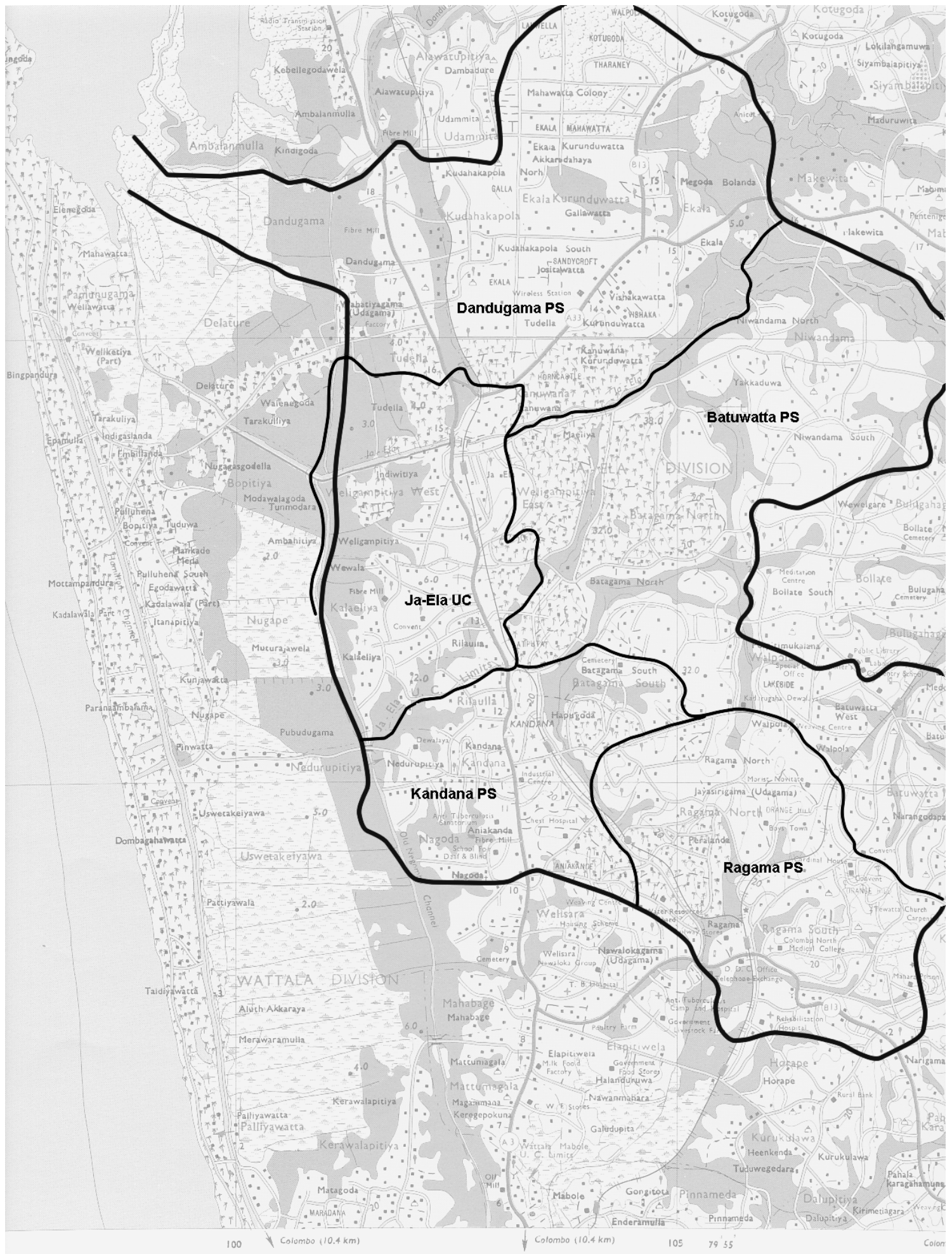


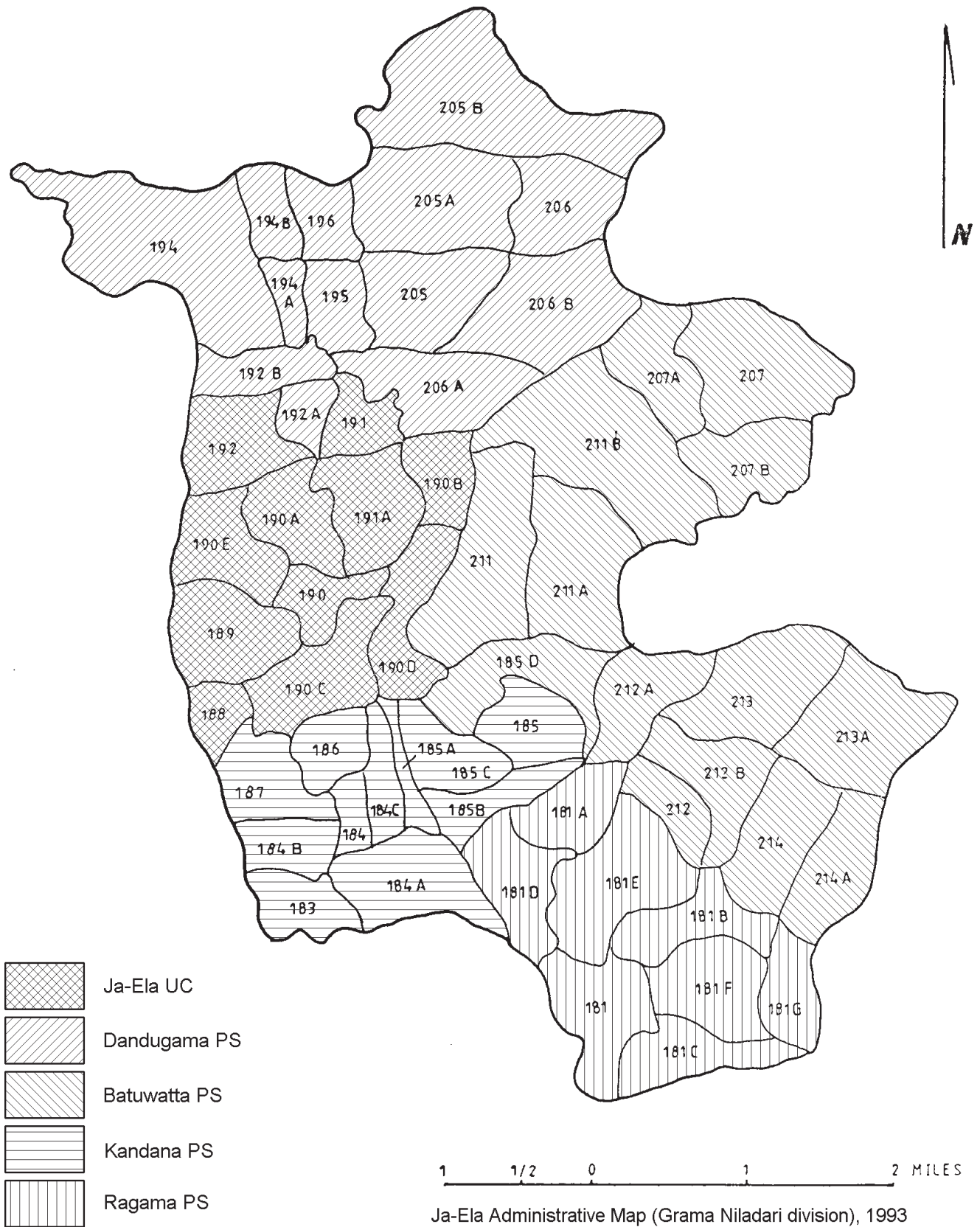
Appendix II Maps and Schemes

- A. Overview of Ja-Ela DS and local authority (PS/UC) areas
- B. Grama Niladari (GN) division map
- C. GN Population numbers (1999)
- D. Coverage of “town cleaners”
- E. Collection scheme Dandugama
- F. Collection scheme Kandana

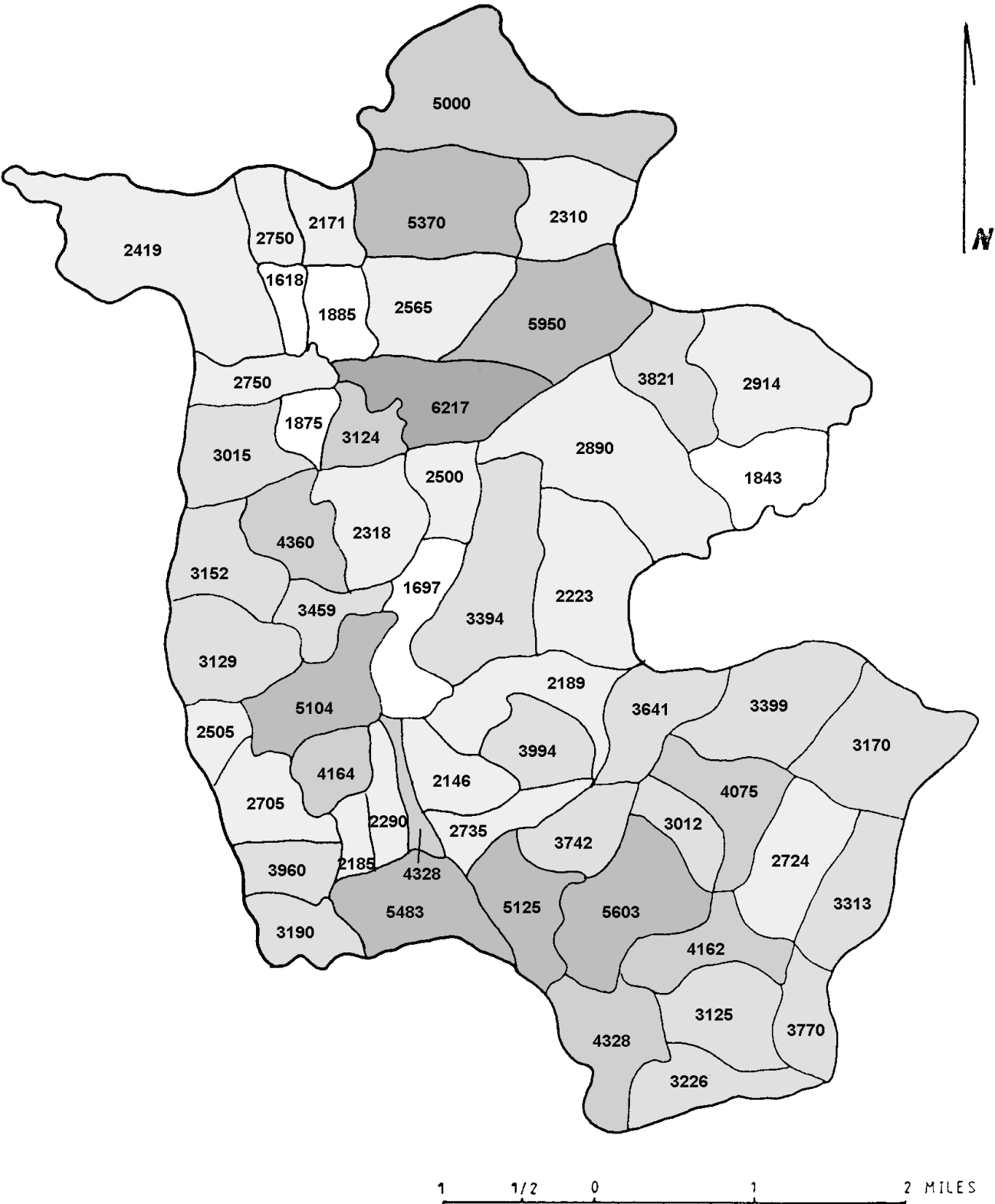
A. Overview Map of Ja-Ela DS



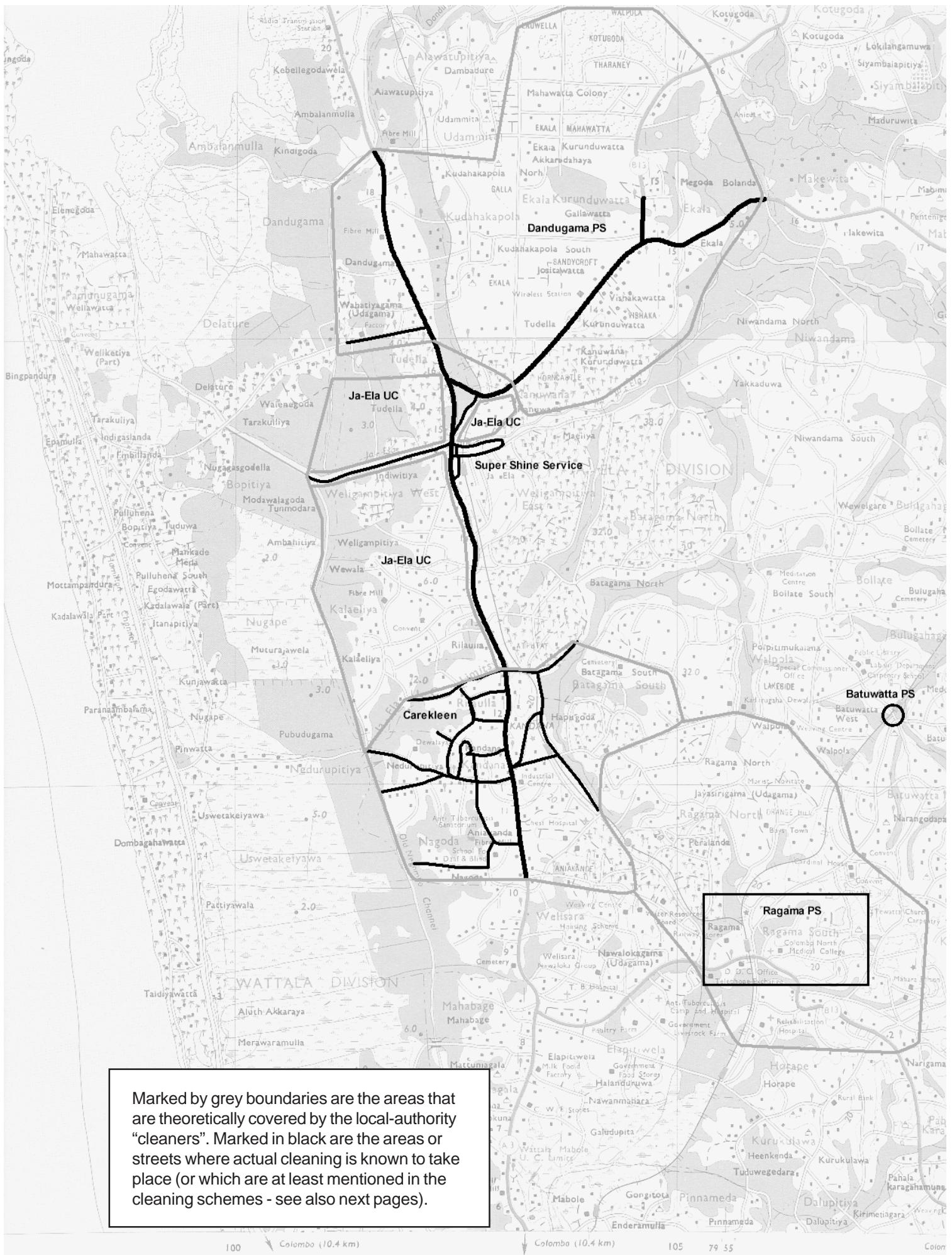
B. GN Division Map



C. GN Population Numbers (1999)



D. Coverage of “town cleaners”



Dandugama Suboffice Division Workplan of Health Division, 2000

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Weedi Road, Muthurajawela Road, Pamunagama Road, Madama Road, Jambo Road, MP's Residence and Office, Singhasala Road, Yeawan Wattha Rd.	From Jambo Rd to Dandugama Totupola Rd, Dehiyagata Church Rd via Dandugama Gamamedda Rd, Dewala Rd, Jositawatta	From Dehiyagata Church Rd to Madama Junction, up to Gampaha Road; Minuwangoda Rd, Airforce Camp and Temple Grayline Housing Scheme opposite the Jayaratna's (MP) Residence	From Madama Junction towards Kanuwana up to Monta Garments, along the roadside From C.T.B. Junction, to Ginwoong Lanka (Pvt) Ltd. through Temple Road	From Agaradaguru Mawatha, Christuraja Mawatha, Alexandra Wattha, to Volleyball Court (60 ft Ekala Road) Jaffagi Housing Scheme	Industrial Zone, Mythree Mawatha and take action for the remaining problems

