

**HOUSEHOLDS' DEMAND AND WILLINGNESS
TO PAY FOR IMPROVED SOLID WASTE
COLLECTION SERVICES IN MZUZU CITY**

**Master of Science in Infrastructure Development and Management
(MSc IDM)**

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**UNIVERSITY OF MALAWI
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(BSc Environmental Health)

**A thesis submitted in partial fulfilment of the requirements for a
Master of Science in Infrastructure Development and Management
(MSc IDM)**

University of Malawi

The Polytechnic

December 2016

DECLARATION

I, Misheck Arden Damien Vwemu, confirm that this research entitled “Households’ demand and willingness to pay for improved solid waste collection services in Mzuzu City” is my own work. It is submitted in partial fulfilment of the requirements for the Master of Science Degree in Infrastructure Development and Management at the University of Malawi, Polytechnic. It has not been submitted for any other degree to any other University.

CERTIFICATE OF APPROVAL

The undersigned certify that they have read and approve for acceptance by the University of Malawi, Polytechnic this thesis entitled “*Households’ demand and willingness to pay for improved solid waste collection services in Mzuzu City*”.

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Date :

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Signature :

Date :

Head of Department :

Signature :

Date :

DEDICATION

I dedicate this dissertation to Mary, mother of God, who offered a heartfelt prayer to God on my behalf, St. John Paul II who inspired my writing and to my late father John Vwemu who has been a source of encouragement to me. I am sure he would have been very happy to see me obtaining this high academic qualification.

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ABSTRACT

Globally, municipal authorities have ultimate and direct responsibility to manage Municipal Solid Waste (MSW) collection services. Many cities in developing countries record low coverage on MSW collection services owing to significantly high costs of equipment, operations, maintenance and human resources. Uncollected waste remains a big threat to environmental and public health. Municipalities in Malawi depend on grants from the central government to finance MSW collection services management. At a household level, cities in Malawi offer free MSW collection services. Moreover, over 61% of solid waste generated remain uncollected due to inadequate resources. From 2009-2014, Mzuzu City got below 30% of the required budget to manage MSW collection services. Mzuzu does not have reliable sources to fund MSW collection services rendering free services unsustainable.

A household survey was conducted to evaluate households' demand and willingness to pay (WTP) for improved MSW collection services in Mzuzu City. To achieve the study objective, a structured household questionnaire was developed and deployed into kobo collect software for easy data collection, entry and monitoring. Data from household respondents were collected utilizing Android smartphones. The study targeted household heads as respondents to the household questionnaire because of their decision-making powers over household expenditures. Furthermore, the researcher conducted key informant interviews with Mzuzu City Council staff to collect data on MSW management and financing. Logistic regression model was used to identify factors that could influence willingness to pay for improved MSW collection services in Mzuzu City. In addition, the study based the analysis of determinant for willingness to pay for improved MSW collection services on Ajzen theory of planned behavior.

The study established that only 7% of the sample population had access to MSW collection services in Mzuzu City. In addition, a majority (63%) of the sample population viewed inadequate MSW collection as a very serious problem in Mzuzu City. The findings also showed that 52% of the total respondents were willing to pay for improved MSW collection services and average WTP was K2050/household/month (\$1=K732). Logistic regression model results showed that level of education and household size had a significant positive relationship with willingness to pay for

improved MSW collection services in Mzuzu City. Furthermore, logistic regression model results showed that that age, gender, concern about environmental degradation, access to MSW collection services, and household income and marital status did not have any influence on willingness to pay for improved MSW collection services in Mzuzu city. In addition, this study showed that high-income areas had more household willingness to pay for improved MSW collection services than low-income households did. The latter would resist commercialization of MSW collection services, as it would bring additional responsibility on the head of households to pay for services that have been free. Therefore, the conclusion was that commercialized MSW collection would only succeed in high-income areas.

Further research is needed on disposal of human excreta and wastewater as these ranked among important environmental sanitation problems in Mzuzu City. The study findings suggested further research on electronic waste management in Mzuzu City as it was apparent that Mzuzu City Council did not have strategies in place to manage high toxic wastes sustainably.

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ABBREVIATIONS AND ACRONYMS

EPA	Environmental Protection Agency
DoF	Director of Finance
DHS	Director for Health Services
DPD	Director of Planning and Development
CBO	Community Based Organization
MCC	Mzuzu City Council
MG	Malawi Government
NCST	National Commission Science Technology
NSP	National Sanitation Policy
SSA	Sub-Saharan Africa
UNEP	United Nations Environmental Programme

CHAPTER 1: INTRODUCTION

1.1 Introduction

Addai & Danso-Abbeam (2014) define waste as useless or discarded material. Furthermore, Fobil, Armah, Hoyark & Carboo (2007) describe waste as materials that are unwanted after a process has been completed. In this study, waste has been defined as any garbage or material resulting from household, industrial, mining, commercial and agricultural operations. Furedy & Lardinios (2000) point out that a material can only be described as waste when it is deemed useless or unusable (cited in Addai & Danso-Abbeam, 2014). Therefore, solid waste can also be defined as any material that constitutes a scrap material or other unwanted surplus substances arising from the application of any process. Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue, and waste from streets (Environmental Protection Agency [EPA], 2014).

Global estimates show that 1.2 billion metric tons of solid waste is generated annually and this figure is expected to double by 2025 (World Bank, 2010). Factors contributing to increased municipal solid waste generation include population growth, increased use and development of ICT, urbanization, modernization, and industrial development (Alam and Ahmade, 2013; Barre, 2014; Oduro-Kwarteng, 2011; United Nation Environment Programme, 2010). To avoid environmental degradation and protect public health, governments regulate waste management. Mismanagement of solid waste results in pollution of water resources, air, and land. When uncollected waste ends up in drainage systems, floods occur resulting in loss of lives, services, economy, and infrastructure (Solomon, 2011). Studies show that waste generated during the early stages of life was mainly ashes and other biodegradable matter that was released back into the environment without noticeable damage to it (the environment) (Kinnaman, Thomas & Fullerton, 1999). Over the years, municipal solid waste (MSW) has changed in quantities and composition making solid waste management more costly and technically more demanding. Therefore, efficient and effective MSW management strategies are critical across all municipalities (Altaf & Deshazo, 1996). Gwatkin et al. (1999) suggest a strong link between disease burdens such as hepatitis B, cholera, diarrhea to uncollected solid waste. Uncollected waste harbors disease vectors such as rats, mosquitoes, flies, and hermits. Mosquitoes transmit plasmodium which causes malaria. Malaria is one of the major causes of child deaths in Southern Africa (Sustainable Development Goals, 2016). In addition, Owosu (2010) argues

that children are more at risk of contracting infections associated with uncollected waste as they often play with and on the waste. Waste management differs for developed and developing nations, urban and rural areas, household and industrial consumers.

The World Bank (2011) estimates that of the total global MSW generation, sub-Saharan Africa contributes 0.05% as the region generates 62 million metric tons of solid waste annually. Of late, African countries have experienced an influx of people moving from rural to urban areas resulting in increased demand for urban services such as water, waste management, electricity, transport, etc. which has strained urban infrastructure (Sankoh, Yan, & Tran, 2013). United Nations Environmental Programme [UNEP] (2005) estimates that Africa is urbanizing at 3.5% annually. Furthermore, increased use of ICT and fast turnover of technology is giving rise to increased generation of e-waste-cell phones, computers, broken cookers, printers, etc. for which many African governments do not have the capacity to manage. Earlier researchers noted that despite huge investments in solid waste management services by governments in Africa, disposal sites remain disorganized and unsafe (Cointreau, 1995). Municipalities in Africa find it hard to provide adequate MSW management services owing to inadequate finances, poor governance, accountability issues, lack of technical capacity, lack of human resources and lack of enabling policies (Takombererwa, 2011; Vitor, Ishak, & Jasaw, 2013). In most African countries, municipalities depend on central governments to finance municipal solid waste collection services. Unfortunately, MSW management is not a political issue in most African countries, as a result, it does not receive the attention it deserves from politicians (UN-HABITAT, 2011).

A report by UN-HABITAT (2011) shows that Mzuzu City generates 253.59 tons of waste annually at the rate of 0.479 kg/capita/day. Compared to Blantyre, Lilongwe, and Zomba, Mzuzu city has the second highest per capita generation rate after Lilongwe which reported a generation rate of 0.493kgs/capita/day (National Commission Science Technology [NCST], 2015). World Bank (2012) reports global solid waste generation rate of 2.2kg/capita/day which is 20% more than that reported for Mzuzu City.

Determinants of MSW generation in Mzuzu City include high population density, changing life styles, urbanization and importation of second-hand materials (Mzuzu City Council [MCC], 2010). Figure 1 shows estimated quantities of waste generated from 2010 and 2014 for Mzuzu City.

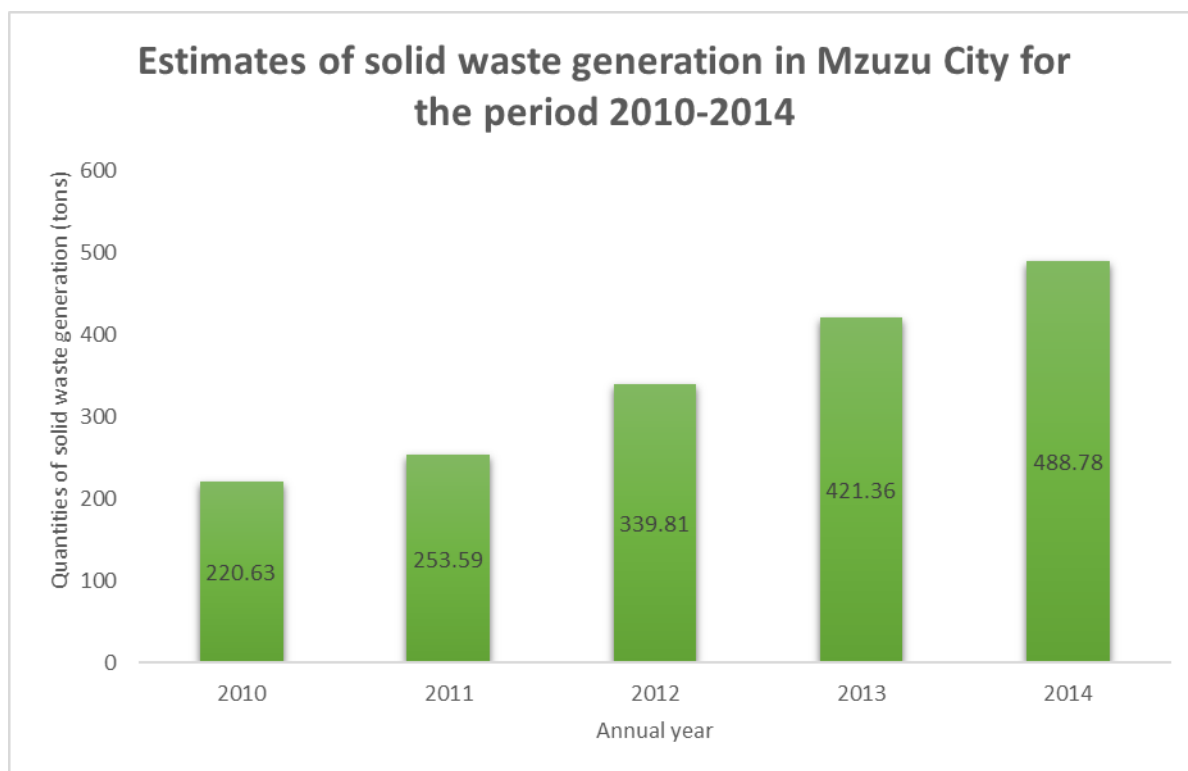


Figure 1: Estimated waste generation in Mzuzu City 2010-2014 (UNEP, 2014)

In Malawi, MSW management is decentralized. Municipalities and districts are responsible for the management of MSW management systems. The National Sanitation Policy [NSP] (2008) mandates municipalities and district councils to provide and manage urban environmental sanitation services including wastewater treatment and MSW management. Recently, the government of Malawi has stepped up calls for private sector participation in MSW management (NCST, 2015).

