



WERABE UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
DEPARTEMENT OF ECONOMICS

**HOUSHOLD WILLINGNESS TO PAY FOR IMPROVED SOLID
WASTE MANAGEMENT PRACTICES AND THEIR DETERMINANTS
(A CASE STUDY OF WELKITE TOWN CENTRAL
ETHIOPIA REGIONAL STATE)**

A THESIS SUBMITTED TO DEPARTMENT OF ECONOMICS IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF
SCIENCE IN DEVELOPMENT ECONOMICS

By
ZADE SEBAGA
(ID MScEc/W/022/15)

UNDER THE GUIDANCE OF
TESHALE W/AMANUEL
(PhD)

CO-ADVISOR
ADEM SUNKEMO. (MSc)

WERABE, ETHIOPIA
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APPROVAL SHEET- ADVISOR
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CERTEFICATE

This is to certify that the thesis entitled, “Household Willingness To Pay For Improved Solid Waste Management Practice and their Determinants in Welkite Town, Central Ethiopia Regional State” submitted in partial fulfillment of the requirement for the award of degree of Masters of Science in Economics with specialization in Development economics is a record of original research work under our supervision and guidance and the thesis has not formed the basis for the award of any degree/diploma/Associate ship/Fellowship or other similar title of any candidate of our university and it complies with the regulation and accepted standard of the university. Therefore, we recommend that the student has fulfilled the requirement and hence hereby can submit the thesis to the department.

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LIST OF ABBREVIATION AND ACRONYM

AA – Addis Ababa.

AAMES-Association Of African Methodist Episcopal Scouts

CSA-Central Statistical Analysis.

CVM- Contingent Valuation Methods

ETB– Ethiopian Birr.

ISWM– Improve Solid Waste Management.

KM – Kilo Metter.

LGAs – Low Government Administrative.

MSW– Municipal Solid Waste.

MASL – Matter above Sea Level.

MSEs – Micro and Small Enterprises.

NGO– Non Governmental Organization.

SNNPR-South Nation Nationality People Region

SWM-Solid Waste Management

VIF – Variance Inflation Factors.

WTP – Willingness to Pay.

UNEPA- United Nation Environmental Protection Agency.

UNESCO- United Nation Environmental, Social, and Cultural Organization\

UNCHS -United Nations Centre for Human Settlements.

USEPR-United States Evolutionary Power Reactor

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ABSTRACT

This study was conducted to investigate the Household willingness to pay for improved solid waste management practices and their determinants in Welkite Town, Central Ethiopia Regional State. To select sample respondents from Welkite Town, this study employed a random sampling technique. A total of 364 respondents were participated in this study. To achieve the objective of the study, both descriptive statistics and Econometric data analysis methods of were utilized. Descriptive Statistics, chi2 test and t-test was used to check significant mean difference. The chi2 result for categorical variable indicates that there was significant difference between willingness to pay group and non-willingness to pay group in terms of educational status of respondents, Awareness, House ownership and Satisfaction from collection service. The t-test result for quantitative variables indicate that there was significant mean difference between Households willingness to pay and those Households not willing to pay in terms of age of household head, family size and income of household. According to probit regression result, age of household head, income of household, awareness, House ownership, Satisfaction and Household Plan to live are statistically significant variables which affect household willingness to pay for improved solid waste management hence; their p-value was less than 5% (0.05 To maximize willingness to pay for improved sanitation in Welkite Town, the municipal administration should implement fair tariff system that balances household income levels with localized incentives for long-term property owners. Furthermore, targeted environmental education campaigns must be deployed to bridge the awareness gap, effectively transforming perceived waste severity into proactive economic participation. By integrating these socio-economic determinants into a interrelated urban policy, the town can secure the fiscal sustainability required for a modern, resilient solid waste management infrastructure.

Key Words: *willingness to pay, improved solid waste management, Welkite Town, Central Ethiopia Regional State.*

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

Solid wastes by definitions include refuse from households, non-hazardous solid waste from industrial and commercial establishments. Refuse from institutions market waste, yard waste, and street sweepings. Broadly households waste otherwise known as residential or domestic waste are made up of waste that are consequence of households activation these include food preparations, sweeping, cleaning, fuel burning and gardening waste to old clothing (Rahman, 2021).

In Ethiopia, mainly cities are faced with the problem of rapid expansion due to population increase and this, no doubt, brought increasing strain on urban infrastructure facilities. On area in which this strains has become obvious is in waste management where the existing system appears to be incapable of coping experiencing an increase rate generated on daily basis the urban centers are experiencing an increase rate of environment deliration, with return dumped a long drain age channels (Solomon, 2022).

Human and the act of production and consumption are always inseparable. In the process of utility maximization procedure there is unexpected externalities, which is waste. The wastes could be both solid and liquid types; and the way they are going to be handled, stored, and disposed can expose the environment and public health to risks (Zhu et al., 2019).

Rouse (2020) defined Solid waste is as material which no longer has any value to its original owner, and which is discarded. The main constituents of solid waste in urban areas are organic waste (including kitchen waste and garden trimmings), paper, glass, metals and plastics.

Ash, dust and street sweepings can also form a significant portion of the waste". Hundred and thousand years ago, the solid waste management system was not a big deal in the globe. One of the studies related to this stated that "The first humans did not worry much about waste management; rather they simply left their garbage where it dropped" (Net Industries, 2019). This implies that solid waste management task is becoming a serious concern due to the alarmingly increasing rate of population growth and the development of urbanization in the world.

This is also supported by Smith (2010). He stated that as far as humans have been living in settled communities, solid waste become an issue, and modern people generate by far more wastes than early humans ever did. Therefore, the urbanization and population growth rate of a particular city/ nation is positively related with the generation rate of solid wastes. Hence, the city which shows increasing population growth and its urbanization should take the question of how to manage solid wastes without scarifying environmental and human health as an agenda.

According to Rouse (2020) “Solid waste management (SWM) involves the collection, storage, transportation, processing, treatment, recycling and final disposal of waste. Systems need to be simple, affordable, and sustainable (financially, environmentally and socially) and should be equitable, providing collection services to poor as well as wealthy households”. To achieve the above stated means of management, household members of a given geographical territory, as one of the stakeholders, have their own responsibility. But the extent of their responsibility is varies depending on the approach that the town follows: either conventional based approach or community based approach (World Bank, 2022); Rahman, 2021); i.e. collection of wastes on temporary storage at the source and dump it on the given municipality material (conventional approach) or handover to the waste collectors (community based approach) is the responsibility of the households of a given area.

Hence, this solid waste management (SWM) service has an advantage to protect the environment from the risk of ineffective disposal system of solid wastes. Moreover, the primary objective of solid waste management activity is to make the environment protected and safe in human health via disposed wastes in a well-organized manner. However, through process the stakeholders of the management system, especially in the developed nations, did not stop on disposed of waste in open dump or landfill only; rather they tried to convert the trash/solid wastes/ to cash and make strong their economy in addition to environmental aspect Rouse (2020).

In line with this view, Smith (2010) also stated about the benefit of properly managed solid wastes beyond securing the environment and human health. It is very much worthy to directly quote the finding of Smith: “For most industrialized nations today, solid waste management is a multibillion dollar business which is also crucial to survival. Garbage collection agencies remove tons of garbage yearly and sort it for recycling or ultimate disposal” (Smith, 2010, p: 1). In

addition, Rouse (2020) also noted that, besides the above benefit of well managed solid wastes, it surely is important to produce Methane gas for the purpose of electric power generation. However, let alone getting the above stated benefits, Solid waste management (SWM) is one of the critical challenges of developing countries including Ethiopia because of the social, economic and environmental implications once not properly managed.

One of the studies show that only 30-50% of the waste generated in developing countries is collected and managed properly (Dawit and Alebel, 2018). The rest is either burned or left to decompose in open space or dumped in unregulated landfills, which is damaging the environment. In addition, the study by sandecs municipal solid waste group (Aklilu, 2021) stated that mostly observed serious problems especially in low and middle income level countries are inadequate collection, storage, treatments and uncontrolled disposal of solid wastes in open dumps which easily expose to harsh hazards, Like environmental pollution and health problem in recent years, urbanization is increasing in most developing countries including Ethiopia. In addition to the above evidences for the relation of solid waste and urbanization, Studies like Solomon (2022) also showed that a positive relationship between solid waste generation and urban growth. Due to this, the low and middle income countries are really suffering from imbalance between the amount of waste generation and the capacity which need to properly manage their wastes.

According to CSA (1994) census Welkite town had a total population of 15,329 which is grown in to a total population of 28,866 (CSA, 2007/2015). This implies that Welkite is also one of the fast growing towns in the country, with increasing solid waste generation. Moreover, according to preliminary survey conducted by the researcher (August 2021 household solid wastes in Welkite town are observed on the road, burning inside the village and disposed in sewerage. This clearly indicated that, Welkite town population rate and the waste generation rate per household is increasing. But the solid waste management, particularly at household level, is not managed in a well- organized manner. This implies that like other developing country cities, Welkite town has also problems that prevent the municipality/ responsible body from doing its task for environmental sound with economic efficiency. So that, this thesis is intended to identify and analyze the main determinants of solid waste management practice at household level.

1.2 Statement of the problem

Urbanization with inadequate waste management practices, specifically, widespread disposal of waste in water bodies, dumping inside the road and uncontrolled dump sites severe the problems of low sanitation levels across the African countries including Ethiopia (UNESCO, 2019).

According to UNESCO (2019), the population growth and the rate of urbanization are alarmingly increasing throughout the African continent. But the technology, technical knowhow, financial capacity, culture, and understanding of the community required to properly manage solid wastes are not adequately available.

Related to this; Ali (2020) noted that with the increase of population, solid waste management practice would be the main challenges for the responsible body. So that, preventive measure should be taken in order to have remedial action at least on biodegradable materials. Otherwise, if the present trend of solid waste generation and disposal practices continues, the area would be a place of unhygienic living condition. As per the result of preliminary survey (pilot study) conducted by the researcher, August 2021, SWM practices of Welkite town were under the control of the town municipality. This municipality has a single old truck and also allowing jobless youths to participate in waste management system via door to door collection by their push cart. Then the households are expected to store wastes on their plastic bags or other temporary storage inside the home and hand over to these private waste collectors; (i.e. community based approach). But what is actually observed is different; i.e. there are wastes which are dumped on the road, burning inside the village and throwing in sewerages by the households. It implies that, household solid wastes are not properly managed at source by its generator.

Most studies conducted so far in line with this thesis give more emphasis to the issues like; “willingness to pay” (Aklilu, 2021), “generation rate of the waste” (Lemma, 2018; Melaku, 2019) and even special emphasis given to the “determinants of recycling of solid wastes”; which is revolving on developed nations (Sterner and Bartelings, 2009). But such assessments do not guarantee to conclude about the determining factors of effective solid waste management at household level. In addition, even though there are some studies which directly or indirectly assessed the constraints of solid waste management, they have reached to different conclusions

for similar research issue (Tewodros, 2017; Gebrie, 2019), which necessitated to have further study. It implies that, the studies conducted in other specific area do not guarantee to conclude about the picture of the rest parts of the world, especially at household level. Hence, whether the identified factors are significant or not depend on the existing situation of the given particular area. In other words, the poor performance of each town or nation solid waste management has its own main contextual factors or causes.

To establish a compelling foundation for this study, the existing literature displays a evident geographical, temporal, and empirical literature gap. While solid waste management is a critical issue across Ethiopia, the vast majority of prior Willingness to Pay (WTP) research is heavily concentrated in major primary metropolitan hubs like Addis Ababa, Hawassa, or Adama. Emerging secondary urban centers specifically Welkite Town under its newly established administrative status within the Central Ethiopia Regional State remain vastly under-researched. Furthermore, dramatic shifting macroeconomic realities and inflationary pressures post-2025 have rendered older empirical data obsolete. Consequently, there is a severe lack of localized, up-to-date empirical literature that captures modern household purchasing power and distinct urban-rural transitional dynamics in secondary Ethiopian towns.

Methodologically, this study addresses a significant methodological and research design gap prevalent in local environmental economics. Most previous studies in the region rely on simple Contingent Valuation Methods (CVM) or basic bidding games, which are notoriously prone to strategic and starting-point biases that distort true economic demand. Additionally, existing studies heavily favor rigid, purely descriptive research design. This study bridges these gaps by adopting both descriptive and econometric technique probit regression model. This approach minimizes response bias, ensures mathematical precision in estimating maximum WTP, and provides the structural context missing from purely descriptive technique.