All the drainage systems have to be cleaned

Under special conditions this programme may change

.....
Officer In Charge

.....
Public Health Inspector

.....
Labourer Foreman

Detailed Cleaning Schedule for the Ja-Ela (Kandana) Pradeshiya Sabha Limits

Roads that are cleaned by the compactor machine and tractors:

Monday, Thursday	Nadoda Jude Rd., Morawattha Rd., Charles Piyanama Rd., Pathima Rd., Sebastian Rd., Street Rd., Nagoda Church Rd., Kandana Cemetery Rd., Roundabout Rd., Main Road, Main Market
Tuesday, Friday	Bernadette Rd., Pantelion Rd., Relaualla Jude Rd., Kandana Church Rd., Devale Rd., D.C. Jayasuriya Rd., Pio Rd., David Soyza Rd., Theresa Rd., Main Road, Main Market
Wednesday, Saturday	Balasuriya Rd., Jayanthi Rd., Halpe Rd., Jayasuriya Rd., Jayasamurugama Rd., Railway Station Rd., Niwasa Rd., Juwan Rd., Main Road, Main Market, Peralanda Rd.
Sunday	Sadasarana Rd.*, Uluporanuwa Rd.*, Uswatta Rd.*, Bogahatotupola Rd., Dawatotupola Rd., Main Road, Main Market, Batagama Rd.*, Lipton Rd.*

*: This indicates roads that are not included in the contract, but are still cleaned once a week

Regional Manager Carekleen (Pvt) Ltd.

Appendix III – Addresses

Rural Area Households (Delatura)

A. Very low income (<Rs. 3000)

1. Jude Laxman
No. 322A Wallenegoda
4 people, 2 employed (driving)
2. U. Edward Perera
No. 338 Nawodaya Mawatha
8 people, 2 earn daily wages (labourer), no permanent job
3. W. K. Mary Malani
No. 328 Nawadeya Mawatha
5 people, 1 employed (labour)

B. Low income (Rs. 3000–6000)

1. Josep Perera
No. 279A Nelumvilla Road
5 people
2. Jayantha Costa
No. 279B Nelumvilla Road
4 people, 1 employed (driving)
3. S. Camilus Perera
No. 334A Nawadeya Mawatha
9 people, 3 employed

C. Normal income (>Rs. 6000)

1. K.D. Antony Nimal
No. 317 Nelumvilla Road
5 people, 1 employed (business)
2. Jagath Nishantha Fonseka
No. 336A1 Nawodaya Mawatha
4 people, 1 employed (carpentry)
3. K. Sunil Perera
No. 331 Nawadeya Mawatha
5 people, 1 employed (government servant)

Urban Area Households (Tudella/Ekala)

A. Low income (<Rs. 6000)

1. Samantha Hemali Manuthunga
No. 67/34 Alexandra Place
Kunuwana, Ja-Ela
4 people, of which 1 employed abroad
2. Jude Lessly
No. 67/40 Alexandra Place
Tudella, Ja-Ela
4 people, 1 earns income (wood chopper)
3. Rita Matilda
No. 64/22 Alexandra Place
Tudella, Ja-Ela
5 people, 2 employed

B. Normal income (>Rs. 6000)

1. G. Godfri Perera
No. 27 Anita Sevana
Agaradaguru Mawatha
Ekala, Ja-Ela
2. D.S.R.T. Fernando
No. 234/2 Alexandra Place
Kunuwana, Ja-Ela
3. Udaya Marapaya
No. 24 Kuduruwattha
Tudella, Ja-Ela
5 people, 1 employed

Retail Shops & Restaurants

Blue Island Restaurant

Food remains collected by pig farmers, rest of waste normally burned

Lakmani Hotel

Negombo Road, Tudella, Ja-Ela

Food remains collected by pig farmers, rest of waste normally burned

Tissara Grocery

Pitipana Road, Tudella, Ja-Ela

Waste (mostly plastic) normally burned

Maneesha Grocery

Pitipana Road, Tudella, Ja-Ela

Waste (mostly plastic) normally thrown in marshland (nearby dumpsite?)

House-to-House Waste Buyers

P. Lingeshwaran

273 Negombo Road

Tudella, Ja-Ela

(There are many more in the area, but this is the only address we have)

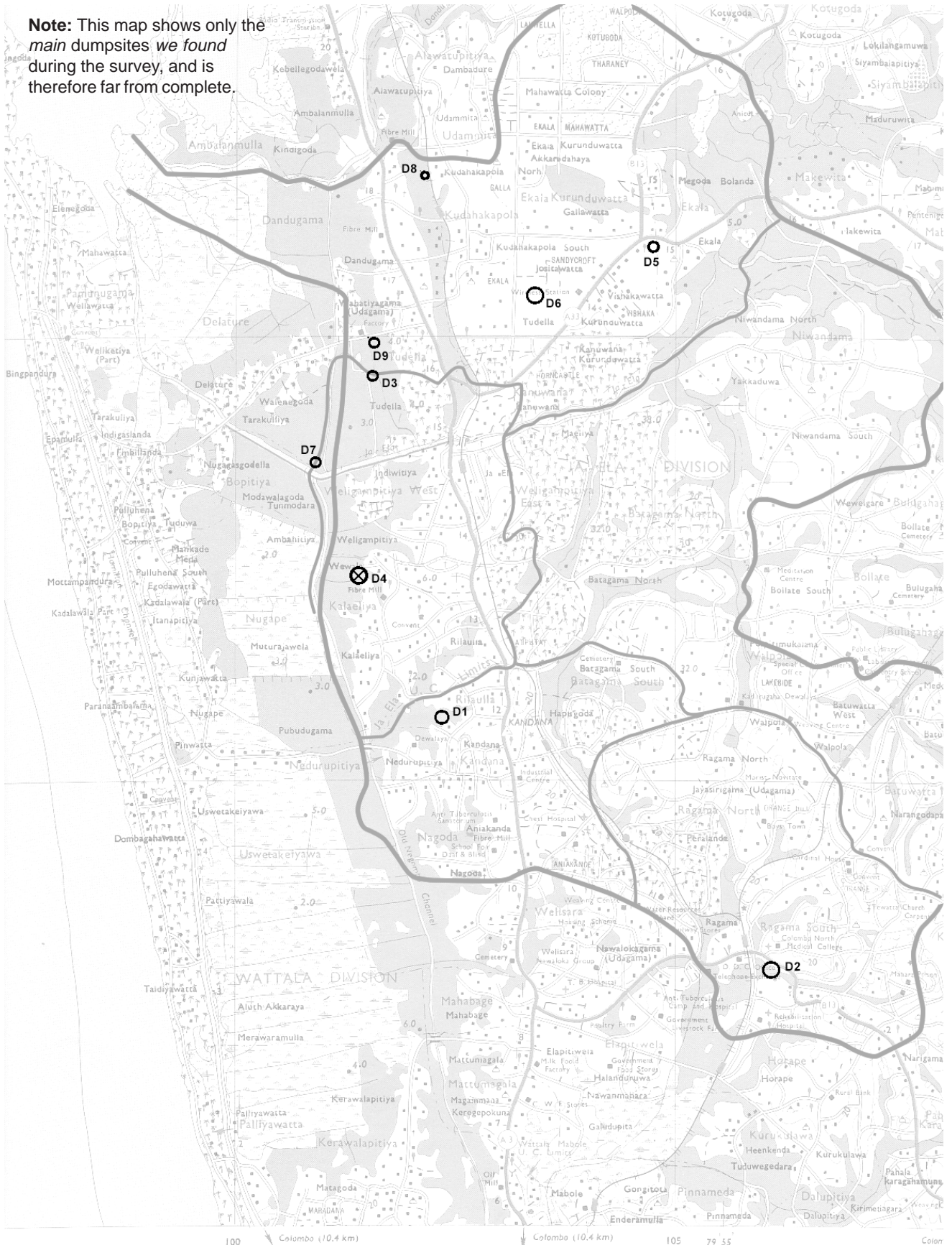
Waste Retailers Ja-Ela

<i>Street</i>	<i>Nr.</i>	<i>Name</i>	<i>Materials</i>
Negombo Road	254	R. Balakrishna	Paper, scrap metal, glass bottles, barrels, plastic containers, sacks
Kanuwana Road	47-1	V. Thavadasan	Scrap metal, glass bottles, barrels, plastic containers, sacks
Old Negombo Road	251	S. Lal	Paper, scrap metal, glass bottles, barrels, plastic containers, sacks
Minuangoda Road	61	S. Raja	Paper, scrap metal, glass bottles, barrels, plastic containers, sacks
	15 A	M. Seluam	Scrap metal, barrels, plastic containers
	124		Paper, corrugated cardboard, plastic containers, sacks
	?	Unknown	Paper, glass bottles, scrap metal, barrels, plastic containers
Indivitiya Road	199	T.A. Milton Appuhamy	Paper, cardboard, scrap metal, barrels, plastic containers, black coloured plastics (see main text, <i>figure 3.19</i>)

(The list of materials for some shops might contain omissions, especially in the case of cardboard.)

Appendix IV: Dumpsites in Ja-Ela DS

Note: This map shows only the main dumpsites we found during the survey, and is therefore far from complete.



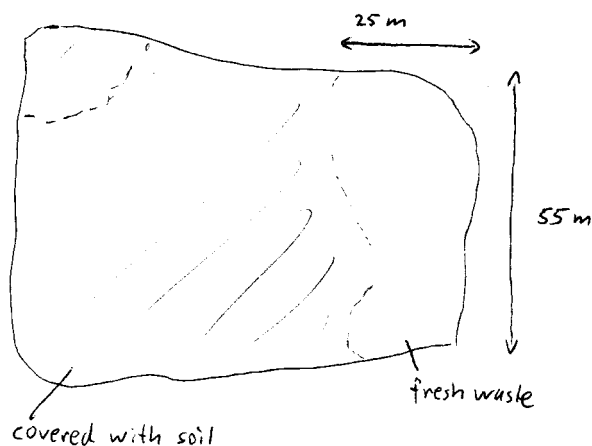
- ⊗ Former dumpsite
- Active dumpsite

- D1 Jayasiriya Road, Kandana
- D2 Ragama Town
- D3 Suduwella, Ja-Ela
- D4 Wewela, Ja-Ela (former site)
- D5 Ekala (asbestos dump)

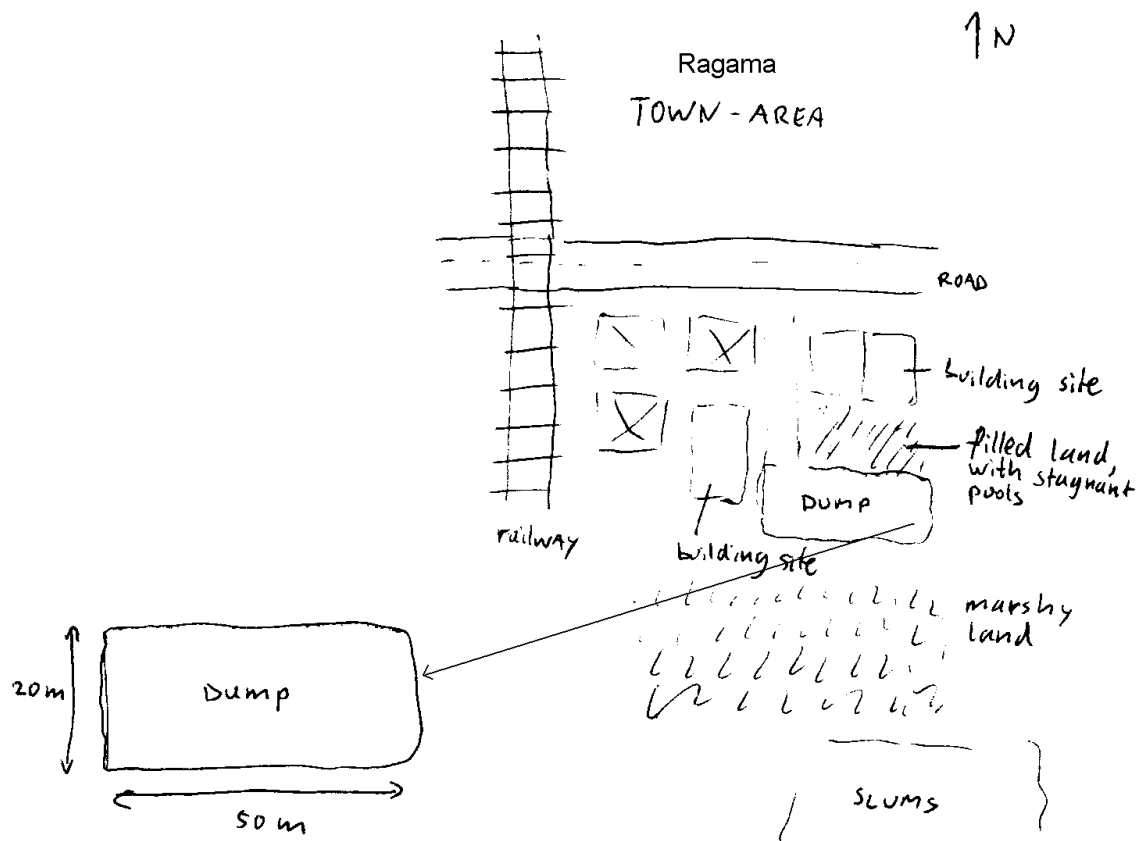
- D6 Ekala Industrial Estate (market waste)
- D7 Mr. Jackson's Place (along Ja-Ela Canal)
- D8 Sri Wijerama Temple, Dandugama
- D9 Pamunagama Road, Tudella