City and district councils in Malawi collect household waste for free. However, it can be argued that residents pay for the services through city rates. Commercial entities (hotels, industries, markets and shopping malls) pay for MSW collection services (Manda, 2012). Cities of Mzuzu and Zomba charge K10 000 (\$10.8 at the current exchange rate) per skip which takes 2-3 weeks to fill (NCST,

2015). Providing solid waste collection services to institutions such as hospitals and schools is regarded as a social responsibility for city authorities and, therefore, these institutions do not pay for the services (Mtika, 2010). However, public sector reforms that are under development now are drawing them closer to start paying for MSW collection services. This presents an opportunity to introduce paid for solid waste collection services across all users. In providing SW collection services, Mzuzu City Council faces numerous challenges such as inadequate resources including human resources, poor urban development plans, inadequate infrastructure, and lack of stakeholder participation. Uncollected wastes remain in homes, streets and collection points, posing health hazards to the public especially women and children. Poor waste management accounts for 48% of illnesses in children presented across hospitals in Mzuzu City, Malawi (Mtika, 2010).

Earlier studies have demonstrated that municipalities can finance municipal solid waste collection services through cost sharing with services' users at household level by introducing user fees (Tadesse and Hadgu, 2009; Addai and Abbeam, 2014; Anjum, 2013). Other researchers have argued that households are willing to pay for MSW collection services as they are able to pay informal waste pickers such as street boys and individual workers (Tadesse, 2006; Addai and Abbeam, 2014). As the waste management pyramid suggests, separation, recycling, and reuse of waste can reduce the cost burden on waste collection and disposal services.

1.2 Statement of the Problem

In sub-Saharan Africa, 40%-60% of municipal solid waste remains uncollected in the streets and collection points despite spending 31%-40% of the annual budgets on MSW management services. In addition, only 11% of households in sub-Saharan Africa have access to solid waste collection services (Tadesse & Hadgu, 2009). For Mzuzu City, Barre (2014) reported an MSW collection services' coverage of 17.6%. A year later, National Commission for Science and Technology (NCST) (2015) reported an MSW collection services coverage of 16.1% which is much lower than what was reported before. Coverage for MSW collection services is a proxy indicator for demand for MSW collection services.

UNEP (2008) attributes poor performance of solid waste management services in developing countries to inadequate budgets, transparency, and poor governance. According to Mzuzu City Environmental Health staff, Mzuzu City gets 28%-30% of the total budget required for solid waste collection making it impossible to increase coverage to 100% from where it is now. Revenue from commercial entities such as hotels, shopping malls, and markets accounts for less than 1% of the annual total budget Mzuzu City Council needs to cover the costs for providing MSW collection services.

Due to policy restrictions, in Malawi and particularly in Mzuzu City, private sector participation in MSW management is very minimal (Mzuzu City profile, 2010). The current policy framework on MSW management does not provide for operating MSW collection services as a business. Furthermore, there is no empirical data on households' willingness to pay improved MSW collection services to attract the private sector. From what studies have documented on private sector participation in MSW management services, private actors that are involved in MSW management are doing it to serve their own purposes such as energy generation and recovery of materials (Kamal-Chaoui et al., 2013).

Developed countries finance solid waste collection services through pay as you generate tariffs. Private sector participates in solid waste collection services as a business and, service users pay tariffs directly to service providers (Addai & Danso-Abbeam, 2014). UNEP (2010) reports that the private actors provide 80% of solid waste management services in the United States of America. Privatization of solid waste collection services has had a positive impact on governance and accountability issues (Kwarteng, 2011). Coad (2005) argues that public institutions have long and complex management structures rendering them slow and resource intensive. In Ghana, private actors helped increase coverage of solid waste collection services from 45%-80% within a five-year period of involvement (Bowen, 2013).

Most studies on MSW management in Malawi, have focused on improving the systems on the supply side and very little has been done to understand the demand side for improved MSW management

in Malawi. Lack of studies on the willingness to pay for improved solid waste management services attests to this.

By comparison, most studies on MSW management in Malawi, have focused improving the systems on the supply side and very little has been done to understand the demand side for improved MSW management in Malawi. Lack of studies on the willingness to pay for improved solid waste management services attests to this.

1.3 Significance of the Study

Earlier studies focused on the supply side of MSW collection services. Not many studies have been done on households' demand and willingness to pay for improved MSW collections services in Mzuzu City. This study is set to evaluate demand and analyze factors that influence willingness to pay for improved MSW collection services in Mzuzu City.

This study will strive to bring out evidence of households' willingness to pay for improved MSW collection services in order to inform policy change to accommodate paid for services at a household level. In addition, evidence of households' demand and willingness to pay for improved MSW collection services is a factor in motivating the private sector to provide the services as a business. From what has been documented in developed and developing countries, expectations are that high private sector participation will improve both coverage and efficiency of MSW collection services to meet aspirations of the users (Baloyi & Masinga, 2010).

1.4 Hypothesis

For this study, three hypotheses were put forward and these include:

- There is no demand for improved solid waste collection services in Mzuzu City,
- Willingness to pay for improved solid waste collection services does not exist in Mzuzu City,
- Marital status, age, education, income, household size and gender do not affect willingness to pay for improved solid waste collection services.

1.5 Objectives

1.5.1 Broad Objective

Broadly, this research aims to evaluate household's demand and willingness to pay for improved solid waste collection services in Mzuzu City.

1.5.2 Specific Objectives

- To evaluate households' demand for improved solid waste collection services in Mzuzu City
- To determine levels of households' willingness to pay for improved solid waste collection services in Mzuzu City
- To analyze factors that can influence willingness to pay for improved solid waste collection services in Mzuzu City

1.6 Dissertation Layout

This dissertation contains five chapters. Chapter 1 provides the background of the study and introduces the research topic. In addition, it explains the specific objectives of the research this study is trying to address or answer. Chapter 2 focuses on reviewing the literature to identify its contribution to the body of knowledge in the light of other studies done before. Chapter 3 is the methodology section. It contains details of what was done to address the research objectives. Chapter 4 presents the results or findings of the study. Chapter 5 discusses the findings. Chapter 6 makes recommendations and concludes the study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature on households' demand and willingness to pay for improved solid waste collection services in different countries across the globe. For a better understanding of the

concepts, the chapter provides definitions of the terms used in this dissertation. Terms such as ‘demand’ and ‘willingness’ have been defined to expound their contextual meanings. Furthermore, this chapter highlights trends on demand for MSW collection services around the world. The chapter also looks at how services’ user tariffs have impacted on quality and geographical coverage of the services in other countries in sub-Saharan Africa. In addition, the chapter also exams factors that have influenced willingness to pay for improved MSW collection services in other cities in developing countries in Asia and Africa.

2.2 Definitions

Willingness to pay: Refers to people’s acceptance or intention to pay tariffs or direct taxes towards environmental services in exchange for improved environmental services and protection of the environment and public health.

Demand: Refers to households’ need for more and quality MSW collection services from the service provider.

Municipal solid waste: Also known as garbage. It consists of everyday items that are used and then thrown away. It consists of items such as product packaging, grass, clippings, food scraps, furniture, clothing, bottle, and food leftovers, newspapers, appliances, paint and batteries. Materials or products that are discarded as no longer useful or required after completion of use or process.

Municipal solid waste collection services: Deals with the process of collecting solid waste from households, offices markets, hospitals, industries, and private offices for disposal, recycling or reclaiming.

Municipal solid waste: Also known as garbage. Consists of everyday items that are used and then thrown away. Consists of items such as product packaging, glass, clippings, food scraps, furniture, clothing, bottle, and food left overs, newspapers, appliances, paint, and batteries. Materials or products that are discarded as no longer useful or required after completion of use or process.

Improved services: Planned services that accurately define the services needed by the city residents who do not allow missing any schedules of services due to challenge or deliberate failure.

Household waste: Also known as domestic waste is waste that results from household activities.

Household size: The number of individuals staying in one household who are above 21 years old.

Solid waste collection services: Deals with the process of collecting waste from households, offices markets, hospitals industries, and private offices for disposal, recycling or reclaiming

Private actors: Non-state collective or individual participants in providing solid waste collection services that usually provide solid waste services at a profit.

2.3 Global Trends in Solid Waste Management

Solid waste management is a global environmental health and sanitation problem not only for developing countries but also for developed countries (Baker, 2006). According to Chuen-Khee & Othman (2010) between 2003 and 2006, global waste generation rates increased, on average, by 7% annually. For Europe, manufacturing and service sector waste declined by 25% between 2004-2012 owing to recycling, recovery, and reuse. Moreover, municipal solid waste generation fell by 2% (UNEP, 2015).

Daily human economic and household activities (food preparation, manufacturing computers, repairing electronic gadgets, manufacturing goods, etc.) produce waste. Municipal solid waste comprises of waste produced by individual households, small businesses, schools, hospitals, hotels, etc. High-income countries produce the most waste per capita while low-income countries produce the listed waste per capita (Medina, 2012). Industrial growth, high-energy demands, urbanization, population growth, changes in lifestyles, etc., directly influence solid waste generation rates (Sawyer, 2010).

