Jimma University
College of Law and Governance
Department of Governance and Development Studies

Determinants of Households' Willingness to Pay for Improved Solid Waste Management in Ethiopia: the case study of Jimma Town

A thesis submitted to Department of Governance and Development studies of Jimma University in partial fulfillment of the requirements of Master's of Arts Degree in Governance and Development studies (Specialization in Development Management).

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Declaration

I declare that this thesis is my original work and has not been presented for a degree in any university and all the sources of materials used for the thesis are duly acknowledged. All comments forwarded by examiners are incorporated.

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Abbreviation and Acronyms

CSA	Central Statistical Agency
CVM	Contingent Valuation Method
EGSSAA	Environmental Guidelines for Small-Scale Activities in Africa
ETB	Ethiopian Birr
FDRE	Federal Democratic Republic of Ethiopia
ISWM	Integrated Solid Waste Management
IUCN	International Union for Conservation of Nature and Natural Resources
NGO	Non Governmental Organizations
SWM	Solid Waste Management
UNEP	United Nations Environment Program
WTP	Willingness to Pay
WB	World Bank

Abstract

In many developing countries solid waste management has become a serious challenge. Improper solid waste management has very high economic, environmental and social costs that have not been critically considered by governments, industries, and households. Environmental quality value can, usually, be estimated from people's willingness to pay to improve or to restore their environment. The main objective of this study is to find out the determinants of households' willingness to pay for improved solid waste management in Ethiopia, a case study of Jimma Town. A total of 200 samples are randomly selected. The study used numerous statistical methods: descriptive analysis, independent t-tests, correlation, cross tabulation and binary logistic regression. The result shows that the majority, which is 88.5 percent, of the respondents stated that they have a concern for environmental protection and safety. The respondents were also asked to state the quality of environment in Jimma Town. Accordingly, the majority of the respondents (54%) reported that the quality of environment is "poor". In the same manner more than half of the respondents (56%) are not satisfied with the existing solid waste management system. Despite municipality's and private collectors' effort, solid wastes are left uncollected and found here and there in streets and communal areas. This implies that there is a desire for the improvement of solid waste management services in Jimma town. The very majority (83.5%) of the respondents are willing to pay for improved door-to-door waste collection service. The findings also revealed that households' willingness to pay for improved solid waste management is significantly affected by income of the household, possession of house and amount of waste generated by households' among other factors. Finally, the study recommends that entrepreneurs and innovators should be encouraged to develop improved schemes for waste collection and management. Regular support and monitoring should be given for the business enterprises and institutions engaged in solid waste management system.

Key Words: Environment, Solid Waste Management, Willingness to Pay

Chapter One
Introduction

This chapter deals with background of the study, statement of the problem, objective of the study, significance of the study, scope and delimitation of the study, and organization of the study.

1.1. Background of the Study

Waste is produced by all sectors of the economy. Every person is a potential producer of waste. It is as old as the existence of human beings. In early times, in order to minimize the health impacts of wastes, transporting the waste out of residential places been the primary concern of authorities. After the end of the Second World War, a high rate of population and urbanization has brought an increased demand of urban and waste disposal land. In developed countries, several mechanisms of waste management have been discovered and applied. However, the condition is different in developing countries (Lindell, 2012).

Waste generation is positively related to income, i.e. increase in income rises consumption and hence waste. This implies that developed countries generate more waste as compared to developing countries. Let alone the amount, developed and developing countries are different in the composition of waste they release. The waste generated in developing countries contains a large proportion of organic materials, about three times higher than developed countries. People in developed countries consume more processed and packaged food; hence their waste contains more packaging materials than in that of developing countries (Medina, 2010).

In low income communities wastes are dumped either at the nearest vacant lot, public space, stream, river, or simply burn it in their compounds (Medina, 2010). Solid waste disposal sites turn into the sources of contamination due to the incubation and production of flies, mosquitoes, and rodents. They, in turn, are the agents of disease that

affect population's health (Abul, 2010). Consequently, solid waste is one of the foremost worries of developing countries because of inappropriate planning, inadequate governance, resource constraint and managerial inefficiency (Mary and Adelayo, 2014).

As of IUCN (2009), it is always the poor who suffer from the effects of living in dirty conditions. The threat of disease from solid waste mismanagement is ever lasting. It reduces workers productivity, keeps children out of school, lowers resistance to shocks and etc. These put poor under severe financial strain and deprive opportunities to improve their standard of living. As a result, improper solid waste management has very high economic, environmental and social costs that have not been seriously considered by governments, industries, and households.

In developing countries municipalities spend 20-50 percent of their budget on solid waste management. In this connection, less than 50 percent of the population is served and 30-60 percent of all the urban solid wastes remain uncollected. The budget for collection of wastes varies from one country to the other. While collection of solid waste consumes up 80-90 percent of municipal management budget in low-income countries, in mid-income countries, however, the collection cost decreases to 50-80 percent of total budget. The cost of collection further decreases to less than 10 percent in high-income countries (see UNEP, 2009).

Like the others developing countries, solid waste management is a serious confront to Ethiopia. This is mainly due to rapid urbanization and population growth. Many towns in the country lack the financial resources and institutional capacity to provide the needed municipal infrastructure for adequate solid waste management (Dagnew et al, 2012). The solid waste management in Ethiopian cities has not been carried out in a sufficient, suitable and appropriate manner. As a result, the quality of environment in cities has become more serious from time to time, and people are suffering from living in such conditions.

Jimma, like other towns of Ethiopia, is characterized by high and rapid population growth. Urbanization and high population growth are responsible for many

environmental problems of which one is solid waste. Around the streets, market, commercial and residential areas, solid wastes easily appear. Despite the progress by Jimma Town to address the challenges of solid waste management, still there are unresolved problems like low coverage of solid waste management (SWM) service, absence of well designed transfer site, and problem of demarcating the final site of disposal. The report from the municipality shows that the solid waste collected by far lower than the amount of waste generated in Jimma town (Jimma City Administration, 2015).

The attempt to alleviate the problem of SWM, in Jimma and others towns of Ethiopia, requires strong commitment on the part of all concerned authorities. The government of FDRE, as indicated in proclamation number 513/2007, realized that it is hardly possible to address the problem of environment, particularly solid waste management, without involvement of local communities. Even if solid wastes management services are the responsibilities of municipalities, the local communities should be involved in the development, implementation, and monitoring of interventions designed to improve SWM. One reason for this view is that beneficiaries' participation ensures that individuals have a voice in activities that will affect their well being.

It is important to study local communities, especially households', interest to contribute for the improvement of SWM. Mary and Adelayo (2014) indicated that the progress of solid waste management has always been assessed based on the performance of the supplier or service provider. This has restricted the success of the improvement in solid waste management system due to the fact that low or no attention has been given to the demand side. However, the participation of local communities or service recipient is essential in making effective decisions and providing solutions to problems of solid waste management. With the view of that, this study aims to analyze the socio-economic determinants of household willingness to pay (WTP) for improved solid waste management in Ethiopia with focus on Jimma Town.

1.2. Statement of the Problem

Cities are centers of civilization and progress. Their growth is illustrated by an increase in their economic and developmental activities, which in turn are driven by the production and consumption patterns. Progress in urban areas improved the standards of living and level of commercialization. It in the same way changed the consumption patterns thereby the waste composition (UNEP, 2009b).

Developing nations in an attempt to increase their industrial development may fail to give all the necessary attentions to solid waste management. As a result, solid waste generation has become an increasing environmental problem in these countries. A poorly managed waste system imposes various costs like social, economic and environmental costs, whereas a properly functioning resource management/waste system brings benefit across all of these elements (Williams, 2013).

Countries like Ethiopia have understood the challenges and introduced proclamations for proper management of solid waste. Adequate and reasonable investment in waste management infrastructure, equipment and services is without any doubt very costly. The involvement of local communities in the SWM program is the most important thing. They are both the beneficiaries and sources of resources for environmental protection. This study stresses the full cost principle, which states all users of environmental resources should pay their full cost, even if there has been a traditional argument that people in developing countries do not give much value for environmental quality. Effective environmental management must take in to account what consumers want and are prepared to pay for an improvement in the quality of an environmental good.

In this regard, various researchers in different parts of the world conducted their study to identify and analyze the determinants of households' contribution or WTP for improved solid waste management in their respective countries. Some of the most important works are: Roy et al (2013), Anjum (2013), Khattak and Amin (2013), Alhassan and Mohammed (2013), Ojo et al (2015), Ojok et al (2015), Joel et al (2014), Mary and

Adelayo (2014), Adebo and Ajewole (2012), Adepoju and Salimonu (n.d.), Adewuyi and Oyekale (2013), and Niringiye and Omortor (2010). From these studies, it is controversial whether which variable has a significant positive or negative impact on households' WTP for improvement of SWM system.

In Ethiopia there are some studies on the determinants of WTP for improved solid waste management; Dagnew et al (2013), Tewodros and Samson (2009) and Workie (2013). Amazingly, the determinants of WTP are a bit different among these studies. What is important in one study is not an issue in other study. As demographic, social, economic and environment factors change solid waste generation and management changes; this in turn affects the households' WTP for waste management.

Households' WTP is a dynamic concept that we need to study again and again to identify factors affecting WTP and hence draw reasonable conclusions for policy directions. Therefore, conducting study on current demographic, social, economic and environmental conditions is very indispensable. The study aimed at understanding and figuring out households' willingness to pay for improved solid waste management, considering the historic town of Jimma. In doing so, this study supplement the existing literatures on SWM, particularly those on Ethiopia.

1.3. Objective of the Study

General objective

The main objective of this paper is to examine the determinants of households' willingness to pay for improved solid waste management in Ethiopia, a case study of Jimma Town.

Specific Objectives

The specific objectives of the study are the following

- To evaluate the condition of households' solid waste management practices in the town.

- ♠ To assess the households' willingness to pay for improved solid waste management.
- ♠ To identify the socio-economic determinants of households' willingness to pay for improved solid waste management.

1.4. Significance of the Study

This research is believed to have the following importance for parties who have direct or indirect interest on the area. The study provide relevant information about the variables affecting households WTP for SWM improvement in Jimma and hence indicate the policy options for concerning body such as government, policy makers, and other institutions working on SWM in the country.

This study will play a significant role in providing useful information regarding WTP for improved SWM. It can be used as an entry point for further policy interventions. Above all, it can serves as potential reference for those individuals who want to conduct further studies on the same or related areas.

1.5. Scope and Delimitation of the Study

The study is limited in its area of consideration to Jimma town only. It is one of the largest towns in Oromiya, the largest region in the country. There is a serious problem of solid waste management in Jimma town. The study is also restricted to analyze the determinants of households' WTP for improved SWM in the town. The data for this study was mainly collected from households'/residents of the town in December 2015. As a result the study is the demand side analysis of SWM. For this study, the researcher applied various techniques of both quantitative and qualitative researches.

1.6. Organization of the Study

The study report is organized into five major parts. The first part includes background of the study, problem statement, objectives of the study, significance of the study, scope and limitations of the study and organization of the paper. The second part deals with theoretical and empirical review of literatures on SWM. The third part discusses the research methodology followed or applied. The fourth part presents major findings of the study and the last part gives concluding remarks and some recommendations.

Chapter Two
Review of Related Literatures

This part is devoted to discuss the overview of solid waste management; theories and experiences in different periods of time. It is a brief combination of theoretical and empirical literature review.