Appendix IV – Dumpsites

Map reference:	D1
Location:	Jayasiriya Road, Kandana
Users:	Carekleen cleaners, Batuwatta PS cleaners and private dump
Land type:	Private property, previously marshland
Current active dumpsite size:	$\pm 55 \text{ m} \times 25 \text{ m} \times 2.5 - 3 \text{ m}$; estimated $3400 - 4100 \text{ m}^3$
Previously filled areas:	estimated $75 \text{ m} \times 60 \text{ m}$ (big site), estimated $50 \text{ m} \times 50 \text{ m}$ (small site), average height $\pm 1 - 1.5 \text{ m}$
Total area used for filling:	$\pm 8500 \text{ m}^2$ (possibly more)
Total amount of waste + soil used for filling:	estimated $12000 - 17000 \text{ m}^3$ (possibly more)
Waste composition:	Household waste, a lot of plant material, some garbage in bags, construction rubble (incl. asbestos), slaughterhouse waste (animal remains), much paper/cardboard
Various observations:	No burning; current dump not yet covered; no houses in direct vicinity of dump (distance $>300 \text{ m}$)

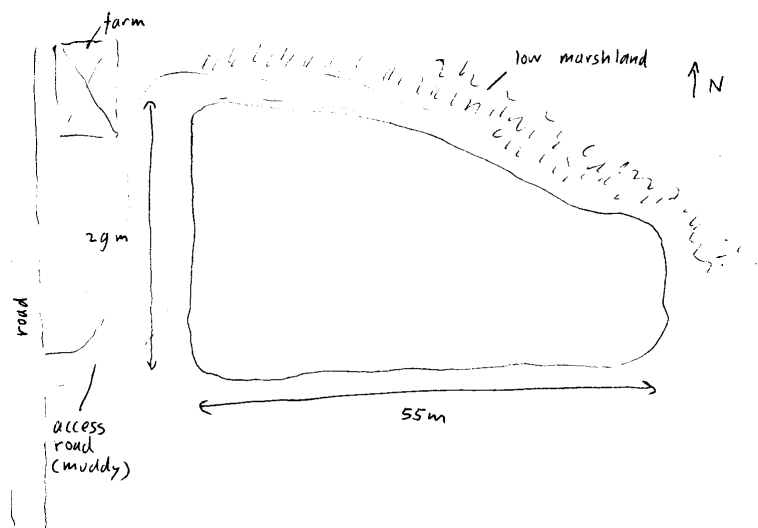


Map reference:	D2
Location:	Ragama town
Users:	Ragama PS cleaners (and some private dump?)
Land type:	Government property (UDA), previously marshy land (with low natural value due to town location)
Current active dumpsite size:	$\pm 20 \text{ m} \times 50 \text{ m} \times 2 \text{ m}$; estimated 2000 m^3 over 1000 m^2
Previously filled areas:	Not precisely known, at least $20 \text{ m} \times 100 \text{ m} \times 1 \text{ m}$, now partly used for building
Waste composition:	Household waste, many plastic bags, some slaughterhouse waste, PVC, rubble, intact glass & plastic (PET) bottles, lot of yoghurt cups and film roll containers
Various observations:	Closely surrounded by houses, including some still being built; waste is burned (smoke will pass through residential area during SW-monsoon); current dump not covered; part of old dump now filled with pools of stagnant rainwater



Map reference: D3
 Location: Suduwella, Ja-Ela
 Users: Private dump (used to be dump for Super Shine Service and Ja-Ela UC cleaners), now used by Ekala industries (e.g. PLL Company, producers of plastic packaging material)
 Owner: Sunil Dasanayke
 Land type: No. 462 Sebastian Perera Road, Suduwella, Ja-Ela
 "Private" property (officially?), previously marshland
 Current active dumpsite size: $\pm 29 \text{ m (max.)} \times 55 \text{ m} \times 1.5 - 2.5 \text{ m}$
 Estimated area: $\pm 1200 \text{ m}^2$
 Estimated amount of waste: $1800 - 3000 \text{ m}^3$
 Waste composition: Mostly organic and plastic material
 Various observations: Several houses / farms along the west-side of the site; currently no visible signs of burning (but see below); waste is not covered and badly spread; very muddy access road with pools of water; large piece of filled marshland to the south of the site, separated from it by a new fence, possibly also used for dumping waste in the past (?)

- Information from site owner:
- The UC collectors would not spread the dumped waste, so the owner asked them to stop dumping
 - PLL is paying Rs. 10,000 per month for collection and dumping of their plastic waste, which amounts to about 3 tractors per 2 days.
 - There also used to be (private) dumping of polythene waste, but that was stopped because it was not burned
 - The owner of the site used to have a farm



Map reference:	D4
Location:	Wewala, Ja-Ela
Users:	Used by Ja-Ela UC cleaners in the past
Land type:	Previously marshland, now a public playground
Size of site:	$\pm 60 \text{ m} \times 125 \text{ m} \times 1.5 \text{ m}$ (max. height); $\pm 7500 \text{ m}^2$
Estimated amount of waste + soil used for filling:	$\pm 11200 \text{ m}^3$
Various observations:	There is some newly dumped waste along the north-edge of the old site

Map reference:	D5
Location:	Ekala (along Gampaha Road)
Users:	Rhino Roofing Products Ltd.
Land type:	Private property
Estimated dumpsite size:	At least 500 m^2
Waste composition:	White asbestos powder and fragments
Various observations:	Most of the site is not (yet) covered; it is located close to a residential area; the owner lives at the edge of the site; part of the site is surrounded by trees; the asbestos powder is mixed with water for transport in an open tractor (which is entirely covered in asbestos powder); the road between the Rhino company and the dumpsite is covered with patches of dried-up asbestos powder
Notes:	See also main text, <i>figure 3.15</i> .



D5



D5

Map reference:	D6
Location:	Ekala Industrial Estate
Users:	Super Shine Service, possibly others
Land type:	Private property
Owner:	Some rich person
Current active dumpsite size:	Waste is scattered in small dumps over a large area
Waste composition:	Market waste, fish remains, slaughterhouse waste
Waste source:	Mostly the Ekala market
Various observations:	The waste is regularly covered with soil. Usually it is dumped in a shallow pit, about half a meter deep. There are a very large number of flies around the waste. A family lives on the edge of the site itself, but it is surrounded mostly by industrial complexes. The smell from the fish and slaughterhouse waste is a big problem: The family have to cover their faces to sleep, and the wife has to vomit every morning. The (flowing) surface water on the site is clear, but does contain significant amounts of strangely coloured algae. When used for washing it causes skin problems. The groundwater (from a well) usually smells very bad. Some guppies (a rather tolerant fish species) do live in the well.

Map reference: D7

Location: Along the Ja-Ela Canal (Mr. Jackson's place)

Users: Ja-Ela UC cleaners, Super Shine Service

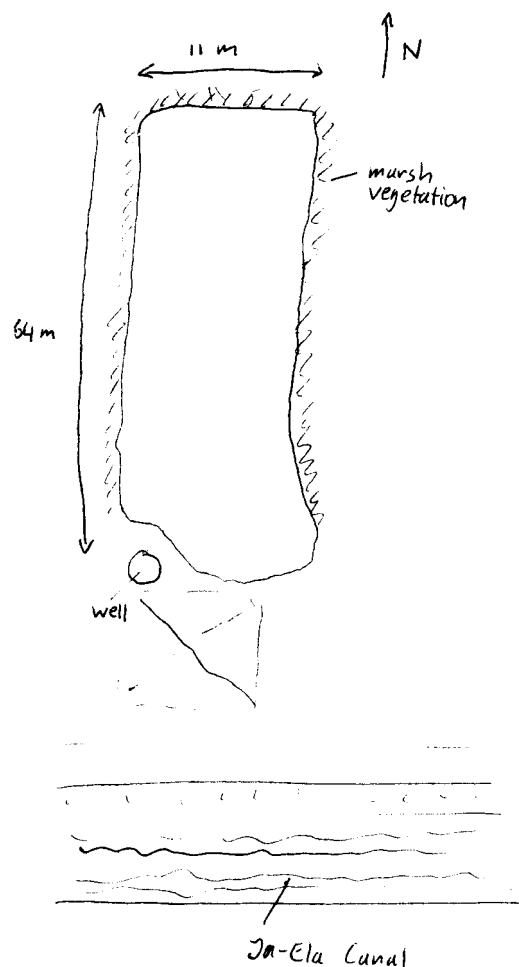
Land type: Private property, previously marshland

Current active dumpsite size: $\pm 64 \text{ m} \times 11 \text{ m} \times 0.5 - 1.5 \text{ m}$; estimated $400-1000 \text{ m}^3$

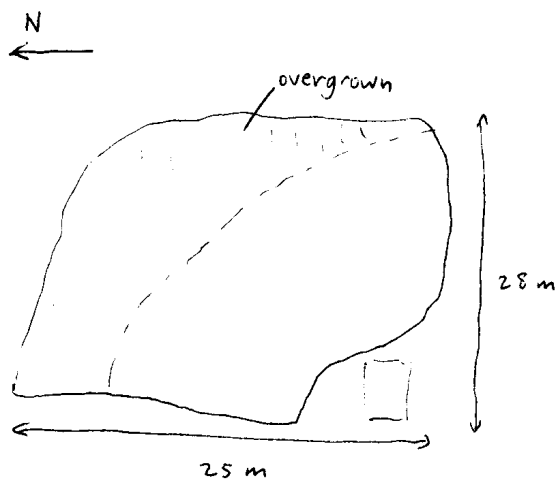
Waste composition: Roadside waste (mostly household waste and a lot of plant material); some residues of household chemicals in small amounts; some potential container habitats (mostly coconut shells)

Impacts: The site is surrounded on three sides with high marsh vegetation, so that most light waste (bags, etc.) is contained. The site is also surrounded on three sides with water, so there is a strong hydrological linkage with the surface water in that part of the marsh. The water shows some signs of eutrophication, but not extensive – although the quality of the water does not seem to be very good. There is a groundwater well next to the site. The water is a bit murky, but does contain some fish and frogs.

Various observations: Muddy entrance, bad access; some waste has been burned; some waste might have been covered with soil once (but it could also be decomposed plant material and paper); some houses are nearby, but it is not really a residential area; some cows seem to have been on the site recently



Map reference:	D8
Location:	Sri Wijerama Temple, Kudhahapola, Dandugama
Users:	Dandugama PS cleaners
Land type:	Private property (Buddhist temple), previously marshy land
Current dumpsite size:	$\pm 25 \times 28 \times 0.5 - 1 \text{ m}$; estimated $300-800 \text{ m}^3$
Waste composition:	Roadside waste: mostly household waste (e.g. milk bottles, packaging, bags, coconut shells, buckets, a few glass bottles, cardboard & paper (already pulping), etc.) and a lot of plant material (grass, (palm) leaves, branches), some cloth remains. The waste is very dry. There are some potential container habitats (mostly coconut shells).
Impacts:	Previously filled areas overgrown by dense vegetation; no clear signs of eutrophication; surface water mostly stagnant, so bad hydrological linkage; groundwater impacts unknown but possible
Various observations:	No burning; current dump not yet covered with soil, but sand is present; no houses in direct vicinity of dump (distance $>200 \text{ m}$); access road is very narrow
Comments:	An additional extension of the filled site of about 15 metres in western direction has been planned.



D8

Map reference:	D9
Location:	Pamunagama Road, Tudella
Users:	Previously used by Supershine and Ja-Ela UC cleaners, currently used by local residents, and possibly others
Land type:	Private property, previously marshland
Waste composition:	Household waste, a lot of plant material (incl. Coconut tree trunks), some garbage in bags, construction rubble (incl. asbestos), much slaughterhouse waste (animal remains, often in bags)
Impacts:	<p>The site is located right along the road, and is therefore clearly visible and smellable for anyone passing by. Previously the waste was burned every night, now this is only done occasionally (see main text, <i>figure 1.8</i>). The burning used to generate large amounts of thick smoke, which irritated the eyes and bronchial tubes. The smoke used to pass over a stretch of road and through a residential area.</p> <p>The slaughterhouse waste generates a very bad smell, and attracts a lot of crows and dogs. Some of it ends up in the water (which floods the Pamunagama Road during prolonged periods of heavy rain), and a lot of slaughterhouse waste is also dumped along the roadside in the vicinity of the dump (especially along the western stretch between the bridge and the entrance of the DSL Container Terminal) (see also main text, <i>figures 3.13</i> and <i>3.16</i>).</p>
Various observations:	The owner has requested to stop dumping and has also put up signs to this effect, although some waste is still being dumped on the site; the site has already been levelled, but new waste was later dumped on top; lots of cattle and pigs feed of the organic materials on the dump each night (see main text, <i>figure 3.17</i>).



D9



Appendix V

Interview Transcripts

Kandana

24 July 2000
Mr. J. K. Kirthsena
Public Health Inspector, Kandana
Office: 01-233865

Collection was fully privatised in November 1999. Before privatisation, the public collection resources consisted of 18 labourers and 2 tractors. Of these labourers, 12 were in permanent service and 6 in temporary service. The labourers earned Rs. 130 per day, and those in permanent service were entitled to additional government allowances and leaves. The monthly cost of the collection system amounted to about Rs. 250,000. After privatisation, labourers and tractors were moved to Dandugama, which lacked system for collection of solid waste.

