ADDIS ABABA UNIVERSITY SCHOOL OF JOURNALISM AND COMMUNICATION

THE RESIDENT'S WILLINGNESS TO PAY FOR IMPROVED BETTER SANITATION, A CASE OF WOREDA 06, YEKA SUB-CITY, ADDIS ABABA.

BY

MELESE MULATUDEMILE
GSE/2477/10
0910303813

ADVISOR
AMANUEL ABDISA

A THESIS SUBMITTED TO THE DEPARTMENT OF PR AND STRATEGIC COMMUNICATION IN PARTIAL FULFILLMENT OF REQUIREMENTS FOR THE DEGREE OF MASTERS OF ARTS IN PR AND STRATEGIC COMMUNICATION

ADDIS ABABA, ETHIOPIA
JULY, 2020

DECLARATION

Addis Ababa University

School of Graduate Studies

This is to certify that the thesis prepared by Melese Mulatu, entitled the resident's willingness to pay for improved better sanitation, a case of woreda 06, yeka sub-city, Addis Ababa and submitted in partial fulfillment of the requirements for the Degree of Master of Arts in public relation and strategic communication. All the sources of materials used for this study have been properly acknowledged.

Signed by the Examining Committee:

Examiner_____ Signature_____ Date_____

Examiner_____ Signature_____ Date_____

Advisor_____ Signature_____ Date_____

_____

Chair of department or Graduate Coordinator

DEDICATION

To my mother Mrs. Zenebu Adugna

You are unique and irreplaceable to my family. You are still carrying our burden. I wish to have your kindness and strength.

Mom you rock!!

APPROVAL

Addis Ababa University

School of Graduate Studies

The undersigned certify that they have read and hereby recommend to Addis Ababa University to accept the Thesis submitted by Melese Mulatu, entitled "The resident's willingness to pay for improved better sanitation, a case of woreda 06, yeka sub-city, Addis Ababa", in partial fulfillment of the requirements for the award of a Master's Degree in (public relation and strategic communication).

Name of Supervisor…….

Signature…….

Date……

Name of Internal Examiner……

Signature…….……

Date…….

Name of External Examiner……..

Signature……...…….

Date……

Name of Head of Department……..

Signature…...……..

Date…….

ACKNOWLEDGEMENTS

First of all, I would like to thank my advisor Mr. Amanuel Abdisa for his continuous support and comments. Similarly, I appreciate my closest friend Mr. Wasihun Belay seiner economist in Ethiopian customs and revenue authority, for his kindly response. My deepest gratitude also goes to Mr. Dagnachew Yismashewa, trade and industry director in Yeka sub city werda 6, Thanks for giving me with all the support I wanted in this study. My special thanks go to Miss Alem Yemane, communication office leader of woreda 6, for all the support she has given me.

In particular, I thank my almighty Jesus Christ, who has been the source of my power and persistence.

BIOGRAPHY

The author was born in January 1982 in Addis Ababa, nearby Saint Michael church. He started his education at Kokebe Tsibah Elementary and secondary School at Addis Ababa around Kebena. He joined Kotebe metropolitan University in 1999 and graduated in Diploma in social science in July 2001. After his graduation, he continued his education and took BA degree in foreign language and literature from 2006 up to 2009 in the same university. He employed at Addis Ababa Wotatoch Genet School. He participated in different groups and institution like teaching Gospel at Saint Michael church and sport for health private group around Megenagna. After these eight years effective service in the organizations mentioned above, he came to Addis Ababa University in 2010 to pursue his study in Public relation and strategic communication for MSc. Degree.

The author is not married

Email melesemulatu7@gmail.com

Phone 0910303813

GLOSSARY

***Idir*:** Commonly it is prevalent sort of funeral grouping in Ethiopia, where assets are organized and pooled to get emotional and material support up on a death of the member himself, his dependents or relatives.

***Iqub*:** A voluntary, informal, and local form of circling saving and credit scheme, where each member gives a mutually agreed amount of money on weekly or monthly basis. In such schemes, each member is entitled to receive the collected lump sum once as per his contribution.

***Ketena*:** The current name of the last level of local administration. Previously these units are named kebele to form a woreda, an arrangement peculiar to Addis Ababa city.

Contents

List of tables

List of figure

ACRONYMS

AAEPA	Addis Ababa Environmental Protection Authority
BOD	Biochemical Oxygen Demand
CSA	Central statistical agency
ECA	Economic Commission for Africa
EPA	Environmental Protection Authority
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
IBM	International Business Machine
JMP	Joint Monitoring Program
OAU	Organization Africa Union
SPSS	Statistical Software for Social Science
STP	Sewage Treatment Plants
SWM	Solid Waste Management
UNEP	United Nations Environmental Program
UNICEF	United Nations International Children's Emergency Fund
VIF	Variance Inflating Factor
WB	World Bank
WHO	World Health Organization
WTP	Willingness to Pay

ABSTRACT

This paper examines the resident's willingness to pay for improved better sanitation, a case of woreda 06, Yeka sub-city, Addis Ababa a sample of 359 households. The data generated to meet this objective were collected via semi structured questionnaires. The survey is cross sectional and also descriptive and explanatory research designs were used. This study is applied descriptive statistics and binary logit model to investigate the impact of resident's willingness to pay for improved better sanitation the logistic regression model has as dependent variable the WTP (willing (yes) and not willing (no)). The explaining variables, age of household head, gender, educational level, marital status, distance from garbage, household size, income, housing unit and occupation of household head. The result of the econometric model indicate that residents willingness for the distance from garbage to pay households who are below 200m are 100 percent times more likely willing to sanitize as compared to the households who are between 201-300m. The age situation is significant at the 5 percent level of significance (p-value 0.035). Households who are owned are 86.3 percent times more likely willing to sanitize as compared to the households who are rented. Households who are employed are 206.806 times more likely willing to sanitize as compared to the households who are unemployed. Households who are literate are 1006.355 times more likely willing to sanitize as compared to compared to the households who are illiterate. Households who have monthly income below 3500 birr are highly willing to sanitize as compared to the households who have monthly income 3501-5500 birr, households who have monthly income below 3500 birr as compared to the households who have monthly income 3501-5500 birr and households who have monthly income below 3500 birr as compared to the households who have monthly income 3501-5500 birr. However, there is no statistically significant evidence as whether gender and marital status of head of household's in woreda 06 yeka subcity affects the resident's WTP. This study recommends that there is a need to educate people about the benefits associated with improved sanitation services supply, in particular.

Keywords: Sanitation, Willingness to pay, Household, Logistic Regression, Binary logistic regeression

CHAPTER ONE

1. INTRODUCTION

This chapter introduces the research problems and associated research questions to be answered and objectives to be achieved. It includes background of the study, statement of the problem, research objectives, significance of the study, hypothesis of the study, scope and limitation of the study, definitions of key terms and finally organization of the paper.

1.1. Background of the study

Improved sanitation refers to any method that can hygienically separate human excreta from human contact. Common types of improved sanitation are the flush toilet, septic tank, or pit latrine, a ventilated improved pit latrine (VIP), pit latrine with slab, or composting toilet (WHO, 2010).

Due to lack of appropriate planning, inadequate governance, resource constraint, and ineffective management, solid waste-especially insufficient collection and improper disposal is a major concern for many rapidly growing cities in developing countries (Chuen-Khee and Othman, 2010; Medina, 2010). According to the United Nations Environmental Program (UNEP, 2004), solid waste generation is an increasing global environmental and public health problem. The swift expansion of urban agricultural and industrial activities, stimulated by population growth, has produced vast amounts of solid and liquid wastes that pollute the environment and destroy resources. Changing economic trends and rapid urbanization also complicate solid waste management (SWM) in developing countries. Consequently, solid waste is not only rising in quantity but also changing in composition (from less organic matter to more paper, packing materials, plastics, glass, metal, and other substances), and is exacerbated by low collection rates (Bartone and Bernstein, 1993; Medina, 2002).

It appears that, in formulating environmental management programs, Nigerian policy makers and planners have a genuine lack of understanding of the willingness to pay for improvements in the urban environment. Nevertheless, willingness to pay considerations should constitute key inputs into programs designed to enhance environmental quality in developing countries if such programs are to be sustainable and replicable. In fact, Whittington et al. (1991) view willingness to pay as a

key concept in an improved planning methodology designed to obtain information on the value placed on different levels of service, this in turn allows for the fixing of charges which ensure that operation and maintenance costs can be recovered. In this respect, Bender et al. (1980) opine that the estimation of willingness to pay schedules should be regarded as an integral component in formulating economically sound environmental policies.

Although there are many policy instruments regarding solid waste management their effectiveness may vary between communities. For example, the 'pay as you throw' policy may not be very successful in some developing countries where the actual volume of solid waste generated by households are not well known (Longe and Ukpebor, 2009). Thus, the price regarding solid waste management services is often based on a flat rate fixed by wastemanagement authorities and paid monthly by each household. It will be interesting to explore how much money that households would be willing to pay for an improvement in waste management services and consequently environmental quality. The improvement in environmental quality has the characteristics of environmental good (e.g. good that its economic value is not revealed in market prices), i.e. non-excludability and non-rivalry (Hanley et al., 2007). Once the good is produced it is practically impossible to prevent anyone from consuming it and the same unit of the good can be consumed by more than one person. The waste management services are often underpriced or non-priced because the economic benefits are not easily inferred from ordinary market (Anaman and Jair, 2000).

Ethiopia has experienced rapid urbanization and increasing urban population in the last few years due to more rural-urban migration and rising per capita incomes (FDRE PCC, 2008). Presumably, increased demand for infrastructure and public service (Charkrabarti and Sarkhel, 2003) accompanies this growth, but this has not been the case. Many towns in Ethiopia lack the financial resources and institutional capacity to provide the most basic municipal infrastructure and service, including solid and liquid waste management.

Although many developing countries have no access to improved sanitation (Mara andLane,2010), the governments in Ethiopia cannot afford to provide heavily subsidized improved sanitation to all or even to the majority of their respective populations. Consequently, improvements in sanitation situation in these countries heavily rely on the financial contributions from households, which in turn depends on not only each household's willingness to pay (WTP) but also on each household's

ability to pay for the improved sanitation services. The WTP concept generally refers to the economic value of a good or service perceived by a person or a household under given conditions. It is essentially the maximum amount of money the beneficiaries are willing to pay for a certain hypothetical service or good (Russell and Fox, 1995).

The biochemical oxygen demand (BOD) in surface water is higher than the accepted normal concentration indicated by the Environmental Protection Authority (EPA) of Ethiopia. Particularly as reported in Addis Ababa Environmental Protection Authority [AAEPA] (2007) and Mengesha (2010) the rivers in the city, such as Akaki River, are highly polluted with organic and inorganic substances since they serve as a sink to some of the wastewater generated from the city.

Information on WTP for improved sanitation facilities can be useful to planners at all levels (national, state, city, rural) for assessing the economic viability of projects, setting affordable tariffs, evaluating policy alternatives, assessing financial sustainability, and designing socially equitable subsidies. Such WTP information is also an essential element of a cost–benefit analysis. Net economic benefits of improved sanitation services, in simple terms, are estimated as the difference between the consumers' maximum WTP for better services and the actual cost of the services (Manila, 2006).

The aim of this paper is to assess the current sanitary service fees and the willingness to pay (WTP) of residents for improved urban waste management.Therefore, this paper is to present estimates and determinants of the willingness to pay for improved environmental sanitation in yeka sub-city woreda 6 and the role of communication strategies in bringing behavioral change in habits of sanitation.

1.2. Statement of the problem

The rapidity of urbanization in Ethiopia has caused dynamic growth of urban slums and contributed to increasing numbers of informal slum dwellers. The result has been overcrowded living conditions; inadequate sanitation facilities; and exposure of slum dwellers, especially children under five years of age, to a high risk of disease Worldwide, about eight million children died in 2010 before reaching the age of five, mainly due to poor sanitation facilities (PLOS, 2017).

According to USAID 2015 urban sanitation study, The growing environmental sanitation and waste management problems in Addis Ababa can be seen as a result of many factors; First, urban sanitation has no clear institutional 'home,' which means responsibilities are diffused among several agencies. Secondly, the sector is under-financed, and facilities for the treatment of liquid waste are almost nonexistent. Thirdly, there is no clear implementation approach of the urban sanitation strategy.

The knowledge of the households' demand for solid waste management services is important in developing sustainable waste management strategy. This is important because the success of the strategy is to a large degree dependent on acceptance by the households. In these areas, 18 percent of the community does not have access to a latrine, 32 percent have no access to water, and 96 percent of latrines do not have washing facilities. Many women who are in charge of waste disposal in their communities do not have the tools or the knowledge to collect and dispose of waste safely. This leads to the spread of disease such as, cholera, typhoid and childhood diarrhea one of the leading causes of deaths in under-fives (Amref, 2016).

Defecation and urination in public places, littering wastes, flushing liquid waste into storm drainage lines, and sweeping waste toward the street are routine urban waste management practices that severely damage the image of Addis Ababa. Efforts to increase knowledge and awareness are critical to change or modify behaviors necessary to sustaining a clean and healthy living environment. The absence of adequate sanitation has a series impact on health and social development especially for children. Contaminate water resource; soil and food are the major cause of diarrhea, the second biggest killer of children in developing countries, and leads to the major diseases such as cholera, schistosomiasis, and trachoma. Improving access to sanitation is a critical step towards reducing the impact of these diseases (WHO, 2008).

Despite the ongoing discussions to address the challenges, little has been achieved in identifying and implementing practical and affordable strategies. Besides, in spite of theonsiderable number of environmental studies on the topic (e.g., Getachew 2006; Mekala, Davidson, and Boland 2007), valuation of households' willingness to pay (WTP) for its improved management has received little attention. Particularly, it is important to estimate demand for and affordability of advanced sewage

treatment plants (STP). To fill this gap, this paper investigates residents' WTP for an improved waste water treatment program and its determinants.

