

## **Problems and constraints in solid wastes disposal and management in the Matara municipal area**

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### **Abstract**

The focus of this research is, to identify the problems and constraints in Solid Wastes disposal and management in the Matara Municipal area and to make suggestions and recommendations to overcome them. Domestic and industrial solid waste has become a rapidly emerging problem in many cities and towns in Sri Lanka. Increasing quantities of solid waste impose a tremendous pressure on local authorities responsible for the disposal and management of such waste. Over the years, the amount of municipal solid waste generated in the Matara municipal area has grown steadily, due to the growing population, and specially due to the changing life styles and the increasing use of disposable materials and excessive packaging. This trend was evident from the observations made at the main dumping site situated at the heart of the Matara town, on the left bank of the Nilwala River at the vicinity of the Mahanama Samaraweera Bridge. The solid waste composition was roughly calculated and the information on the existing solid waste disposal system was obtained through interviews, questionnaire surveys and self observations made during regular visits to selected sites. Currently, the Municipal solid waste amounts to  $2.386\text{kg} \pm 0.206$  per household unit per day. The current population size of the Matara municipal area is 71134 individuals, who generate sufficient wastes to fill about 25-30 garbage tractor loads each day, averaging to a total of about 23 metric tones per day. The mean composition of the domestic waste generated by a household in Matara municipal area was found to be, 53% of short term decomposable organic matter, 15% of long term decomposable organic matter, 8% of metallic rejects, 6% of polythene and plastic materials, 6% of wooden matters, 3% of paper waste, 1% of glass and the remaining 8% made up of other materials. This investigation highlights certain important problems associated with solid waste disposal such as the disposal of solid waste generated by health-care activities, day to day problems faced by the local residents in the disposal of domestic solid waste and the financial constraints faced by the local government authority and the administrative deficiencies in the disposal mechanism.

### Introduction

Solid wastes can be broadly defined as those wastes, which have been rejected for further use and which neither can be transported by water into streams nor can readily escape into the atmosphere. They include all the discarded solid materials from municipal, agricultural and industrial activities. More specifically, solid wastes can also be defined as “Any unwanted or discarded material from residential, commercial, industrial, mining and agricultural activities that cause environmental problems. Solid wastes management comprises of purposeful and systematic control of the generation, storage, collection, transport, separation, processing, recycling, recovery, and disposal of solid wastes” (Dara, 1998). Unsystematic disposal of solid waste (garbage) could cause severe damage to the environment and a threat to human welfare. Accumulation of waste matter has been increasing haphazardly as the result of increases in population density, urbanization, industrialization and land fragmentation.

Owing to increasing industrialization and ever increasing population, the production of paper, rubber, metals plastics and ceramics has been steeply increasing over the last few decades, resulting in a steep increase in the generation of solid wastes both in the developed and developing countries. Since, the quantity of waste generated depends on the affluence of the society; the per capita waste produce in Sri Lanka is naturally lesser as compared to that produced in western countries. Further, the new products such as cans, bottles, plastic containers, tires, food packaging materials and several other items are considered to be cheaper to throw away than to reclaim. Thus with the advent of “throw away” concept in present civilized society, the generation of solid waste has been considerably increasing both in quantity as well as in complexity (Dara, 1998).

In developed societies, various methods are employed in the disposal of solid waste. A major portion goes into sanitary landfills. Environmental consciousness has led to organized programmes for recycling of the waste as much as possible. Composting too is beginning to be practiced by individual households. A part of the solid waste is incinerated.

Municipal solid waste (MSW) is a rapidly emerging and a pressing problem in many cities in Sri Lanka. Matara is one of the most popular major cities in the Southern province of Sri Lanka. Matara Municipal Area covers an area of about 1280ha (Surveyor Generals Surveying Order ref no: MTR/2000/131, Proposed map of Matara municipal area), which harbors a population of 71134 inhabitants. The current population density in the Matara town area is more than 5000 inhabitants per

one square kilometer (Provincial Planning Secretariat, 2001). Matara Municipal area is subdivided into 46 Gramasevaka divisions. Both the population density and the population growth in the Matara municipal area were relatively higher, in comparison to the other Pradesiya sabha divisions in the Matara district. Increasing quantities of solid waste, exert pressure on the local authority responsible for the collection, disposal and management of solid waste. The amount of solid waste generated in the Matara Municipal area is quite substantial at present. However due to inadequate facilities for safe disposal, the waste management has become a growing problem in the Matara city.