The private company *Carekleen Ltd.* now handles roadside solid waste collection in parts of the Kandana area, on a yearly contract basis. This contract lists the streets that should be kept clean by the company, as well as the minimal collection frequency. Collection is monitored irregularly by the Public Health Inspector (PHI), and through complaints from the local population. The criterion is that the streets listed in the contract should be free of garbage. Complaints from local residents or the PHI are immediately forwarded to the Carekleen company. If duties performed are not up to standard, the PHI may decide to stop payment.

Waste collection is paid for with public money. There is no special tax for this, but tax money used includes assessment tax and trade licence fees. Under the 1999-2000 contract, Carekleen gets paid Rs. 310,000 per month.

Average waste production in the Kandana area amounts to about 13 metric tonnes per day. During major feasts, waste production can be considerably higher. There is no proper dumping ground for the solid waste. At the moment, private property is used, by request of the owner. The waste is just dumped, not burned.

Waste collection is limited to roadside cleaning, of a limited number of (main) roads. Resources are lacking for a more extensive system. Also, public awareness campaigns are needed on waste disposal and health aspects.

3 August 2000
Mr. G.S.P. Harishchandra
Supervisor, Carekleen Ltd. (Kandana branch)
Office: 074-830319

The Kandana branch of Carekleen is responsible for cleaning the roads that are stated in the contract, between Nagoda and Rilawula. It is part of a bigger company *Carekleen (Pvt) Ltd.*, which also handles waste collection in other places (e.g. parts of Kandy and Colombo). The address of the mother company is 96/A Dutugamunu Street, Kohuwala, Dehiwala (tel.

85430).

The collection resources consist of 25 labourers, 10 hand carts, 2 tractor trailers (with 1 engine) each capable of transporting about 1 metric ton of waste, and 1 garbage truck with hydraulic compression, which can transport about 3 metric tonnes. There are 3 supervisors, and the PHI also does (infrequent) checks. The labourers each earn about Rs. 5000 per month.

Waste is collected two times per day along the main roads and at the market, and one or two times per week along the smaller roads. The contract only states one time per week for the latter roads, but some have to be cleaned more frequently in order to keep them clean. The morning shift officially runs from 6:30 to 12:30, the afternoon shift from 12:30 to 17:30. The labourers are instructed not to move waste from the smaller roads to the main road, but to collect it on the spot.

Per day, about 4 tractor-loads and 1 truckload of garbage are collected, amounting to about 7 metric tonnes. A large part of the waste seems to consist of trees and branches that were cut down by people. The company uses one dumpsite, close to the town. Carekleen takes care of spreading the waste and levelling the site after dumping. However, this takes some time, at the expense of collection duties. The labourers are instructed not to burn waste. Some of them collect empty bottles, etc. for reselling.

The dumpsite is private property. No money is paid to or by the owner for the dumping. There are some problems with the owner, as sometimes he will not permit dumping. The site is not official, as Kandana PS is not responsible for finding or authorising dumpsites. Sometimes waste is dumped on other grounds by request of the owners, without government authorisation.

Carekleen also cleans the drainage system, once every three months. The drainage system is poorly built, and is usually filled with soil, plant material and garbage by the time it is cleaned. Sometimes structures (e.g. a bus-stand) are built over the drainage channels, making cleaning near to impossible.

9 October 2000
Mr. G.S.P. Harishchandra
Supervisor, Carekleen Ltd. (Kandana branch)

Carekleen has placed some 40 barrels in the town area, mainly at the market places and at butcheries. The shop owners keep an eye on the barrels, so they are not so easily stolen. So far about 10 barrels have disappeared.

16 October 2000
Mr. Mervin Silva
Public Health Inspector, Kandana

Kandana PS now has another PHI, and has no EDA but only a Community Development Officer. The drains along the main roads are owned by the RDA, drains along other roads are owned by the PS.

Dandugama

24 July 2000

28 July 2000

Mr. Anton Fernando

Public Health Inspector, Dandugama

Office: 01-236260

The public collection resources of Dandugama consist of 9 labourers, and 2 tractors, which were transferred from the former public collection system of Kandana. The labourers get paid Rs. 130 per day. The total cost of collection amounts to about Rs. 125,000 per month. The money is derived from assessment tax, trade license fees and a contribution from the national government (Department of Local Government Services). The collection resources are not sufficient for a satisfactory functioning of the system, and complaints are sometimes made about delays in collection. There is no systematic cleaning of drainage systems, although it does usually happen when drainage gets blocked. There are plans to privatise the collection of waste without job loss, by handing the tractors and labourers over to a private company.

About 5 metric tonnes of solid waste are collected per day. There is currently one main dumping ground at the Sri Wijerama Temple site, on private property by request of the owner. The waste is not burned, and is periodically covered with plant material. Many of the labourers collect glass, bottles, tins, metal and sometimes paper for selling.

The Dandugama area also includes the Ekala industrial estate. Disposal of company waste in this area is formally the responsibility of the BOI. The waste should be collected and disposed of in a proper way. However, this does not happen. Most companies have hired their own personnel to handle solid waste disposal. It is unclear what happens to the waste from most of the companies. There are however, some known problem cases.

Rhino Roofing Materials Ltd. is known to produce a lot of asbestos waste, which is dumped on a private site nearby. This waste, consisting mostly of a wet asbestos mixture, is transported in open tractor carts, and is not covered after dumping. The result is an open site covered with a layer of dry asbestos dust, in the middle of a populated area. The route from the company to the dumpsite is also covered in asbestos patches that have leaked from the transport carts. The Rhino company has received a warning (dd. 14 July 2000) from the PHI regarding the open transport.

Union Carbide, a producer of batteries (Eveready) among other things, also has an open dumpsite. Most of the dumped material seems to consist of cardboard, metal, plastic and carbon battery components, but it is possible that harmful chemicals are also dumped here. Much of the waste is also burned.

Many slaughterhouses in the area dump their slaughter waste by the roadside. This practise forms a nuisance and a possible health hazard. In addition to the problems of illegal dumping, the public collection system is also being abused by local politicians, for instance to clean their own property. Some of the illegal dumping practices also take place under the protection of politicians, so that it is difficult for the PHI to take

action.

There are no central points for the collection of garbage. The local residents just scatter the waste or dump it by the roadside. Awareness activities undertaken by the Dandugama PS are restricted to compost barrels in local schools, and the planning of a small campaign aimed at households. The planned campaign however, seems to be (mostly?) for the promotion of local waste burning by residents.

16 October, 2000

There is 1 supervisor for cleaning. There are not many drains, but the drains present are owned by the RDA. The dimensions of the tractor trailers are as follows: 3 m length, 1.8 m width, 0.4 m height, and an additional 0.6 m high wire mesh construction on three sides of the trailer.

Ja-Ela UC

25 July 2000

Mr. Nelson Piumwardena

Public Health Inspector, Ja-Ela UC-area

Office: 01-236822

The Ja-Ela Urban Council area has both a public and a private waste collection system. As of July 1st, 2000, the private company *Super Shine Service* is under a contract to keep the market areas and most of the main roads free from garbage. The public collectors clean the bypass roads, the drainage system, and spray an insecticide called *Betex* in an attempt to curb the mosquito problem. The public cleaning resources consist of 4 tractors (\pm 3 metric tonnes per tractor), 4 small hand-carts (150-200 kg per cart) and 50 labourers, of which about 35 attend daily. Both permanent and temporary labourers earn Rs. 137 per day. Permanent labourers get additional government allowances and leaves. Attendance of the labourers is normally good. The tax money used to pay for waste collection comes mostly from assessment tax and trade licence fees.

The tractors and carts do about 3-4 drives per day. The daily amount of waste collected through the public system amounts to about 13-15 metric tonnes. Only roadside waste is collected. Some people collect their waste in a rubbish-bag, which they place by the roadside. Some roads have central ("formal") places for waste collection. However, in most places waste is still scattered ("informal"), especially outside of the urbanised areas, where the people have more space and are generally less educated. The UC does not distribute any rubbish bags, and has not established any central collection points. There are no plans to increase public-awareness on waste disposal.

Collected waste is mostly dumped at the three main sites at Wewala, Indivitiya and Suduwalla. These sites are private properties, and dumping is done by request of the owners. The owners pay the UC a certain amount of money for the dumping, through a tender-system. Before a new area is accepted as a dumping-ground, a suitability check is performed. The dumpsite is covered with sand once a day. Dumped waste is usually not burned although it does happen in some cases (ie. with some coconut-shells, and during

outbreaks of Dengue fever). Also, the labourers are not instructed not to burn waste, so they sometimes do. Many of the labourers also collect empty tanks, bottles, etc. for selling.

Scattered waste often clogs up the drainage systems, which causes the water to stagnate, thus forming a breeding place for mosquitoes. Only four labourers are available for cleaning of the drains about twice a week, with additional spraying of *Betex*. Neglect of local residents and lack of resources for cleaning and maintenance form a significant threat to the proper functioning of the drainage system.

At the moment, there have been no complaints about waste collection. Some complaints have been received on illegal dumping and burning of waste. If a complaint is made against someone who is illegally dumping waste, a warning is issued by the PHI. If the activities continue, written instructions are sent to stop the dumping (according to the Nuisance Ordinance). If the offender does not comply within the given time, prosecution will follow. At least, in theory...

Twice daily, a number of designated roads are cleaned by the private collectors of the Super Shine Service. The morning shift lasts from 07:00 to about 11:30. The evening shift starts at about 16:00. The site of the fish market is also cleaned by the Super Shine Service, between 20:00 and midnight.

3 August 2000
Mr. Deshapriya Perera
Operations Manager, Super Shine Service
No. 31, St. Xavier's Road, Ja-Ela
Tel. 074-381979

The Super Shine Service is a local company, which also does initial cleaning of buildings, landscaping, janitorial services, shampooing of carpets and polishing of floors. According to the contract with Ja-Ela UC, the company does solid waste removal along the main road and at the two markets. The Urban Council pays the company Rs. 149,000 per month. A person from the UC supervises the work of the company.

Collection resources consist of 5 handcarts, each manned by one collector, and 2 tractors, each manned by 3 labourers and a driver. There is one extra driver making a total of 3 drivers, as once a week a driver gets an off day. Collection is done twice a day. The day shift officially runs from 6:30 to 18:00 and is manned by 2 drivers, 10 workers and a supervisor. The evening shift runs from 18:00 to 6:00 and has five workers extra.

Daily about 4 tractor loads of waste are collected. It is dumped at the Suduwella site, which is also used by the UC cleaners and by some companies in the Ekala area (who mainly use it to dump plastic waste). There are problems with this dumpsite, as it is almost full and it tends to get very muddy after rain, making tractor access difficult. Levelling and covering of the site are the responsibility of the UC. The UC chairman has been asked to provide the company with a new dumpsite. Sometimes waste is dumped at other sites, by request of the owner. These sites have to be approved by the UC, which can be a fairly lengthy procedure.

The labourers are instructed not to burn waste, and not

to dump at sites which are not UC-approved. If they should break these rules, they will receive one warning. At recurrence the labourers involved will be fired. Some of the labourers collect empty bottles, etc. for reselling.

Since one week the company has also started to systematically clean drainage systems. The UC had been asked about their plans with regard to the cleaning of draining systems, but they had none.

Before commencing the collection for the UC, the Operations Manager had visited the big dumpsite at Bloemendhal, Colombo, in order to get an idea. He says it is mainly muddy and messy and in a terrible state. According to him there is an urgent need for good central processing (dumping or incineration) facilities for solid waste. He also criticises the local and central government authorities for not taking any action to solve the waste problem.

29 August 2000
Mr. Nelson Piumwardena
Public Health Inspector, Ja-Ela UC-area

There is a new dumpsite, which is currently the only site and has been in use for several months. It is located on the property of Mr. Jackson, along the Ja-Ela canal. Dumping on the Indivitya site has been stopped, apparently following a petition led by the brother of Mr. Felix Perera. Super Shine also dumps at a site near the Ekala fish market (they also clean this market).

The Urban Council is responsible for the selection of dumpsites, financing waste collection (including Super Shine Service) and owns part of the drainage system (which is cleaned by the UC collectors and by Super Shine along their parts of the route). The PHI is responsible for organising waste collection, but does so with the help of the Urban Council. The Chairman of the Urban Council can (and does) sometimes give instructions to the PHI, e.g. to change to a new dumpsite, etc. The PHI is also responsible for monitoring the waste collectors. He does this by getting information from and giving instructions (on where to dump, etc.) to the 2 collection supervisors.

29 August 2000
Mr. J. Sathurasinghe
Secretary, Ja-Ela UC

Different parts of the drainage systems in the UC area belong to the Urban Council, the Super Shine Service and the Urban Development Authority. Each is responsible for maintaining their own part of the system.

According to the contract, Super Shine Service must provide daily, weekly and monthly reports of its activities to the PHI. The UC must provide a dumpsite. If it is not able to do so, the monthly payment to Super Shine is increased from the normal amount of Rs. 149,498.00 + 12.5% GST to Rs. 164,490.00 + 12.5% GST.

There is no longer any dumping-tender. No payment is made for dumping, and there is no official contract. There is just an agreement between the UC Chairman and the owner of the site, in which the latter gives

permission to dump the collected waste on a designated part of his property, as long as the collectors take care of spreading the waste evenly across the terrain.

9 October 2000
Mr. Deshapriya Perera
Operations Manager, Super Shine Service

The dumpsite currently provided by the Urban Council is inadequate. It is rather full, and dumping is almost impossible during rain because the tractor has to traverse part of the dump (which has a very low carrying capacity when wet). Super Shine Service could easily find a better dumpsite to use, away from the town, but then the UC would have to pay Rs. 15,000 extra per month, which they won't easily do.

As required by the contract, daily reports are sent to the PHI, stating the duties performed that day. Besides cleaning and collection of litter and garbage, these duties also include clipping grass and cutting down banners (except during the election campaigns).

Daily, about 3 tractor loads of waste are collected in the dayshift, and 2 in the nightshift. The dayshift consists of 10 labourers, 2 drivers and 1 supervisor (who works until about 23:00). The nightshift has 15 labourers and 1 driver (who also acts as spare driver for the dayshift). The labourers earn Rs. 210 per day.