Finally, this study also resolves a critical variable and contextual gap within the local literature. Traditional econometric models analyzing WTP in Ethiopia focus almost exclusively on conventional socio-economic determinants such as household income, age, and education level. However, they routinely omit vital behavioral and institutional variables. This research breaks new ground by integrating novel explanatory variables specifically adapted to Welkite's municipal reality, such as institutional trust (awareness).By filling the above research gaps, the

goal of this study was to assess household willingness to pay for improved solid waste management practices and their determinants in Welkite Town, Central Ethiopia Regional State

1.3 Research questions

- What proportions of households in Welkite Town are willing to pay for improved solid waste management services?
- How much households are willing to pay for improved solid waste management practice?
- What is the current situation of solid waste management in the study area?
- What are the determinants of household willingness to pay for improved solid waste management practice in the study area?

1.4 Objective of the study

1.4.1 General objective

The general objective of the study was to assess households' willingness to pay (WTP) for improved solid waste management services and identify the factors influencing their willingness to pay in Welkite Town, Central Ethiopia Regional State

1.4.2 Specific objectives

- To determine the proportion of households willing to pay for improved solid waste management services in Welkite Town
- To estimate the amount households are willing to pay for improved solid waste management services
- To assess the Current status of solid waste management in the study area
- To investigate the determinants of household willingness to pay for improved solid waste management practices in the study area

1.5 Significance of the study

The finding from this study expected to benefit the researchers, university, urban residents and potential researcher in this area and the region as well as nation at large. It also contributes to the literature to the literature stock place of the study area. The university benefit from having additional researcher paper for shelves. It initiates other interested researchers to undertake a better and detail study in the area. The finding of this research would provide input for policy makers as it enables. To know whether households are willing to pay for improve solid waste management service or not and determine WTP for improved environment quality.

1.6 Scope of the study

The study was conducted in Welkite town, Central Ethiopia Regional State. Geographically, the study has been confined to three Kebele's in the Welkite town. The study was also limited in examining the household willingness to pay for improved solid waste management practices in the study area. The independent variables included under this study were Age of household head, income of household, awareness, House ownership, Satisfaction and household plan to live .To meet the study's purpose, probit model was used. This study only considers urban areas. Rural areas are not included in the study. The study was employed Yamane's (1967) sample size formula, which is employed for finite populations. Furthermore, this study only covers 2026 G.C.

1.7 Limitation of the study

One significant limitation of this study was the potential for response bias in the survey data collected from households in Welkite Town. Participants may have provided socially desirable answers regarding their willingness to pay for improved solid waste management practices, influenced by a desire to align with perceived community values or expectations. This could lead to an overestimation of actual willingness to pay, as respondents might express a willingness that does not accurately reflect their true financial capacity or commitment to pay for enhanced services. Additionally, the study's reliance on self-reported data can introduce inaccuracies, as participants may lack precise knowledge of their financial situations or may misinterpret the implications of their responses.

Another limitation is the geographic and cultural specificity of the study, which may hinder the generalizability of the findings to other regions in Ethiopia or similar contexts. The unique socio-economic dynamics, cultural attitudes toward waste management, and local governance structures in Welkite Town may not be representative of broader trends across the country. Consequently, while the insights gained from this research are valuable for understanding household willingness to pay in this specific locale, caution should be exercised when extrapolating these results to inform policies or practices in different towns or regions. Future research could benefit from comparative studies across diverse settings to enhance the robustness and applicability of findings related to solid waste management practices.

1.8 Organization of the paper

The thesis comprised of five chapters: the first chapter introduces the background of the study, statements of the problem, the research objective and questions, significance of the study, and hypothesis of the study, the scope and limitation of the study, and outline of the study while the second chapter deals with literature review of the study the third chapter deals with methodology of the study and data source, and fourth chapter also deals with descriptive analysis and econometrics analysis and the final chapter is conclusion, summary and recommendation.

CHAPTER TWO

2. LITRATURE REVIEW

2.1 Definitions And Concepts

1.Willingness to Pay (WTP)

Willingness to Pay is defined as the maximum monetary amount an individual is prepared to sacrifice to acquire a specific good, service, or improvement in environmental quality, serving as a primary indicator of the economic value that households place on enhanced public services (Bello et al., 2021). In the context of waste management, it quantifies the threshold a household is ready to contribute to transition from informal or poor waste collection to a formal, improved, and sanitary solid waste disposal system (Ullah et al., 2023).

2. Improved Solid Waste Management (ISWM)

Improved Solid Waste Management refers to a structured, functional system that encompasses the organized collection, transportation, and sanitary disposal of waste, designed to minimize negative impacts on public health, the environment, and aesthetics (Moges et al., 2022). For households, this entails moving beyond burning or open dumping practices toward reliable curbside collection, the provision of standardized waste containers, and the utilization of controlled, engineered landfill sites (Tadesse et al., 2021).

3. Household Determinants

Household determinants are the socioeconomic, demographic, and psychological variables that influence a household's decision-making process regarding their engagement with and financial support for municipal services (Gebreegziabher et al., 2023). These factors typically include monthly income, level of education, household size, gender of the household head, and the perceived quality of the existing municipal service (Kassie & Adem, 2022).

4. Contingent Valuation Method (CVM)

The Contingent Valuation Method is a widely utilized stated-preference technique that uses survey-based questionnaires to elicit how much a respondent would be willing to pay for a hypothetical improvement in a service, such as a localized solid waste management program

(Bello et al., 2021). It is considered a robust tool in developing regions, like Central Ethiopia, where market prices for environmental goods are often missing, allowing researchers to simulate a market scenario to value public environmental improvements (Ullah et al., 2023).

5. Solid Waste Disposal Practices

Solid waste disposal practices encompass the day-to-day methods and behaviors adopted by households to manage their generated refuse, ranging from improper disposal such as uncontrolled burning or dumping in open fields to improved practices like participation in municipal collection or source segregation (Moges et al., 2022). Identifying these practices is crucial for policy formulation, as it highlights the current gap between existing waste handling habits and the desired sanitary outcomes expected under improved management programs (Tadesse et al., 2021).

According to Tchongbanglons (1993) all wastes arising from human and animal activities that are normal solid and are discarded as use less or unwanted are broadly defined as solid waste it includes municipals girl age, industrial and commercial wastes, sewerage slag, waste of agriculture and animal husbandry, demolition waste and meaning residue. Different individuals have defined municipal solid waste (MSW) differently, Medina 2016 defines MSW as....”The materials discarded in the urban area for which municipalities are usually held responsible for collection, transport and final disposes. It in composed household refuse, institutional wastes, street sweeping, commercial wastes as well as construction and demolition debris, for Cointreau (1982), MSW is material for which the primary generator or user abounding the material within the urban area requires no composition after abandonment. Contrail argues, to be qualifies as an urban solid waste it should generally be per saved by society as being in the responsibility of the municipality to collect and dispose of.

Based on the sector of the economic responsible for generating them, Enter and smith (2010), categorized solid waste in to three broader kinds as agriculture, industrial, and municipalities solid waste. Municipal waste are which are no longer needed by peoples because they are break spoiled or have no longer use including waste from households, commercial establishment, institutions and some industries are classified under, municipal solid waste can further classified in different ways, vise-avers the point of origin of west materials nature of material, kind of materials and heat consist of the materials. Based on point of the materials there are six types of

municipal solid wastes namely “domestic waste, commercial waste, industries waste, institutional waste, street sweeping, and constructional and demolition waste (Rand et al: 2000), based on the nature of waste materials MSW can be classified as organic in organic, combustible, paper scabble and non paper scabble function (Cornwel, 1998), Cornwel regarded waste classification based on the kind and heat content of the waste materials as the most the full domestic wastes or household waste derived from residential may have neighbor in the largest component of municipal solid.

waste management (SWM), is define as the control, generation storage collection and transported processing and disposal of solid waste consistent with the best practices and public health, economics and financial engineering administrator legal and environmental consideration (Outman , 2002), solid waste management has three main components collection and transportation: recycling it reuse and treatment or disposal (SIDA, 2006), USEPA recommended using integrated hierarchical approach to waste management with four component; stores reducing recycling, combination and lands failing to address the increasing volume of municipal solid waste its ranks source reduction including reuse as the most referred method followed by recycling and in posting and lastly, disposal in combination afflicted and land full.

Developing countries have peculiar solid waste management problems different than those observed in the industrialization countries. Although low-income countries solid waste generation rates average only 0.4 to 0.6 kg person /day as opposed to 0.7 to 1.8 kg/person/day in the industrialization countries in deed, the very composition of their waste is different than that of developed, nations coin trash (1982), Blight and Mbande (1996) and Arlosoroff (1982) noted developing countries waste are 2-3 times greater than in waste density at the same time 2-3 times greater than in moisture content than that of industrialization nations developing countries nests also involve large amount of organic waste (Vegetable matter, etc...) large quantities of dust, dirt (street sweeping , etc...) and smaller particles on average than in industrialized nations.

Although there might be some potential opportunities which arises from their waste composition, these peculiarities from industrialized nations present additional problems (Contreau 1982, Zerbock, 2003), firstly a higher solid waste density has many implications for the traditional methods, of collections and disposal, the collection and transfer trucks which are able to achieve compression rates of up to 4:1 in industrialization nation may achieve only 1.5:1 developing

countries and land fill compression technology which average volume reduction of up to 6:1 in industrial nations may only achieve 2:1 compaction with these increased waste industries, secondary, the high moisture content and organic composition of waste in developing World may lead to problems of increased decomposition rates particularly in areas with high average daily temperatures, a high seasonal or year round rain fall would also compound those problems, presenting additional challenges with in sect population and condition conducive to diseases in order to mitigate these problem developing countries in hot human areas must to much more frequency collection, than would be needed in color drier climates, to remove organic wastes before they are able to do compose, perhaps be weekly collection of organic materials (possibly in conjunction with a municipal composting operations), would be needed to reduce decomposition if not daily collection.(Contreau 1982, Zerbock, 2003).

Collecting, transporting and disposing of MSW presents formidable challenges too many third cities waste management represents a large expenditure of these cities and usually accounts for 30-50 percent of municipals operational budgets. (Medina, Martin, 2016).

In addition, despite these high expanses cities collect only 50-80 percent of these refuse generated (Medina: 2016), residents in area that lack reuses collection usually low-income community, tend to either dump their garbage at the nearest vacant 10t, public space, creak, river or simply burn it in their back yards. Uncollected waste many accumulate on the street and clog drains when it rains, which may cause flooding, waste can also be carried away by runoff water to rivers, lacks and seas, affecting those ecosystem. Alternatively, wastes may end up in open dumps-legal the most common disposal methods in the third world, open dumping of solid wastes generates various environmental and health a hazards,, for example, methods and carbon dioxide are green household gases that contribution to global warning methane is 20x time more effective at trapping than carbon dioxide, and more persistent in the environment (USEPR,2019), leach ate from the land lad folds can enter ground water system leading to the increase nutrient levels that case hector privation(EL, fad let al, 1997) moreover, bio communications of focusing and heavy metal an occur.

During the last two decades rapid urban infrastructure and service contributed to decrease implementing urban environmental pollution in regarding solid waste management. Currently, or global has been in calcified with the production new technology which emanate gas and other

solid waste, (Plastic bags, construction materials, food items, clothes and the like), in connection with this we increase our demand and presence and buying more and more food items. Nondurable housing encampment for living as the result we have created our service a major environment problems. (EL, Fadlet al, 1997).

As urbanization continued to take place the management of solid waste is becoming a major public or health and environmental concern in urban areas of many developing countries the concern is serious. Particularly in the capital cities which are often get ways to the countries for foreign diplomatist, business man, and Tourists, for visual appraisal of those cities will have negative impacts on official and Tourist visited and foreign investment .(UNCHS,2016)

Majority of the developing countries have suffered by lack of financial resources to expand infrastructure and service provision. It is the general truth that growing population and low level of financial technical and managerial capabilities for infrastructural, and services development have further contributed to the developing crisis in solid waste management service. As a result many Town administration have not been able to solve the rapid growth of the solid waste problem and continuously many cities municipalities have collected less than half of the waste generated every day.(UNCHS, 2016)

According to the (UNCHS,2016) global report on human settlement, between one third and more than one half of the solid waste generated in most cities in middle and low-income countries are not collected respectively. They usually end up as illegal dump on street open space and waste lands for instance Darussalam or (Tanzania) about 25% of the total generated collected and disposed off 40% and 60% of the total solid waste generated collected and disposed off Pakistan and Indonesia respectively while in many African countries particularly in sub-Saharan Africa countries solid waste collected and disposed of less than 20% the waste generated (UNCHS, 2016).