At present solid wastes (including domestic, commercial and industrial wastes) generated in the Matara municipal area amounts to an average of about 23 metric tones per day (Karunanayake D, 2004). The only waste disposal method now practiced in Matara is “open dumping”. If properly identified and managed, an open dumping site can be converted into a less hazardous area overtime. However with regards to the Matara municipal area, solid waste disposal has created considerable problems due to careless disposal practices.

The objectives of the current study are, to describe and investigate the various aspects of solid waste disposal and its management in the Matara municipal area, including constraints and problems, with a view to suggest alternatives and recommendations to overcome them.

### Methodology

Field studies were conducted over a period of 4 months (March - June) in 2004. To get more insight into the working plan and the organization of solid waste disposal and management procedure in the Matara municipal area, several interviews were conducted with the Chief Public Health Inspector (C.P.H.I) of the Matara Municipal Council, the cleaning parties and the local residents. The investigator was accompanied by some groups of town cleaners on their morning shift, to gain familiarity with their methods and to understand the composition and amounts of wastes collected. To study the domestic waste composition and the amount of waste material to be disposed from the households on a daily basis, 65 households were selected randomly from 06 sites in Matara municipal area (figure 01) and their daily production of solid waste material was examined and weighed. The number of households to be included in the survey from each site was decided according to the population density in each site. The households from each site were selected randomly using a table of random numbers. The main dumping site in the Matara

town was visited and other illegal minor dumping sites found around the streets spread throughout the municipal area were also visited on a number of occasions during the study period. Detailed observations were made during these visits.