The company has placed 34 barrels (painted and marked) all over town, but after a few weeks there were only some 15 or 16 left. The rest were probably stolen, repainted and sold. The total cost for one barrel is about Rs. 250.

According to Mr. Perera the absence of a good dumpsite is currently their biggest problem. (It is also a problem for the UC cleaners.) He says that private companies like his are eager to improve the management of municipal solid waste if they are given the chance, but that the Government should at least back up and assist them. Currently the lack of support from local authorities is making it difficult for them to do their job properly.

Ragama

7 August 2000
Mr. Jayasinghe
Public Health Inspector, Ragama
Office: 01-958035 / 01-958230

The Ragama area has some 8736 houses, and a population of about 40,000. This figure includes the people residing in Ragama General Hospital and the two private hospitals in the area. The responsibility for organising and financing waste collection and for cleaning the drainage system is with the Ragama sub-office of Ja-Ela (Kandana) PS. The PHI is responsible for supervision and practical implementation. The dumpsite and the drainage system are owned by the Urban Development Authority, who are also responsible for maintenance of the drains.

Daily collection starts at 06:00 and ends at 15:30. The collection resources consist of 16 labourers, about

twelve of which attend daily. There are 2 tractors (of which 1 has been broken down for the last 15 days) and 1 handcart. The tractors each have a capacity of about 500 kg. The tractors do about 5-6 daily runs, in total. The labourers each earn Rs. 137 per day. Most of them informally collect bottles, etc. Total collection costs amount to about Rs. 75,000 monthly. The usual taxes are used to pay for this.

Waste collection mainly focuses on the Ragama town area and the market. When these are done and there is some time left, some of the smaller roads outside the central town area also get cleaned. There are not enough resources to work according to a fixed collection scheme. There is one central dumpsite near the town, but it is no longer sufficient to receive all the waste. The waste is not covered after dumping, and it is usually burned at the dumpsite. The population around the dumpsite is increasing, and some of the residents have petitioned to stop dumping at this site.

Households do not systematically dump their waste, but mostly scatter it along the roadsides. There are also problems with animal husbandry and slaughterhouse waste. Some awareness building is done among schoolchildren, although this mostly relates to health issues. During epidemics, leaflets and speakers are also used to increase awareness among the general public (again, mostly health related). They are not properly built, and poorly cleaned and maintained due to institutional problems (shared responsibilities).

In the past, people used to buy garbage to make compost. This does no longer happen, due to the increased use of plastics.

14 October 2000

The cleaners have 1 supervisor. Waste from the hospitals in the area is burned by the hospitals themselves.

Batuwattha

Mr. R.M.P. Rathnayake
Public Health Inspector, Batuwattha
Office: 01-230196

Batuwattha has a population of about 25,000 and is mostly a rural area. Most people dump their waste on their own property, usually somewhere behind the house. There is, however, a small town area. Since privatisation of the Kandana PS waste collection, one tractor has been assigned to Batuwattha for 2 days per week. The tractor is only called when needed, though. The rest of the time, the tractor is used in Dandugama. There are 2 labourers, which are paid by the Kandana sub-office of Ja-Ela PS. The collected waste (about 250-300 kg per day) is taken to Kandana and dumped there.

Some people collect waste informally, usually house to house. There is some awareness building, related to the use of compost barrels. These barrels are supplied at Rs. 350 per barrel, but still the demand exceeds the supply. There is no drainage system as such. Some people dump their waste-water in holes, which tend to overflow in the raining-season.

Central Environmental Authority

06 September
Mr. Mansharam
Deputy Director, CEA

The responsibility for dumpsites is with local authorities. For transport and disposal of asbestos waste, the CEA has made guidelines, which have been passed on to two of the three big asbestos producers in the country. Rhino Roofing Products is still a bit of a problem. They have not yet received a copy of the guidelines, and no proper dumpsite has yet been selected. The selection of a dumpsite (incl. EIA) will take about another 2-3 years, after which the waste on the current site should be transferred to the new site. Local residents have started a court case against the company for the current dumping practices, but the CEA is staying out of that.

19 October 2000
Head of the Pollution Control Division, CEA

There are currently no regulations, guidelines or standards for solid waste landfills, or for the emission of solid waste by industries and other companies. No licences are issued to this effect, not even for hazardous solid materials. The relevant provisions in the Environmental Act have not been implemented. There are no plans to do anything about solid waste, as this is a task for the local authorities.

Ministry of Forestry & Environment

20 September 2000
Ms. C.P. Batuwitage (Director Solid Waste Management)
Ms. Aruni Abeywardana (Research Assistant)
Pollution Control Division

Additional notes on the National Strategy for Solid Waste Management

The strategy focuses on municipal solid waste.

Awareness campaigns will be mostly targeted at school children, and carried out through the school programmes of the CEA, in co-operation with the Ministry of Education. Children are easier to educate than adults are, therefore it is hoped to educate the parents through their children. However, the public in general will also be targeted by a media campaign. NGO's will also be involved. An advertisement is already appearing in the major newspapers, to reduce the use of carrier bags and to promote re-use.

Sorting of waste will be mostly done at the household-level, using colour-coded bags for the various material types. There is currently a successful pilot project running with such a system. Large colour-coded baskets will also be placed at central points, like petrol stations, supermarkets, etc. Such barrels and baskets are already in place in the offices of the Ministry and the CEA. All packaging should receive a colour-mark or symbol, to ease separation. There are no plans to impose return fees on plastic (PET) bottles.

Currently the provinces are being visited, and the plans are being discussed with various local and regional authorities. The latter will have to submit detailed time-bound plans for local implementation of the strategy.

Sharing resources (e.g. dumpsites) among authorities at a regional level will somewhat cut down the costs. To increase work efficiency, more of the waste management should be privatised. Some funds can be recovered by prevention (saving money on health care, cleaning, etc), recycling and re-use, and by selling compost barrels (Rs. 250 for taxpayers, Rs. 500 for others). Some additional funds will come from EA1P. Other sponsors are still being sought. Local authorities will also have to find new ways to use their existing resources more efficiently.

In co-operation with the relevant ministry, tax measures will be introduced to promote recycling (e.g. tax relief for recycling equipment) and to cut down use of certain materials and promote use of others.

Producers of packaging materials shall have to be made aware and regulated. More use should be made of biodegradable plastics. Currently these are more expensive than normal plastics, so policy should be made to make their use more attractive. Production and use of better quality carrier bags should be promoted, so that they can be re-used. This can be done through tax measures and quality standards.

A number of measures have already been proposed to cut down the use of plastics. A Cabinet paper on mitigation of the use of plastics is currently awaiting approval. Proposed measures include banning plastic decorations for election campaigns.

For disposal, central (regional) semi-engineered landfill-sites will be established, for which an EIA first has to be carried out. Biogas is also a good (and cheap) disposal option for many types of waste. Hazardous waste should be collected and disposed of separately.

Solid Waste Buyers

We have visited some small-scale enterprises that buy and sell waste materials, mostly glass bottles, metal parts, empty barrels and sacks and paper and cardboard.

3 August 2000

S. Raja
No. 61, Minuangoda Road, Ja-Ela

This is a very small-scale business. Two collectors mostly collect from households (glass bottles, newspapers, metal parts, barrels and sacks). Sometimes the owner picks up larger batches of these materials (e.g. from companies). Scrap metal is sold for melting (to AVM Metals in Colombo 14). Some big companies (like AVM) provide loans to these kinds of small merchants, for which the payback is in goods. Glass bottles are mostly re-used for distributing traditional medicine. Paper is sold to restaurants for wrapping food packets.

T.A. Milton Appuhamy
No. 199, Indivitya Road, Hettigama, Ja-Ela

This slightly larger business deals mostly in plastics, metal parts, paper, cardboard and barrels. The materials are supplied by solid-waste collectors and others. Barrels are often bought from other companies. Usually about 7 metric tonnes per month is obtained, but sometimes up to 15. The materials are sold through a middleman. Paper and cardboard are sold by the middleman to a big company that exports them to India for recycling. Sometimes it is also supplied to a local paper factory. Plastics are also sold for recycling. The main problem is that these small enterprises do not make enough money to buy much garbage. The big companies that export or process the materials make most of the profit.

M. Seluam
No. 15 A, Minuangoda Road, Kanuwana, Ja-Ela

This business only buys scrap metal and barrels from larger companies, mostly in the Free Trade Zone and Colombo.

Further observations

Many of the barrels that were collected by the buyers have previously been used to store chemicals. Several barrels still had their original labels, stating chemicals like Roundup (a much-used herbicide). If such barrels are sold to people for storing drinking water, this might pose a health hazard.

House-to-house Collectors

P. Lingeshraran [?]
273 Negombo Road
Thudella, Ja-Ela

He collects waste from households around Bopitiya and Seeduwa on bicycle, and sells it at a shop three times per day. He uses the money obtained from selling the waste to buy new waste. This way he can make a profit of about 100-300 Rs. per day. He can live from this work. He buys glass bottles, broken glass, metal and paper, and monthly collects about 2000 kg in total. He visits each area about once a week. He walks through the neighbourhood, talks to people and buys waste materials from them. The rates are as follows: 1 kg of paper is bought at Rs. 8 and sold at Rs. 9; a glass bottle is bought at Rs. 0.50 and sold at Rs. 1; 1 kg of scrap metal is bought at Rs. 4 and sold at Rs. 5.

Observations

Waste Collection

24 August 2000
Super Shine Service collection (1 crew), morning shift (07:45-12:15)

Present: 1 driver, 3 labourers, 1 tractor with trailer, 1 basket, 1 broom, and 1 shovel
Approximate trailer size: 3 m long, 2 m wide, 1.3 m high

Cleaning

The basic division of tasks is as follows:

1 person is mostly sweeping with the broom
1 person is mostly using the shovel
both are using the basket to transfer waste to the trailer
1 person sits in the trailer to arrange the incoming waste, but also does cleaning
all 3 labourers are wearing gloves, so they also pick up garbage by hand
the driver does driving and more or less decides where to pick up waste
he also sees to it that the place is properly cleaned (i.e. not too much waste is left behind)

Through the use of broom and shovel, a lot of sand, gravel and stones also end up in the trailer. A lot of the waste consists of leaves and plant material. The residents of the town also point out waste to be cleaned (a form of public monitoring). As a result of this, less cleaning is done when there are fewer people around.

The trailer is left at the market at night, so the labourers in the night shift can dump their waste. Waste along the roadsides is collected by handcarts at night, and dumped in several central locations along the road. The tractor crew collects this waste the following morning.

Household waste

Some households (mostly the larger houses, outside the town centre) put their garbage by the roadside in plastic bags, barrels or in small mounds. Waste is collected in bags (some re-usable), bins or barrels from many retail shops and restaurants. The handcart also visits a lot of these places (including the town hospital) in the town centre.

Houses with gardens often have a lot of plant material among their waste. The bigger materials (trunks, palm leaves) are not always collected.

Petrol stations and some small companies (machinery's, garages, painters, etc.) can produce waste containing chemical residues (oil, petrol, paint, etc.), including a lot of containers/bottles/etc. Food remains are often put in (closed) plastic bags.

The Super Shine Service is going to place barrels at places where there is known to be much waste. This will make collection more efficient.

Waste composition

We estimate that more than 50% (probably even >75%) of the weight consists of organic material (mostly plant material) and sand/gravel/stone. More than 50% of the volume seems to consist of paper and organic material (again, mostly plant material). Plastic and other non-degradable materials (excluding silicates) probably take up less than 10% of the volume and less than 1% of the weight. Unfortunately these materials are also very well fragmented and therefore hard to separate from the rest of the waste.

Recycling

During collection, some materials are sorted out and kept separate from the rest of the waste. Cardboard is kept in one corner of the trailer. Firewood and pig-feed

are also kept at the back. Cans, glass bottles and some smaller pieces of firewood are kept in separate bags.

Per day, the amounts collected by one SSS tractor crew are estimated as follows:
~15 kg of cardboard, ~10-20 cans, ~15-25 bottles, 1-2 large sacks of firewood and 5-10 small plastic bags containing suitable pig-feed. One person collects the cardboard, cans and bottles (and firewood?) and sells them at the end of the week for around Rs. 600-700. The labourers are encouraged by the manager to rear at least one pig and to collect and re-sell re-usable waste materials.

Glass is often deposited by the roadside is often separated from the rest of the garbage. The labourers do not collect broken glass for reselling, only whole bottles.

The UC-cleaners also separate certain materials from the rest of the waste. Cans, scrap metal and glass bottles are kept in a separate corner of the dumpsite. These are collected periodically and sold. They might also collect cardboard and other materials.

Dumping

Since last week, the Super Shine Service has a new dumpsite. This site is also used by the UC-cleaners. The trailer used is fitted with a hinge and hydraulic lifting-mechanism, to facilitate dumping.

Further observations

Some parts of the draining system are also cleaned, though unsystematically. A person with a handcart (using rubber boots and a shovel) does cleaning of the drains in the town centre. The drains outside of the town centre are not cleaned, and are partly filled with garbage, leaves and soil and overgrown with plants. The bottom of some of the drainage channels is not concrete, but sand, gravel and some larger stones. In some places, structures (for instance a bus-stand) are built over the drainage channel. The drain covers seem to pose some problems to the cleaners: The shop-owners along the road don't want the covers removed during the day. But it can not be done at night, as that would require large lamps etc. Also, some of the drain covers cannot be removed.

There is much asbestos (mostly in small plate-fragments) along the roadsides.
Organic waste (plant material) is often burned.

There is no return fee on PET-bottles. Many are re-used several times for storage, and then thrown away. The manufacturers do not collect PET-bottles, supposedly because it is not considered worth the trouble (i.e. no further profit will be made, as the bottles can be cheaply manufactured).

When it comes to waste, there is both an awareness problem and an attitude problem.

Everyone we spoke to said that the Super Shine Service is doing a much better job at cleaning than the UC-cleaners did. Some people reported having to pay the UC-cleaners money to get them to remove the waste in their street. The street in question used to have a big pile of garbage by the side of the road. This

has decreased markedly since the SSS took over, although they now use this location to empty their handcarts at night. Wealthy people sometimes come during the night with a car, and dump their garbage with the rest. The residents of this street do see garbage as a problem, although this is mostly due to the smell.