2.1. Theoretical Literature Review

2.1.1. Solid Waste Management Definitions and Concepts

Man's life is interconnected with various other living and non-living things. The inter-linkages between the environment and the economy are all-embracing. In fact, every economic action can have some effects on the environment, and every environmental change can have an impact on the economy. Economic activity takes place within the natural environment. Human beings and animals, from the days of primitive time, have used the resources of the environment to support life and dispose of wastes (Takele, 2004). Environment has the power to assimilate waste. However, this power is limited. As long as earth is not being disturbed by the excess amount of wastes, the environment cleanup natural wastes. If the waste exceeds the absorptive capacity, then the pollutants or wastes accumulate in the environment. This in turn leads to undesirable consequences (Tietenberg and Lewis, 2012).

The concept of waste, as of Addai and Danso-Abbeam (2014), refers to a useless or discarded material. Kirunda (2009) stated that waste is a dynamic concept which can be defined in different ways. It has a different meaning for different people. According to Klundert and Anschütz (2001: page 9) waste is:

> *"unwanted for the person who discards it; a product or material that does not have a value anymore for the first user and is therefore thrown away. But 'unwanted' is subjective and the waste could have value for another person in a different circumstance, or even in a different culture"*

The dominant types of waste include; municipal waste, solid waste, hazardous waste and electronic waste. With an increasing population and urbanization, the demand for solid waste, above all, increase (Lindell, 2012). The US Law-Solid Waste Act 2 (1999), as cited in Abul (2010: page 64), refers solid waste as:

> *"any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations."*

As countries urbanize, their economic wealth, standards of living, disposable incomes, consumption of goods and services increases. This in turn results in an increase in the amount of waste generated (Hoornweg and Bhada-Tata, 2012). Based on this, substantial divergences exist between industrialized and developing countries in terms of solid waste, due to difference in income, standard of living, consumption patterns, institutional capacity, and capital available for urban investment. In the same way, there are also profound differences between waste management in urban and rural areas. In developing countries, often per capita incomes are higher in the cities than in rural areas. As a result urban residents tend to generate more residential wastes per person. The composition of urban wastes tends to be highly diverse due to the wide variety of production activities and all the various material inputs used in them (Medina, 2010).

Currently, world cities generate about 1.3 billion tones of solid waste per year and the volume is expected to increase to 2.2 billion tones by 2025. Accordingly, solid waste management costs will increase from today's annual $205.4 billion to about $375.5 billion in 2025. The waste generation rates will more than double over the next twenty years in lower income countries (Hoornweg and Bhada-Tata, 2012).

In Africa, as of EGSSAA (2009), thousands of tons of solid waste are generated daily. They are thrown into open dumps and wetlands, contaminating surface and ground water and posing major health hazards. While the generation rates may seem modest compared to the 1–2 kg per person per day generated in developed countries, most

wastes in Africa are left uncollected by municipal collection systems because of poor management, fiscal irresponsibility or malfeasance, equipment failure, or inadequate waste management budgets.

Solid waste management represents a large expenditure for developing country cities. It accounts for 30–50 percent of municipal operational budgets (Medina, 2010). Despite this huge expenditure, waste management is inadequate. A considerable portion of the population does not have access to a waste collection service. Above all systems of solid waste management are insufficient from the environmental, economic and financial points of view (Schübeler, 1996).

The proper management of solid wastes is a very important part of environmental health service in a community. Otherwise, solid waste is a source and contributors of various environmental, health and economic problems. So, the appropriate management of solid waste is pivotal in this regard. It is expected to reduce all the problems of solid waste and hence contributes to economic development.

According to Takele (2004: page 2), solid waste management is a broad concept expressed as follows:

> *"is the discipline associated with the control of generation, storage, collection, transfer and transport, processing, and disposal of solid wastes in a manner that is in accordance with the best principles of public health, economics, engineering, conservations, and that is also responsive to public attitudes."*

As of Alie (2015: page 50) solid waste management is

> *"a mixture of human activities which tend to increase with rapid development, improved living standard and changing consumption of products. If solid waste is properly used, it can be a valuable resource, but if it is not effectively managed, it can result in serious adverse impacts on the growth and development of the enterprises."*

In the same way, the FDRE proclamation number 513/2007 (page, 3524) defined solid waste management as:

> *"the collection, transportation, storage, recycling or disposal of solid waste, or the subsequent use of disposal site that is no longer operational."*

Solid waste management is a public good. Economic theories suggest market cannot produce efficient level of public good. The market provision of public goods tends to be inefficient; it often undersupply public goods. Inefficient level of production (undersupply) of public goods results because individuals have the incentive to free ride. Because of the consumption indivisibility (non-rival) and non-excludability properties of public goods, individuals benefit from consuming a public good without paying for it. With a free-riding problem, private firms cannot earn sufficient revenue from selling a public good. Hence they lack the incentive to produce the socially optimal level of the public good (Tietenberg and Lewis, 2012).

The inefficiency of the private provision is often remedied by government intervention in the provision of public goods. Accordingly, solid waste management is generally designed and implemented by governments, especially of local level. However, without the participation and contribution of local resident, it is difficult to achieve desired objectives. It is important to consider the willingness and demand of local communities to the improvement of solid waste management.

2.1.2. Solid Waste Management System and Practices

Even if solid waste management is one of the problems of developing countries, they usually pay inadequate attention to proper solid waste management. The impact of inappropriate SWM is far reaching in terms of economic, social, health and environmental aspects. Environmental quality protection, particularity of solid waste management, requires high efforts. It is one of the most important elements to the attainment of sustainable development.

In conventional system of SWM municipalities have been responsible for managing the wastes generated by residents. In this scheme the main activities are waste collection and taking it to its final disposal site. This approach is highly dependent on municipal budget allocation. In developing countries due to the fact that significant proportion of population do not pay different types of taxes, municipalities often lack the budget to provide waste collection service. As a result two approaches were emerged to address the challenges of traditional waste management model. These are privatization and informal sector involvement. Particularly, the private sector involvement become popular and backed by international institutions like World Bank. It improved efficiency and lowered operating costs throughout the waste management system (Medina, 2010).

Recently, efficient and sustainable management system has become the focus of all stakeholders of solid waste management. The interest and roles of these stakeholders are briefly described below.

Table 1: Stakeholders of SWM and their roles

Stakeholders	Description
Waste generators (Residents and Businesses)	The main concern of households' or business is to get efficient and dependable waste collection service at a reasonable price. Their preferences for particular types of waste service and WTP for that service have an impact on the solid waste management system.
Local Government	In most countries local government authorities have a responsibility over the management of solid waste, usually, as specified in by laws and regulations.
National and Regional Government	They play a key role in establishing the institutional and legal framework for SWM so that local governments have the necessary authority, powers and capacities for effective solid waste management.
NGOs	NGOs also play a key role in improving the environment or the quality of life for poor. They are known for

	encouraging and strengthening local small scale enterprise and others projects engaged in environment conservation and preservation.
Private Sector Enterprises	Private companies usually do not have any direct responsibility for maintaining public sanitation; however, in partnership with the public sector, they may provide several functions.
Informal Private Sector	This sector usually includes: unregistered, unregulated activities carried out by individuals, families, groups or small enterprises. It is highly known for recovering materials from solid waste stream or sometimes manufacture new items using the recovered materials
External Support Agencies	This refers to bilateral and multilateral external support agencies (ESAs) engaged in supporting SWM in low-income countries.

Source: Schübeler (1996) and UNEP(2005)

Proper solid waste management is believed to have efficient combination of various elements of solid waste management in an integrated manner. It doesn't merely refer collecting and dumping of waste (water aid, 2008). Instead, integrated solid waste management is a wide principle and practice. According to water aid (2008), it is

> "a *process of optimizing the waste management system as a whole with application of a variety of suitable technologies".*

Currently, the integrated waste management system consists of: waste prevention, re-use, recycling, composting, incineration, and sanitary land-filling.

Table 2: Components of Integrated solid waste management system

Components of ISWM	Description
Waste prevention	This is one of the most important components of IWM. It deals with reducing the amount of waste that individuals, businesses, and other organizations generate.
Re-use	It deals with the encouragement of re-using of products and materials. It saves energy and water, reduces pollution, and lessens society's consumption of natural resources.
Recycling	Recycling is the process of recovering materials and reintroducing them as raw materials. The most noted recycle-able wastes are: plastics, wood, metals, glass, textiles, paper, cardboard, rubber, ceramics, and leather.
Composting	Composting is the biological decomposition of organic materials, so that the outcome is beneficially used for land.
Incineration	Incineration is the burning of waste or mass-burn combustion of bulk MSW under controlled conditions with and without energy recovery.
Sanitary land-filling	Landfill is the controlled deposit of waste to land. A sanitary landfill is a prepared for final disposal of waste, to reduce the effect of solid waste.

Source: Medina (2010)

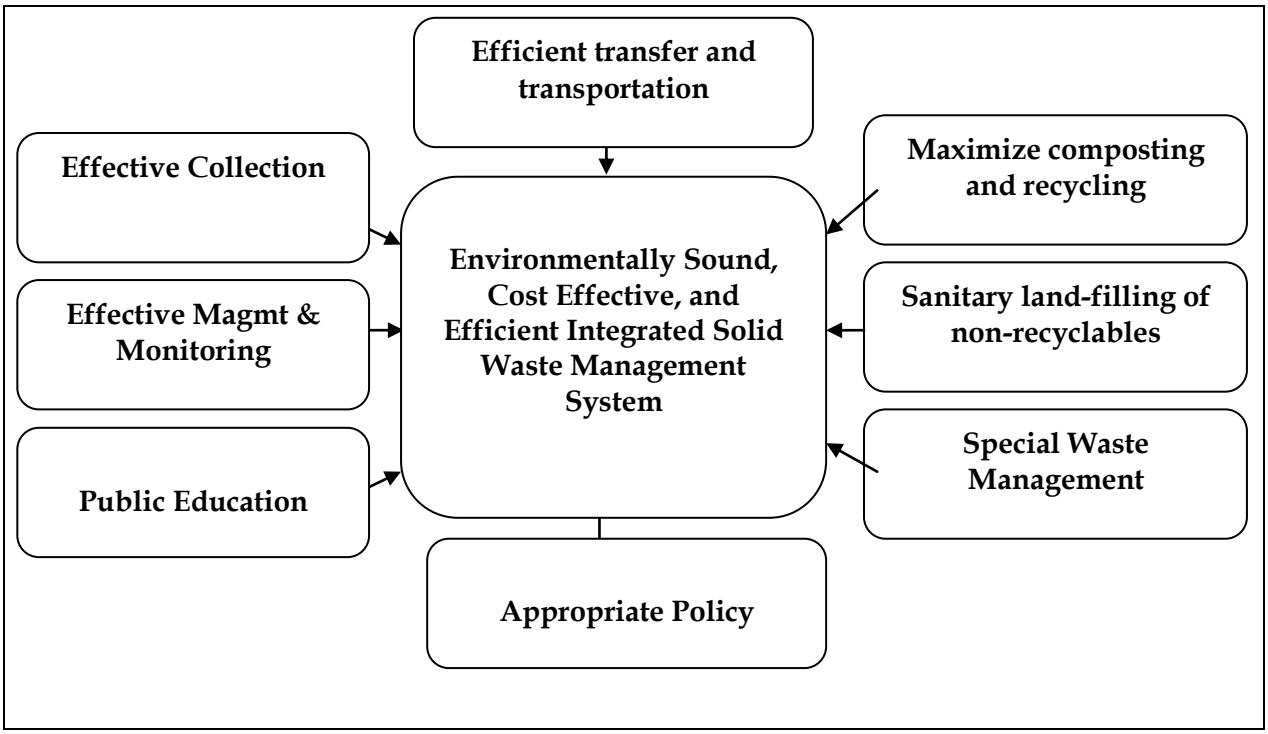
Integrated Solid Waste Management (ISWM) is, therefore, a broad system of waste prevention, recycling, composting, and disposal program. In other words, it involves preventing, recycling, and managing of solid waste in ways that efficiently protect human health and the environment. Actually each of these activities requires strong cooperation of all actors and partners of SWM.

