



**HOUSEHOLD WILLINGNESS TO PAY FOR IMPROVED SOLID WASTE MANAGEMENT
IN KIGALI, RWANDA**

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ABSTRACT

In several rapidly growing cities in developing countries solid waste is a major source of concern due to lack of appropriate planning, inadequate governance, resource constraint and ineffective solid waste management. In our everyday activities, generation of solid waste is inevitable. Kigali, capital of the Republic of Rwanda, is expanding at very alarming rate in terms of infrastructure, economic activities and population. This leads to increased household solid waste, which accounts for more than half of total solid waste. This study attempts to study the household willingness to pay for improved solid waste management in Kigali by using a sample of 220 households. Descriptive statistics and logistic regression analysis were used. The results reveal more than half of sampled population willing to contribute so that we may have a cleaned area. It is suggested that, government authorities should take time to educate the household of the importance of segregation of solid waste. The principle of pay-as-you-throw (PAYT) principle may be adopted to minimize waste generation.

Keywords: Household, Willingness to Pay, Solid Waste Management, Contingent Valuation Method

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1. Introduction:

The rapid increase in the quantity of solid waste is emerging as major environmental problem in developing countries. According to Pierce and Turner (1994), the current system of solid waste management in most developing countries is inefficient and ineffective. This inefficient of solid waste management is generating the problems of air pollution in the form of green house effect, ozone depletion, water and soil pollution as well as acid rain (Visvanathan, 2006).

Anemanyo (2004) in Ghana revealed that, mismanagement of solid waste leads to negative impacts such as pollution (air, soil, and water), green house gases and health problems. This is the result from a lack of appropriate planning, inadequate governance, resource constraint and ineffective management; solid waste is a major source of concern. According to United Nations Environment Programme (2004) and Abedullah (2006), solid waste generation has become an increasing environmental and public health problem everywhere in the world, particularly in developing countries. The rapid expansion of industrial activities motivated by rapid population growth has produced large quantity of solid and liquid wastes that reversely create pollution to the environment and destroy resources. Consequently, solid waste is not only increasing in quantity but also changing in composition which will aggravate its collection rates (Bartone and Janis, 1993; Medina, 2002).

Household solid waste is a type of municipal solid waste (MSW) and consists mainly of plastics, paper, glass, metals, organics, wood and others. These wastes must be predisposed appropriately to assist in keeping environmental quality and human health, as well as to preserve natural resources (Daskalopoulos et al., 1998; Lin et al., 2008). Household solid waste has both direct and indirect effects on environment and human welfare. Direct effects range from the damage of materials and loss of aesthetic importance to the impairment of human health, thus creating significant socioeconomic impacts. Indirect effects are mainly long-term effects, which range from changes in ecosystem structure and behaviour to the climate change, which in turn affects socio-economic status and the sustainability of the region (Woodwell, 1970 and Basnet, 1993).

2. Statement of the Problem:

In Kigali City, some people dispose their waste illegally; they dispose it under bridge, in river, open places, sewer, etc. The situation is not different from rural areas. Solid and liquid waste management is an issue in both urban and rural areas of Kigali (State of environment and outlook report, 2013). While there is central landfill system, people continue to dump wastes illegally.

Nowadays, solid waste plays a major role in the pollution of environment. As it has been shown that household waste accounts for more than half of Kigali City wastes, this shows that household waste needs more attention so that it can be efficiently managed. Cooperation among government authorities and companies/cooperatives in charge of sanitation and solid waste management as well as population is an important aspect to the management of household wastes. Therefore, this paper makes an attempt to study the household willingness to pay for improved solid waste management in Kigali.

3. Objectives:

1. To study the socioeconomic factors of the respondents in the study area.
2. To study the existing practices of household solid waste management and environmental impact on health in the study area.
3. To identify whether the respondent are willing to pay or not.
4. To provide policy suggestions for sustainable management of household solid waste in the study area.

4. Methodology:

Contingent valuation method

The contingent valuation method (CVM) is playing a very important role when there is absence of market for some environmental goods. Contingent valuation methods are required in the estimation of both use and non-use values. To estimate the values humans place on non-market goods, the approach of contingent valuation is merely to ask them. It is called “contingent” valuation because people are asked to state their willingness to pay for a given environmental good or service.

The method is also known as the stated preference technique, as the people are directly asked to state their value rather than inferring values from the actual choice. In simple way, contingent valuation method involves directly asking people in a survey, how much they are willing to pay for improved goods and service they are going to receive. The most important aspect of the contingent valuation survey is to create a hypothetical market, close to the real market, in order to obtain hypothetical bids that conform to actual bids if the actual market had existed.