Majority of those areas are characterized by slum and squatter settlement, which are left with no service to solid waste disposal. They are usually used as compound building and disposing on street; ditches and playing ground that are exposed to air pollution to the surrounding areas (UNCHS, 2016).

Solid waste today contains many materials such as plastic that are, not readily degradable and toxic materials, primary various types of chemical waste produced by industries. Similarly the amount of around as waste generated has been undergoing dramatic change. In additions industries increase their annual discharges of toxic chemical directly in to the environment. Early civilization and did not have a problem with waste because it consist of mainly organic waste and the decomposers converted it in to use full materials. There were also fewer people and they generated little waste. The problems become large with more people generating more and Varity of waste (chemical, liquid, solid nuclear and hazardous), little of this waste is food for the decomposers. Thus a Varity of methods must be used to manage the waste. Comprehensive solid waste management program encompasses seeping, storage, collection, and disposes of solid waste. Proper management in those for areas helps greatly in controlling insect, radian's, and fish ponds(UNCHS, 2016).

2.1.1 Types of Hazardous Solid Waste

Request includes all solid waste in practice is categories includes garbage, rubbish ashes and other waste.

1) Garbage: - designated participlal waste resulting from the growing, handling, preparation of cooking and serving of food. It attracts insect's rates and rapidly decomposed is production of unpleasant odor .

2) Rubbish: - this term includes non-predicable refuse except ashes. There are two categories of rubbish combustible and no combustible.

A) **Combustible:** this materials is primary organic in nature and includes items such as paper, card board, wood and bedding (Ullah et al., 2023).

B) **Non-combustible:** this materials is primary inorganic and include tin cans, metals, glass ceramics and other materials refuse (Ullah et al., 2023)..

3) Ashes:-in compostable materials that remains after fuel or soil waste has been burnt or waste products from the coal, charcoal and wood when burned (Moges et al., 2022).

4) **Infection waste:** - are wastes that contain or carry pathogenic organism in part or in whole such as waste from hospital and biological laboratories solid with blood or bodily fluids (Moges et al., 2022).

5) **Special waste:** - are waste from residential and commercial source that includes;-Bulky items (large worn out or broken household, commercial and industrial items like furniture, lamp bookcases, filing cabinets etc.). Consumer electronic includes worn out broken and other no-longer wanted items such as radio, stereo's TV sets. White good (large worn out a broken household, commercial and industrial appliance such as stove, refrigerators rather dish washer, cloth washer and dryer) (Moges et al., 2022)

6) **Organic waste:** food waste, paper, card board, plastics, textiles, rubber leather, wood, yard wastes (Moges et al., 2022).

7) **In organic waste:** glass, crockery (CUPS, plates etc) tin cans, aluminum, and other metals (Moges et al., 2022).

8) **Dead bodies:** dead animals like dogs, cows, donkey etc.

9) **Other waste:** demolished of materials a abundant cars and construction waste are also considers as municipal waste.

2.1.2 Source of Solid Waste

The materials that are collected under the term solid waste include many different substances from a multitude of source, the source of solid waste are dependent on the socio economic and technological level of society. As small rural community in Ethiopia many have known types of solid waste from knows source: while a big cities such as Addis Ababa may have many source.

Most people can identify solid waste management when their empty trash can there are much more household waste that are considers to waste than realized.

Commercial: - waste generates from business establishment, shops etc that generates generally hazardous waste such as paper car board: wood metal and plastic (Tadesse et al., 2021).

Industrial waste: - from various type of industrial process, the nature of the waste depends on the type of industry and kinds of raw materials involved. There may be toxic and hazard duos waste that have adverse effect to the environment (Tadesse et al., 2021).

Institution solid waste: generating from public and government institution office, religious institution, school, university etc, generally not hazardous (Tadesse et al., 2021).

Hospital solid waste: discarded, unwanted solid waste from hospital of both non-hazardous and hazardous waste, the above classification to identify whether the waste is hazardous or not (Tadesse et al., 2021).

With respect to Ethiopia, context, many urban centers are largely characterized by public provision of urban infrastructure service among the infrastructure service provided by the public agencies as water supply and solid waste collection are usually poor in quality and quantity. The reason for the inconvenience, particularly in the case of solid waste, is mostly related with poor administration structure, weak manpower/poor intension of local government to participate private enterprise and inadequate financial arrangement, from 1998 onwards, many municipalities have started to introduce private enterprise as partner for primary solid waste collection, such partner are establishing micro enterprises, which organize themselves from street dwelling, unemployed women and youth, recently, in Addis Ababa, capital of the nation, the number of micro enterprises who are involved in primary solid waste collection have been dramatically increasing from 54 in 1998 to 650 micro enterprise by 2022 of these a few enterprises have engaged on secondary collection which is transportation of solid waste disposal site (AAMES: 2022)

2.1.3 Components / hierarchy of solid waste management

The following information taken from different source provided basic insight in to the solid waste management components and the preferred solid waste hierarchy to address the increasing volume of municipal solid waste that is generated by household or institution in the country. The environment protection agency of the united nation recommendation using hierarchical approach to waste management with four component: source reduction, recycling, composition and land filling, environment protection agency has ranked the most environment sound full approach for municipal solid waste management (loan,etal 1999).cointreauliven, 2000).

1. Source reduction

Source reduction is the most preferable method to provide basic improvement on solid waste management. According to Cointreau liven, 2010 and haa.et al et al, 2008 source reduction is

defined as to any reduction of waste generated daily in the Town design, manufactures, purchase, or reuse of materials or products their amount or toxicTown before they become municipals waste further they elaborate that source reduction helps to reduce costs for waste collection transportation and land filling. It avoids the cost of recycling, compositing and also conserves resource and reduces pollution.

2. Recycling

According to our environment protection agency municipals solid waste recycling refers to the separation of collected solid waste and transformed manufacturing of solid waste in to usable or marketable product. This implies that the recycling program ensures to enable countries to prevent so much waste from ending up in landfills and incinerators, furthermore, it support low income household to buy purchase the recycle solid waste at lower cost (Tadesse et al., 2021).

The US environmental protection agency also presented that in developing country besides to large scale private sector enterprise, many small scale enterprise are engaged on recycling of solid waste. These small and micro enterprises sometimes belonging to the informal sector, if they operate in unregistered and unregulated way. In the previous, informal waste collection was seen as social out cost; their businesses are illegal and considered as a problem for urban life.

Compositing:- compositing is another way of recycling, according to the environment protection agency, composting is a biological decomposition of organic waste such as animal waste and yard waste in to humans a soil like materials composition is natural methods of recycling of organic waste materials, which is used as fertilizer. A World Bank paper (2020) argued that although compositing is an essential element for sustainable development of solid waste management it is neglected with integrated waste management programs.

Thus, the World Bank recommendation that compositing should a wide speared practice in developing countries.

3. Landfilling

The fact that source reduction (reuse), recycling and composting taken the large protection solid waste management system; some solid remain to be placed in landfills, land of waste is the most

impotent and widely. Land filling Used on solid waste management methods. However, landfills practice most low and middle income countries are open dumping and burning with very little control (Hein, et al 1998). The subsequent of waste dispose in open land fill is that problem on public health.

4. Combustion

For many, in developing countries burring of waste material in the open land fill disposal site has been a common method of reducing the volume of waste combustion refers to the confined and controlled burring which helps to decreased the volume of wasted disposed on open land fails, further, in industrialized countries the waste burring processes recover energy which is used to produced stream and electric Town (Horn wera, et al, 1998).

2.1.4 Causes of poor solid waste management in developing countries

There are four major problems faced in developing countries on municipal solid waste management such as: in adequate service coverage, operating in efficiency, in adequate service management of special waste and in adequate land fill disposal (Zurabug and scheretenlie, 1998)

A) In adequate service coverage

Zurbug and schetenilb1998, stated that solid, waste collection service cities in developing countries generally serve only limited part of the urban population which is founded at the heart of the Town and high income people. Those who are remaining without waste collection service are usually low-income living at periphery.

B) Operational in efficiency of service and limited use of the informal sector.

According to and schereferileb, (1998) municipal authorities in development countries usually spend around 20 to 50% of the total municipal expenditure of the whole African cities. Whole African cities, however, event's such expenditure the level service is low. Only 40 to 50 percent of solid waste is collected and saving less than 50% of the population once collected it is disposed off in un controlled open dump.

C) In adequate management of special waste (hazardous waste)

Zurbrug and scheretenlib put this as third challenges argument. They argued that waste produced from hospital and clinic can be regard as special waste non industrial hazardous waste,

Approximately 70% of the total waste generated by hospital and clinic assumed to be non-hazardous waste, where as 20% of the total regard as hazardous and infection waste.

While the remaining, 10% is considers as non-infections: but hazardous wastes therefore, it is essential that the generated. Waste be separated the non-hazardous and infection waste are: sharp needles, scarps, pharmaceutical and chemical residues and other hazardous waste (Zurbruy and schereterlib, 1998).

D) Inadequate land and disposal

In most developing courtiers solid wastes are deposited off on uncontrolled open dumping sites.

These unsafe open dumps lay on large plate, which is un controlled further it is exposed to scavenger, informal waste pickers, and animals eatery and ingesting of waste birding insects and usually produces unpleasant odor many authors suggested that the main reason t the inadequate land fail disposal is due to poor financial and institutional arrangement especially where local government are under financed and low level of institutional cape Town and rapid population growth further (Zurbruy and schereterlib, 1998), indicated that inadequate land fail deposal have acquired in area where appropriate guide lines for sitting lacks design and operation of new land fails as well as missing recommendation for possible up grading option of gaiting open land fail disposal sites.

2.1.5 Households demand for improved environmental quality

Economic studies on solid waste management in Ethiopia, especially those involving contingent valuation are externally scanty or non-existent. Therefore, in this section we review the broader literature particularly studied in other developing countries that look at the demand for improving environmental quality or service living contingent valuation technique.

The following conclusion can drown from the four going preview forestry municipal solid waste management is serious concern can collecting can transporting and disposing of MSW. Persons from editable challenges to many third world ethics including Ethiopia secondly, waste management represent in large expenditure of those cities and usually account for 30-50% of the refuse generated, despite those high expanses but more importantly, cost recovery is a serious eminent to efficient and effective solid waste management in those cities schereferileb, (1998).

Thirdly, despite their low average rate of per capital solid waste generation per day, developing countries have peculiar solid waste management problem different than those faced by industrial countries. In particular the very composition of their waste is different from that of developed nations. Those peculiarities form industrialized nations present additional challenges to developing countries cities in term of collection frequencies and equipment demand schereferileb, (1998).

Over the relative scientific of house hold socio economic waste and environmental attributes of solid separation, collection and disposal of household's major developing countries cities have rarely been explored. There for, such WTP study would help finding out sustainable means of funding for improve the solid waste management service in the cities schereferileb, (1998).

2.2 Empirical evidence on solid waste management

Alter and deshazo (2016), in a study of household in Gujranwala Town, in the Punjab, Pakistan, surveyed the existing solid waste disposal system, WTP for improvements, and the print that household attach to improvements in solid waste management relative to improvement in water supply and sanitation. They use a stratified random sample of about 1000 households. They study explores the demand side information and verify whether using such demand-side information helps improve solid managements development countries. Put differently, they want to tests the briefs that integrating demand side information can improve the planning for provision of municipal service.

Chuen knew and Othman (2010), estimated the economic value of household performances for chemical solid waste disposal service in Malaysia, employing contingent valuation. They estimate and compare the mean ETP for two alternative disposal methods, representing improve options with better level of service characteristics, versus the current disposal methods both in the genetic and labeled format. The genetic option are "existing facility" vis-à-vis "proposal alternatives" and the label option are "control toping" vis-à-vis "sanitary land fill: and icon ration "incineration" in their case, their case the WTP is interpreted as the additional or incremental monthly SWM payment that public pays for improved quality of service. Wang et al. (2021) conducted economic analysis of municipal solid waste management in Eryan, a poor located in Yunnan province, china. They estimate the WTP of residents for an improved solid waste collection and treatment service and compare it with the prefect cost. Their study finds that the

mean WTP is about 1 percent of household income, and the total WTP can basically cover the total cost of the project. Their analysis also show, that the poorest household in Eruan, in general, are not only willing to pay more than the rich households, in percentage of income terms, but also are willing to pay not less than the rich, in absolute terms, particularly where no solid waste service are available.