Purposive selection of the topic is due to the severity of the problem of sanitation in the whole Addis Ababa as well as woreda 06 and as sanitation problem affects the overall socio-economic aspects of a society, investigating such problem is important from development perspectives.

1.3. Research question

- How to elicit the willingness to pay of the community?
- What arethe socio-economic determinant variables of WTP of the community?

1.4. Objective of the study

The general objective of this study is to examine the resident's willingness to pay for improved better sanitation, a case of woreda 06, Yeka sub-city, Addis Ababa.

The Specific Objectives includes:

- To elicit willingness to pay (WTP) of the community.
- To identify the socio-economic determinant variables of WTP of the community.
- Based on research findings, draw policy recommendations to address the problems.

1.5. Hypothesis of the Study

In accordance with objective of the study, the following hypothesis is formulated for investigation. Hypotheses of the study stands on the theories related to WTP that has been develop over the years by different researchers and past empirical studiesrelated. Hence, based on the objective, the present study seeks to test the following null hypothesis.

H1: Age has no significant impact on households WTP.

H2: Sex has no significant impact on households WTP.

H3: Marital status has no significant impact on households WTP.

H4: Educational status has no significant impact on households WTP.

H5: Household size has no significant impact on households WTP.

H6: Household head income level has no significant impact on households WTP.

H7: Housing unit level has no significant impact on households WTP.

H8: Occupation has no significant impact on households WTP.

1.6. Significance of the study

This study helps to identify whether the WTP has any positive impact on household sanitation or not. Sanitation basically constitutes an important part of the health of any given urban households. When WTP fee values appreciate, it is translated to the health of the sanitized community directly or indirectly through various ways. It also increases the impact on the sanitized households.

Therefore, the study is providing evidence to policy-makers so that appropriate interventions and correct choices would be made with regard to allocating limited resources to an area where a real difference is possible.

This study is basically targeted for the purpose of knowledge. As the matter under investigation is known for its resource scarcity, this research contributes a lot for the academic wealth by igniting the interest of other researchers to carry out similar studies at Addis Ababa as a whole. Therefore, the findings of this study give/serve as a wake-up bell for the stakeholders to find possible solutions.

1.7. Delimitation/ Scope of the study

This study is delimited by problems of the resident's willingness to pay for improved better sanitation in evidence from Addis Ababa: the case of Woreda 06, Yeka sub-city. The researcher selects this sub-city and woreda randomly and by supposing the select sub-city and woreda is representative enough to infer about the impact of WTP on household sanitation in the city. It is

known that different factors may influence the urban households. However, this paper has delimited only on who WTP for better sanitation.

The research is focused on Addis Ababa, Ethiopia. Particularly the study is conducted at Yeka sub-city. Under Yeka sub-city, woreda 06 is focused. Yeka sub-city is the second most large populated sub city next to KolfeKeraniyo sub-city. Total population 346,483 people and it is one of the expansion areas of the city situated in the north part of Addis Ababa. The sub-city covers an area of about 8213.1 hectares and an average density of 42.18 people per hectare. Currently, the sub-city is divided into 13 woredas, 124 sub woredas (ketenas) (AACA, 2016). The selected woreda have 9 ketenas. This shows the prevalence of tenants living within the same compound which affirm the best representation of the areas of the research problem.

1.8. Limitation of the study

The major constraints included unavailability of adequate and up to date quantitative as well as qualitative information, lack of adequate source and information in proper recording and keeping of documents and files among woreda as well as the municipality of the city. This was created exhaustion to the data collectors and huge financial cost to knock and check on houses in the select ketenas. Additionally, some respondents were reluctant and unwilling to spare their time to give the necessary data.

1.9. Organization of the paper

This research report is organized in five chapters. Chapter one provides a general introduction to the whole study. Chapter two describes the review of related literature. Chapter three provides a detail description of the methodology employed by the study. Chapter four contains data presentation, analysis and interpretation. Finally, the last chapter concludes the total work of the study and gives a conclusion and relevant recommendations based on the findings.

CHAPTER TWO

2. LITRATURE REVIEW

This chapter reviews the literature related to WTP and sanitation by focusing on the literature associated with the research topic. The purpose is to explore what other authors and scholars have written and been able to identify factors for analyzing the WTP with sanitation situation.

2.1. Sanitation

Sanitation is one of the most essential aspects of community welfare because it is a safeguard of human health, increases life spans, and is documented to provide profits to the economy. Sanitation (e.g. toilets, latrines, mechanized wastewater treatment) is now used as a way to contain and/or treat human excreta (and in some cases grey water) to guard human health and the environment. “Developed” (now referred to as “basic” since 2015) access to sanitation is defined by the Joint Monitoring Programme (JMP) as one that separates “human excreta from human contact” in a hygienic manner (e.g. flush toilet, ventilated improved pit latrine (VIP), piped sewer systems, composting toilets, and septic systems) (WHO/UNICEF JMP, 2017).

Figure 1. Woreda sanitation problems evidence

2.2. Definition and Components of Domestic Waste

Domestic solid wastes are wide variety produced from household activities such as food preparation and consumption, sweeping, burning, and garden wastes, and used items like clothing, furnishings, and abandoned equipment. Domestic waste includes both solid and liquid and sometimes hazardous wastes generated from residential areas and sometimes referred to as household wastes.

2.2.1. Domestic solid waste

Domestic solid waste refers to wastes produced from residential areas from day to day activities called "household" solid wastes (Edward S., 2010). These kinds of wastes in lower income countries are dominated largely by food and ash wastes and accounting for the highest proportion of municipal solid wastes, for instance, about 75 percent in developing countries (Solomon, 2006).

There is 5 percent rise urban waste generation per year (World Bank, 2004). From the daily solid waste generated only 65 percent is collected, 5 percent recycled and 5 percent composted. The remaining 25 percent is simply dumped on open sites, drainage channels, rivers and valleys as well as on the streets.

In line with this, the composition of the residential waste has been changing into higher proportions of plastics, papers, packaging materials and alkaline batteries. Residential solid waste contains rapidly decomposing animal and vegetable matters which are the bi-products of the handling, preparing cooking and consumption of food, paper, cardboard, textile, ash, wood, old furniture, old household

The rapid population growth rate is also resulting in a rise of approximately 5 percent of urban waste generation. This implies that the current waste collection and disposal capacity of the city could not match with the growing population and generation of waste. The uncollected waste is disposed off through informal means, except smaller percentage going to incineration, dumped on open sites, drainage channels, rivers and valleys as well as on the streets.

2.3. Environmental Impacts of Domestic Wastes

2.3.1. Ecological impacts

Due to inadequate domestic waste collection and disposal considerable amounts of waste ends up in open dumps (WB, 2012) or drainage system, threatening both surface and ground water quality and provide a breeding ground for pests. Open air burning and spontaneous combustion in dumping site, are among the causes of air pollution, more exacerbated in slum areas where there is lack of garbage collection containers. It also leads to loss of productive land due to the presence of non-biodegradable items and contamination of soil, ground and surface waters by leach ate. Buried hazardous domestic wastes can filter down through the soil and contaminate groundwater. Pouring hazardous liquids on the ground can poison soil, plants and water.

2.3.2. Socio-economic impacts

Inadequate collection, transport or improper disposal of household waste can have adverse health impacts. Potential health hazards from accumulation of polluted water, which provide breeding grounds for mosquitoes and attract flies, vermin. Lack of the most basic waste services in crowded, low-income areas is a major contributor to the high morbidity and mortality among the urban poor. According to Alebachew*et al.,* (2004), deficiencies of sanitary services, low capacity for urban waste management and the absence of regulations and scientific criteria for enforcement pose increasing environmental and public health hazards in the major towns of Ethiopia.

2.4. The waste hierarchy

2.4.1. Solid Waste Reduction, Reuse and Recycling

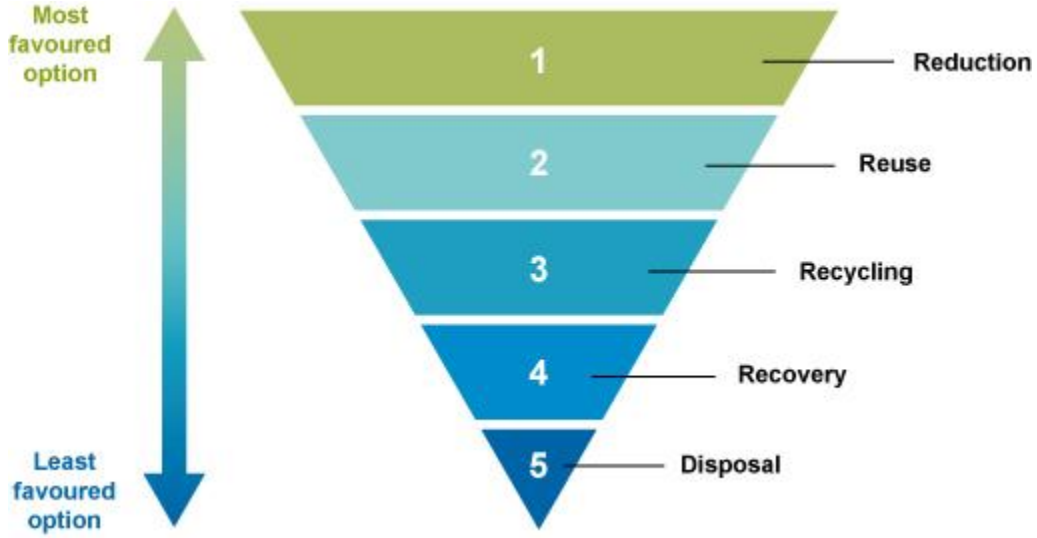


Figure 2. Solid Waste Reduction, Reuse and Recycling

2.4.1.1. Waste reduction

At the top of the hierarchy is waste reduction. This is the best option because the most effective way to limit the health effects and environmental impacts of a waste is not to create waste in the first place. Industry has a major part to play in waste reduction. If more efficient manufacturing processes were adopted, greater quantities of products could be made without increasing the use of raw materials.

Waste reduction is also important at household level. In Ethiopia a number of waste reduction initiatives have been put in place in big cities like Addis Ababa and Mekelle by informal organizations and private sector enterprises. These initiatives frequently involve several different stakeholder groups including urban Health Extension Workers, civil society, private sector enterprises and organized women's development groups. The local kebele administration and appropriate experts from the Woreda Health Office and Greenery and Beautification Office are also likely to be involved.

The Ministry of Health has produced some teaching aids and promotional materials aimed at educating communities on how to reduce and minimize waste at household level. Educational campaigns can raise awareness of the individual economic incentives, and can also be used to reduce the stigma attached to working with waste. This can result in behavioral change among the community members and increase their active participation in waste reduction (and reuse) at the household level.

There are many possible ways of reducing the amount of waste produced at home that could be suggested to householders. These include educating and encouraging them to:

- Buy products that use less packaging. Buying in bulk, for example, can reduce packaging and save money. Where households cannot afford to pay large sums of money up front, it may be possible for neighbors to club together and buy a large quantity of a basic foodstuff between them.
- Make use of reusable rather than disposable items.
- Use their own shopping bags, preferably made of cloth or other recycled material rather than plastic bags.

2.4.1.2.Waste reuse

Reuse can be defined as using a waste product without further transformation and without changing its shape or original nature. This is the second option in the waste hierarchy. Different types of solid wastes can be reused, such as bottles, old clothes, books and anything else that is used again for a similar purpose to that originally intended. Reuse means that less solid waste is produced. It brings other benefits by taking useful products discarded by those who no longer want them and passing them to those who do.

2.4.1.3.Waste recycling

Recycling waste means that the material is reprocessed before being used to make new products. The reprocessing activities can have an impact on people's health and the environment, but these

impacts are usually lower than those from making the product from new, raw materials, Recycling means treating the materials as valuable resources rather than as waste.

The options for recycling depend on the type of waste. For example, Plastic bottles can be ground down and used to make plastic rope or plastic coating for electric wires, Waste metals can also be recycled by making another shape into new raw materials like ‘medeja’. For some wastes, recycling involves complex technical processes and requires specialized machinery, but others can be recycled more simply and on a small scale. All types of organic waste can be recycled by composting, which can be carried out at home or on a larger scale.

Figure 3: partial feature of waste metal recycle

2.4.1.4.Waste separation

It is difficult to recycle materials once different wastes have been mixed together, so the first stage of the recycling process is to separate the materials into different categories. This is called waste segregation or separation at source and should be done by the householder when the waste items are finished with and discarded. Waste is separated by placing the different categories of waste into different bags or containers.

The degree of separation required will depend on the recycling opportunities that are available, but it is important to separate ‘dry’ and ‘wet’ materials. The simplest method of separation is to keep food waste separate from the remaining materials so that the food waste can be composted or used to make biogas. If ‘korales’ are active in the area, they may ask householders to keep all

their recyclable materials (paper, metals, plastics and glass) together, or ask for just one or two materials to be separated.

Once separated materials have been collected from householders by the korales or by the more formal sector, they are passed on to merchants and eventually to the industrial operations that transform the wastes back into useful raw materials or products.

Figure 4: solid waste separation plastic bag

2.4.1.5. Composting

Composting is the process where biodegradable organic wastes (food and garden waste) are converted into compost in a natural biological process. Composting can be done by individual householders and community groups or on a commercial scale. On the larger scale, the waste from an entire town or city could be composted if sufficient land, labour and equipment are

available. The benefits of composting are not only the reduction of waste, but also the production of compost which is a valuable soil improver. Soils treated with compost are better able to withstand droughts and are more fertile because plant nutrients are returned to the soil, which reduces the need for manufactured fertilizers. It is possible to add a certain amount of animal manure to residential waste for composting, which may help with other waste problems in the community and adds to the amount of useful soil improver that is made.

2.4.1.6. The composting process

1. **Separation of compostable materials:** It is important to begin with an uncontaminated input to the process. Nearly all organic wastes can be composted, but if a composting pile attracts rodents and other scavenging animals it may be better to exclude meat products and cooked food from the process and just collect garden waste and raw vegetable waste.