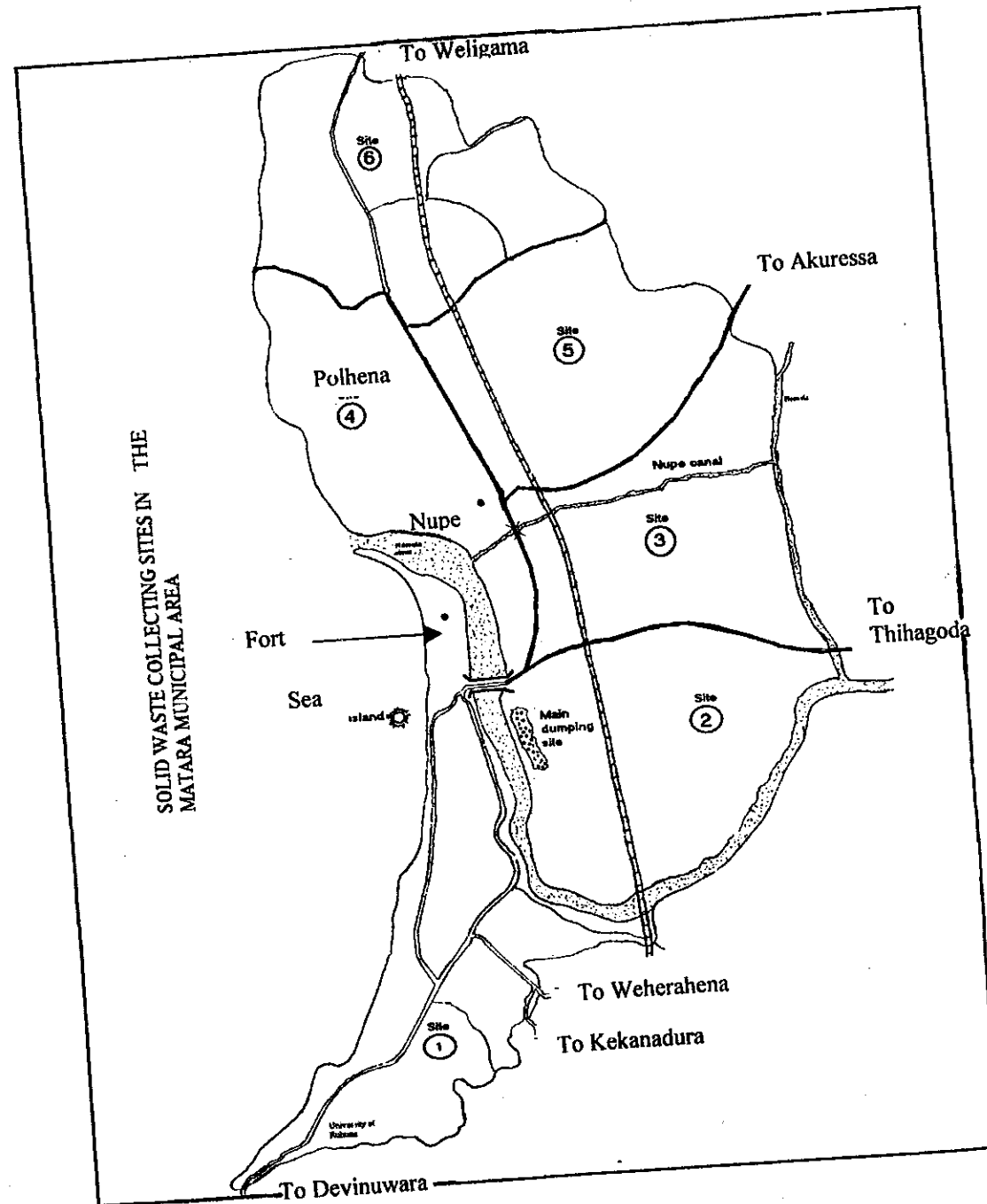


Figure 01 - Six sites selected within the Matara municipal area for the survey

### Results and Discussion

The current investigation into the solid waste disposal and management problems in the Matara municipal area, highlighted a number of serious problems such as the disposal of solid waste generated by health-care activities, day to day problems faced by the local residents in the disposal of domestic solid waste and the financial constraints faced by the local government authority and the administrative deficiencies in the disposal mechanism. Unsystematic waste dumping on to the main waste dumping yard was also noted. The lack of facilities and equipments to collect the wastes, hygienic problems faced by the residents and serious environmental consequences (pollution) were recognized as major constraints.

#### A. Waste production

Over the years, the amount of municipal solid waste generated in the Matara municipal area has grown steadily, because of the growing population, and specially because of the changing life styles and the increasing use of disposable materials and excessive packaging. This was evident from the observations made at the main dumping site of the Matara town. At present the solid waste production in the Matara town amounts to  $2.386\text{kg} \pm 0.206$  per housing unit per day. The current population of 71134 inhabitants in the Matara municipal area fill about 25 - 30 garbage tractor loads each day, amounting to about 23 metric tones of waste per day. The average domestic waste composition of a household is shown in figure 02.

