-4 Household information

(person)	Nuwara Eliya
Avg. number of family members	5.9
(Rs.)	Nuwara Eliya
Avg. household income	10,974

(Rs.)	Nuwara Eliya
Income per person	1,860

Q1-5 How much is the total expenditure of your household per month on average?

(Rs.)	Nuwara Eliya
Avg. household expenditure	8,167

(Rs.)	Nuwara Eliya
Expenditure per person	1,384

Q1-6 Please specify the priority for your daily life regarding the improvement of the following aspects?

	Nuwara Eliya	point
1 First	Water supply	48
2 Second	Others (Toilet / housing problems)	46
3 Third	Wastewater collection	23
4 Fourth	Storm water drainage	17
5 Fifth	Garbage collection	10
6 Sixth	Electricity supply	5
7 Seventh	Access road to their houses	4

Note: Interviewees are asked to answer three most prioritized matters among the seven choices mentioned above, and the total points are calculated by adding up three to the most prioritized matters, two to the second priority and one to the third priority.

2. Questions about Your Work

Part A : Status and Wage

Q2-1 Are you a permanent worker or a casual worker?

	Nuwara Eliya	
	Number	%
1 Permanent	9	30%
2 Casual	19	63%
3 Kangani	2	7%
Total	30	100%

Q2-2 How long have you been doing this job?

(years)	Nuwara Eliya
Average working years	10.6

Q2-3 How many days do you usually work per week?

(days)	Nuwara Eliya
Average working days per week	6.0

Q2-4 How many hours do you usually work per day?

(hours)	Nuwara Eliya
Average working hours per day	7.0

Q2-5 Had either your father or mother done this same job?

	Nuwara Eliya	
	Number	%
1 Yes	20	67%
2 No	10	33%
Total	30	100%

Q2-6 How much is your monthly wage on average (including official allowance such as holiday pay, overtime and so on)?

(Rs)	Nuwara Eliya
Average monthly income	5,122

Q2-7 Do you have any secondary jobs after working hours?

	Nuwara Eliya	
	Number	%
1 Yes	8	27%
2 No	22	73%
Total	30	100%

Q2-8 How often and what type of work do you do as a secondary job?

- (1) How often: Frequency varies from every day to a few times per month.
- (2) Type of work: Labor work such as cleaning houses, cleaning gardens, shoe repairing and so on.

Q2-9 How much is your monthly wage on average from this secondary resource?

(Rs)	Nuwara Eliya
Average monthly income from secondary job	1,231

Note: Number of effective answers are 8.

Q2-10 Are there some waste generators which give you small allowance, including the reward to your extra cleaning work?

	Nuwara Eliya	
	Number	%
1 Yes	10	33%
2 No	20	67%
Total	30	100%

Q2-11 How much is your income from small allowance per month on average?

(Rs)	Nuwara Eliya
Average monthly allowance from waste generators	145

Note: Number of effective answers are 10.

Q2-12 Do you know other solid waste laborers who sometimes receive a small allowance?

	Nuwara Eliya	
	Number	%
1 Yes	17	57%
2 No	5	17%
98 Don't know	8	27%
Total	30	100%

Q2-13 Do you collect recyclable materials from waste for sale?

	Nuwara Eliya	
	Number	%
1 Yes	9	30%
2 No	21	70%
Total	30	100%

Q2-14 If yes to Q2-13, what materials do you collect, how much do you collect per month and who do you sell them to?

	Nuwara Eliya	
	Number	%
1 Bottle	9	22%
2 Iron	2	5%
3 Aluminum	4	10%
4 Tin	2	5%
5 Copper	0	0%
6 Other metal	2	5%
7 Paper	0	0%
8 Brass	1	2%
9 Irrelevant	21	51%
Total	41	100%

(Rs.)	Nuwara Eliya
Average monthly income from recycling	171

Note: Number of effective answers are 6.

Part B : Working Conditions and Technical Problems

Q2-15 These are the possible difficulties you may face. Please prioritize your difficulties?

Nuwara Eliya		(points)
1	Heavier workload and unhealthier conditions due to the improper discharge as waste by people	34.5
2	Unsanitary waste such as human waste / excrement is mixed with other waste	30.5
3	Heavier workload for you due to absenteeism among your colleagues	12
4	Heavier workload for you due to alcoholism among your colleagues	5
5	Insufficient wage	45.5
6	Health problems	21.5
7	The working schedule such as allocation of vehicles and routes are so changeable	3
8	Lack of protecting clothing (boots, gloves, apron and so on)	67
9	Vehicle often breakdown	7
10	Not enough tools for collection work	28
11	Vehicle parked on the street makes your work more difficult	15
12	Others	14
Total		283.0

Note : Others are "not enough labors for dumping site", "no shade at the dumping site", "not enough vehicle". Interviewees are asked to prioritize six difficulties among the twelve choices mentioned above, and the total points are calculated by adding up 3 to the most prioritized matters, 2.5 to the second one, 2 to the third one, 1.5 to the fourth one, 1 to the fifth one and 0.5 to the sixth one.