2. **Grinding or shredding:** To speed up the composting process it may be necessary to shred the raw waste before placing it in the compost pile. On a domestic scale this can be achieved simply by cutting up the waste into smaller pieces.

3. **Blending or proportioning of materials:** Composting works best with the right mixture of wastes so that the moisture content and the proportions of the chemical elements carbon and nitrogen are suitable.

4. **Composting:** Composting is normally carried out in a pile. For larger scale composting processes, on the domestic scale the pile will be much smaller, forming a rounded heap. The pile can be built up as waste becomes available, but it is important to have enough material present to allow the biological processes to take place reasonably quickly, so as a guide a domestic compost heap should be at least 1 cubic meter to start the process.

Composting is an aerobic process, so the pile needs to be turned regularly to introduce air. This means dismantling it, mixing the waste to introduce air and then rebuilding the pile. The first turning-over of the heap should be done after two to three weeks and then every three weeks or

so. The composting process will be complete within three to six months. The composting process generates heat, so it is normal to see s coming out of the pile.

The process is complete once the pile no longer heats up after mixing and rebuilding. The final product should be brown and crumbly and look like a good soil. If it still contains identifiable items, the process is not complete.

2.4.1.7.Benefits of reducing and reusing solid waste

Waste is becoming a bigger problem in urban areas each year. Households are producing more waste, so disposal sites are filling up and new sites are further away from residential areas. Where waste is collected and transported to a disposal site, this is becoming more expensive. Where householders have to dispose of waste themselves, they have to spend more time doing this. Anything that reduces the amount of waste that has to be disposed of helps to reduce these problems.

A. Community benefits

Reuse can be very helpful for disadvantaged people who cannot afford to buy new goods. These could include clothing, building materials, and business equipment. Reuse centers that collect and distribute reusable goods can also provide community benefits by engaging in job-training programmes and general training for the long-term unemployed, disabled people and young people.

B. Economic benefits

By reusing materials rather than creating new products from raw materials, there are fewer burdens on the economy as a whole especially if reuse results in a reduction in raw material and product imports. Reuse is an economical way for many people to acquire the items they need. It is almost always less expensive to buy a used item than a new one.

C. Environmental benefits

Reusing something uses little or no water, energy or other resources and is unlikely to cause pollution. As well as these benefits, reuse eliminates the environmental damage that would have been caused if the item had been disposed of, rather than reused.

2.5. Institutions and sustainability in waste management

2.5.1. Overview of the concept of sustainability

The concept of sustainability, which literally refers to "the ability to sustain, or a state that can be maintained at a certain level" (Kajikawa, 2008: 218), arose out of the belief that the growing population of the world, with the attendant pressure on natural resources, poses a threat to our survival on the earth.

As the interaction between human populations and the environment are essentially the outcome of our quest for development, the term 'sustainability' became more associated with the term 'development' than any other. It can be argued then that a sustainable system or development is one which satisfies environmental sustainability (the sustainability of the planet), economic sustainability (the sustainability of prosperity or profit) and social sustainability (the sustainability of the values and cultures of people). Thus, a sustainable waste management system is one oriented at attaining all three components of sustainability: environmental, economic and social. It is important that each of the three components is given equal attention and priority in order to ensure sustainable outcomes (Rogers *et al.,* 2008).

2.5.2. Institutions and environmental sustainability in waste management

In simple terms, environmental sustainability implies that human developments or activities such as waste disposal should not hinder the ability of biological and physical systems to maintain their ecological resilience or robustness (Rogers *et al.,* 2008). In waste management, environmental sustainability implies that, the rates of deposition of pollutants should be maintained within the rate at which the ecosystem can safely absorb or convert those pollutants to some other useful or harmless substances.

A. Formal institutions and environmental sustainability

Formal institutions in the form of laws, regulations, policies, standards and guidelines often take the lead in the pursuit of environmental sustainability.

B. Informal institutions and environmental sustainability

Informal institutions – including traditions, customs, beliefs, values and attitudes – play vital roles in waste management at the community level. In rural areas of developing countries, especially, where formal education is usually low and formal institutions either unknown or ignored, traditional authorities tend to apply traditional laws and customs to protect the local environment.

2.6. Empirical studies

A community based cross-sectional study project was employed in one of the slum areas in Addis Ababa (Ethiopia), in Kirkos sub-city, wereda 11.This study was conducted to evaluate the sanitary practice and related causes of the city slums located in Addis Ababa March, 2015. In this study, more or less all the families had some form of latrine, among this 72.3 percent of them had a pitlatrine. This result is in agreement with a earlier study Conducted in Addis Ababa (Ethiopia) and unlike with a report from KersaArea (East Ethiopia) which informed that 91.7 percent of households had pit latrine (Bizatu and Negga, 2010, VanRooijen and Taddesse, 2009).

In the current study, 35.8 percent of households had enhancedlatrine facility. This result is lower as compared with a study result from city slum of Pokhara submetropolitan (Nepal) which informed 74.72 percent households had developed non-shared latrine (Acharya et al., 2015,Sahiledengle et al. 375).

In this study, it was witnessed that 52.5 percent of the sanitation services had a foul smell, impure and need adjustment; that is lower than a study from Kersa, which informed 67.3 percent of the studied family latrine witnessed the existence of flies in and nearby the latrine. This result is also higher than a study conducted in North Ethiopia that informed 22.6 percent of the cases witnessed foul smell and had uncomfortable during use (17.8 percent) (Ashebir, 2013,Bizatu and Negga, 2010).

A related finding also stated from Bangladesh shown that 61 percent of the latrines had noticeable doo-doo. Although, 76.1 percent of the respondents know that hand washing exercise

was the core protective methods for diarrheal diseases; most of the households (71.9 percent) had no practical and washing facility which is a serious concern since having a hand washing facility had a optimistic implication and beneficial over avoiding feco-oral transmission (Rabie and Curtis, 2006,Alam, 2013).

This study also presented that 74 percent of the families exercise open dumping of solid trashes. This finding was reliable with a study from Kersa (38.5 percent) and similar solid waste dumpling practices were also stated from Northern Ethiopia. (Bizatu andNegga, 2010) (Tewodros et al., 2008)

In this study, 46.9 percent of the households had better sanitation practice. This result was closely related to a similar study from Addis Ababa which reported 43.89 percent of the families practice. Related finding from Kabul (Afghanistan) indicated poor hygienic activities among urban slums. A study from slum of Luck now, capital of Uttar Pradesh, also reported households had insecure practices towards water storage and sanitation management (Abdissa andWalelegn, 2016, Mubarak, 2016,Shukla 2016)

This study also showed that households having better sanitation facilities were more likely to hadgood sanitation practice than those who use backward sanitation facility. This statement is also in agreement with a study report from Addis Ababa, and a systematic assessment report, that revealed families with shared sanitation facilities were poorer than those that did not shared (Heijnen *et al.*, 2014, Abdissa and Walelegn, 2016).

In the same way, the Joint Monitoring Programme (JMP) for water supply and sanitation of WHO and United Nations Children's Fund (UNICEF) stated that shared sanitation facilities tend to be less hygienic and less accessible than private sanitation services (WHO and UNICEF, 2012; WHO and UNICEF, 2014).

Furthermore, sharing of a sanitation facility intensely is associated with the presences of acute diarrhea between slum children. A case from Kisumu (Kenya) studied the quality of shared sanitation facilities and described they were dirty, and their quality reduced with an increase in the number of households sharing them (Adane, 2017,Simiyu, 2017).

CHAPTER THREE

3. RESEARCH METHODOLOGY

This chapter discusses the study area, data source, methods of data collection, sample size, research design, analysis tools, techniques, description of variables and econometric model used in the study.

3.1. Description of the study area

Addis Ababa has the status of both a city and a state. It is where the Africa Union and its predecessor the OAU were based. It also hosts the headquarters of the United Nations Economic Commission for Africa (ECA) and numerous other continental and international organizations, therefore often referred to as "the political capital of Africa" for its historical, diplomatic and political significance for the continent (wikipedia.org/wiki/Addis Ababa).

Addis Ababa is home to 25 percent of the urban population in Ethiopia and is one of the fastest growing cities in Africa. It is the growth engine and a major pillar in the country's vision to become a middle-income, carbon-neutral, and resilient economy by 2025. Addis Ababa's economy is growing annually by 14 percent. The city alone currently contributes 50 percent towards the national GDP, highlighting its strategic role within the overall economic development of the country (World Bank, 2015).

Addis Ababa lies at an elevation of 2,300 meters (7,500 ft), located at 9°1′48″N 38°44′24″E coordinates: 9°1′48″N 38°44′24″E. The city lays at the foot of mount Entoto the areas raises to 3,000 meters into the north (see https://en.wikipedia.org). 3,194,999 total population (1,679,998 women and 1,515,001 men) (CSA, 2013). 662,728 households were counted living in 628,984 housing units, which results in an average of 5.3 persons to a household (CSA, 2007).

About 119,197 people in the city are engaged in trade; 113,977 in manufacturing and industry; 71,186 in civil administration; 50,538 in transport; 42,514 in education, health and, social

services; 32,685 in hotel and catering services; and 16,602 in agriculture (wikipedia.org/wiki/Addis_Ababa).

Despite the strong economic growth trends, Addis Ababa faces significant development challenges. For example, unemployment and poverty levels in Addis Ababa remain high, estimated at 23.5 percent and 22 percent respectively. More than one in four households report an unemployed adult compared to one in 10 households in other urban areas, and the informal sector employs about 30 percent of the economically active labour force in the city (World Bank, 2015).

Yeka sub-city is one of the 10 sub-cities in Addis Ababa city administration with the total population of 404,336 (216,796 women and 187,540 men) the second largest populated sub-city next to kolfekeraneyo sub-city total population 500,163 (CSA, 2013). The sub-city divided into 13 woredas and borders with Oromia in the north, Oromia in the east, Gulele, Arada and kirkose sub-city in the west, Bole sub-city in the Southeast (see www.edaethiopia.org). Housing units are 87,346 with 90,195 households, average number of person per house 3.8 and an average number of household per house 1.033 (CSA, 2007).

Woreda 06 is one of the 13 woredas of Yeka sub-city. The total population is 27,490 located in the centre of megenagna and kasanches villages, Based on woreda 06 administration data there are 5498 households and 5788 house units (Private, public or kebele, governmental rented, 7 block condominiums and other houses), within the total households, owned 2548 households, rented 2850 households.

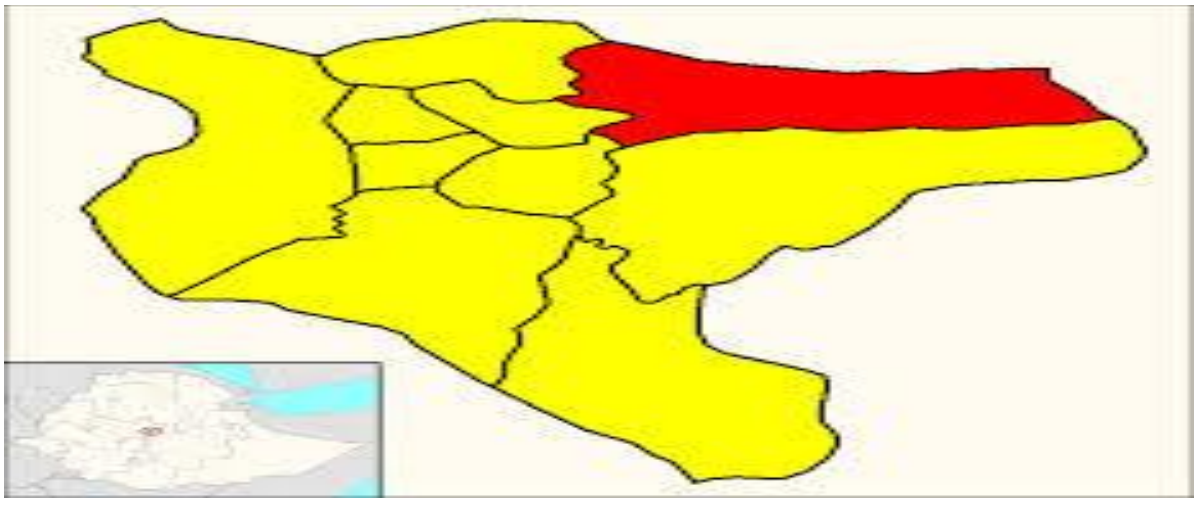


Figure 5. Yeka sub city map

3.2. Target population

The population of this study is only Yeka sub-city woreda 06 households. The population of this study does not include all households in the woreda due to a limitation of resources such as time and money. According to woreda 06 administration documents, there are about 27,490 population, 5498 households and 5788 house units. But within this number, the kebele houses households (998) and house units (1157) were excluded due to low rent fee procedures. Total 4500 households were targeted to this study.

3.3. Research strategy, approach and technique

The research strategy that was applied is qualitative and quantitative. Descriptive and explanatory types of research were used. Descriptive type of research was used because of the objective of the research which is intended to reveal the challenges ofhousehold's WTPon sanitation. The study is also explanatory to explain the determinant of WTP on sanitation. The study was used cross-sectional method on the sense that first hand and relevant data are collected at one point in time.

3.4. Source of data

To achieve the objective of the study, quantitative and qualitative data are gathering from both primary and secondary sources. The primary data was obtained from households and administration offices through questionnaire and focused group discussion. This helps to get first-hand information from the participants and officials about WTP situation. The secondary data collection constitutes an extensive survey of literature from different sources including books, journals, official documents, websites and reports from the town trade office.

3.5.Method of data collection

Structured questionnaire: To gather information from selected householdsa sample population of 254 household from unknown specific target population by using structured questionnaires with closed-ended questions from each households. The structured questionnaires were

organized into two main sections, the first section personal information of the respondents which includes gender and age composition, marital status, educational level, and the size of household members. The second section of the questionnaire was focused on obtaining the socio-economic condition of the sample households of selected respondents and determinant of participating in sanitation through WTP. It also concerns the problems of sanitation which includes socio-economic conditions in terms of household's income level.