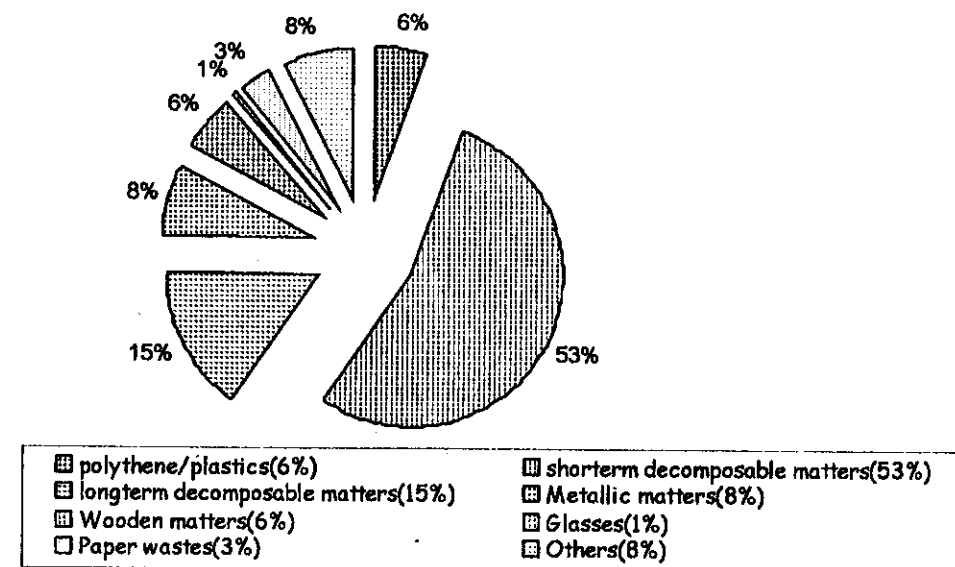


Figure 02 - The percentage composition (by weight) of domestic solid waste in the Matara Municipal area during 2004.

Plastic and paper fractions accounted for the largest volume of household waste, which can be compressed significantly to reduce the volume. By total weight, the organic fraction made a relatively large contribution to the total weight of the solid waste, due to the high density and water content inherent in organic waste. Packaging materials along accounted for more than 50% of the plastic and paper fractions, both by weight and by volume.

In addition, the average domestic waste composition varied with the occupation (income level) of the members of households. Highest percentages of most waste categories were produced by those engaged in the private sector while, the highest percentage of plastic / polythene were produced by those who were working in the public sector and the other occupations. Most of other waste categories did not significantly vary with the occupation. The survey results are shown in the figure 03.

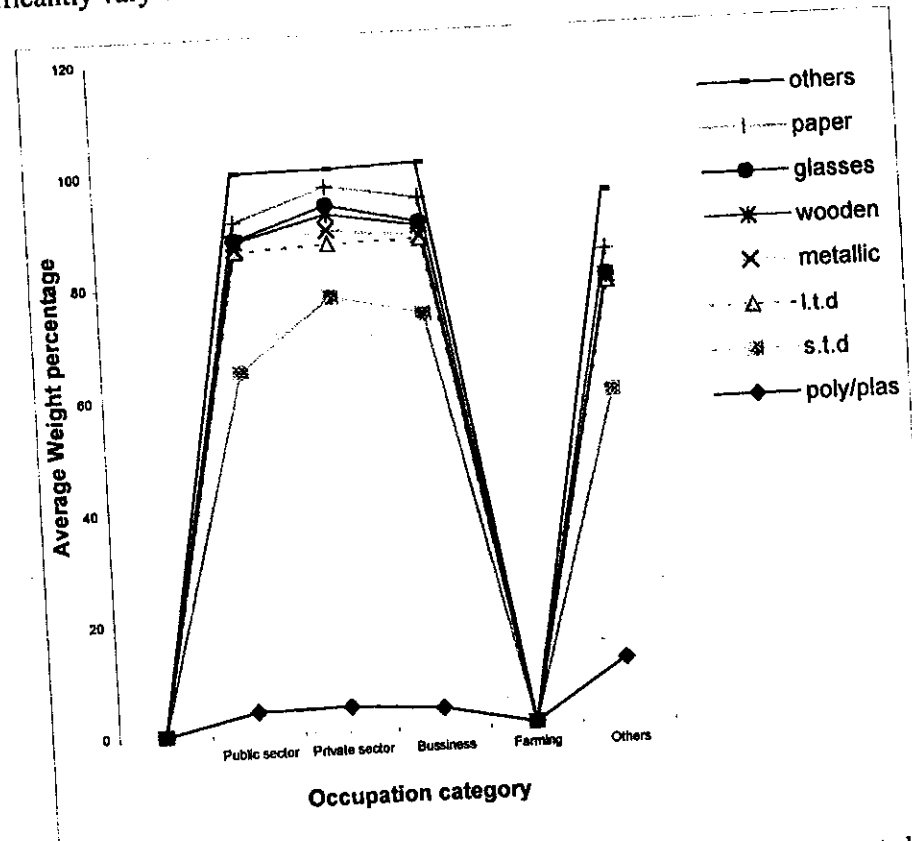


Figure 03 - Percentage weight of different types of domestic waste generated by the households in the Matara municipal area by occupational category - 2004