Seth et al. (2014) contend that solid waste is a problem directly resulting from thoughtless consumerism. Resource intensive lifestyles are contributing to rising production of solid waste

putting more pressure on the environment (Sebastian, 2010). Second-hand consumer goods imported from Europe and Asia to Africa, which are usually sub-standard products, contribute to the rapid increase in waste generation in Africa (Lyse, 2003). Resource intensive type of lifestyle is permeating communities in developing countries in Asia and Africa. However, developing countries will continue to suffer the problem of inadequate solid waste collection services as systems have not changed to respond to the increased demand.

Across the globe, governments regulate waste management industry for safety and efficacy. However, MSW management practices in developed countries differ from developing countries due to varying economic development levels (Rahji & Oloruntoba, 2009). Availability of adequate resources, better MSW management frameworks, and technological advancements support governments' systems to provide reliable and efficient MSW collection services in developing countries. In part, high level of service users' involvement has also supported developed countries to secure high levels of waste separation, recycle and reuse. Furthermore, governments in Europe, America, and other developed countries impose strict rules and regulations to avoid careless disposal of waste by individuals, industries, and institutions. However, in most cases, it is the responsibility of the generator to manage commercial and industrial hazardous waste (Sanchez, 2014).

Starting from the 1970s, Ventosa (2008) argues, 48% of the municipalities in Spain, collect user fees for MSW collection services. In Europe and many other developed countries, municipal authorities implement Pay as You Throw (PAYT) programs to finance solid waste collection services. According to Sakai et al. (2012), in Japan, 954 municipalities have successfully implemented PAYT programs where households, companies and government institutions purchase MSW collection services and materials. According to Maria et al. (2013), by 2000, over 6000 communities in the United States had implemented solid waste collection user fees to support municipalities on financing MSW collection services. Chatterjee (2009) added that policy frameworks have been a major determinant to support a high level of willingness to pay for solid waste collection services in developed countries. Additionally, private firms operate solid waste collection services as a business even though municipalities are ultimately responsible for services' management. For example, in the United States, nearly 12,000 firms participate in the solid waste collection, transportation,

treatment and final disposal; small firms and a few large companies operate approximately 80 percent of domestic, commercial, and industrial urban MSW management services (Sanchez, 2004).

2.4 Solid Waste Management in Africa

World Bank (2000) observes that, in Europe, daily per capita solid waste generation is 18.6% more than in Africa. Factors that contribute to high waste generation rates in European countries include: high economic growth and urbanization, changing life styles. Major sources of urban waste are sewage plants, street sweepings, markets, schools, hospitals, recreation areas, industries, shops, livestock manure and households (World Bank, 2012). In Africa, 8 out of 10 municipalities manage solid waste collection systems directly (World Bank, 2010).

MSW management constitutes one of the major public and environmental health problems in African Countries. Compared to developing countries, 90% of the cities in Africa fail to safely dispose of their waste due to inadequate financial resources. In MSW collection, African countries face challenges such as high costs of equipment, operations cost, lack of human resources and inadequate infrastructure (Seth et al., 2014). The majority of cities in Africa depend on grants from central governments to finance waste collection systems management. Due to competing priorities, governments fail to adequately finance solid waste management systems. According to Kamal-Chaoui, Cointreau & Wang (2013), waste management is a not a political issue in the majority of African countries and, therefore, it does not get political attention as compared to markets, economy, energy and food security. For developed countries, only 1 out of 10 countries has problems to manage its waste. However, according to UNEP (2010), 9 out of 10 municipalities in African countries are facing serious challenges to manage waste. Poor governance in SW management systems and weak social accountability weigh down on solid waste management systems in Africa and other developing countries (Cointreau, 2004).

In other African countries such as South Africa and Egypt, municipalities impose user fees to finance solid waste collection services. World Bank (1995) adds that when private institutions are engaged in providing solid waste collection services, cost on services management is reduced by over 40% due to short decision making structures and efficient use of time and resources as compared to government institutions. Sustainable funding mechanisms attract private institutions to offer waste

management services as a business. Developed countries are a good example where user tariffs on solid waste management services have proved a reliable means to finance solid waste management services.

Putting in place a policy framework that supports tariffs on solid waste collection services is the first step to mobilize communities to pay for the services at establishment level (Vitor et al. 2013). According to EPA (2014) municipalities in African countries can emulate the example from states in America where fan education has been used to engage communities to protect the environment.

2.5 Solid Waste Management in Sub-Saharan Africa

According to Sava (2010) municipalities in sub-Saharan Africa generate approximately 62 million tons of solid waste per year. Sub-Saharan Africa has a per capita solid waste generation rates ranging from 0.09 to 3.0 Kg/day. However, the average is 0.6kg/capita/day. In sub-Saharan Africa, municipalities spend 20%–50% of annual budgets on solid waste management services (Eshun & Nyarko, 2011).

According to Aggrey & Douglason (2010) municipalities in sub-Saharan Africa only collect 20%–60% of total MSW generated for safe disposal despite the huge investments in the services by the governments. Moreover, Fobil et al. (2007) observe that MSW collection services and other public services in Africa are too costly and inefficient. According to Aggrey & Douglason (2010), low coverage on the collection, irregular collection schedule, waste spillover of the bins, indiscriminate disposal of solid waste, lack of storage containers, burning, waste littering is some of the major challenges facing cities in sub-Saharan Africa. Hardoy et al. (2005) contend that problems in solid waste management in sub-Saharan Africa have been compounded by the lack of transparency, accountability and weak governance structures. According to UNEP (2008), good governance can promote recycling, reuse and separation activities which have the potential to reduce cost on solid waste management by at least 14% in sub-Saharan Africa.

To improve service delivery on MSW collection services, earlier researchers suggested rearranging the institutions that manage the services (Eshun & Nyarko, 2011; Kim et al., 2011). According to Damschroder et al. (2007), solid waste privatization is a sustainable strategy to improve the service

delivery. However, Eshun & Nyarko (2011) warned that for privatization to be effective in sub-Saharan Africa, municipalities need to formulate policies that will support the initiative. In addition, Kwarteng (2011) contend that private sector participation offers a means to enhance efficiency and lower costs through the introduction of commercial principles and greater attention to customer satisfaction. However, households' willingness to pay for improved MSW collection services is key for municipalities to privatize MSW collection services (Manda, 2010).

For Tarkwa-Nsuaem Municipality in Ghana, Eshun & Nyarko (2011) reported a willingness-to-pay for improved solid waste collection services rate of 77.7%. Furthermore, Eshun & Nyarko (2011) found a strong relationship between household income and willingness to pay for improved MSW collection services. Again, Eshun & Nyarko (2011) reported a positive relationship between households' willingness-to-pay for improved MSW management services and access to services. Furthermore, for Osun State Nigeria, Adepoju & Salimonu (2012) reported WTP for improved solid waste management services rate of 68%. Both Osun State of Nigeria and Tarkwa-Nsuaem Municipality of Ghana have a similar level of economic development as that of Malawi. Literature shows that there is high willingness to pay for improved solid waste collection services in developing countries even though many developing countries do not have policies that oblige citizens to pay for MSW management services (UNEP, 2010).

Results from the studies done by Addai & Danso-Abbeam (2014) and Hagos, Mekonnen & Gebreegziabher (2012) in sub-Saharan Africa show that there is households' willingness to pay for improved MSW collection services. However, most municipalities do not have policies in place to support paid-for services. Studies also show that majority of municipalities in sub-Saharan Africa manage solid waste collection services directly even though it has been documented that private institutions can improve both coverage and reliability of the services (Nkansah, Dafor & Essel-Gaisey, 2015).

2.6 Solid Waste Management in Malawi

According to UN-HABITAT (2010), Mzuzu City covers 17.7% of the households on MSW collection services. Four years later, Barre (2014) reports a service coverage of 16.1%. These

statistics imply that coverage for MSW collection services has been going downwards over time. Please see information here.

According to MCC (2010), municipal councils in Malawi get grants from the government to finance management MSW collection services. Mtika (2013) points out that Mzuzu City Council needs K210, 00 (\$1500) per week to manage waste collection services. However, the central government is only able to provide 40% of the required weekly budget. As a result, Mzuzu City Council only collects 45%-59% of the total waste generated every week (UN-HABITAT, 2013). Vitor et al. (2013) note that underserved households adopt unauthorized, usually unsafe means of disposing of waste. Households bury waste in pits dug within their compounds resulting in continued groundwater contamination.

Grants from the government will never be enough to finance waste collection services as the government has far more pressing areas to spend resources on. For example, water supply, electricity, food security, emergencies, etc., demand a lot of attention from the government. The World Bank (2010) urges governments in developing countries to introduce sustainable means to finance MSW collection services to protect the environment and support people's livelihoods in a sustainable manner. According to Oduro-Kwarteng (2011), Community Based Organizations (CBO) adopt local strategies that respond to community needs. For example, in Mzuzu City, areas such as Chengautuwa where access roads are limited, wheelbarrows may be required to collect solid waste to a central communal collection point (UN-HABITAT, 2011).

According to the World Bank (2010) commercialization of MSW management services has proved sustainable, efficient and effective in North America, Europe and other developed countries in Africa such as South Africa and Egypt. Free MSW collection services are not only unsustainable but also discourage communities from adopting innovative practices to reduce waste generation at the source. To attract private actors to offer MSW collection services as a business, cities must guarantee profits. In a study on private sector capacity in the management of urban waste in Ghana, Bowan (2013) reports that private actors were responsible for 51% increase in MSW Collection coverage at household level between 2009 and 2012 in Zoomlion City. Again, Bowan (2013) suggests that private sector participation is a good option where government institutions have failed to deliver on solid waste management services as it reduces the overall cost of operating and managing MSW

management services. However, Coad (2009) warns that in cases where there had been political interference, private sector failed to deliver. In the cities of Blantyre, Mzuzu, Lilongwe, and Zomba in Malawi, private companies manage <2% of total waste generated (NCST, 2015).

Experience from developed countries showed that recycling and reuse reduce quantities of waste for collection, lowering overall MSW management system cost. Noting that 1% of the world population depended on waste for livelihoods, Madina (2002) suggests that governments ought to increase waste recycling activities in order to reduce waste at the source. NCST (2015) notes that there are no tangible waste recycling programs in cities in Malawi aimed at either reducing quantities of waste being generated or generating income from recyclables. Vitor et al. (2013) further contend that innovative packaging at industries could significantly reduce quantities of waste generated, further bringing down budget constraints which municipalities face.

