HOUSEHOLD WILLINGNESS TO PAY FOR IMPROVED SOLID WASTE MANAGEMENT IN IBADAN METROPOLIS, OYO STATE, NIGERIA

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ABSTRACT

Solid waste management is important in our society because of the welfare gains that accrue from it to the household and to the society at large and the dangers that are associated with dirty environment. This research work examined the households' willingness to pay for improved solid waste management and the associated problems they face in Ibadan metropolis. Data were collected from randomly sampled 150 households' head with the aid of a well structured questionnaire. The data were analyzed using descriptive statistics, conditional logit model, and logit model. The average age of the household's head was 39.8 years. Majority (67.76 percent) of the households' heads were males. The households' heads were found to be professionals (26.32%) , artisans (25.66%), traders (11.84%), civil servants (28.95%) and few (7.24 percent) were found to be unemployed. Average monthly income of the households' head was ₦45, 701.32. Two methods of solid waste collection were identified; these were collection by government and private organizations. Similarly, methods of households' solid waste disposal adopted were open dumps, burning, common containers provided by local authorities and rivers. The dichotomous contingent valuation technique was used to elicit the willingness to pay of the households' heads for improved solid waste management in the study area. Estimated mean willingness to pay of the households' head for prompt collection of waste was ₦317, private collector was ₦464, waste treatment was ₦195, waste sorting and incineration is ₦2113 and ₦2428.Willingness to pay of the households' head for improved solid waste management were influenced by age, gender, dependency ratio, monthly income, household size, educational level, asset index, and social capital of the households' head. Based on the findings of the study, it was recommended that households should find ways of mobilizing their family labour through establishment of less capital intensive small scale business in order to improve their income and hence their purchasing power and that they should sort their waste to generate some recyclable items that can be sold to generate more income. It was also recommended that as a result of benefits that accrue to households from improved solid waste management, households should demand for payment and improvement in the management of their solid waste as this will bring about tremendous benefits for them.

Key words: Willingness to pay, Solid waste and Households

INTRODUCTION

Due to lack of appropriate planning, inadequate governance, resource constraints and ineffective management, solid waste is a major source of concern in many rapidly growing cities in developing countries. According to UNEP (2004) solid waste generation has become an increasing environmental and public health problem everywhere in the world particularly developing countries.

Waste is the bye product of most human activities and every day, waste are being generated around cities (Allende, 2009). According to Tchobanglous (1993) solid waste are all waste arising from human and animal activities that are normally solid and are discarded as useless or unwanted. It includes municipal garbage, industrial and commercial waste, sewerage slug, waste of agricultural and animal husbandry, demolition waste and mining residues. Waste was an early problem and a growing one that is of major concern to mankind and every nations of the world (Allende, 2009). In early pre-industrial times, when populations were smaller waste generations were not issues. Waste was disposed off in the ground to land fill site selection for municipal solid waste management and also as compost.

During the transition from the nomadic hunting and gathering to farming Waste management stated becoming a growing problem. The rapid growth of population in urban areas due to rural and urban migration, the natural high rate of growth of population and also rising per-capita income would presuppose an increase demand in the provision of required infrastructure and public services (Indian statistical institute, 2003). Solid waste management could therefore be defined as the control, generation, storage, collection, transfer, and transport, processing and disposal of solid waste.

A consumer's willingness is always being expressed in form of his preference for a particular commodity or service. Willingness to pay for a commodity is the amount of money that a person is willing to pay for a higher level of environmental or commodity quality. According to Golan and Kuchler (1999), Willingness to pay (WTP) is a measure of the resources individuals are willing and also able to give up for a reduction in the probability of encountering a hazard that compromises their health. In economics, willingness to pay is the maximum amount a person would be willing to pay, sacrifice or exchange for a good. Park and Srinivasan (1994) express consumer' willingness to pay in terms of (monetary) added values endowed by a brand to a specific product with its competitors or an unbranded baseline products.

