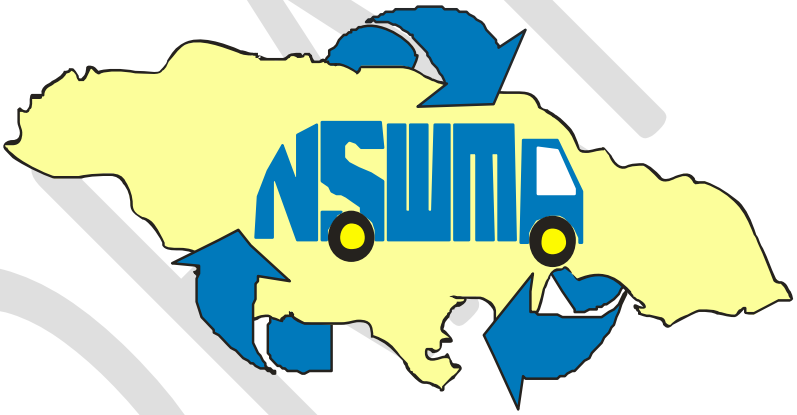
WASTE CHARACTERIZATION AND PER CAPITA GENERATION RATE REPORT 2013

THE METROPOLITAN WASTESHED



Prepared by

Planning & Research Department
National Solid Waste Management Authority (NSWMA)

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1.0 INTRODUCTION

The provision of reliable solid waste services, particularly to an increasing urban population, requires an accurate and up to date database, which is consistently maintained. Knowledge of the composition of municipal waste streams has direct implications for the planning of collection, recovery and disposal activities and will enable municipal authorities and those engaged in solid waste management to effectively address these issues. Data collected can help policy makers and city planners reduce landfill waste, set up recycling programs, and conserve money and resources. Waste characterization plays an important part in any treatment of wastes.

Additionally, increases in our population and changes in consumption patterns have undoubtedly influenced waste composition and generation rates. It is on this basis that the Planning and Research Department of the National Solid Waste management Authority (NSWMA) has undertaken this research to determine the current generation rates, the quantities and composition of solid waste within the Riverton Wasteshed.

2.0 AIMS AND OBJECTIVES

The principal goal of this research is to determine the characteristics of the waste streams generated and collected from households within the Riverton. In order to achieve this, the following objectives were established.

a) To determine the composition of the waste collected
b) To determine the daily household generation rates
c) To determine the patterns of generation among households and communities
d) To determine (by extrapolation) the overall waste generated within each parish of the wasteshed.

3.0 METHODOLOGY

The following provides a detailed description of the procedures adopted in the survey.

1. The communities comprising the sample were selected from a primary list of all communities within the Riverton Wasteshed based on the following factors:

    a. The perception of the community income levels, i.e. high, middle or low
    b. Location within the Riverton Wasteshed
    c. Predominantly residential with clearly defined geographic boundaries
    d. Largely homogenous with regard to income and other factors which may be used to define the community
    e. Having a twice-weekly or weekly collection schedule

    The communities selected were:

    - Point Hill

- Johnson Town
- Eltham Park
- Mona Heights
- 3 West (Greater Portmore)
- Cherry Gardens

2. The survey was conducted over a period of six (6) days, between March 12th and 22nd 2013. Samples were collected using a tipper truck. Only one sample of waste was taken from each community.

3. Wastes from an average of 25 houses were collected from each selected community.

4. Sorters were briefed to identify various categories of wastes.

5. The waste was sorted into the specified categories, which were then bagged, weighed and recorded *(See Appendices 1 and 2 for sample of forms used in the survey).*

6. The data gathered for each community was analyzed using the weighted average technique[1].

[1] *This technique weights each material according to the total sample weight and its relationship to the other elements of the samples.*

4.0 CONSTRAINTS

The following are constraints, which were encountered during the survey period.

a. In response to difficulties experienced in the pilot it was established that the quantity of waste to be collected would be that which could be sorted within one day.
b. The limited time that the department had to complete the study
c. Limited resources made available to conduct the survey
d. Collection crew was used to sort the waste after collection due to lack of resources. This resulted in an increase time span to completed the exercise each day.

5.0 FINDINGS AND ANALYSES

The composition, characteristic and quantity of wastes collected during the survey period are presented in this section.

5.1 Composition of Waste Collected

Table 1 and Figure 1 provide a summary of the survey's findings.