Restaurants and Hotels produced a large amount of food and kitchen remains, which were usually collected by local pig farmers, who used it as animal feed. Retail shops

produced mostly packaging waste materials. The average amount of waste generated per day by a household increased with the number of family members. (Figure 04)

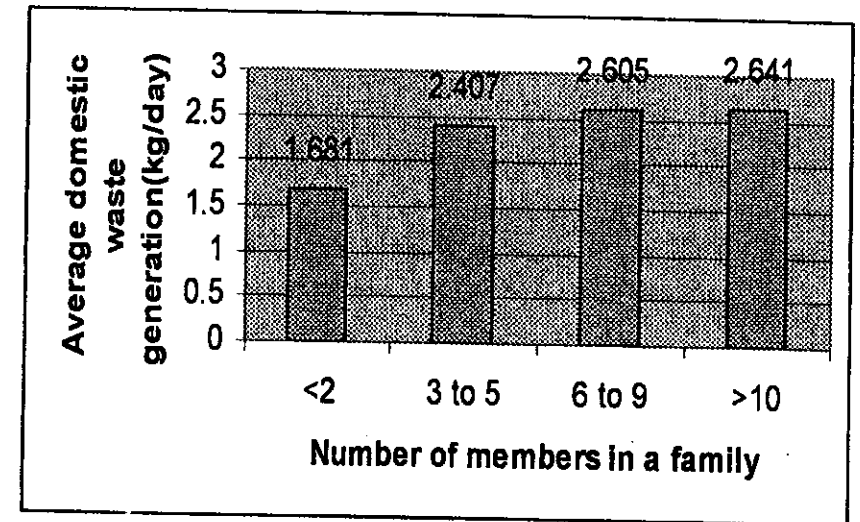
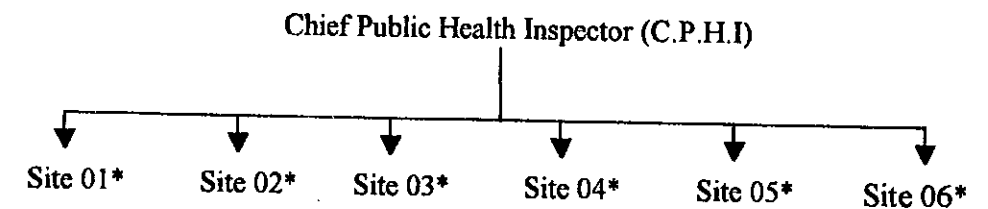


Figure 04 - Relationship between the size of the family unit and domestic waste generation in the Matara municipal area 2004

### B. Waste collection

The Matara Municipal Council is responsible for the collection and disposal of solid waste in the municipal area. They have developed a working plan to carry out the regular waste collection and disposal. The man power distribution for solid waste collection and disposal in the Matara municipal area can be depicted as follows,



- \* Composition of the team assigned to each site
- ❖ 1 Public Health Inspector (P.H.I)
- ❖ 1 Officer in charge
- ❖ 3 Labourers on an average (number can vary)

Figure 05 - Total work force (strength) assigned for the collection of solid waste within the Matara municipal area in 2004

For the purpose of cleaning the city, the entire area is divided administratively into 06 sections (figure 01). Each labourer is assigned to a specific route (section) and is

expected to sweep the road and collect waste dumped on the roadside in small heaps. Labourers deposit waste collections/road sweepings at a vacant land in the vicinity or by the road sides. The tractor trailer takes few hours to collect those waste deposits and to transport them to the main disposal yard which is situated close to the Nilwala River.

Information on the human resources engaged and the physical resources used in the waste collection of the Matara Municipal Council in the year 2004 are presented in table 01 and 02.

### Human Resources

Employees engaged in waste collection fall into different categories such as supervisors, road cleaners, drivers, vehicle assistants and labourers, who consist of 121 permanent and 96 casual workers (Table 01).