29 August 2000

Measurement of a UC tractor trailer near Indivitiya

The dimensions of the trailer (in meters) are as follows:
3.00 l, 1.90 w, 1.25 h.

According to the collectors, they have been told that they may dump on any site, when asked to do so by the owner.

16 September 2000

Several pigs were seen eating food remains on the garbage dumpsite along Pamunagama Road.
One of the pigs ingested a piece of plastic film used for food wrapping.

Questionnaire Solid Waste Management – Results

1. What do you usually do with your garbage?

RA1*	We throw garbage away
RA2*	We bury garbage and sometimes throw away to the marshy land
RA3*	
RB1*	We collect garbage and burn, or sometimes throw to the marshy land or bury We burn polythene and bury clothing material (waste)
RB2*	
RB3*	We collect garbage and burn
RC1*	We burn garbage, including plastic
RC2*	
RC3*	We burn garbage (waste) (organic given to animals)
UA1	We collect waste and burn together
UA2	We burn garbage (waste) (incl. organic)
UA3	Throw away garbage to the marshy land (incl. organic); afterwards we burn it
UB1	We collect waste to burn
UB2	We dispose of garbage into a hole
UB3	We bury all the waste, including plastic, under a tree

*: All rural households give most of organic waste to their own animals or to farmers; some also use it for compost

2. Do you know what happens to it after that? (Collection? Dumping / Burning? Decomposition time?) If so, how do you know?

RA1	We do not know what will happen to it after throwing away
RA2	Marshy land will get filled
RB1	-
RB3	-
RC1	-
RC3	We have no idea on what will happen to the waste after burning
UA1	No idea
UA2	We are not bothered to look into what has happened to waste after burning
UA3	-
UB1	-
UB2	We have no idea what will happen to the waste after disposal
UB3	-

3. Do you recycle (re-use) things yourself? If so, which things, and for which purpose?

RA1	We do not recycle things
RA2	We do not recycle things; we burn plastic items
RB1	Sometimes make pillow covers out of clothing material pieces without throwing to dustbin
RB3	Do not recycle things
RC1	Do not recycle
RC3	We do not recycle anything, but we do use dried tree leaves in potted plants
UA1	Do not recycle things; sometimes use throwaway cloth pieces to make dusters
UA2	We do not recycle anything
UA3	Make compost out of organic waste, by throwing it in a pit in the ground
UB1	We separate glass pieces from other waste material, and we use pieces of waste cloth material to wipe things and sometimes burn.
UB2	Do not recycle
UB3	Do not recycle

4. Do other people collect things? (for recycling or otherwise)
(If so, who are these people?)

RA1 No one comes to collect other waste materials
 RA2 No one comes to collect garbage except for glass bottles and newspaper
 RB1 People, especially Tamils, come to collect pieces of glass and iron pieces
 RB3 No one comes to collect waste
 RC1 A person comes to buy bottles and newspapers; if not, we will throw it to empty land
 RC3 No one comes to collect waste
 UA1 People used to come to collect glass and newspapers
 UA2 Some people used to come to collect newspapers and bottles (glass)
 UA3 A person comes to collect glass and newspaper, about twice a week
 UB1 -
 UB2 No one comes to collect waste, but someone comes to collect newspaper and glass bottles.
 UB3 No one comes to collect waste

5. Do you think that garbage is a problem?
If so, why?

RA1 This collecting garbage is a problem for us because there is no space to store it
 RA2 Garbage is a problem for us, because there isn't a proper place to store
 RB1 We don't consider garbage as a problem because not much garbage gets collected at our place
 RB3 Garbage is not a problem
 RC1
 RC3 As we have plenty of space, this is not a problem
 UA1 Waste is a problem; it's good if there is a person to collect waste
 UA2 Garbage is a real headache, as we do not have enough space and our surroundings get dirty
 UA3 Collection of garbage is a real problem to us, as we do not have much space
 UB1 It is difficult to bury during rainy days - because of this it is a problem
 It is also difficult to burn remains of vegetables (organic waste)
 UB2 Collection of waste is a problem; no proper place to dispose
 UB3 Garbage is not a problem for us, as we have plenty of space to dispose

6. Are you aware of any health issues relating to garbage (waste)?
If so, how do you know these things?

RA1 We get sick because of garbage through mosquitoes; know from media (television)
 RA2 We know that this causes illnesses, through school education and media
 RB1 Do not have any idea on the illness caused by garbage
 RB3 Had no idea of illness caused by waste
 RC1 Have knowledge on illnesses caused by waste, through media (television)
 RC3 We know about illness caused by waste through media
 UA1 Have a knowledge on illnesses, through school education
 UA2 Have knowledge on illness caused by waste through media (television)
 UA3 We do not know anything about illnesses caused by waste
 UB1 Are aware of it through school education and media; diseases spread through flies
 UB2 Are aware of it through media television; flies spread diseases
 UB3 Are aware of it through radio

7. Do things need to change, and if so, in what way?
Who do you think needs to make these changes?

RA1 It's good if someone can collect the garbage
 RA2 There should be a change in it; if the Urban Council can do something about this it would be helpful
 RB1 Garbage is not a big problem because we have space to throw garbage because there are not much houses around our home
 RB3 It's good if someone can come and collect waste, but this is not happening
 RC1 It is good if someone can collect garbage (waste), either the provincial council or any other person or institution
 RC3 No problem
 UA1 There should be a change in it; then it will be clean

UA2	It's good if people can organise in a programme like this
UA3	The Government should take steps in this regard
UB1	It would be good if there was a proper way to dispose of garbage The community & Government officials should take initiative in a process like this
UB2	It is good if someone can collect waste The government officials should take the lead
UB3	It is good if some other institute can start collection of waste Government institutes

8. What do you think you (or your community) can do about it?
(And what would be the main obstacles?)

RA1	We can assist by collecting garbage properly, and anybody will support this idea because it is very convenient for us
RA2	We all can help to carry out a programme by collecting garbage (waste) and this will make our surrounding clean; some people who have space to store waste will not follow this procedure
RB1	-
RB3	If there is a big bucket to collect waste, then people will collect waste in it
RC1	I think that community participation is most appreciated in these tasks; there should be public interest
RC3	-
UA1	People should take leadership, we will give our support by collecting waste
UA2	Can not say anything about it; it is good if people can take the initiative
UA3	People will participate if there is a programme to collect waste, but sometimes this will be difficult because some people will not collect garbage as instructed
UB1	-
UB2	The female members of each home should follow a proper method of collection of waste
UB3	People (the community) should keep the surroundings clean. If there is proper collection of garbage then everybody would follow the rules and collect waste.

Appendix VI

Appendix VI Results of Collection and Analysis

- Weight measurements from households
- Volume measurements from households
- Composition of the plastic fraction (households)
- Composition of the paper fraction (households)
- Measurements from shops & restaurants

- Graph of average household waste composition (by weight)
- Graphs of household collection results

Appendix VI - Results of Collection and Analysis

Waste Collection from Households

Start	1	20000815 morning															
Note: wt.pp = weight per day, wt.pp.pp = weight per person per day																	
Round 1	1->2	20000818 morning				3 days				8 rural hh		6 urban hh					
Household	Persons	wt.pp	wt.pp.pp	Weight	Plastic (g)	Paper (g)	Organic (g)	Other	Sorting	sum weight	diff.	Max. diff	Plastic %	Paper %	Organic %	Other %	Total %
RA1	4																
RA2	8	242	30	725	240	50	0	400	good	690			15%	10%	0%	75%	100%
RA3	5	210	42	630	150	180	250	0	p/p mixed	630			22%	18%	0%	57%	97%
RB1	5	67	13	200	80	50	0	80	weird	210			45%	23%	0%	36%	105%
RB2	4	420	105	1260	120	0	1150	0	good	1270							
RB3	9	130	14	390	60	310	0	0	p/p mixed	370							
RC1	5	733	147	2200	550	395	0	1100	big/small	2045							
RC2	4	50	13	150	40	105	0	20		165							
RC3	5	187	37	560	100	125	0	310	good	535							
Total R				6100	1400	1175	1600	1925									
UA1	3	125	42	375	50	120	200	0	none	370							
UA2	4	33	8	100	0	100	0	0		100							
UA3	5	577	115	1730	50	90	790	800	use/area	1730							
UB1	7	93	13	280	90	140	0	50	good	280							
UB2	5	192	38	575	180	80	325	0	use/area	585							
UB3	5	108	22	325	175	150	0	0	good	325							
Total U				3390	530	650	1360	850									
Total R+U	Total				Organic	Other	Metal	Glass	Stone								
	9490			1930	2960	2775	180	1800	320								
	100%			19%	31%	29%	2%	19%	3%								
Round 2	2->3	20000821 morning				3 days				6 rural hh		6 urban hh					
Household	Persons	wt.pp	wt.pp.pp	Weight	Plastic (g)	Paper (g)	Organic (g)	Other	Sorting	sum weight	diff.	Max. diff	Plastic %	Paper %	Organic %	Other %	Total %
RA1	4																
RA2	8	167	21	500	75	50	0	375	good	500			0.0%	0%	0%	75%	100%
RA3	5	147	29	440	95	80	0	250	good	425			15%	18%	0%	57%	97%
RB1	5	37	7	110	50	25	0	40	p/p mixed	115			-4.5%	23%	0%	36%	105%
RB2	4																
RB3	9	87	10	260	25	50	0	175	p/p/v good	250			10%	19%	0%	67%	96%
RC1	5	168	34	505	75	140	275	40	none	530			15%	28%	54%	8%	105%
RC2	4																
RC3	5	30	6	90	55	40	0	0	good	95			61%	44%	0%	0%	106%
Total R				1800	350	370	280	800									
UA1	3	330	110	990	40	50	900	0	none	990			4%	5%	91%	0%	100%
UA2	4	37	9	110	15	60	40	0	none	115			14%	55%	36%	0%	105%
UA3	5	237	47	710	60	40	590	0	o-jags/mixed	690			8%	6%	83%	0%	97%
UB1	7	250	36	750	55	175	0	505	very good	735			7%	23%	0%	67%	98%
UB2	5	183	37	550	125	150	290	0	not much	565			23%	27%	53%	0%	103%
UB3	5	125	25	375	175	200	0	0	very good	375			47%	53%	0%	0%	100%
Total U				3425	475	675	1775	500									
Total weight R+U				Total	Plastic	Paper	Organic	Other	Metal	Glass	Stone						
				5105	750	1000	2055	1300	10	900	370						
				100%	15%	20%	40%	25%	0%	18%	7%						

Round 3 3->4

20000828 morning

7 days

rural

urban

[illegible]

Total weight R+U	Numbers:																	
	Total	Plastic	Paper	Organic	Other	Metal	Glass	Stone	Cloth	LTDG org	STDG org	PI, Bags	C Bags	O Bags	PI Pack	PI Other	PP Pack	PP News
14730	1430	2075	7910	3315	0	2620	425	210	350	185	130	750	750	250	250	750	625	
100%	10%	14%	54%	23%	0%	18%	3%	1%	2.4%	1.3%	0.9%	5.1%	5.1%	1.7%	1.7%	5.1%	4.2%	

Note: PP = Paper, PI = Plastic, LTDG = Long Term Biodegradable, STDG = Short Term Biodegradable, C = Carrier, O = Other

Round 4 4

20000831 morning

3 days

rural

urban

	Household	Persons	w/pd	w/pp/pd	Weight	Plastic (g)	Paper (g)	Organic (g)	Other	Sorting	sum weight	difff (g)	Max. diff.	Plastic %	Paper %	Organic %	Other %	Total %	Comments
RA1	4	8	57	7	170	155	15	0	0	mixed	170	-10	-3.3%	91%	9%	0%	0%	100%	
RA2																			
RA3	5	100	300	20	300	15	290	0	5	pl+pp/mix	310	-10	-5.3%	5%	97%	0%	2%	103%	
RB1	5	63	13	190	50	50	0	100	100	pap/mixed	200	-10	-10%	26%	26%	0%	53%	105%	
RB2	4	150	38	450	55	60	195	0	150	pl/pp+org	460	-10	-2.2%	12%	13%	43%	33%	102%	
RB3	9	40	4	120	20	100	0	0	0	p/p good	120	0		17%	83%	0%	100%		
RC1	5	192	38	575	100	375	120	5	none	600	-25	-4.3%	17%	65%	21%	1%	104%		
RC2	4	25	6	75	50	25	0	0	0	good	75	0		67%	33%	0%	0%	100%	
RC3*	5	17	3	50	0	50	0	0	0	good	50	0		0%	100%	0%	0%	100%	Not at home
Total R					1750	425	750	315	260										
UA1	3																		
UA2	4	105	26	315	15	150	160	0	0	org+pp	325	-10	-3.2%	5%	48%	51%	0%	103%	
UA3	5	733	147	2200	200	1010	860	135	lix /org+pp	2205	-5	-0.2%	9%	46%	39%	6%	100%		
UB1	7	72	10	215	100	115	0	0	pp/h.pl/s.pl	215	0	0.0%	47%	53%	0%	0%	100%		
UB2	5																		
UB3*																			
Total U	5	608	122	1825	110	1660	?	1660	70 net/pp+org	1840	-15	-0.8%	6%	0%	91%	4%	101%	5 Persons?	