1. The average mass of waste sorted per community in the Riverton wasteshed was 409.25 kg.

2. Data from the survey indicate that households within urban communities generate an average of 18.29kg of wastes between each collection day[2]. Of this total approximately 62% represents compostable, while plastic and paper accounted for 12% and 9% respectively.

[2] *Represents waste generated over 3.5 days.*

3. Data from the survey indicate that households within rural communities generate an average of 12.53kg of wastes between each collection day[3]. Of this total approximately 61.21 % represents compostable, paper accounted for 6.07 % and plastic 13.49 %.

4. On average, for the collection period of 2-7 days, each household generated approximately 10.9kg of compostable, 1.5kg of paper, 2.0 kg of plastics, 0.46 kg of glass, 0.9 kg of cardboard, 0.1 kg of wood/board, 0.39 kg of metal/Tin, 0.83 kg of textiles and 0.01kg of electronic waste. See Table 1

5. Using the mean household size of 3.5 persons recorded for 2011[4], and the data from the survey, the average daily generation rate per person was calculated to be 1kg[5].

6. There has been a decrease in the per capita generation of most of the selected communities.

7. There has been a total decreased in the total kilograms of waste from the selected communities. A decrease from 3040 kg in 2006 to 2455.5 kg in 2013.

8. Compostable still accounts for the largest waste fraction in all communities.

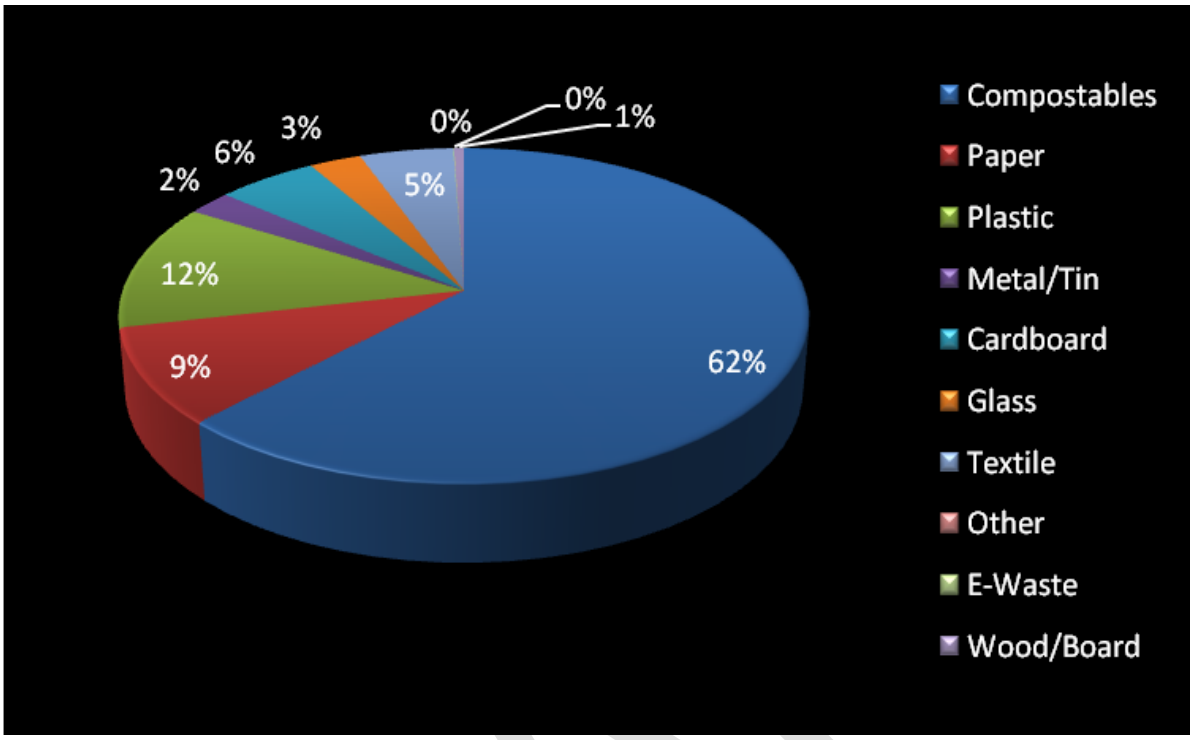
[3] *Represents waste generated over 3.5 days.*
[4] *Jamaica Survey of Living Condition 2011 Report.*
[5] *This is primarily representative of urban generation.*

