An Analysis of Willingness to Pay for Better Solid Waste Management Services in Urban Areas of District Peshawar

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AN ANALYSIS OF WILLINGNESS TO PAY FOR BETTER SOLID WASTE MANAGEMENT SERVICES IN URBAN AREAS OF DISTRICT PESHAWAR

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ABSTRACT

Growing quantity of solid waste is one of the most important environmental hazards prevailing in developing countries. It is difficult for the government in developing countries like Pakistan to rectify it properly due to scarcity of resources. Public awareness and their monetary contribution can help government to overcome the menace of solid waste. This study was undertaken to quantify public willingness to pay and find its determinants. This paper is based on household survey conducted in urban areas of district Peshawar in September-October 2008. Important results were obtained indicating that 49 percent of the sample HH's were willing to pay for better solid waste management (SWM) services. Interestingly, 53 percent of respondents were found satisfied with the existing SWM services. The results further show HH size, Income of HH and Higher education as important determinants of HH willingness to pay for better SWM services.TMA and HH were found the vital parities to be contacted for better SWM services.

Key words: Willingness to pay, Contingent valuation method, Solid waste management, binomial logit model

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INTRODUCTION

Rapid population growth in developing countries has accelerated the pace of urbanization which has resulted in many environmental problems. These include inability to safely dispose municipal solid waste, provision of safe drinking water, liquid waste management, air and noise pollution. The rapid increase in the quantity of solid waste is emerging as a major environmental problem in developing countries. According to Pierce and Turner (1994) current systems of solid waste management in most of developing countries is inefficient and ineffective. This inefficient solid waste management is generating the problems of air pollution in form of green house effect, ozone depletion, acid rains as well as water and soil pollution (Visvanathan, 2006).

Solid waste can be defined as "any residue that is of no use in its current status to the people who caused it". In the words of Misra and Panday (2005), "*a material becomes waste when it is discarded without expecting to be compensated for its inherent value"*. Solid waste generation to a large extent depends on the population size and its life style. Nowadays proper solid waste management is becoming a challenge for developing countries due to scarcity of resources, lack of awareness and lack of interest by the public and concerned authorities. The proper disposal of the solid waste is not only the problem of developing countries but also of the developed countries. In United States and Europe, public concern about solid waste management has increased very rapidly in last decade (kinnaman *et. al.*1999).

In Pakistan like other countries of the world, life style has changed. Waste generation has increased enormously in Pakistan due to consumption oriented population and recent consumption led growth. Use of disposals in both food and non food items is growing very rapidly. The solid waste in Pakistan mostly consists of plastic, rubber, metals, food waste, animal waste, glass, building material and material taken out of drains. Solid waste is produced by households, commercial centers, business organizations and industries. Some quantity of solid waste is also generated by health care centers and hospitals. According to estimates given by world wildlife Fund (2001) about 250,000 tons of medical waste is produced by the health care centers in Pakistan

each year .Similarly in Pakistan 0.6 to 0.8 kg/capita/day waste is produced and is increasing at the rate of 2.5 % per annum.

However, comparable efforts on part of government to cope with the solid waste produced are lacking. About 40% of waste remains in the streets and production points or sometimes at the collection places. In Pakistan, the management of solid waste was the responsibility of Municipal corporations in urban areas and district councils in rural areas. With the promulgation of Local Governments Ordinance 2001, it is the responsibility of TMA (Town/Tehsil municipal Administration) to manage the problem of solid waste.

In Pakistan, the waste efficiency is between 51 to 69 % by different municipal authorities while the remaining lies uncollected in streets, roads or open spaces (PEPA, 2005).The solid waste management is a major problem especially in the urban areas as these areas are densely populated as compared to rural areas. After the collection the other most important problem regarding the solid waste is its safe disposal. Land fill is considered one of the best source for proper disposal of solid waste as described by Ward *et al.*(1993), Read *et al.*(2001),Rathi and Sarika (2007). The waste collected by the respective authorities in Pakistan is generally disposed off without proper treatment.

Public awareness towards better solid waste is crucial to ensure its proper disposal. Similarly there is a need to quantify public willingness to pay (WTP) for better solid waste management (SWM) services. Therefore, this study is designed to find out the prevailing awareness status of the people and to quantify their WTP for better SWM services. Peshawar is the most populated city and provincial capital of NWFP, Pakistan.Therfore it is taken as a pilot area to conduct a household survey which will give a better insight of public preferences regarding solid waste, its proper disposal and public willingness to pay for better solid waste management services. Thus, this study reports public concerns as well as their willingness to pay for improved solid waste management services in urban areas of district Peshawar.