According to Yusuf et al. (2010), demand and willingness to pay for improved MSW collection services is a precondition to introduce commercial services. There are no specific demands and willingness-to-pay studies for Malawi and, therefore, it is difficult to understand people's attitude toward paid-for services. However, Assa (2013) reports a willingness-to-pay for a household waste rate of 67% for economic reasons such as gardening, energy, growing flowers, for Lilongwe City. On the other hand, earlier researchers observed that municipalities in Malawi experience high demand for improved solid waste collection services as it was reported that over 41% of solid waste generated in cities remained uncollected (Assa, 2013). Of great concern is the inability of infrastructure and land use planning methods (including waste management) to cope with urban growth, (the highest in the world) at 3.5% annually.

Earlier studies show that willingness to pay for MSW collection services is determined by household demographic and social economic factors such as age, gender, marital status, household size, household income, level of education, level of awareness about environmental degradation and access to services (Das & Gogoi, 2010; Wang et al., 2011; Yusuf et al., 2010). In a study on demand for improved solid waste collection services, Tadesse & Hadgu (2009) reported that household income was a positive determinant of willingness to pay for improved solid waste collection

services. Niringiye & Omortor (2010) reported a negative association between willingness to pay for improved MSW management services and age.

2.7 Theoretical Framework

The theory behind this study was that households have a certain level of resistance to make a decision to pay for improved MSW collection services. Also, households' decision to make a payment for improved SWM services was dependent on meeting a set of conditions. To analyze determinants of an amount of money heads of households were willing to spend on MSW collection services in Mzuzu City, assumptions were based on Ajzen Theory of planned behavior. The theory of planned behavior is an extension of the theory of reasoned action (Ajzen & Fischbein, 1980; Fischbein & Ajzen, 1975 as cited in Ajzen, 1991). According to the theory of planned behavior, a behavior of heads of households could be predicted more accurately from a set of prevailing conditions. The central factor in the application of planned behavior is the head of household's willingness to pay for improved MSW collection services. As in the original theory of planned behavior, it was hypothesized that a set of conditions such as age, gender, access to MSW collection services, and concern about environmental degradation, household size, household income, and level of education represented motivation factors. Furthermore, it was assumed that those were the indicators on how favourable the environment was for heads of household to make a decision on whether to pay for improved solid waste collection services or not.

According to the theory of planned behavior, resources such as household's income, the level of education, and opportunities made available to individuals somehow dictate the likelihood of heads of households' willingness to pay for improved solid waste collection services. Moreover, perceived behavioral control plays an important part in the theory of planned behavior. In fact, the theory of planned behavior differs from the theory of reasoned action in its addition of perceived behavioral control.

According to the theory of planned behavior, willingness to pay is a function of intentions and perceived behavior control. For accurate prediction of the intention to pay for improved solid waste collection services, a set of conditions has to be fulfilled. In other words, the environment has to satisfy such preconditions such as income, availability of solid waste collection services to

encourage or motivate individual heads of households to pay for improved solid waste collection services. Figure 6 below is a diagrammatic representation of the theory of planned behavior.

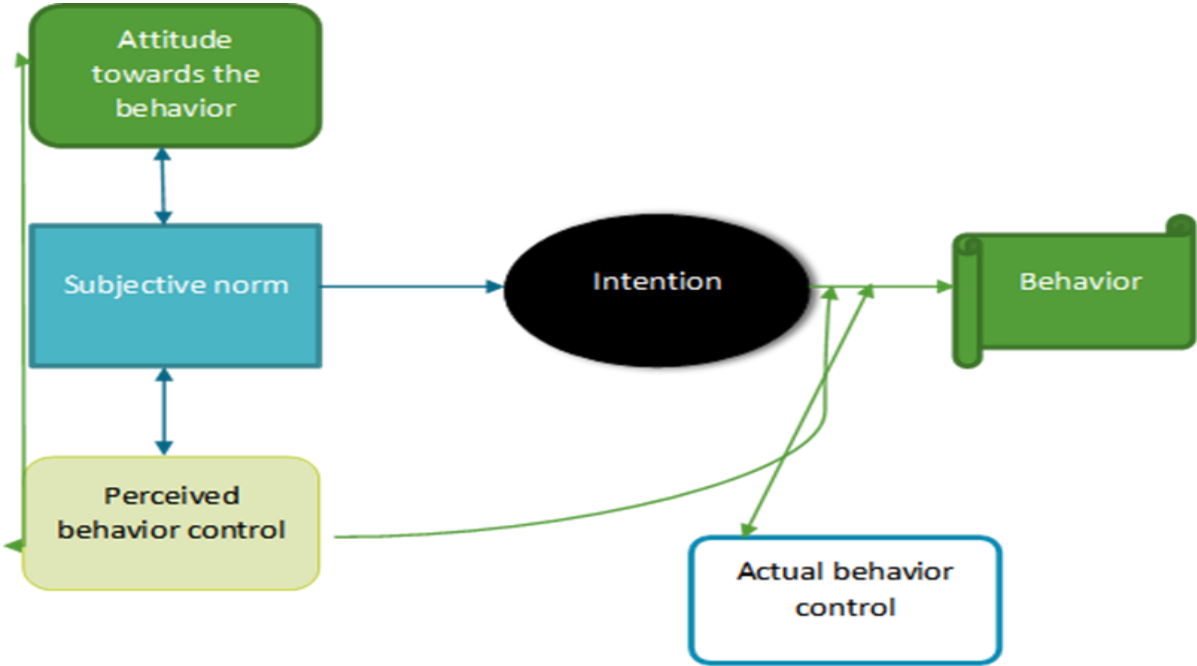


Figure 2: Theory of planned behavior (Ajzen, 1991)

2.8 Conclusion

The chapter reviews the literature of municipal solid waste situation at global, Africa, sub-Saharan Africa, and Malawi levels. Literature shows that waste generation continues to increase in quantities due to varying factors. The Literature has shown that solid waste collection is a global issue and needs adequate resources to manage the system. Privatization of solid waste collection services has proved effective and reliable. However, for the private sector to provide waste collection services, willingness to pay for improved services must be understood. Most studies in Malawi focus on the supply side of waste collection services and so far no studies have been reported on the willingness to pay for improved solid waste collection services. Therefore, this study forms a strong foundation to bridge the gap in knowledge on WTP for improved solid waste collection services in Mzuzu City. The next chapter presents the methodology of this study.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter presents the details on the methodology used to conduct this study. It gives details on the study design, study area, sample population, sample size, sampling procedure, data collection, theoretical framework and ethical consideration. Again, the chapter gives details on the logistic regression model or equation that was used to determine factors that would influence willingness to pay for improved MSW collection services in Mzuzu City. More importantly, the chapter analyses the theoretical framework within which households would make decisions on spending on waste collection services.

3.2 Study Design

A household survey was conducted for this study. The study used a structured questionnaire to collect primary data on demand and willingness to pay for improved MSW collection services from households. The researcher divided the questionnaire into four parts: demographic data, socio economic characteristics, major environmental sanitation concerns, existing situation on MSW

collection services and demand for improved MSW collection services. Earlier studies in sub-Saharan Africa showed that household surveys are the most appropriate, efficient and simplest approach to collect data on households' demand and willingness to pay for improved MSW collection services (Addai & Danso-Abbeam, 2014; Kassim & Ali, 2006). This approach has demonstrated to have high response rate and gives the researcher an opportunity to explain the proposed improvements on solid waste management services to respondents (Niringiye & Omortor, 2010). Furthermore, the researcher conducted semi-structured interviews with key informants on overall management, financing of MSW management services and existing situation on MSW collection services to beef up the data that the researcher collected at a household level.

3.3 Study Area

Mzuzu City is the third largest city in Malawi after Lilongwe and Blantyre. It is located at latitudes of 11° 27' south and longitudes 34 ° 0 ' east. The city covers a total area of 143.8 square Km (Demographic Health Survey, 2010). It is the government's center of administration, commerce, industry, and services for the northern part of Malawi. According to National Statistics Office (2010), Mzuzu City has a population of 186,706 people.

The Tumbuka, Ngoni and Tonga tribes constitute 28%, 34% and 14% of the total population in Mzuzu City, respectively. The remaining 24% is comprised of the Nkhonde, Chewa, Yao, and Lomwe. Tumbuka is the most commonly spoken language in the City/Region and English is the official language for business. Some of the major economic activities in Mzuzu City include Agriculture, tobacco grading and sales, transport, hospitality services, mining, and food processing. Of the employed population, 27% work in the agriculture and mining industries (MCC, 2008).

Major sources of solid waste in Mzuzu City include households, markets, hospitals, education institutions, hotels and industries (UN-HABITAT, 2012). According to NCST (2015) hotels in Mzuzu City have solid waste generation rate of 1.5 kg/day/bed. Hotels in Mzuzu City generate more waste than hotels in Lilongwe. Hotels in Lilongwe City generate 0.4kg/day/bed. However, Mzuzu city has the lowest household solid waste generation rate (0.46kg/capita/day) compared to Blantyre, Lilongwe, and Zomba (Manda, 2012). In addition, Mzuzu City has the lowest solid waste recycling rate (< 1 percentage) as compared to other cities in Malawi.

According to Diaz (2011), Mzuzu City faces challenges such as substantial population growth, lack of legislation for realistic long-term planning on MSW collection services, lack of proper disposal of waste, scavenging, lack of appropriate equipment and technologies and insufficient personnel in MSW management. Moreover, the City lacks basic infrastructure to provide adequate basic urban services such as sanitation and environmental services (UN-HABITAT, 2011). The World Bank (2010) reports that over 60% of the populations in Mzuzu City live in unplanned settlements. Figures 2, 3 & 4 are maps of Mzuzu City.