Table 01 - Distribution of employees engaged in solid waste collection and disposal by status; Matara municipal council - 2004

Supervisors		Road cleaners		Garbage disposal drivers	
Permanents	Casual	Permanents	Casual	Permanents	Casual
5	2	110	88	6	6

### Physical Resources

All physical resources (vehicles and equipments) used for garbage collection belonged to the Matara municipal council. The total number of such vehicles and equipment is 34. The main vehicles used for this purpose are, four wheel tractors, and hand carts. However, the presently available human and physical resources are not adequate to carryout the required tasks properly.

Table 02 - Number of vehicles and equipments used for solid waste collection and disposal - 2004 (Data obtained from the Matara municipal council).

Type of resource	Amount
Compact truck	01 (Not presently available)
Excretory transport browser	01
Four wheel tractors	08
Hand pushed carts	25

Frequent cleaning and collection of roadside waste is mostly restricted to the main roads and the town area. Cleaning of the roadside drains is also included in the duty lists of the municipal council, but poorly attended at present. The cleaners proceed

along their daily casual routes, sweeping and shoveling up roadside litter and garbage and throw them into a tractor trailer or handcart.

There seems to be an increasing tendency, especially among shop owners, small scale industries and high income householders on the residential area, to use garbage bags or bins instead of just dumping the garbage along the roadside. Centrally placed garbage barrels and containers, provided by the municipal council, were also effective, although many barrels were been frequently stolen. Plant materials make up a very large portion of the collected municipal waste. Municipal council has a good working plan for collection and disposal of solid waste, but it was not currently implemented effectively, due to the following reasons.

- The Public Health Inspectors (P.H.I.s) in each site neglecting their responsibilities (inadequate attendance)
- Inadequate facilities (Gloves, Rubber boots, Masks, etc.) for waste collectors and other workers. (commitment to duty not satisfactory)
- Inadequate physical and mechanical resources for waste collection and disposal
- Poor institutional relations between municipal council and other institutions such as hospitals and small scale industries.

The Municipal council pays less attention in the collection of waste from the hospitals. There is no proper treatment for the waste generated from the health-care activities prior to its disposal. Although an incinerator is available at the Matara General Hospital, it is not used for the treatment of these wastes. There are no safety guidelines assigned for the workers who are handling hospital waste and they are exposed to health-care activity wastes without any safety measures. Most of the households within the Matara Municipal area were not satisfied with regard to the waste collection activities and the outcome of the survey on this issue in given figure 05.

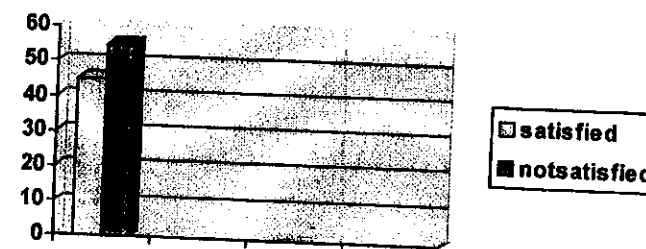


Figure 05 - People's satisfaction with regard to waste collection by the Matara municipal council - 2004

**C. Waste disposal**

Households generally dump or burn their waste materials. Dumping is usually done by throwing the waste into a Bin or into a shallow pit dug on the ground, depositing along the roadsides or on a nearby dumping site, disposed into a low lying marshland or discharged into water ways or water bodies. Dumped materials are often periodically burned or handed over to the waste collecting vehicle of the municipal council. Most of the households (45%) burned their waste immediately after the collection while others follow other means of disposal (figure 06).