District Government and its responsibilities

Solid waste generally pertains to urban areas, therefore only the urban union councils of Peshawar district are selected for the survey. According to 1998 census, population of Peshawar consisted of 2,019,000 persons. Out of this urban population is 983,000 (48.69 %) and rural population is 1,036,000 (51.31%). Thus about half the population of district Peshawar lives in the urban areas. As far as the collection and

disposal of solid waste is concerned, it is the responsibility of city district government, which is further divided in to four towns. There are 92 union councils out of which 43 are urban and the remaining are in rural areas.

The Chief Officer is responsible to make necessary arrangements for the disposal of solid waste. The sanitary staff is working under the chief officer of the town. Most of the sanitary staff is working in the urban union councils and they rarely visit rural areas. The sanitary staff consists of 1937 employs in Peshawar district. This includes 1134 sweeper, 562 nullah cleaners, 103 drivers, 99 trolley loaders, 3 Chief Municipal Inspectors, 31 Municipal Inspectors and 5 chief officers as given in Table I.

Table I: Sanitary staff in district Peshawar

S.No	Post	Town-I	Town-II	Town-III	Town-IV	Total
1	Sweepers	758	26	320	30	1134
2	Nullah Cleaners/ katta kullies	215	67	230	50	562
3	Drivers	53	9	34	07	103
4	Trolley loaders	46	05	28	20	99
5	CMI	1	-	2	-	3
6	M.I	25	02	2	02	31
7	Chief officer	01	01	2	01	5
	Total	1099	110	618	110	1937

Source: Town offices and Budget Book Town-II

MATERIALS AND METHODS

This study is based on the primary data which have been collected from 36 union councils of urban areas of district Peshawar during September-October 2008. Questionnaire was developed to take into account all the important variables of public willingness to pay for better solid waste management services.Questionaire was discussed with experts and was pretested before finalizing it. By using systematic random sampling, a sample of 216 questionnaires was collected from 36 urban union councils of the study area. Secondary data regarding the available services was collected from the district and town offices.

Methodology

In order to achieve the objectives of the study Contingent valuation method (CVM) has been used. CVM shows the valuation that an individual attaches to a good or service which is not sold in the market like environmental quality, good health, safe drinking water, reduction in pollution etc. "*The approach asks people directly what they are willing to pay for a good, or what they are willing to accept to give it up, rather than inferring this from observed behavior*" (World Bank, 2002).

Contingent valuation method is based on the stated valuation of a consumer for any good or service which is not marketable. CVM is widely used in surveys and research globally. It has been used on wide range in various studies conducted by World Bank as well. It can also be defined as a method which measures how an individual be compensated or charged for a good or service which sells or takes as the case may be (World Bank, 2002). Kimenju, *et al* (2005) has compared various methods and found the contingent valuation method to be easy and fast in use.

The Model

Household willingness to pay (WTP) for better solid waste management services depend upon a number of important determinants. In this study, HH's WTP is treated as the dependent variable. It is taken as a categorical dummy variable which assumes only two values. If a HH is willing to contribute monetarily for improved SWM services, the WTP variable assumes the value of 1 while 0 depicts not willing to pay. Logistic regression model is one of the important econometric techniques that is used for regression analysis when the dependent variable appears to be a categorical variable. It helps in calculating the elasticities of different independent variables upon a dependent variable. As WTP is treated as dependent variable in this study therefore, the binomial logit regression is the appropriate econometric technique to find out the determinants of HH's WTP. Among the set of independent variables different variables including education level, income, awareness etc were identified. These variables are believed to affect HH's demand and consequently their WTP for better solid waste management services. These variables are believed to affect HH's demand and consequently their WTP for better solid waste management services.

