HOUSEHOLD'S WILLINGNESS TO PAY TO IMPROVE URBAN WASTE COLLECTION SERVICES: A CASE STUDY OF SELECTED AREAS OF RAWALPINDI

By

Syed Farhan Raza

Reg. No. PIDE2017/FMPHILENV06

Supervised by

Dr. Hafsa Hina

Department of Environmental Economics

Pakistan Institute of Development Economics

2019

Pakistan Institute of Development Economic

CERTIFICATE

This is to certify that this thesis entitled: **"Household's Willingness to pay to Improve Urban Waste Collection Services: A Case Study of Selected Areas of Rawalpindi."** submitted by Syed Farhan Raza is accepted in its present form by the Department of Environmental Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree in **Master of Philosophy in Environmental Economics**.
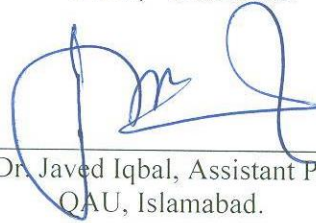
Supervisor:
_____
Dr. Hafsa Hina
Assistant Professor
PIDE, Islamabad.

External Examiner:
_____
Dr. Javed Iqbal, Assistant Professor
QAU, Islamabad.

Head,
Department of Environmental Economics
_____
Dr. Abedullah
Head
Department of Environmental Economics
PIDE, Islamabad.

Dedicated to

MY BELOVED FAMILY

And to my wife Mehwish Kazmi

Whose Lovable attitude and Sincere Passion always compel me to do something new and innovative!

ACKNOWLEDGEMENT

First and foremost, I thank Allah, The Almighty for enabling me to perceive my ambitions and objectives. No one can achieve success in this world without his consent and blessing. I am deeply indebted to Dr. Hafsa Hina for her reading numerous drafts of this dissertation. I cannot thank her enough for the time she dedicated to insure that I successfully complete this dissertation. I would like to extend special thanks to all my friends who stood beside me at every moment. I would also like to thank my parents, I am forever thankful for their love and support.

ABSTRACT

Respectable and Vigorous life is still unresolved issue to the most of people of developing countries including Pakistan. Solid waste collection is a serious environmental problem in developing countries and it consumes a large portion of municipal budget.. One fifth of the world population living in South Asian countries and struggling for healthy life. As an emerging country like Pakistan, has no barring to that state. Proper sanitation system is big challenge to better life especially in developing countries. This study has focused on how people respond towards solid waste collection services by valuing their willingness to pay, perception, behavior, and opinion. The study follows contingent valuation method and Severity Index for assessment of responses. Where severity index has different approach over responses. It has descriptive approach. Primary data used in this study with the help of questionnaire which is based on open ended questions in district Rawalpindi. Two areas are selected which are DHA 1 and Tench Bhatta. The objective of this research is to discover the household's willingness to pay for better solid waste collection services, effectiveness of current system and level of patronage of solid waste collection services. There are three income groups. High, low and middle income group used to estimate the results by binary logistic and multiple logistic regression. In high and middle income group income is significant and positively associated with willingness to pay. Income is statistically insignificant in low income group.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

WTP	Willingness to pay
CVM	Contingent valuation method
HH	House hold
SWM	Solid waste management
SW	Solid waste
EPA	Environmental protection agency
Medrole	Media role
ownHH	Ownership of household
HHSIZE	Household size
PSP	Private sector participation

Chapter 1

INTRODUCTION

1.1. Introduction

Uncontrolled urbanization, increasing size of population, high living standard and exploitation of resources are causing environmental damages (Minghua *et al.,* 2009). Poor solid waste management is one of the main problems of environmental degradation (UN, 2000). SW management can be defined as, the waste which is generated from anthropogenic activities and cannot be recycled. Solid waste management becomes a complex issue in developed and developing countries where rapid urbanization takes place (Madina *et al* 2010). This issue become severe where there is lack of community discussion, poor management and financial resources.

According to Cairncross (1993), developed countries generate double waste as compared to developing countries because of industrialization, but due to inadequate waste management in developing countries they are facing consequences in term of poor health specially in children. In most of the countries the common perception is that government is responsible to manage the waste. Sujauddin *et al.* (2009), reported that waste management is the responsibility of municipal government and most of the time they are failed to deliver safe and healthy environment to inhabitants due to insufficient finance. As a result of limited government revenue, there are increasingly focus on identification of specific revenues generation for waste collection and encourage the participation of private sector (Banga *et al.,* 2011). In all over the world, developing and transition countries waste management considered to be a responsibility of the government that financed by general revenues (Longe *et al.*, 2009). According to Longe and Williams (2006), in Nigeria different sources to collect the household's waste which is mixed and after that dispose without segregation and sorting. Delgado *et al.*

(2007) waste which is generated from the household contain toxic waste including expired drugs, broken class and syringes that contribute in serious health and environmental hazard. The willingness to pay put direct negative and positive impact on consistency of any solid waste collection strategy (Epp and Mauger, 1989, Rahman *et al*., 2005). Longe and Ukpebor (2009) examined that pricing of solid waste collection in developing countries is not suitable where the authentic size of household waste is rising without being treated. According to Anjum (2013), Solid waste collection in Pakistan is a substance of serious concern as 5 million people die each year owing to waste-related ailments. In Pakistan irregularly 20 million tons of solid waste is produced yearly, with annual growth rate of about 2.4 percent. All main cities, are facing massive challenges in undertaking the problem of urban waste. According to Haider (2012), Pakistan being a developing country where the waste collection is the biggest problem. Due to poor system it is difficult for the government to rectify the proper waste collection. There is scarcity of resources specifically in case of Pakistan. Waste management put enormous impact on environmental quality. The situation of waste management in case of Pakistan is unsatisfactory. Health related issues are also cause to motivate the WTP specifically in developing country like Pakistan.

1.2. Problem Statement

Due to lack of appropriately designed research studies on this issue, the problem of solid waste collection, in all over the country and particularly in metropolitan cities has been increasing over the years. Presently, the task of solid waste collection comes under the auspices of concerned municipalities. There are two area of study in which different organizations work. Tench Bhatta is the congested area of Rawalpindi in which waste collection service is not satisfactory. The main problem facing by the people of Tench Bhatta is the less availability of dust bin in the area. Mostly people through their left

over on the sides of the road due to this the scenic beauty of this area is not good. On the other hand DHA 1 is the well-organized area of Rawalpindi under the private organization. The main objective to do survey in DHA 1 is to check whether people willing to pay if they are satisfied with the existing service.

1.3. Objectives of the Study

The objectives of study are to

1) Examine the household's willingness to pay for three income groups' high, low, and middle incomes. To analyze opinion and perception of people on existing services.

2) Determine the factors that encourage household to pay for better waste collection services.

3) To check the level of patronage of solid waste collection services.

1.4. Motivation of the Study

Whenever we think about "environmental health" then we think about the quotation of Hazrat Muhammad (P.B.U.H) "Cleanliness is half of faith". The 1st motivational factor is that Islam promotes cleanliness.

Being a developing country Pakistan facing serious environmental damages due to this reason natural resources are in enormous pressure. According to EPA (2005), being a developing country Pakistan faces serious environmental degradation, annual population growth rate of a country is 2.6% while on the other hand annual GDP growth rate in 2004-05 is 6 percent per year so this situation put massive burden on the financial resources of a country. There will be some factors which will determine willingness to pay for solid waste management. Ecological disaster is another problem which is faced by Pakistan, due to this issue health problems are increased day by day. There are many

stakeholders include directly or indirectly causing this problem Mustafa (2011). The main problem with this issue is low allocation of budget for waste collection in Pakistan. People dispose their waste in the open space which cause damage scenic beauty and also cause environmental degradation, sometime the garbage burn on the road side which also cause serious illness (from survey). This study can motivate issues related to waste collection and survey can bring awareness among the people. According to the survey people have not much concerns about the waste dumping after collecting from households.

1.5. Significance of the Study

The areas which are selected are urban areas of Rawalpindi that are Tench Bhata and DHA1. Tench Bhatta is the biggest bazar of Asia there is no proper waste management people are not satisfied with the existing services (VisitPak 2014). RWMC is the waste management company whose main purpose is to provide services. Mostly people of Tench Bhatta are not well educated and have low incomes (Survey). Their WTP is also less because of low income. DHA phase 1 is the area of well-educated people and well aware about waste management issues. The waste management services in this area are satisfactory but people are willing to pay more to get better services.

Awareness is critically important to bring positive changes towards waste management. There is no focus group discussion in these areas. Mustafa (2007); Anjum; (2012) Haider; (2014) analyzed the WTP of solid waste management by using binary logistic regression and CVM survey method to collect data from respondents. This study has new methodology that is Severity Index along with binary logistic regression. In severity index there is a way to show perception, opinion and patronage of respondents

towards solid waste management. This methodology has focus on descriptive statistics through likert scale.

There is a need of community participation and government should take initiative to educate the people about SWM because this is a major environment degradation.

1.6. Organization of the Study

In Chapter 1 we have discussed introduction, objectives of the study and significance of the study. In chapter 2 literature review is discussed. In chapter 3 we discuss methodological and theoretical framework. In chapter 4 we discuss results and discussion. In chapter 5 conclusion and policy recommendation are discussed.