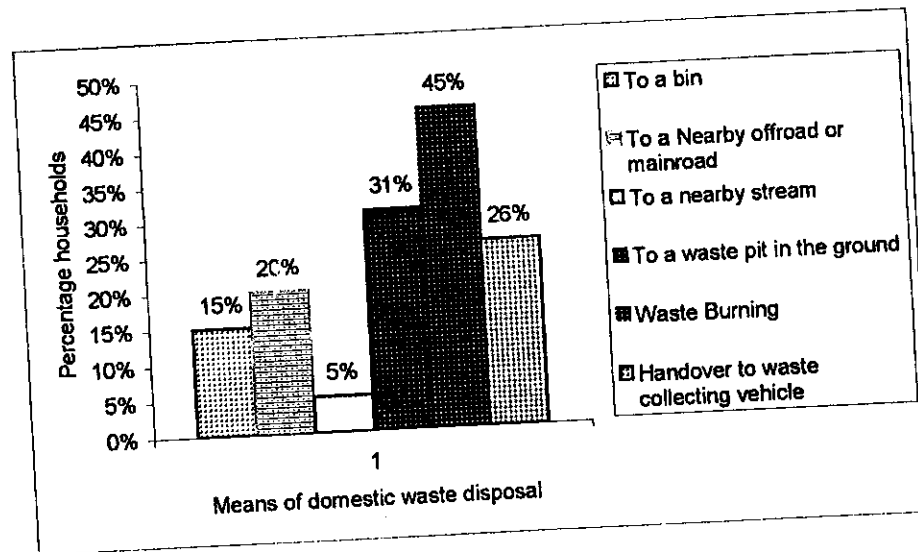


Figure 06 - Different means of domestic waste disposal by households in the Matara Municipal area as a percentage.

Local authority (Matara Municipal Council) usually dumps its collected waste on crown land located near the left bank (flood plain) of the Nilwala River. The area of the main dumping site is about 20 hectares. Generally the distance between any dumping site and any water body should be 500m or more. But in Matara, the dumping site opens directly to the Nilwala River. The distance from the key places to the main garbage disposal yard of the Matara municipal is shown in table 03.

Table 03 - Distance to the garbage disposal yard in the Matara Municipal Area

Residence area (km)	Schools and Hospitals (km)	Shops and shopping complex (km)	Rivers and reservoirs (km)
0.1	0.5	0.15	0.002

Source-An analysis on garbage disposal in the southern province 2001

Finding alternative sites suitable for garbage disposal is difficult, and the current site is therefore often over-used. Officially or as a regular practice waste is not burned by the authority after dumping, although it is frequently done by unidentified sources. Uncontrolled dumping of industrial wastes, hospital wastes, and slaughter house waste poses a serious and potential health risk.

The prevailing method of disposal of solid waste in Sri Lanka is open dumping. Matara city is not an exception with respect to this issue. The main open dumping site of the Matara city is not engineered to minimize or control the pollutants released from the decomposition process of the waste. In the absence of a secure disposal facility, hazardous industrial waste and hospital waste are generally stored on site, without adequate management.

Due to the unavailability of a clinical waste (hospital waste) disposal system segregated at source, this waste is mixed with the non clinical waste during transport and eventually reaches the open dumps. This is a health hazard especially to those coming in contact with such waste. It could be concluded that the current disposal site of the Matara city receive all types of waste including clinical, industrial, domestic and slaughterhouse waste, etc.

With regard to the hospital waste /clinical waste, the National Environmental Act of 1988 has categorized the infectious material as Hazardous wastes. Clinical waste from hospitals consists of human tissue, sharps, pathology and laboratory wastes, pharmaceutical wastes, disposable containers for urine and body fluids, cytotoxic waste related to chemotherapy treatment, low level radioactive wastes, disposable medical materials such as contaminated aprons, gloves etc. (MoFE, 2000).

The industrial wastes consist of both hazardous and non hazardous wastes. The proper disposal of these industrial wastes is a serious problem due to non availability of adequate disposal facilities. At present, the government is in the process of establishing a Hazardous/Industrial waste disposal facility in the country (Batuwitige, 1999). In the Matara municipal area there are several industries such as paints, fiber glass and textiles and many of these industries discharge their waste into the open dumping yard closes to the Nilwala River, causing serious environmental water pollution and health problems.

Although the amount of these hazardous wastes in the Matara open dumping yard is not considered to be excessive at the moment, the facilities for its safe disposal and management are matters for serious concern. This needs more effective legislation,

law enforcement, facilities and infrastructure for the effective management of these hazardous wastes.

Other problems with garbage disposal include bad smell, prolonged exposure to noxious gasses from the burning of waste, creating breeding grounds for mosquitoes and flies, scattering of waste materials, presence of potential container habitats, ingestion of plastic bags by cows and dogs and other animals, serious water pollution due to direct contamination of waste with Nilwala River, etc, which need the urgent attention of authorities.