Education is considered the most important variable in explaining the HHs behavior towards better SWM service. To proxy education, the highest education among the HH members is taken as a variable. This represents that as the education within a family increases, it will positively affect the health concerns of that particular HH. To control for huge variations in the years of schooling, the education among the HH is categorized into four categories i.e. primary, metric, graduate and post graduate. Thus education is explained as a categorical variable which take the value of Zero (0) or One (1). Among the given categories, primary is kept as a base category. Another important determinant in defining HH's WTP is their income level. HHs are categorized into four income quartiles, according to their income level, with keeping Q1 as a base category. Among the other explanatory variables the HH size, disease history and awareness regarding the importance of SWM are also considered. Family disease history is defined as the presence of any vector born diseases (such as Gastro, Skin disease, Diarrhea, Malaria, Typhoid and Hepatitis) among the HH members within the last one month The variables of disease history and awareness were captured by a dummy, where zero reflects negation of the variable while one exhibit otherwise.

The model used for determination of household WTP for better solid waste management services is

$$WTP_i = \beta_0 + \beta_1 E + \beta_2 I + \beta_3 HHS + \beta_3 A + \beta_4 DH + u_i$$

WTP= Willingness to Pay

E= Education of Household

I=Income of household

HHS=Household Size

A=Awareness to SWM

DH=Disease History

SWM situation in district Peshawar

This section elaborates the public perception about various important factors that are related to SWM sector in district Peshawar. The survey revealed that 90 percent of people feel that solid waste and its management is important for healthy life. This indicates that majority of people does have the awareness. However, there is a need to

look into the actions of masses to judge the authenticity of their claim. Once HH behavior is in the line with their claim then it is necessary to translate their awareness into action to get maximum benefit from it.

Public behavior about safe disposal is depicted from their disposal strategy. According to the survey results, majority (58 %) of HHs use polythene bags to collect waste at home and then drop these into community dump to dispose of their waste. The second option that is used the most is dumping of waste in open drum (33 %) prior to its disposal while some of the people (3.7%) uses wheel barrow to collect and dispose their waste (Figure 1).

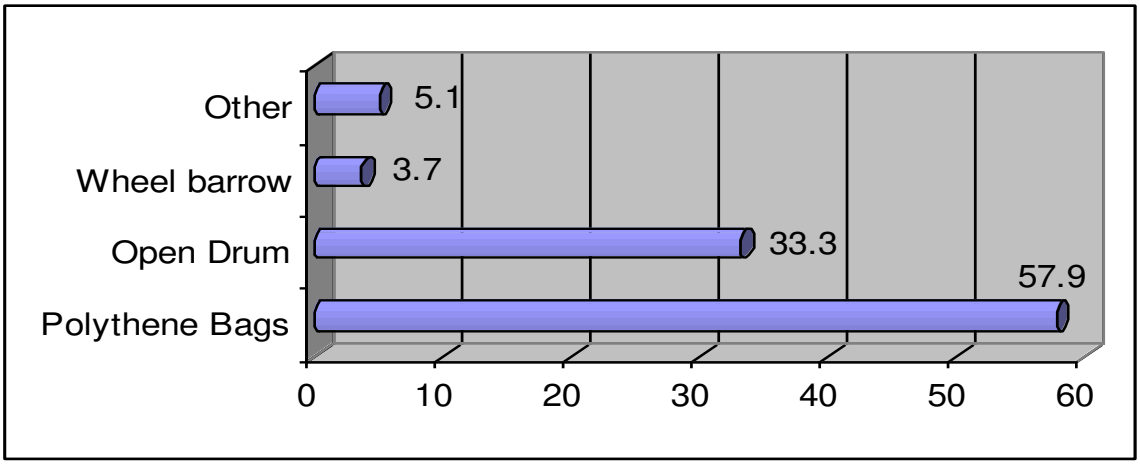

Figure 1: Method used for collecting waste at your home

Measuring HH's WTP for better SWM services was a major objective of this study. Survey revealed that forty nine percent of surveyed HH's were willing to pay for better SWM services if they were provided with improved SWM services. It is an encouraging situation which depicts the potential for improvement in the service level and also shows the revenue raising potential in this sector.

Once it is certain that public is demanding better services and is WTP for it, it would be important to note down the range in which HHs willingness to pay, falls. For this purpose, the HHs WTP is categorized as depicted in Figure 2. Out of the given response, the highest proportions of HHs were WTP in the range of Rs 100 per month/HH for an improved SW collection, transportation and disposal services. The rest of the WTP can be categorized as 26.3, 24.2, 13.5 and 6.9 percent per month/HH for Rs. 200, Rs. 150, Rs. 50 and Rs. 250 respectively. Thus, it can be summarized that majority of the HHs were WTP in the range of Rs. 100 to Rs. 200 per month in return for

environmental friendly SWM services. This indicates that people want to contribute to achieve better living standards and to save environment.