CHAPTER 2

LITERATURE REVIEW

Solid waste disposal is one of developing countries ' common problems. It has become a challenge to the reliability of the environment. Naeem and Suleman (2013), test the Peshawar WTP for risk of environmental quality and care for this hazard as well. PEPA (2005), originates from the lack of competent and organized management of the community, transport and disposal of the SW of the household. Management is another problem for Pakistan year after year that the problems get worse than before, causing serious damage to health. The main cause of this issue is poor management of SW. Rathai (2007), estimated the per day waste in Mumbai city. According to him about 6256 tons' waste is gathered in Mumbai every day and MCGM is responsible to collect waste. However, as time passes the time required to pick up the waste has become critical issue and is causing serious health and environmental damages.

WWFP (2001), in Pakistan, Municipal SW is generally gathered in bins on the road sides and urban management provides preparations for its assortment occasionally. According to the survey 0.6 to 0.8 kg waste produced per capita on the daily basis and 2.4% on yearly basis and 40% of waste still in the bins on the road sides and no proper collection of this waste sometime it burns on the road sides or in open place due to this act lot of diseases are found in the people those living in these areas. Another serious environmental damage is that there are different SW but there is no proper policy to collect it separately. In Pakistan, urbanization is the cause of SWM because more people are moving towards cities due to lack of facilities in rural areas like facility of education etc.

Arlosoroff (1991) explained that urban population of developing countries almost 1 million live in urban areas. Chodhuary (1999), using the contingent valuation method

to check the WTP for clean drinking water the objective of the study is to provide the basic necessities of life without affecting the health of people. Mostly developing countries have less availability of resources due to this there is poor system of SWM.

Belhaj (2003) followed the CVM survey in which the inhabitants of Rabat and Sale, Morocco, measured the benefits related to clean air. Khorshiddoust (2004) used CVM to calculate the WTP for environmental conservation in Tabriz, Iran. The main purpose of this study is to estimate the public participation of Tabrazian population for the problems of environment which is generated due to raising living standard and increased population.

Kumar *et al.* (2013) took primary and secondary data of 400 households to measure community perception, attitude and willingness towards waste management in city of Bangalore, India. The results showed that 63% of households are willing to participate for improved solid waste management and 97.8% respondents preferred collection on daily basis. Whereas 82.5% households preferred segregating solid waste into different bins (only in case the bins are provided by Government or Non-government organizations). About 71% household are willing to use those products which are recyclable. Author suggested that for the reduction in the problem of waste management, there should be penalties, implementation of the law and environmental awareness programs.

Mustafa et al (2007) empirically estimated the household WTP for safe drinking water in Abbottabad district by applying CVM and aversive behavior approach through multivariate logistic model. Three classes of the respondents were made based on income level and the whole study sample of 455 was separated in two blocks according to area as urban and rural areas results reveal that education level has direct relationship

between different categories of willingness to pay and is statistically significant. The income level of household has insignificant effect on willingness to pay, this shows that willingness to pay of the people for safe drinking water is not directly influenced by their income levels. Results show that urban population has more willingness to pay than that of rural population.

In Pakistan, Municipal solid waste is generally collected from roadside bins and town management makes arrangements for its collection irregularly. On the average 0.6 to 0.8 kg per capita and per day is created in Pakistan. Likewise, the growing rate of Solid Waste is 2.4% per year. Captivatingly, 40% of total produced waste leftovers at collection points, in roads or drains side. It is typically burnt in open space. The household waste is typically composed by the town and transported over the town trucks and directly to a landfill place. A hazardous rehearsal is that diverse forms of the solid waste are not treated separately and there is no proper preparation for its harms. Solid waste management difficulties in Pakistan enlarged due to growth of population and unceasing movement of people from rural areas (World Wildlife Fund Pakistan 2001).

In Pakistan waste collection is speedily growing problem and a complex issue. There are multiple ways to explain it. First and primarily, it narrates to environmental problem.

Wastes sites poison all sectors of environment, comprising soil, water and air. The waste issue becomes more complex and severe, most of the people of the nearby wastes zones belong to the very poor class, illiterate, absence of awareness and additionally through no health care amenities around. Kids of all ages play all over the place at waste dumps and are uncovered to illness producing bacteria, viruses and danger to their health. Waste is an appreciated reserve, if properly re-used & recycled. Waste from one

manufacturing industry could be recycled as raw material for alternative industry (Khawaja 2016).

In low and middle income countries total deaths occurred because of environmental pollution are about 8.4 million people, 10% of which is supposed to be because of polluted wastes place (UNEP SDG Fact Sheet 2015 & WHO 2012 report)

According to Environmental Protection Agency (EPA) study around 20 million tons of solid waste is created in Pakistan maximum of which is thrown in open space, close to water forms, agriculture land and marketplaces. There is no requirement to effort and work out the exact substantial from the waste generation industry, health care part, agriculture and household left-over and to help give info grounded on exact production of waste so that policy and act strategy to environmentally thorough management are similar. Massive quantity of municipal solid waste that is released from industrial organizations is not treated properly.

According to the opinions of Mahar, Malik, Qadir, Ahmed, and Khan (2007) in Islamabad, Lahore, Faisalabad and Peshawar due to rapid movement of people from rural to urban areas, growth rate and usual highest growth rate of population and growing per capita income may take for granted in growing demand for the establishment of mandatory infrastructure and public facilities. Pak-EPA (2004) on average 387.6 tons/day waste is produced in Islamabad and Rawalpindi city and the treatment for gathering is very little that is less than 60 percent. The waste which is not collected is a risk for the residents.

According to Nisar (2010) in Pakistan, solid waste is mostly composed by municipal administration and efficiently collection compares from 0% in rural zones to 90% in high-income urban zones. In isolated areas, where the only source to dispose of solid

waste is often hunting by people and animals and burning the waste at the main point is not a formal way to dispose of and also illegal.

According to Ali *et al. (*2010), the collection of solid waste in Rawalpindi city is that generated waste range between 51% and 69% and uncollected waste which remains on streets, corner of the roads and in open space is 49% to 31%. The waste which is not collected also causes the blockage of draining system.

Many factors directly and indirectly, affect solid waste collection issues. Socio economic characteristics are important to check the WTP for solid waste collection. Where the people are educated they shows concerns to waste issues and environmental degradation.

Anjum (2013), analyzed the WTP for solid waste management services and using the simple random sampling taking the 500 respondent of Islamabad city and examine the behavior of people toward the present situation of SWM issues. Whenever increased the offer price people are less willing to pay. The results shows that 64.4% showed their interest to improve environmental quality and they are willing to pay for clean environment.

Julius et al. (2017), originate the study in Zimbabwe on the improvement of solid waste management with context of rural to urban migration. Researchers claimed that in every community solid waste problem is common.

Nkansah *et al.* (2015), conducted cross sectional survey in which 156 household sample used in Tema Metropolis using Contingent Valuation Method in Ghana. To estimate the determinants of willingness to pay for improved solid waste management tobit regression model was used. There was conclusion that income, educational level,

number of dependents, size of household influences the willingness to pay for improvements in sanitation.

Naeem *et al.* (2013), conducted a study to find out willingness to pay for solid waste management in district Peshawar, Pakistan. Binomial regression model was used in this study. The estimations were carried out by using statistical packages SPSS. The regression results indicated that income of households, education, awareness, household size and disease history have significant impact on willingness to pay.

Major findings show that plastic and ash constituents are in waste bulk and study shows that there is positive relationship between waste collection and income of households. This logistic regression model concluded that household head, education level, location that is away from the main roads, willingness to pay of households, access to waste services which are running by private means and awareness on waste collection.

There are several studies conduct on this issue. The major issue in developing countries is poor management. Bureaucratic hurdles, inadequate waste management equipment, lack of urban planning, and low public awareness contribute to the problem. Local and municipal governments are responsible for collecting waste throughout most of Pakistan's major cities. Developed countries facing same issue like developing countries but they have resources to handle these issues.

Chapter 3

DATA AND METHODOLOGY

3.1. Introduction

This chapter briefly explains the theoretical framework of willingness to pay for solid waste collection service in section 3.2. After that section 3.3 presents the appropriate econometric methodology for empirical analysis which includes multiple logistic regression methodology and methodology of severity index. Section 3.7 will provide detail on collection of survey data from two different locations of Rawalpindi.

3.2. Theoretical Framework

CVM is the direct method used to estimate the WTP of the people and to value the nonmarket goods. This technique simply used to estimate the environmental quality of any good in monetary term and also generate the imaginary market in which patterned the maximum WTP of people to advance well facilities (Anjum, 2013).

Using a simple questionnaire, CVM measures the price of the good by asking various people to check how much cost is acceptable for any non-market good (Haider, 2014). The main objective of the CVM method is to estimate the individual willingness to pay and willingness to accept and also check what changes occur due to change in quality and quantity of any good and services.

Solid waste is a factor that have negative effect on the environment by worsening the living conditions of the people living around. Improper waste collection have negative impacts on environmental degradation. Health hazards are other serious problems. It is difficult to estimate the value causes for the environment and people,being a non-market good Malik and Jehangir (2008). This study follows the economic model of SWM

developed by Haq, *et al*. (2008) and Mustafa, *et al.* (2009) in order to figure out the main factors that determine the public WTP.

In economics, individuals have preferences beyond goods from both market and nonmarket places. These preferences are showed over their utility functions. Consumer wants to accomplish their utility from quality and quantity of goods and services consumed under their specific budget limitations. Thus the utility function can be written as:

$$U\ (w,\ g) \dotfill (1)$$

w = waste management

g = composite of all market goods

Whereas the expenditure function is:

$$e\ (p,\ w,\ u) \dotfill (2)$$

Where p = prices and u = utility

Equation 2 is the expenditure functions that represent the lowest sum of cash the buyer basically spends to achieve the agreed level of utility. This is aggregate function of 'p' and 'u' and diminishing function of 'w' when there is proper waste management then expenditures on health decreases. Most of people want to achieve agreed level of utility within their lowest budget.