Table 1: Overall Composition of Waste Collected

Composition of Waste	Percentage (%) Generated	Kg Generated per Household
Compostable	62.22	10.9
Paper	9.27	1.5
Plastic	12.2	2.0
Metal/Tin	2.38	0.39
Cardboard	5.46	0.9
Glass	2.81	0.46
Textile	5.09	0.83
Other	0	0
E-Waste	0.04	0.01
Wood/Board	0.53	0.1
Total	***100***	

***NB:** Waste collected on each collection day represents wastes generated over three and a half days (3½).*

Figure 1: Composition of Household Waste



5.2 Description

Per Capita Generation

Waste characterization studies for the years 2010 and 2013 indicate that the per capita generation of waste has decreased for most of the communities over the three year period. In 2010 all communities have per capita generation of one and over except for Point Hill and Cherry Gardens, with the highest per capita generation being the non-urban community of Eltham and the low-income community of Johnson Town both accounting for 1.10 kgs per capita GDP. These were the same communities that had the highest per capita in 2010. However, in 2013 Point Hill was the only community to fall below the threshold of one. The rural community of Point

Hill had the lowest per capita generation of waste for both 2010 and for 2013. There has been no increase for the community of Eltham which has remained constant at 1.10 for both years. There has been an increase for the community of Point Hill from 0.75 kg in 2010 to 0.92 kg in 2013, indicative of a 23 % increase.

There has been a slight decrease in the 3 West Greater Portmore community of 6.4 % in 2013 moving from 1.09 kg per capita generation in 2010 to 1.02 kg. Also, there has been a decrease for the community of Mona Heights, the data indicates that there has been a 0.56 % decrease from 2010. Compared to the year 2010 there has also been a decrease of per capita generation in the community of Johnson Town decreasing from 1.16 kg to 1.10 kg in 2013, a 9 % decrease. However, in Cherry Gardens there has been a steady but minimal increase of 34 % from 2010 increasing from 0.79 kg to 1.06 kg per capita generations.

Composition

The total amount of waste generated within the study areas has decreased from 3040 kg in 2010 to 2456 kg in 2013 a 19% decrease over the period. Compostable continues to account for the largest percentage of the wastes, increasing from 1504.4 kg (49%) in 2010 to 1527.8 kg (62.22 %) in 2013. Although there has been just a minimal increase in the kilograms for the period, in 2013 compostable accounted for a significant portion of all wastes generated than in 2010. In 2013 plastics accounted for only 12.20 % just over half as compared to 20% in 2010. In 2013 plastic supersedes paper to become the second highest component as opposed to 2010. In 2010, paper accounted for 621.8 kg and only 227.7 kg in 2013, 20% and 9.27 % respectively and a 55.2 % increase in the total kilograms generated.

In 2010, glass contributed for 31 kg and in 2013 69 kg an increase of more than 50 %. There has been an increase in cardboards from 47 kg in 2010 to 134 kg in 2013 increasing from a total contribution of 2% to 5.46 %. Also, there has been a slight increase of metals/tin over the period increasing from 2% in 2010 to 2.38 % in 2013. However, there has been a drastic decline in the composition of wood/board in 2013, accounting for only 13 kg in that year a significant fall from 55 kg in 2010. Textiles made up 3 % of the total waste composition in 2010 and 5.09 % in 2013 an increase of 2.09 %. E-Waste continued to account for the lowest total waste (1 % or less), with 1 % in 2010 and 0.4 in 2013.