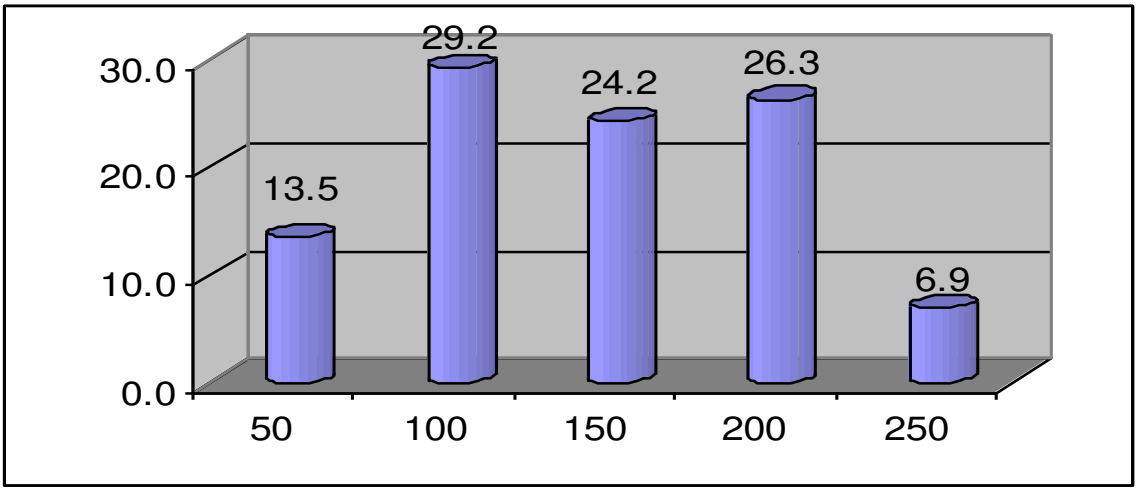

Figure 2: HH's WTP for improved SWM services

Once it is observed that half of the surveyed HHs are not willing to pay, it is essential to find out reasons for which they deny any monetary contribution. Therefore it was tried to investigate reasons and public concerns which are enlisted in Table II. Survey revealed very interesting results. As the survey was conducted only in the urban areas of the district majority of the people (53 %) portrayed that they are satisfied with the existing SWM services. This is reflective of the fact that TMAs at Peshawar are doing good job. The second most observed reason for avoiding monetary contribution for better SWM services was that twenty eight percent of the HHs thought that government is responsible to ensure the availability if basic amenities to its masses. Third major concern (14 %) was that the proposed services will not be provided consistently and thus the new system would not be reliable. While the least observed concern was that public was not satisfied with the quality of the services provided by the TMAs. This gives us a clear picture into the issue zero WTP.

Table II: Reasons for not contributing for an improved SWM service (Percentage)

Don't like the Municipal Corporation	5.2
Satisfied with existing system	53
Government responsibility to provide such service	27.8
Service would probably not be reliable	13.9

To ensure better SW collection and to lessen hazards attached with its mismanagement, waste bin availability play a crucial role. According to the survey only 17.8 percent of the HHs pointed out that government has installed waste bins in their area.The survey being conducted in the urban areas where TMAs are providing SWM services, seventy two percent of the HH's stated that TMA workers do collect waste in their areas. This is reflective of the fact that TMA is extending their services to majority of its jurisdictions.

Similarly, 50% of the respondents suggested to contact the households for the improvement current solid waste situation. 69.4 % respondents suggested to use community mobilization as source of awareness about solid waste and 14.8 % of HH's recommended television for this purpose.

ESTIMATION

Summery statistics of important variables

Mean income of the sample HH is calculated to be Rs. 4237.75 per month. The variables of Model along with summery statistics are described at Table III.