In contingent valuation survey, among elicitation techniques used to elicit respondent willingness to pay, this study adopt dichotomous choice as recommended by NOAA (1993), Hanemann et al. (1991). The dichotomous choice contingent valuation is the most popular and apt method of CV among practitioners, due to its simplicity of use in data collection.

The contingent valuation method is a survey based on elicitation technique to estimate willingness to pay values of goods or services that are not traded on the market. In the schedule used in this study, there are very important parts, which cannot be missed in this study. Notice that important part is the composition of contingent valuation question designed to estimate the willingness to pay for improved solid waste management in Kigali City. In this study, the researcher applied dichotomous choice contingent valuation approach where individuals were asked the amount of money(bid level) they are willing to pay by responding “yes “or “no”.

5. Selection of Study Area, Sample Size and Methods of Data Collection:

Based on the objectives of the study, the research uses scheduled method for getting information from the households living in the study area. The targeted respondents in this study are the heads of households from planned and unplanned housing system. In case the household head is absent or inability to answer the questions, the next eldest who knows information on household is asked to provide answers to the questions. Both primary and secondary data were used in the research. In the present study, multi-stage random sampling method is very useful in the selection of 220 respondents as the sample size.

6. Model and Tools used in the Study:

In this study of household willingness to pay for improved solid waste management in Kigali, the data analysis was done by using statistical package for social sciences (SPSS) analysis software programme. Descriptive and inferential statistics are used to analyse the data and conclusion is drawn from the results.

The logit model used in this study has also been used in previous studies such as Hanemann (1989), Yusuf et al. (2005), Adepoju and Omonona (2009). In addition, this model was selected because of its ability to deal with the dichotomous dependent variables.

The logit regression model is established below

$$P_i = E(Y = 1/X_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_i)}}$$

Where: P_i = probability that $Y=1$

Y = dependent variables, X_i = set of independent variables, β_0 =the intercept which is constant, β_1 = the coefficient of the price that households are willing to pay for improved solid waste management.

The coefficient estimates obtained from the identification of the factors influencing household willingness to pay for solid waste management were then used to calculate the mean willingness to pay for improved solid waste management and it is used as given by Hanemann(1989).

$$MeanWTP = 1 * \ln \frac{1 + (\exp \beta_0)}{\beta_1}$$

Where β_0 , β_1 are the absolute coefficient estimates from the logistic regression and the mean for improved solid waste management.

7. Results and Discussions:

Table3. 1.
Socio economic characteristics distribution of the respondents

Gender	Area of Residence		Total
	Unplanned	planned	
Male	85 (77.3)	101 (91.8)	186 (84.5)
Female	25 (22.7)	09 (8.2)	34 (15.5)
Age group			
Up to 29	19 (17.3)	12 (10.9)	31 (14.1)
30-39	26 (23.6)	40 (36.4)	66 (30.0)
40-49	22 (20.0)	28 (25.5)	50 (22.7)
50-59	15 (13.6)	10 (9.1)	25 (11.4)
Above59	28 (25.5)	20 (18.2)	48 (21.8)
Religion			
Christian	110 (100)	98 (89.1)	
Muslim	0 (0.0)	12 (10.9)	
Education			
Primary	17 (15.5)	14 (12.8)	31 (14.1)
Secondary	48 (43.6)	25 (22.7)	73 (33.2)
Tertiary	45 (40.9)	71 (64.5)	116 (52.7)
Occupation			
Government	35 (31.8)	33 (30.0)	68 (30.9)
Private	75 (68.2)	77 (70.0)	152 (69.1)
Family type			
Nuclear	107 (97.7)	106 (96.4)	213 (96.8)
Joint	3 (2.7)	4 (3.6)	7 (3.2)
Size of family			
Below 5	15 (13.6)	06 (5.5)	21 (9.5)
5 to 7	44 (40.0)	55 (50.0)	99 (45.0)
Above7	51 (46.4)	49 (44.5)	100 (45.5)
Income (RWF)			
Up to 150000	05 (4.5)	00 (0.0)	05 (2.3)
150001-300000	59 (53.6)	26 (23.6)	85 (38.6)
Above 300000	46 (41.8)	84 (76.4)	130 (59.1)