Q2-16 Are there any particular areas of the city where you feel difficult to collect garbage?

Nuwara Eliya		
	Number	%
1	Yes	18 60%
2	No	10 33%
3	Irrelevant	2 7%
Total		30 100%

Note: Two labors work at the dumping site.

Q2-17 If yes to the previous question, what are the reasons of difficulties?

Nuwara Eliya		
	Number	%
1	Improper discharge of waste by people	5 15%
2	Physically difficult work	5 15%
3	Large amount of garbage	4 12%
4	Traffic and many people	7 21%
5	Road conditions	0 0%
6	Other	0 0%
98	Don't know	0 0%
99	Irrelevant	12 36%
Total		33 100%

Q2-18 When difficulties relating to your work arise, whom you talk to first? (**Choose only one.**)

	Nuwara Eliya	
	Number	%
1 Officer in charge such as PHI and MOH	0	0%
2 Supervisor	26	87%
3 Minor supervisor	3	10%
4 Colleagues	1	3%
5 Others	0	0%
Total	30	100%

Q2-19 How do you think MC / UC can improve the garbage collection system? Please give your honest opinion.

	Nuwara Eliya	
	Number	%
1 Household / citizens contribution	0	0%
2 Need salary increase	7	13%
3 Need more workers	8	15%
4 Need awareness program	5	9%
5 Need more equipments / vehicles	6	11%
6 Health protection incl. introducing protecting clothing	10	19%
7 Others	17	32%
Total	53	100%

Note: Other means "cooperation among workers is necessary." "Should make us permanent", "Should introduce garbage bin to households." and so on.

3.4 Middlemen Survey

3.4.1 Survey Sheet

Middlemen and Micro-industries Recycling Survey

Interviewer:		Date:	
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General Information:

Name of Interviewee:	
Position of Interviewee:	
Name of Business:	
Address/location:	
No of Years of Operation:	

Nature of Business:

a) What are the main activities of your business?

Recycling Activities Collection Details

3.1 What materials do you recycle and in what condition? *(please circle the materials recycled and their condition in the table below)*

Materials	Condition				
	Plastics	Mixed, unwashed	Sorted, unwashed	Sorted, clean	Other
Polythene	Mixed, unwashed	Sorted, unwashed	Sorted, clean	Other	
Bags	Polysacks	Flour bags	Poultry feed bags	Sugar bags	Other
Paper	Old newspapers	Old exercise books	White paper	Cardboard/boxes	Other
Glass	Whole Arrack bottles	Whole beer bottles	Other whole bottles/jars	Broken bottles	Other
Metals	Aluminium	Beer cans	Copper/brass	Ferrous	Other
Tyres	Small			Large	
Other	Old battery cases (washed, cleaned)		Wood		Other

Please describe what "other" means below:

.....
.....

- 3.2 Who collects these recyclable materials for you? (*tick one or more and describe the type of wastes to which they apply*)
- | | <i>Tick</i> | <i>Waste Types</i> |
|--|-------------|--------------------|
| (a) Individuals | [] | |
| (b) You and/or some of your workers | [] | |
| (c) LA/private contractor garbage collection labourers | [] | |
| (d) Community groups/non-governmental organizations | [] | |
| (e) Middlemen | [] | |
| (f) Other – describe: | [] | |

- 3.3 What are the main sources these recyclable materials come from? (*fill in the table with the materials you recycle, the main sources and the approximate percentages from these sources if you know them*)

Materials	Main sources			
	First	Second	Third	Others
<i>e.g. Cardboard</i>	<i>C (75%)</i>	<i>M (15%)</i>	<i>Ht (5%)</i>	<i>S, GO (5%)</i>

Use the following codes:

H	Households	Ht	Hotels	Hp	Hospitals
C	Commercial enterprises (e.g. shops, banks, etc.)	GO	Government offices	I	Industries
M	Markets	S	Schools	O	Other

Please describe what “other” means below:

.....

- 3.4 Where do these recyclable materials come from and what is the approximate percentage of materials collected from each area?
- | | <i>Tick</i> | <i>%</i> |
|---|-------------|----------|
| (a) Within Urban/Municipal Council Area | [] | [] |
| (b) Within District | [] | [] |
| (c) Within Province | [] | [] |
| (d) Other Areas – describe: | [] | [] |

- 3.5 Fill in the table below with the following information:
- (a) On average, how many units (kg, items, etc.) of these recyclable materials do you collect per month?
 - (b) How much do you pay for such materials per unit (Rs/kg, Rs/item, etc.)?
 - (c) Is your demand for these materials stable?
 - (d) Is the supply greater than or less than your demand?
- Please add any relevant comments on demand/supply issues for these materials below the table.