Focus group discussions (FGDs): Focus group discussions was conducted to capture qualitative data and to fill in the gap of information that not be covered by other methods of data collection and to validate the findings. The discussion was conducted by giving special emphasis to the participation of households in sanitation through WTP and the solution suggestions with the same age groups men and women including officials, stakeholders and selecting respondent.

The data was collected by 10 enumerators under the supervision of the researcher. In order to facilitate data collection, the enumerators were trained regarding the objectives of the study, about contents and how to complete the questionnaire, and data collection procedure. The collected data was entered in to SPSS, version 26, software.

3.6. Sampling technique and Sample size

A multi-stage cluster sampling technique was used in choosing a sample of 354. The first stage was involved the random selection of sub-city from 10 sub-cities, namely Yeka sub-city. The second stage was involved the random selection of woreda 06 from 13 woredas. The third stage was involved the random selection households house number from the community list. In this study, two types of sampling techniques were used. Those are from random sampling and stratified random sampling methods. Woreda 06 administration households list as a sampling frame.

The head of households was selected from each stratum by using stratified random sampling and by applying the principle of the proportional sample selection method. Head of households was stratified according to their "ketena"(sub woreda unit) in order to conduct the survey in the woreda. There are nine (9) "ketenas" and the total head of the households is 4500 homeowners 2039 and rented 2461.

To calculate sample size the following formula is used (Kothari, 2004, pp 175):-

$$\text{n} = \frac{z^2.p.q.N}{e^2(N-1)+z^2.p.q}$$

Where,

n = sample size required = 354,

N = number of population = 4500,

p = 0.5,

q = 0.5,

e = 0.05,

Z = confidence level = 1.96 for 95 percent confidence.

The sample size in each stratum is proportional to the size of a stratum. With proportionate stratification, the sample size of each stratum is proportionate to the population size of the stratum. Strata sample sizes are determined by the following equation:

nh = (Nh / N) * n Where nh is the sample size for stratum h, Nh is the population size for stratum h, N is total population size, and n is total sample size (Kothari, 2004).

Table 1: Proportional sample allocation method

Woreda	Ketena	Number of Households	Sample Size
	Ketena 1	473	37
	Ketena 2	326	26
	Ketena 3	436	34
	Ketena 4	533	42
	Ketena 5	492	39
06	Ketena 6	514	41
	Ketena 7	480	38
	Ketena 8	700	56
	Ketena 9	546	33
Total	9	4500	346

3.7.Methods of data analysis

The main aim of the study was to analyze the resident's willingness to pay for improved better sanitation as measured by selected economic indicators. In an attempt to address the research questions, various descriptive indicators such as frequency distributions, averages, and percentages were reported and presented from the field survey data collected to draw appropriate inferences. Household's demographic characteristics, socioeconomic and information were examined using descriptive analysis. The results from the descriptive statistics also serve to develop and specify the appropriate variables to be used in the quantitative analysis.

The studies of resident's willingness to pay for improved better sanitation have been modeled using the approach of logit models to examine the households WTP.

The logistic distribution is also more preferable than the others in the analysis of dichotomous outcome variable, in that it is extremely flexible and easily uses a model from the mathematical point of view and results in a meaningful interpretation (Gujarati: 2004 pp 617).

The logit model is a maximum likelihood estimator that allows for estimating the probability that an event occurs or not by predicting a binary dependent outcome from a set of observable independent or predictor variables.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} \ldots\ldots\ldots\ldots + \beta_n X_{ni} + \varepsilon i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Let us consider a linear regression of the form;

Y_i = the outcome variable predicted from the equation

X_i = a vector of explanatory variables representing household

β's = a vector of regression coefficients to be estimated

ε_i= the error terms

Logistic regression assumes meaningful coding of the variables. A logistic coefficient is difficult to interpret if not coded meaningfully. The convention for binomial logistic regression is to code the dependent class of interest as 1 and the other as 0.

3.7.1. Assumptions of Binary Logistic Regression

Unlike general linear models, binary logistic regression does not have many key assumptions; particularly it does not require a linear relationship between the dependent and independent variables, normality of the error distribution, homoscedasticity of the errors and measurement level of the independent variables. (http://www.statisticssolutions.com/assumptions-of-logistic-regression/) however logistic regression still requires other assumptions.

1. Binary logistic regression requires the dependent variables to be binary.

2. Since binary logistic regression assumes that that P(Y=1) is the probability of an event occurring, it requires that the dependent variable is coded accordingly.

3. The model should be fitted correctly. It means that all meaningful variables should be included. Also, it should not be over-fitted with meaningless variables included.

4. Binary logistic regression requires each observation to be independent. Also, it should have little or no multicollinearity, which means that independent variables are not linear functions of each other.

5. Binary logistic regression requires the linearity of the relationship between independent variables and log odds. Meanwhile, it does not require a linear relationship between dependent and independent variables.

6. Binary logistic regression requires quite large sample sizes. Studies with small sample sizes overestimate the effect measure. Also, the more independent variables are included in the model; the larger the sample size is required.

3.7.2. Maximum Likelihood Estimation

Although the logistic regression model looks like a simple linear regression model, the underlying distribution is binomial, α and β parameters cannot be estimated in the same way as for simple linear regression. The coefficients are usually estimated by the Maximum Likelihood Model (Park, Hyeoun-Ae, 2013). The likelihood is a probability to get observed values of the dependent variable given the observed values of independent variables. The likelihood varies from 0 to 1 like any other probabilities. The probability estimation of the dependent variable as applied by Gujarati: (2004) can be represented by;

$$Prob(Yi=1)=F(\beta'Xi)\ldots\ldots\ldots\ldots\ldots (2)$$

$$Prob(Yi=0)=1-F(\beta'Xi)\ldots\ldots\ldots\ldots\ldots (3)$$

Where:

$$Y_i = \begin{cases} 1 \text{ if} - \text{HH willing to pay} \\ 0 \text{ if} - \text{HH not willing to pay} \end{cases} \ldots\ldots\ldots\ldots\ldots (4)$$

The probability model involves regression of the conditional expectation of Y on X as given by:

$$E(Y|X) = 1[F(\beta'X)] + 0[1 - F(\beta'X)] = F(\beta'X) \text{…….. (5)}$$

The F-function represents that the logit model uses a logit cumulative distributive function. When an outcome variable is dichotomous or binary, the relationship between variables may be nonlinear and can be converted into linear ones through logarithmic transformation. Therefore, the logit regression equation from which the probability of the outcome variable (Y) is predicted is given by:

$$P(Y = 1|X) = \frac{e^{\beta'X}}{1+e^{\beta'X}} \text{…….…… (6)}$$

$$P(Y = 0|X) = 1 - \frac{e^{\beta'X}}{1+e^{\beta'X}} = \frac{1}{1+e^{\beta'X}} \text{…….. (7)}$$

Where: P(Y) = the probability of Y occurring as defined in equation (4)

e = the base of natural logarithms

The logit regression in equation 6 and 7 are expressed in logarithm terms and overcomes the problem of nonlinearity. The result of the logit regression varies between 0 and 1: values closer to 0 indicates that the outcome variable (Y) is unlikely to have occurred and values closer to 1 indicate the probability of Y occurring is very high.

The output of the logit regression model explains the probability that the outcome variable (Y) changes when the independent variables change. Thus, a positive logit coefficient tells us that a change in the independent variable (X) increases the probability that (Y=1). A significant coefficient indicates that the positive effect is statistically significant. But the logit coefficient does not tell us by how much percentage the probability of (Y=1) change when the explanatory variable (X) changes by one unit. The logit coefficient shows the direction of the change not the magnitude of the change. The magnitude of the effect would be estimated by calculating the marginal effects.

According to Gujarati: (2004)

$$\frac{\partial E[Y_i|X_i]}{\partial X_i} = F(\beta'X)[1 - F(\beta'X)]\beta \text{…… (8)}$$

It indicates how much percent the probability of (Y=1) changes when the X covariates change by one unit. SPSS software version 26 has an inbuilt system to compute the coefficients of the logit function and the marginal effects.

Because the dependent variable WTP has two categories (if Yes = 1, if No = 0), so binary logit is used here to check the determinants of WTP on environmental sanitation.

3.7.3. Evaluation of Binary Logistic Regression Model

3.7.3.1.Overall model evaluation

a) Likelihood ratio test

Due to the overall model evaluation, we can see how strong the relationship between all independent variables and the dependent variable is. If logistic regression with k independent variables demonstrates an improvement over the model without independent variables (null model), then it provides a better fit to data (Park, Hyeoun-Ae, 2013). This is performed using the likelihood ratio test, which compares the likelihood of the data under the full model with the likelihood of the data under the model without independent variables. The overall fit of the model with k coefficients can be accessed via a likelihood ratio test which tests the null hypothesis -2 log-likelihood of the null method is compared with 2 log-likelihoods of the given model. The likelihood of null method is the likelihood of obtaining the observation if explanatory variables have n4o impact on the outcome. The likelihood of the given model is the likelihood of obtaining the observation if all explanatory variables are included in the model. It measures how well independent variables influence the dependent variable. If the p-value for the overall model fit statistic is less than 0.05, then decline $H0$ with the conclusion that at least one of the independent variables has an impact on the outcome or dependent variable.

b) Chi-square Goodness of Fit Tests

Chi-square goodness of fit test is a non-parametric test that is used to find out how the observed value of a given event is significantly different from the expected value. There are two hypotheses to test in relation to the overall fit of the model:

H0: In the Chi-square goodness of fit test, the null hypothesis assumes that there is no significant difference between the observed and expected value.

H1: In the Chi-square goodness of fit test, the alternative hypothesis assumes that there is a significant difference between the observed and expected value. If the p-value is less than the significance level, the null hypothesis is rejected.

c) Hosmer-Lemeshow test

Hosmer-Lemeshow test also measures how good the model is. The test evaluates whether observed event rates match expected event rates in subgroups of the model population. Divides subjects into 10 ordered groups of subjects and then compares the number actually in each group (observed) to the number predicted by the logistic regression model (predicted). If the H-L goodness-of-fit test statistic is greater than .05, as we want for well-fitting models, we fail to reject the null hypothesis that there is no difference between observed and predicted values, implying that the model's estimates fit the data at an acceptable level (Hosmer and Lemeshow, 2000 pp 150).

3.7.3.2. Statistical significance of individual regression coefficients

After evaluating the overall model, the next step is to assess the significance of every independent variable. The coefficient of i-th explanatory variable indicates the change in the predicted log-odds for one unit change in the i-th explanatory variable when all other explanatory variables remain unchanged.

a) Likelihood ratio test

As mentioned above, the likelihood ratio test is used to evaluate the overall fit model. The test is also used to evaluate the statistical significance of individual predictors.

b) Wald statistic

The Wald statistic is used to test the significance of individual coefficients in a given model (Bewick et al., 2005). The statistic is the ratio of the square of the regression coefficient to the square of the standard error of the coefficient.

Cox and Snell's R-Square and Nagelkerke's R2 is part of SPSS output in the 'Model Summary' Table and is the most-reported of the R-squared estimates. The result indicates the relationship between the predictors and the prediction.

3.7.3.3.Validation of Results

At this stage, the validation sample used to assess the external validity and practical significance of the model. The predictive power of the fitted model is assessed by comparing the correct classification percentage for the two samples. If the model produces almost the same classification accuracy for the model fitting sample and the validation sample then the models are said to be accurate/ valid.

3.7.4. Selection of dependent and independent variables

Table 2. Description of variables

Variables	Variable description	Type	Expect sign
Dependent variables			
Willingness to pay for improved service	1 if yes and 0 if no	Binary	
Explanatory variables			
Age of head of household	<18 years old	Categorical	+/-
	18-29 years old		
	30-40 years old		
	41-50 years old		
	Above 51 years old		
Gender ofhead of household	0=Female, 1=Male	Binary	+/
Marital status ofhead of household	0= if single, 1= if married	Binary	+/
Household size	Total number of members in families	Continuous	+/
Education head of household	literate	Binary	+/
	Illiterate		+/
Head of household income	< 1200 Birr	Categorical	+/
	1201-3000 Birr		+/
	3001-5000 Birr		+/
	5001-8000 Birr		+/
	> 8001 Birr		+/
Occupation of head of household	Employed	Binary	+/
	Unemployed		+/
Housing unit of head of household	Owned	Binary	+/
	Rented		+/
Distance fromhome of head of household to local garbage area(m)	<200 m	Categorical	+/
	201-300 m		
	301-400 m		
	>400m		

3.7.5. Ethical considerations

Participants of the research were clearly informed about the major objectives of the research emphasizing that the data was used only for the academic purpose. The data was collected using questionnaire distribution techniques and doing with the full willingness of the participants. A statement that clearly indicates their participation is only on a voluntary basis and they are advised not to include their names and address on the questionnaire. Also, focus group discussion was conducted upon the respondent's willingness and collaboration. Careful attention

was given in respecting the rights, needs, and values of the participants; and maintaining confidentiality of the data and acknowledging sources of information.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1. Survey results and discussion

The total target population was 4500 households based on 95 percent confidence level 346 households were selected, more than 100 percent 359 respondent's response the questionnaire. The information captured using the household questionnaires (from June first up to June last 2020 for one month) which covered demographic data, economic activity, and employment, sources of income, and monthly expenditure during the last 12 months, employment earnings and regular payments (monthly). Data collecting period spend 1 months including enumerator orientation.

4.1.1. Descriptive analysis of survey data

4.1.1.1. Socioeconomic characteristics of the respondents

The findings indicated that 61 percent of household heads were female male only 39.9 percent are male. This summary implies that genders are a dominant effect on socio economic condition as well as solid waste management actions.