During the last decades there were prominent increases in the demand for goods produced with a relatively low impact on the environment. According to the Organization for Economic Co-operation Development (OECD), the stated price that an individual would be willing to pay for avoiding the loss or the diminution of an environment service expresses his willingness to pay. Earlier studies have shown that consumer reveal their commitment for the environment through the choices they make on the market. Hence consumers are able to make an indirect impact on environmental policies with their income. In Ibadan city and indeed many cities in Nigeria, the role and performance of solid waste service providers such as local authorities and waste collection contractors have always been used

as a yardstick for measuring and assessing the standard of solid waste management. According to Sansa and Kaseke (2004), most legal policies and frame work governing solid waste management have been directed at these providers those completely ignoring the demand side of the problem. This leaves solid waste service provider not fully appreciated by households and other service receivers. The involvement of the service receiver especially households' who are the primary producers and generator of significant proportion of solid waste may not only allow them (households) determine their provider via some arrangement and participate in making of sound policy decisions including designing of effective joint solutions but also help the provider to understand household's willingness to participate, pay and neighborhood characteristics

Problem Statement and Objectives of the Study

Urbanization is one of the significant features of developing countries including Nigeria. Urbanization brings about concentration of population that generates waste. A study by (Okpala, 1984) revealed that an average solid waste generation rate is 0.5kg per person per day Ibadan had experienced and is still experiencing rapid urbanization with the accompanied increase in population growth. One would presuppose that this rapid pace of urbanization will bring about an increase in the provision of basic infrastructures. This has not been the case, as the city lacks most of the basic infrastructures to take care of the expanding population. The result is that the city is being characterized by heaps of refuse or open dumps on streets, highways, in both private and public places. The problems are likely to become even more pronounced as the level and pace of urbanization continues to grow rapidly.

Waste collection is irregular and restricted to certain areas in the cities while improperly sited open dumps deface several other areas thereby endangering public health by encouraging spread of odors and disease, uncontrolled recycling of contaminated goods and pollution of waste resources. Linkages exist between poor solid waste management and health status of the households. Improper collection and disposal of solid wastes leads to spread of communicable diseases, causes obnoxious conditions and spoils biosphere as a whole.

Lack of funds has forced most environmental protection agencies in the country to hire vehicles and maintain few staffs on a permanent basis (ESESA,1998).The ·waste management fee is insufficient to cover for waste management. Also, environmental agencies do not have adequate capacity to handle the increasing solid waste mainly due to limited budgets, low morale of environmental protection agencies and workers due to poor remuneration and stagnation in promotion. Revenue from solid waste management collections are simply rolled into the general treasury, as opposed to returning to waste related operations and cumbersome procurement procedures. Majority of environmental agencies have little or no functional background or training in engineering and management, so the operation results in ineffective and inefficient solid waste management.

Ibadan metropolis appeared to be most stricken by the problem of poor solid waste management. Therefore, there was the need to embark on a study to address the issue, the research objectives basically:

1. Identified the various disposing methods adopted by households.
2. Determined the constraints / problems facing waste management in Ibadan city.
3. Identified the willingness to pay for environmental waste management in Ibadan metropolis.
4. Identified the factors driving willingness to pay for environmental waste management in Ibadan metropolis.

Research Methodology

The study was carried out in Ibadan metropolis, Oyo State, Nigeria. The data for the study were obtained mainly from primary sources. Using a multi stage random sampling technique with urban and semi urban in the first stage, local governments area were selected from each of the areas in the second stage while household's heads were selected from the local government area in the last stage. Primary data were collected from 152 households in the study area with the aid of a well structured questionnaire. Data collected included socio economic, product information, level of awareness, willingness to pay, methods of solid waste management adopted by households', constrains and problems households' head are facing on waste management. The analytical framework for this study includes descriptive statistics, logit model and conditional logit model. This study used four price levels and a total number of 38 respondents for each price levels. This gives a total number of 152 household respondents. The four price levels used for the study were ₦1000, ₦1250, ₦1350 and ₦1500. Given the fact that the existing refuse management service (collection of refuse two times in a month) in the area costs between ₦500 and ₦1000 and that an improvement in the service (increment in frequency of refuse collection to four times in a month that is weekly) will necessarily require an additional charge, the four price levels were then chosen from the adjustment of the price levels of the existing service to reflect the proposed improvement with a pretest. This was done by using the method by Loomis et al (1994) and OECD (1995) as used by Zaim (1999) in willingness to pay study in Istanbul and Branka and Kelly (2001) in a willingness to pay study in the USA. The price range was such that, at the low end, anyone who valued improved refuse management service would very likely pay at least ₦1000 whereas almost no one was expected to pay more than ₦1500 per month for the service.