The current philosophy is that with ISWM it is possible to achieve the objectives of municipalities' solid waste management. As stated in Schübeler (1996) the main

objectives of proper solid waste management are: to protect residents' health, particularly of poor who highly suffered; to promote of the quality of environment; to support local economic development; and to create job opportunities for segment of the population.

The following figure demonstrates strategies for integrated solid waste management and hence achieving the goals effective solid waste management.

Figure 1: Strategy for Integrated Solid Waste Management



Source: This figure is taken from Water aid (2008), Solid waste management in Nepal.
www.**wateraid**.org/~/media/Publications/**solid-waste-management-nepal.pdf**

2.2. Empirical Literature Review

Solid waste management is one of the most critical issues the world, particularly in developing countries. This had led to the recognition of improved SWM as a central point for international environmental sustainability and development. Several studies have been conducted to analyze the demand side or households' willingness to pay for improved SWM system.

In India, Roy et al (2013) examined the WTP for sustainable solid waste management using binary probit regression. The study revealed that monthly average household expenditure, household size, average education, environmental awareness and number of working woman presented in family positively associated with the WTP for solid waste management scheme. Informal waste disposal arrangement is not significantly associated with the WTP. The study finally concluded that if solid waste management scheme is introduced, there is a probability of success.

Anjum (2013), in Pakistan, using logistic and multiple regression, identified that willingness to pay for solid waste management is significantly affected by age, household income, education and environmental awareness. In the same way, Khattak and Amin (2013) aimed at finding out the public Willingness to Pay (WTP) for the treatment of environmental hazard in the form of solid waste in Pakistan. Using Binomial Logit Model, the study found that income of household, family disease history, education and size of households as major factors which affect the household's decision regarding WTP. Mustafa et al (2014) used contingent valuation method for assessing the House Holds WTP for improved environment through better SWM services. The binomial logit regression method shows that Education, income, awareness, location and HH size were found to be influencing WTP.

In Ghana, Alhassan and Mohammed (2013) analyzed households' demand for better solid waste disposal services using the Contingent Valuation Method. According to the study, the most significant and influencing factors that affect WTP are the environmental safety concern of the respondent, level of satisfaction of current waste disposal services, education, household size, length of stay in the current residence, walking time to public dumpster, and sex of respondent. Addai and Danso-Abbeam (2014), in the same manner, revealed that willingness to pay for improved solid waste management is significantly related to level of education, gender, household size and age of the household head. However, for Amfo-Otu et al (2012) respondents' sex, level of education, income, expenditure level, frequency of payment, frequency of collection and satisfaction with the present waste management system do not have any significant

influence on the willingness of the respondents to pay for waste collection semi-rural towns of Ghana. However, variables like mode of collection, occupation and age are seen to have a significant effect on willingness to pay.

Ojo et al (2015), in Nigeria, analyzed improved household solid waste management system using multiple regression model. The study identified that age, income, environmental awareness and household expenditure have a positive and statistically significant relationship with the willingness of households to pay for waste disposal in the area. However, household size has a negative and statistically significant relationship with households' willingness to pay. In the same country, for Mary and Adelayo (2014), the households' willingness to pay is affected by the price of service, age of the respondents, level of education and household size. Adebo and Ajewole (2012) showed that willingness-to-pay for waste disposal is significantly affected by gender, nature of primary occupation, marital status, level of education and average monthly income.

In Uganda, the study by Ojok et al (2015) examined households' willingness to pay (WTP) for improved municipal solid waste management using logit linear regression model. The determinants of WTP, according to the study, are gender, age, household size, education level, income level, marital status and migration status of household respondents. Niringiye and Omortor (2010), however, revealed that the age of the household head is negatively associated with the willingness to pay for solid waste management. Other variables are not significantly associated with the willingness to pay for improved solid waste management. The study, finally, concluded that there is little chance of success if solid waste collection service charges are introduced.

Joel et al (2014), using contingent valuation method and multiple regression techniques identified the determinants of willingness to pay in Kenya. The result showed that the WTP are influenced by income, education, age and total disposal methods available to the household. The study suggested that WTP estimates can be used by government authorities to determine the socially optimal charges for solid waste services.

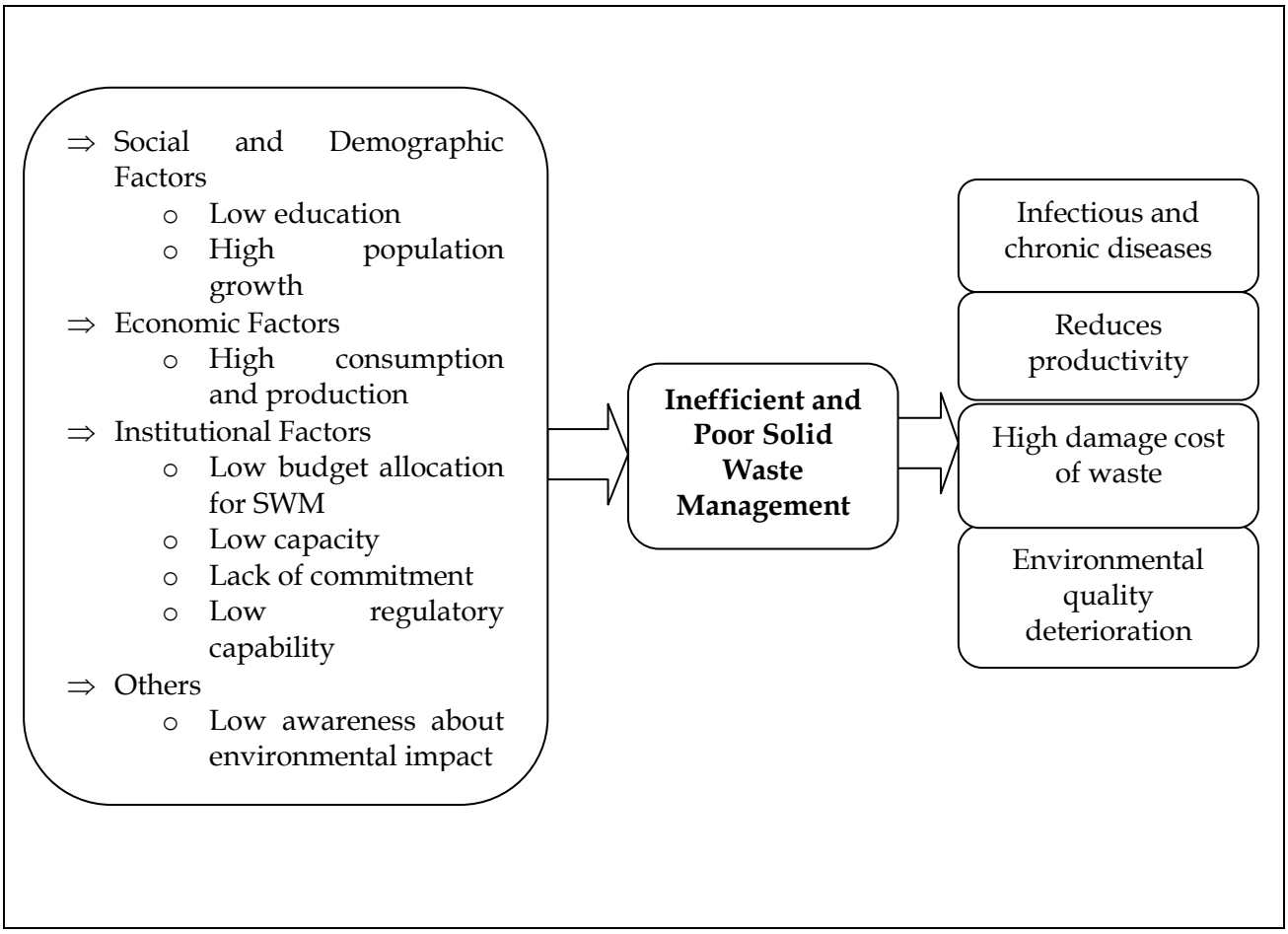
When we come to Ethiopia, few studies were conducted in this regard. According to Dagnew et al (2013), residents' WTP for improved solid waste management is significantly related to income and awareness of environmental quality, among other factors. As of Tewodros and Samson (2009), WTP is significantly affected by household income and current access to waste disposal containers. However, demographic features such as education, age, household size and gender have insignificant impact on the demand for improved services of waste collection. In the same way, Workie (2013) shows that households' WTP is affected by level of education, family size, number of children, length of time/years of stay, income and household work. Except for family size that inversely related with the probability of saying yes to the WTP question all other variables have a positive effect on WTP amount.

In general, it remains controversial whether which variable has a significant positive or negative impact on households' WTP for SWM improvement. This is because the socio-economic conditions vary from country to country and hence difficult to apply a general rule for the demand side of SWM. Though SWM is still far from being improved in Ethiopia, it is appropriate to assess actual demand or interest of residents' for SWM improvement. With this connection, few researches are conducted in the area of WTP for SWM improvement. This study, also, aimed at filling the knowledge gap by taking Jimma town as case study.

2.3. Conceptual Frame Work

Environmental protection was one of the most important components of millennium development goals and is considered as one of crucial elements in the post 2015 development agendas. Sustainable waste management plays a key role in achieving the sustainable development goals. After reviewing various literatures, this study identified that improperly managed solid waste leads to various health, environmental and socio-economic problems. The following figure shows the cause and consequences of poor solid waste management system.