The few studies focus on the capital city, Addis Ababa (Terfesa; fantu: 2017), or other aspects of improvement in environmental quality Weldesilassie et al (2019) study of SWM for WelkiteTown, also our review contingent valuation in developing countries shows and in expensive household survey can provide valued in puts in to cities planning processed and, in our cases inform policy makers on how to improve SWM delivery. The respondent households are willing to pay for improved solid waste management service while majority of them choose the low price level for improved solid waste management. The study suggests that participation of household must be increased by informing them about the nature of improvement so that the importance of household in improved solid waste management being reached. Ologedeta,(2020),The study reveals that among the factors income and awareness of environmental quality significantly influence the household's willingness to pay for improved solid waste management service. The study suggests that the fees charged to most waste generator used for solid waste management must be increased so that the company dealing with solid waste management can reach their goals.

Dagnew, (2020) The study shows that respondents willing to pay more for improved waste management services. Improved waste management service is determined by level of education, length of stay in area, housing arrangement and awareness of respondents. The study suggests that all the people must come forward for managing solid waste problems. (Dodson, 2021)Majority (85%) of the respondents are willing to pay for improved solid waste service. Willingness to pay for improved waste disposal in Tema Metropolis is greatly influenced by educational level, number of dependents, income, size of household age of respondents and distance to solid waste dumping sites. Nkansah,(2018)The households are willing to pay for improved waste management but it is not directly influenced by education level, marital status, quantity of waste generated, household size and household expenditure. Age of the respondents alone has significantly related to the willingness to pay. The study suggests creating awareness

on negative side of mismanagement of solid waste. Agrey, (2020) The study shows that service price, education level, age, household size and the household monthly expenditure are the main variables that determine or influence willingness to pay for waste management. (Yousef, 2019)

Generally, the above empirical work showed that the existing research on willingness to pay for solid waste management service is conducted on whole source of solid waste but this paper was used only household's sources of solid waste exist in the town.

2.3. Conceptual Framework

The conceptual framework involves creating an understanding of the relationships between dependent variable and independent variables, represents them graphically or diagrammatically. Under this study the dependent variable is household willingness to pay and independent variables such as Age of household head, income of household, awareness, House ownership, Satisfaction and household plan to live

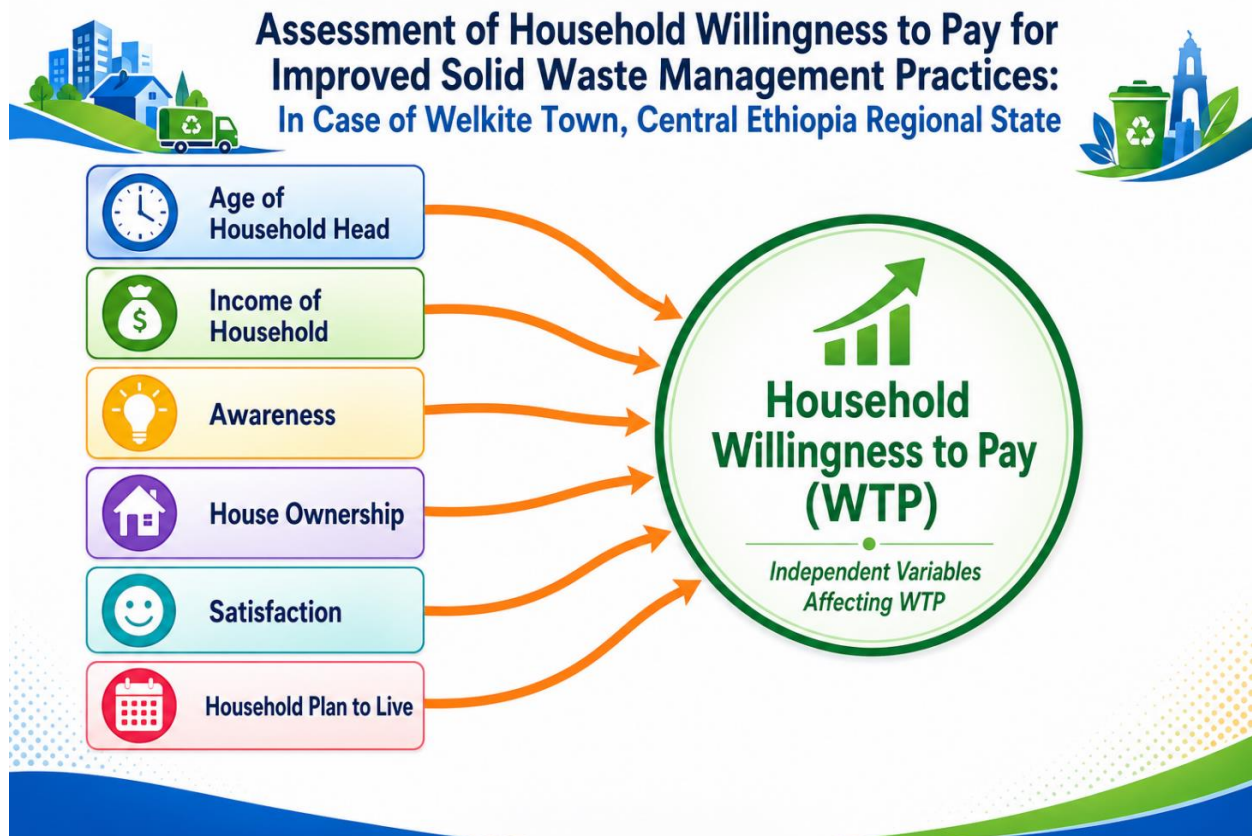


Figure 1 Conceptual Framework (WTP) Is Dependet Variables.

Source: Dagnew, (2020)

CHAPTER THREE

3. METHDOLOGY OF STUDY

3.1 Description of the study area

Welkite (also transliterated Wolkite) is a town and separate woreda in south-western Ethiopia. The second administrative center of the Central Ethiopia and GurageZone .this town has a latitude and longitude of 8°17'N 37°47'E and an elevation between 1910 and 1935 meters above sea level. It is surrounded by Kebenaworeda and it was part of former Goroworeda.

According to the Gurage Zone government, Welkite is one of 12 towns with electrical power, one of 11 with telephone service and one of nine that have postal service. The SNNPR's Bureau of Finance and Economic Development, adds that as of 2003 Welkite also had a bank branch and other financial institutions, as well as a hospital. An all-weather road was built in 1963 which connects Welkite to Addis Ababa by way of Endibir.

At Welkite an extreme example of an attempt at eviction of tenants before the Ethiopian revolution is reported to have occurred. A retired colonel living in the area held title to 4,000 hectares, which some 500 tenants cultivated. Following a fertilizer demonstration by the United Nations' Food and Agriculture Organization in 1969, the colonel decided to introduce modernized farming. At first he decided to modernize rapidly and announced that he was going to terminate the tenancy relationships with all of his tenants. The tenants, however, are said to have responded violently, attempting to stone their landlord one night as he left a bar in Welkite. The colonel then changed tactics, modernizing his lands piecemeal and evicting smaller numbers of tenants (welkite town administration, 2026).

Based on the 2022 Census conducted by the Central Statistical Agency, this town has a total population of 77,514 of whom 38,842 are men and 38,672 women. The plurality of the inhabitants practiced Ethiopian Orthodox Christianity, with 48.17% of the population reporting that belief, while 42.31% were Muslim, 7.86% were Protestants, and 1.34% were Catholic.

The 1994 national census reported this town had a total population of 15,329 of whom 7,580 were men and 7,749 were women. In the villages around Welkite there are believed to be about

1,000 speakers of Gumuz, who are a Nilo-Saharan people whose homeland straddles the border between Ethiopia and Sudan.

As per survey conducted by (Solomon; 2022) due to inadequate waste collection service waste are dumped nearby river, open space, drain and burned openly. Even the household stated that municipal by it collected solid waste and burn in surrounding of community living area. Such action or failure of municipal really indicates contribution of solid waste a lot to environmental pollution and human health problem. In Welkite town solid waste are generated in form of plastic, paper, cattle feed, and its waste are some form of solid waste generated by house hold in Welkitetown. He found that generation rate and types of solid waste is determined by the consumption habit and living condition of households.

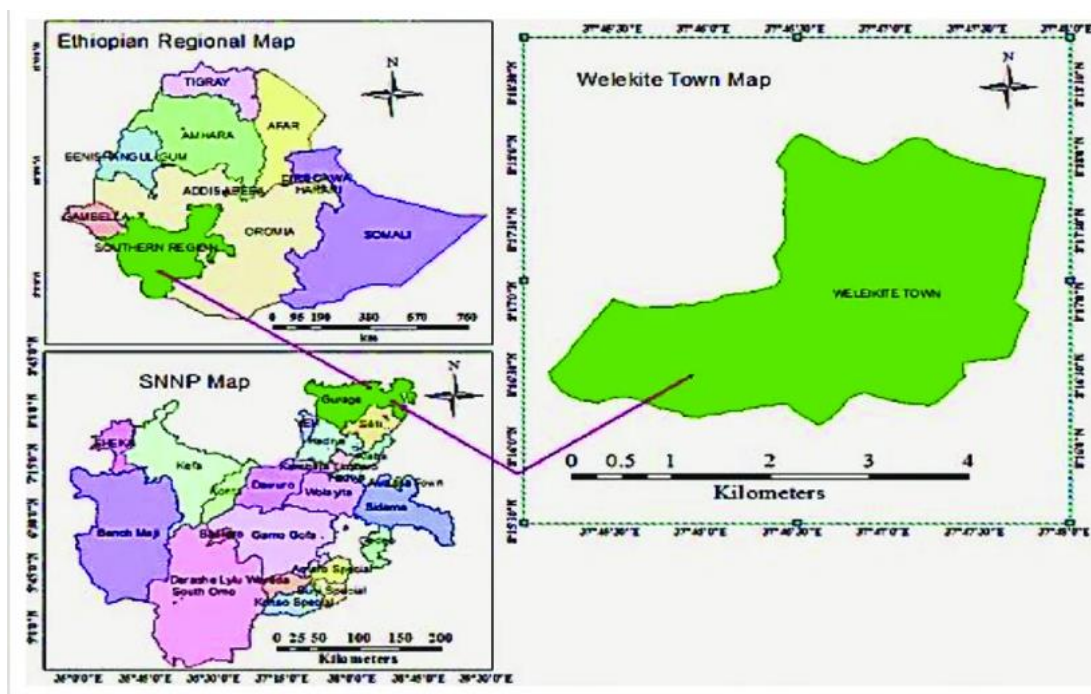


Figure 2 Map of Study Area

3.2 Target group

The target groups of this study were households that live in the study area, which are the major suppliers of waste to the surface of the town (Welkite).

3.3 Sampling techniques and sample size

3.3.1 Sampling techniques

This study used a multi-stage sampling technique to choose sample respondents in Wolkite Town administration. Wolkite Town is purposefully chosen from the central Ethiopia Regional State at the first stage based on accessibility of data. At the second stage, three kebeles namely Selamber, EdgetBora and Menaharia kebeles were selected from six kebeles based on the number of household. At third stage, by Using a simple random sampling technique, respondents was chosen from each kebeles.

3.3.2 Sample Size

In Wolkite town there are six kebeles having a total of 19500 households (Wolkite town administration 2022). From six kebeles of the town, three kebeles were select randomly; those are Selamber kebeles having 3100 household, EdgetBora kebeles having with 3400 household, Menaharia kebeles having with 3500 households. These kebele selected due to the intensity of the problem, and their accessibility, and in order to determine the sample size of each kebeles the formula used By the formula of Yemane (1967) **for sample determination**

$$n = \frac{N}{1 + N(e^2)} = \frac{10000}{1 + 10000(0.05)^2} = 384$$

Where, n=sample size

N= Total NumberHousehold

e=estimated error of the sample [5%]

The total number of households in three kebeles will be used to determine the sample size.

$$n = 10000 / (1 + 10000(0.05)^2) = 384 \text{ sample}$$

Sample size from Selamber kebele= $3100 / 10000 * 384 = 119$ households

Sample size from Edgetbora kebele= $3400 / 10000 * 384 = 131$ households

Sample size from Menaharia kebele= $3500 / 10000 * 384 = 134$ households

3.4 Data source and type

In order to attain the objectives of the investigations the this study used both primary and secondary sources of data. **Primary data** to full fill the objectives of the study using cloth ended

questionnaires are from the 384 samples of households in three urban kebeles of Welkite town. secondary data permitting to the study is gathering from municipalities of Welkite administration office, magazines and annual reports and Welkite town libraries and various leading journals and articles form Internet are searching.

3.5 Methods of Data Collection Tools /instrument of data collection

Questionnaires: the study conduct highly depends on primary data. The data requiring for the study is collecting through questionnaire; the questionnaires are designing to address the objective of the study and the research questions raise in the study. The questionnaires are distributing to sample respondents of the welkite town. The data was collected from household

Contingent valuation method: contingent valuation method used in order to ask respondents households about a maximum amount of willingness to pay in order to improve the problem solid waste management service in case of Welkite town.