The descriptive statistics were frequency counts, percentages and means. Willingness to pay in this study is with respect to households' head response to questions on improved solid waste management. Logit model was used to determine the mean willingness to pay of households for an improved refuse management service and the factors influencing their willingness to pay. The logit model was adopted since the Ordinary Least Square (OLS) procedure was not appropriate particularly when the dependent variable is dichotomous.

The responses of the households to the willingness to pay question were regressed on the prices they were asked to pay for the improved service. The coefficient estimates obtained was then used to calculate the mean willingness to pay of the households. The logit regression model is specified as

$$\text{Mean WTP } Y = \frac{1}{1 + \exp^{-(\beta 0 + \beta 1 X)}} \quad \ldots\ldots\ldots\ldots (1)$$

Where Y = response of household to the willingness to pay question which is either 1 if yes or 0 if no.

β_0 = constant

β_1 = coefficient of the price that the household was asked to pay

X = the price that the household was asked to pay for the improved service (₦).

The mean willingness to pay of the households for improved solid waste service was then calculated using the formula derived by Hanemann (1989). The formula is given as

$$\text{Mean WTP} = \frac{1}{\beta_1} * \ln(1 + \exp^{\beta 0}) \quad \ldots\ldots\ldots (2)$$

Where β_1 and β_0 are coefficient estimates obtained from the logistic regression and mean WTP is the mean willingness to pay of households for improved refuse management.

Factors Driving Willingness to Pay of Households

To identify the factors driving the willingness to pay of households for improved solid waste management, the household's responses to the willingness to pay question were regressed on the prices they were asked to pay and on other socioeconomic characteristics of the households. The logit regression model is specified as

$$Y = \frac{1}{1 + \exp^{-Z}} \quad \ldots\ldots\ldots\ldots (3)$$

Where

Y = response of the household to the willingness to pay question which is either 1 if Yes or 0 if No.

$Z = \beta_0 + \beta_1X_1 + \beta_2X_2 + \ldots\ldots\ldots + \beta_8X_8$

β_0 = constant

$\beta_1 \ldots . \beta_9$ = coefficients of the explanatory variable $X_1 \ldots X_9$

X_1 = Price that household is asked to pay monthly for the improved service (#)

X_2 = Age (yrs)

X_3 =Gender; dummy variable (Male =1, Female = 0)

X_4 =Dependency Ratio

X_5 = Monthly income (#)

X_6 = Household size (no of people in the household)

X_7 = Educational level (no of years spent in school)

X_8 =Asset index

X_9 = Social capital

Results and Discussion

Methods of refuse disposal adopted by household

The distribution of the households according to the methods adopted for disposal of their refuse depicted that 24.34 percent of the households disposed of their refuse through waste contractors, 24.34 percent made use of designated dumpsites for disposal purposes, 25.66 percent made use of open dump for disposal of their refuse, 24.34 percent burned their refuse while 1.97 percent dumped their refuse into rivers as stated in Table below Majority of the households used inappropriate and unhygienic charge-free disposal methods. It could also be inferred from the result that disposal of refuse through waste contractor was not effective in households.

Table 1: Methods of refuse disposal adopted

Method of refuse disposal	**Frequency**	**Percentage**
An open dump	39	25.66
Incineration (burning)	37	24.34
Dump site (through waste contractor)	37	24.34
River side	3	1.9

Total	**152**	**100**

Constrains and Problems facing Waste Management in Ibadan City

There are various problems and constraints facing waste management. These problems interferes with the proper management of waste in the area and thereby encourages set back in the level of adoption of improved solid waste management by households. As shown below majority, (65.13 percent) of the households' head were uninformed that is they are not aware of the adverse effect of poor waste management. Also, 11.18 percent of households have problem of inadequate collection of waste in their area while 2.63 percent have problem with the truck stopping too far from them.

Table 2: Problems Faced with Waste Management in their Area.

Problems Faced by Household in Their Area	**Frequency**	**Percentage**
Inadequate collection of Waste	17	11.18
Stopping point of truck too far	4	2.63
Inadequate campaign on waste management	30	19.74
Uninformed	99	65.13
Others	2	1.32
Total	**152**	**100**

Willingness to Pay for Improved Waste Management in Ibadan Metropolis

The economic (monetary) value that household place on improved solid waste management and the factors influencing such value are shown below. Majority of the households (92.76 percent) were willing to pay for improved solid waste management program me while just a few (7.24 percent) were not willing to pay.