Table 4.1: Summary statistics of household head gender

GENDER			
		Frequency	Percent
	Male	140	39.0
	Female	219	61.0
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

Out of total respondents, 43.2 percent of respondents are married and 56.8 percent were single. This implies that single household head are much higher than get married household heads. This

implies that in the study area single households are higher than the households who are the married.

Table 4.2: Summary statistics of the household marital status

MARITAL STATUS			
		Frequency	Percent
	Married	155	43.2
	Single	204	56.8
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

The findings in Table showed that 9.2 percent of the respondents were aged at 18 years, 11.4percentbetween 18-30 years, 61.6 percent between 30-40 years, and 17.8 percent between 40-50 years old, respectively. Majority of the sample household head respondents (61.1 percent) were between 30-40 years old. The mean age of respondents was calculated to be 35 years and it implies that majority of the respondents were still in their economically active age.

Table 4.3: Summary statistics of the household head age

AGE			
		Frequency	Percent
	18	33	9.2
	18-30	41	11.4
	30-40	221	61.6
	40-50	64	17.8
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

It was also observed that 21.7 percent of the respondents are living alone, 21.4 percent of the respondents had household sizes of 2-3 members, 37 percent had 4-5 members, and 19.8 percent

had more than 8 members, respectively. The average household size was 3.31 members. The average household size was 3.31 members.

Table 4.4: Summary statistics of the household size

FAMILY SIZE			
		Frequency	Percent
	1	78	21.7
	2-3	77	21.4
	4-5	133	37.0
	above 5	71	19.8
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

It was also observed that 50.7 percent respondents earned between 1,200 to 3,000 birr per month a living income from a different source, 37.6 percent respondents were earned between 3,000 to 5,000 birr per month a living income only 11.7 percent out of total respondents are earned above 5,000 birr per month.

Table 4.5: Summary statistics of the household income

INCOME			
		Frequency	Percent
	1200-3000	182	50.7
	3000-5000	135	37.6
	5000-8000	32	8.9
	above 8000	10	2.8
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

An education level of the respondents in Table was distributed as follows; 83.8 percent respondents were above primary education level and only 16.2 percent out of total respondents

were never attend formal education. Education is a key determinant of individual opportunities, attitudes and economic and social Status, Education becomes very important when it comes to children. This number implies that to creating awareness about solid waste treatment on the formal public relation methods will be guaranteed.

Table 4.6: Summary statistics of the household head education level

EDUCATION			
		Frequency	Percent
	Literate	301	83.8
	Illiterate	58	16.2
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

Weekly amount of solid waste which extracted from sampled households are the following 41.2 percent of respondent households waste 1-5 kg solid waste each week, 35.4 percent of sampled households 6-10 kg solid waste each week,17 percent of sampled households 11-15 kg solid waste each week and 6.4 percent sampled households dumped above 15 kg per week.

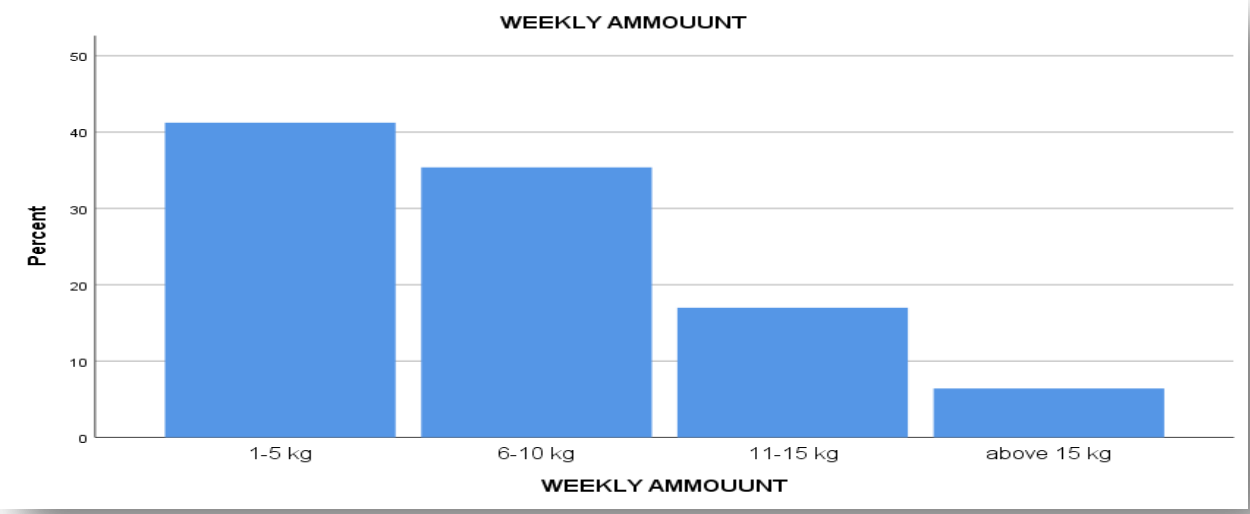
Weekly amount of solid waste which extracted from sampled private and state owned organizations are the following 41 percent of respondent waste 11-20 kg solid waste each week, 50 percent more than 50 kg solid waste each week. This implies that there is huge source of solid waste in the city.

Table 4.7: Summary statistics of the organizations weekly solid waste amount

WEEKLY AMMOUUNT			
		Frequency	Percent
	11-20 kg	5	41.7
	21-30kg	1	8.3
	above 30kg	6	50.0
	Total	12	100.0

Source: Researcher own calculations using survey data 2020.

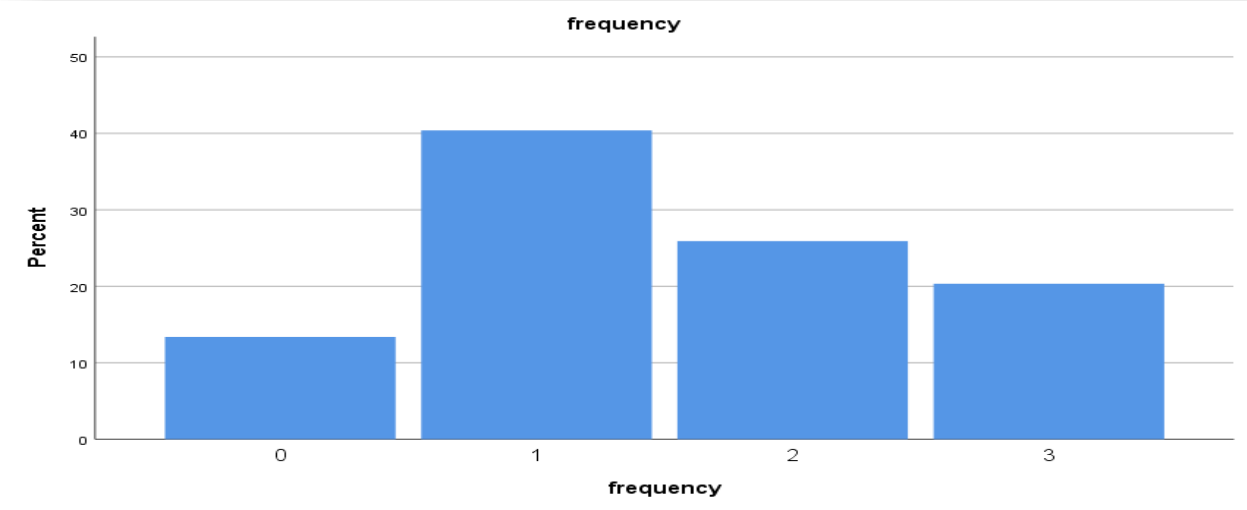
Figure 6: Summary statistics of the household weekly solid waste amount



Source: Researcher own calculations using survey data 2020.

Based on the survey finding 14.3 percent of sampled respondents are not schedules dump on weekly, 39.8 percent of households and 8.3 percentprivate and state owned organization dump only once per week, 25.9percent of households and 25 percentprivate and state owned organization dump twice per week and 20.3 percent of households and 41.7 percent of private and state owned organization dump three days per week. This number implies that every week each organization does not get the service of solid waste collection from municipal.

Figure 7: Summary statistics of the household weekly waste dumping frequency



Source: Researcher own calculations using survey data 2020.

Majority of respondents (78 percent) permanently living for more than 3 years in one place in Addis Ababa as compared to 21 percent rented households but 62 percent of rented household living current houses for less than 4 years, this means rented household do not stay one place for while due to different reasons compared to owners.

Table 4.8: Summary statistics of the household head stay one place

STAY			
		Frequency	Percent
Valid	1-2	35	9.7
	2-3	44	12.3
	above 3	280	78.0
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

Out of the total 359 respondent households 347 (96.7 percent) sampled households are not satisfied on waste treatment practice and only 3.3 percent and 12 respondent households are satisfied. Almost out of 12 sampled government and private owned organizations 100 percent of respondents are not satisfied on current solid waste management techniques. This finding implies

that almost all sampled respondents due to one or another reason they are not feel comfortable on municipal existing solid waste management system and trends.

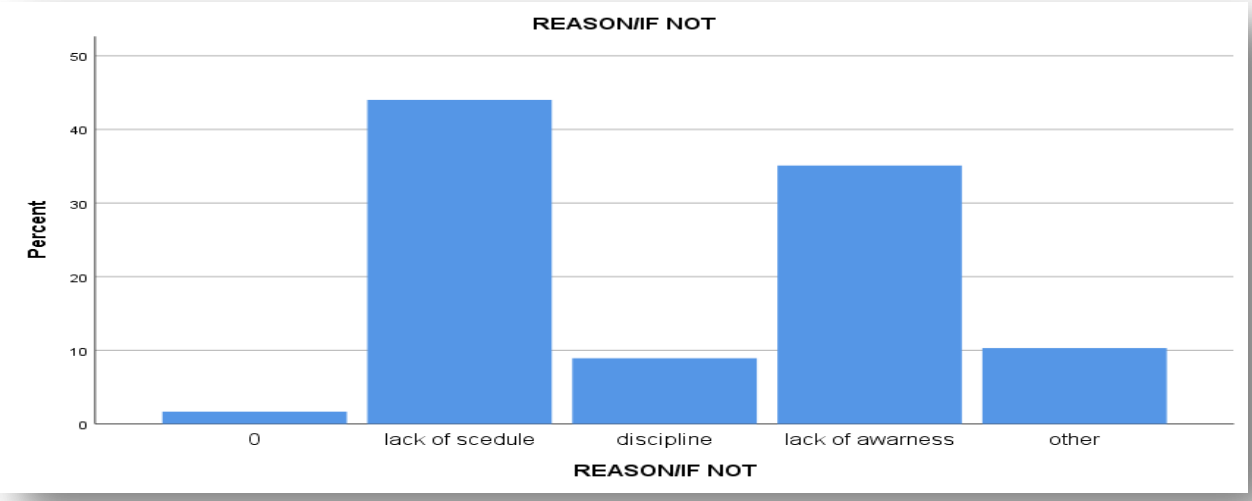
Table 4.9: Summary statistics of the household satisfaction on existing waste management

HOUSEHOLD LEVEL SATISFACTION			
		Frequency	Percent
	Satisfied	12	3.3
	Not satisfied	347	96.7
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

From the list which is indicated to identify the main reason for the households why they are not well satisfied. Among the following 44 percent of respondents (50 percent organization) were not happy on uncertain municipal agents solid waste collection practices, 35.1 percents was mentioned there are lack of awareness creation program (33.3 percent organization), 8.9 percent (16.7 percent organization) was set for lack of well solid waste collectors and transporters work discipline and the rest respondents was categorized there complain unspecific.

Figure 8: Summary statistics of the dissatisfaction on existing waste management



Source: Researcher own calculations using survey data 2020.

Majority of respondents (61.3 percent) permanently living less than 300 meters from nearmain road, almost 75 percent of state and private owned organization near less than 600 meters from the main road. This implies that nearness had advantage to dump frequently and easily for any truck to providing solid waste collection service. Out of the total respondent households 17 percent are living between 300 to 600 meters radius from the nearestsolid waste dumping container/garbage (25 percent organization), 17 percent are living between 600 to 900 meters radius from the nearestsolid waste dumping container/garbage (8.3 percent organizations) and only 9.5 percent respondents (50 percent organization) were living almost one kilometer from the garbage. This implies that when the municipal set solid waste dumping garbage must be keep the proportion from huge solid waste supply.

Table 4.9: Summary statistics of the organization distance from garbage

DISTANCE FROM GARBEDGE			
		Frequency	Percent
	less than 300 meter	2	16.7
	300-600 meters	3	25.0
	600-900 meters	1	8.3
	above 900 meters	6	50.0
	Total	12	100.0

Source: Researcher own calculations using survey data 2020.

The research was tried to investigate the former payment system and community willingness to pay for the service which is municipal and enterprises provided. Out of 359 respondents 74.9 percent households were engaged on solid waste treatment payment system and 25.1 percent of respondent households are not pay on one and another reason (similar result for state and private owned organization engagement). Out of 74.9 percent households were engaged on solid waste treatment payment system majority (70.8 percent) households are pay minimum 50 birr and maximum 100 birr per months and only 11.7 percents are pay more than 100 birr per month for solid waste management task force.

Table 4.10: Summary statistics of the household payment situation

PAYMENT			
		Frequency	Percent
	Yes	269	74.9
	No	90	25.1
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

The payment modality was one of the strongest investigation mechanisms for the future institutional setup majority (60.7 percent) were identified they are paid with utility bill and 24.8 respondents pay direct for municipal solid waste management. Majority of respondents 55.2 percent respondents mentioned there is illegal solid waste damping practice and illegal who are involved through the chain

Table 4.11: Summary statistics of the household how they pay

PAYMENT SYSTEM			
		Frequency	Percent
	Others	52	14.5
	With water bill	218	60.7
	Municipal	89	24.8
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

Majority of respondent households (69.6 percent) has no experience to separate solid waste on their characteristics; this implies that there is lack of awareness on household's level on the first step to treat solid waste and the rest 30.4 percent out of the total 359 respondent household are separate solid wastes at household level. 58.3 private and state owned organization does not separate there solid waste based on the waste characteristics. Based on survey data finding out of 30.4 percent households 32.6 percent (117 respondents) separate on two parts, 10.9 percent

(39respondents) separate on three parts and 16.4 percent (59 respondents) separate there solid waste more than four parts.