In addition to the above most of the households dump their waste on either sides of roads or public places, causing environmental pollution, water contamination, Stench and ugliness, unhygienic conditions and blocking of drains

#### **D. Public awareness and attitude**

The facts/results presented below might not be a true representative of the actual situation, because of the small size of the sample and non-specificity of the answers. Many people do not seem to be aware of the environmental problems caused by disposal of solid waste. Garbage is often only seen as a problem because of practical reasons. Many seem to know about health problems relating to garbage, through formal education or media. The extent and depth of this knowledge was not assessed but they seem to be inadequate. However, most of educated people in the town area pay adequate attention to domestic solid waste.

#### **E. Major impacts of solid wastes**

##### **E.1 Impacts on land**

- Reduction in flood retention areas due to the major disposal site (open disposal site) near the Nilwala River
- Reduction and pollution of the wetland habitats at the dump site. It is directly in contact with the river and most of the pollutants are dissolved in water of the Nilwala River
- Aesthetic impairment due to wind blown litter and waste left uncovered.
- Degradation of land due to leachate seepage from uncontrolled dumping with adverse effects on soil fertility and productivity of the dump site.

##### **E.2. Impacts on water resources**

- Municipal council dumps solid waste adjacent to the Nilwala River, with consequent contamination of potable water supply downstream

- Hospital-waste and slaughterhouse-waste are disposed to this site which may result in pathogenic organisms entering water giving rise to health risk to water uses.

##### **E.3. Impacts on biodiversity**

- Changes in the ecological balance of the surrounding area due to the attraction of vermin and scavenging animals, including birds.

##### **E.4. Impacts on air quality**

- Due to anaerobic decomposition of underlying waste and generation of Methane, which contribute to green house gas emissions.

##### **E.5. Impacts on health**

- Insects / Mosquito breeding in stagnant water pools on waste sites and in canals and water ways blocked with waste, resulting in the spread of diseases.
- Health hazards to workers and neighboring residents. They are exposed to health hazards primarily by coming into contact with syringes, contaminated needles, other hospital wastes, fecal matter and hazardous wastes.
- Nuisance caused to the neighborhood due to bad odor flies and constant movement of refuse transferring vehicles.

#### **Conclusion and Suggestions**

Results have shown that, a considerable number of problems and constraints have been created due to solid waste accumulation and their careless disposal. A high percentage of biodegradable waste (short term decomposable organic matter) was evident in domestic solid wastes. A composting plant can be established to reduce the quantity of wastes. The role of the Matara Municipal Council with regard to solid waste management and the maintenance and cleaning of drainage channels is often proved to be inefficient, paving the way for a number of problems and constraints. The existing resources and the management system of the local authority should be improved. With regards to this issue, measures for waste reduction at the source should be implemented through reduction of the amount plastic bags provided by shopkeepers or used by consumers and by reducing the amount of packaging waste. They should be provided with better alternatives. Since the open dumping site also creates an unhealthy atmosphere for the neighboring inhabitants, the dumping facilities should be improved through the construction of a properly engineered dumpsite. At the very least, suitable location should be selected for a new site (which

means that a suitability check has to be performed). More research is needed to inquire into the effects of the current open dumpsite near the Nilwala River in the Matara town. Some samples of groundwater and surface water in the vicinity of dumpsite should be tested and analyzed on a regular basis. Proper awareness and instruction campaigns are needed to educate people on the effects of the current solid-waste disposal practices, and on solutions for the problems. Usage instructions should be given clearly and in short, preferably using additional illustrations. They should be written in simple and unambiguous language, and should also include information on what should not be done. Finally, steps should be taken to implement the national solid waste management strategy of the government as approved by the cabinet of ministers as far back as in 1998, which had concerns on Waste avoidance / reduction, Reuse, Recycling, and Final disposal.

This strategy is not a new system, but the strategy well known as the 3R system. The Ministry of Forestry and Environment has introduced the framework for the establishment of solid waste management system at local authority level and it can be considered as a national programme (MoFE, 2000, NSSWM).

#### **Acknowledgement**

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