Table 3: willingness to pay for improved solid waste management program me

Willingness to Pay	**Frequency**	**Percentage**
Yes	141	92.76
No	11	7.24
Total	**152**	**100**

Mean Willingness to Pay

A conditional logit regression was used to obtain the parameter estimates that are used to calculate the household mean willingness to pay. The result of the conditional logit regression in table 4 below showed that holding everything else constant, coefficients indicated that as the price of the improved refuse collection and disposal increased the likelihood of households paying for the services decreased. The negative effect as discovered in the study is in line with the study conducted by Yusuf (2006). More so the desire to pay for increased time of collection; bag and nylon for waste packaging; private form as collector; treatment of waste through incineration or sorting; and treatment of waste significantly and positively influence willingness to pay for improved waste management at 1 percent level of significance. Using the formula by Hanemann (1989), the mean willingness to pay was calculated. The result depicts that the values of mean willingness to pay for the attributes described in this study were positive. This implies that the household are willing to pay for attributes of the improved solid waste management. In summary the choice experiment reveals that households were willing to pay for incineration followed by sorting and the use of bag for packaging of their waste. They were however less willing to pay for use of can as an improved packaging method of waste which was reflected in their low mean willingness to pay of ₦10.

Table 4: Willingness to pay of Households

Variables	**Coefficient**	**Standard Error**
Price	-0.13196***	0.00145
Time of collection	41.8152***	0.27965
Can	1.3617	1.10059
Bag	186.5414***	1.18763
Nylon	167.1341***	1.03709
Collector (Private=1, 0=Government)	61.1872***	0.47664
Incineration	320.4373***	1.12657
Sorting	278.764***	0.9543
Treatment	25.7619***	0.69209

Number of observation = 912
Log likelihood function = -316.0725
*** Significant at 1%

Table 5: Mean willingness to pay of the household for the various attributes

Variables	Mean willingness to pay (₦)	Rank
Time of collection	317	6
Can	10	8
Bag	1414	3
Nylon	1267	4
Collector	464	5
Incinerator	2428	1
Sorting	2113	2
Treatment	195	7

Factors Influencing Willingness to pay for Improved Waste Management Attributes

The conditional logit regression analysis of the willingness to pay by households for improved solid waste management in Table 6 below reveals that age, gender, dependency ratio, household monthly income, household size, educational level of household heads, household asset index, and social capital of the households' head resulted to 20.79 percent of the variations in their mean willingness to pay for prompt evacuation, 30.87 percent of the variation in their mean willingness to pay for improved packaging, 22.30 percent variation in their mean willingness to pay for private collector, 25.32 percent variation in their mean willingness to pay for waste treatment and, 32.44 percent variation in their mean willingness to pay for waste sorting.

Table 6 Factors Influencing Willingness to pay for Improved Waste Management Attributes

	Prompt Evacuation			Improved Packaging			Private Collector			Treatment			Sorting		
Explanatory Variables	Coeff	Std. Err.	dx/dy	Coeff	Std. Err.	dx/dy	Coeff	Std. Err.	dx/dy	Coeff	Std. Err.	dx/dy	Coeff	Std. Err.	dx/dy
Age of Heads of households	-0.0038	0.0375	-0.01	-0.0239	0.0456	-0.004	-0.013	0.0445	-0.0023	-0.0118	0.0417	-0.00	-0.884*	0.05	-0.013
Gender	0.4509	0.4412	0.084	1.5669**	0.6183	0.2225	0.565	0.5121	0.0942	0.91105	0.5885	0.132	-0.0592	0.56	-0.009
Dependency ratio	1.3803	1.9235	0.247	-1.4647	1.9438	-0.2469	-1.131	1.9444	-0.0233	-0.9532	1.8973	-0.15	-0.1705	1.96	-0.025
Monthly income	0.034***	0.0116	0.006	0.035***	0.0109	0.0056	0.029***	0.0101	0.0051	0.0198*	0.0104	0.003	0.03**	0.01	0.0035
Family size	0.1421	0.1981	0.025	-0.7367	0.2239	-0.0124	-0.122	0.2193	-0.0216	-0.1576	0.2265	-0.03	0.7***	0.25	0.0945
Household	0.054	0.06	0.0	0.070	0.08	0.01	0.119	0.08	0.02	-	0.08	-	0.15	0.0	0.02