Table 4.12: Summary statistics of solid waste separation trends

HOUSEHOLD SEPARATION			
		Frequency	Percent
	Yes	109	30.4
	No	250	69.6
	Total	359	100.0
ORGANIZATION SEPARATION			
		Frequency	Percent
	Yes	5	41.7
	No	7	58.3
	Total	12	100.0

Source: Researcher own calculations using survey data 2020.

Majority of respondent households (69.6 percent) has no experience to separate solid waste on characteristics; this implies that there is lack of awareness on household's level on the first step to treat solid waste and the rest 30.4 percent out of the total 359 respondent household are separate solid wastes at household level. Based on survey data finding out of 30.4 percent households 32.6 percent (117 respondents) separate on two parts, 10.9 percent (39respondents) separate on three parts and 16.4 percent (59respondents) separate there solid waste more than four parts. Out of 30.4 percent solid waste separated household's 45.7 percent's are separate waste for the consumption of compose, 17.5 percent for recycled use,4.2 percent to protect themselves from toxic wastes and the rest 32.6 separate random without specific purposes. Majority of respondent households 53.5 percent (192 respondents) has no experience to seriously separate toxic type of waste and only 46.5 percent (167 respondents) are concerned 0on toxic wastes.

Table 4.13: Summary statistics of types of separated solid waste

TYPE OF SEPARATION			
		Frequency	Percent
	Compose	164	45.7
	Recycled	63	17.5
	Danger	15	4.2
	Other	117	32.6
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

Majority of respondent households 67.1 percent (241 respondents) has no experience to use solid waste for reused purpose in terms of recycle and 32.9 percent (118 respondents) of household use solid wastes for different equipment's for reuses But 58.3 percent of the organization recycle solid waste. 27.6 percent for compose like fruit waste, and 26.5 percent for energy source (cooking like khat), this number implies that the majority of households dump their large consumption.

Table 4.14: Summary statistics of household who are recycle solid waste

HOUSEHOLD LEVEL RECYCLE			
		Frequency	Percent
	Yes	118	32.9
	No	241	67.1
	Total	359	100.0
ORGANIZATION LEVEL RECYCLE			
		Frequency	Percent
	Yes	7	58.3
	No	5	41.7
	Total	12	100.0

Source: Researcher own calculations using survey data 2020.

Majority of respondent households 67.1 percent (241 respondents) has no experience to use solid waste for reused purpose in terms of recycle and 32.9 percent (118 respondents) of household use solid wastes for different equipment's for reuses. This number implies that the majority of households dump their large consumption. 62.4 percent of parents are responsible or initiated to use solid waste for reuses and 32.3 percent of children are initiated to use solid waste for other purposes. This number implies that parents had more willingness to use solid waste at household level.

Table 4.15: Summary statistics of household member who are recycle solid waste

WHO RECYCLE			
		Frequency	Percent
	0	45	12.5
	Mother	179	49.9
	Father	19	5.3
	Daughter	60	16.7
	Son	56	15.6
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

Majority of respondent households 67.1 percent (241 respondents) has no experience to use solid waste for reused purpose in terms of recycle and 32.9 percent (118 respondents) of household use solid wastes for different equipment's for reuses. This number implies that the majority of households dump their large consumption. 62.4 percent of parents are responsible or initiated to use solid waste for reuses and 32.3 percent of children are initiated to use solid waste for other purposes. This number implies that parents had more willingness to use solid waste at household level.

Out of 12 private and state owned organizations 58.3 percent are dump there solid waste by human by carrying, 25 percent use cart (either animals and handcart), 8.3 percent were use trucks and 8.3 percent organizations waste dumping trade was not identified.

Table 4.16: Summary statistics of how organization dump solid waste

HOW ORGANIZATIONS DUMP SOLID WASTE			
		Frequency	Percent
	Carrying	7	58.3
	Cart	3	25.0
	Truck	1	8.3
	Other	1	8.3
	Total	12	100.0

Source: Researcher own calculations using survey data 2020.

Based on survey data analysis almost equal proportion of household members participate to dump solid waste which are consumed on the households 20.6 male and 33.7 females are respectively responsible to dump solid waste on near garbage. 75.5 percent of solid waste transported on human carrying, 18.7 percent households is use cart to transport solid waste and 1.9 percent respondents are use rent truck for solid waste transport and dump

Table 4.16: Summary statistics of household member who are responsible dump solid waste

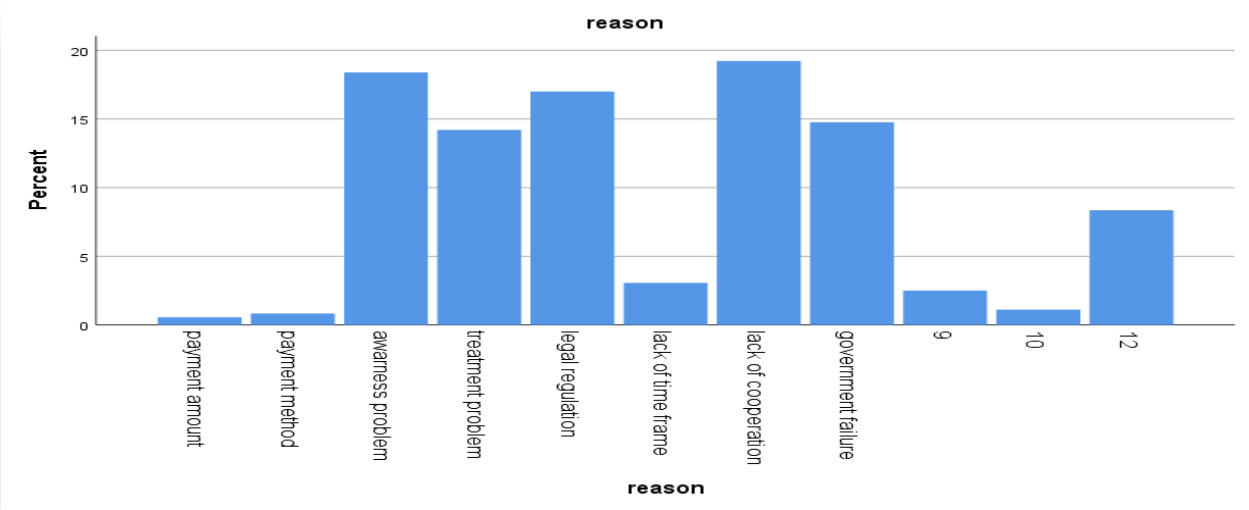
WHO DUMP			
		Frequency	Percent
	Male	74	20.6
	Female	121	33.7
	Kids	68	18.9
	Others	96	26.7
	Total	359	100.0

Source: Researcher own calculations using survey data 2020.

Based on the respondent's opinion lack of awareness creation around solid waste collection, separation, recycling and treatment, lack of cooperation between stakeholders and lack of legal

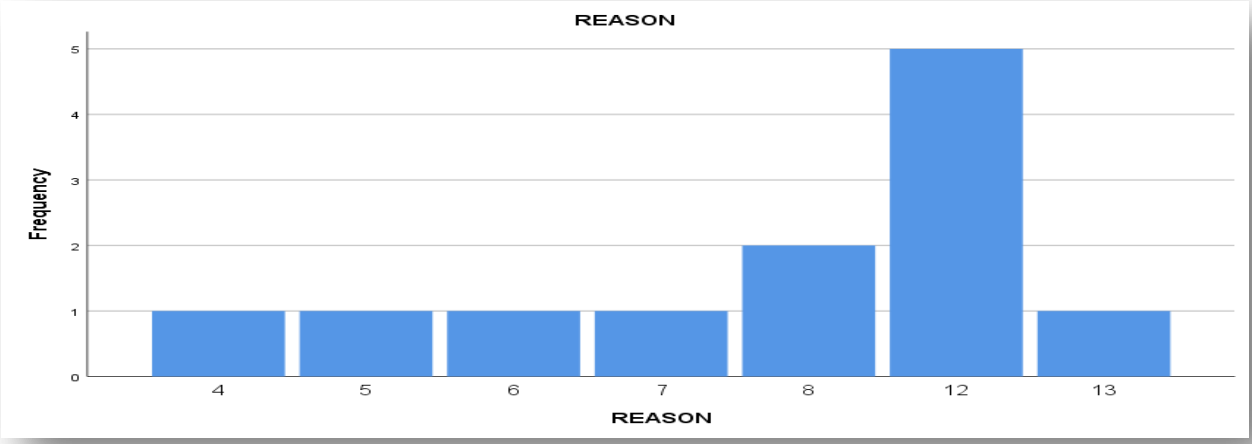
regulation almost 54.6 percent mention those are the main problem on Addis Ababa solid waste existing practices.

Figure 8: Summary statistics of the main reasons for poor yeka sub city solid waste management system household perspective



Source: Researcher own calculations using survey data 2020.

Figure 9: Summary statistics of the main reasons for poor yeka sub city solid waste management system organization perspective



Source: Researcher own calculations using survey data 2020.

Note: numbers indicate, 4 improper solid waste management systems, 5 lack of legal regulation, 6 lack of solid waste collection schedule formalization, 7 lacks of stakeholder's cooperation, 8 household head problem, 12 government failure and 13 weak service providing tactic.

4.2. Binary logistic regression with all independent variables

In this thesis, the IBM SPSS version 26 software was used to conduct logistic regression. Let us see what happened when we used all 8 strong explanatory variables as predictors in our model. Before estimating the models, it was necessary to check for multicollinearity. The reason for this is that, if multicollinearity turns out to be significant, the simultaneous presence of the two variables will attenuate or reinforce the individual effects of these variables. The problem of multicollinearity was checked by variance inflation factor VIF (variance-inflating factor) based on the test for each variable was 1.49 which is less than 10 then there is no multicollinearity problem (Gujarati, page 366).

Based on the "Case Processing Summary" output it is visible that 359 cases used out of 359 (100 percent cases included).

Table 4.17: Case Processing Summary

Case Processing Summary			
UnweightedCases[a]		N	Percent
Selected Cases	Included in Analysis	359	100.0
	Missing Cases	0	.0
	Total	359	100.0
Unselected Cases		0	.0
Total		359	100.0
a. If weight is in effect, see classification table for the total number of cases.			

The case processing summarysimply tells us about how many cases are included in our analysis. The dependent variable encoding reminds us how our outcome variable is encoded '0' for 'yes'

and ‘1’ for ‘no’. The category that is assigned the value zero is called the reference category. When interpreting results, all comparison is made with references to this category.

Table 4.18: Classification Table (block model)

Classification Table[a]					
	Observed		Predicted		
			Satisfaction		Percentage Correct
			WTP	Not WTP	
Step 1	Satisfaction	WTP	10	2	83.3
		Not WTP	3	344	99.1
	Overall Percentage				98.6
a. The cut value is .500					

According to the above Table 4.18, the model with just the constant is a statistically significant predictor of the outcome. However, it is only accurate 98.6 percent of the time! The reason we can be so confident that our baseline model has some predictive power (better than just guessing).

Omnibus tests of model coefficients

The omnibus tests of model coefficients Table 4.19 give the result of the Likelihood Ratio (LR) test which indicates whether the inclusion of this block of variables contributes significantly to model fit. A p-value (sig) of less than 0.05 for block means that the block 1 model is a significant improvement to the block 0 model.

Here the chi-square is highly significant (*chi-square=77.320,df=11, p<.001*) so our new model is significantly better. The *Sig.* values are $p < .001$, which indicates the accuracy of the model improves when we add our explanatory variables.

Table 4.19: Omnibus Tests of Model Coefficient

Omnibus Tests of Model Coefficients			
	Chi-square	Df	Sig.

Step 1	Step	77.320	11	.000
	Block	77.320	11	.000
	Model	77.320	11	.000

Model summary

Model summary has values shown in Table 4.20 indicate how good the model fits the data.

Table 4.202: Model Summary

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	27.837[a]	.194	.763
a. Estimation terminated at iteration number 20 because maximum iterations have been reached.			

In this summary -2 Log likelihood (goodness of fit test) is 27.837. By itself, this number is not very informative this statistic measures how poorly the model predicts the decisions (Karl L.Wuensch, 2014). The p-value for our overall model is less than 0.05, which means that null hypothesis is rejected and there is evidence that at least one of the explanatory variables contributes to the prediction of the outcome.

Cox & Snell R square and Nagelkerke R square are both methods of calculating the explained variation. The Cox & Snell *R2* can be interpreted like *R2* in a multiple regression but cannot reach a maximum value of 1. The NagelkerkeR2can reach a maximum of 1(Karl L.Wuensch, 2014). For our model, the explained variation ranges from 0.194 to 0.763 depending on whether we reference Cox & Snell R square or Nagelkerke R square, respectively. Nagelkerke R square is the modification of Cox & Snell R square and is more preferable to use.We can conclude that between 19.4 percent and 76.3 percent of the variation in solid waste management satisfaction can be explained by the model. In our case it is 0.763, indicating a moderately strong relationship of 19.4 percent between the predictors and the prediction.

Table 4.21: Classification Table

Classification Table

Observed			Predicted		
			Satisfaction		
			WTP	Not WTP	Percentage Correct
Step 1	Satisfaction	WTP	10	2	83.3
		Not WTP	3	344	99.1
	Overall Percentage				98.6
a. The cut value is .500					

The classification Table 4.21 tells us how good the fitted model is for prediction purposes. Based on Table 26 SPSS output result 359 households included in the analysis, 98.6 percent of them are classified correctly on the basis of their household characteristics.

This Table is the equivalent to that in Block 0 but is now based on the model that includes our explanatory variables. As you can see our model is now correctly classifying the outcome for 79.4 percent of the cases in the model.