Figure 2 Showing Composition of Waste Generation 2010

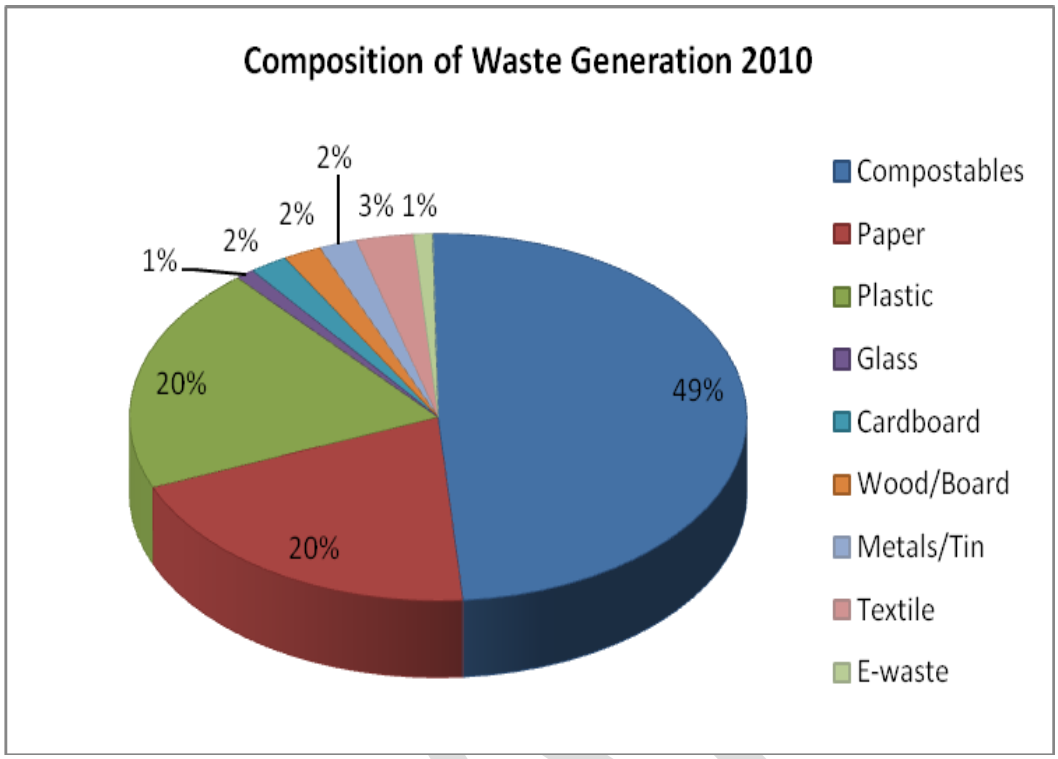
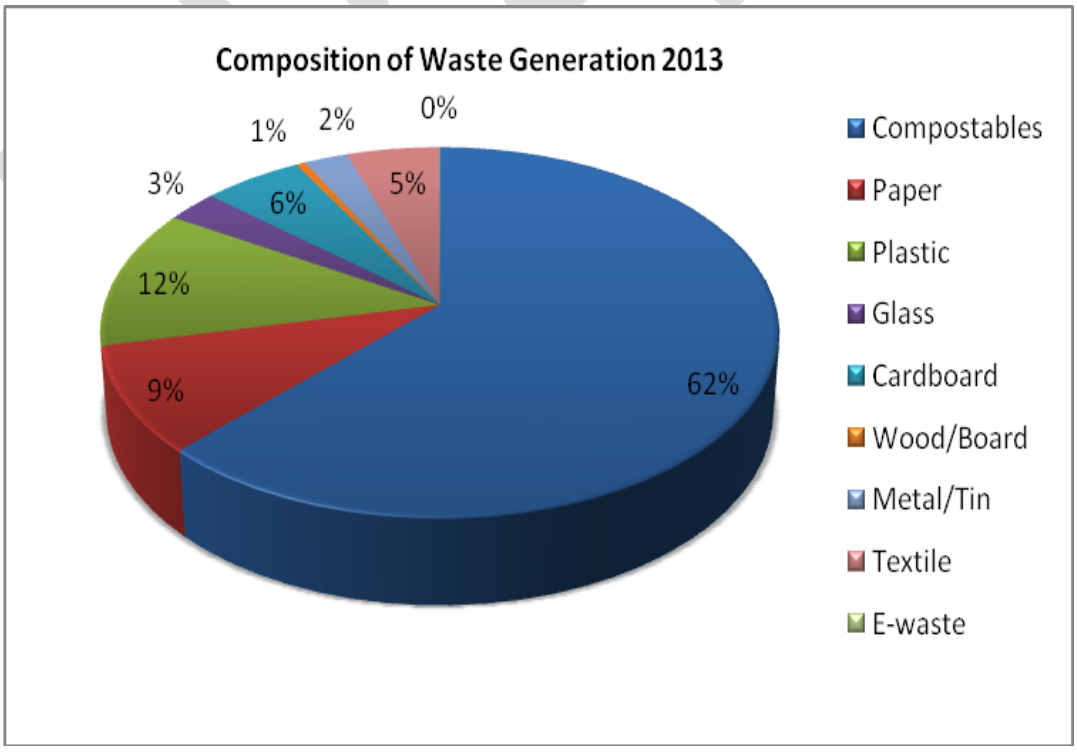


Figure 3 Showing Composition of Waste Generation 2013



5.3 Composition of Waste Collected by Selected Communities

The following provides a brief profile of the communities within the sample frame and a description of the composition of waste collected from each community within the survey period.