Material	Quantity	Price paid	Total payment (Rs/mth)	Demand stable	Supply vs. demand
<i>e.g. Clean, sorted plastics</i>	<i>80kg/mth</i>	<i>5Rs/kg</i>	<i>400 Rs</i>	<i>Yes</i>	<i>Greater</i>
Total payment					

Comments:.....
.....

Worker Details

In the table below, indicate the number of full-time and part-time workers, including yourself, and in each case, the average number of hours worked per week and days worked per month **on the recycling activities** carried out by your business.

Table 2 : WorkerDetails

Workers	No	Hrs worked per wk on recycling activities	Days worked per month on recycling activities
Manager/owner			
Full-time worker			
Part-time worker			

Recycling Activities Processing/Sales Details (fill in Table 3 with answers)

- 5.1 What do you do with these materials? (*tick one or more and describe the types of waste to which they apply*)
- | | <i>Tick</i> | <i>Waste Types</i> |
|--|-------------|--------------------|
| (a) Transport directly to factories | [] | |
| (b) Pre-process (e.g. sort, wash, dry) and transport to factories | [] | |
| (c) Process (e.g. grind, pelletise, etc.) and transport to factories | [] | |
| (d) Use as raw materials for making other products | [] | |
| (e) Other – describe: | [] | |

- 5.2 If you ticked (d) in Q5.1, what products do you make from these materials?
-
.....

5.3 Who do you sell these materials and/or the products you make from them to? Where relevant (e.g. commercial, industrial), specify the name, location and how far away are these places are located.

Customers	Materials sold	Name	Location	Distance (km)
Individuals				
Commercial enterprises (e.g. shops, markets)				
Tourists				
Factories for further processing				
Other				

Please describe what "other" means:

.....

Fill in the table below with the following information:

- (a) How many units (kg, items) of these materials and/or products do you sell per month?
- (b) How much do you sell these materials and/or the products you make from them for?
- (c) Is the demand for any products you make from these materials small, medium or large?

Material	Quantity	Sales Price	Income (Rs/mth)	Demand
<i>e.g. Plastic pellets</i>	<i>50kg/mth</i>	<i>40Rs/kg</i>	<i>2,000</i>	<i>Medium</i>
Total income:				

Comments:.....

.....

What is your average expenditure and income per month from these recycling activities:

Average operating expenses = Rs/mth
 Average income = Rs/mth
 Net income = Rs/mth

What are the main costs incurred by your business in these recycling activities?; and what is the approximate percentage total costs in each category? (*tick all that apply and estimate the approximate percentages of the five main types. If you do not know this, just rank the five main types, 1 = highest, 2 = 2nd highest, etc.*) Tick % or rank

- (a) Buying the recyclable materials [] []
- (b) Storage prior to transportation [] []
- (c) Transportation [] []
- (d) Labour [] []
- (e) Other raw materials (e.g. chemicals, additives) [] []
- (f) Utilities (electricity, water, telephone, etc.) [] []
- (g) Land/building rental [] []

- | | | |
|-----------------------------|-----|-----|
| (h) Machinery maintenance | [] | [] |
| (i) Other – describe: | [] | [] |

Other Information

How much waste do you produce from your recycling activities per month?

Answer: kg/mth

What do you do with the waste from your recycling activities? (*tick one or more*)

- | | |
|---|-----|
| (a) All waste is recycled | [] |
| (b) Collection by LA/private contractor | [] |
| (c) Bury/burn on property | [] |
| (d) Other - describe: | [] |

What are the main issues/problems facing your recycling activities? (*tick all that apply and rank up to the five most serious problems, 1 = worst, 2 = 2nd worst, etc.*)

	<i>Tick</i>	<i>Rank</i>
(a) Shortage of recyclable materials	[]	[]
(b) Contamination/poor quality of recyclable materials	[]	[]
(c) High land/building rental costs	[]	[]
(d) Excessive transportation costs	[]	[]
(e) Unstable demand for recyclable materials and/or products	[]	[]
(f) Utilities problems (e.g. electricity cuts, no water, etc.)	[]	[]
(g) Loss of market (e.g. collapse of tourism)	[]	[]
(h) Difficulties in obtaining credit	[]	[]
(i) Other - describe:	[]	[]

Comment on what could be done to help solve these problems/issues?

.....

Any other comments/useful information?

.....

Notes for interviewer:

1. Check that quantities collected for recycling tally with quantities sold on to others, where relevant.
2. Check that costs and income tally with quantities and indicated sales prices.