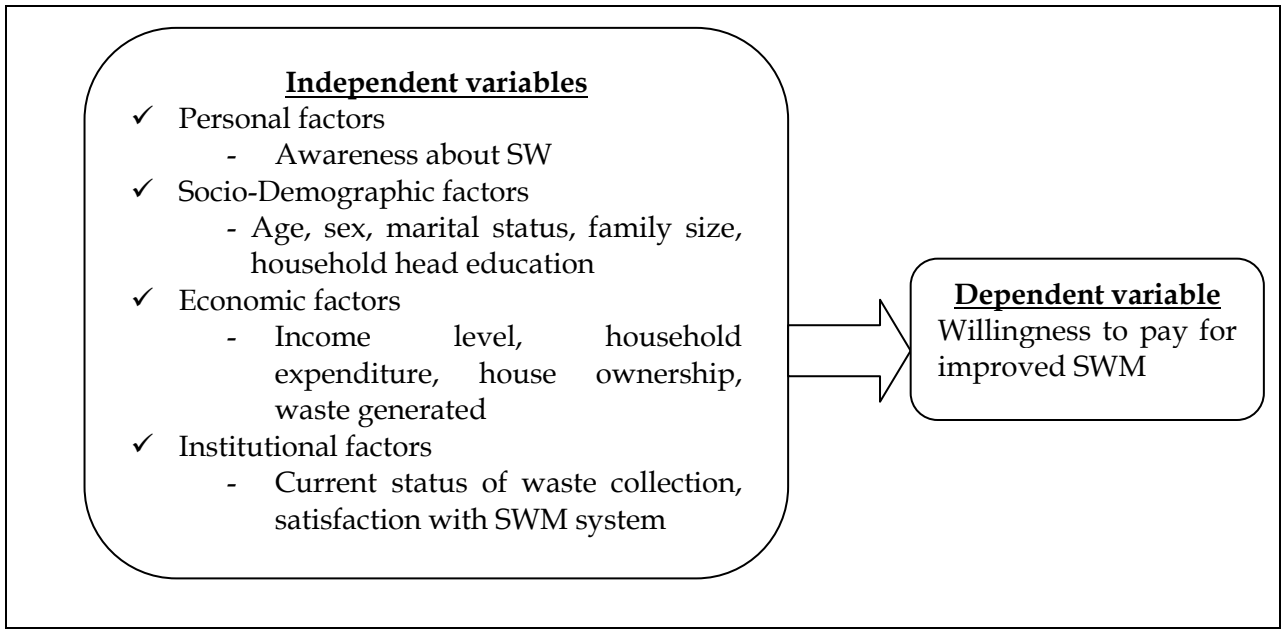
Figure 2: Causes and consequences of poor solid waste management



Sources: Literatures (2016)

This study assumed that, in order to overcome the challenges of poor solid waste management, it is important to involve households or residents to the decision making process. Due to the fact that households are the agents and victims of solid waste, they are expected to contribute something (especially finance) towards its proper management. This study aims at identifying factors responsible for households' willingness to pay for improved solid waste management. The empirical literature review shows that the determinants are many in number and dynamic in their nature. The following figure illustrates explanatory (independent) and explained (dependent) variables in a simpler way.

Figure 3: Determinants of Households' WTP for improved SWM



Source: Literatures (2016)

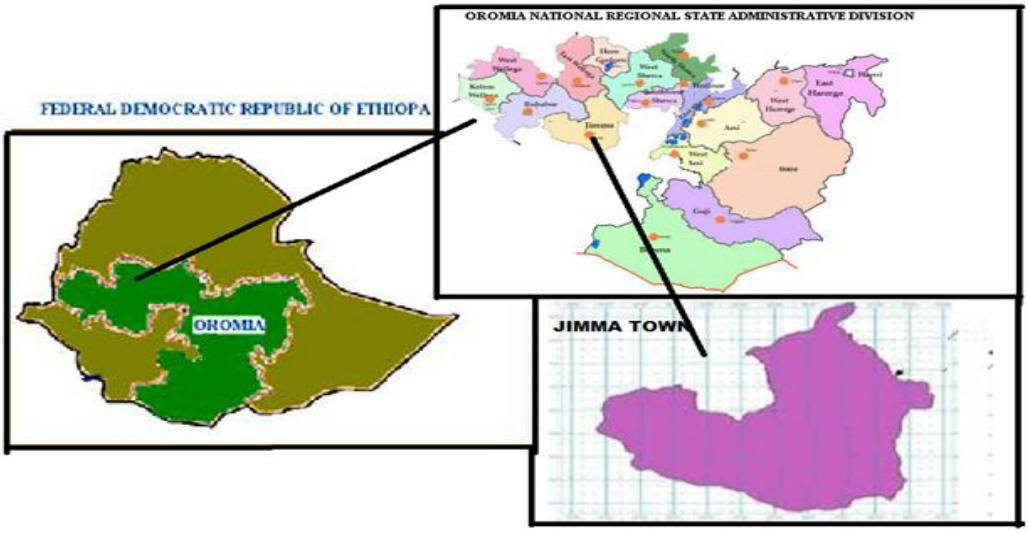
Chapter Three
Methodology of the Study

In this chapter site description, the research design, sources of data, the instrument employed for collecting data, selecting sample sites and respondents, method of data analysis and presentation, model specification and expected sign, and ethical considerations are presented.

3.1. Site Description

Jimma is one of the largest towns in Oromia Regional State, located in south western part of Ethiopia. It is the capital of Jimma Zone, one of 19 zones of Oromia regional state, the largest region in the federation of Ethiopia. Jimma has been the dominant political, economic, and historical center in south west Ethiopia. It is located at 335 KMs from Addis Ababa on the main road of Mettu – Gambella. It is situated on 7°40′N (North) latitude and 36°50′E (East) longitude. The total area of the town being the total area of land town is 4623 Hectares (Kassa, 2008).

Figure 4: Map of the Jimma town (Study Area)[1]



[1] Source: http://en.wikipedia.org/wiki/Ethiopia

Oromia National Regional State Program of Plan on Adaptation to Climate Change (2011)

According to the 2007 population census, the population of Jimma is 120,960, of which the male population is 60,824 and that of female is 60,136 (CSA, 2007). With 3% growth rate at a moment population is expected to reach 163,000. The population of the town is composed of different religious, ethnic and linguistic groups. The two major ethnic groups in the town are: Amhara and Oromo. Other ethnic groups living in the town are Tigre, Gurage and others. The dominant languages spoken in the town are Afaan Oromo and Amharic. Most of the inhabitants of the town are followers of Ethiopian Orthodox Church and Islam.

Jimma town is selected for this study at least because of two reasons: First, to the knowledge of researcher such a study has not been done in Jimma town and second, the system of municipal solid waste management is inefficient.

3.2. Research Design and Methods

In this study a mixed approach is used. It helps to triangulate the consistency of the information gathered. However, the main approach is a quantitative approach, used for detail analysis of the determinants of households' willingness to pay for solid waste management. The qualitative data from various sources are used to supplement the quantitative approach.

3.2.1. Data Sources

In order to get all the necessary information on the area under which the research is conducted, both primary and secondary sources of information is used. The primary data is mainly collected from the residents, government officials, and key informants. These sources helped the researcher to get first hand and relevant information about the topic in consideration. Secondary data is collected from various documents. The most important secondary data sources used are; strategic plan, reports, and documents from Jimma Town municipality.

3.2.2. Instruments of Data Collection

Both quantitative and qualitative data is collected using questionnaires, document analysis, and interview.

3.2.2.1. Household Questionnaire

It is a very popular way of collecting data, particularly when the sample size is large. The Quantitative data is collected through the use of structured questionnaire. The main advantage of questionnaire is that it enables us to obtain information on a wide range of topics when in-depth inquiring of responses is not required. It was used to collect data from the residents of four kebeles in Jimma Town.

The questionnaire had the following important parts: Introduction, general information about respondents, Household details, households' perception about environment and existing SWM system, Socio-economic status the respondents, current status of solid waste management, WTP to improved SWM, and finally households' attitude toward SWM.

In order to check the validity and reliability of the questions, the pilot study was done by conducting interview with non-sampled respondents and then based on their feedback valuable improvements were made and irrelevant items were discarded. After the pilot study, the questionnaires was distributed to data collectors and filled and collected through data collectors. Data collectors were give a detail orientation about the purpose of the study.

3.2.2.2. Interview

The qualitative data was collected using interview. The Interview was used to collect data from different respondents such as key informants, SWM experts, and municipality's officials. This study assumed that the information from participants is important and meaningful in the process of solid waste management. The interview was

done in Afaan oromo. The structured interview was used to get valuable background information about the environment where a research project is being undertaken.

3.2.2.3. Document Analysis

Document analysis is also one important form of collecting data for research. In this case different documents from Jimma municipality are interpreted by the researcher to give support around an assessment topic. The main advantage of this instrument is that it provides basic information about the situation of solid waste management in Jimma Town.

3.2.3. Sampling Method and Sample Size

As regard to sampling, its objective is to select a set of elements from a population. Random sampling enhances the probability of accomplishing this objective and also allows for the objective assessment of the reliability of the sample. In the first stage of sampling 4 out of 13 kebeles of the town were selected: these are Boche Bore, Ginjo, Ginjo Guduru and Mendera Kochi.

According to Kothari (2006) the sample size should be determined by a researcher keeping in view the following key points: Nature of units, size of the population, size of questionnaire, finance, availability of trained investigators, the conditions under which the sample is being conducted, the time available for completion of the study and etc. Based on this, in the second stage of the sampling procedure, 200 respondents were selected from households' in those four kebeles, most importantly considering prior studies, financial and time constraints. Above all, the population is assumed homogenous, hence small sample size is required. The sample size used was higher as compared to the works of Addai and Danso-Abbeam (2014), Adebo and Ajewole (2012), and Mary and Adelayo (2014) and others, who conducted their study on the same topic. In Ethiopia, the sample size used in this study is identical to the study of Workie (2012) and a bit less than to the works Dagnew et al (2012).

In addition to household survey, the information from key informants was used. These people are purposely selected. In this case, the informants that were considered as key informants are SWM experts at Jimma Town Administration and well-informed residents of each kebeles. These people are more aware about SWM so that they gave extra and complementary information regarding solid waste management.

3.2.4. Method of Data Presentation and Analysis

The study used both descriptive statistical tools and inferential statistics models. In order to evaluate the households' solid waste management practices and their willingness to pay for improved solid waste management, descriptive tools like means, standard deviation, percentage and etc were used. The study applied inferential statistics (like correlation and chi-square) to check the association of variables. Independent t-tests were also applied to examine the mean differences. In addition, the micro-econometrics technique, **Binary logistic model**, was applied to identify the demographic and socio-economic determinants of households' WTP for improved SWM. The collected data through household survey entered, manipulated and analyzed using **SPSS** software version 20. In addition MS-Excel was used to supplement SPSS. Tables and charts were used for describing the data result.

3.2.5. Model Specification: Binary Logistic Model

The contingent valuation method (CVM) is applied in this study. It is the most commonly used method of valuing environmental qualities. In the CVM, individuals are simply asked to state their WTP for the non marketed resource through WTP surveys. It uses questionnaires with open-ended or dichotomous questions to reveal an individual's willingness to accept or willingness to pay for a change in the quality of an environmental amenity.

As used by Adewuyi and Oyekale (2013), Anjun (2013), Roy et al (2013), and Amfo-Otu et al (2012), to characterize households WTP for improved solid waste management in

the study area, the researcher used a probability model in which the chances of WTP are linked to individual, socio-economic and demographic characteristics.

The logit model analysis produces statically sound results, which can be easily interpreted, and the method is simple to analyses. Assume the following basic model, it can be express the probability that *y*=1 as a cumulative logistic distribution function.

$$Y_i = \beta_1 + \beta_2 X_i + \varepsilon_i$$
$$P_i = E\left(Y = 1/Xi\right) = \beta_1 + \beta_2 Xi$$

Where, Y dependent variable and Xi refers to independent variables.

From this we can get the cumulative Logistic distributive function. It is written as:

$$p_i = \frac{1}{1 + e^{-(\beta_1 + \beta_2)}} = \frac{e^{z_i}}{1 + e^{z_i}}$$

$$where, Z_i = \beta_1 + \beta 2 X_i$$

The value pi Note lie in the interval [0, 1] or between zero and one. Z_i also ranges from $-\infty$ to $+\infty$, and hence, are interpretable.