Consequently, customer wants to stay with the equal utility, it is suitable to practice spending minimization issue.

$$Min\ (Pw.w + g) \dotfill (3)$$

$S.t\ U = (w,\ g)$

Where prices of composite goods are equal to one ($Pg=1$).

13

The minimization problem can be set by implementing Lagrange's multiplier to achieve Hicksian demand for the analogous goods.

The Hicksian demand is assumed by:

$$h_i = h_i (p^w, u^*) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

Substituting the values of matching Hicksian demand in the lowest expenditure function we can compute the least expenditure function:

$$e^* = e (p, w, u^*) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5)$$

Where "e" is minimum expenditure required to achieve fixed level of utility "u*" and using the waste management "w", and is the function of price of other goods, the fixed level of utility and the quality of SWM services itself.

The derivative of expenditure function with respect to price give equivalent Hicks Compensated demand function for good under deliberation.

$$\partial e/\partial p_i = h_i (p^w, u^*) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

WTP for the change in SWM services is the integration of marginal WTP to attain improved waste management from "w" to "w*"

$$WTP = -\int^{w*} \partial e (w, u^*)/\partial w. \, Dw \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$

WTP is the full amount of money a buyer would contribute to gain an enrichment in the value of life due to better SWM. The WTP for the improved SWM is:

$$WTP = e (p, w, u) - e (p, w^*, u) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (8)$$

Where, "*w*" is a contaminated level of waste management and "*w**" is a better level of SWM.

Now taking into account the other factors that determines the HH's WTP, may include household's features and demographic characteristics. Therefore, to incorporate all possible features of WTP the economic model is presented as

$$WTP_i = \alpha_i + \alpha_1(H_i) + \alpha_2(D_i) + \alpha_3(A_i) \dots\dots\dots\dots\dots\dots\dots\dots \text{ (9) Where:}$$

WTP = HH's willingness for better *SWM*.

H_i = Household features (Highest education level of the HH, income level of the HH and HH size).

D_i = Demographic characteristics of the Households (Type of house, House ownership)

A_i = Awareness about effects of improper SWM.

3.3 Econometric Methodology

Logit regression is the statistical model in which one or more independent variables used to predict the binary output. In this study the variable of interest is WTP, which is dependent and dichotomous.

Suppose the numerical values of 0 and 1 are assigned to the two outcomes of a binary variable. Often, the 0 represents a negative response and the 1 represents a positive response. The mean of this variable will be the proportion of positive responses. If p is the proportion of observations with an outcome of 1, then 1-p is the probability of an outcome of 0. The ratio p/ (1-p) is called the odds and the logit is the logarithm of the odds, or just log odds. Mathematically, the logit transformation is written,

$$(Y_i = 1) = [1 + \exp(X_i b)]^{-1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (10)}$$

Where Y_i is the state of cell i, X_i is a vector of the predictor variables for cell i, and b is a vector of coefficients to be estimated. The term on the right side of the equation is the logit transformation, that is, the logarithm of the odds.

3.4. The Multiple logistic Regression Model

It is an extension form of binary logistic model where the responses of people are come in continuous form like 1, 2 and 3. It is also called categorical variable where we made the categories of reference group to interpret the results.

3.5. Severity Index Model

Collection of data will be focused on straight household survey management in order to get information on occupant's over-all view on behavior and awareness on household waste (HHW) handling and management, waste collection services, patronage, and willingness to pay for such waste collection services. This severity index is based on descriptive statistics and have no link with WTP. There are a lot of studies in which only econometrics term used to estimate the variables but in severity index we are analyzing the household willingness to pay through three sections. (i) Opinion and perception on SWM system (ii) opinion on WTP for waste collection (iii) opinion on patronage of SW collection services.

The questionnaire is organized conferring to the Likert Scale in order to quantify the strength of the respondent's view on the household waste collection matters under consideration (PageBuchi, 2003; Isa *et al*., 2005; Uebersax, 2006). The respondents provided with numerous declaration choices such as strongly disagree, disagree, neutral, agree, and strongly agree. By likert's method, behavior of person is restrained by joining (adding or averaging) their responses through all items. Then in order to access the general attitude of respondents to solid waste collection services. Answers to questions will be shown on a 0 to 4 point Likert Scale while the severity index calculated using the following equation after Al-Hammed & Assaff (1996):

$$SI = \sum_{i=0}^{4} a_i x_i \Big/ 4 \sum_{i=0}^{4} x_i \, (100\%) \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots (11)$$

Where:

a_i = the index of a class; constant expressing the weight given to the class

x_i = the frequency of response i = 0, 1,2,3,4 and described as below: where:

x_0, x_1, x_2, x_3, and x_4 are the frequencies of response corresponding to $a_0 = 0$, $a_1 = 1$, $a_2 = 2$, $a_3 = 3$, $a_4 = 4$, respectively.

0 = strongly disagree, 1 = disagree, 2 = neutral, 3 = agree, 4 = strongly agree

After calculating the severity index by using equation (11) is compared with the rating classification:

Strongly disagree	0.00----12.5
Disagree	12.5----37.5
Neutral	37.5----62.5
Agree	62.5----87.5
Strongly agree	87.5----100

3.6. Data Description and Methodology

In this section we have discussed the data and methodological framework which will be used for the further analysis. The study is based on primary data collection from urban areas of Rawalpindi. For this purpose, we have used the simple random sampling. The available services of waste management provided by the government is not satisfactory. Two areas are selected for studies i.e. Tench Bhatta and DHA 1. Tench Bhatta is the congested area of Rawalpindi where the people are not satisfied with the existing services of solid waste collection. Usually people of Tench Bhatta are the vendors they run their small business to earn the money and the survey data shows that in this area people are not highly educated. Government services are also not provided to people and they don't care where the waste dispose of directly.

Tench Bhatta residential have complained about the existing waste collection services the garbage drain in to water which cause the harmful impact on health while garbage bins are full and left over on the road. Tench Bhatta is under the authority of RCB. A survey was conducted to check and find out the composition of waste to recover and provide the facilities Pak EPA (2016). According to RCB (Rawalpindi cantonment board) it is responsibility to every sanitation staff to improve the standard of cleanliness and citizen to play the best role and improve the scenic beauty which is good for the eye vision. According to them 56 large and small vehicles are used to collect garbage in 12 area of Rawalpindi on the daily basis and in cant areas 600 trash trollies are used to collect the garbage (RCB 2018).

The main goal to concentrate on this area of study is that people are not much conscious of the environmental degradation and are also less worried about it. This research also conducted to give indicators to the government that how the situation is going on and how could be destructive it is.

While on the other hand DHA is not a congested area at all. It is full of facilitates provided by private organization. Park, hospital and schools are near to home. So in this area people are concerned with waste collection services. DHA 1 is the area of high income people. They are more aware and educated (from survey). In this study two areas are selected because we want to see that how is the situation under the government and private sectors and what the factors are which determines willingness to pay for two different localities. RCB is regulatory authority in Tench Bhatta and DHA 1 is under the private authority.

3.7. Survey Methodology

This study conducted survey in two areas of Rawalpindi Tench Bhatta and DHA 1. These areas have different socio economic characteristics. All areas ' respondent has different environmental destruction ratings. And each pay different sums to the waste collection system as well. There are different responses that come from the respondent in term of "Yes" or "No" for the payment of specific amount per month to give the safe disposal services.

Discrete choice type questions are used in questionnaire to see the behavior of people and also check out the concerns of asked question by the respondent "are you willing to pay" for any "X" "Y" "Z" amount of money to get better waste management services.

If the respondent rejected the first bid then go for less. Then less amount to check the WTP if respondent rejects the bids then asked question "how much average willingness to pay". At the end we give open handed question to the respondent to check maximum and minimum Willingness to pay. Three bids are used. In Tench Bhatta Rs. 150, Rs. 200, and Rs. 250 for the waste collector service. In DHA 1 Rs. 500, Rs. 800, and Rs. 1000 to collect waste. Three income groups are made and to check how the different income groups respond. From the survey, it is cleared that HH's belonging to DHA 1 are high income group. Whereas, in Tench Bhatta HH's are either belonging to low income or middle income group. This heterogeneity restrict to construct single regression analysis on whole data. Data will be divided into three sets low, middle and high income group. Therefore, binary logistic regression will be preferred separately.

3.8. Sample Selection

This study is conducted in the selected areas of Rawalpindi. The simple random sampling used to collect the data. The sample size which is selected for the survey is direct method by using Pakistan Bureau Statistics (PBS). The population size of Rawalpindi is 1,927,612 in 1998 and 3,258,547 in 2017. The sample size of 219 is determined by 95% confidence interval using sample calculator. The detailed questionnaire is attached in annex. The HH's in all respective areas are selected by simple random sampling.

CHAPTER 4

RESULTS AND DISCUSSION

4.1. Introduction

This chapter discusses the behavior of variable toward solid waste collection services. Respondent's opinion and perception on solid waste management system by Severity Index explained in 4.2. Before presenting the results of logistic regression the description of important variables are presented in section 4.3. Binary logistic regression results and interpretation is discussed in 4.4. Multiple logistic regression results and interpretation is discussed in 4.5 Marginal effects of binary logistic regression and interpretation is discussed in section 4.6.

4.2. Respondent's opinion and perception on solid waste management system by Severity Index

Table 4.1 presents the calculated values of severity indices related to public opinion and perception on solid waste collection services. The values between 34.07 and 79.42%. In this section there are mixed reviews of respondents. Value 40.2% lies in range which shows neutral opinion and perception. The value 34.07% lies in range which shows they are disagree with the services of solid waste collection services. The value 79.42% shows that people agree to provide with nylon bags by private sector.