Differences in the composition of waste generated among the communities were not significant. They are as follows:

- Cherry Gardens (high income) generated the most compostable wastes.
- 3 West Greater Portmore (middle income) generated the highest percentage of paper as well as plastics.
- The distribution of plastics within the selected communities ranged from 6% to 28%.
- The distribution of wood/board and E-Waste is relatively low in all communities.

➢ Point Hill

Point Hill is located within the northwestern section of St. Catherine. It is regarded as a rural community. The total population of the community is 2,099 persons based on the 2011 population census with an average household size of 2.9 persons. Wastes from a total of 25 households were taken as the sample from this community. The collection day for the community is on Sundays.

➢ Johnson Town

Johnson Town, which is located in East Kingston, is perceived as a low-income residential community. The main housing type is detached, however, some lots

have as many as six houses. Based on the 2011 census, there are approximately 2,468 people living in this community, with an average household size of 3.2 persons. House-to-house collection is conducted once per week on Fridays within the community. Wastes from a total of 25 households were taken as the sample from this community.

Bags and drums were the primary receptacles used for disposal, although other receptacles such as buckets were used.

Compostable accounted for approximately 58.2% of the total waste generated within the community. Approximately 14.7% of the remaining generation was plastic, while 2.0% and 11.2% was metal/tin and paper respectively. See table 2 below.

Table 2: Composition of Waste Collected by Selected Community

Waste Composition	Composition of Waste Collected					
	Johnson Town	Mona	West Greater Portmore	Cherry Gardens	Eltham	Point Hill
	%	%	%	%	%	%
Compostable	58.2	69.9	47.4	74	63.2	60.5
Paper	11.2	9.2	12.6	8.5	10.7	4.5
Plastics	14.8	8	17.5	6.5	10.4	14.6
Glass	1.8	4	1.7	1.7	3.1	5.1
Cardboard	4.9	5.3	9.8	4	4.8	5.2
Wood/Board	0.3	0	1.1	1	0	0
Metal/Tin	2	1.8	3.5	1	2.8	3
Textile	6.8	1.8	6.4	3.2	5	7.1
E-Waste	0	0	0	0.1	0	0
Total	**100**	**100**	**100**	**100**	**100**	**100**

- **Mona Heights**

This community is located in St. Andrew East, within the vicinity of the University of Technology. It has a population size of approximately 4,114 people, and an average household size of 2.2 persons. This community has a well-planned road network with large detached houses, and in some area semi-detached houses and town houses/apartments. It is also considered to have middle-income status residents. Mona has a once per week collection schedule which is on Tuesdays. The sample of waste collected represented 25 households.

Bags placed in mesh bins were the predominant disposal method. Other types of receptacle included drums and plastic bins.

Sixty nine point nine percent (69.9%) of the total waste collected within Mona was compostable, most of which represents food waste. Paper accounted for 9.2%, while plastic accounted for 8%. (See Table 2). It is possible that the high percentage of compostable could be due to a relatively high student population living in the community.

- **3 West Greater Portmore**

3 West Greater Portmore is considered a middle-income residential community of Greater Portmore, located in South St. Catherine. Portmore has a total population of 182,153 persons, with an average household size of 3.7 persons[6]. The primary housing type within this community is row houses, consisting of eight or more units. The road network of this community is also well planned, however most roadways are narrow with the exception of arterial roads. Additionally, there are several cul-de-sacs within this community, which makes it more time consuming for house-to-house collection within the area. 3 West Greater Portmore is collected on Mondays. Waste from a total of 25 households was collected during the survey.

Drums and bags are the main types of receptacle used for disposal. There were also a few buckets and crates.

Approximately 47.4% of the 3 West Greater Portmore's waste stream is compostable, while 12.6% is paper and 17.5% is plastic. (See Table 2).