If P_i= prob(Y = 1| X) is the response probability, the non-response probability (1- Pi) is given as:

$$1 - p_i = prob\left(Y_i = 0/X_i\right)$$

$$1 - P_i = 1 - \frac{e^{z_i}}{1 + e^{z_i}} = \frac{1}{1 + e^{z_i}}$$

$$\frac{P_i}{1-P_i} = \frac{prob\left(Y_i = 1/X_i\right)}{prob\left(Y_i = 0/X_i\right)} = \frac{1+e^{Z_i}}{1+e^{-Z_i}} = e^{Zi}$$

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \beta_1 + \beta_2 X_i \text{ (Gujarati and sangeetha, 2007)}$$

L_i is called the logit**,** thus, the log-odds is a linear function of the explanatory variables. The above transformation has certainly helped the popularity of the logit model. Note that for the linear probability model it is P_i that is assumed to be a linear function of the explanatory variables. The odds ratio can be interpreted as the probability of something happening to the Probability it will not happen.

Therefore, in this study binary logit equation is defined as follows:

$$\mathbf{P_i = E(Y= 1/R_i) = \alpha + \beta R_i}$$

WTP=f(Age, Sex, Educational level, PCE, PCI, dist, home ownership, others socio-economic variables)

Where:

Dependent variable, WTP is in binary nature (1=yes or 0=no): indicates probability of paying to the improvement of solid waste management.

Independent variable, R_i: Age of the household head, Sex of household head, Educational level, marital status, income of the household head, Assets (house owner ship), satisfaction of current SWM service, and waste generated by households.

The expected relationship between dependent and independent variables used for this study are summarized as the following table.

Table 3: Expected relationship between WTP and explanatory variables

Independent Variable: Willingness to pay				
S. No	**Independent variables**	**Nature of Variable**	**Expected Sign**	**Remark**
1	Sex	Categorical	+	Sex (female) and WTP are positively related.
2	Age (Year)	Numeric	+	
3	Marital status	Categorical	+	
4	Household Head Education	Categorical	+	Education (higher) and WTP are positively related.
5	House Ownership	Categorical	+	House ownership and WTP positively related.
6	Average Income (Monthly)	Numeric	+	
7	Solid waste per week	Numeric	+	
8	Satisfaction with current SWM	Categorical	+	Dissatisfaction with current SWM and WTP are positively related

Source: Literatures, 2016

3.3. Ethical considerations

The researcher had informed the respondents about the aim of the study and confidentiality of their idea. Above all, they were requested to give their idea genuinely and voluntarily. The permission of the respondents was secured through an official letter from Jimma University. The data collection was begun once verbal consent is obtained from a participant after reading out a consent section for each data collection method.

Chapter Four
4. Results and Discussions

This chapter presents the analysis of survey data and its interpretation. It discusses the current solid waste management practice, perception and attitudes of respondents towards improved solid waste management; and demographic, economic and social factors determining of household' willingness to pay for improved solid waste management in Jimma Town.

4.1. Socio-Economic and Demographic Features of Respondents'

As indicated in table 4 and 5, the majority of the respondents are in their active years. More than 99% of the respondents are above 25 years. The largest share is found between 36-45 years (45%) followed by 46-55 years (26.5%). The mean (average) age of respondents is 43.06 years. This, therefore, shows that respondents are at critical age to know the benefits of environmental quality and hence make wise decisions about solid waste management.

Table 4: Age of respondents' (Percentage)

Age (Years)	Percent
Below 25	0.5%
25-35	18.5%
36-45	45%
46-55	26.5%
56-65	9%
Above 66	0.5%
Total	

Source: Own Survey and Computation, 2016

Table 5: Age of respondents' (Mean)

	Minimum	Maximum	Mean	SD
Age of the household head	24	66	43.06	8.931

Source: Own Survey and Computation, 2016

In terms of sex, the majority of the household head are male (81.5%). This is the typical features of developing countries. Around 80 percent of household heads are married whereas 18.5 percent of them are widowed and divorced from their wives or husband for different reasons. Only 5 percent of the respondents are single. The higher proportion of the married in the study area may encourage the willingness to pay for improved solid waste managment.

Table 6: Demographic and social features

	Percent
Sex	
Male	81.5%
Female	18.5%
Marital Status	
Never Married	5.0%
Married	80%
Divorced & Widowed	15%
Family size	
Below 3	11.5%
3-5	72.0%
6-8	16.5%
Education of household head	
Read and Write	5.0%
Primary	29.0%
Secondary	34.5%
Tertiary	31.5%

Source: Own Survey and Computation, 2016

Table 7: Family Size (mean)

	Minimum	Maximum	Mean	SD
Family size	0	8	4.20	1.487

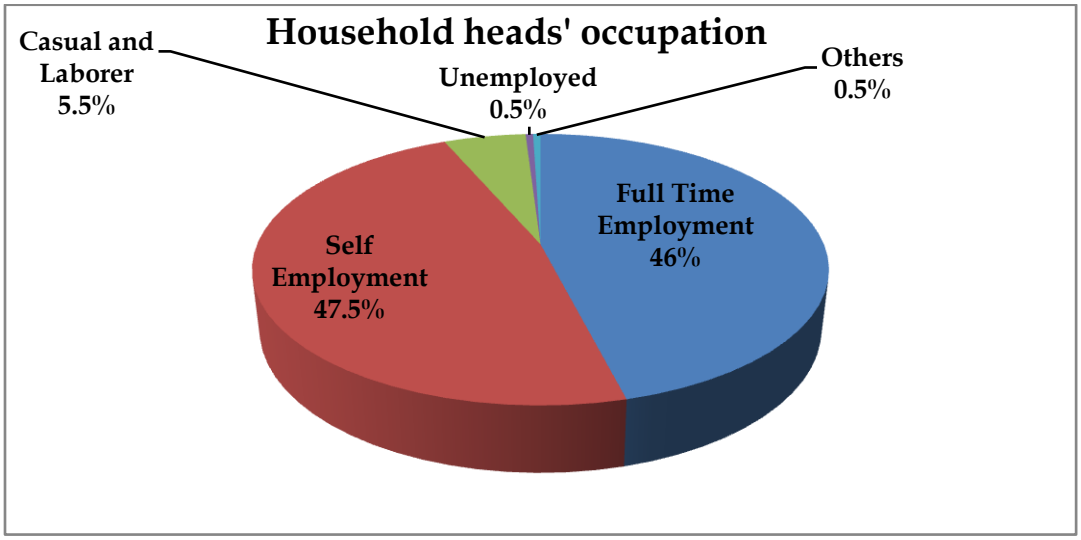
Source: Own Survey and Computation, 2016

Another demographic variable that affects the socio-economic well being of the household members is household size. The average family size is 4.2 persons. This number can easily show that a household consists of father, mother, a son and a daughter. In support of this table 6, shows that the majority (72%) of households have a family size of between 3 and 5.

Education wise, the survey findings highlights that the literacy level is high in sampled kebeles of Jimma Town. This study assumes that a person is literate if he or she can read with understanding and write a short statement at least in one language. Otherwise, a person is considered to be illiterate. In this regard all respondents are literate. Of all sample, 31.5 percent attended tertiary education and have certificate (TVET, diploma, degree, masters' degree and so on). Around 35 percents of the respondents have finished secondary education.

The considerable majorities of the respondents have jobs. Around 48 percent of the respondents are self–employed (engaged in their own businesses or works). The remaining 46 and 5.5 percent are full time employee and casual and laborer, respectively. Due to the fact that the very majorities are employed, they can easily pay for environmental improvement.

Chart 1: Occupation of household heads



Source: Own Survey and Computation, 2016

The average monthly income of the respondents' is ETB 4002.45 (±2962.8) ranging between ETB 600 and ETB 20,000.

Table 8: Monthly Income

	Minimum	Maximum	Mean	SD
Monthly income	600	20000	4002.45	2962.797

Source: Own Survey and Computation, 2016

In terms of house ownership, 61.5% are living in their own houses and the remaining 38.5 % are living in rented houses. The higher the number of the house owners in the study involves many households will pay for environmental quality improvement.

Table 9: House Ownership

	Percent
House ownership	
Yes	61.5%
No	38.5%

Source: Own Survey and Computation, 2016

4.2. Solid Waste Management Practices

This section discusses the current solid waste management practices in Jimma town, based on information collected from households', key informants, and Town Municipality.

As of Jimma city Administration, in the year 2007 E.C. (2014-15 G.C.) the largest solid waste was released by households' or residents' -around 50 percent of total solid waste generated in the year- followed by commercial services (21.5%) and public services (8%).

Table 10: Solid Waste Generation by different sectors

Sector	Rank	SW generated (m3)
Residential	1	72,750
Commercial Services	2	31,050
Public services	3	11,555
Agriculture/forestry/fishery/tourism)	4	10,530
Industry	5	7,560
Transport	6	6,555
Total		**144,000**

Source: Jimma City Administration Sanitation, Beautification and Abattoir Department (2015)

Of total solid waste generated in Jimma town around 56 percent is collected, the highest percentage being households' waste followed by commercial services and public services.

Table 11: solid waste collection from different sectors

Sector	Rank	SW collected (m3)	Percentage of waste collected
Residential	1	40,576	55%
Commercial Services	2	17,853	57%
Public services	3	7,927	68%
Agriculture/forestry/fishery/tourism)	4	6,492	61%
Industry	5	4,247	56%
Transport	6	4,057	62%
Total		**81,152**	

Source: Jimma City Administration Sanitation, Beautification and Abattoir Department (2015)

As indicated in the above table, the most collected solid waste is the one from public services while the least collected waste is the one from residential or households. This shows that due attention should be given to wastes emitted from households.

The solid waste collection by municipality is very small, closer to 1 percent. Almost all of the solid waste in Jimma town is collected by private establishments. They are responsible for around 99 percent of solid waste collection. Currently, there are two micro and small enterprises and one private institution engaged in the door-to-door collection of solid wastes and transporting it to the communal collection containers. They provide service in 14 kebeles of Jimma Town. The evidence from residents and key informants show that enterprises collect solid wastes on weekly basis and charge households ETB 10 per month for the service. With respect to the frequency of the existing solid waste collection system, some interviewees' indicated that there is inconsistency in the collection process, especially the exact date of collection is unpredictable. As a result, households are forced to keep wastes for more than a week, exposing them to various diseases.

Table 12: Forms of solid waste collection

Forms	**Rank**	**SW Amount (m3)**	**Share of total waste collected (%)**
Collected by private establishments	1	80,523	99.2%
Collected by municipality	2	696	0.8%
Burn or Bury	3	15	0.01%
Dump in open space/backyard	4	5	0.006%
Dump in river	5	3	0.003%
Total		**81,152**	**100%**

Source: Jimma City Administration Sanitation, Beautification and Abattoir Department (2015)

The municipality has prepared many "**Waste Containers**" or "**Gendas**"(in Ahmaric) in different parts of the town, each carrying 8 meter cubic. However, the interview from authorities and key informants shows that people, who are located closer to the waste Containers or "Genda", are not happy about the location of the dumpsite. There are frequent complaints from residents, because dumpsite is too close to their houses. As a result, they complained that, they are suffering from various diseases.