3.6 Data analysis techniques

The data gathering through both primary and secondary methods are processed and analyzing by descriptive statistics and econometrics model by using statistical software Stata version 14. Descriptive statistics(quantitative and qualitative method) which includes tabulation, frequency distribution table, and percentage method using in presenting households profile. Accordingly the summarizing data are analyzing to brief the theoretical frame work of the study to arrive at a meaning full conclusion and recommendation.

Given the nature of data, econometric analysis may provide better information and clearer focus on factors determine willingness to pay for improved waste management service. Policy recommendation made based on result conclusion. Probit model used to identify, which factors are responsible for being willingness to pay for solid waste management service.

The probit model

This model is using to identify factors that influence household's willingness to pay for improving solid waste management service the dependent variable in the model take value 1 and 0. 1 if household willing to pay for solid waste management service and 0 otherwise

The functional form of the probit model is presented as follows:

$$P_i = E\left(\frac{Y_i}{X_i}\right) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_i)}} \dots\dots\dots \text{equation (1)}$$

$$P_i = E\left(\frac{Y_i}{X_i}\right) = \frac{1}{1 + e^{-Z_i}}$$

Where

P_i = is a probability of a i^{th} household being willingness to pay for improved solid waste management

Z_i = is a functional form of explanatory variables (X) which is expressed as:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots + \beta_n X_n \dots\dots\dots \text{equation (2)}$$

Where;

β_0 = is the intercept and

β_i = the coefficient of explanatory variable . The slope tells how the log-odds in favor of a given household willingness to pay for improved solid waste management change as independent variables change.

P_i = is the probability of household being willingness to pay for improved solid waste management, then

Thus, if the stochastic disturbance term (U_i) is taken into consideration the probit model becomes

$$L_i = \beta_0 + \beta_1 X_i + U_i \quad \text{Thus, the probit regression model is explained as:}$$

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots + \beta_n X_n \dots\dots\dots \text{equation (2)}$$

Where;

X_i = the coefficient of explanatory variable . The slope tells how the log-odds in favor of a given farmers adopted status change as independent variables change.

Z_i = is the probability of household being willingness to pay for improved solid waste management , then Thus, if the stochastic disturbance term (U) is taken into consideration the Probit model becomes

$$WTP_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots + \varepsilon$$

Where

β = vector of coefficient

x_i = vector of independent variable

ε = error terms

Definitions of the variables and their expected signs

1. Age (age): - this refers to the age of the respondent in terms of year and it is expected to affect willingness to pay negatively. This is because old people may consider waste collection, as government's responsibility and could be less willing to pay for it. While the younger generation might be more familiar with cost sharing like for education, health, etc and they could be more willing to pay and also older people may be more willingness to pay due to high income they earn.

2. Family size (FASI): - this variable is continuous explanatory variable and refers to the number family of the household. It is assumed that household with large family size can have more households expenditure, therefore the variable expected to effect the WTP negative.

3. House ownership (HO):-This study expects that those who are living in their own house are more willing to pay for the improved waste management service than those who are living in a rented property. This is due to house owners are more concerned about maintaining the cleanliness of their property and surroundings.

4. Household (HHIC):-is monthly income of the head of the household in birr. Income is the main determinant of demand for normal good and service. It is a general agreement from economic theories as income increase demand increase and also purchasing power of consumer increase. Therefore the expected sign of the coefficient is positive for willingness to pay (WTP).

5. Awareness: Awareness of households about the impacts of poorly managed solid waste on the environment has a significant effect on the respondents' WTP for improved SWM service. Hence, households' awareness about the impacts of solid waste is expected to positively affect their WTP for improved SWM service in Dilla town as found by other studies in different study areas (Dagnew et al., 2013; Maskey & Singh, 2017).

6. Satisfaction: This variable refers to the satisfaction of households from the existing solid waste collection service. Households are more willing to pay for improved SWM if they are not satisfied with the existing solid waste collection service (Alhassan & Mohammed, 2013; Muhdin et al., 2016).

Table 1 Table of Expecting sign of variable and it's measurement

S.NO	Variables Name	Variables Type	Hypothesized effect
1	Age	Continuous	-
2	Households income	Continuous	+
3	House ownership	Dummy	+
4	Satisfaction	Dummy	+
5	Awareness	Dummy	+
6	Household's Plan	Dummy	+or-
7	Family size	Continuous	-

CHAPTER FOUR

4. RESULT AND DISCUSSION

The primary purpose of this chapter is to present and discuss the empirical findings derived from the data collected in the study area. The analysis aims to provide a comprehensive understanding of the dynamics surrounding solid waste management and the commitment of households toward its improvement. To ensure a logical progression of evidence, the chapter is structured into three distinct yet interrelated sections.

The first section utilized descriptive statistics to provide an initial estimation of the proportion of households willing to pay (WTP) for solid waste management services. The assessment of the current situation of solid waste management within the study area is discussed using descriptive techniques. Finally, by employing both descriptive and econometric techniques, the key determinants that influence a household's willingness to pay for improved solid waste management practices is presented. All data were processed and analyzed using STATA14 version. **4.1 Response Rate**

From Total of 384 Distributed questioner, 364 (94.7%) respondents was filled questioner properly and the remaining 20(5.3%) respondent was not filled questions accurately. This is due to the surplus questionnaire were distributed to respondents to participate much households. As result total of 364 respondent's response was used for this study for detail see below table

Table 1. Response rate

Questionnaires	Frequency	Percentage
Distributed	384	100
Returned	364	94.7%
Not returned	20	5.3%

Source: own Survey, 2026

4.2. Socioeconomic characteristics of respondents

Table 2 Descriptive Statistics for Categorical variables

Variables	Edu.	Freq.	Percent	Chi2
Educational status of respondents	Not attended formal education	137	37.64	Pearson chi2(4) = 5.4644 Pr = 0.0243
	Primary	57	15.66	
	Secondary	30	8.24	
	Diploma	71	19.51	
	Degree and above	69	18.96	
	Total	364	100.00	
Household Plan	Temporarily	131	35.99	Pearson chi2(1) = 1.8944 Pr = 0.169
	Permanently	233	64.01	
	Total	364	100.00	
Awareness	Yes	228	62.64	Pearson chi2(1) = 199.3437 Pr = 0.000
	No	136	37.36	
	Total	364	100.00	
Satisfaction	Satisfied	246	67.58	Pearson chi2(1) = 122.3936 Pr = 0.000
	Not Satisfied	118	32.42	

House ownership	Own House	179	49.18	Pearson chi2(1) = 203.2150 Pr = 0.000
	Rented House	185	50.82	
	Total	364	100.00	

Source: own Survey, 2026

1. Educational status of respondents

As indicated in above table 2, the survey result of respondents show that out of 364 respondents 137 (37.64%) of the respondents were not attend formal education, 57(15.66%) respondents enrolled primary school, 30(8.24%) respondents enrolled secondary school, 71(19.51%) respondents were holder of diploma and the remaining 69 (18.96%) were holder of degree. In order to check significant difference between two groups (willingness to pay group and non-willingness to pay group), chi2 test was conducted. The Pearson chi2 (4) = 5.4644 Pr = 0.0243 hence the p-value is greater than 5% which indicated that there was significant difference between two groups in terms of education.

2. Awareness about Advantage of Improved solid waste management

Table 2 above indicates that from total of 364 respondents, a considerable proportion of the respondents 228 (62.64%) have awareness about solid waste management trust, whereas 136 (37.36%) of the respondents have no awareness about solid waste management. The chi-square result further supports the observation of a significant difference between two group Pearson chi2 (1) = 199.3437 Pr = 0.000.

3. Household Plan to Live in A town

As can be seen in Table 2 above, 131 (35.99 %) respondents living in a town for temporarily, whereas the majority of 233 (64.01%) of respondents living in a town for permanently The chi-square test was used to determine if there was a significant difference between household who have willingness to pay for improved solid waste management and households who have no willingness to pay for improved solid waste management. The outcome invalidates the

significant difference between willingness to pay group and non-willingness to pay group in terms of **Household Plan** (Pearson $\chi^2(1) = 1.8944$ Pr = 0.169).

4.Satisfaction

Based on table 2 above, the satisfaction is believed to have their own effect on willingness to pay for improved solid waste management. As shown table in below table, from total of 364 respondents, 246 (67.58%) of respondents were satisfied from current waste collection service and the remaining 118(32.42) of respondents were not satisfied from current waste collection service. As shown in above table 4, the χ^2 was tested to investigate significant difference between two groups in terms of satisfaction. Tested χ^2 indicated that, there is significant difference between two groups in terms of satisfaction with (Pearson $\chi^2(1) = 122.3936$ Pr = 0.000).

5. House ownership

As shown in above table 2, from total of 364 respondents, 179 (49.18%) of respondents have own house and the remaining 185 (50.82%) of respondents were live in rented house .As shown in above table 4, the χ^2 was tested to investigate significant difference between household who have willingness to pay for improved solid waste management and households who have no willingness to pay for improved solid waste management.in terms of House ownership. Tested χ^2 indicated that, there is significant difference between two groups in terms of House ownership with (Pearson $\chi^2(1) = 228.5536$ Pr = 0.000).

4.3. The Current Situation of Solid Waste Management in the Study Area

Before evaluating the economic valuation of service improvements, it is essential to establish the empirical current situation of the current waste management landscape. This section addresses the second research objective by assessing the prevailing conditions of solid waste management in the study area through three critical dimensions: disposal methods, perceived severity of the waste problem, and the frequency of collection services. The following analysis utilizes descriptive statistics to paint a comprehensive picture of the operational challenges and service gaps that currently define the study area's sanitation profile.

4.3.1. Solid disposal methods

Table 3 Solid disposal methods

How do you dispose of your solid waste?		Frequency	Percent
	Direct dumping in approved public land	122	33.5
	Direct dumping on your own land	70	19.2
	Throw it on an open space or on the street	24	6.6
	Throw it into the nearby river	76	20.9
	Burning around the house or in the village	72	19.8
	Total	364	100.0

Source: own Survey, 2026

As indicated in the above table 3, the majority 122(33.5%) of respondents used Direct dumping in approved public land, 70 (19.2%) of respondents dumping waste on their own land, 24(6.6%) of respondents throw waste on an open space or on the street, 76(20.9%) of respondents dispose of waste in nearby rivers and the remaining 72(19.8%) of respondents burning the waste around the house or in the village.

4.3.2. The frequency of solid waste collection services

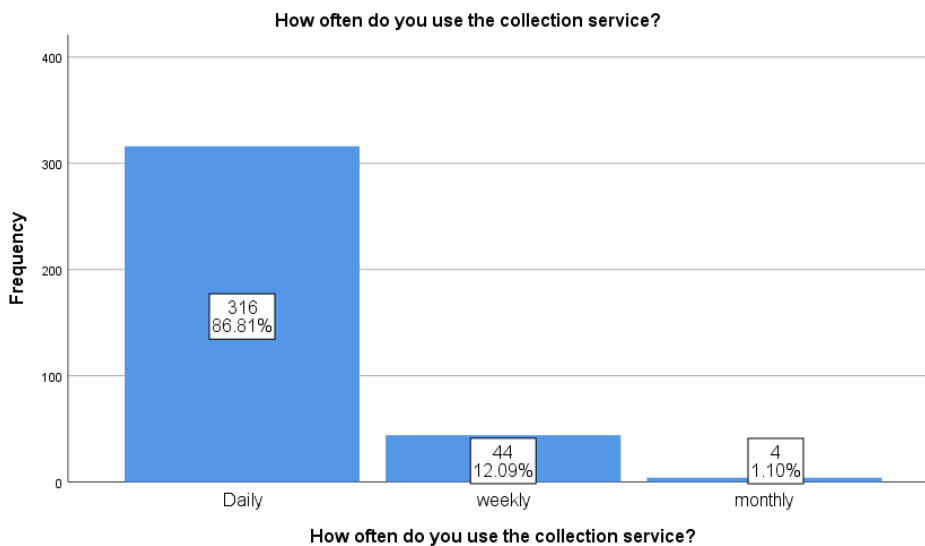


Figure 3 Frequency of solid waste collection services

As indicated in above figure, the majority of 316 (86.81%) of respondents utilizing the collection service on a daily basis. This high concentration of daily users suggests that solid waste generation at the household level is a continuous process and necessitating collection to maintain local improved solid waste management. In contrast, the remaining segments of the population exhibit significantly lower frequencies of service utilization. Households engaging with the service on a weekly basis represent 44 (12.09%) of the sample, while a negligible 4(1.10%) respondent's report monthly usage.