Note: Households marked with * were left out of the final calculations

	Total	Plastic	Paper	Organic	Other	Metal	Glass	Stone	Cloth	LTDG org	STDG org	Pl. Bags	SOC nanofibers:	>40 C/Bags	O Bags	PI Pack	PI Other	PP Pack	PP News	PP Other	PP School	Pl. lam.	Pl. Other	Pl Recycl
Total wt.	6240	750	2000	2990	500	100	50	0	350	200	2790	210	180	30	350	100	265	400	1275	550	110	200	50	
	100%	12%	32%	48%	8%	2%	1%	0%	6%	3%	45%	3.4%	2.9%	0.5%	5.6%	1.5%	4.2%	6.4%	20.4%	8.8%	1.8%	3.2%	0.8%	

<u>Volume</u>		Total	Plastic	Paper	Organic	Others											
18 Aug	Unc.	168															
	Wt.	9490															
	Density	56 g/l															
	Vol/hh/day	4.0															
	Wt./hh/day	226															
21 Aug	Unc.	147	60	69	11	7	Plastic R	Paper R	Plastic U	Paper U							
	Comp.		28	20			30	30	30	39							
	Compr.		47%	29%			14	9	14	11							
	Wt.	5105	750	1000	2055	1300	47%	30%	47%	28%							
	Density	35	13	14	187	186	350	370	475	675							
	Compr. D.		27	50			12	12	16	17							
	Vol/hh/day	4.1	1.7	1.9	0.3	0.2	25	41	34	61							
	Wt./hh/day	142	21	28	57	36	10	10	13	19							
28 Aug	Total	235	71	112	42	10	Glass	Incomb.	Cloth	Pl. Bags	Pl Pack	Pl Other	PP Pack	PP News	PP Other	PP Wet	
	Unc.			14			7			28	36	7	36	54	22		
	Comp.			13%					1.7				5	7	2	2	
	Compr.												14%	13%	9%		
	Wt.	14730	1430	2075	7910	3315	2620	425	210	350	750	250	750	625	210	425	
	Density		20	19	187	332	374	425		13	21	36	21	12	10		
	Compr. D.			148					124				150	89	105	213	
	Vol/hh/day	2.4	0.7	1.1		0.1	0.1			0.3	0.4	0.1	0.4	0.6	0.2		
	Wt/hh/day	150	15	21	81	34	27	4	2	4	8	3	8	6	2		
31 Aug	Total	154	57	77	16	4	Metal	Cloth tot.	Pl. Bags	Pl Pack	Pl Other	PP Pack	PP News	PP Other			
	Unc.		14	20			1.4		22	25	7	12	28	33			
	Comp.		25%					2.3	7	6	2	4	7	9			
	Compr.			26%					32%	24%	29%	33%	25%	27%			
	Wt.	6240	750	2000	2990	500	100	350	210	350	100	265	400	1275			
	Density		13	26	187	125	71		10	14	14	22	14	39			
	Compr. D.		54	100				152	30	58	50	66	57	142			
	Vol/hh/day	4.7	1.7	2.3		0.1	0.0		0.7	0.8	0.2	0.4	0.8	1.0			
	Wt./hh/day	189	23	61	91	15	3	11	6	11	3	8	12	39			
Average	D. Uncomp	49	15	20	187	214	Cloth	Pl. Bags	Pl. Pack	Pl. Other	PP. Pack	PP. News	PP. Other				
	D. Compr.		40	99			138	11	18	25	21	13	24				
	Compressn.		38%	20%				30	58	50	108	73	123				
								37%	30%	50%	20%	18%	20%				
	Vol/hh/day	3.6	1.4	1.8	0.3	0.1											
	Percentage		38%	50%	8%	4%											
	Wt./hh/day	177	19	37	76	28											
Calc.Wt. using volume			21	35	57	30											
Calc vol% using Density			35%	51%	11%	4%											

Note: Values shown in RED were estimated indirectly from other data, and are therefore NOT based on direct measurements!
They are for indicative use only, and have not been used in calculating other values...

Plastic Composition

	Plastic	Bags/Foil	C Bags	O Bags	Packaging	Others	Laminates	Various	Recyclable
Total wt.	1430	350	185	130	750	250	175	275	300
	750	210	180	30	350	100	110	200	50
Total vol.	71	28			36	7			
	57	22			25	7			
Compr. Vol.	14	7			6	2			
Amount		~100	>41	50					
		>62	>40	22					
Contribution wt.		24%	13%	9%	52%	17%	12%	19%	21%
		28%	24%	4%	47%	13%	15%	27%	7%
Average		26%	18%	7%	50%	15%	13%	23%	14%
Subgroup		100%	53%	37%	100%		23%	37%	40%
		100%	86%	14%	100%		31%	57%	14%
Average			69%	26%			27%	47%	27%
Contribution vol.		39%			51%	10%			
		39%			44%	12%			
Average		39%			47%	11%			
Contr. Compr. Vol.		50%			43%	14%			
Compression	22%	28%			20%	29%			

Paper Composition

	Paper	Packaging	Newspaper	Others	*Wet/Scho	Subtotal
Total wt.	2075	750	625	210	425	1585
	2000	265	400	725	550	1390
Total vol.	112	36	54	22		112
	77	12	28	33		73
Compr. Vol.	14	5	7	2		14
	20	4	7	9		20
Contribution wt.		47%	39%	13%		
		19%	29%	52%		
Average		33%	34%	33%		
Contribution vol.		32%	48%	20%		
		16%	38%	45%		
Average		24%	43%	32%		
Contr. Compr. Vol.		36%	50%	14%		
		20%	35%	45%		
Average		28%	43%	30%		
Compression	13%	14%	13%	9%		
	26%	33%	25%	27%		
Average	19%	24%	19%	18%		

*: Not counted in final composition

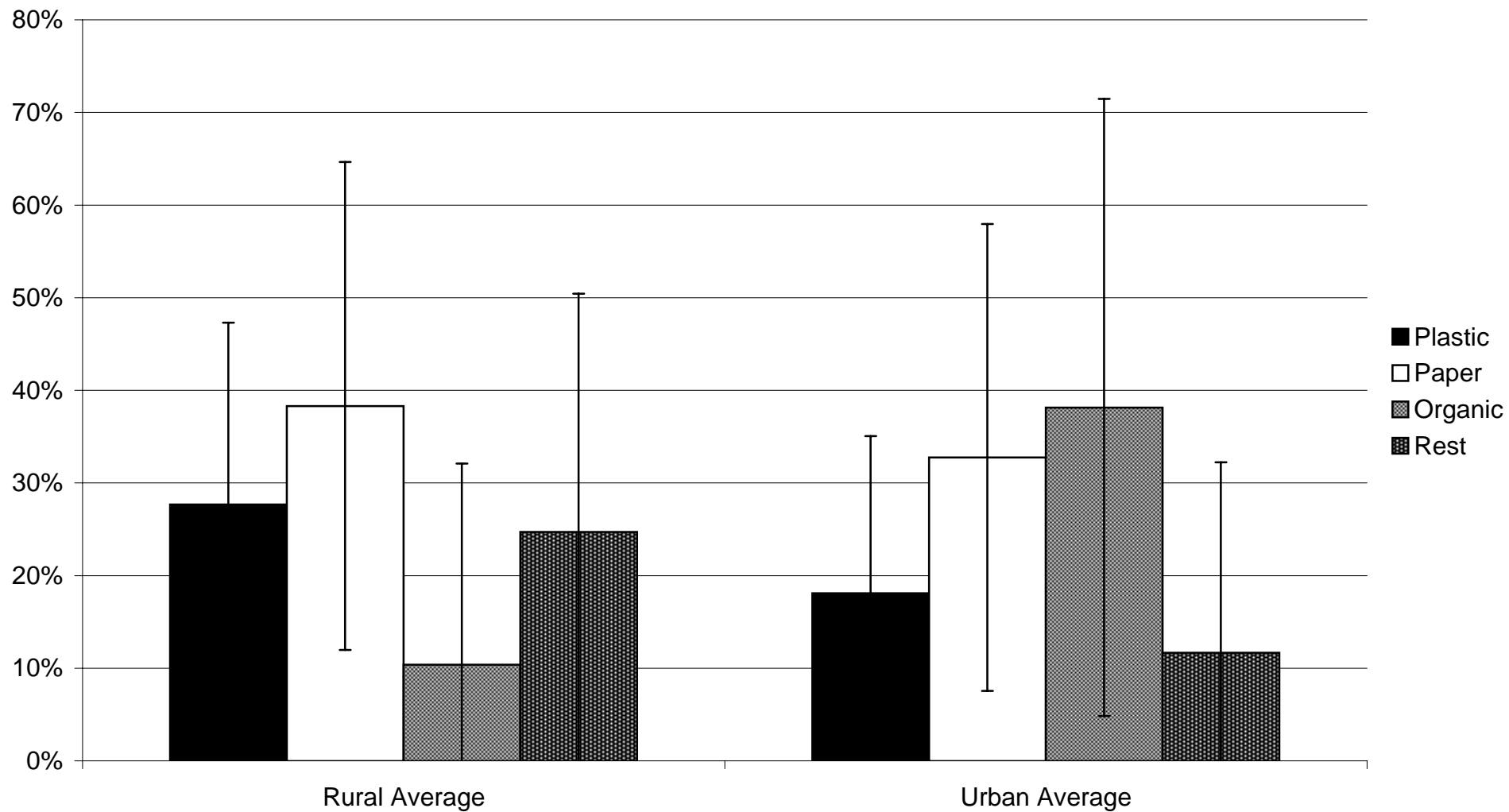
Retail Shops & Restaurants

20000912	Days	Total	Plastic	Paper	Organic	Metal	Others	Sum total	Comments
Blue Island	2-3		360	640				1000	2-3 Days plastic, 2 days paper
			14 l (Uncompressed)		26 g/l				
			3 l (Compressed)		120 g/l ---->		21% Vol. compression		
Lakmani Hotel	0.5	660	130	300	200	60		690	
Tissara Grocery	1	180	80	100				180	
Maneesha Grocery	1	400	110	150	(= others)	(=others)	150	410	
20000913									
Blue Island	1/~7	750	90	170		490		750	1 Day plastic + paper, ~1 week metal
						110 g (of which)	alu. Beer cans		Total wt. includes rice bag
20000914									
Lakmani Hotel	0.5	290	50	140		<25		215	Collected at 12:00, before lunch!
Tissara Grocery	1	310	125	200				325	
Blue Island	1	1900	250 (dirty)	175	1505	1125 g (of which) mixed kitchen waste, incl. some paper		1930	Incl. from Poya-evening
					230 g eggshells				
					150 g straw				
20000915									
Tissara Grocery	1	185	75	100	25	<10		200	
Maneesha Grocery	1	625	125	190	150	90	50	605	metal all bottle caps

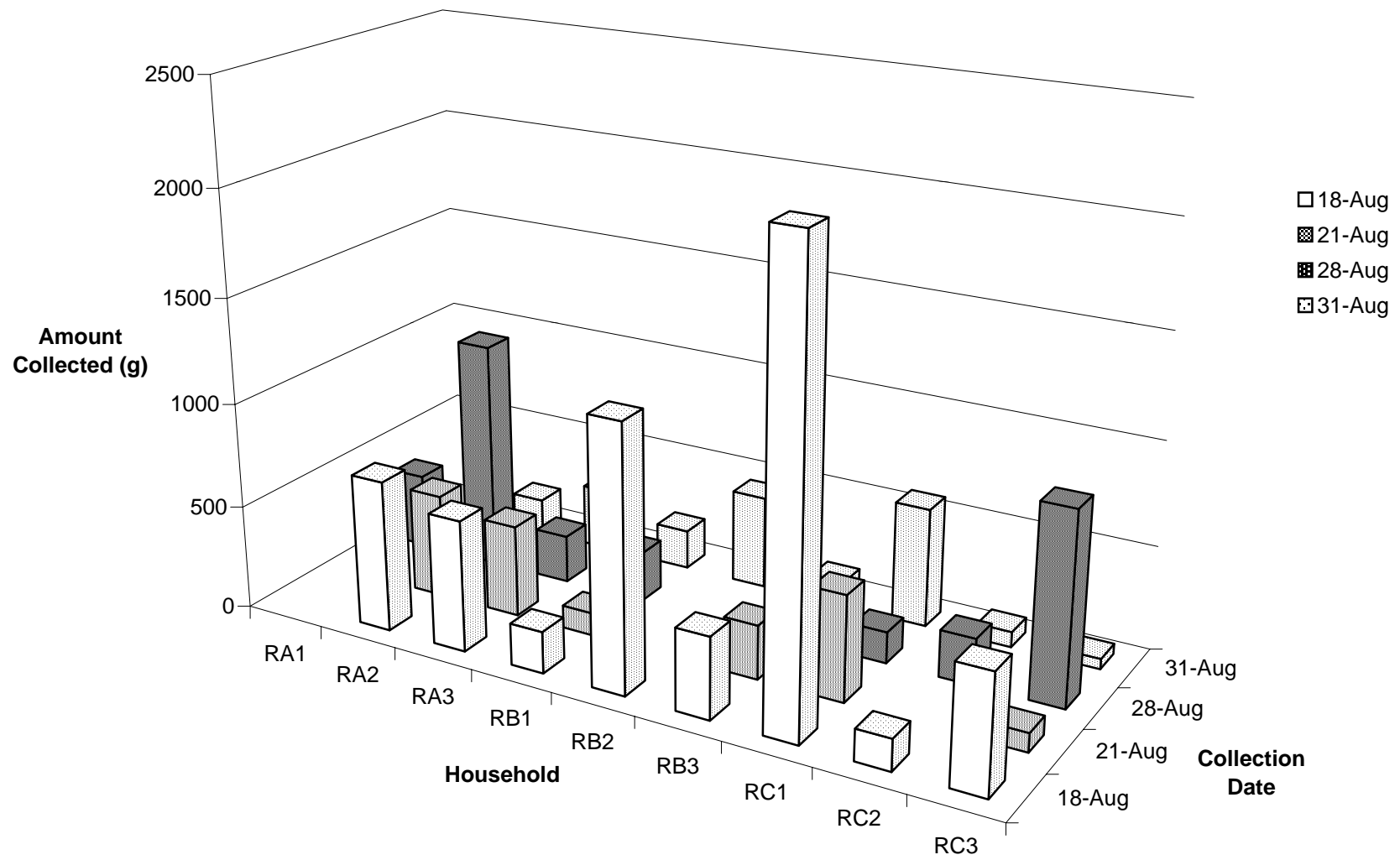
Tissara Grocery ~300 customers/day
Maneesha Grocery ~200 customers/day

Approx. totals per day		Total	Plastic	Paper	Organic	Metal	Others	Sum total	
Blue Island	20000912		144	320				464	
	20000913		90	170		70		330	
	20000914	1900	250	175	1505			1930	
	Average		161	222	1505	70		908	
Lakmani Hotel	20000912	1320	260	600	400	120		1380	
	20000914	580	100	280		50		430	<- Collected before lunch, so not usable
Tissara Grocery	20000912	180	80	100	0	0	0	180	
	20000914	310	125	200	0	0	0	325	
	20000915	185	75	100	25	<10	0	205	
	Average	225	93	133	8	2	0	237	
Maneesha Grocery	20000912	400	110	150 (= others)	(=others)		150	410	
	20000915	625	125	190	150	90	50	605	
	Average	513	118	170	100	70	50	508	
Grocery average		340	103	148					