3.4.2 Result 1

Middlemen			1	1	2	3.1																				
ID No	Business name	Address/location	Opn Yrs	Main activities	Plastics				Bags			Paper				Glass				Metals					Oth	
					MU	SU	SC	Tot	PS	FB	Tot	NP	EB	CB	Tot	Arr	BB	BJ	Br	Tot	Al	BC	CB	Fe		Tot
MM1	Mr T Wijekumara	14, Waterfield Dr, NE	30	Collect/sell recycables		Y		Y				Y	Y		Y	Y		Y	Y		Y	Y	Y	Y	Y	Y
MM2	Rilvan Brothers	Mrs. A.R.M. Sashika, 51, Queens St, NE	30	Collect/sell recycables	Y			Y		Y	Y	Y	Y		Y	Y		Y	Y		Y	Y	Y	Y	Y	Y
MM3	Mr MRM Wimalasena	47/1, Queens St, NE	12	Collect/sell recycables	Y			Y		Y	Y	Y	Y	Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y
MM4	Ameen Traders	Mr M Halimsa, 75/4, St. Andrew Rd, NE	30	Collect/sell recycables						Y	Y			Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y
MM5	Goony Kade	Mr. Ariyadasa, 55, Ramathar Building, NE	20	Collect/sell recycables						Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y
Total		Total no of middlemen surveyed	5	No	2		0	3	0	4	4	4	3	1	4	5	5	1	3	5	5	5	5	5	5	4

Notes:

1. Cells containing formulae shaded in light blue - do not use.
2. NA = no answer; IR = irrelevant

3.2 Collectors							3.3 Main sources																																		
ID No	Pl	Ba	Pa	Gl	Me	Ba	Tot	Plastic (%)					Bags (%)				Paper/cardboard (%)							Broken glass (%)				Gl bottles (%)				Metals (%)				Batteries (%)					
								H	Ht	C	I	O	H	Ht	C	I	H	Ht	C	Go	S	I	O	H	Ht	C	O	H	Ht	C	O	H	C	I	O	H	I	C	O		
MM1	A,B		A,B	A,B	A,B	A,B	A,B	0	100	0	0	0			40	60	0	0	0	0	0	0					40	0	0	60	40	0	0	60	40	0	0	60			
MM2	A	A	A	A	A	A	A,B	50	50	0	0	0	50	0	50	0	0	0	100	0	0	0	0	0	0					50	50	0	0	70	0	0	30	40	0	0	60
MM3	A,B	A,B	A,B	A,B	A,B	A,B	A,B	100	0	0	0	0	40	0	60	0	60	0	20	20	0	0	0	0	30	70	0	0	30	70	0	0	10	0	0	90	20	0	0	80	
MM4	A	A	A	A	A	A	A					0	0	100	0	0	0	0	0	0	0	0	0	20	75	5	0	20	75	5	0	30	0	50	20	0	0	100	0		
MM5	A	A	A	A	A	A	A					50	0	50	0	50	0	0	50	0	0	0	0	30	70	0	0	30	70	0	0	80	0	0	20	100	0	0	0		
Total							Avg	50	50	0	0	0	35	0	65	0	38	15	30	18	0	0	0	27	72	1.7	0	34	53	1	12	48	0	10	44	40	0	25	35		
							Wt avg	98.8	1.2	0.0	0.0	0.0	2.0	0.0	98.0	0.0	45.9	4.7	14.2	35.2	0.0	0.0	0.0	23.6	73.2	3.2	0.0	24.8	68.2	3.1	3.8	39.7	0.0	19.2	41.1	16.2	0.0	53.7	20.1		
							Sum =	100				Sum =	100				Sum =	100					Sum =	100			Sum =	100			Sum =	100			Sum =	100			Sum =	100	

	Count							
A	3	4	4	5	5	4	5	
B	2	1	2	2	2	2	3	
C	0	0	0	0	0	0	0	
D	0	0	0	0	0	0	0	
E	0	0	0	0	0	0	0	
F	0	0	0	0	0	0	0	

Qty's of different materials collected by different middlemen used in calculating weighted average sources (%) in Q3.3

	Pl	Bg	P/C	Glass			Me	Ba
				Br	Bo	Tot		
MM1	5	0	75	0	200	200	2120	500
MM2	15	60	100	0	80	80	370	0
MM3	1000	100	180	50	300	350	575	20
MM4	0	15000	0	800	2000	2800	2345	1000
MM5	0	500	600	400	600	1000	895	50
Total	1020	15660	955	1250	3180	4430	6105	1570

Must adjust this table after entering data to eliminate any values for which there is NA in Q3.3 - do manually
Adjusted cells shaded in orange