4.3.3. Current solid waste problem in the town

Table 4 Current solid waste problem in the town

Current solid waste problem in the town	Frequency	Percent	
Very serious	170	46.7	
Not serious	14	3.8	
Serious	122	33.5	
Do not know	58	15.9	

Total	364	100.0	
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Source: own Survey, 2026

The above table 4 reflects the community's perception of environmental degradation in Welkite Town, serving as a critical psychological indicator for their potential willingness to pay (WTP) for improved management systems. The results indicate, 170 (46.7%) of respondents categorizing the current solid waste situation as "Very serious", 14(3.8%) of respondents perceived the issue as "Not serious.", 122 (33.5%) of and an additional 33.5% (n = 122) viewing it as "Serious" and the remaining 58(15.9%) of households) indicated they "Do not know" the extent of the problem.

4.4. Households Willingness to Pay for Improved Solid Waste Management in The Study Area

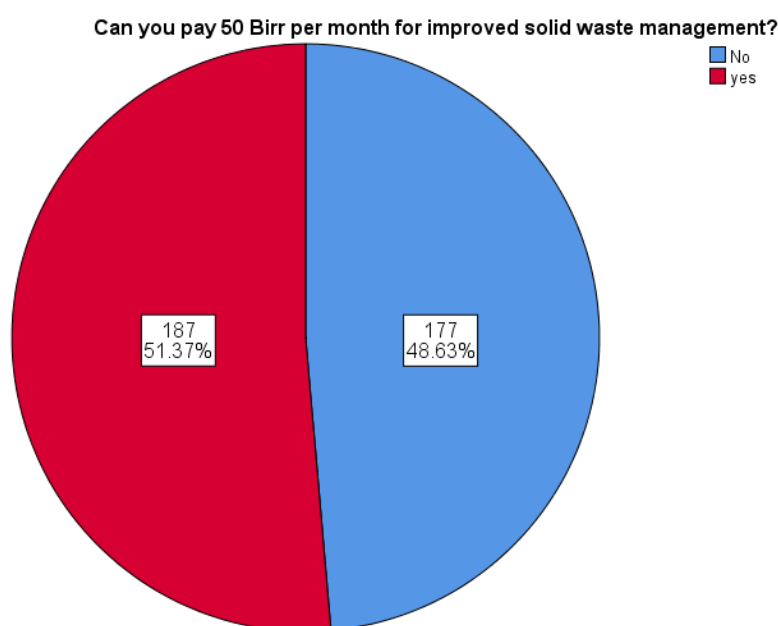


Figure 4 Willingness to pay improved solid waste management

To bring about the economic value households place on improved environmental quality, this study employed the Contingent Valuation Method (CVM). Residents were presented with a hypothetical market scenario and asked a dichotomous choice question regarding a predetermined monthly bid of 50 Birr.

As illustrated in Figure 3, the survey results regarding the financial commitment of households toward enhanced solid waste management. Out of a total sample of 364 households, 187 (51.37%) household expressed a willingness to pay a monthly fee of 50 Birr for improved solid waste management. Conversely, 177 (48.63%) of the households indicated they were not willing to pay a monthly fee of 50 Birr for improved solid waste management.

In achieving the second specific objective, the study utilized a single-bounded contingent valuation approach (or a binary bid format) at a starting bid of 50 Birr per month, as shown in pie chart. The estimation yields over half the community (51.37%) can immediately be estimated to have a mean or median WTP 50 Birr/month. This proves that an improved service is economically viable if a 50 Birr tariff is introduced. The Resistance Threshold For 48.63% of the households, 50 Birr exceeds their current valuation or economic capacity. This indicates that the maximum amount this specific segment is willing to pay is strictly less than 50 Birr < 50 birr per month

4.5. Probit Regression Assumptions

Prior to running the probit regression model, both the continuous and discrete explanatory variables were checked for the existence of multicollinearity (MC) problem. Multicollinearity problem arises when at least one of the explanatory variables is a linear combination of the others. The existence of multicollinearity might cause the estimated regression coefficients to have the wrong sign and smaller t-ratios that might lead to wrong conclusion. To test the presence of serious multicollinearity problem, Variance Inflation Factor test for both discrete and continuous variables was applied. From this test the value of Variance Inflation Factor (VIF) was used as a rule of thumb, if VIF of the variable exceeds 10, there is MC problem.

4.5.1. Multicollinearity (MC) Test

Table 5 Multicollinearity (MC) Test

Variable	VIF	1/VIF
Awareness	2.86	0.349802

House ownership	2.29	0.436269
Satisfaction	1.59	0.627581
Income	1.42	0.702314
Age of Household head	1.06	0.946536
Household Plan	1.05	0.954741
Mean VIF	1.71	

Source: own Survey, 2026

As indicated in table 7 above The mean VIF values (1.46) shown that all the continuous and categorical variables have no serious multicollinearity problem. The result indicate that there is no problem of multicollinearity

4.5.2. Heteroskedasticity Diagnosis Test

Heteroscedasticity problem arises when the variance of the error term may increase or decreases with the dependent variable or one of the independent variables (Gujarati, 2003). Under heteroscedasticity problems, the estimators of the regression coefficients are unbiased and consistent. However, the estimated variances of the regression estimators are biased and the conventionally calculated confidence intervals and test of significances are invalid which leads to wrong conclusions. According to Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, if the p-value is below the chosen significance level ,then we reject the null hypothesis of homoscedasticity.

The Breusch-Pagan test for heteroskedasticity the p- value is less than 0.05 i.e $p=0.000 < 0.05$ we can conclude that there is heteroskedasticity problem. Under this study $\text{Prob} > \chi^2 = 0.1117$ which is greater than 0.05 , Therefore there is no problem of heteroskedasticity problem .

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Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of WTP

chi2(1)      =      2.53
Prob > chi2   =    0.1117

```

4.6. Coefficient of Determination

Coefficient of Determination (R^2) shows the explanatory power of independent variables. The proportion of variation in a dependent variable that can be explained by independent variables is denoted by the coefficient of regression (R^2).

Table 6 Coefficient of determination

Number of obs	Prob > chi2	Pseudo R Square	LR chi2(5)
364	0.0000	0.8570	400.84

Source: own Survey, 2026

As shown in above table 8, Psudo R2 of this study was 0.8570. it is interpreted as, about 85% of dependent variable (willingness to pay) is explained (affected) by the independent variables such as age of household head , income of household , awareness, House ownership , Satisfaction and household plan . The remaining 15 % of dependent variable (willingness to pay) is explained by other variables which are not included under this study which is included under error term

Probit model for WTP, goodness-of-fit test

(Table collapsed on quantiles of estimated probabilities)