Figure 5: Photos of solid waste conditions in Jimma Town

Source: Own Observation, 2016

Table 13: Solid Waste Disposal

Disposal condition	Rank	Share of total waste (%)
Open Dumping	1	56.46%
Composted	2	32.86%
Burn or Bury	3	8.54%
Recycled	4	2.13%
Other		
Total		**100%**

Source: Jimma City Administration Sanitation, Beautification and Abattoir Department (2015)

Most of the generated wastes are disposed in an open space. The main solid waste disposal site of Jimma town is found in Kofe Kebele on the road to Seka. It is an open field where wastes are dumped on the land, that otherwise would be used for agriculture. The information from the municipalities also shows that there is a problem of demarcating this disposal site.

Respondents were also asked to estimate amount of wastes they generate under normal circumstances per week in terms of **garbage bag** or a **"50 Kg sack"**, for all types of solid waste. On average the amount of wastes generated per household are 1.10 sacks per week. This implies that households' generate more than one sack of solid waste per week.

Table 14: Average waste generated by households

	Minimum	Maximum	Mean	SD
Solid waste produced per week	0.25	3.00	1.1088	0.59657

Source: Own Survey and Computation, 2016

4.3. Households' Attitude and Perceptions towards SWM

Under this topic we are going to see the households' attitudes, perceptions and understanding about environmental protection in general and solid waste management in particular. In all cases there is no statistical difference between those are willing to pay for improved SWM and those who not.

The survey results indicate that the majority, which is 88.5 percent, of the total respondents state that they have a concern for environmental protection and safety. In this connection, respondents were asked to state the quality of environment in Jimma Town. The majority of the respondents (54%) reported that quality of environment is "poor". Around 45 percent evaluate that solid waste management is "average "while the remaining 2 percent states that it is "good".

Table 15: Concern for Environment

	Percent
Concern for Environment	
Yes	88.5%
No	11.5%
Quality of environment	
Good	2.0%
Average	44.0%
Poor	54.0%
Satisfaction with current SWM	
Yes	44%
No	56%

Source: Own Survey and Computation, 2016

When we see households' satisfaction towards solid waste management in Jimma town, the majority (56%) are not satisfied with the existing service system. Despite municipality and private collectors' effort, solid wastes are left uncollected and found here and there in streets and communal areas. This implies that there is a desire for the improvement of SWM services in Jimma town. From among the respondents, 44 percent indicated that they are satisfied with the current service system but they believe that there are still so many problems that need to be considered.

During the survey the respondents were also asked whether they have a proper knowledge of the impact of solid waste, 93% agreed that they have a good knowledge about the consequences of mismanagement of solid waste. Close to 70 percent believe that solid waste has been increasing over the last years. In the same way, around 70 percent responded that improper solid waste management is the critical problem in Jimma Town.

Table 16: Impact of Solid Waste

	Percent
I have proper knowledge of the impact of solid waste	
Strongly Agree	2.0%
Agree	91%
Undecided	2.0%
Disagree	5%
Solid waste in Jimma Town has been increasing over the last few years.	
Strongly Agree	4.0%
Agree	66%
Undecided	21%
Disagree	9.0%
Solid waste mismanagement is the critical problem in Jimma Town	
Strongly Agree	9.0%
Agree	63%
Undecided	13%
Disagree	12%
Strongly Disagree	3.0%

Source: Own Survey and Computation, 2016

Around 85 percents of the respondents believe that the government is not doing enough to deal with solid waste problem. According to key informants the reason for such complain is that they government couldn't properly expanded road and infrastructures that facilitates solid waste management. The majority of the respondents (56%) also think that garbage collection is not the only solution to proper solid waste management. Due attention should also be given to the process of sorting, composting, recycling and dumping. Solid wastes have potentials of being re-used or recycled.

Table 17: Government and garbage collection

	Percent
The government is not doing enough to deal with solid waste problem.	
Strongly Agree	16%
Agree	68%
Undecided	4.0%
Disagree	10%
Strongly Disagree	2.0%
Regular collection of garbage is the only solution to the waste problem.	
Strongly Agree	2.0%
Agree	18%
Undecided	24%
Disagree	55%
Strongly Disagree	1.0%

Source: Own Survey and Computation, 2016

Respondents have, indeed, a good awareness about the impact of environmental quality deterioration. Of all the respondents about 95 percent suggested that proper solid waste management is good for environment and it should be further promoted. In the same way, around 95 percent indicated every person should contribute to solid waste management (see table 16). This is in line with the basic idea of payment for ecosystems service (PES), which states that those who provide ecosystem services should be paid for doing so. In other words, PES is based on the 'beneficiary pays principle'. It provides an opportunity to put a price on ecosystem services like climate regulation, water quality regulation and solid waste management, in doing so it contributes for sustainable development.

Table 18: Contribution to Solid waste management

	Percent
Proper SWM is good for environment and it should be further promoted.	
Strongly Agree	23%
Agree	72%
Undecided	2.0%
Disagree	3.0%
Everybody could contribute to SWM.	
Strongly Agree	35%
Agree	59%
Undecided	2.0%
Disagree	4.0%

Source: Own Survey and Computation, 2016

4.4. Determinants of Households WTP for improved SWM

This section discusses households' willingness to pay for improved SWM system and its determinants. It has four types of analysis: descriptive, correlations and independent t-tests, cross tabulation and binary logistic regression.

4.4.1. Descriptive Analysis

The study informed all respondents about a new system of solid waste management. This waste collection service would thus address two problems: waste would be picked up regularly from residents' house and waste would not be left around the neighborhood to create a sanitary problem. This proposal is based on the knowledge that keeping households' waste in the house for a week or longer has health implications, because it creates harmful microorganisms, rats, mosquitoes, air pollution and others. Considering this, households may be encouraged to pay for improved, timely and regular waste collection. This kind of service can only be offered if a sufficient number of households agree to pay a reasonable amount of money on a

regular basis. The service can be offered by the municipal corporation or by private firms.

Based on this proposal, as shown in table below, the majority (83.5%) of the respondents considered in this study are willing to pay for improved a door-to-door waste collection service.

Table 19: WTP for improved waste collection and disposal system

	Percent
Yes	83.5
No	16.5
Total	100.0

Source: Own Survey and Computation, 2016

The average willingness to pay is ETB 17.26, while the minimum and maximum being 0 and ETB 35, respectively. This is significantly greater than the current fee. It shows households have an interest to contribute for environmental service, even more than the existing fee.

Table 20: Monthly willingness to pay

	Mean	Median	Mode	SD
Monthly WTP (in ETB)	17.261	17.500	15.0[a]	9.4604

[a] Multiple modes exist. The smallest value is shown.

Source: Own Survey and Computation, 2016

Respondents close to 17 percent are not interested for the newer system of solid waste collection. Table 21 shows factors responsible for "no WTP" for improved SWM. The main factors are the following; they are poor and could not afford to pay (48.5%), satisfied with the current solid waste management system (18.2%), it is the responsibility of the government (15.15%), and the service would probably not be reliable (15.15%).

Table 21: Main reasons for "no" willingness to pay

	Percent
Don't like a private company	3%
We are poor and cannot pay	48.5%
Satisfied with existing system	18.2%
Government's responsibility to provide waste collection for free	15.15%
Service would probably not be reliable	15.15%
Total	100.0

Source: Own Survey and Computation, 2016

***NB: The table considered those who are not willing to pay (17% of total respondents)

4.4.2. Correlations and Independent t-tests Analysis

This topic mainly deals with analyzing households' willingness to pay (continuous variable) in relation to major independent (exogenous variables). This study gives due attention to the effect of eight variables in determining households' willingness to pay for improved solid waste management system in Jimma Town. Those variables are: Age, sex, marital status, income, solid waste generation, house ownership, education, and satisfaction with current system.

Accordingly, the pearson correlation test is used to see the correlation between age, income, waste generation and WTP in ETB. The result shows that households' WTP is positively and significantly associated with income of the households' and amount of waste generated by families. As indicated in the table 22, the correlation between income and WTP is moderate; it is 0.587. In the same way, correlation between waste produced and WTP is 0.554. As regard to the correlation between age of household head and WTP, the outcome shows that association between them very small or statistically insignificant.

Table 22: Correlations of major variables

		Age of the household head	Average Monthly Income	Solid waste produced per week
Maximum Monthly WTP	Pearson Correlation	.032	.587**	.554**
	Sig. (2-tailed)	.652	.000	.000
	N	200	200	200

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Own Survey and Computation, 2016

The study also applied the independent t-tests to check who pays more for proposed solid management system. In this case due attention is given to see the effect of sex, marital status, education, house ownership and satisfaction with current system on households' willingness to pay.

As revealed in table 23 males' WTP is significantly greater than that females'. This happens due to the fact the monthly income of the male respondents supersedes that of the females. The power of income creates difference in WTP. Joel et al (2014) also identified that that males are more willing to pay for solid waste management than the females in Kenya.

In terms of marital status, the average WTP for married (ETB 18.59) is significantly greater than others (single, divorced and widowed). This implies that family stability is a base for environmental care and willingness to pay for its protection. The independent t-tests also show that having certificates (TVET, diploma, degree) implies a high willingness to pay for improved management of solid waste. It indicates that the more people get educated the more they care for environment. This outcome is simple and logical since level of education could be related to a better understanding of the problem of solid waste.

Table 23: Independent t-tests

Outcome indicator	Treatment variables	Samples	Mean	SD	t-test for Equality of Means	
WTP	Sex					
	Male	163	18.004	9.2731	t	2.359
	Female	37	13.986	9.7086	Sig.(2-tailed)	.019
	Marital Status					
	Married	160	18.592	8.955	t	4.137
	Others	40	11.938	9.665	Sig.(2-tailed)	.000
	Education (Certificate)					
	Yes	61	19.96	7.715	t	2.991
	No	139	16.077	9.928	Sig.(2-tailed)	.003
	House ownership					
	Yes	123	20.018	8.26	t	5.396
	No	77	12.857	9.637	Sig.(2-tailed)	.000
	SWM Ser. Satisfaction					
	Yes	88	18.068	11.376	t	1.022
	No	112	16.627	7.622	Sig.(2-tailed)	.309

Source: Own Survey and Computation, 2016

In the same token, respondents live in their house have a significantly higher willingness to pay as compared to those who rent house. The mean WTP for house owners is ETB 20.018 while for those who rent house is ETB 12.857. The independent t-tests hold that the average willingness to pay for unsatisfied households' is almost the same to those who said they are satisfied with the current system. In other words, the amount they are willing to pay for proposed system is the same.

4.4.3. Cross Tabulation Analysis

The cross tabulation analysis is also used to assess the association of households willingness to pay (in binary terms, i.e. YES or NO) and dichotomous or nominal

independent variables. As of table below (table 24) even if the majority of both males and females are willing to pay for improved system, males' WTP (85.3%) is higher than that of females (75.7%), despite the fact that difference is statistically insignificant.

Table 24: Cross tab analysis of Sex and WTP

		Household head sex		Total
		Male	Female	
WTP(binary)	No	14.7%	24.3%%	16.5%
	Yes	85.3%	75.7%	83.5%
Total		100.0%	100.0%	100.0%
Pearson Chi-Square				
Value: 2.017[a]		DF: 1	Asymp. Sig.(2-sided): .156	

Source: Own Survey and Computation, 2016

In relation to marital status and WTP condition, table 23 shows that being married is one factor that creates difference in paying for environmental service. The outcome shows that married households have a significantly higher willingness to pay as compared others (single and divorced), it is 87.5% and 67.5% respectively.