Table 4.2 presents severity index values obtained range between 27.98 and 76.54% on respondent's opinion on WTP for waste collection services. The value 76.54% shows that people are agree for willing to pay for the waste they generate. The value 27.98% shows those respondents opinion who are disagree to pay because the value of this index lies in range of disagree. The value of index 76.54% shows that people are agree to the concept that more income will encourage more payment because 76.54% value lies in

range of agree. The value 38.25% lies in the range of neutral which shows that respondents are giving neutral opinion about price charged by private sector is too high.

Table 4.3 Severity results of patronage of solid waste management services show that patronize the PSP operators have SI value of 34.73% lies in the range of disagree shows that respondents are disagree to patronize the private sector participation. While those who engage the services of dust bin have SI value of 34.51%, respectively. It also shows that respondents are showing that they are disagree. The data of severity index is on combined survey data from Tench Bhatta and DHA 1.

Table 4.1: Respondents' opinion and perception on solid waste management system

Frequency Analysis

Item		(SD) 0	(D) 1	(N) 2	(A) 3	(SA) 4	SI
1. There is an organized waste disposal program	NR	62	65	29	48	22	40.26
	PR	27	28	12	21	8	
2. I enjoyed the services in my area	NR	66	86	19	36	19	34.07
	PR	29	38	8	16	8	
3. Nylon bags should be provide to people by PSP	NR	0	13	22	90	101	79.42
	PR	0	5	9	40	44	

(NR): Number of respondents, (PR): percentage of respondents, (SD): Strongly Disagree, (D): Disagree, (N): Neutral, (A): agree, (SA): Strongly agree,

Table 4.2: Respondents' opinion on willingness to pay for waste collection Services.

Item		(SD)	(D)	(N)	(A)	(SA)	
		0	**1**	**2**	**3**	**4**	**SI**
1. Ready to pay for the disposal of waste I generate	NR	8	2	41	92	83	76.54
	PR	3	0.8	18	40	36	
2. I am not ready to pay	NR	83	74	42	13	14	27.98
	PR	36	32	18	5	6	
3. Earning more income will encourage payment	NR	4	6	40	98	78	76.54
	PR	1	2	17	43	34	
4. Amount charged by PSP indicators is too high	NR	57	81	25	37	26	38.25
	PR	25	36	11	16	11	

Table 4.3: Respondents opinion on patronage of solid waste collection services

		(SD)	(D)	(N)	(A)	(SA)	
		0	**1**	**2**	**3**	**4**	**SI**
1. I patronize the PSP operators	NR	74	76	11	44	21	34.73
	PR	32	33	4	19	9	
2. I engage the services of Dust bin in my area	NR	76	76	15	30	29	34.51
	PR	33	33	6	13	12	

4.3. Qualitative Assessment of Public's Willingness to Pay for Better Solid Waste Management

This section presents the descriptive analysis from the data and also present trend of data. Descriptive statistics shows the behavior of people toward any problem, here we highlight the environmental problem. Different variables are used for demographics characteristics, socio-economic characteristics and many other factors that cause more willingness to pay from the residences. As discussed earlier that there is heterogeneity among the locations due to different income levels. The heterogeneity among the groups are visualized by the scatter plot of income, presented in Figure 4.1. Therefore, three income groups are made to estimate the willingness to pay of people. Low income group, middle income group and high income group. In the low income group the income of people are 20000 to 40000. In middle income group the income of people are 50000 to 80000. In high income group income of people lies between 75000 to 2, 30000. Total 219 respondents from Tench Bhatta and DHA 1. According to the results in Tench Bhatta Maximum age is 66 and minimum age is 20. Total 36% were male respondent and 63% were female respondent. Another important factor is the level of education. About 20% respondents had matriculation. While 39% respondents had intermediate. While 24% respondents had graduation. There are 12% respondents who had masters. M.Phil. scholars are 1%. Minimum household size is 2 and maximum household size is 10. Minimum income is 20,000 and maximum is 80,000. In DHA 1 results show that there are Maximum age is 49 and minimum age is 19. Total 26% were male respondent and 64% were female respondent. Another important factor is the level of education. About 15% respondents had matriculation. While 23% respondents had intermediate. While 23% respondents had graduation. There are 19% respondents who had masters. M.Phil.scholars are 19%. Minimum household size is 2 and maximum household size is 10. Minimum income is 75,000 and maximum is 2, 30,000.

Demand for solid waste collection services has different responses where respondent give their response back on three bids to improve the environmental quality. Whenever there is increase in the amount of bid people respond differently and it also shows that how people behave when amount of bid increases and the quality of waste collection improved.

Table 4.4 shows the summary descriptive for the variables used in Tench Bhatta

Variable Name	Distribution	Total (Year)
Age	Minimum	(20)
	Maximum	(66)
Gender	Male	53
	Female	93
Education in a HH	No education	0
	Matric	30
	Intermediate	58
	Graduate	36
	Masters	18
	M.Phil.	02
House structure	Semi-cemented	08
	Cemented	138
HH size	Minimum	2
	Maximum	10
Income	Minimum	20,000
	Maximum	80,000

Table 4.4.1 shows the summary descriptive for the variables used in DHA 1

Variable Name	Distribution	Total (Year)
Age	Minimum	(19)
	Maximum	(49)
Gender	Male	26
	Female	47
Education in a HH	No education	0
	Matric	11
	Intermediate	17
	Graduate	17
	Masters	14
	M.Phil.	14
House structure	Semi-cemented	0
	Cemented	73
HH size	Minimum	2
	Maximum	10
Income	Minimum	75,000 PKR
	Maximum	2, 30,000 PKR

Table 4.5. High income group Bid 1 is 500, there are 47.9% people who are not willing to pay for waste collection service and 52.1% people are willing to pay. Bid 2 is 800, show the same results as in bid one. Bid 3 is 1000, there are 61.6% people not willing to pay and 38.4% people are willing to pay. This is because most of people were satisfied with the existing services therefore percentage of willing to pay is less.

Figure 4.1
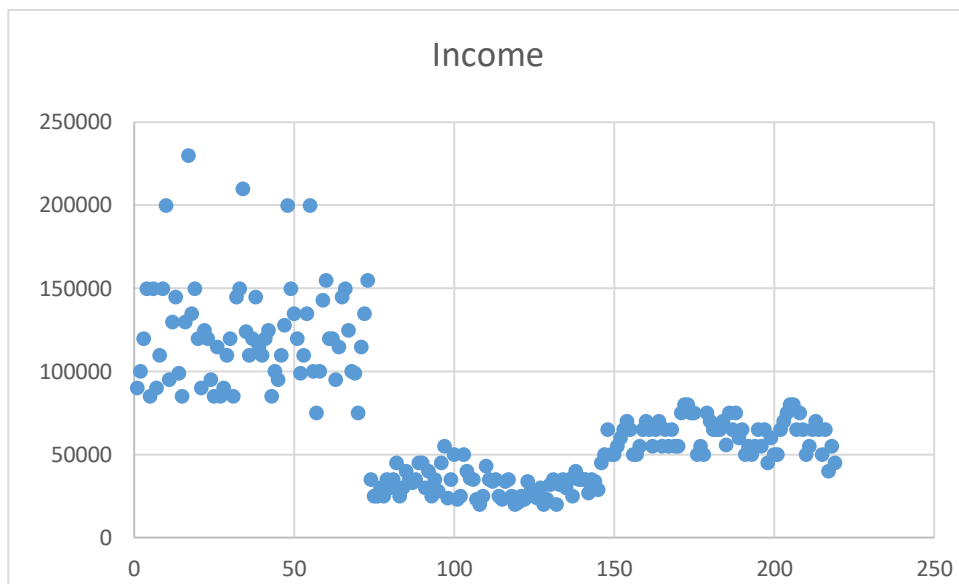
High Income Cluster   Low Income Cluster   Middle Income Cluster

Average willingness to pay in high income group is 957 PKR. Zero is excluded from this data because here it indicates that people are already satisfied with existing services. In low and middle income group average willingness to pay is 119 PKR. Here zero is not excluded because it shows that people are not willing to pay. There is Heterogeneity in the data which restrict to construct the clusters of income.

Table 4.6. Low income group bid 1 is 150, there are 53.4% people are not willing to pay and 46.6% people are willing to pay. Bid 2 is 200, shows the same results as in bid one. Bid 3 is 250, where 79.5% people are not willing to pay and 20.1% people are willing to pay.

Table 4.7. Middle income group bid 1 is also 150, where 52.1% people are not willing to pay and 47.9% people are willing to pay. Bid 2 is 200, where the results are same as in bid one. Bid 3 is 250, where 65.8% people are not willing to pay and 34.2% people are willing to pay.