```
number of observations =      364
number of groups =      10
Hosmer-Lemeshow chi2(8) =      0.72
Prob > chi2 =      0.9995
```

4.7. Probit Regression Result

According to logistic result, age of household head , income of household , awareness, House ownership , Satisfaction and Household Plan to live are statistically significant at 5% level of significance because their respective p value is less than five percent (that is $(p > |z| < 0.05)$).

4.8. Interpretation of Marginal Effect After Probit Model

Table 7 Marginal Effect after Logistic regression

Variable	dy/dx	Std. Err.	z	P>z	[95% C.I.]	X
Age	.0259893	.00838	-3.10	0.002	-.042417 -.009562	47.2995
House Hold Plan*	.5110368	.1399	3.65	0.000	.236846 .785227	.64011
Income	.0000429	.00001	-3.67	0.000	-.000066 -.000002	24924.4
House Ownership	.9590265	.04408	21.76	0.000	.872635 1.04542	.508242
Satisfaction	.6716332	.12043	5.58	0.000	.435596 .907671	.324176
Awareness	.7241846	.07409	9.77	0.000	.578963 .869406	.373626

I. Age of Household head

Age of household head affects household's willingness to pay for improved solid waste management negatively and is statistically significant at 1% level of significance. This shows that, keeping other variables remains constant, age household increase by one year, the probability of household's willingness to pay for improved solid waste management decreased by 2 %.

The negative relationship between age and willingness to pay observed in Welkite Town is consistent with findings in Jimma Town, Ethiopia, where age was identified as a significant socioeconomic determinant influencing preferences for improved waste services (Abebaw & Ayenew, 2008). This consistency is often attributed to the "planning horizon" hypothesis, suggesting that older household heads may be less inclined to invest in long-term environmental improvements compared to younger generations who anticipate longer benefits from a cleaner environment. Similarly, a study in Shashemene City confirmed that age is a key determinant of WTP, reflecting that older individuals may have fixed disposal habits or lower perceived utility from modernized municipal waste collection systems (Ayenew et al., 2019).

In contrast, other empirical literature provides evidence that contradicts the Welkite findings, suggesting that age can sometimes have a positive or non-significant effect. For instance, recent research in Mbarara District—while in a different regional context—indicated that older age groups (39–75 years) actually showed a higher descriptive prevalence of willingness to pay (68.9%) compared to younger residents (57.6%), although the variable was not statistically significant in their multivariable regression model (Musiime et al., 2026). Furthermore, global and regional literature often argues that older household heads may possess greater accumulated wealth or a stronger sense of civic responsibility, which can lead to a positive correlation with WTP, directly opposing the 2% decrease per year found in your study.

II. Household Plan to Live

As indicated in above table 10, Household Plan to Live It is significant at 1 level of significance and its coefficient is positive (0.51). Other variables remain constant; the households who living in a town permanently have higher probability for willingness to pay than those household who live temporarily by 51%.

The finding that residential stability significantly increases the probability of willingness to pay (WTP) for improved solid waste management in Welkite Town aligns with broader empirical evidence from Ethiopia, which suggests that long-term investment in a locality fosters a greater commitment to environmental quality. For instance, research conducted in Jimma Town found that "possession of house"—a proxy for permanent residency—was a key determinant affecting households' WTP for improved door-to-door waste collection services (Girma, 2012). This consistency stems from the "public good" nature of waste management, where permanent

residents anticipate long-term benefits from reduced local pollution and improved health outcomes compared to temporary dwellers (Abebaw & Ayenew, 2008).

However, some empirical findings in the Ethiopian context provide a more nuanced or contradictory perspective regarding the exclusivity of residency status as a primary driver. Studies in Mekelle City and Shashemene indicate that while residential characteristics matter, socio-economic variables like household income, education level, and environmental awareness often exert a more dominant and statistically significant influence on the Probit model outcomes (Hagos et al., 2012; Tassie et al., 2019). For example, research in Shashemene Town highlighted that even among permanent residents, WTP can be low if the household generates smaller amounts of waste or lacks awareness of the health risks associated with poor disposal, suggesting that residency status alone may not be a sufficient predictor of financial commitment without considering these moderating factors (Tassie et al., 2019).

III. Income of Household

Income of household affects willingness to pay positively and is statistically significant hence; the p- value is less than 5% level. Its coefficient is .0000429 This shows that, keeping other variables remains constant, income of household increase by one birr, the probability of willingness to pay for solid waste management increased by 0.4 %.

The finding that household income has a positive and significant impact on the willingness to pay (WTP) for improved solid waste management in Welkite Town is highly consistent with the economic theory of demand and numerous empirical studies in Ethiopia. According to the "ability-to-pay" principle, waste management is treated as a normal good where demand increases as disposable income rises. This is supported by research such as Determinants of households' willingness to pay for improved solid waste management in Ethiopia: The case study of Jimma Town (Girma, 2012), which found that higher-income households are more likely to allocate budget for environmental services to improve their quality of life. Similar consistency is found in the study Households' willingness to pay for improved urban waste management in Mekelle City, Ethiopia (Hagos et al., 2012), which confirms that income is a robust predictor of WTP across various urban Ethiopian contexts, as wealthier households often have a higher opportunity cost for the time spent disposing of waste illegally or inefficiently.

Conversely, some literature introduces contradictions regarding the marginal effect or the linearity of this relationship in low-income urban areas. While your model suggests a specific

0.4% increase per birr, the study Household willingness to pay for improved solid waste management in Shashemene Town, Ethiopia (Tassie et al., 2019) suggests that in very low-income brackets, income may not be a significant driver if the baseline cost of the service exceeds a certain percentage of the total household budget, creating a "threshold effect." Additionally, research titled Assessment of households' willingness to pay for improved solid waste management service: The case of Bench Maji Zone (Abebe & Tadesse, 2017) indicates that variables like "environmental awareness" and "educational level" can sometimes overshadow income, contradicting the idea that financial capacity alone dictates willingness. In these cases, even lower-income households showed high WTP when they perceived a high health risk, suggesting that the positive income coefficient may not be universally the most dominant factor in every Ethiopian township.

IV. House ownership

House ownership: the coefficient for House ownership is positive (0.95) and is statistically significant at 1% level of significance. Other variables remain constant; the household who have own house has high probability for willingness to pay for solid waste management than those households who live in rented house by 95%.

The finding that house ownership has a positive and significant influence on the willingness to pay (WTP) for improved solid waste management in Welkite Town is strongly supported by recent empirical literature in the Ethiopian context. Research indicates that home ownership serves as a key determinant because owners often have a greater long-term interest in maintaining the cleanliness and environmental quality of their property and the surrounding neighborhood (Dagnew et al., 2012; Tugume et al., 2026). For instance, a study in the Gullele sub-city of Addis Ababa highlighted that house owners are more likely to pay for waste removal to preserve their property's value and hygiene, whereas renters often view their residency as temporary and may feel less responsible for local service improvements (Adugna, 2021). This consistency across urban Ethiopian towns reinforces the idea that tenure security acts as a motivator for investing in municipal public goods.

However, some recent studies provide a more nuanced or contradictory perspective, suggesting that while ownership is important, it may not be the primary driver of WTP compared to service quality or environmental awareness. For example, research in Jimma City and Shashemene Town found that factors such as the total amount of waste generated, frequency of door-to-door

collection, and specific household income levels were more dominant predictors than tenure status alone (Ayenew et al., 2019; Muhdin et al., 2024). Furthermore, in Mbarara District, while residency status was analyzed, it was noted that "receiving town council services" and "monthly income" were more statistically significant factors in the final logistic regression model than simple house ownership (Tugume et al., 2026). These contradictions suggest that the 95% higher probability observed in Welkite might be exceptionally high compared to other regions where service accessibility and financial capacity are more critical bottlenecks than ownership status.

V. Satisfaction:

The regression result shows Satisfaction from solid waste collection service is significant variable which affect willingness to pay for improved solid waste management because the p-value is 0.000 and its coefficient is 0.6716332 which less than 5%. This shows that other variables remain constant; the households who satisfied from waste collection service have higher probability for willingness to pay for solid waste management by 67%.

The finding that satisfaction with existing solid waste collection services significantly increases the probability of willingness to pay (WTP) is consistent with several empirical studies in Ethiopia and East Africa. This positive relationship is often attributed to the "trust-in-service" effect, where households are more willing to contribute financially when they perceive the current management as reliable and effective. For example, research titled Willingness to Pay for Solid Waste Management Services and Associated Factors in Mbarara District, Southwestern Uganda (Tugume et al., 2026) found that satisfaction with service delivery was a primary driver of WTP, as it reduces the perceived risk of financial misappropriation. Similarly, in the study Determinants of sustainable solid waste management in Jimma City, Southwest Ethiopia (Muhdin et al., 2024), researchers noted that households satisfied with the frequency and quality of collection showed a higher propensity to support service improvements, reinforcing the idea that service quality is a prerequisite for financial sustainability.

In contrast, some empirical literature presents a contradictory view, suggesting that dissatisfaction—rather than satisfaction—can sometimes drive a higher WTP for improved services. This is based on the logic that households currently receiving poor or unsatisfactory services are more desperate for a change and are thus willing to pay more to escape the negative externalities of uncollected waste. For instance, the study Households' willingness to pay for improved urban waste management in Mekelle City, Ethiopia (Hagos et al., 2012) indicated that

individuals experiencing the most significant service gaps often expressed a higher WTP for a hypothetical, superior alternative compared to those already satisfied with their current situation. Additionally, research titled Assessment of households' willingness to pay for improved solid waste management service: The case of Bench Maji Zone (Abebe & Tadesse, 2017) found that satisfaction was not always a statistically significant predictor when compared to the severity of environmental health risks, suggesting that the "need for improvement" can sometimes be a more powerful motivator than "satisfaction with the status quo."

VI. Awareness:

Awareness: the coefficient Awareness is positive and is statistically significant at 1% level of significance. Their coefficients were 0.72. The regression result showed that, keeping other variables remains constant, the household have Awareness have higher probability to pay for solid waste management than those household who have no Awareness by 72%

Researchers consistently argue that when households understand the link between improper waste disposal and public health risks—such as the spread of waterborne diseases or air pollution—they are more likely to view waste management as a priority investment rather than a burden. For instance, a study in Mekelle City found that awareness of environmental quality and health was a primary predictor in the Probit model, indicating that households with higher ecological knowledge were significantly more likely to support cost-recovery mechanisms for municipal cleaning (Hagos et al., 2012). Similarly, research in Jimma City underscored that "attitude" and "environmental concern" function as critical drivers of sustainable waste practices, directly increasing the likelihood that residents will contribute financially to door-to-door collection services (Muhdin et al., 2024).

However, some literature provides a contradictory perspective, suggesting that high levels of awareness do not always translate into financial commitment if other structural or economic barriers exist. This is often referred to as the "awareness-action gap." For example, research conducted in Bench Maji Zone highlighted that while awareness was high among residents, actual WTP was more heavily constrained by the household's income and the perceived inefficiency of the service provider (Abebe & Tadesse, 2017).

CHAPTER FIVE

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. SUMMARY

Solid waste management (SWM) service has an advantage to protect the environment from the risk of ineffective disposal system of solid wastes. Moreover, the primary objective of solid waste management activity is to make the environment protected and safe in human health via disposed wastes in a well-organized manner. However, through process the stakeholders of the management system, especially in the developed nations, did not stop on disposed of waste in open dump or landfill only; rather they tried to convert the trash/solid wastes/ to cash and make strong their econ solid waste management, particularly at household level, is not managed in a well- organized manner. This implies that like other developing country town, Welkite has also problems that prevent the municipality/ responsible body from doing its task for environmental sound with economic efficiency. So that, this research is intended to identify and analyze the main determinants of solid waste management practice at household level.in addition to environmental aspect. The general objective of the study is to examine household willingness to pay for improved solid waste management practices: in the case of Welkite Town, Central Ethiopia Regional State.

To accomplish the objective of the study, this study used both descriptive and econometric technique was employed. The target population of this study was primarily households who are live in Welkite Town in three selected kebeles namely Selamber kebeles, EdgetBora kebeles and Menaharia kebeles. Under this study both primary and secondary data was employed. To select sample respondents from study area, this study was employed simple random sampling techniques. Totally of 364 respondents was participated under this study. To achieve the objective of the study, both descriptive and Econometric method of data analysis was utilized. From Descriptive Statistics, chi2 test and t-test was used to check a significant difference between household who are willingness to pay for improved solid waste management and households who are not willingness to pay for improved solid waste management. The chi2 result for categorical variable indicate that there was significant difference between willingness to pay group and non-willingness to pay group in terms of educational status of respondents, Awareness, House ownership and Satisfaction from collection service hence p- value less than

5%. The t-test result for quantitative variables indicate that there was significant mean difference between Willing Households and Unwilling Households in terms of age of household head ,family size and income of household thus their p- value is less than 0.05. To investigate the determinants of CBHI program participation binary probit regression model was used under this study. According to probit result, age of household head , income of household , awareness, House ownership , Satisfaction and Household Plan to live are statistically significant variables which affect household willingness to pay for improved solid waste management at 5% level of significance because their respective p value is less than five percent (that is $(p > |z'| < 0.05)$.

5.2 CONCLUSION

In line with specific objective 1, this study found that 51.37% of the 364 sampled households in Welkite Town are willing to pay a monthly fee of 50 Birr for improved solid waste management, as revealed through the Contingent Valuation Method (CVM) with a dichotomous choice question. This narrow majority signals strong but not unanimous support, underscoring a critical mass of residents ready to invest in better services amid competing economic pressures.

In line with specific objective 2, the study utilized a single-bounded contingent valuation approach (or a binary bid format) at a starting bid of 50 Birr per month, as shown in pie chart. The estimation yields over half the community (51.37%) can immediately be estimated to have a mean or median WTP 50 Birr/month. This proves that an improved service is economically viable if a 50 Birr tariff is introduced. The Resistance Threshold For 48.63% of the households, 50 Birr exceeds their current valuation or economic capacity. This indicates that the maximum amount this specific segment is willing to pay is strictly less than 50 Birr < 50 birr per

In line with specific objective 3, this study found widespread challenges in the current solid waste management landscape, including improper disposal practices. The analysis reveals a critical gap between household needs and current disposal infrastructure. While there is a high reliance on daily collection services (86.81%), the actual disposal methods remain environmentally hazardous. A significant portion of the community resorts to direct dumping in public lands (33.5%) or rivers (20.9%), and burning waste (19.8%). Despite these poor practices, 170 (46.7%) of respondents categorizing the current solid waste problem as "Very serious" and 33.5% (n = 122) viewing it as "Serious" " This suggests that the current mismanagement is not due to a lack of awareness, but rather a lack of sustainable disposal alternatives.

In line with specific objective 4, this study found that household willingness to pay for improved solid waste management is significantly influenced by key determinants such as age of household head , income of household , awareness, House ownership , Satisfaction with collection service and Household Plan to live hence p-value is less than 5%

5.3. Recommendation

Based on the findings of this study, the following possible policy recommendations were developed:-

- Since age significantly influences willingness to pay (WTP), the Welkite Town administration should design intergenerational communication strategies that influence the wisdom of older household heads while engaging younger residents through modern digital platforms. For older demographics, focus on the long-term legacy of a clean environment, whereas for younger heads, emphasize the efficiency and technological modernization of the improved waste system.
- To address the impact of income on affordability, the municipality should implement a progressive, tiered tariff structure that ensures equity. By introducing a sliding scale fee system where higher-income households contribute more to subsidize essential services for lower-income families, the town can ensure financial sustainability without excluding those with limited economic means from participating in improved waste practices. The town administration should consider a "pro-poor" tiered pricing model. Since WTP increases with income, the 50 Birr fee could be set as a baseline, while high-income households or commercial entities are charged a slightly higher premium to cross-subsidize services for lower-income neighbourhoods.
- Given that awareness is a primary driver of WTP, the local environmental office must launch a strong public education campaign utilizing local radio, community meetings (Iddirs), and school programs. These initiatives should clearly demonstrate the direct link between proper waste disposal and public health outcomes, transforming passive knowledge into a proactive commitment to fund and support professional waste management services.
- Recognizing that homeowners show a higher commitment to the town's infrastructure, the government should create incentive-based programs for property owners, such as modest property tax rebates for those who maintain consistent waste service subscriptions. Simultaneously, targeted outreach to tenants and landlords is necessary to ensure that waste

management is integrated into rental agreements, fostering a sense of "ownership" over the local environment regardless of tenure status.

- To maintain and increase WTP, the waste collection micro-enterprises must prioritize service reliability and responsiveness; high satisfaction acts as a catalyst for payment. Implementing a transparent feedback mechanism—such as a dedicated hotline or a monthly service scorecard—will allow the municipality to address service gaps in real-time, proving to residents that their financial contributions are translating directly into a cleaner, and more efficient urban space.
- Since long-term residents are more likely to invest in the town's future, the administration should foster a sense of community belonging through neighbourhood beautification projects and "Green Welkite" initiatives. By strengthening the social tie between residents and their geographic location, the town can encourage even transient populations to view improved waste management as a vital investment in the place they currently call home.
- Introduce tiered monthly contributions managed through a dedicated municipal fund, financing expanded collection fleets, modern composting stations, and youth employment programs to ensure seamless daily services town-wide, fostering long-term financial independence and community ownership.
- Roll out dynamic "Welkite Warriors" initiatives with festivals, school challenges, and neighborhood competitions, equipping residents with tools and incentives to eliminate open dumping and burning, while building a vibrant culture of environmental stewardship.
- Collaborate with NGOs and regional investors to construct biogas plants that convert waste into renewable energy for homes and streets, generating revenue to subsidize services and create green jobs for locals.
- Train and equip community groups in advanced sorting, upcycling, and biogas production, offering rebates and market linkages to high performers, transforming waste streams into economic opportunities and sustainable livelihoods.

5.3.1. Recommendations for further study

- To further enrich the understanding of household willingness to pay for improved solid waste management practices in Welkite Town, it is recommended that future studies should employ qualitative methods such as focus group discussions and in-depth

interviews could be employed to capture the degrees of community perceptions and preferences regarding waste management.

- Moreover, integrating a longitudinal approach could provide valuable data on how willingness to pay evolves over time, particularly in response to changes in service quality or public awareness campaigns about the benefits of improved waste management. This could also include assessing the impact of educational initiatives on household behaviors and their subsequent willingness to contribute financially. Collaborating with local government and community organizations to implement pilot programs could offer practical insights into effective communication strategies and payment structures that resonate with residents. Ultimately, these recommendations aim to create a more comprehensive framework for enhancing solid waste management practices that are both sustainable and economically viable for the community.

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APPENDIX I



WERABE UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

Dear Sir/Madam,

I am **ZADE SEBAGA**, a graduate student at Werabe University, college of Business and Economics. Currently, I am undertaking MSc Thesis on **“HOUSHOLD WILLINGNESS TO PAY FOR IMPROVED SOLID WASTE MANAGEMENT PRACTICES AND THEIR DETERMINANTS IN WELKITE TOWN, CENTRAL ETHIOPIA REGIONAL STATE”** for partial fulfillment of Masters of Science Degree in Economics with major in Development Economics. Your participation in this survey is voluntary. The information you provide will be used only for the purpose of the study and will be kept strictly confidential. Thus, your anonymity is guaranteed. Questions clarity regarding the survey can be directed to the researcher: **ZADE SEBAGA**

Thank you in advance for your kind cooperation!!!!

Part 1: General Profile - Please put a tick “√” mark for your answer

1. Gender

A) Male B) Female

2. Age----- years

3. Marital Status

A) Unmarried C) Divorced

B) Married D) Widowed

4. Household size.....

5. Occupation

A) Government and Non-government employee B) Private employee

C) Businessperson D) Unemployed

E) Self-employed F) Retired

G) Others (specify).....

6. What is your academic background?

- A. Illiterate
- B. Grade 8 and less
- C. Grade 9 to 12 completed
- D. TVET/ Diploma
- E. BA/ BSC
- F. MA/ MSC and above

7. Average income per month,_____ ETB

8. House ownership status

A) Owned B) Rented

9. How long have you lived in the town? Years

10. How do you plan to live in the town?

A) Permanently B) Temporarily If “Temporarily”,

11. If you plan to live temporarily in the town, what is your reason that forces your household to leave the town?

- A) The town is not comfortable for life
- B) Searching for better livelihoods in another place
- C) Inter-communal conflict
- D) Any other (specify).....

Part Two: Questions on Current Situation of solid waste management

1) How many sacks (50 kilograms) of solid waste are generated in your household per week?

2) How do you dispose of your solid waste?

- A) Direct dumping in approved public land or community bins
- B) Direct dumping on your own land
- C) Throw it on an open space or on the street
- D) Throw it into the nearby river
- E) Burning around the house or in the village
- F) Making compost

G) Any other (specify)

.....

3) Is your household getting the service of solid waste collection or disposal?

A) Yes B) No

If “Yes” go to question 4 If “No”, go to question 10

4) Which collection service do you use?

A) Public (Welkite Town municipality)

B) Private

C) Other (specify).....

5) Do you have regular solid waste collection service in your area?

A) Yes B) No

If “Yes” go to question 6 If “No”, go to question 8

6) Do you use the service?

A) Yes B) No

7) How often do you use the collection service?

A) Once in a week B) Twice in a month C) Other (specify).....

8) Do you pay for the solid waste management?

A) Yes B) No

If “Yes” go to question 9 If “No”, go to question 10

9) How much do you pay for the service per month?_____ ETB

10) Are you satisfied with the current solid waste collection service in the town?

A) Yes B) No

11) How do you see the current solid waste problem in the town?

A) Very serious B) Serious C) Not serious D) Do not know

12) Who do you think is responsible to properly manage SOLID WASTE in Welkite Town?

A) Local authorities B) Households C) Both

13) Do you think that the solid waste is creating environmental problems such as water pollution and air pollution due to open burning and uncontrolled dumping of solid waste?

A) Yes B) No

14) Do you think that the solid waste is damaging members of the household's health?

A) Yes B) No

If "Yes" go to question 15

15) Have your household members suffered any one of the following diseases due to SOLID WAST? Tick the type of disease.

- | | Diseases | Tick (✓) |
|------|---------------|----------|
| i. | Common cold | |
| ii. | Asthma | |
| iii. | Typhoid fever | |
| iv. | Malaria | |
| v. | Diarrhea | |
| vi. | Cholera | |

Other diseases (specify).....

16) Does the solid generated affect your household's daily life via making the members unable to engage in productive works, school or elsewhere due to sickness?

A) Yes B) No

17) Have you incurred a cost to your household members in order to get medical treatment from health stations?

A) Yes B) No

18) How many days on average a household member becomes unable to engage in his or her own work per month during illness?

Part Three: Contingent Valuation (CV) Scenario

Section Four: Questions on WTP for Improved SOLID WAST MANAGEMENT

19) Are you willing to pay some amount of money as a SOLID WAST M fee in order to participate in SOLID WAST MANAGEMENT?

A) Yes B) No

If "Yes", go to question 20 and 24 If "No", go to question 25

20) Are you willing to pay. ETB per month?

- A) Yes B) No

If “Yes”, go to question 21 If “No”, go to question 22

21) Are you willing to pay. ETB per month?

- A) Yes B) No

Either “Yes” or “No”, go to question 23

22) Are you willing to pay. ETB?

- A) Yes B) No

Either “Yes” or “No”, go to question 23

23) What is your maximum willingness to pay (MWTP)?_____ ETB

Section Five: Examination Questions

24) Why are you willing to pay for an improved SOLID WAST MANAGEMENT service?

- A) The new proposed SOLID WAST MANAGEMENT service will make the town suitable for life
- B) The negative impacts of poorly managed solid waste will be minimized or vanished
- C) A Clean, safe and healthy environment will be created in the town
- D) Any other reason (specify).....

25) Why are you not willing to pay anything for an improved SOLID WAST MANAGEMENT service?

- A) Satisfied with the existing system
- B) Do not trust the new proposed system
- C) I cannot afford

D) It is the government's responsibility to provide SOLID WAST MANAGEMENT service for free

E) Other (specify).....

Thank you very much for your cooperation as well as contribution to this survey

APPENDEIX II