Table 25: Cross tab analysis of Marital Status and WTP

		Marital condition		Total
		Married	Others	
WTP(binary)	No	12.5%	32.5%	16.5%
	Yes	87.5%	67.5%	83.5%
Total		100.0%	100.0%	100.0%
Pearson Chi-Square				
Value: 9.291[a]		DF: 1	Asymp. Sig.(2-sided): .002	

Source: Own Survey and Computation, 2016

Education plays a key role in every aspect of life. The higher the education levels, the better awareness about environmental value and its protection. The cross tab analysis shows that those with certificates (TVET, diploma, degree) have a statistically significant higher WTP as compared those who "have not".

Table 26: Cross tab analysis of Education and WTP

		Certificate (Education)		Total
		Yes	No	
WTP(binary)	No	6.6%	20.9%	16.5%
	Yes	93.4%	79.1%	83.5%
Total		100.0%	100.0%	100.0%
Pearson Chi-Square				
Value: 6.298[a]		DF: 1	Asymp. Sig.(2-sided): .012	

Source: Own Survey and Computation, 2016

Like independent t tests analysis, the cross tab also shows that households who own house have a higher WTP for improved solid waste management system. The chi square reveals a statistically significant difference of WTP between those who live in their house and those who rent.

Table 27: Cross tab analysis of House Ownership and WTP

		House ownership		Total
		Yes	No	
WTP (binary)	No	8.1%	29.9%	16.5%
	Yes	91.9%	70.1%	83.5%
Total		100.0%	100.0%	100.0%
Pearson Chi-Square				
Value: 16.245		DF: 1	Asymp. Sig.(2-sided): .000	

Source: Own Survey and Computation, 2016

Finally, the association between WTP and satisfaction in the current system of waste collection and disposal was seen via cross tab analysis. The result tells that dissatisfaction of the current system implies the higher willingness to pay. That means, WTP for those who satisfied (77.3%) is less than WT of those unsatisfied (88.4%). The difference is statistically significant.

Table 28: Cross tab analysis of Satisfaction and WTP

		Current Satisfaction		Total
		Yes	No	
WTP(binary)	No	22.7%	11.6%	16.5%
	Yes	77.3%	88.4%	83.5%
Total		100.0%	100.0%	100.0%
Pearson Chi-Square				
Value: 4.423	DF: 1	Asymp. Sig.(2-sided): .035		

Source: Own Survey and Computation, 2016

4.4.4. Binary Logistic Regression

As mentioned earlier a binary logistic model is employed to factors affecting households' WTP for improved solid management system. In this model dependent variable, WTP, is regressed against eight independent variables. These are: sex [SEX], age [AGE], marital status [MSTATUS], income [INCOME], solid waste generation [SWGEN], house ownership [HOUSEOWN], satisfaction with current service [SAT] and education [EDU].

Before running the econometric model estimation, it is important to see how the logit model fitted the data? The classification tables show that the model correctly predicted 87.5 percent of the observations.

Table 29: Classification Tables

Classification table 1				
Observed		**Predicted**		
		WTP		**Percentage**
		No	**Yes**	**Correct**
WTP	No	0	33	51.5
	Yes	0	167	94.6
Overall Percentage				83.5

Classification table 2				
Observed		**Predicted**		
		WTP		**Percentage**
		No	**Yes**	**Correct**
WTP	No	17	16	51.5
	Yes	9	158	94.6
Overall Percentage				87.5
The cut value is .500				

Source: Own Computation, 2016

As indicated in table 30 the chi-square strongly rejects the hypothesis that the model has no explanatory power.

Table 30: Omnibus Tests of Model Coefficients

	Chi-square	df	Sig.
Step	81.164	8	.000
Block	81.164	8	.000
Model	81.164	8	.000

Source: Own Survey and Computation, 2016

Apart from these, the Hosmer and Lemeshow (H-L) test reveal the model well fitted the data, insignificant p-values indicates that the data fit the model well.

Table 31: Model Summary and Hosmer and Lemeshow Test

Step	2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
	97.983[a]	.334	.564

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	4.136	8	.845

Source: Own Survey and Computation, 2016

Under model summary (table 30) we see that the -2 Log Likelihood statistics is 97.983. This statistic is interpreted as the smaller the statistic the better the model. The Cox & Snell R^2 can be interpreted like R^2 in a multiple regression, but cannot reach a maximum value of 1. The Nagelkerke R^2 can reach a maximum of 1. Accordingly their value is good.

Finally before interpreting the estimates multicollinearity was checked since it reduces the accuracy of estimating the coefficient of variables. Accordingly, multicollinearity is a serious if the correlation matrix is in excess of 0.8. Thus the result indicates multicollinearity is not a serious problem in the data (see appendix part).

As of table 32, four variables out of eight are statistically significant and theoretically sound. These are income [INCOME], solid waste generation [SWGEN], house ownership [HOUSEOWN], and satisfaction with current system [SAT].

According the table below, income level is found to be a significant determinant of household willingness to pay. The coefficient for income is found to be positive and significant at 5 percent level of significance. As the income level increases by one unit, the odds of households' WTP increase by a factor of 1.001. This implies that when income level of household increases the probability of WTP for the improved service would be increase. This is in line with economic theory which states that SWM is a normal economic good whose demand changes in the direction of income change.

Table 32: Determinants of Households' WTP (Binary Logistic Output)

	B	S.E.	Wald	df	Sig.	Exp(B)
SEX (1)	-.707	.776	.829	1	.362	.493
AGE	-.053	.034	2.404	1	.121	.948
MSTATUS (1)	-.145	.785	.034	1	.853	.865
EDU (1)	.623	.683	.832	1	.362	1.864
INCOME	.001	.000	6.408	1	.011**	1.001
HOUSEOWN (1)	1.79	.669	7.188	1	.007**	6.003
SAT	-1.15	.539	4.551	1	.033**	.317
SWGEN	2.77	1.135	5.952	1	.015**	15.959
Constant	-.299	1.410	.045	1	.832	.742

**Statistically Significant at 5% level

Source: Own Computation, 2016

House ownership is also one of the factors that determine households WTP for solid waste management. Being owner has a high likelihood of paying for improved solid waste management. The coefficient for the level of solid waste generation is found to be statistically significant. The higher waste generation implies the higher possibility of paying for improved management of solid waste.

The remaining variables (age, marital status, sex and education) contrary to the expectation, the coefficient for the variables was not found to be statistically significant at either of 1, 5 or 10 percent. The effect of age is statistically insignificant. In the same manner, in various studies age is found to be insignificant; some of them are Alhassan and Mohammed (2013), Anjun (2013), Amfo-Otu et al (2012) and Tewdros and Samson (2009).

Even if the association between marital status and WTP (in binary terms) is significant and positive, the regression outcome shows that the effect of marital status on WTP is insignificant. The good thing, however, is that the sign is as expected being married positively related to probability of willing to pay. In this regard, Addai and Danso-

Abbeam (2014), Niringiye and Omortor (2010) and Adelayo and Mary (2014) stated that marital status is insignificant in determining WTP. When we see the impact of sex on probability of WTP for improved system is insignificant. This is in confirmation of the outcome obtained by Adelayo and Mary (2014) and Tewdros and Samson (2009).

The binary logistic regression output shows that respondents with higher education have no significant difference in paying to improved SWM, as compared to non-certified respondents. However, the sign is in line with expectation. Niringiye and Omortor (2010) revealed that education do not significantly influence willingness to pay for improved waste management. In Ethiopia as of Tewdros and Samson (2009), education, is found to have insignificant impact on the demand for improved services of waste collection.

4.5. Estimating Total Willingness to Pay

In this section we will estimate total households' willingness to pay in Jimma town. Therefore, this mainly deals with derivation of the demand curve for improved SWM. According CSA (2007) the population of Jimma Town was 120, 000. Using the annual growth rate of 2.9, as of 2016, the population of Jimma is projected as 163,000. This study shows that the average family size 4.20. So, dividing the projected population by average family size we get the total of households in Jimma town, i.e. 38, 809. As of this survey the mean WTP is ETB 17.261. Thus, the aggregate WTP for improved solid waste management, for Jimma Town, is found to be ETB **669,891.2** per month and ETB **8,038,694.4** per year.

Chapter Five
5. Conclusions and Recommendations

This chapter provides conclusions made and recommendations forwarded. Each of these topics will be discussed one by one in the following sections.

5.1. Conclusions

Solid waste management is one of a serious confronts to Ethiopia, mainly due to rapid urbanization and population growth. The solid waste management in Ethiopian cities has not been carried out in a sufficient, suitable and appropriate manner. As a result, the quality of environment in cities has become more serious from time to time, and people are suffering from living in such conditions.

It is important to study local communities, especially households', interest to contribute for the improvement of SWM. In this regard, various researchers in different parts of the world conducted their study to identify and analyze the determinants of households' contribution or WTP for improved solid waste management in their respective locations. From these studies, it is controversial whether which variable has a significant positive or negative impact on households' WTP for SWM improvement.

This study aims to analyze the socio-economic determinants of household willingness to pay (WTP) for improved solid waste management in Ethiopia with focus on Jimma Town. Jimma is one of the largest towns in Oromia Regional State, located in south western part of Ethiopia. The main objective of this paper is to find out the main determinants of households' willingness to pay for improved solid waste management in Ethiopia: case study of Jimma Town. This research is believed to have importance for parties who have direct or direct interest on the area.

The main data source is primarily collected from the residents, government officials, and key informants. A total sample of 200 was selected from households' in those four kebeles. The study applied the inferential statistics (like chi-square and independent t-

tests) and micro-econometric technique, **binary logistic model**, to identify the socio-economic determinants of WTP.

The results show that of total solid waste generated around 56 percent is collected, the highest percentage being households' waste followed by commercial services and public services. Almost all of the solid waste in Jimma town is collected by private establishments. The evidence from residents and key informants show that enterprises collect from houses on weekly basis and charge households ETB 10 per month to these enterprises. With respect to the frequency of the existing solid waste collection system, some interviewees' indicated that there is inconsistency in the collection process. Even if in the majority of cases they collect once a week, the exact date of collection is unpredictable.

The survey results also indicate that the majority, which is 88.5 percent, of the total respondents state that they have a concern for environmental protection and safety. About 56% of the respondents are not satisfied with the existing solid waste management service. During the survey the respondents were also asked whether they have a proper knowledge of the impact of solid waste, 93% agreed that they have a good knowledge about the consequences of mismanagement of solid waste.

The study informed all respondents about a new system of solid waste management. Based on that around 83.5% of the respondents are willing to pay for improved a door-to-door waste collection service. The average willingness to pay is ETB 17.26. This is significantly greater than the current fee. It shows households have an interest to contribute for environmental service, even more than the existing fee. Respondents close to 17 percent are not interested for the newer system of solid waste collection. The main factors are the following; they are poor and could not afford to pay, satisfied with the current solid waste management system, it is the responsibility of the government, and the service would probably not be reliable.

As regard to factors affecting households WTP, both independent t-tests and cross tabulation analysis show that marital status, education and house ownership are the most important factors associated with households' WTP. Binary logistic regression was also employed to identify factors affecting households' WTP for improved solid management system. The outcome shows that four variables are found to be statistically significant. These are income [INCOME], solid waste generation [SWGEN], house ownership [HOUSEOWN], satisfaction with current service [SAT] and education [EDU]. The aggregate WTP for improved solid waste management, total of Jimma Town, is estimated to be ETB **669,891.2** per month and ETB **8,038,694.4** per year.