ID No	3.4 Coll'n area (%)				4. Worker details										5.1 Processing						5.2		5.3						Name, location, distance (km)			
	Prop (%)	A	B	C	Manager/owner		Full-time workers			Part-time workers			Total H/mth	Equiv FT	PI	Ba	Pa	GI	Me	Oth	Products	PI	Ba	Pa	GI	Me	Oth					
					No	Hr/wk	d/mth	No	Hr/wk	d/mth	No	Hr/wk																d/mth				
MM1	8.6	100	0	0	0	1	70	30	0			1	2	1	300	1.44	R,WS		R,WS	R,WS	R,WS	R,WS	R,WS	IR	WS		WS	WS	WS	WS	WS	Gampola, Kadugannawa
MM2	2.3	70	25	0	5	1	48	25	0			0			171	0.82	R,WS	R,WS	R,WS	R,WS	R,WS	R,WS	IR	In,WS	In,WS	In,WS	In,WS	In,WS	In,WS	NA		
MM3	29.1	70	30	0	0	1	42	30	2	96	25	2	8	2	525	2.52	R,WS	R,WS	R,WS	R,WS	R,WS	R,WS	IR	In,WS	In,WS	In,WS	In,WS	In,WS	In,WS	In,WS	Gampola, Kadugannawa, Col.	
MM4	50.2	90	0	0	10	2	96	25	0			5	25	1	346	1.67		R,WS		R,WS	R,WS	R,WS	IR		In		In,WS	In,WS	In,WS	In,WS	DK	
MM5	9.8	100	0	0	0	1	56	30	0			0			240	1.15		R,WS	R,WS	R,WS	R,WS	R,WS	IR		In,WS	In,WS	In,WS	In,WS	In,WS	In,WS	Kadugannawa	
Total	Avg	85.6	93	0.6	5.1	6			2			8			1583	7.61																Total

Assume equiv FT worker = 208 h/mth in private sector (8h/d x 26d/mth)
MM4 - PT workers estimated to work 1day/wk
"Prop" column lists proportion of materials collected from different sources, as calculated in purchases sheet - used for calculating weighted averages in Q3.4

R = retail	3	4	4	5	5	4	In	2	4	3	4	4	3
WS = w/sale	3	4	4	5	5	4	CE	0	0	0	0	0	0
A	0	0	0	0	0	0	T	0	0	0	0	0	0
B	0	0	0	0	0	0	F	0	0	0	0	0	0
C	0	0	0	0	0	0	Oth	0	0	0	0	0	0
D	0	0	0	0	0	0	IR	0	0	0	0	0	0
E	0	0	0	0	0	0	NA	0	0	0	0	0	0
NA	0	0	0	0	0	0	Sum	2	4	3	4	4	3
IR	0	0	0	0	0	0	Use "In" for individuals						

5.5 Profit			Exp and Income			chec	5.6 Main Costs								6.1	6.2	6.3								6.4 & 6.5		
ID No	Expend-iture	Income	Net income	Recycl Paymer	Recycl Sales	Net income	A	B	C	D	E	F	G	H	Qty (kg/mth)	Action	Main problems								Comments on how to solve these problems + other		
MM1	20000	25000	5000	21400	28250	7850	1		2	4				3	6	D	3			4		1				2	Give aid/low interest loan, open main recy centre
MM2	10000	15000	5000	6690	8925	2235	1		2				3		5	D	1			2		3				2	Open main recy centre
MM3	20000	25000	5000	16545	21788	5243	1		2	3		4	5		15	D				2		1		3	4	Give aid/low interest loan, open main recy centre	
MM4	110000	120000	20000	113788	133400	19613	1		2	4		5	3		250	D				2		1				4	Give financial aids & stores facilities
MM5	25000	30000	5000	22650	28275	5625	1					3	2	4	750	D					1			2		4	Give aid/low interest loan, open main recy centre
Total	185000	215000	40000	118107.3	221837.8	40565																					

From comparison of recyclables and purchases data, suspect data identified (shaded in orange)

From recyclables purchases and sales data										Rank	A	B	C	D	E	F	G	H	
1	2.5	5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
2	2	0	0	4	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
3	1.5	0	0	0	1	0	1	2	1										
4	1	0	0	0	2	0	1	0	1										
5	0.5	0	0	0	0	0	1	1	0										
Sum		5	0	4	3	0	3	4	2										
Wt avg	12.5	0.0	6.0	3.5	0.0	3.0	5.5	2.5											

- 6.2
- MM1 Have NEMC service
 - MM2 Have NEMC service
 - MM3 Have NEMC service
 - MM4 Have NEMC service
 - MM5 Have NEMC service

3.4.3 Result 2

Sector		1	3.1	3.5	Plastics										Bags						Newspaper						Exercise books					
ID No	Business name	Code	Qty	Unit	Price	Unit	Total	Dem	SvD	Code	Qty	Unit	Price	Unit	Total	Dem	SvD	Qty	Unit	Price	Unit	Total	Dem	SvD	Qty	Unit	Price	Unit	Total	Dem	SvD	
MM1	Mr T Wijekumara	SU	5	Cans	40	ea	200	Y	L	FB	60	bags	4	ea	0	Y	L	25	kg	14	/kg	350	Y	L	50	kg	3	/kg	150	Y	L	
MM2	Rilvan Brother	SU	15	Cans	10	ea	150	Y	L	FB	100	bags	6	ea	240	H	L	100	kg	20	/kg	2000	Y	L	50	kg	6	/kg	300	Y	H	
MM3	Mr MRM Wimalasena	SU	1000	Cans	7	ea	7000	Y	Me	FB	15000	bags	4.5	ea	67500	Y	L	100	kg	15	/kg	1500	Y	H	50	kg	6	/kg	300	Y	H	
MM4	Arneen Traders						0			FB	15000	bags	4.5	ea	67500	Y	L	100	kg	15	/kg	0			50	kg	6	/kg	0			
MM5	Goony Kade						0			FB	500	bags	4	ea	2000	Y	H	200	kg	14	/kg	2800	Y	H	400	kg	4	/kg	1600	Y	H	
Total			1020	kg cont/barrel			7350	Rs			15660	bags		ea	70340	Rs		425	kg		/kg	6650	Rs		500	kg		/kg	2050	Rs		