Hosmer and Lemeshow Test

The Hosmer-Lemeshow test shown in Table 4.22 explores whether the predicted probabilities are the same as the observed probabilities. An overall goodness of fit of the model is indicated by p-values > 0.05 (Hosmer and Lemeshow, 2000 pp 150). This model produced a significant difference between the observed and predicted probabilities indicating a poor model fit.

Table 4.22: Hosmer and Lemeshow Test

Hosmer and Lemeshow Test			
Step	Chi-square	Df	Sig.
1	.009	5	1.000

The null hypothesis of this test is that the model fits the data well. As can be seen from the above Table 4.22 the Chi-square test statistic is insignificant p-value 1.000 (as the p-value exceeds 5 percent). Thus, we can conclude that the model fits the data well.

4.3. Interpretation of the model

The next Tableprovides the regression coefficient (B), the Wald statistic (to test the statistical significance) and the all-important Odds Ratio (Exp (B)) for each variable category. If the odds ratio Exp (B) is less than one (i.e., the estimated regression coefficient is negative), then this means that the odds (or the likelihood) of being not satisfied on solid waste management is higher for the reference category. If Exp (B) is greater than one, then the odds are higher for a particular category as compared to the reference category.

Table 4.23: Variables in the Equation

Variables in the Equation							
		B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
Step 1[a]	Gender(1)	**.489**	**1.130**	**.187**	**1**	**.665**	**1.631**
	Marital status(1)	**-1.618**	**1.678**	**.929**	**1**	**.335**	**.198**
	Age			**8.595**	**3**	**.035****	
	Age(1)	**9.093**	**5389.446**	**.000**	**1**	**.999**	**8895.727**
	Age(2)	**-36.348**	**2751.994**	**.000**	**1**	**.989**	**.000**
	Age(3)	**-26.403**	**2751.988**	**.000**	**1**	**.992**	**.000**
	Distance from Garbage			**7.637**	**2**	**.022****	
	Distance from Garbage (1)	**-23.491**	**8.501**	**7.637**	**1**	**.006***	**.000**
	Distance from Garbage (2)	**15.949**	**3593.215**	**.000**	**1**	**.996**	**8443.728**
	Distance from Garbage (3)	**8.493**	**3.145**	**7.292**	**1**	**.007***	**4881.860**
	Education (1)	**6.914**	**2.645**	**6.833**	**1**	**.009***	**1006.355**
	Housing unit (1)	**-1.986**	**.720**	**7.617**	**1**	**.006***	**.137**
	Occupation(1)	**5.332**	**2.212**	**5.812**	**1**	**.016****	**206.806**
	Income			**8.295**	**4**	**.081*****	
	Income(1)	**-1.554**	**.923**	**2.837**	**1**	**.092*****	**.211**
	Income(2)	**-3.273**	**1.156**	**8.019**	**1**	**.005***	**.038**
	Income(3)	**-1.671**	**.788**	**4.495**	**1**	**.034****	**.188**
	Income(4)	**-1.383**	**.981**	**1.987**	**1**	**.159**	**.251**
	Constant	**27.152**	**2751.990**	**.000**	**1**	**.992**	**619358**
A. variable(s) entered on step 1: gender, marital status, age, stay, frequency, kebele, distance from garbage, how much.							

Source: Model output

** Significant at 5 percent; * Significant at 1 percent

1. **Age**

The variable age situation is significant at the 5 percent level of significance (p-value 0.035). However, there is insignificant difference in the likelihood of being household aged 18-29 years old, 30-40 years old, 41-50 years old and above 51 years old. This means that whatever their age situation is, there is no effect on WTP of respondent's for sanitation since age situation is significant.

2. **Distance from garbage**

The variable distance from garbage is significant at the 5 percent level of significance (p-value 0.022). The odds ratio for the distance from garbage (1) is 0.000 since the coding distance from garbage (1) refers to the households who are 201-300 m. The reference category distance from garbage (0) refers to the households on the distance from garbage below 200 m and the Exp (B) is 100 percent (1-0.000=1). The implication is that the households who are below 200 m are 100 percenttimes more likely willing to sanitize as compared to the households who are between 201-300 m, keeping all other covariates constant.

3. **Housing unit**

The variable housing unit is significant at the 1 percent level of significance (p-value 0.006). The odds ratio for the housing unit (1) is 0.137 since the coding housing unit (1) refers to the households who are rented. The reference category housing unit (0) refers to the households who are owned and the Exp (B) is 86.3 percent (1-0.137 =0.863). The implication is that the households who are owned are 86.3 percenttimes more likely willing to sanitize as compared to the households who are rented, keeping all other covariates constant.

4. **Occupation**

The variable occupation of head of household is significant at the 5 percent level of significance (p-value 0.016). The odds ratio for the occupation (1) is 206.806since the coding occupation of head of household (1) refers to the households who are employed. The reference category occupation (0) refers to the households who are unemployed and the Exp (B) is greater than one.The implication is that the households who are employed are 206.806 times more likely

willing to sanitize as compared to the households who are unemployed, keeping all other covariates constant.

5. **Education**

The variable education head of household is significant at the 1 percent level of significance (p-value 0.009). The odds ratio for the education (1) is 1006.355since the coding education of head of household (1) refers to the households who are literate. The reference category education (0) refers to the households who are illiterate and the Exp (B) is greater than one.The implication is that the households who are literate are 1006.355 times more likely willing to sanitize as compared to the households who are illiterate, keeping all other covariates constant.

6. **Income**

The variable head of household income is significant at the 10 percent level of significance (p-value 0.081). The odds ratio for the income (1) is 0.211since the coding head of household income (1) refers to the households who have monthly income 3501-5500 birr. The reference category income (0) refers to the households who have monthly income below 3500 birr and the Exp (B) is 78.9 percent (1-0.211=0.789).The implication is that the households who have monthly income below 3500 birr are highly willing to sanitize as compared to the households who have monthly income 3501-5500 birr, keeping all other covariates constant.

The category income (2) (5501-7500 birr) is significant at 1 percent level (p-value 0.005) and has an odds ratio equals to 0.038. The reference category is households who have monthly income below 3500 birr. Thus, the odds of being willing to pay are 96.2 percent (=1-0.038) higher for the households who have monthly income below 3500 birr as compared to the households who have monthly income 3501-5500 birr, keeping all other covariates constant.

The category income (3) (7501-9500) is significant at 5 percent level (p-value 0.034) and has an odds ratio equals to 0.188. The reference category is households who have monthly income below 3500 birr. Thus, the odds of being willing to pay are 96.6 percent (=1-0.034) higher for the households who have monthly income below 3500 birr as compared to the households who have monthly income 3501-5500 birr, keeping all other covariates constant.

However, there is no statistically significant evidence as whether gender and marital status of head of household's in wereda 06 yeka sub city affects the resident's willingness to pay.

CHAPTER FIVE

5. CONCLUSION AND POLICY RECOMMENDATION

5.1.Summary

In this study, an attempt has been made to explore the demographic and socio economic Impact of resident's willingness to pay for improved better sanitation, a case of woreda 06, Yeka sub-city, Addis Ababa. The survey is cross sectional and also descriptive and explanatory research design was used, and largely used primary data obtained through conducting household survey. In order to assess the Impact of resident's willingness to pay for improved better sanitation, data on the determinant of WTP were collected from 359 respondents. The information captured using the household questionnaires (from June first up to June last 2019 for one month) which covered demographic data, economic activity, and employment, sources of income, housing situation, and monthly expenditure (health, education, rent fee, food and non-food) during the last 12 months, employment earnings and regular payments (monthly). Data collecting period spend 1 months including enumerator orientation. The sample was selected by using KothariSample Size Formula and the data were analyzed by using descriptive and econometrics methods.

5.2.Conclusion

The distribution of sample respondents by sex shows that the majorities (61.0 percent) of the respondent were found female and (39.0 percent) were male. Out of the total 359 respondents majority of the sample household head respondents (61.1 percent) were between 30-40 years old. With regard to educational level of respondents, 83.8 percent respondents were above primary education level and only 16.2 percent out of total respondents were never attend formal education. Regarding marital status of head of households, 43.2 percent of respondents are married and 56.8 percent were single. It was also observed that 50.7 percent respondents earned between 1,200 to 3,000 birr per month a living income from a different source, 37.6 percent respondents were earned between 3,000 to 5,000 birr per month a living income only 11.7 percent out of total respondents are earned above 5,000 birr per month.

Data on household size was also observed that It was also observed that 21.7 percent of the respondents are living alone, 21.4 percent of the respondents had household sizes of 2-3 members, 37 percent had 4-5 members, and 19.8 percent had more than 8 members, respectively.Weekly amount of solid waste which extracted from sampled households are the following 41.2 percent of respondent households waste 1-5 kg solid waste each week, 35.4 percent of sampled households 6-10 kg solid waste each week,17 percent of sampled households 11-15 kg solid waste each week and 6.4 percent sampled households dumped above 15 kg per week. Weekly amount of solid waste which extracted from sampled private and state owned organizations are the following 41 percent of respondent waste 11-20 kg solid waste each week, 50 percent more than 50 kg solid waste each week. This implies that there is huge source of solid waste in the city. 89.7(322 respondent) percent of the respondents were found willing to sanitize (said yes) and 10.3(37 respondent) percent were willing to sanitize (said no) at the time of survey.

The multivariate analysis shows that six of the independent variables found they are significantly determine the resident's willingness to pay. Those are age, distance from garbage, education, occupation, housing unit and income of household head influence the probability resident's willingness to pay whereas, , there is no statistically significant evidence as whether gender and marital status of head of household's in wereda 06 yeka subcity affects the resident's willingness to pay.

The result of the econometric model indicate that resident's willingness for the distance from garbage to pay orhouseholds who are below 200 m are 100 percenttimes more likely willing to sanitize as compared to the households who are between 201-300 m. The variable age situation is significant at the 5 percent level of significance (p-value 0.035). Households who are owned are 86.3 percenttimes more likely willing to sanitize as compared to the households who are rented. Households who are employed are 206.806 times more likely willing to sanitize as compared to the households who are unemployed.Households who are literate are 1006.355 times more likely willing to sanitize as compared to the households who are illiterate.Households who have monthly income below 3500 birr are highly willing to sanitize as compared to the households who have monthly income 3501-5500 birr, households who have monthly income below 3500 birr as compared to the households who have monthly income 3501-5500 birr and households

who have monthly income below 3500 birr as compared to the households who have monthly income 3501-5500 birr. However, there is no statistically significant evidence as whether gender and marital status of head of household's in woreda 06 yeka sub city affects the resident's willingness to pay.

5.3.Policy Recommendation

The high rate of population, rapid urbanization trends and change in life style of residents has resulted in production of large volume of solid and liquids waste from urban residences, hotel and restaurant, commercial center including black market, live stock production, health care and educational institution, street cleaning and sweeping, medium and high industrial manufacturing facilities as well as building and construction activities. Generation of different types of waste in market center is the main challenge of solid waste management in the city besides improper management at household, hotel and restaurant etc, which result detrimental effect on environmental component(water bodies, soil, atmosphere ,human health, biodiversity).more specifically, based on our findings, the researcher and draw the following policy implication:

1. An important policy implication from the strong positive relationship between education level and willingness to connect to the improved sanitation service is that there is need to educate people about the benefits associated with improved sanitation service in general, and having private connection to the new sanitation service, in particular.

2. The strong positive relation b/n the wealth(income)of household and the willingness to have private connection to the improved sanitation service imply that there is a need to consider households' income status in designing policies related to supply of improved sanitation service.

3. Given that what people say today remained for tomorrow, an important policy implication of high amount of WTP i obtained in my study is that the existing tariff is set below the people's WTP, which implies that in setting tariff for sanitation service ,the WTP of the beneficiary should be taken in to consideration. Besides, since WTP is affected by income the household, tariff setting should consider the poor income group not to be devoid of from access to the minimum requirement to sustain their life. Furthermore it also implies that designing income

generating programs that address the poor households can help to sustain the system to function well.

4. Study result showed that people are more willing and can afford to pay for an improved sanitation service at a price equal to the AIC supplying the improved service. This implies that if least cost method is used in formulating projects for improved sanitation supply service, it is possible to set tariff that enable to recover the full cost of providing the improved sanitation service.

5. High WTP amount and the ability of the consumers to pay for the price of the improved water supply equal to the AIC imply that the city sanitation service officials not only can establish full cost recovery, it can also attain an efficient and proper utilization of the resources since one of the advantages of implementing cost recovery program is efficient and proper utilization of the resources.

6. Our study we found that most of the respondents able and are willing to pay the full cost of providing the improved sanitation service. An important policy implication from this finding is that it is advisable for the utility to set objective which can abandon the low-level equilibrium trap, which is the cycle of poor service, little revenue and low reliability, and which can lead to attain high level equilibrium, which is high private connections and high reliability of the service given the improved sanitation service is provided.

REFERENCE

Ethiopia Transportation System Improvement Project (TRANSIP), (2016). Social Impact Assessment (SIA) Addis Ababa, Ethiopia. AACA.

Abdissa A, Walelegn W (2016). Sanitation practice of slum communities in Addis Ababa, Ethiopia. Science Journal of Public Health 4(4):297-304.

Acharya P, Kaphle HP, Thapa SB (2015). Hygiene and sanitation practices among slum dwellers residing in urban slums of Pokhara sub-metropolitan, Nepal. International Journal of Health Sciences and Research 5(5):298-303.

Adane M, Mengistie B, Kloos H, Medhin G, Mulat W (2017). Sanitation facilities, hygienic conditions, and prevalence of acute diarrhea among under-five children in slums of Addis Ababa, Ethiopia: Baseline survey of a longitudinal study. PLoS ONE 2(8). Available at: https://doi.org/10.1371/journal.pone.0182783

ADB. (2002). Impact Evaluation Study on Water Supply And Sanitation Projects In Selected Developing Member Countries.Manila:Asian Development Bank.