Source: Computed 2019

Note: Figures in parentheses are percentages to Colum total

In the above table, majority of the respondents 84.5 per cent are male and 15.5 per cent of the respondents are female in the study area. This means that majority of household-heads are males in this study area. The general view in Rwanda is that, male is one who propose the female for the formulation of the family. This is the reason for the domination of male in the study area. In life, various age groups of people influence decisions and behaviour. That is, how people view things is depending on their age. In this study, respondents are classified into five age groups. The first group corresponds to those who are below 30 years, while the second group consists of the respondents who are in 30 to 39 years. The third group is for people in 40 to 49 years, fourth group is in the 50 to 59 years and finally the 60 and above age group. The Table shows that 14.1 per cent of the respondents are below 30 years, whereas 30 per cent of the respondents belong to the 30 to 39 age group. Also 22.7 per cent of the respondents are between 40 and 49 years, whilst 11.4 per cent of the respondents are in the age group of 50 to 59 years. Finally, 21.8 per cent of the respondents are above 59 years, it is shown that second category has more respondents. The belief of respondents can be seen in different religions such as Christians Muslims and other believers. 94.5 per cent of the respondents are Christians and 5.5 per cent of the respondents are Muslims. None was found to belong to religions other than Christian and Islam in the study area. The educational level in this research is classified into four levels: the first level is primary education, second level is secondary education and third level is tertiary education. 14.1 per cent of the respondents had primary education only, 33.2 per cent of the respondents had secondary education and 52.7 per cent of the respondents had tertiary education. Table 5.8 clearly shows that a huge number of the respondents had tertiary level of education followed by secondary education and finally the lower number of the respondents has primary education level only. For the occupation of the respondents, 30.9 per cent of the respondents were participating in government jobs, whereas the remaining 69.1 per cent of the respondents were in the private activities for earning money for their livelihood. 96.8 per cent of the respondents are staying in nuclear type of family, whereas the remaining 3.2 per cent of the respondents are staying in joint family in the research area. This shows that majority of families are living in nuclear life. The above table also shows that number of members within the household in this paper is divided into three categories. The first category is the household with membership less than 5, the second category is in 5 to 7 members within the household and the last category corresponds to the above 7 members in the household. Again 9.5 per cent of the respondents were having below five members in the household, 45 per cent of the respondents have four to seven members in the household. The third category constitutes 45.5 per

cent of sample respondents that has more than seven members in the household. It shows that in this study area both second and third category has more family members. Finally the monthly income of the respondents in this paper is grouped into three groups. The first group captures the respondents with income up to 150000 RWF, and the second group consists of those earning between 150001 RWF and 300000 RWF. The third group represents persons who earn above 300000 RWF. Table 5-12 in this research shows that 2.3 per cent of the respondents belong to the first group; 38.6 and 59.1 per cent of the respondents belong to the second and third income groups respectively.

Table- 3.2.
Wish to Participate and Stay in Clean Area

Wish to participate and stay in area	Area of residence		Total
	Unplanned	Planned	
Participate in keeping area more cleaned	83 (75.5)	85 (77.3)	168 (76.4)
Stay in clean place	110 (100)	110 (100)	220 (100)

Source: Computed 2019

Note: Figures in parentheses are percentages to Colum total

During this research, the question on the participation in keeping the environment clean from solid waste as well as to stay in clean area is asked. Table 2 shows that all the respondents are very comfortable and like to stay in cleaned environment, and 76.4 per cent of the respondents are ready to participate in the cleaning activity, this shows that, the respondents are ready to offer everything so that they have their area cleaned.

Table 3. 3.
Respondents willingness to pay

Willing to pay	Area of residence		Total
	Unplanned	Planned	
Willing to pay	43 (39.1)	82 (74.5)	125 (56.8)
Not willing to pay	67 (60.9)	28 (25.5)	95 (43.2)
Total	110 (100)	110 (100)	220 (100)

Source: Computed

Note: Figures in parentheses are percentages to Colum total

From the hypothetical scenario presented to the respondents, the information on the willingness to pay for solid waste management service by the respondents in the study area is shown in Table 3. The table shows that 56.8 per cent of the respondents are willing to pay for the improved solid waste management service and the remaining 43.2 per cent of the respondents are not willing to pay. For those who are willing to pay, they have reasons and those who are not willing to pay also have their own reasons.

8. Conclusion and Policy Suggestion:

In our everyday life, we make so many activities which generate waste. We can see the generation of waste from different sources such as residential or household activities, industrial activities, institutional activities, commercial activities, agriculture activities, municipal activities, processing activities and construction activities, etc.

The study also showed that more than half of the respondents are willing to pay for the additional fee in the study area. The mean willingness to pay for improved household solid waste management is 1382.52 RWF per month for each household and it is shown that the willingness to pay for improved household solid waste management is influenced by age the respondents, education of the respondent, income of the respondent and years of staying in the study area. Government as well as companies dealing with solid waste management should create awareness among the population on the segregation of solid waste. During *Umuganda*, government authorities should take time again to emphasise the importance of sorting household solid waste. Increasing household willingness to pay for improved services would require waste management companies to be effective in their waste collection. Also, the amount charged should be affordable to the people, and may be below the estimated mean in this study.

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