Notes:

1. Blue shaded cell indicates no quantity or cost information given (NA inserted in units column rather than qty column, as the latter upsets the spreadsheet calculations)
2. Green shaded cell indicates data that has been modified so that sales and purchases figures are consistent.
3. NA = no answer
4. L = low. Me = medium, H = high

Section																																				
ID No	Cardboard/boxes						Broken glass						Code	Arrack/beer/other bottles						Metals - ferrous						Metals - copper/brass										
	Qty	Unit	Price	Unit	Total	Dem	SvD	Qty	Unit	Price	Unit	Total		Dem	SvD	Qty	Unit	Price	Unit	Total	Dem	SvD	Qty	Unit	Price	Unit	Total	Dem	SvD	Qty	Unit	Price	Unit	Total	Dem	SvD
MM1		kg		/kg	0				kg		/kg	0			Arr/Beer	200	bottles	5	ea	1000	Y	L	2000	kg	5	/kg	10000	Y	L	50	kg	70	/kg	3500	Y	L
MM2		kg		/kg	0				kg		/kg	0			Arr/Beer	80	bottles	5	ea	400	Y	L	300	kg	4	/kg	1200	Y	L	10	kg	50	/kg	500	Y	L
MM3	30	kg	1.5	/kg	45	Y	H	50	kg	1	/kg	50	Y	L	Arr/Beer	300	bottles	5	ea	1500	Y	L	500	kg	5	/kg	2500	Y	L	40	kg	50	/kg	2000	Y	L
MM4		kg		/kg	0			800	kg	0.5	/kg	400	Y	L	Arr/Beer	2000	bottles	5	ea	10000	Y	L	2000	kg	5.5	/kg	11000	Y	L	115	kg	62.5	/kg	7187.5	Y	L
MM5		kg		/kg	0			400	kg	1	/kg	400	Y	H	Arr/Beer	600	bottles	5	ea	3000	Y	H	500	kg	5.5	/kg	2750	Y	H	80	kg	60	/kg	4800	Y	H
	30	kg		/kg	45	Rs		1250	kg		/kg	850	Rs			3180	bottles		ea	15900	Rs		5300	kg			27450	Rs		295	kg			17888	Rs	

Section		Metals - Aluminium						Metals - Beer Can						Batteries						Total quantities					Actual	Prop'n of total (%)		
ID No	Qty	Unit	Price	Unit	Total	Dem	SvD	Qty	Unit	Price	Unit	Total	Dem	SvD	Qty	Unit	Price	Unit	Total	Dem	SvD	Cont-ainers	Bottles	Bags			Kg	Payments (Rs)
MM1	50	kg	50	/kg	2500	Y	L	20	kg	35	/kg	700	Y	L	500	kg	6	/kg	3000	Y	L	6	200	0	2895	21400	=	8.5
MM2	50	kg	40	/kg	2000	Y	L	10	kg	20	/kg	200	Y	L	20	kg	5	/kg	100	Y	L	15	80	80	470	6690	=	2.3
MM3	25	kg	40	/kg	1000	Y	L	10	kg	25	/kg	250	Y	L	20	kg	5	/kg	100	Y	L	1000	300	100	825	16545	=	29.1
MM4	200	kg	50	/kg	10000	Y	L	30	kg	20	/kg	600	Y	L	1000	kg	5.5	/kg	5500	Y	L	0	2000	15000	4145	113788	=	50.2
MM5	75	kg	50	/kg	3750	Y	H	40	kg	30	/kg	1200	Y	H	50	kg	7	/kg	350	Y	H	0	600	500	1745	22650	=	9.9
	400	kg			19250	Rs		110	kg			2950	Rs		1570	kg			8950			1020	3180	15660	9880	181073		100

1. "Actual" column advises whether actual payments will be higher based on whether or not complete information was supplied.
2. Proportion column calculates the proportion of total materials collected by different enterprises as (no of containers/total containers + no of bottles/total bottles + no of bags/total bags + kg/total kg)/4 * 100% - used in general spreadsheet