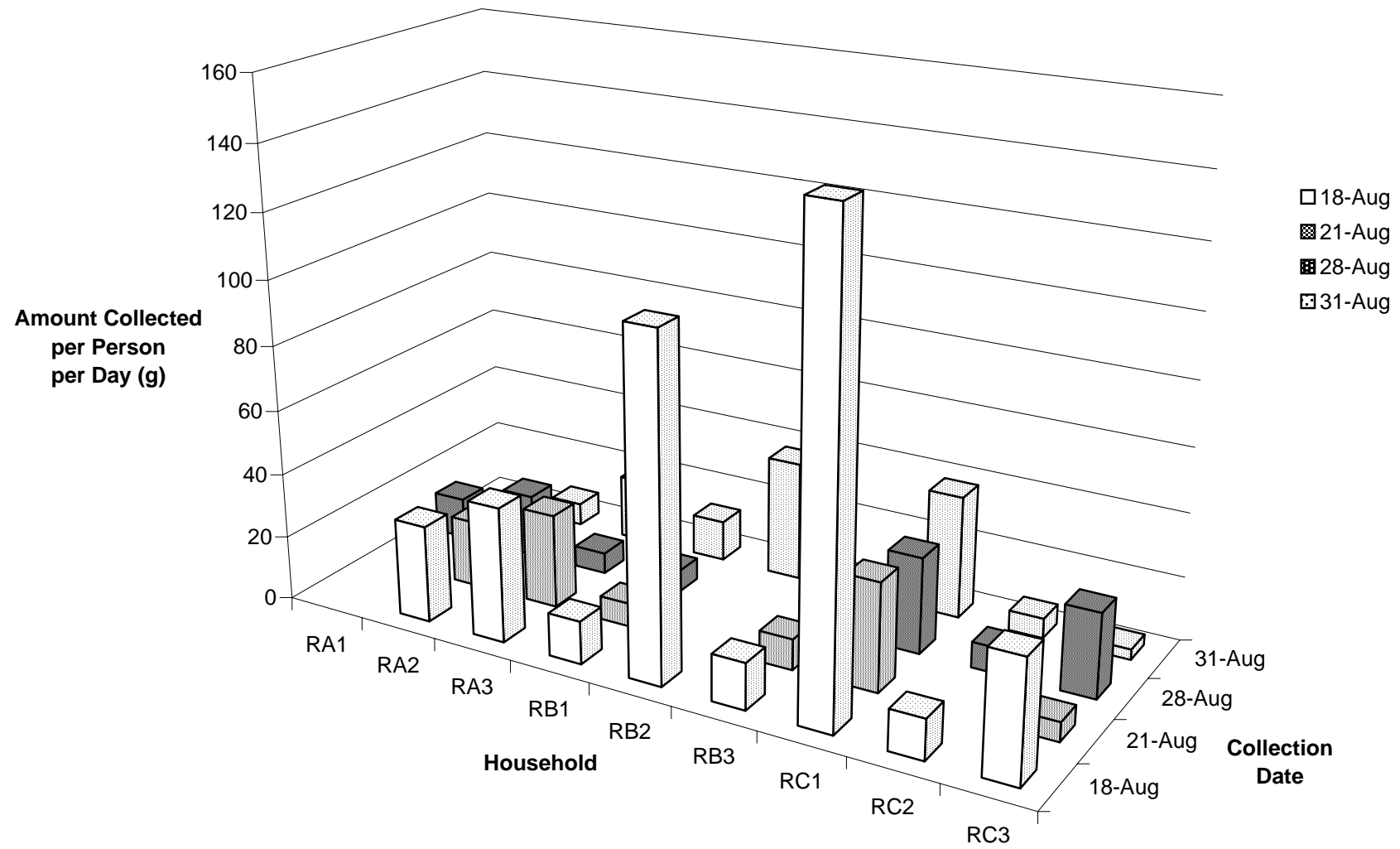
Average Household Waste Composition (by weight)



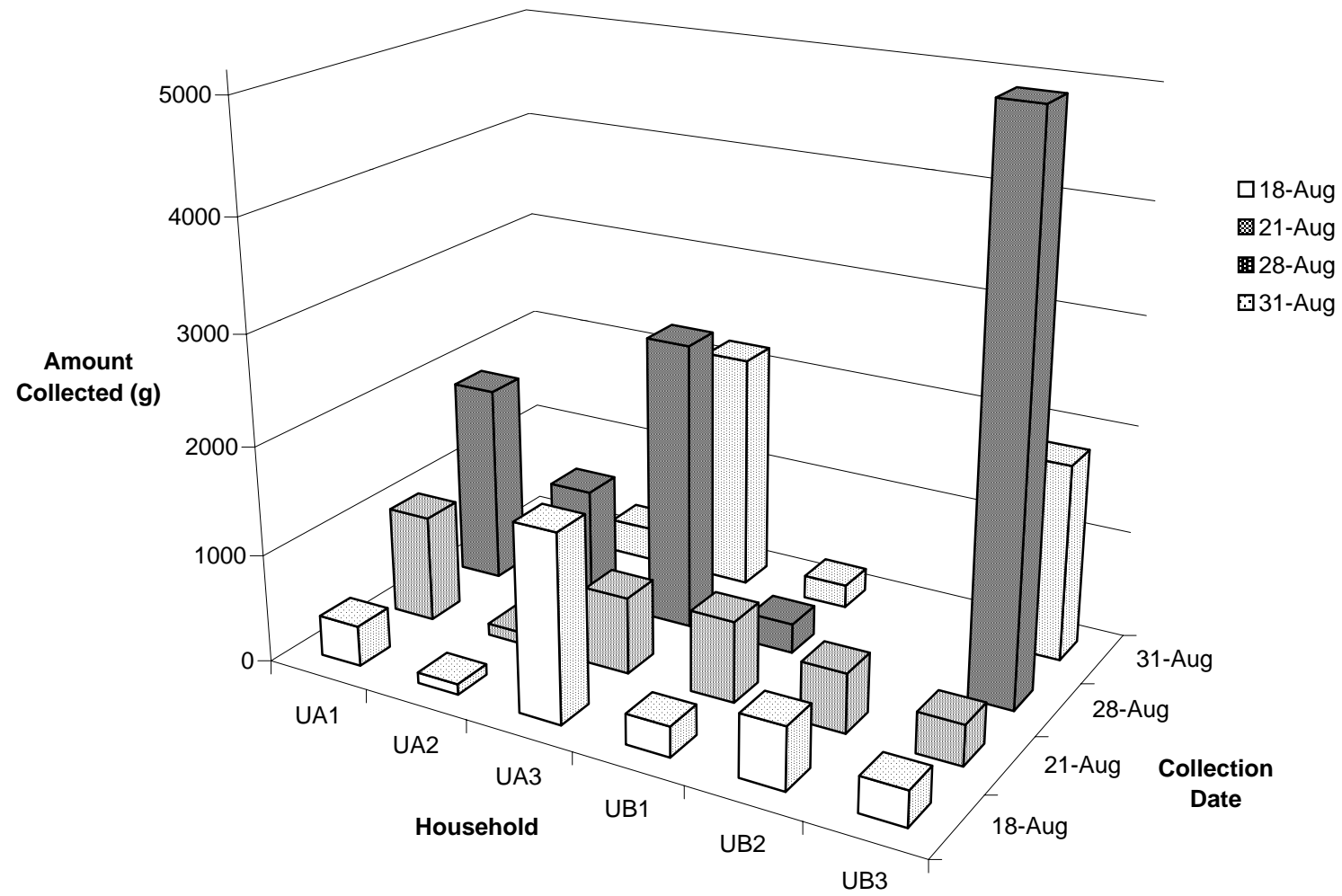
Rural Household Collection



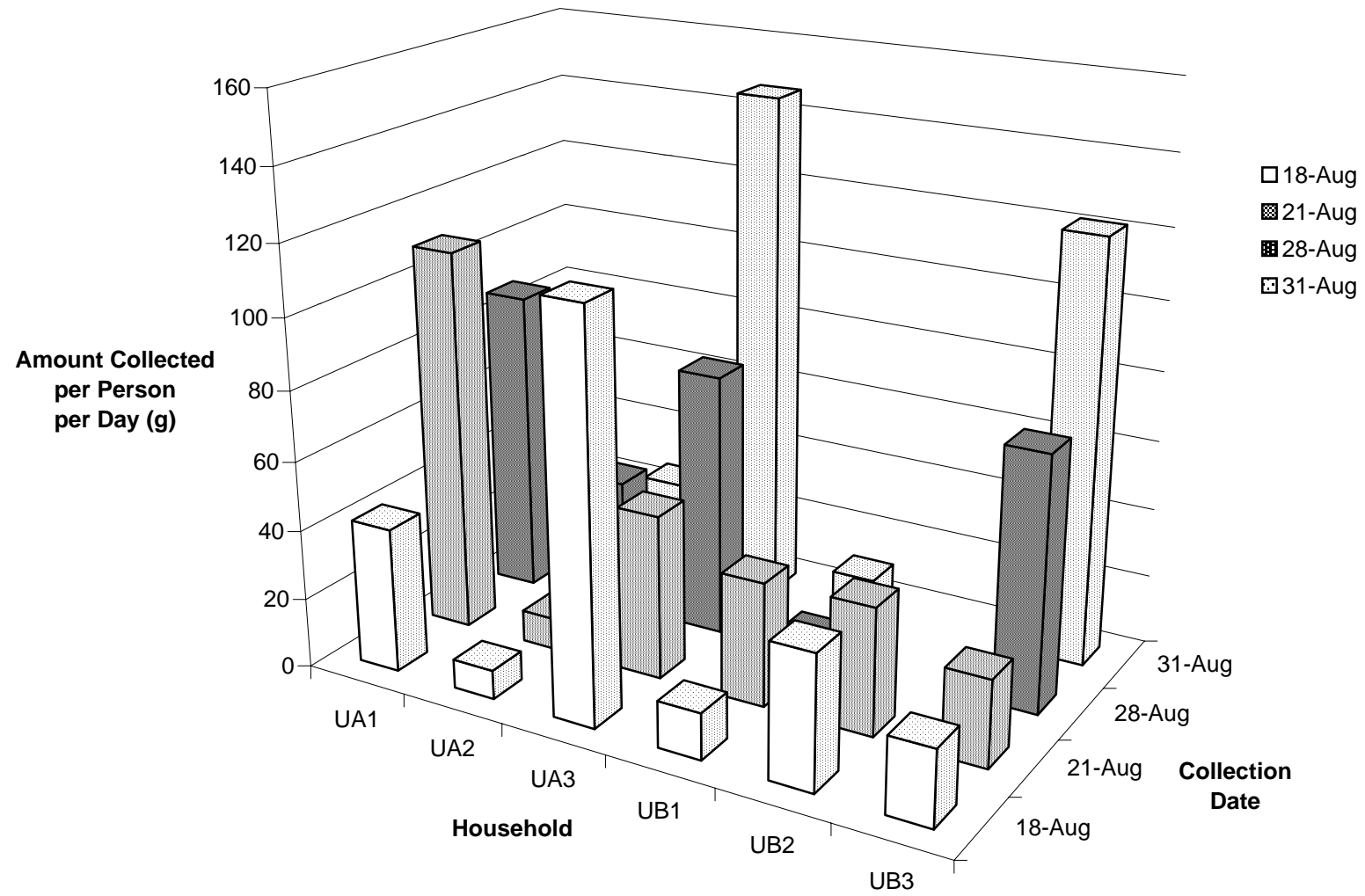
Rural Household Collection (corrected figures)



Urban Household Collection



Urban Household Collection (corrected figures)



Appendix VII – The Marsh Visitor Centre

In the course of that last few months I have noticed several shortcomings in the management of garbage at The Marsh, Muthurajawela Visitor Centre, as well as some possibilities for improvement.

The shortcomings are as follows:

- Waste (mostly gardening-waste, along with some plastic and paper) is still being dumped and burned at the waterside, between the IRMP field-office building and the Fisherman's Village. Not only does this look untidy and is it a bad example to the visitors, but because of the wind a lot of plastic (e.g. plastic bags) and paper ends up into the water and the vegetation beyond.
- The compost barrels are not being used and maintained properly. The content of the barrels is much too dry and generally has a very high C/N ratio, so that the decomposition rate is way too low.
- Most of the gardening waste (like grass clippings, leaves, branches, etc.) is burned. This is rather pointless, as it only contributes to air pollution, while plenty other alternatives are available. It also sets a bad example.
- Plastic film is often used in the restaurant to cover the plates, so that they are kept clean. This constitutes an unnecessary use of plastic.

If an eco-tourism (community) visitor centre can't manage its waste properly, then why should the general public? A visitor centre such as The Marsh can and *should* play an exemplary role when it comes to things like proper waste disposal. The day-to-day waste management of the Centre is in fact a conservation measure. If done properly, it can be integrated into its educational function. At the Centre people can see in practice what measures they themselves can take to reduce the garbage problem.

Therefore, I would like to make the following recommendations:

- The restaurant produces a large amount of plastic (PET*) mineral-water bottles, which are currently discarded. These bottles are very easy to collect and recycle. There should be several companies that are able to recycle PET waste, one of which is *Eswaran Brothers (Pvt.) Ltd.* Bottles could either be collected and sold to the recycling company directly, or through a re-seller of waste materials. The latter might be preferable to prevent having to organise transport for the bottles to the recycler. Such a bottle recycling activity as proposed here might even be expanded to include collection of PET bottles from tourist establishments in Negombo. See the report for details.
- Gardening waste should not be burned. It should either be cut up or composted in the compost barrels, or put in a (compost) heap, for instance somewhere in the banana plantation.

* Polyethylene terephthalate

- The compost barrels should be used and maintained correctly. The added material should be half "green" and half "dry", and some moisture might have to be added periodically. As there are two compost barrels, one can be filled while the content of the other one is left to decompose for several weeks. In this case, the content of the latter barrel will have to be "turned" regularly.

The General Aids will have to be instructed on proper maintenance of compost barrels. See *paragraph 1.7* for more details. They also must be instructed not to dump and burn waste by the waterside, but to move it to the pit in the banana plantation instead.

- If a pilot-project is set up for community based collection and recycling of household waste in the Muthurajawela area, the Visitor Centre needs to be included in the system. This will increase the visibility and exemplary function of such a project, and at the same time provides an alternative to the current dumping and burning of the garbage from The Marsh. Additionally, the direct link with IRMP may enable early identification of possible problems with the collection system.
- A poster on solid waste management could be included in the exhibition of The Marsh.