4.5 High Income (DHA 1)

	Bid 1 (500)	WTP
	Frequency	Percent
0	30	41%
1	43	59%
Total	73	100%
	Bid 2 (800)	**WTP**
0	42	58%
1	31	42%
Total	73	100%
	Bid 3 (1000)	**WTP**
0	47	64%
1	26	35%
Total	73	100%

4.6. Low Income (Tench Bhatta)

		Bid1	WTP
		Frequency	Percent
	0	31	43%
	1	42	57%
	Total	73	100%
		Bid 2	**WTP**
Valid	0	38	53%
	1	35	47%
	Total	73	100%
		Bid 3	**WTP**
Valid	0	47	65%
	1	26	35%
	Total	73	100%

4.7. Middle Income (Tench Bhatta)			
		Bid 1	**WTP**
		Frequency	Percent
Valid	0	33	48
	1	40	54%
	Total	73	100.0
		Bid 2	**WTP**
Valid	0	35	58%
	1	38	52%
	Total	73	100%
		Bid 3	**WTP**
Valid	0	45	62%
	1	28	38%
	Total	73	100%

4.4. Willingness to pay

Willingness to pay is how consumers will spend their money to get any good and service on limited prices. In middle income group (Tench Bhatta) in figure 4.2 when the bids starts from 150 the lower price at Rs 150 Per month the whole set of respondents 52% percent are willing to pay this lowest amount for solid waste management services. Then the bid price is increased previously offered the next set of respondents are asked for Rs. 200 per month, so in this set 41% percent of the respondents showed their willingness for paying this amount. Further, the bid amount is increased to find the percentage of respondents willing to pay an amount of Rs. 250 per month for collection services, in this set 35% percent of the respondents showed their willingness. In low income group (Tench Bhatta) figure 4.3 bid start from Rs 150 per month from respondents 54% are willing to pay. At Rs. 200 there is 43% respondents are willing to

pay. Further the bid amount increases to Rs 250 there are 38% respondents are willing to pay. In high income group (DHA 1) figure 4.4 when the bids starts from 500 the lower price at Rs 500 Per month the whole set of respondents 58% percent are willing to pay this lowest amount for solid waste management services. Then the bid price is increased previously offered the next set of respondents are asked for Rs. 800 per month, so in this set 42% percent of the respondents showed their willingness for paying this amount. Further, the bid amount is increased to find the percentage of respondents willing to pay an amount of Rs. 1000 per month for collection services, in this set 35% percent of the respondents showed their willingness. This confirms that an increase in the price for waste management services will substantially reduce the demand for such services. This phenomena is also in line with the theory of demand as the price for (solid waste management services) increases, demand for these services reduces.
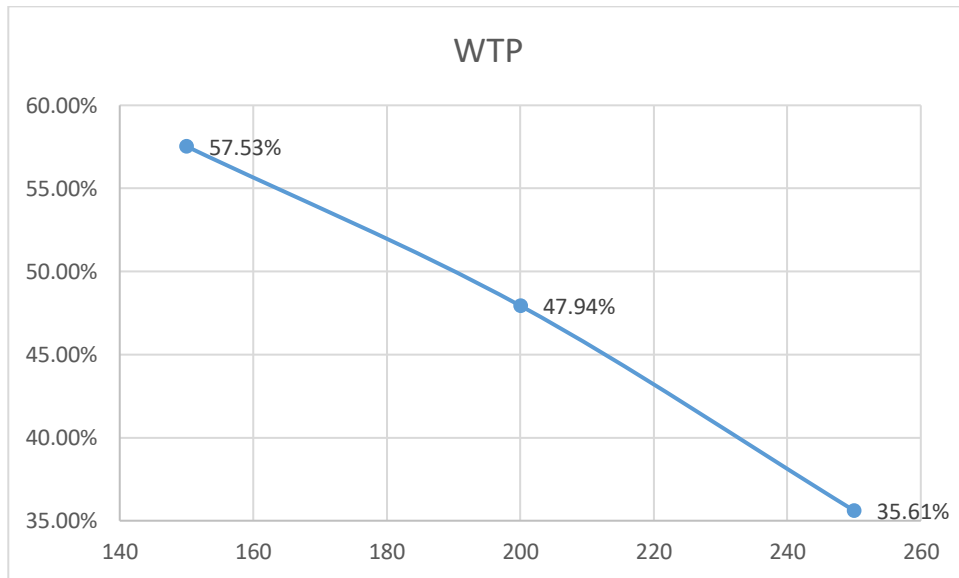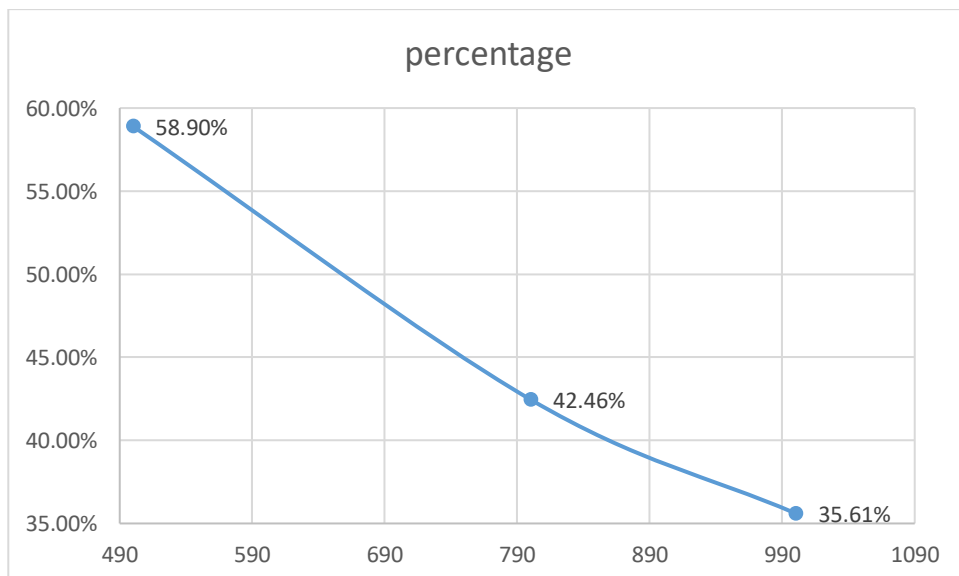
Middle income group

Figure 4.2
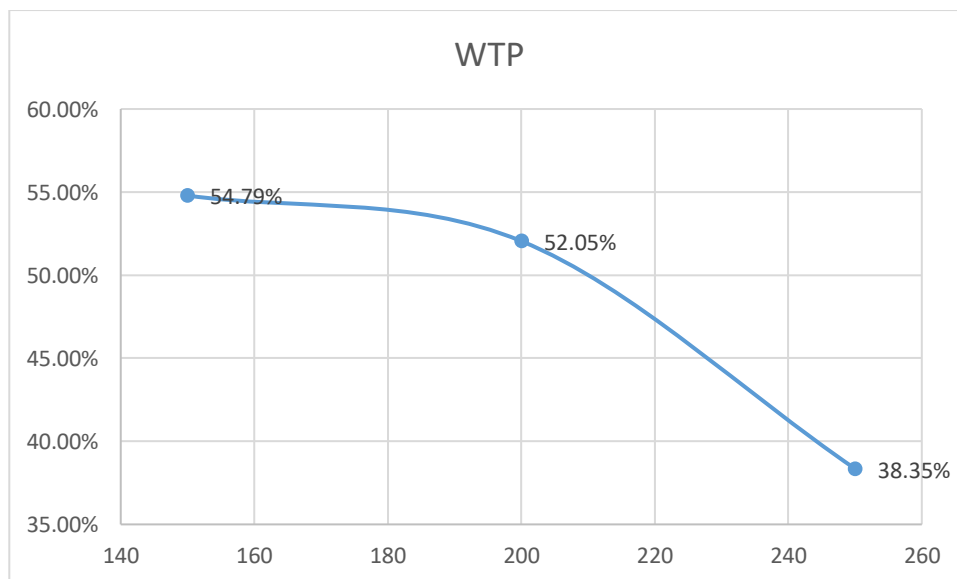
Low income group

Figure 4.3

High income group

Figure 4.4

4.5. Binary Logistic Regression and Interpretation

Binary logistic is the statistical model which is widely used to estimate the relation between dependent and independent variables where the dependent variable is in the form of 0 or 1.

Table 4.8 presents logistic interpretation of high income group from DHA 1. The results shows that odds ratio value for Gender is 11.04 this suggests that male as compared to reference category which is female are more willing to pay. Ownership of household has odds ratio value of 3.889 positively associated with willingness to pay, this shows that owners of houses as compared to reference category are more willing to pay, and there will be increase in willingness to pay. This is statistically significant. The age has a negative association with willingness to pay, we can say that if all other variables are held constant if there is increase in age, willingness to pay reduces and it is statistically insignificant. Odds ratio depicts that if age increases by one unit they are .985 times unwilling to pay. If there is increase in income then willingness to pay increases. Income and willingness to pay has positive association. Odds ratio shows that if income increases they are 13.04 times willing to pay. Education has positive association with willingness to pay. If education increase then willingness to pay will be increased. It is statistically insignificant. Odds ratio showing that if education increase by one year then they are 1.134 times willing to pay. The effect of education is statistically insignificant. Mstatus has positive association with willingness to pay, odds ratio 4.54 suggests that people who are married as compared to reference category are more willing to pay than unmarried. It is statistically significant. Media role has positive association with willingness to pay, if Media role increase there will be increase in willingness to pay. It is statistically insignificant. According to odds ratio they are 1.464 times willing. The effect of media role is statistically insignificant. HHSIZE has

33

positive association with willingness to pay, if household size increase then there will be increase in willingness to pay. It is statistically insignificant. Odds ratio 1.140 shows that if HHSIZE increase they are 1.140 times willing to pay. The effect of HHSIZE is statistically insignificant.