3.4.4 Result 3

		1		3.1		5.4																					
ID No	Business name	Plastics						Various bags						Newspaper					Paper - exercise books								
		Code	Qty	Unit	Price	Unit	Total	Dem	Code	Qty	Unit	Price	Unit	Total	Dem	Qty	Unit	Price	Unit	Total	Dem	Qty	Unit	Price	Unit	Total	Dem
MM1	Mr T Wijekumara	SU	5	Cans	50	ea	250	Me																			
MM2	Rilvan Brother	SU	15	Cans	15	ea	225	Me	FB	60	bags	5.0	ea	300	Me	100	kg	22	/kg	2200	Me	50	kg	5	/kg	250	Me
MM3	Mr MRM Wimalasena	SU	1000	Cans	10	ea	10000	Me	FB	100	bags	8	ea	800	Me	100	kg	17	/kg	1700	L	50	kg	7.5	/kg	375	L
MM4	Ameen Traders						0		FB	15000	bags	5.5	ea	82500	Me		kg		/kg	0			kg		/kg	0	
MM5	Goony Kade						0		FB	500	bags	5	ea	2500	Me	200	kg	20	/kg	4000	Me	400	kg	6	/kg	2400	Me
Total			1020	Cont			10475	Rs		15860	bags		ea	88100	Rs	425	kg		/kg	8350	Rs	500	kg		/kg	3025	Rs

Notes:

1. Blue shaded cell indicates no quantity or cost information given (NA inserted in units column rather than qty column, as the latter upsets the spreadsheet calculations)
2. Green shaded cell indicates data that has been modified so that sales and purchases figures are consistent.
3. NA = no answer
4. L = low, Me = medium, H = high

ID No	Cardboard					Broken glass					Glass - Arrack/beer/other bottles						Metals - ferrous						Metals - copper/brass								
	Qty	Unit	Price	Unit	Total	Dem	Qty	Unit	Price	Unit	Total	Dem	Code	Qty	Unit	Price	Unit	Total	Dem	Qty	Unit	Price	Unit	Total	Dem	Qty	Unit	Price	Unit	Total	Dem
MM1		kg		/kg	0				/kg	0			Arr/Beer	200	Bott	7	ea	1400	Me	2000	kg	7	/kg	14000	Me	50	kg	90	/kg	4500	Me
MM2		kg		/kg	0				/kg	0			Arr/Beer	80	Bott	6	ea	480	Me	300	kg	8	/kg	2400	Me	10	kg	60	/kg	600	Me
MM3	30	kg	2.25	/kg	67.5	L	50	kg	2	/kg	100	Me	Arr/Beer	300	Bott	6	ea	1800	Me	500	kg	6	/kg	3000	Me	40	kg	60	/kg	2400	Me
MM4		kg		/kg	0		800	kg	0.75	/kg	600	Me	Arr/Beer	2000	Bott	5.5	ea	11000	Me	2000	kg	6.5	/kg	13000	Me	115	kg	70	/kg	8050	Me
MM5		kg		/kg	0		400	kg	1.5	/kg	600	Me	Arr/Beer	600	Bott	6	ea	3600	Me	500	kg	6.5	/kg	3250	Me	80	kg	75	/kg	6000	Me
	30	kg		/kg	67.5	Rs	1250	kg		/kg	1300	Rs		3180	Bott		ea	16200	Rs	5300	kg		/kg	35650	Rs	295	kg		/kg	21550	Rs

ID No	Metals - Aluminium					Metals - Beer Can					Batteries					Total quantities					Actual			
	Qty	Unit	Price	Unit	Total	Dem	Qty	Unit	Price	Unit	Total	Dem	Qty	Unit	Price	Unit	Total	Dem	Containers	Bottles		Bags	Kg	Sales (Rs)
MM1	50	kg	70	/kg	3500	Me	20	kg	45	/kg	900	Me	500	kg	8	/kg	4000	Me	5	200	0	2695	29250	=
MM2	50	kg	50	/kg	2500	Me	10	kg	22	/kg	220	Me		kg		/kg	0		15	80	80	470	8925	=
MM3	25	kg	45	/kg	1125	Me	10	kg	30	/kg	300	Me	20	kg	6	/kg	120	Me	1000	300	100	925	21788	=
MM4	200	kg	55	/kg	11000	Me	30	kg	25	/kg	750	Me	1000	kg	6.5	/kg	6500	Me	0	2000	15000	4145	133400	=
MM5	75	kg	55	/kg	4125	Me	40	kg	35	/kg	1400	Me	50	kg	8	/kg	400	Me	0	600	500	1745	28275	=
	400	kg		/kg	22250	Rs	110	kg		/kg	3570	Rs	1670	kg		/kg	11020	Rs	1020	3180	15660	9880	221838	

3.4.5 Data summary for graphs

Q3.3

	Main sources (%)						
	Plastic	Bags	Pa/card	Br glass	Glass bottl	Metals	Batteries
Households	98.8	2.0	45.9	23.6	24.8	39.7	16.2
Hotels	1.2	0.0	4.7	73.2	68.2	0.0	0.0
Commercial	0.0	98.0	14.2	3.2	3.1	0.0	63.7
Government offices	0.0	0.0	35.2	0.0	0.0	0.0	0.0
Industries	0.0	0.0	0.0	0.0	0.0	19.2	0.0
Other	0.0	0.0	0.0	0.0	3.8	41.1	20.1
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Q5.6 Costs