Figure 3: Map of Mzuzu City showing aerial view

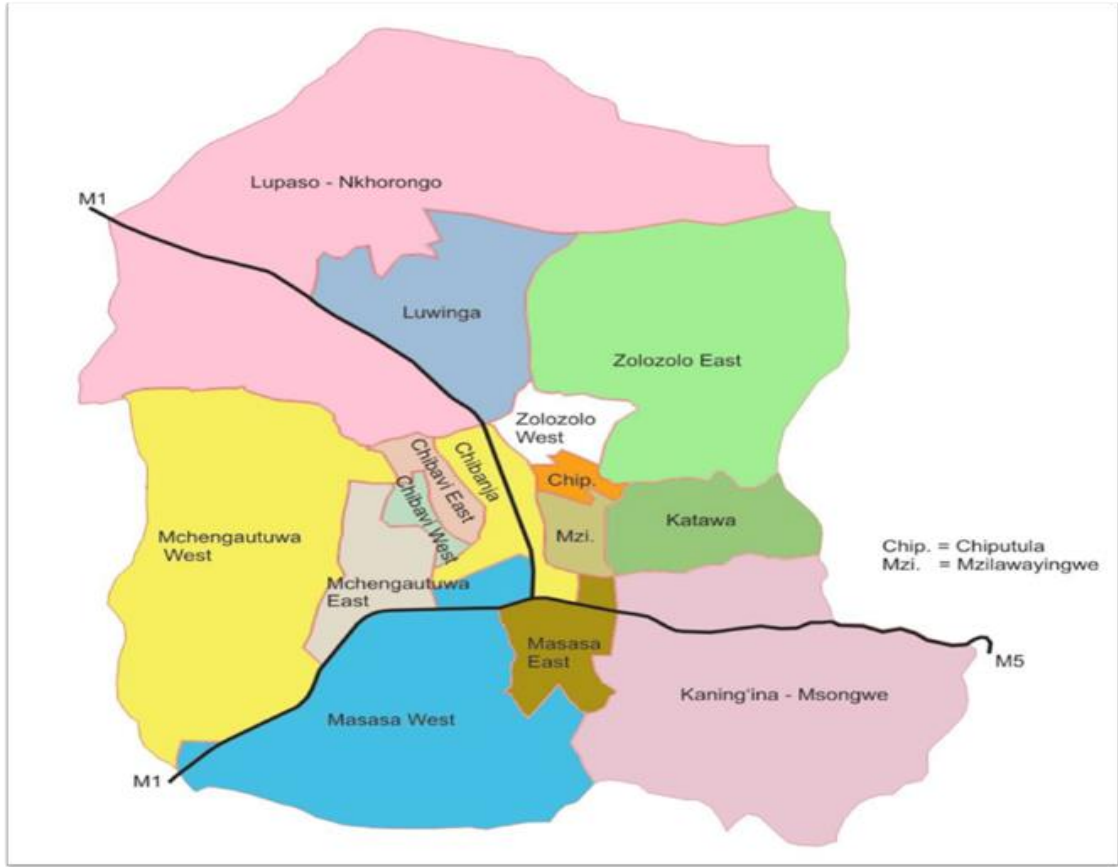


Figure 4: Map of Mzuzu showing administrative areas

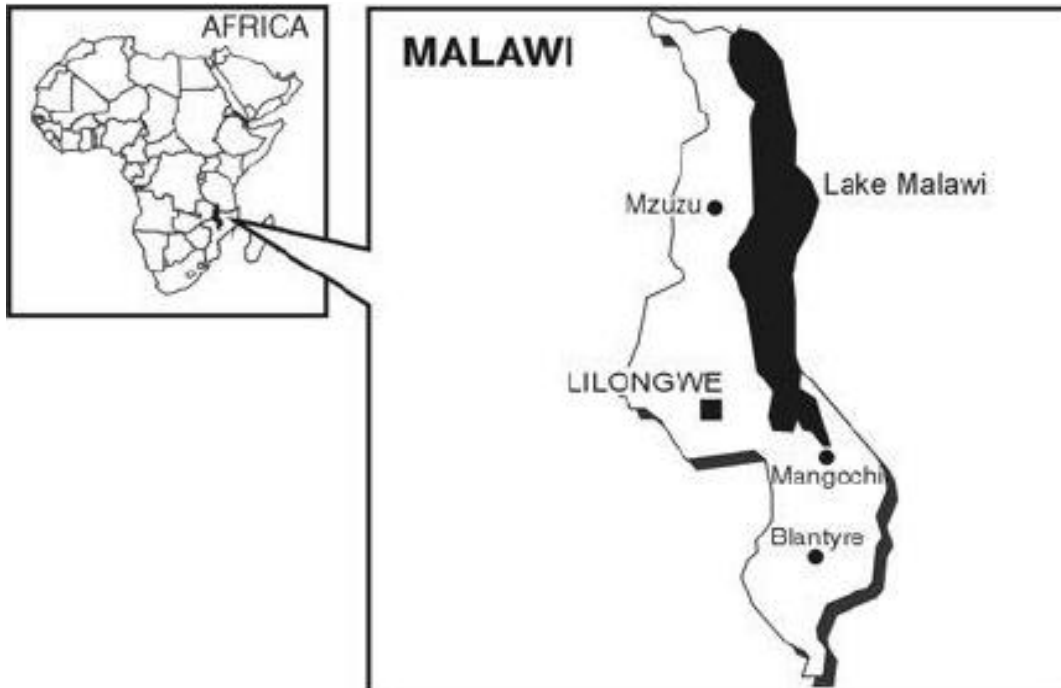


Figure 5: Map of Malawi showing the position on Mzuzu City

3.4 Study Population

Households were units of analysis for the study. The researcher targeted household heads (a father or a mother) as respondents. Household heads were targeted because of their decision-making powers regarding household expenditure on urban services. Again, the researcher targeted wards also known as administration areas as study areas. The researcher targeted Mzuzu City Council senior officers that had direct involvement with providing solid waste collection services (Department of Finance, Cleansing, Health, Planning, and Development) for key informant interviews. Key informant interviews and household survey complemented each other to get sufficient data for the study.

3.5 Sample Size

The researcher predetermined a sample size of 96 households at a confidence interval (C.I) of 95%, standard deviation of 0.5 and margin of error of 10%. Figure 3 shows the formula for calculating the sample size for this study:

Equation 1: Formula for calculating sample size

$$\text{Sample size} = \text{stadDev}^2 * \frac{\text{stadDev}(1 - \text{stadDev})}{\text{Margin of error}^2}$$

The literature shows that a sample of 96 was large enough to give reliable study results. In a similar study in Dunkwa-on-Offin, Ghana, Addai & Danso-Abbeam (2014) sampled 100 households from a population of 196,000. Addai & Danso-Abbeam (2014) subjected the data to logistic regression technique analysis to identify determinants of willingness for improved solid waste collection services. In another similar study by Khattak et al. (2009) a sample of 216 was used from a population of 1,036,000 in a study on ‘analysis of willingness to pay for better solid waste management services in Peshawar City, Pakistan’. As the population of Mzuzu City is estimated at 186,706, Peshawar City, the population of Pakistan is 5 times more than that of Mzuzu City. However, Khattak et al. (2009) used contingent valuation method to evaluate determinants of willingness to pay for better solid waste management services. Literature shows that contingent valuation method needs a larger sample than logistic regression analysis. In another similar study by Hagos et al. (2012) on ‘households’ willingness to pay for improved urban waste management in Mekelle City, Ethiopia, data were collected from a sample of 226 households and the data was subjected to Tobit and Probit models. However, Seth et al. (2014) in a study on ‘household demand and willingness to pay for solid waste management services in Tuobodom in the Techiman-North District of Ghana, sampled 200 households. The population of the Municipality of Tuobodom is two times more than that of Mzuzu City. However, Seth et al. (2014) used contingent valuation analysis to determine factors that would influence willingness to pay for improved solid waste collection services. Therefore, it can be concluded that the sample size used in this study was enough to yield reliable results.

Furthermore, the researcher allocated sample to sampled study areas based on population sizes of the sampled areas. The sample size of 96 exceeds a priori minimum size ($n \geq 74$) derived from power analysis using G*Power (Franzel *et al.*, 2007). G*Power is a statistics program that supports in calculating sample sizes for willingness to pay studies and all other types of power of analysis.

3.6 Sampling Procedure

The study used the multistage sampling technique to select a sample of 96 households. In addition, the researcher used a purposive sampling technique to select the areas for the study. For this study, the areas were categorized into low and high-income areas. Due to mixed characteristics of the areas such as the size of plots, type of roads, type of markets, housing and population density, it was difficult to come up with middle-income areas category even though Mzuzu City Council categorizes the administrative areas into three (low, medium and high-income area). The researcher randomly selected study areas from each of the two categories. Categorizing the administrative areas in high and low-income areas was an important stage of the sampling procedure to ensure that the population sample was representative. In addition, the hypothesis for the study was that income levels did not influence willingness to pay for improved MSW collection services in Mzuzu City. Therefore, it was important to get a representative sample from both low and high-income areas.

The researcher used systematic random sampling to select individual households to participate in the study. To identify the first household, a bottle was rotated from the areas' central points and where the bottle directly pointed became the first household. After the identification of the first household, every fifth household was sampled. The absence of a mother or a father who are usually decision makers on household expenses was a criterion to exclude a household from the sample population. However, children were still interviewed for child headed households because of the decision-making positions on household expenses.

For key informant interviews on MSW collection services, the study used purposive sampling to select positions within Mzuzu City Council to be included in the sample population. The decision on whether to include the position in the sample population or not was based on the degree of involvement with MSW collection services management. Based on this criteria, the Cleansing Activities Manager, Head of Cleansing Department, Director of Health, Director of Finance, Director of Planning and Development, Office of the Mayor and Office of the Chief Executive participated as key informants. Key informant interviews were very important for this study as it provided a platform to confirm household data on challenges faced by Mzuzu City Council in the management of MSW collection services. The researcher made appointments with the key informants two weeks before the study through emails which were followed up with phone calls

after two days. Three days before the study, the researcher sent reminders to all sampled key informants to confirm the appointments.

3.7 Data Collection

To develop a good and common understanding of data collection requirements for the study and enhance data collection skills for the data collectors, a 1.5 day training for enumerators was conducted. Another objective of the training was to orient data collectors on how to collect data using a Smartphone.

Data for this study was collected in April 2016. Data collectors held interviews with heads of households to collect data on households' demand and willingness to pay for improved MSW collection services (Appendix 1). As mentioned already, the household questionnaire was designed to collect household data on demographics, socioeconomic characteristics, MSW collection services, major environment sanitation problems, demand and willingness to pay for improved MSW collection services.

In addition, key informant interviews (6 interviews) were held with the following: Director of Finance, Director for Health Services, Director of Planning and Development, Head of Cleansing Department, and the City Mayor to obtain additional information on MSW collection services management, financing and private sector participation.

3.8 Data Management and Analysis

Data collection tools for the study were developed in English because English is the official business language in Malawi. However, the tools had to be translated into Chichewa and Tumbuka then back to English considering that the study was carried out in a predominantly Tumbuka speaking area. Translating the household questionnaire into Tumbuka and Chichewa languages was important for the study as it allowed data collectors more understanding of study data requirements. It is important to note that there was no loss or distortion in the meaning of the questions and study data requirements due to translation. Data collectors made some suggestions on language and flow of the questions. Based on the suggestions from the data collectors, the researcher made some changes on the data collection tools. The researcher built the final version of the household questionnaire into

Kobo Toolbox to aid in collecting data using smartphones. Collecting data using smart phones helped to cut down the research costs and helped minimize errors from data entry. Kobo collect software allowed the researcher to have instant access to study data as data collector collected it in the field. Instant access to data during data collection helped the researcher to ask data collector to recollect where inconsistencies were noted.