AIDSTAR-One. (2012). Improving the Lives of People Living with HIV (PLHIV) Through WASH: Water, Sanitation, and Hygiene—Participant Technical Resource Guide. Arlington, VA: USAID's AIDS Support and Technical Assistance Resources, AIDSTAR-One, Task Order 1.

Alam M, Rahman M, Al-Firoz M (2013). Water supply and sanitation facilities in urban slums: A case study of Rajshahi City corporation slums. American Journal of Civil Engineering and Architecture 1(1):1-6.

Amref health Africa: June 2016case study on hand washing campaign at Yeka sub city district.

Ashebir Y, Rai-Sharma H, Alemu K, Kebede G (2013). Latrine use among rural households in northern Ethiopia: a case study in Hawzien district, Tigray. International Journal of Environmental Studies 70(3):629-636.

Assumptions of Binary Logistic Regression(http://www.statisticssolutions.com/assumptions-of-logistic-regression/)(Accessed: 16May 2018).

Aubel, Judi. 2004. Participatory Monitoring & Evaluation for Hygiene Improvement Beyond the toolbox: What else is required for effective PM&E? A Literature Review.Strategic Report 9. EHP (Environmental Health Project), Arlington,Virginia.

Bajracharya. (2003). Myanmar experiences in sanitation and hygiene promotion: lessons learned and future directions. Intrenational Journal of Environmental Health Research, *13*(1).

Bewick *et al.* (2005). Statistics review 14: Logistic regression*Critical Care*Vol 9 (1), 112-117.

Bizatu M, Negga B (2010). Community based assessment on household management of waste and hygiene practices in Kersa district, Eastern Ethiopia. Ethiopian Journal of Health Development 24(2):103-109.

C.R. Kothari. (2004). *Research Methodology, Methods and Technique*, 2 editions, New Delhi: New Age International private Ltd, publishers.

Cees, L. 2000.Reconceptualising participation for sustainable rural development, towards a negotiation approach. Development&change, Nov. 2000, vol. 31 Issue 5,

CSA. (2010). *2007 Population and Housing Census of Ethiopia, Results for Addis Ababa City Administration Statistical Report*, Addis Ababa, Ethiopia.

CSA. (2012). *Ethiopia Households Consumption Expenditure (HCE) Survey Result for: Addis Ababa City Administration Volume I statistical paper*, Addis Ababa, Ethiopia.

DDWS.(2001). Central Rural Sanitation Programme Total Sanitation Campaign. New Delhi: Department of Drinking Water Supply,Ministry of Rural Development, Government of India.

Dick de Jong(IRC)January 2003advocacy for water ,environmental sanitation and hygiene Thematic overview paper.

Dinbabo, M.F., 2003. Development theories, participatory approaches and community development.Unpublishedpaper.Bellville: Institute for Social Development, University of theWestern Cape.Page 17 of 20

Dinbabo, M.F., 2003. Development theories, participatory approaches and community development.Unpublished paper. Bellville: Institute for Social Development, University of the Western Cape.Page 18 of 20

Ethiopia Households Consumption Expenditure *(HCE)* (2012).Survey Result for*:* Addis Ababa CityAdministration Volume I statistical pape*r*, Addis Ababa, Ethiopia. CSA.

Gujarati N.D. (2004). *Basic Econometrics*, Fourth Edition, New Delhi: The McGraw−Hill Companies.

Guy bessete- 2004-01-01Involving the community-A guide to participatory communication

Hosmer D. W., and Lemeshow S., (2000).*Applied Logistic Regression, Second Edition*. New York, USA: John Wiley and Sons.

Kleinau, Eckhard, and David F. Pyle. 2004. Assessing Hygiene Improvement:Guidelines *for* HouseholdandCommunity *Levels*. Strategic Report 8.EHP,Arlington, Virginia.

Mubarak M, Abram L, Mari A, Bradley F, Matthew L (2016). Hygienic practices and diarrheal illness among persons living in at-risk settings in Kabul, Afghanistan: a cross-sectional study. BMC Infectious Diseases 16:459.

Park, Hyeoun-Ae. (2013). an Introduction to Logistic Regression: From Basic Concepts to Interpretation with Particular Attention to Nursing Domain *Korean Acad Nurs* Vol.43 (2), 154-164

Population and Housing Census of Ethiopia,*2007*.(2010).Results for Addis Ababa City Administration Statistical Repor*t*, Addis Ababa, Ethiopia.CSA.

Rabie T, Curtis V (2006). Hand washing and risk of respiratory infections: a quantitative systematic review. Tropical Medicine and International Health 11(3):258-267.

Rodríguez, Giselle, and NardaMeléndez. 2000. Taking the Pulse of Gender. TowardEquity Series.The Social Program of the World Conservation Union and theArias Foundation's Center for Human Progress.

Roodt, M. 2001. Participation, civil society, and development. (Eds) Coetee, J,

S.White, 2004participatory communication working for change and development. New Delhi: sage publication.

Shukla M, Agarwal M, Rehman HM, Yadav K, Imchen T (2016). Housing and sanitary conditions in slums of Lucknow, capital of Uttar Pradesh. International Journal of Medical Science and Public Health 5:1153-1157.

Simiyu S, Swilling M, Cairncross S, Rheingans R (2017). Determinants of quality of shared sanitation facilities in informal settlements: case study of Kisumu, Kenya. BMC Public Health 17:68.

Tamas, A. 2000.System theory in community development. Ontario.

Uma Maheswari Assistant Professor, Department of Media Sciences, Anna University, Chennai - 600025, Tamil Nadu, India)

UNDP.human development report2013.the rise of the south: Human progress in a diverse world. New York (http://hdr.undp.org/en/content/human-developement-report-2013)

UNICEF-2011water, sanitation, and hygiene annual report

USAID 2015 situation analysis of urban sanitation and waste management research in Ethiopia

Van-Rooijen D, Taddesse G (2009). Urban sanitation and waste water treatment in Addis Ababa in the Awash Basin, Ethiopia. Availabe at: https://wedcknowledge. lboro.ac.uk/resources/conference/34/Van_Rooijen_D_- _95.pdf.

WHO/UNICEF 2017 Joint Monitoring Programmereport (https://www.unwater.org/new-publication-whounicef-joint-monitering-programme-2017-report)

World Health Organization (WHO) and United Nations Children's Fund (UNICEF) (2012).World Health Organization (WHO) and United Nations United Nations International Children's Emergency Fund.

መጠይቅ

ውድ የጥናቱ ተሳታፊ,

ይህ የዳሰሳ ጥናት መጠይቅ በየካ ክ/ከተማ ወረዳ 6 ውስጥ የቆሻሻ አያያዝ ተጽኖን ለማጥናት ተዘጋጅቷል. በዚህ የዳሰሳ ጥናት የተገኙት መረጃዎች ለአካዳሚክ ትምህርት ዓላማ ብቻ ጥቅም ላይ የሚውሉ ናቸው. የእርስዎ ምላሾች በምስጢር የተጠበቁ እና የፖሊሲ ምክሮችን ለመቅረጽ የጥናቱ ትክክለኝነት እና አስተማማኝነት እንዲጨምር ከፍተኛ ጠቀሜታ ይኖራቸዋል. ለእዚህ ጥናት ስኬት እርስዎ የሚሰጡት ትክክለኛ መረጃ በጣም አስፈላጊ ነው።

የተጠያቂው.....ዕታ.....ወረዳ.....ቀበሌ.....የቤት/ቁ.....

የትምህርት ደረጃ.....የትዳር ሁኔታ..... ስራ..... እድሜ.....

1. አሁን ባለው የከተማ የቆሻሻ አወጋገድ ደስተኛ ኖት? 1/ አዎ 2/አይደለሁም
2. መልሶ አይደለሁም ከሆነ ምክንያቱ ምንድነው?
   1) በወቅቱ ስለማይሰበሰብ 2. በቆሻሻ አንሽዎች ስነምግባር
   3. በቆሻሻ አያያዝና አወጋገድ ላይ ግንዛቤ ስለማይፈጠር 4. ሌሎች
3. መልሶ አዎ ከሆነ ምክንያቱ ምንድነው?
   1) በወቅቱ ስለሚሰበሰብ/ስለሚነሳ 2. የቆሻሻ አንሽዎች ስነምግባር
   3. በቆሻሻ አያያዝና አወጋገድ ግንዛቤ ስለሚፈጠር 4. ሌሎች
4. ከቤቶ በሳምንት በግምት ምን ያህል ኪሎ ግራም ቆሻሻ ይወጣል?
   1/1-5 ኪ.ግ 2/ 6-10 ኪ.ግ 3. 11-15 ኪ.ግ 4. ከ15 ኪ.ግ በላይ
5. ከቤቶ የተሰበሰበውን ቆሻሻ በሳምንት ስንት ግዜ ወደ ገንዳ ወስደው ይደፋል?
   ሀ/ 0 ለ/1 ሐ/ 2 መ/3
6. በአካባቢዎ ካለ የቆሻሻ ገንደ ቆሻሻ በሳምንት ስንት ግዜ ይነሳል?
   ሀ/ 1 ለ/2 ሐ/ 3 መ/ ከሳምንት በላይ
7. ከቤተሰብ አባል የቆሻሻ ማስወገዱ ሃላፊነት በይበልጥ የሚወድቀው ማን ላይ ነው?
   ሀ/ እናት ለ/ አባት ሐ/ ሴት ልጅ መ/ ወንድ ልጅ
8. ቆሻሻን ሲያጠራቅሙ በአይነት የመለየት ዘዴን ይጠቀማሉ? ሀ/ አዎ ለ/አልጠቀምም
9. መልሶ አዎ ከሆነ በስንት ቦታ ከፍለው ያጠራቅማሉ?

ሀ/ 2 ለ/3 ሐ/4 መ/ 5 ና ከዚያ በላይ

10.ቆሻሻን ሲያጠራቅሙ በየትኛው አይነት ይከፋፍላሉ?

1/. የሚበሰብስ2.መልሶ መጠቀም የሚቻል 3. አደገኛ ቆሻሻ4. ሌሎች

11.ቆሻሻን መልሶ ጥቅም ላይ የማዋል ልምድ አሎት?

ሀ/ አዎ ለ/የለኝም

12. መልሶ አዎ ከሆነ ቆሻሻን ለምን ይጠቀማሉ?

1/ ለተፈጥሮ ማዳበርያ 2. ለማገዶ 3.ለተለያዩ አገልግሎቶች/ለሌሎች

13. ከቤተሰብ አባል ቆሻሻን ጥቅም ላይ እንዲውል የሚያደርገው ማነው?

1/ እናት 2/ አባት 3/ ሴት ልጅ 4/ ወንድ ልጅ

14.ቆሻሻን ከቤት ወደ ግዜያዊ ማጠራቀሚያ የሚወሰደው በማን ነው?

ሀ/ በወንድ ለ/ በሴት ሐ/ በልጆች መ/ ሌሎች በጭራሽ ወደ ገነዳ አልወስድም

15.ቆሻሻ ከቤት እስከሚጠራቀምበት ድረስ የሚወሰደው እንዴት ነው?

ሀ/ በሸክም ለ. በጋሪ ሐ. በትራክ መ. በሌላ

16.ቆሻሻን ከቤት እስከማጠራቀምያ ገንዳ ለመውሰድ የሚከፈል ክፍያ አለ?

ሀ/ አዎ ለ/ የለም

17.መልሶ አዎ ከሆነ በወር ምን ያህል?

ሀ/ 50-100 ለ. 100-150 ሐ.150-200 መ. ከ200 ብር በላይ

18. በከተማዋ በሕገወጥ መልኩ ቆሻሻን የመሰብሰብና የማስወገድ እንቅስቃሴ አለ ይላሉ?

ሀ/ አለ ለ. የለም

19.መልሶ አለ ከሆነ በዚህ ድርጊት የተሳተፉ ግለሰቦች በግምት ቁጥራቸው ስንት ይሆናል?

ሀ/. 1-20 ለ. 20-40 ሐ. 40-60 መ. ከ60 በላይ

20.የሕገ ወጥ ቆሻሻ የመሰብሰብና የማስወገድ ድርጊት እንዴት ሊጀምር ቻለ?

ሀ/ የክፍያ ሁኔታለ. የማህበረሰቡ የኑሮ ሁኔታ ሐ. የአደረጃጀት ችግር መ. ሌሎች

21. በቆሻሻ መሰብሰብና ማንገዝ ላይ የግል ክፍሉ ይሳተፋል? ሀ/ አዎ ለ. አይሳተፍም

22. መልሶ አዎ ከሆነ በምን መልኩ?

ሀ/ ገንዘብ በማዋጣት ለ. በመኪናው ቆሻሻ በማንገዝ

ሐ. አካባቢን በማስተባበር በማፀዳት መ. ሌሎች

23. ለደረቅ ቆሻሻ አወጋገድ ዋና ማነቆ ነው ብለው የሚገምቱት ምን ይመስሎታል?

_____

_____

_____

24. በመጨረሻም አሁን ያለውን የከተማዋን ቆሻሻ አወጋገድ ዘመናዊ በማድረግ ለነዋሪዎች ምቹና ፅዱ ስፍራ ለመፍጠር ከማህበረሰቡ፤ ከባለድርሻ አካላት ከመንግስት ምን ይጠበቃል ይላሉ?

ከማህበረሰቡ፡-_____

ከባለድርሻ አካላት፡-

_____

ከመንግስት፡-_____

25. መልሶ አይደለሁም ከሆነ ምክንያቱ ምንድነው?

ሀ) በወቅቱ ያለመሰብሰብና ቆሻሻን ያማከለ አለመሆኑ ለ. የተለያዩ የባለ ድርሻ አካላትን ባለማሳተፉ ሐ. የቅንጅትና የአደረጃጀት ችግር ስላለበት መ. ሌሎች

Appendixes

Photo: deep interview

Photo: community participation on cleaning

Photo: Sharing toilets in kebele 19