	Rank	1	2	3	4	5	Wt avg
A	Purchases	5	0	0	0	0	12.5
C	Transportation	0	4	0	0	0	8.0
D	Labour	0	0	1	2	0	3.5
F	Utilities	0	0	1	1	1	3.0
G	Land/building rental	0	1	2	0	1	5.5
H	Machinery maintenance	0	0	1	1	0	2.5
	Sum	5	5	5	4	2	35.0

Q6.3 Problems

	Rank	1	2	3	4	5	Wt avg
A	Shortage of recyclables	1	0	1	0	0	4.0
D	Excessive transportation cost	0	3	0	1	0	7.0
F	Utilities	4	0	1	0	0	11.5
G	Loss of market	0	1	1	0	0	3.5
H	Obtaining credit	0	1	0	1	0	3.0
	Sum	5	5	3	2	0	29.0

		Percentages of total qty of recycables									Tot	Notes	From inside			
		H	Ht	Hp	C	M	S	GO	I	O						
	PI	98.8	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100		NEMA			
	Bg	2.0	0.0	0.0	98.0	0.0	0.0	0.0	0.0	0.0	100					
	P/C	45.9	4.7	0.0	14.2	0.0	0.0	35.2	0.0	0.0	100					
	Br	24	73.2	0.0	3.2	0.0	0.0	0.0	0.0	0.0	100					
	Bot	24.8	68.2	0.0	3.1	0.0	0.0	0.0	0.0	3.8	100					
	Me	39.7	0.0	0.0	0.0	0.0	0.0	0.0	19.2	41.1	100					
	Ba	16.2	0.0	0.0	63.7	0.0	0.0	0.0	0.0	20.1	100					
Tot (kg)				Actual quantity from different sources											kg/mth	kg/d
0	PI	0	0	0	0	0	0	0	0	0	0	1		0	0.0	
1566	Bg	32	0	0	1534	0	0	0	0	0	1566	2		1340	44.1	
955	P/C	438	45	0	136	0	0	336	0	0	955			817	26.9	
1250	Br	295	915	0	40	0	0	0	0	0	1250			1070	35.2	
2099	Bot	521	1432	0	66	0	0	0	0	79	2099	3		1796	59.0	
6105	Me	2424	0	0	0	0	0	0	1173	2509	6105			5224	171.7	
1570	Ba	254	0	0	1000	0	0	0	0	316	1570			1343	44.2	
13545	Tot	3964	2392	0	2776	0	0	336	1173	2904	13545			11590	381.0	
Adjust Tot1		3964	2392	0	2776	0	0	336	1173	2904	13545	4				
Location factor		73	100	100	90	100	100	100	87	85	86					
Adjust Tot2		2875	2392	0	2498	0	0	336	1020	2468	11590	5				
Qty	kg/d	95	79	0	82	0	0	11	34	81	381					
Notes:	%	24.8	20.6	0.0	21.6	0.0	0.0	2.9	8.8	21.3	100.0					

1. PI quantity specified here omits containers which are reused rather than recycled
2. One bag weighs 0.1 kg
3. One bottle weighs 0.66 kg (avg weight of 10 beer and arrack bottles) - assume same source distribution for bottles and broken glass.
4. Adj1 - adjust total to a/c for a total of 5 middlemen in NE with all 5 being surveyed (i.e. no adjustment)
5. Adj2 - adjust Adj1 to a/c for 86 % of materials collected in NEMA (assume applies to all categories)
6. Location factors selected as follows:
 - a. From MM2,3,4 metals data, at least 117kg/d comes from I outside NEMA & 236kg/d from O outside NEMA
 - b. From MM2,3,4 batteries data, ~100kg/d comes from C outside NEMA and ~5kg/d from O outside NEMA
 - c. From MM2,3,4 bags data, ~155kg/d comes from C outside NEMA
 - c. Hence, max I value = 1173 - 117 = 1056kg/d; max O value = 2904 - 241 = 2663; max C value = 2776 - 255 = 2521
 - a. Assume 100 % for Hp, M and S - no impact as qtys from these sources are zero.
 - b. Assume 100 % for GO - only pa/ca - reasonable to assume comes from these institutes in NE
 - c. Assume 100 % for hotels (pa/ca, broken gl/gl bottles); high no of hotels in NEMA; very few in close proximity outside
 - d. Assume 90 % for C - consistent with MM2,3,4 data
 - e. Assume 87 % for I - consistent with MM2,3,4 data
 - f. Assume 85 % for O - mainly garages & consistent with MMC4 data.
 - g. Get household total by difference= 73 % or 2875 kg/mth