After data collection, all data were exported into excel and IBM SPSS version 20.1 for analysis. The researcher used IBM SPSS 20.1 to generate descriptive statistics for reporting the results and discussion. Logistic regression model was generated to determine the factors that influence willingness to pay for improved solid waste collection services based on literature from studies done elsewhere in sub-Saharan African and other developing countries in Asia.

3.9 Ethical Considerations

Before the study, the Office of the Dean of Postgraduate studies wrote an introductory letter to introduce both the researcher and the study to Mzuzu City Council officials (Appendix 3). This letter requested Mzuzu City Council to support the researcher to conduct the study for academic purposes.

Data collectors explained the purpose of the study at each sampled household as one of the ethical obligations. Data collectors also explained the perceived benefits of the study to respondents to elicit willingness to participate. Before participating in the survey, respondents consented to participate by signing a consent form.

3.10 Analytical Framework

Logistic regression model is a uni and multivariate technique that researchers use to estimate the probability of an outcome event occurring through predicting a binary dependent outcome from a number of independent variables (Niringiye & Omortor, 2010). Based on cumulative probability function, the study used logistic regression model because of its rich theoretical background and ability to deal with dichotomous dependent variable (Aggrey and Douglason, 2010). The study used logistic regression function to determine factors that influence WTP to pay for improved MSW collection services in Mzuzu City.

The influence that each factor had on willingness to pay for improved MSW collection services was given by:

$$y = \beta xi + \mu i \quad (1)$$

When the head of the household makes a decision to pay, Y assumes the value of 1 and when the head of the household decides otherwise it takes the value of 0. And, thus:

$Y_i=1$ if X_i is greater than or equal to a critical value, X^* and $Y_i=0$ if X_i is less than a critical value, X^* .

Equation (1) represents a binary choice model representing level of likelihood of willingness to pay. Y is a function of the independent variable (X_i) and mathematically, it can be represented as:

Probability ($Y_i= 1$) = $F(\beta X_i)$,

$$Probability P(Y = 0) = 1 - e^{-\beta X} / (1 + e^{-\beta X}) = 1 / (1 + e^{\beta X}) \quad (2)$$

Where Y_i is an observed response (action) of the head of the household. And, X_i represents independent variables such as age, gender, access to services, and concern about environmental degradation, household size, household income, and level of education.

$$P(Y=1) = e^{-\beta X} / (1 + e^{-\beta X}),$$

$$P(Y = 0) = 1 - e^{-\beta X} / (1 + e^{-\beta X}) = 1 / (1 + e^{\beta X}) \quad (3)$$

The logistic regression model of expectation of Y as dependent variable and X as a set of independent variables is given by:

$$E(Y) = 1 [F(\beta'X)] + 0 [1 - F(\beta'X)] = F(\beta'X) \quad (4)$$

The model is nonlinear. And, therefore the coefficients are not necessarily marginal effects of independent variables. The relative effect of each independent variable on household's willingness

to pay for improved solid waste collection services is obtained by differentiating equation (4) with respect to X_i (Vitor et al., 2013).

$$\partial P_i / \partial X_i = [\lambda \beta' X_1 + \lambda \beta' X] \beta = F(\beta' X) [1 - F(\beta' X)] \beta \quad (5)$$

The maximum probability method was used to estimate the coefficients of factors influencing willingness to pay for improved solid waste collection services. The purpose of using the logistic regression model is to demonstrate that a head of the household would make a decision to pay for improved municipal solid waste collection services when combined effects of factors exceed the threshold of resistance to pay for improved municipal services. To analyze factors that can influence willingness to pay for improved municipal solid waste collection services in Mzuzu City, the researcher preferred logistic regression to linear regression model because the factor estimates from logistic regression model are efficient and consistent as compared to linear regression analysis (Akudugu, Egyir, & Mensah-Bonsu, 2009). Estimation procedure in logistic regression model defeats the problem of heteroscedasticity (Vitor et al., 2013). Logistic regression model was preferred over probit because logistic regression model is intrinsically simple and it has low variance so is less prone to over fitting (Pindyck & Rubinfeld, 1981). Advantages of logistic regression model include: it does assume linear relationship between independent variable and dependent variable; the dependent variable does not need to be normally distributed (Victor, 2011).

3.10.1 Variables for Logistic Regression Model

Selection of variables for the logistic regression model was based on common literature. Earlier researchers suggested that sex, marital status, access to solid waste collection services, household size, household income and level of education influence willingness to pay for improved MSW management services (Anjum, 2013; Dam Schroder et al., 2007; Hagos et al., 2012; Khattak et al., 2009).

Gender: Gender represents sex of the respondent. Anjum (2013) contends that female headed households have more likelihood to pay for improved MSW collection services since they are responsible for solid waste management at household level. This is consistent with what other earlier researchers had reported. Particularly in Asia and Africa, women are culturally responsible for waste

collections at household level hence a positive relationship with willingness to pay for improved MSW management services. As noted by Aggrey and Douglasson (2010) in Kampala, female-headed households were expected to have more willingness to pay for improved MSW collection services.

Age: The concept of cost sharing on solid waste management is new. Old people do not understand the concept as they are used to getting free MSW collection services (Hagos et al., 2012). In a study on determinants of willingness to pay for solid waste management in Kampala, Uganda, Niringiye and Omortor (2010) reported a negative relationship between age and willingness to pay for MSW management services. Old people believe that it is government's responsibility to pay for MSW collection services (Cointreau, 2009). For this study, the hypothesis is that age does not influence willingness to pay for improved MSW services in Mzuzu City.

Household size: Household size refers to the number of individual persons living in the same household whose age is greater or equal to 18 years. Other researchers have used household size as an indicator for quantities of waste households generate. Earlier researchers theorized that households that harbor bigger numbers of people need solid waste management services more than those that harbor smaller numbers of people (World Bank, 2010; Cointreau, 2009; UN-HABITAT, 2011). Thus, population size is an important factor in waste generation. The hypothesis for this study is that household size does not influence willingness to pay for improved collection services.

Education level: refers to the number of years a respondent spent in school. For this study, it has been postulated that the higher the education level, the higher the likelihood of willingness to pay for improved MSW collection services. Earlier researchers in sub-Saharan Africa reported that heads of households who were educated cared more about the environment owing to more awareness about environment degradation and its effects on human health and climate change than those with limited knowledge about environmental issues (World Bank, 2010; Bowan, 2013; Assa, 2013).

Household income: refers to the amount of money the household is able to raise for household use from all sources in a month. It includes money earned by other household members such as spouse and children. Literature shows that those who earn more money have more willingness to pay for solid waste management services (Pek and Jamal, 2010; Khattak et al., 2009). It implies that

households that have high income are more likely to make a decision to contribute resources towards improved MSW collection services.

Marital status: refers to whether the respondent was either a husband or a wife to someone. The hypothesis for this study was that married individuals are less willing to pay for solid waste collection services than those who are single. When a respondent was married, the variable took the value of 1, and 0 when it was otherwise.

Environmental awareness: Well-informed individuals about environmental issues are more likely to take a step towards preserving the environment. Earlier researchers reported that access to information on the environment influenced willingness to pay for improved MSW collection services. For Peshawar, India, Khattak et al. (2009) found that household heads of who were more aware of environment issues had more probability of willingness to pay for waste collection than those who had limited knowledge. A hypothesis for this study is that more awareness about the environment positively influences willingness to pay for improved MSW collection services.

Access to MSW collection services: Mensah and Larbi (2005) contended that availability of reliable and adequate MSW management services induces WTP for MSW management services. As noted by Carson and Hanemann (2006), availability of environmental services allowed beneficiaries to assign market value for the services. In a study on willingness to pay for solid waste management services in European member states, EC (2000) found that solid waste management service providers who scored highly on providing timely and efficient service had more clients than those who scored lower. For this study, the hypothesis is that access to MSW collection services is positively related to WTP for improved services.

3.11 Study Limitations

To achieve stable and meaningful results, logistic regression model needs a large sample of more than 96. For this study, the sample size was 96. Had it not been for financial constraints, more households would have been sampled. However, this sample size exceeded a threshold of at least 50 data point per predictor which was necessary to achieve stable results for the study (Franzel et al., 2007).

On the other hand, choice of independent variables for the regression model was based on literature from studies done outside Malawi. Much of the literature was taken from studies done in sub-Saharan countries which have similar economic levels to Malawi.

3.12 Conclusion

This chapter has given an extensive overview of the methodology used to conduct this study. The chapter has also presented other methodologies that other researchers used in conducting similar studies in other countries in Africa and other developing countries under similar economic conditions. Furthermore, the chapter has looked at some sample sizes that have been used in similar studies. The study has also given an overview of the limitation of the study. The next chapter presents the results of the study and the discussion. For purposes of clarity and cohesion, results and discussion have been dealt with simultaneously.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents key study results and discussion in combination. Results and discussion sections have been combined to achieve coherence and consistency of the study results and the discussions. Both results and the discussion follow study objectives. The chapter starts with key findings on demand. Results on the willingness to pay for improved MSW collection services come second and finishes with findings on determinants of willingness to pay for improved MSW

collection services. Demand for MSW collection services in Mzuzu City.

4.1.1 Most Important Environmental Sanitation Problems in Mzuzu City

As seen from figure 7, 21% of the respondents considered inadequate MSW collection services as the most important environmental sanitation problem in the City. As also seen from figure 7, 15%, 13%, 11% and 10% of the respondents considered littering or illegal piles of solid waste, inadequate disposal of household wastewater, difficulties to access drinking water and inadequate disposal of human excreta as most important environmental sanitation problems in Mzuzu City, respectively.