years of education	7	85	1	2	62	18		09	1	0.0572	38	0.01	7*	9	27
Asset Index	0.3178	0.2524	0.057	0.1973	0.2123	0.0333	0.058	0.1933	0.0103	0.598***	0.2228	0.096	0.396*	0.22	0.0574
Social Capital	-0.1213	0.1905	-0.02	0.0217	0.2088	0.0036	0.050	0.1911	0.0103	0.1498	0.1677	0.031	0.1834	0.22	0.0265
Constant	-3.0568	3.0412		-2.2489	3.2234		-3.249	3.2286		-0.02564	3.0675		-3.5574	3.40	
Number of Obs	149			149			149			149			149		
LRchi2 (8)	38.62			55.28			39.450			42.84			54.89		
Prob>chi2	0.000			0.000			0.000			0.000			0.000		
Pseudo R2	0.2079			0.3087			0.223			0.2532			0.3244		
Log likelihood	-73.5755			-61.8897			-68.890			-63.1834			-57.1549		

* significant at 10%

**significant at 5%

***significant at 1%

Conclusions and Recommendations

The study concludes that improved solid waste management in the study area will be based on improved packaging of waste, proper disposing method which will result in increased welfare gains and improve the environmental quality in general. However the result of the conditional logit analysis showed that the higher the price attached to improved solid waste management, the lower the households were willing to pay. Age of Households' head, monthly income of households' head, family size of household, households' head level of education, and asset index of households' head influences mean willingness to pay for improved solid waste management in the study area. Policy should be directed at creating enabling environment for private firms to go into waste collection. More so, the willingness to pay for private service operator was positive and relatively high. Inadequate campaign on proper waste management was identified as one of the major problems faced by households in this study. It is therefore recommended that renewed effort should be given to awareness campaign on need for solid waste disposal.

REFERENCES

Allende A. (2009). Landfill site selection for municipal solid waste management.

Branka,I. and Kelly,G. (2001). Contingent valuation on willingness to pay with respect to geographical nested samples: Case study of Alaskan stellersealion.2001 w-133 Western Regional Project Technical meeting proceedings pp 2-4

ESESA (Enugu State Environmental Sanitation Agency),1998.ESESA Rerprts,1998.

Economic Research Unit Indian statistical Institute, (2003) Economics of solid waste management: A survey of existing literatures.

Garrod, G. & Willis, K. (1999), *Economic Valuation of the Environment, Methods and Case Studies* Edward Elgar Publishing Limited, Cheltenham UK

Hanemann, M. W. (1989). "Welfare Evaluations in Contingent Valuation Experiments
with discrete Responses Data". American Journal of Agricultural Economics 71(Nov.):1057-61.

Hanemann, M. W. (1994). Valuing the Environment through contingent valuation method: Journal of Economic perspective ,vol.8 No .4 pp 19-43

Loomis,J. Gonzalez-Caban, A and Gregory R. (1994). "Do reminder of Substitute and Budget constraints influence Contingent Valuation Estimates". Land Economics 70 (4):499-506

OECD Organisation for Economic Co-operation and Development (1995). The Economic Appraisal of Environmental Projects and Policies. OECD publication services, Paris. pp 57-95.

Okpala Don, C.T (1984). Nigeria Urban Environmental Management Problem; Institutional preface 363.70669 okp. NISER Ibadan, Nigeria PP 32-37

Sansa, A. and kaseke, N. (2004). Welfare Gains Due to improved solid waste Management: A case study of Bugoloobi flats, Kampala pp 1-20

Tchobanglous, G., (1993). Integrated solid waste Management: Engineering principles and Management Issues, M C Graw-Hill: Inc., N.Y.

Yusuf,S.A, Ojo, O.T. and Salimonu, K.K. (2007). Households' willingness to pay for improved solid waste management in Ibadan-North LGA of Oyo State ,Nigeria. Journal of Environmental Extension University of Ibadan.vol:6 pp 57-63.

Zaim, Katalin Kovari (1999). 'The Right Garbage Collection Service Charge Estimated Through Contingent Valuation Method: The Case of Istanbul', Bilkent University.