Table III Summery statistics of important variables

Variable	Obser-vation	Mean	Standard Deviation	Min	Max	95% Conf. Interval]	
						Min	Max
Per capita income per month	216	4237.75	3493.95	950	26041.67	3769.169	4706.342
Disease history	98	0.454	0.499	0	1	0.387	0.521
HH size	216	6.58	3.07	2	22	6.17	7
Non zero WTP	104	143.75	64.87	50	300	131.13	156.36
Maximum WTP	216	68.89	84.97	19	300	57.59	80.377

Estimation Results

In order to estimate the determinants of HHs WTP for improved SWM services, the contingent valuation model was used to note down public stated perception. Having a categorical dependent variable, the binomial logit regression is employed for the economic quantification of HH's WTP.Software "Stata 9" has been used for estimation in

this study. Education is the most important variable in the given analysis. Education is always considered as a crucial factor to achieve higher degree of awareness. According to the results obtained, higher education positively affects HH's WTP for improved SWM services. Within the given categories for education, the highest education i.e. post graduate has a positive and significant relationship with the given HH's demand for better SWM services. This indicates that as the number of highly educated family member increases, family will be more willing to contribute for better services. Thus higher education has significant influence upon public WTP.

Income is another very important determinant of HH demand for any service. With the increase in family income people can spare money for improvement in their living standards. Results exhibit that HH which are in the third income quartile are WTP to get better SWM services. Thus people who fall in the upper middle class are willing to have better manage solid waste and want to contribute monetarily for this purpose. The other two income categories i.e. Q2 and Q4 failed to represent any significant relationship with WTP. Nevertheless, it is still understandable because those HH which falls in the second income quartiles might be left with no money after fulfilling their basic necessities. Thus they will find it hard to spare money for other social issues. On the other side, HHs that come under the fourth income quartile have often careless attitude or they are already spending a fair amount of money to get their home and surroundings clean. Thus if proper motivation and persuasion is achieved, there is great possibility that they will become willing to contribute in monetary terms for better SWM services.

Another important variable discussed in the regression is the HH size. There is a statistically significant relationship between HH size and HH WTP for SWM services. Among the other variables, awareness regarding the need for SWM and disease history of the HH are considered and included in the regression. However, these two variables failed to establish statistically significant relationship with the dependent variable. The overall model is fit as the p values shows in the Table IV

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Table IV Marginal effects of binomial logit regression

Independent Variables	Coefficient	Std. Err.	Z	P value
Constant	-2.7112*	0.8462	-3.2	0.001
Metric (Highest level of education of HH)	0.0376	0.5793	0.06	0.948
Graduation (Highest level of education of HH)	0.4029	0.6142	0.66	0.512
Post graduation (Highest level of education of HH)	1.1554***	0.6144	1.88	0.06
Q2 (Second income quartile)	0.4829	0.4307	1.12	0.262
Q3 (Third income quartile)	0.9291**	0.4452	2.09	0.037
Q4 (Fourth income quartile)	0.27	0.4778	0.57	0.572
HH size	0.2209*	0.0678	3.25	0.001
Awareness	0.0827	0.5938	0.14	0.889
Disease History	0.4353	0.3118	1.4	0.163
Log likelihood				-130.65
Number of observation				216
LR chi2(10)				37.68
Prob > chi2				0.0000

Similarly the results show 49% of the sample HHs are willing to pay for better solid waste management services in urban areas of district peshawar.Interstingly 53% of respondents were found satisfied with the existing SWM services.

CONCLUSION AND RECOMMENDATIONS

Summarizing the discussion it can be concluded that SWM services in district Peshawar are better although not up to the mark. According to the regression results education, income and HH size are the important determinants of HH demand and consequently their WTP for better SWM services. There is lacking awareness among the HHs as it failed to establish any significant statistical relationship with HH Willingness to pay, despite the huge claim of being aware. These types of claims are normally observed in the surveyed analysis as respondents feel social pressure while exhibiting some information.

The following recommendations are made on the basis of study findings to improve the SWM services in urban areas of District Peshawar.

i. Channels identified for achieving higher awareness should be followed to motivate public towards better solution.
ii. Furthermore, although TMAs are doing good job in the urban areas, there is a need to extend such services to the surrounding rural areas as well which are sharing the burden of urbanization
iii. Government should go for material management behavior inspite of management of solid waste. There are certain valuable items, which can be retrieved easily from the collected waste, if desired.
iv. Recycling plants should be set up, which will generate employment generating opportunities as well as will help in environment friendly disposal of solid waste.
v. HH's are found willing to pay for better SWM services, therefore government should take initiatives to satisfy HH's and tap their WTP which will result in lessoning their burden.
vi. Efforts should be made for community mobilization for better SWM.

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