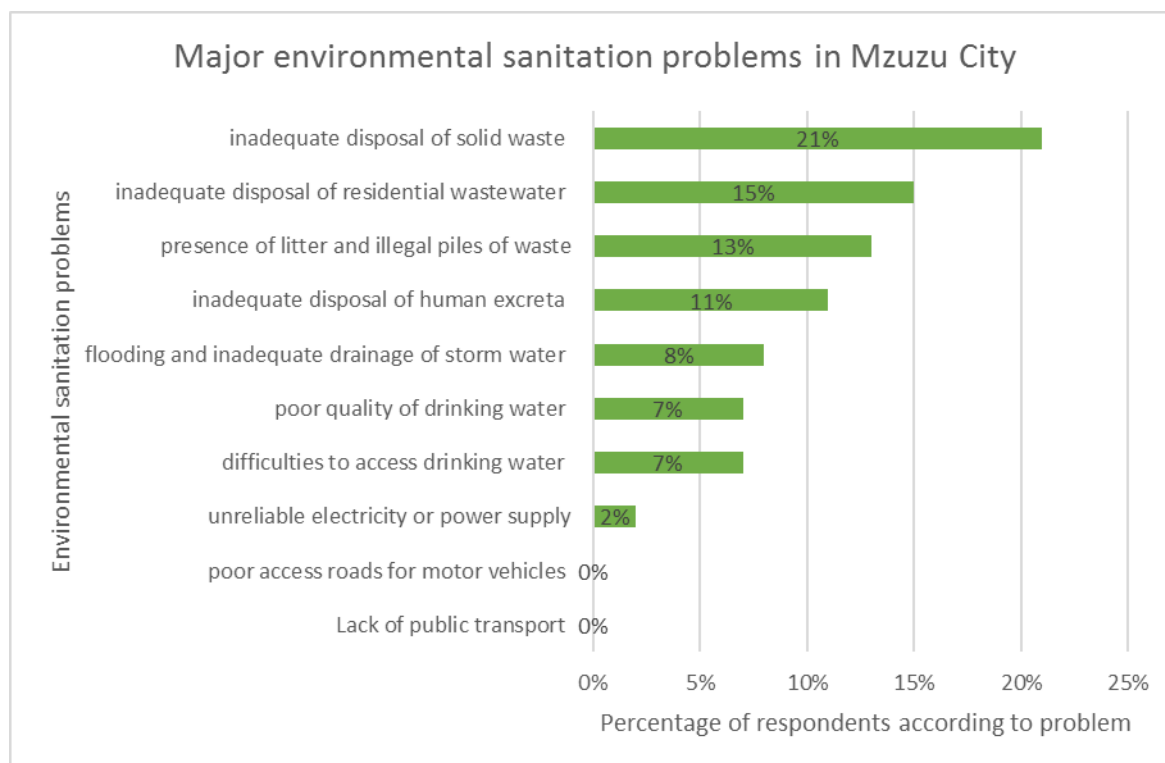


Figure 6: Major environmental sanitation problems in Mzuzu City

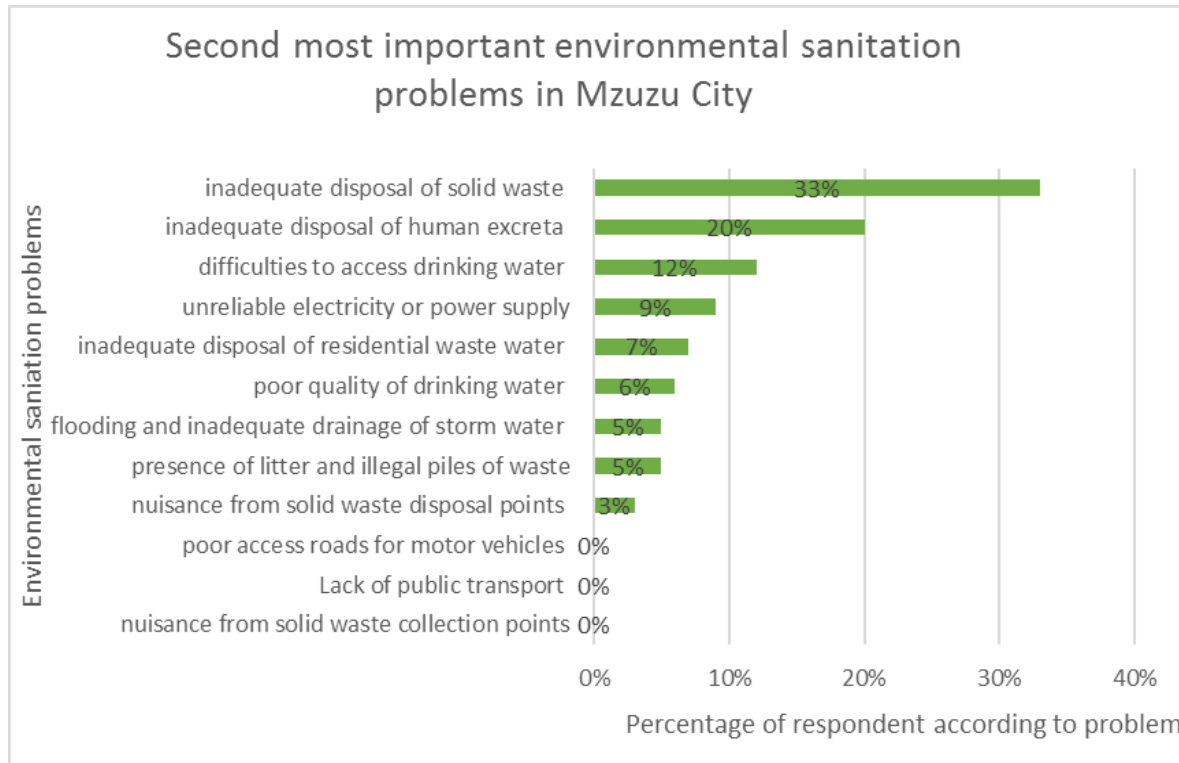


Figure 7: Second most important environmental sanitation problem

Moreover, as can be seen from figure 8, 33% and 20% of the sample population considered inadequate MSW collection services and inadequate disposal of human excreta, respectively as second most important environmental sanitation problems in Mzuzu City. Combined, 28% of the respondents considered difficulties in accessing drinking water, unreliable electricity, and inadequate disposal of household wastewater as second most important environmental sanitation problems in Mzuzu City.

The findings show that 21% of the respondents view the problem of littering and illegal piles of solid waste as very serious. Nevertheless, 63% of respondents said that they view the problem of littering and illegal piles of municipal solid waste as serious. And, 9% and 5% of the respondents said that they view the problem of littering and illegal piles of solid waste as somewhat serious and not serious, respectively.

Moreover, the findings show that 63% of respondents qualified inadequate MSW collection services as a very serious problem. The findings further show that 21%, 12% and 4% of the sample population

consider the problem of inadequate MSW collection services as serious, somewhat serious and not serious, respectively. Figure 9 shows how respondents qualified the problem of inadequate MSW collection services in Mzuzu City:



Figure 8: Qualification of the problem of inadequate MSW collection services

As can be seen from Figure 9, the study results show that 41%, 29% and 11% of the respondents consider the problem of the nuisance in solid waste collection points as very serious, serious, and somewhat serious, respectively. Moreover, 13% of the respondents said that they view the problem of the nuisance in solid waste collection points as not serious and only 6% were not sure.

From the results, the study establishes that there are various environmental sanitation problems in Mzuzu City. The study confirms that inadequate MSW collection services, inadequate disposal of human excreta, the illegal stock of waste and littering at collection points are some of the major environmental sanitation problems facing Mzuzu City. More importantly, the study establishes that

inadequate MSW collections services considered a serious problem in the Mzuzu City. Furthermore, the study establishes that inadequate means disposing of wastewater, difficulties in accessing potable water and inefficient drainage systems are also some of the challenges facing Mzuzu City.

The hypothesis for this study was that there was no demand for solid waste collection services in Mzuzu City. Contrary to the hypothesis, study results confirm that there was demand for improved MSW collection services as it was clear that inadequate waste collection services are one of the major and serious environmental sanitation problem residents in Mzuzu City face. UN HABITAT (2010) reports that Mzuzu City Council has problems of lack of access roads, inadequate infrastructure, and lack of vehicles, inadequate human resources, and inadequate budgets to deliver on MSW collection services. According to Vitor et al. (2013) municipalities in Africa find it hard to provide adequate MSW management services owing to lack of finances, good governance, accountability, technical capacity, human resources and enabling policies.

With regards to municipal solid waste management services, researchers had documented more challenges than solutions to failing solid waste management systems. World Bank (2010) argues that in developing countries, it was impossible to develop infrastructure to cope with increased demand due to the high level of corruption and lack of social accountability. Due to lack of infrastructure to collect MSW, large quantities of waste are left to rot in the streets allowing leachate seep into the ground contaminating ground water.

4.1.2 Access to MSW Collection Services

The findings show that only 7% of the sample population had access to MSW collection services and majority (93%) indicated that they did not. Figure 10 below shows results on extent of access to MSW collection services in Mzuzu City.

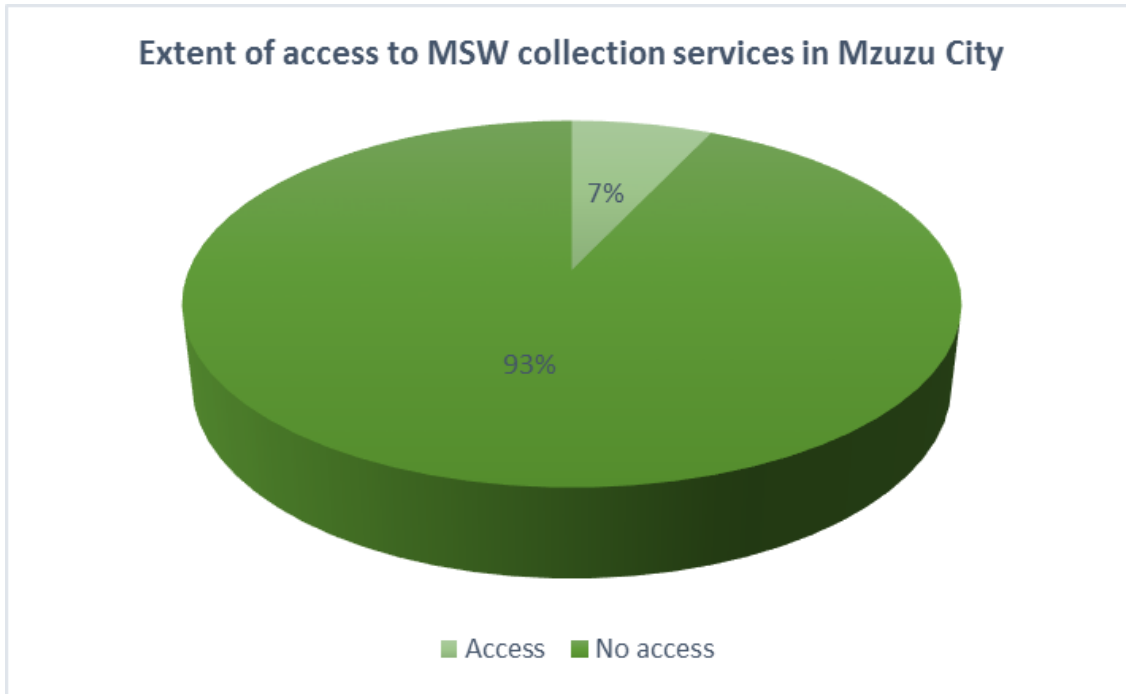


Figure 9: Extent of access to MSW collection services In Mzuzu City

Of those households who had access to MSW collection services, 84% indicated that they were not satisfied with the services. Figure 11 shows that 29%, 28%, 25% and 22% of those who had access to MSW collection services cited bad odors and flies at communal containers, the long interval between collections, the unreliability of services, and lack of clean appearance in the neighborhood as reasons for dissatisfaction with MSW collection services. Figure 11 shows reasons for dissatisfaction with MSW collection services in Mzuzu City.