Table 4.9 presents logistic interpretation of middle income group from Tench Bhatta. The results shows that odd ratio value for Gender is 6.33 suggest that male as compared to reference category are more willing to pay than female. It is statistically significant and showing positive association between gender and wtp. OwnHH has positive relationship with willingness to pay, this is showing that if there is increase in OwnHH, willingness to pay will be increased. It is statistically significant. Odds ratio 3.77 suggests that owners of houses as compared to reference category are more willing to pay. Age has negative association with willingness to pay. It is statistically insignificant. If age increases then wtp reduces. Odds ratio is showing if there is increase in age then people are .964 times unwilling. Income has positive association with willingness to pay, if all other variables held constant we can say if there is increase in income, willingness to pay increases. It is statistically significant at 1 percent level. Odds ratio shows that if income increases people are 9.321 times willing to pay. The education has positive association with willingness to pay, if education increases there will be an increase in willingness to pay. Odds ratio shows that if education increases people are 1.264 times willing to pay. The effects of education is statistically insignificant. Mstatus has positive association with willingness to pay. Odds ratio 5.68 suggests that married people as compared to reference category are more willing to pay than unmarried. It is statistically significant. Medrole has negative association with willingness to pay, if Medrole increases, willingness to pay reduces. It is statistically insignificant. Odds ratio shows that if Medrole increases people are .834 times unwilling. The variable HHSIZE

has positive association with willingness to pay, if HHSIZE increases, there will be increase in willingness to pay. It is statistically insignificant. Odds ratio suggest that if there is increase in HHSIZE people are 1.073 times willing to pay. The effect of HHSIZE is statistically insignificant.

Table 4.10 presents logistic interpretation of low income group from Tench Bhatta. The results shows that odds ratio value for Gender is 6.62 suggests that male as compared to reference category are more willing to pay than female. It is statistically significant. Ownership of household has Odds ratio value of .647 suggests that owners of houses as compared to reference category are more willing to pay. The effect of this variable is statistically insignificant. The age has a negative association with wtp, if age increases, willingness to pay reduces. It is statistically insignificant. Odds ratio suggests that if age increases people are .987 times unwilling. The income has positive association with willingness to pay. If there is increase in income, willingness to pay increases. It is statistically insignificant. Odds ratio shows that if income increases people are 4.524 times willing. The effect of income is statistically insignificant. Education has positive association with willingness to pay. If there is increase in education, willingness to pay increases. It is statistically insignificant. Odds ratio suggests that if education increases people are .097 times willing to pay. The effect of education is statistically insignificant. Mstatus has positive association with willingness to pay. It is statistically significant. Odds ratio 19.95 suggests that married people as compared to reference category are more willing to pay than unmarried people. Medrole has negative association with wtp. If Medrole increases, willingness to pay reduces. It is statistically insignificant. Odds ratio is showing that if media role increases people are .934 times unwilling. HHSIZE has positive association with willingness to pay, if HHSIZE increases, willingness to pay increases. It is statistically significant. Odds ratio suggests that if HHSIZE increases

people are 1.515 times willing to pay. Average willingness to pay in high income group is 957 PKR. Zero is excluded from this data because here it indicates that people are already satisfied with existing services. In low and middle income group average willingness to pay is 119 PKR. Here zero is not excluded because it shows that people are not willing to pay.

There are differences in results of three income groups under same variables. For example, income is statistically significant in high and middle income group and in low income group it is statistically insignificant.

4.6. Marginal Effects of Binary Logistic Regression and Interpretation

Table 4.8 presents marginal effects of high income group DHA 1, gender has a coefficient value of .496, According to regression results, willingness to pay will be increased by 49 percent. It is statistically significantly affects WTP. OwnHH has coefficient value of .320. If there is increase in own HH then willingness to pay increases by 32 percent. It is statistically significantly affects willingness to pay. Age has coefficient value of -.003, results shows that if age increases willingness to pay reduces by 3 percent. It is statistically insignificantly affects WTP and has negative association with willingness to pay. Income has a coefficient value of .001, it shows that if there is increase in income then willingness to pay will be increased by 1 percent. It is significantly affects WTP. Education has a coefficient value of .030 which shows that if education increases then WTP increases by 3 percent. It is statistically insignificantly affects WTP and has positive association. Mstatus has coefficient value of .350, according to results, it has positive association with WTP and statistically significant. Willingness to pay 35 percent increases. Medrole has coefficient value of .092, shows that if media role increases then willingness to pay increases by 9 percent.

HHSIZE has coefficient value of .031, shows that willingness to pay increases 3 percent if HHSIZE increases. It is statistically insignificant.

Table 4.9 presents marginal effects of middle income group from Tench Bhatta, gender has coefficient value of .402, shows that if gender increases then WTP increases by 40 percent. It is statistically significantly affects WTP. OwnHH has coefficient value of .313, results shows that if ownership of household increases, WTP increases by 31 percent. It is statistically significantly affects WTP. Age has negative association with WTP. It has coefficient value of -.009, which shows that if age increases, WTP reduces by 9 percent. It is statistically insignificant. Income has coefficient value of .001, results shows that if income increases, there will be increase in WTP by 1 percent. It is statistically significant at 1 percent level. Education has coefficient value of .057, shows that if education increases, WTP increases by 5 percent. It is statistically insignificantly affects WTP. Mstatus has coefficient value of .396, results shows that WTP reduces by 4 percent. It is statistically insignificant. Medrole has coefficient value of -.044, shows that WTP reduces by 4 percent. HHSIZE has coefficient value of .017, if household size increases, WTP increases by 1 percent. It is statistically insignificant.

Table 4.10 presents marginal effects of low income group from Tench Bhatta, gender has coefficient value of .403, shows that willingness to pay increases 40 percent if gender increases. It is statistically significantly affects WTP. OwnHH has coefficient value of -.103, results shows that if ownHH increases then WTP reduces by 10 percent. It is statistically insignificant and has negative association with WTP. Age has coefficient value of .043, shows that if age increases willingness to pay reduces 4 percent. It is statistically insignificant and has negative association. Income has coefficient value of -.001, shows that if income increases WTP reduces by 1 percent. It

is statistically insignificantly affects WTP. Education has coefficient value of .023, results shows that if education increases, WTP increases by 2 percent. It is statistically insignificant. Mstatus has coefficient value of .600, shows that WTP will be increased by 60 percent. It is highly statistically significant. Medrole has coefficient value of -.016, shows that if media role increases then WTP reduces by 1 percent. It is statistically insignificant and has negative association. HHSIZE is statistically significantly affects willingness to pay. It has coefficient value of .099, results shows that if household size increases, WTP increases by 9 percent

Table 4.8 Binary logistic results and marginal effects of high income for willingness to pay

High Income Group Logistic Results			Marginal Effects of High Income Group		
Variables	Coefficient	P-value	Odds- R	dy/dx	p-value
Gender	2.402	.019	11.04	.496	0.001
OwnHH	1.358	.062	3.889	.320	0.048
Age	-.016	.618	.984	-.003	0.618
Income	5.236	.064	13.035	.001	0.062
Edu	1.25	.359	1.133	.030	0.361
Mstatus	1.513	.046	4.539	.350	0.030
Medrole	.381	.594	1.464	.092	0.592
HHSIZE	.131	.459	1.140	.031	0.460
Constant	-1.328	.643	.265		

Table 4.9 Binary logistic results and marginal effects of middle income for willingness to pay

Middle Income Group Logistic Results			Marginal Effects of Middle Income Group		
Variables	Coefficient	P-value	Odds-R	dy/dx	P-value
Gender	1.844	.061	6.325	.402	0.018
OwnHH	1.324	.069	3.760	.313	0.052
Age	-.037	.265	.964	-.009	0.264
Income	2.150	.146	9.321	.001	0.146
Edu	.235	.229	1.264	.057	0.230
Mstatus	1.736	.032	5.677	.396	0.017
Medrole	-.182	.808	.834	-.044	0.808
HHSIZE	.070	.684	1.073	.017	0.684
Constant	-7.051	.043	.001		

Table 4.10 Binary logistic results and marginal effects of low income for willingness to pay

Low Income Group Logistic Results			Marginal Effects of low Income Group		
Variables	Coefficient	P-value	Odds-R	dy/dx	P-value
Gender	1.889	.082	6.615	.403	0.028
OwnHH	-.435	.635	.647	-.103	0.630
Age	-.013	.694	.987	-.043	0.693
Income	2.240	.839	4.524	-.001	0.839
Edu	.097	.601	1.102	.023	0.604
Mstatus	2.993	.005	19.942	.600	0.001
Medrole	-.068	.929	.934	-.016	0.929
HHSIZE	.415	.047	1.515	.099	0.047
Constant	-4.233	.245	.015		

4.7. Multiple Logistic Regression Results and Interpretation

Table 4.11 represents the results of multiple logistic regression from high income group DHA 1. Multiple regression is widely used to explain the relationship between dependent and independent variables in which there are several explanatory variables predict the outcome of a responsive variable. It is used when we predict value of variable which is based on two or more other variables. Age has a coefficient value of -.004 shows people are less willing to pay than zero. Age is continuous variable and it's coefficient has a negative sign which shows that as age increases the people are less willing to pay This is because people of DHA 1 are already satisfied with existing waste collection service so as age increases it could not put significant impact on willingness to pay. Dika et al (2019) explains that age is statistically insignificant to wtp the main reason behind that we think people who are mature more concern to their future generation but after some data collection we can see that young people are more aware and concern about the waste collection and say yes to more willing to pay as compare to old ones. Income has a coefficient value of .002 it is showing that people are more willing to pay than zero. Education has a coefficient value of -.096 which shows that people are less willing to pay than zero. HHSIZE has a coefficient value of .148 shows respondents are more wtp than zero. Gender variable has a coefficient value of -1.640 which is less than zero shows that male are less willing to pay as compared to female than zero. OwnHH has .271 coefficient value shows that people who have their own houses are more willing to pay as compared to those who do not have their own houses. Mstatus has a coefficient value of -3.300 which is showing that people who are married are less willing to pay as compared to unmarried people. Medrole has a coefficient value of -.609 which is less than zero and people are less willing to pay.