- **Cherry Gardens**

Cherry Gardens is considered a high-income community located in upper St. Andrew. The general terrain of the area is hilly. In 2011, it recorded a population size of approximately 2,793 people, and an average household size of 2.8 persons. Cherry Gardens has a well-planned road network with detached houses on large lots. There are a few apartments/town houses at some locations. House-to-house collection is done on Wednesdays each week. The sample of waste collected represented 30 households.

Mesh bins are the main waste receptacles adopted by the residents of this community.

Approximately 74% of the waste stream within Cherry Gardens is compostable. This reflects regular trimming of trees and grasses by households. Paper and plastic accounted for 8.5% and 6.5 % respectively. (See Table 2).

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6. The total population and the average person per household of Portmore and not specifically for 3 West Greater Portmore.

- **Eltham**

Eltham is located in Spanish Town, St. Catherine. It is considered a rural middle-income community with approximately 4492 persons. The roadways within Eltham are well planned, and in fair conditions. Detached and semi-detached houses are

common within Eltham. House-to-house collection is done once weekly on Fridays. The sample of waste collected represented 25 households.

Approximately 63.2% of the waste stream comprised of compostable, 10.7 % paper and 10.4 % plastics (See Table 2).

6.0 CONCLUSIONS

The MPM Wasteshed produces in excess of one million tonnes of household solid waste annually. More than half of the total waste generated annually is composed of yard and food wastes. This fraction is substantial enough to encourage the development of an economically viable composting program. Such a program, if implemented, may result in a significant reduction in the amount of yard and food waste that enters the various disposal sites, thus increasing their lifetime. Additionally, a well-developed and widespread composting program will reduce the stress that is currently being placed on the resources devoted to the island's waste collection and disposal system.

Other significant component of the island's waste stream includes paper and plastic wastes. Together they represent 25% of the total waste that is generated annually and suggests the potential for development/growth within the recycling industry. Differences in the composition of wastes among the communities were not significant. The largest percentage of yard and food wastes was generated within the community perceived to be high income.

Further work remains to be done primarily in analyzing rural areas and further separating the composition of yard and food waste.

6.0 RECOMMENDATION

Based on the findings revealed and the conclusion outlined, the following recommendations are therefore made;

1. Take steps to reduce the quantities of organic waste through methods such as composting, waste diversion, reuse as animal feed etc. this will in turn result in a reduction in operational cost and increase in revenue for the NSWMA.
2. Restart the composting project that was developed in house a few years ago and ensure that the necessary infrastructure is put in place so that JICA support can be achieved.
3. Expand the current recycling initiatives that have been implemented over the past few years. This must not be limited to PET bottles but other waste materials as well.
4. Promote greater levels of public private partnerships in the recycling sector. Participation over the last year has had a positive net effect on the reduction of waste being disposed at the Riverton Disposal Site.
5. Approach multilateral development agencies such as UNEP, JICA, CIDA, IDB and others to explore the possibility of them funding a national recycling initiative.
6. Promote NSWMA's recycling initiatives through the clean school competition, environmental expositions and community forums.
7. Solicit other private sector investment in waste recovery at other NSWMA owned / operated facilities such as that at the Riverton Disposal Site.
8. Institute waste diversion policy at the Riverton Disposal Site. A similar policy is already in place for scrap metal and this must be expanded to other waste fractions as well.
9. Expand the management regime for the management of e-waste and other types of hazardous waste that enters the wastestream. This should be implemented with the aim of achieving zero percent disposal.
10. Revisit the Waste to Energy (WtE) opportunities that are available to the NSWMA/GOJ.

APPENDIX

APPENDIX I

Sheet #……..

Date. ……….

WASTE COMPOSITION SURVEY

COMMUNITY NAME……….……………………………………………………………………………….

RECORDER NAME……………………………………………………….……………………………………..

COMPOSITION OF HOUSEHOLD WASTE (<u>WEIGHT in kg</u>)										
Paper	**Cardboard**	**Plastic**	**Glass**	**Food Waste**	**Yard Waste**	**Wood/Board**	**Metal/Tin**	**Textile**	**Other (Specify)**	**Comment**

APPENDIX II

Sheet #……..

Date. …….

WASTE GENERATION SURVEY

COMMUNITY NAME ……

RECORDER NAME ……

WASTE GENERATION FORM									
Street Name	**Number of House Collected**	**Street Length**	**Collection/Loading Time**		**Type of Container**				**Comment**
			Start	Finish	Bag	Drum	Mesh	Other	