```
. tab WTP
```

Can you pay
50 Birr per
month for
improved
solid waste
management?

	Freq.	Percent	Cum.
No	177	48.63	48.63
yes	187	51.37	100.00
Total	364	100.00	

```
. reg WTP age FamilySize Income Householdplan Housownership Satisfaction Awareness
```

Source	SS	df	MS	Number of obs	=	364
Model	70.6770944	7	10.0967278	F(7, 356)	=	177.47
Residual	20.2542243	356	.056893889	Prob > F	=	0.0000
Total	90.9313187	363	.2504995	R-squared	=	0.7773
				Adj R-squared	=	0.7729
				Root MSE	=	.23852

WTP	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
age	-.0053393	.0012946	-4.12	0.000	-.0078853	-.0027933
FamilySize	.0140906	.0046239	3.05	0.002	.0049971	.0231842
Income	-.000013	1.98e-06	-6.54	0.000	-.0000169	-9.06e-06
Householdplan	.0819394	.026664	3.07	0.002	.0295007	.1343781
Housownership	.4536536	.0379081	11.97	0.000	.3791017	.5282055
Satisfaction	.2135273	.0337181	6.33	0.000	.1472156	.279839
Awareness	.37109	.0443495	8.37	0.000	.2838701	.4583099
_cons	.5200671	.0844247	6.16	0.000	.3540333	.6861008

```
. vif
```

Variable	VIF	1/VIF
Awareness	2.94	0.339560
Housowners~p	2.30	0.435190
Satisfaction	1.59	0.627515
Income	1.43	0.699659
FamilySize	1.08	0.927381
age	1.06	0.946467
Householdp~n	1.05	0.954312
Mean VIF	1.64	

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of WTP

chi2(1) = 2.31

Prob > chi2 = 0.1285

```
. probit WTP age FamilySize Income Householdplan Housownership Satisfaction Awareness
```

```
Iteration 0:  log likelihood = -252.16819
Iteration 1:  log likelihood = -41.852629
Iteration 2:  log likelihood = -33.376148
Iteration 3:  log likelihood = -32.887765
Iteration 4:  log likelihood = -32.883098
Iteration 5:  log likelihood = -32.883094
Iteration 6:  log likelihood = -32.883094
```

```
Probit regression               Number of obs   =       364
                               LR chi2(7)         =       438.57
                               Prob > chi2         =       0.0000
Log likelihood = -32.883094     Pseudo R2        =       0.8696
```

WTP	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
age	-.0727084	.0229101	-3.17	0.002	-.1176114	-.0278055
FamilySize	.1711926	.0723682	2.37	0.018	.0293535	.3130317
Income	-.0001177	.0000303	-3.89	0.000	-.000177	-.0000584
Householdplan	1.454045	.4651531	3.13	0.002	.5423617	2.365728
Housownership	4.731574	.918057	5.15	0.000	2.932216	6.530933
Satisfaction	3.028394	.7421323	4.08	0.000	1.573841	4.482946
Awareness	2.886928	.6719675	4.30	0.000	1.569896	4.20396
_cons	.518405	1.326663	0.39	0.696	-2.081806	3.118616

. mfx

Marginal effects after probit

y = Pr(WTP) (predict)

= .68916362

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]	X
age	-.0256811	.00881	-2.92	0.004	-.042946 -.008416	47.2995
Family~e	.0604665	.02531	2.39	0.017	.010855 .110078	5.56593
Income	-.0000416	.00001	-3.36	0.001	-.000066 -.000017	24924.4
Househ~n*	.5144117	.14486	3.55	0.000	.2305 .798323	.64011
Housow~p*	.969618	.0383	25.32	0.000	.894553 1.04468	.508242
Satisf~n*	.6817736	.13127	5.19	0.000	.424483 .939064	.324176
Awaren~s*	.7101032	.08023	8.85	0.000	.552851 .867356	.373626

(*) dy/dx is for discrete change of dummy variable from 0 to 1

. tab WTP educ,chi2

Can you pay 50 Birr per month for improved solid waste nanagement ?	Educational Status of Houshold Head					Total
	not atten	primary	secondary	diploma	degree an	
No	75	24	12	37	29	177
yes	62	33	18	34	40	187
Total	137	57	30	71	69	364

Pearson chi2(4) = 5.4644 Pr = 0.243

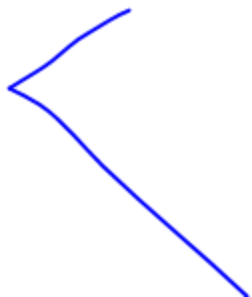
```
. tab Housownership
```

House ownership status	Freq.	Percent	Cum.
OwnHouse	179	49.18	49.18
Rented House	185	50.82	100.00
Total	364	100.00	

```
. tab Housownership WTP,chi2
```

House ownership status	Can you pay 50 Birr per month for improved solid waste management?		Total
	No	yes	
OwnHouse	155	24	179
Rented House	22	163	185
Total	177	187	364

Pearson chi2(1) = 203.2150 Pr = 0.000



```
. sum age FamilySize Income
```

Variable	Obs	Mean	Std. Dev.	Min	Max
age	364	47.29945	9.94009	20	65
FamilySize	364	5.565934	2.811535	1	13
Income	364	24924.44	7547.33	5000	41000

```
. tab educ Householdplan Housownership Housownership Satisfaction Awareness
```

```
. tab Householdplan
```

How do you plan to live in the town?	Freq.	Percent	Cum.
Temporarily	131	35.99	35.99
Permanantly	233	64.01	100.00
Total	364	100.00	

```
. tab Householdplan WTP,chi2
```

How do you plan to live in the town?	Can you pay 50 Birr per month for improved solid waste management?		Total
	No	yes	
Temporarily	70	61	131
Permanantly	107	126	233
Total	177	187	364

Pearson chi2(1) = 1.8944 Pr = 0.169

```
. sum age FamilySize Income
```

Variable	Obs	Mean	Std. Dev.	Min	Max
age	364	47.29945	9.94009	20	65
FamilySize	364	5.565934	2.811535	1	13
Income	364	24924.44	7547.33	5000	41000

```
. tab educ Householdplan Housownership Housownership Satisfaction Awareness
```

```
. ttest age,by( WTP)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
No	177	48.66667	.6818068	9.070849	47.3211	50.01224
yes	187	46.00535	.7722137	10.55986	44.48192	47.52877
combined	364	47.29945	.5210023	9.94009	46.27489	48.32401
diff		2.661319	1.034423		.6270869	4.695551

```

diff = mean(No) - mean(yes)                                t =    2.5728
Ho: diff = 0                                                degrees of freedom =    362

Ha: diff < 0                Ha: diff != 0                Ha: diff > 0
Pr(T < t) = 0.9948          Pr(|T| > |t|) = 0.0105          Pr(T > t) = 0.0052

```