Table 4.11 presents Age has a coefficient value of -.018 which shows that people are less willing to pay than zero. Education has a coefficient value of .180 shows that people are more wtp than zero. HHSIZE has a coefficient value of .105 shows that people are more wtp than zero. Gender has a coefficient value of -2.702 which is less than zero shows that male are less willing to pay as compared to female. OwnHH has a coefficient value of -1.713 which is less than zero showing that people are who have their own houses are less willing to pay as compared to those who do not have their own houses. Mstatus has a coefficient value of -.906 which is less than zero shows that people who are married are less willing to pay as compared to unmarried. Medrole has a coefficient value of -.252 less than zero shows that people are less willing to pay

Table 4.11 Parameter Estimates of high income group

Variables	Coefficient	Std.Error
Intercept	-6.858	4.902
Age	-.004	.046
Income	.002	.000
Edu	-.096	.201
HHSIZE	.148	.245
gender	-1.640	1.302
OwnHH	.271	1.200
Mstatus	-3.300	1.335
Medrole	-.609	1.112
Intercept	3.606	3.443
Age	-.018	.033
Income	.000	.000
Edu	.180	.149
HHSIZE	.105	.188
gender	-2.702	1.080
OwnHH	-1.713	.795
Mstatus	-.906	.869
Medrole	-.275	.746

Table 4.12 presents multiple logistic regression results from middle income group Tench Bhatta. Age has a coefficient value of -.019 which shows people are less willing to pay than zero. Income has coefficient of .001 which shows people are equally willing to pay. Education has a coefficient of .259 which shows people are more willing to pay than zero. HHSIZE has a coefficient value of .083 which show that people are more willing to pay than zero. Gender has coefficient value of -.929 less than zero is showing male are less willing to pay as compared to female. OwnHH has a coefficient of -1.291 which shows that people who has their own houses are less willing to pay as compared to those who do not have their own house. Mstatus has a coefficient of -1.153 less than zero which shows that people who are married are less WTP as compared to unmarried. Medrole has coefficient value of .216 greater than zero which shows that people are more willing to pay.

Table 4.12 presents Age has coefficient of -.067 which shows that people are less willing to pay than zero. Income has coefficient of .001 which shows that people are equally willing to pay. Education has a confident of .177 which shows that people are more willing to pay. HHSIZE has a coefficient value of .027 which shows that people are more willing to pay than zero. Gender has a coefficient value of -2.319 which is less than zero shows that male are less willing to pay as compared to female. OwnHH has a coefficient value of -1.376 which is less than zero shows that people who have their own houses are less willing to pay as compare to those who do not have their own house. Mstatus has a coefficient value of -2.765 which is less than zero shows that married people are less willing as compared to unmarried. Medrole has a coefficient value of -.728 less than zero which shows that people are less willing to pay.

4.12 Parameter Estimates of middle income group

Variables	Coefficient	Std. Error
Intercept	-7.268	3.872
Age	-.019	.036
Income	.001	.000
Edu	.259	.209
HHSIZE	.083	.197
gender	-.929	1.123
ownHH	-1.291	.833
Mstatus	-1.153	.885
Medrole	.216	.824
Intercept	-3.486	4.740
Age	-.067	.042
Income	.001	.000
Edu	.177	.259
HHSIZE	.027	.214
gender	-2.319	1.080
ownHH	-1.376	.930
Mstatus	-2.765	1.068
Medrole	-.728	.959

Table 4.13 presents multiple logistic results from low income group Tench Bhatta. Age has a coefficient value of .015 shows that people are more willing to pay than zero. Income has a coefficient value of .001 shows that people are equally willing to pay. Education has a coefficient value of .129 shows that people are more willing to pay than zero. HHSIZE has a coefficient value of 1.169 shows that people are more willing to pay than zero. Gender has a coefficient value of -22.834 less than zero shows that male are less willing to pay as compared to female. OwnHH has a coefficient value of 23.472 greater than zero shows that people who have their own houses are more willing to pay as compared to those who do not have their own houses. Mstatus has a coefficient value of -4.096 less than zero shows that married people are less willing to pay than unmarried. Medrole has a coefficient value of -.993 less than zero shows that people are less willing to pay.

Table 4.13 presents Age has a coefficient value of -.020 shows that people are less willing to pay than zero. Income has a coefficient value of .001 shows that people are equally willing to pay than zero. Education has a coefficient value of .194 shows that people are more willing to pay than zero. HHSIZE has a coefficient value of .223 shows that people are more willing to pay than zero. Gender has a coefficient value of -1.531 less than zero shows that male are less willing to pay as compared to female. OwnHH has a coefficient value of -.734 less than zero shows that people who have their own houses are less willing to pay as compared to those who do not have their own houses. Mstatus has a coefficient value of -2.619 less than zero shows that people who are married are less willing to pay than unmarried. Medrole has a coefficient value of .250 greater than zero shows that people are more willing to pay.

So we can conclude that age is negative in high income group. Then positive in low income group and again negative in middle group. In high income group results shows that if age increases the willingness to pay decreases. Age is negative in middle income group shows that people are less wtp when age increases. Age is positive in low income group which shows that if age increases willingness to pay increases. Income is positive in all income groups. The results shows that if income increases willingness to pay increases. Education is negative in high income group. According to the results education will not lead to the more willingness to pay. Education is positive in middle and low income group. Which shows as education increases wtp increases.

4.13 Parameter Estimates of low income group

Variables	Coefficient	Std. Error
Intercept	-9.736	7.647
Age	.015	.065
Income	.001	.000
Edu	.129	.293
HHSIZE	1.169	.466
gender	-22.834	2.221
ownHH	23.472	.000
Mstatus	-4.096	2.310
Medrole	-.993	1.522
Intercept	.238	4.050
Age	-.020	.035
Income	.001	.000
Edu	.194	.196
HHSIZE	.223	.234
gender	-1.531	1.096
ownHH	-.734	1.087
Mstatus	-2.619	1.047
Medrole	.250	.813

Chapter 5

CONCLUSION AND POLICY RECOMMENDATION

This chapter mainly focus on the major findings are obtained from techniques applied by taking in to account WTP. The variables which are used to interpret the results are income, education, household size, age, gender, household ownership and marital status. Two models used to show different results. Binary logistic model used to check the significance and insignificance of variables. Another model is severity index in which there are descriptive statistics.

5.1. Conclusion

Being a developing country Pakistan facing severe environmental damages. The main objective of this work to highlight the issues which are facing by people of Rawalpindi. For this purpose, contingent valuation survey was conducted to collect data from the selected areas of Rawalpindi. The people of Tench Bhatta are running their small businesses so basically they are middle class and low income class residents and have not much concern towards the environment. Age gives maturity. Aged people have more concerns because they are conscious for their families and themselves as well. But results shows that age is statistically insignificant. Which shows that aged people have no concerns to pay for solid waste. Education is statistically insignificant with WTP. Which shows that it is not compulsory that education will give awareness. In DHA 1 people are more willing to pay. In Tench Bhatta all respondents are un-satisfied with the existing services. Due to less incomes and education they are not much willing to pay but some people who are well educated and have sufficient income are willing to pay. Which means more income and high education will lead to more willingness to pay. Severity index has different approach. In this model perception, opinion and behavior of people is obtained through likert scale. In this model there are mixed

reviews of respondents towards each question and this is what severity index is all about.

5.2. Policy Recommendation

- Existing waste collection services are not reliable for the citizen. So it is also responsibility of people to play important role through community participation. People needs focus group discussion to sort out their problems.

REFRENCES

Abedullah. (2006). Sources & Consequences of Environmental Pollution and Institutions Role In Pakistan. Journal of applied science, 6 (15), 3134-3139.

Afroz, R., Hanaki, K., & Hasegawa-Kurisu, K. (2009). Willingness to pay for waste management improvement in Dhaka city, Bangladesh. Journal of environmental management, 90(1), 492-503.

Alhassan, M., & Mohammed, J. (2013). Households' demand for better solid waste disposal services: Case study of four communities in the New Juaben Municipality, Ghana. Journal of Sustainable Development, 6(11), p16

Altaf, M. A., & Deshazo, J. R. (1996). Household demand for improved solid waste management: A case study of Gujranwala, Pakistan. World development, 24 (5), 857- 868.

Amfo-Otu, R., Debrah, W. E., Adjei, K. P., & Akpah-Yeboah, S. (2012). Willingness to pay for solid waste collection in semi-rural Ghana: A logit estimation. *International Journal of Multidisciplinary Research*, *2*(7), 40-49.

Anjum, R. (2013). Willingness to Pay for Solid Waste Management Services: A Case Study of Islamabad (No. 2013: 03). Pakistan Institute of Development Economics

Arene, C. J., & Mbata, G. I. (2008). Determinants of Profitability and Willingness to Pay for Metropolitan Waste-Use in Urban Agriculture of the Federal Capital Territory, Abuja, Nigeria. Journal of Tropical Agriculture, Food, Environment and Extension, 7 (1), 41- 46.

Begum, R. A., Siwar, C., Pereira, J. J., & Jaafar, A. H. (2006). Factors and values of willingness to pay for improved construction waste management – A perspective of Malaysian contractors. Waste management 27, 1902 – 1909.

Bhattarai, K. (2015). Households' willingness to pay for improved solid waste management in Banepa municipality, Nepal. *Environment and Natural Resources Journal*, *13*(2), 14-25.