5.2. Recommendations

Based on findings from the study as well as the information from key informants, further development and improvement of solid waste management system appears valuable.

Therefore, the recommendations made below try to identify way to encourage SWM improvement and its further development.

- ✓ Awareness creation and training should be given to the community on efficient solid waste disposal through shared efforts of all stakeholders such as local government, the private sector, NGOs and residents.
- ✓ Increasing the participation of local communities in solid waste management decision making activities is necessary.
- ✓ Mechanisms of controlling should be designed for illegal dumping of wastes.
- ✓ Government, in collaboration with NGOs and communities, should seriously work on infrastructures that contribute for environmental safety.
- ✓ Policy makers should consider important variables like income, education, marital status, waste generated and house ownership in designing improved SWM service.
- ✓ Entrepreneurs should be encouraged to develop improved schemes for waste collection and management. Regular support (technical, managerial

and financial) and monitoring should be given for the private sectors engaged in solid waste management system.

- ✓ For SWM to be improved, all stakeholders must show mutual understanding, transparency and commitment in all their dealings with each other. There should be coordinated, honest communication of information between all parties for confidence building and effective partnership.

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Appendix Part

A-1 Household Questionnaire

Determinants of Households' Willingness to Pay for Improved Solid Waste Management in Ethiopia: case of Jimma Town

Informed Consent

This survey is being undertaken by a post graduate student of Jimma University, department of Governance and Development Studies as partial fulfillment of for the award of Master's of Art Degree in Governance and Development Studies. This questionnaire is designed to obtain information on the "Determinants of Households' Willingness to Pay for Improved Solid Waste Management in Ethiopia: a case of Jimma Town". The information is collected purely for academic purpose and has nothing to do with any governmental or non-governmental organization. Whatever information you provide will be kept strictly confidential and will not be disclosed to other persons. Participation in this survey is voluntary and you can choose not to answer any individual question or all of the questions. However, I hope that you will participate fully in this survey since your views are important.

May I begin the interview now?

1=Respondent Agrees to be interviewed **Continue**	2=Respondent does not agree to be interviewed **End**

Interview Schedule Number: _____

General Information

Kebele…….....

House Number.....

Date of interview (dd/mm/yyyy).....

Name of Enumerator.....

A-Household Details

S. No	Variable	Variable values
1	Household head sex	1- Male _____ 2-Female_____
2	Age of the household head	_____
3	Marital Status	1. Married _____ 3- Widow/er_____ 2. Single _____ 4- Separated_____
4	Family size	Male Female Total 0-15 years ____ _____ _____ Above 15 _____ _____ _____
5	Educational level of household head	1. Illiterate _____ 2. Read and Write _____ 3. Primary education_____ 4. Secondary Education_____ 5. Tertiary Education _____
6	Educational level of spouse(If	1. Illiterate _____

	married)	2. Read and Write _____ 3. Primary education_____ 4. Secondary Education_____ 5. Tertiary Education _____
7	Employment status of (household head)	1. Full time employment _____ 2. Self employed _____ 3. Casual and laborers _____ 4. Unemployed _____ 5. Others _____
8	Average Monthly Income (per month)	_____
9	How many years have you stayed in this house?	_____
10	Do you own this house you stay in?	1-Own_____ 2=Rented_____
11	How far is your house in Kilometers (Km) from the main road?	_____

B- Households Perception of About Environment and the Existing Solid Waste Management System

1. Are you concerned about environmental issues in your area?
   1) Yes _____ 2) No_____
   Why_____
2. How would you rate the quality of your environment?
   1) Very good_____ 2) Good_____ 3) Average_____ 4) Poor_____
3. Are you concerned about solid waste management issues in your area?
   1) Yes_____ 2) No_____
4. Do you think that solid waste collection and disposal is a big problem for you and your neighbors?
   1) Yes _____ 2) No _____
5. Can you tell us the impacts of poor solid waste management in your area?
   _____
6. How do you evaluate the current solid waste management system in Jimma Town?
   1) Fair_____ 2) Poor_____
7. Do you have access to municipal waste disposal containers?
   1) Not enough _____ 2)Enough _____ 3)Access _____ 4)None at all_____
8. What is the distance of the waste containers from your house? _____(Minutes)
9. How much do you pay for your collection service per month? _____
10. How does your household dispose solid waste?
   a. Dispose on the solid waste (garbage) container around our home_____
   b. Dispose on open space around _____
   c. Dispose on mobile waste collector (truck) _____
   d. Collected by private solid waste service provider from our home_____
11. If your answer for Q.No-6 is d:
   a. Which institution provides you the service?_____
   b. How often do you get the service per month? _____
   c. How much do you pay for the service per month? _____
12. Do you have any waste containers in your home?

1) Yes_____ 2) No_____

13. Do you sort the waste generated in your home?

1) Yes_____ 2) No_____

14. Are there any items from your waste that you reuse?

1) Yes_____ 2) No_____

15. How many times is your waste collected per week?

1) Once____ 2) Two times____ 3) Three times_____

4) Everyday of the week ____ 5) other, please specify ____

16. Are you satisfied with their service? 1] Yes_____ 2] No_____

17. How do you dispose waste like glasses, use plastic bags, paper, etc?

1) by separating from other waste types_____
2) Simply dispose together with other waste types_____
3) Others, specify_____

18. How much solid waste does your household produce per week? _____ (in 50 kg sack)

C-Households' Willingness to Pay For Improved Solid Waste Management

Description of Improved Solid Waste Management

Assuming a decision has been taken to offer a new solid waste collection service to households in Jimma Town such that someone would pick up the waste from your house each day. The waste from all the houses subscribing to the service would be disposed of properly and would be hauled away from your neighborhood in trucks to a municipal landfill. This waste collection service would thus address two problems: your waste would be picked up regularly from your house, and your waste would not be left around the neighborhood to create a sanitary problem. This kind of service can only be offered if a sufficient number of households agree to pay a reasonable charge on a regular basis. The service can be offered by the municipal corporation or by a private firm.

1. In future, are you willing to pay for this improved waste collection and disposal system?

1) Yes_____ 2)No _____

2. If your answer for question 1 is Yes, What is the maximum monthly bill you would be willing to pay for this new waste collection and disposal service?

1) ETB 12.5_____ 2) ETB 15_____ 3) ETB 17.5_____ 4) ETB 20_____ 5) ETB 25_____
6) Other price, _____ETB

3. If you do not want to pay for improved waste collection service(s) what is your main reason?

1) Don't trust a private company _____
2) Don't like a private company _____
3) We are poor and cannot pay _____
4) Satisfied with existing system _____
5) Government's responsibility to provide waste collection for free _____
6) Service would probably not be reliable _____
7) Other (specify) _____

D-Solid Waste Management Attitude

S. No		Scales				
		5	4	3	2	1
1	Solid waste mismanagement is the critical problem in Jimma Town					
2	Other personal issues (like crime, unemployment, and cost of living) are more important to me than a waste-free community.					
3	I play an important role in the management of waste in my community.					
4	Environmental education should be taught in schools.					
5	The government is not doing enough to fix the garbage problem.					
6	Regular collection of garbage is the only solution to the garbage problem.					
7	Public education about proper garbage management is one way to fix the garbage crisis.					
8	It is very important that the Government put recycling laws and programs in place.					
9	People throw garbage on the streets and in the drains because they have no other means of getting rid of (disposing of) their garbage.					
10	Jimma has enough garbage containers throughout the town					
11	Jimma town has enough waste collection system					
12	It is necessary work together with other residents/traders/market vendors for better waste management					
13	Solid waste in Jimma Town has been increasing over last years					
14	There is an improvement in solid waste management of Jimma Town					
15	Proper SWM is good for the environment and it should be further promoted.					
16	Everybody could contribute to SWM.					
17	I have proper knowledge of the impact of solid waste					

Key Note: 1= Strongly Agree, 2= Agree, 3=Not Decided, 4=Disagree, 5=Strongly Disagree

Time Finished: _____ Signature of collector: _____

A-2 Interviews Questions

These interviews are designed to obtain background information on the "**Determinants of Households' Willingness to Pay for Improved Solid Waste Management in Ethiopia: a case of Jimma Town**". The information is collected purely for academic purpose and has nothing to do with any governmental or non-governmental organization. And your name and personal information will be kept confidential. Therefore, you are kindly requested to give me a genuine answer for the following questions.

Thanks in Advance

Interview for key informants

Part I: General Information

Interview No._____
Kebele or village_____
Age of the respondent_____
Sex of the respondent_____
Educational status of the respondent_____
Date of interview_____
Name of enumerator_____
Language of the respondent_____

Part II: SWM questions.

1. Are you a resident of Jimma Town?
2. What is your perception towards the conservation of the environment? What do you suggest as the best means of conservation of environment?
3. How do you evaluate your participation in solid waste management?
4. How many times is your waste collected per week?
5. What is the interest of your group looks like on the issue of solid waste management?
6. Is any complaining from community towards the current SWM?
7. What should be considered for effective and sustainable solid waste management?
8. Have you ever been informed or trained about solid waste management?
9. What do you think are the challenges of the current SWM system?

Interview for Jimma Town Administration

1. How do you evaluate the sufficiency, sustainability and effectiveness of material and technical support to those who engaged in solid waste collection process?
2. Would describe the current state of solid waste management system in Jimma Town.
3. What are the major achievements of SWM?
4. What are the challenges of SWM?

A-3: Correlation Matrix

Correlation coefficients, using the observations 1 - 200

Sex	Age	mstatbinary	certificate	income	
1.0000	-0.1735	0.6953	0.1198	-0.2202	Sex
	1.0000	-0.1322	0.0236	0.0249	Age
		1.0000	0.1683	-0.2736	mstatbinary
			1.0000	-0.0099	certificate
				1.0000	income

houseown	weightsolid	Sersatisf	
-0.2317	-0.1628	-0.0591	Sex
0.4374	0.0453	0.0782	Age
-0.2723	-0.2384	0.0101	mstatbinary
-0.0555	-0.0614	-0.0035	certificate
0.2899	0.6860	0.1246	income
1.0000	0.2741	-0.0025	houseown
	1.0000	0.0538	weightsolid
		1.0000	Sersatisf

A-4: Association of knowledge of the impact of solid waste and WTP

WTP(binary) * I have proper knowledge of the impact of solid waste Crosstabulation

			I have proper knowledge of the impact of solid waste				Total
			Strongly Agree	Agree	Undecided	Disagree	
WTP(binary)	No	Count	1	29	1	2	33
		% within WTP(binary)	3.0%	87.9%	3.0%	6.1%	100.0%
		% within I have proper knowledge of the impact of solid waste	25.0%	15.9%	25.0%	20.0%	16.5%
	Yes	Count	3	153	3	8	167
		% within WTP(binary)	1.8%	91.6%	1.8%	4.8%	100.0%
		% within I have proper knowledge of the impact of solid waste	75.0%	84.1%	75.0%	80.0%	83.5%
Total		Count	4	182	4	10	200
		% within WTP(binary)	2.0%	91.0%	2.0%	5.0%	100.0%
		% within I have proper knowledge of the impact of solid waste	100.0%	100.0%	100.0%	100.0%	100.0%