Boateng, S., Amoako, P., Poku, A. A., Appiah, D. O., & Garsonu, E. K. (2016). Household willingness to pay for solid waste disposal services in urban Ghana: The Kumasi Metropolis situation. *Ghana Journal of Geography*, *8*(2), 1-17.

Chiemchaisri, C., Juanga, J. P., & Visvanathan, C. (2007). Municipal solid waste management in Thailand and disposal emission inventory. Environmental monitoring and assessment, 135(1-3), 13-20.

Chuen-Khee, P., & Othman, J. (2010). Household Demand for Solid Waste Disposal Options in Malaysia. International Journal of Business and Economic Sciences, 4 (2), 229-234.

E.O. Longe, O.O. Longe, E.F. Ukepebor (2009) people perception on household solid waste management in OJO local government area in Nigeria, Journal environmental health sciences vol:06 pp:201-208

Flex, B., & Olorunfemi. (2009). willingness to pay for improved environmental quality among Residents living in close proximity in close proximity in Lagos metropolis, Nigeria. Ethiopian Journal of environmental studies and management, 2 (3), 27-37

Guerrero, L. A., Maas, G., & Hogland, W. (2013). Solid waste management challenges for cities in developing countries. *Waste management*, *33*(1), 220-232.

Julius, M., Charles, N., & Mufandaedza, S. (2017). Determinants of willingness to pay For solid waste management in Gweru city, Zimbabwe. *Alanya Akademik Bakış*, *1*(3), 15-21.

Lema, Z., & Beyene, F. (2012), "Willingness to pay for improved rural water supply in GoroGutu District of eastern Ethiopia: An application of contingent valuation", Journal of Economics and Sustainable Development, 3(14), 145-159

Lohri, C. R., Camenzind, E. J., & Zurbrügg, C. (2014). Financial sustainability in municipal solid waste management–Costs and revenues in Bahir Dar, Ethiopia. *Waste Management*, *34*(2), 542-552.

Niringiye, A., & Omortor, D. G. (2010). Determinants of Willingness to Pay for Solid Waste Management in Kampala City. Current Research Journal of Economic Theory, 2 (3), 119-122.

Nisar, H., Ejaz, N., Naushad, Z., & Ali, Z. (2008). Impacts of solid waste management in Pakistan: a case study of Rawalpindi city. *WIT Transactions on Ecology and the Environment*, *109*, 685-691.

APPENDIX

Survey Questionnaire

This interview is made to you to undertake a research for the partial fulfilment of the award of MPhil degree in Environmental Economics. I would like to know about the environmental issues faced at the HH level in RAWALPINDI that is Solid waste management in the city. Your response will help policy makers to formulate an informed policy about improved waste management services. The interview will take a few minutes and the answers will be completely confidential and strictly for academic purpose. Thus, please answer the questions honestly and as truthfully as you can.

A. Household Details

1. **Name of the respondent:**

   ……………………………………………………………………

2. **Are you the head of the household**?　　Yes/No

3. **Name of the head of the house hold: …………………………………………………………….**

4. **Total members of the Household** …………; Male………….; Female……….. Children (6-14)………　　　　　　Kids (1- 5 years)...........; Infants (<1 year)..........

5. **Education of the HH head…**: Highest education among the members of the HH……..

   0. Illiterate; 1. Primary; 2. Middle; 3. Matric; 4. FA/FSc; 5. BA/BSc/BCS; 6. MA/MSc; 7. Above

6. **Total number of HH who are employed…………..**

7. **Employment status of Head of Household Head**

1　Unemployed	2.　Street Vendor/Small Informal Business
3　Government Employee	4.　Own Business
5　Private Employee	6.　Other

8. **Average Monthly Household Income**

9. **Do the members of the HH (>12 years) watch T.V.**

   1. Every day　　　　2. Once a week　　　　3. Once a month　　4. Almost never

51

10. **Do you think that media has raised your awareness about water, sanitation and solid waste management?**

   Yes   1   No   0   *(if yes cont. to Q.11)*

11. **What type of mass media component was more effective in generating your awareness?**

   a. Radio   2. Television   3. Newspaper   4. Social media

12. Marital status

   1. Married   2. Un-married

B. Demographic characteristics

12. **What type of house they lived in?**

   1. Paved   2. Semi- paved

13. **What is source of energy?**

   1. Coal burning   2. Natural gas   3. Wood fire

14. **Do you have electricity?**

   1. Yes   2. No

15. **House ownership**

   1. Own house 2. Rented

C. Household Waste Generation and Disposal

15. **In your opinion which of these is a priority concern about waste in the area (tick only)?** 1. Littering and looks bad   2. Effect on human health

   3. Effect on environment   4. Others……………….

16. **Can you roughly identify percentage composition of your generated waste?**

   a. Kitchen waste…………. %   2. Plastic …………%   3. Paper …………..%

   4. Solids ………………….%   5. Others …………. %

17. Do you separate different type of waste at your home?

Yes   1   No   0   *(if yes cont. to Q17)*

18. Would you do so if you are told by your collection service provider?

Yes   1   No   0

21. Are there any large bins in your area?

Yes   1   No   0

D. Garbage Collection Services

22. Do you have regular garbage collection in your area?

Yes   1   No   0   *(if no cont. to Q26)*

23. If yes, do you use it?

Yes   1   No   0   *yes/no (if no cont. toQ26)*

24. How often do you use the collection service?

    1.   Once a week

    2.   Other—specify……………………………………………

25. Which collection service do you use?

    a. Public   2. Private

    3. Other—specify…………………………………………….

26. How much do they charge per month?

Rs: ……………………. per month

27. Are you satisfied with your current waste collection service?

YES   1   NO   0

28. What is the main reason for your level of satisfaction/dissatisfaction?

    1. Costs   2. Unreliability

3. Improper collection   4. Reliable

5. Cooperative   6. Others

29. Do you separate different type of waste at your home?

Yes   1   No   0   *(if no cont. to Q.28)*

30. Would you do so if you are told by your collection service provider?

Yes   1   No   0

31. Do people dump their waste alongside the garbage bins instead of putting it inside those?

Yes   1   No   0   *(if no cont. to Q.30)*

32. If Yes, Why, in your opinion, people behave like this?

    a. Difficult to put waste inside the bin due to height of the bin

    b. Difficult to put waste inside the bin due to waste and litter spread around the bin

    c. Stray animals (dogs, mouse and birds etc.

    d. Any other reason   ………………………..

33. Please identify some of the main problems with the current solid waste management system?

Waste lying around   1   Odor   2

Rats   3   Flies   4

No problem   5   others – Specify: …….6

34. What is the distance between your house and dumping site?

    1. ………………. Meters

35. **Has anyone in your household suffered from any of these listed diseases during the last six weeks?**

Yes   1   Yes/No

No   0

1. Diarrhea	2. Dysentery	3. Dengue	4.Typhoid
5. Ringworm	6. Scabies	7. Cholera	8. Malaria
9. Cough	10. Asthma	11. Skin disease	12. Others……………………

36. **What are the main causes of environmental degradation in RAWALPINDI?**

_____

_____

37. **What are you more concerned about?**

    1. Air pollution,   2. Water pollution,   3. Waste pollution

    4. Damage to scenic beauty,   5. Noise pollution,   6.Others (specify)

E. Environmental Awareness

38. **This year, did you or any member of the family participate in any community cleanup activities or other voluntary cleanups?**

    1. Yes   0.   No

39. **In your opinion is waste management an environmental problem?**

    1. Yes   0   No

40. **Do you know how your service provider disposes your collected waste?**

    1. Yes   0   No

41. **Are you concerned about the disposal methods of the service provider?**

1. Yes   0   No

42. **Do you consider that environmental degradation has negative effect on your family?**

       1. Yes   0   No

43. **Do you think that leaving a better environment to future generations is something?**   0. Very important   1. Not important at all

F. Willingness to pay for Solid waste management

*Your household currently pays Rs. _____ per month for solid waste management. However, there is certain level of dissatisfaction regarding the service provision. If you are provided with door to door collection of solid waste (five days a week), weekly street/mohalla cleaning, weekly cleaning of intermediate waste bins and safe disposal of waste generated, would you be willing to pay **Rs. 150** per month for such services? Note that this amount would be in addition to your current monthly household expenditures, but you have than nothing extra to pay in this regards.*

YES   NO

If YES,

Will you be willing to pay **Rs. 150**?

YES   NO

If NO

Why Not?

1. You are satisfied with existing service   2. You cannot afford

3. You don't want to pay   4. Others: _____

Follow up Question: What is your Maximum/Minimum WTP, Rs: _____?

Severity Index

Classification of residential areas

Classification	Selected household
Low income area	73
Middle income area	73
High income area	73

Respondents' opinion and perception on solid waste management system

Item	Frequency Analysis				
	(SD)	(D)	(N)	(A)	(SA)
	0	1	2	3	4
1. There is an organized waste disposal program in my area					
2. I enjoyed the service of service provider in my area					
3. Nylon bags for waste collection should be provide to people free to people by PSP					

Respondent's opinion on willingness to pay for waste management services.

Item	Frequency Analysis				
	(SD)	(D)	(N)	(A)	(SA)
	0	1	2	3	4
1. I am ready to pay for disposal of waste I generate					
2. I am not ready to pay for disposal of waste I generate					
3. Earning more income will encourage payment for waste disposal services					

4. Amount charged by PSP indicators is too high	

Respondents' opinion on patronage of solid waste management services.

Item	Frequency Analysis				
	(SD)	(D)	(N)	(A)	(SA)
	0	1	2	3	4
1. I patronize PSP operators					
2. I engaged the services of cart pusher in my area					

Thanks for Your *Time*