Furthermore, study results show that of the respondents who had access to MSW collection services, 87% had accessed the services very seldom and only 3% of the respondents had access to MSW collection services every week. The results further show that none of the households had access to MSW collection services daily.

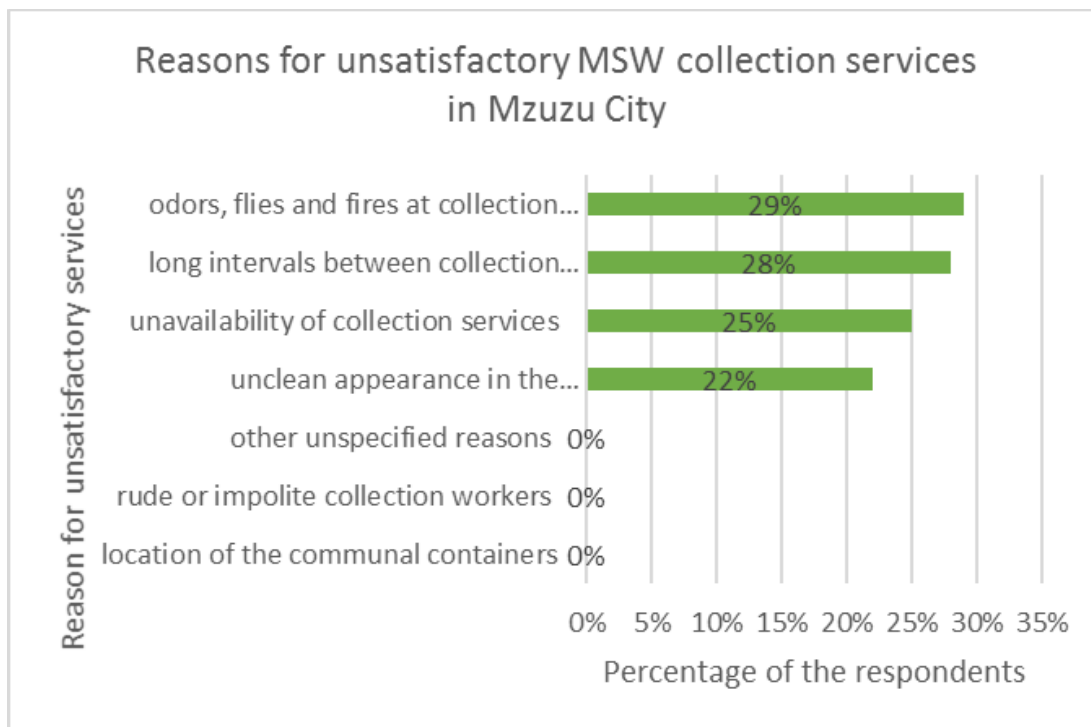


Figure 10: Reasons for dissatisfaction with the services

Low coverage of MSW collection services and high level of dissatisfaction with the services suggested a high demand for improved MSW collection services in Mzuzu City. Again, these study findings reveal high- level weaknesses that exist in Mzuzu City Council on protecting the environment from adverse effects of indiscriminate disposal of solid waste by failing to control solid waste management at a household level. In comparison with other cities in sub-Saharan Africa, Mzuzu City had one of the lowest coverage rates on MSW collection services. When governments fail to collect and safely dispose of waste, city residents usually adopt unsafe practices (Manda, 2009).

In a study on challenges and opportunities in solid waste management: A case study of cities in Malawi, NCST (2015) reported a municipal solid waste collection services coverage of 17.6% for Mzuzu City. In a study on solid waste management in Kenya, Gakungu et al. (2012) observed that most cities in developing countries struggle to keep waste collection schedules due to vehicle breakdown and insufficient fuel for operations.

Hagos et al. (2012) argues that MSW collection services are not a political issue as it is the case with water supply, agriculture, and transport, therefore, it is not a priority for city authorities and politicians. For Mzuzu City, despite the fact that challenges and opportunities have been well documented, the trend on coverage of MSW management services continues to go down. As it is the case at a global level, environmental health campaigners have a responsibility to raise the status of environmental degradation to gain publicity and more political recognition at municipal and national levels. Due to low coverage of MSW collection services, households, in Mzuzu City bury solid waste into the ground allowing leachate to seep into the ground and contaminate ground water in the process.

Earlier researchers documented that poor access roads prevented low- income areas from accessing MSW collection services. The findings of this study suggest that low-income areas have even far much lower access to MSW collection services. These findings are consistent with what Oduro-Kwarteng (2011) reported for Kampala in Uganda that high-income households have a monopoly of waste management services due to economic advantage. Inadequate infrastructure such as access roads to slums makes it even more difficult for city authorities to provide solid waste collection services to the urban poor (Kaseva and Mbuligwe 2003). As this study had a focus on households' demand and willingness to pay for improved solid waste collection services, it was difficult to document the challenges that were unique to low- income areas with regards to MSW collection services delivery that was responsible for the difference in the level of access to services.

Despite the challenges, the Malawi Government has a very little commitment towards changing the policy on solid waste management. Mzuzu City Council has continued to be the sole service provider in line with the policies on the environment. With high-level of demand for improved solid waste collection services, it imperative that the government considers changing municipal solid waste management systems to accommodate more private actors to improve the services. In developed countries, private actors provide solid waste collection services as a business to support government improve both coverage and quality of MSW collection services. It is inconceivable that the government is not showing any commitment to change municipal solid waste collection systems despite the fact that climate change is an important global environmental issue.

4.1.3 MSW Collection Services Providers in Mzuzu City

The results show that of the sample population, 87% indicated that Mzuzu City Council provides MSW collection services and 13% did not know. Figure 11 shows the extent of knowledge about the service provider MSW collection services.

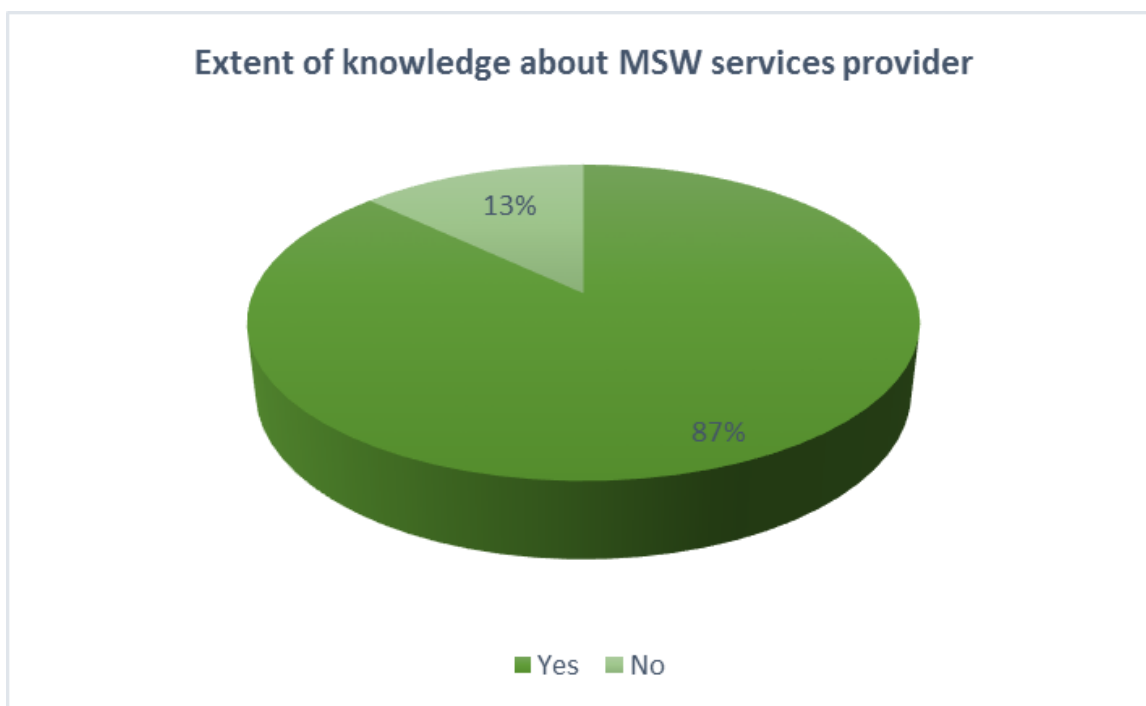


Figure 11: Extent of knowledge about MSW services provider

Even though Mzuzu City Council has failed to deliver on MSW collection services, the results show that the Council has a monopoly on providing solid waste collection service in Mzuzu City. What is more disturbing from these results is that there is still a sect of the population that does not know the service provider for municipal solid waste collection services despite all the efforts the government was making to improve the services. Again, these findings indicate that the majority of households dispose of household waste without advice from the technical people at Mzuzu City Council. On the other hand, these findings reveal how slow the systems in the Malawi Government are to adapt to change. Despite overwhelming evidence from studies that private institutions provide efficient solid waste collection services, the policy has not changed to support private solid waste collection service providers. Contrasting these study results, Bowan (2013) suggests that private sector participation is

a good option where government institutions have failed to deliver as it reduces the overall cost of operating and managing MSW management services. However, Barre (2014) observes that in the city of Lilongwe, private actors participate in providing MSW management services on a very small scale to serve their own purposes and do collaborate with the city council. NCST (2015) confirms this revelation from this study as they report low participation of the private sectors in solid waste collection services for Mzuzu City. Kwarteng (2011) argues that private sector participation improves both coverage and frequency of solid waste management. Results from this study confirm what NCST (2015) had reported that cities in Malawi lack evidence based planning resulting in working on assumptions.

On the sample population, 41% indicated to have known the communal waste disposal site and were concerned about environmental safety and acceptability of the dump site. In addition, 51% and 8% of the sample population indicated not to have known and not sure, respectively, about the location of the communal disposal site. However, only 24% of the sample population indicated not to have been concerned about environmental safety and acceptability of the dump site. In a study on public concerns about and perceptions of solid waste dump sites and selection of sanitary landfill sites in the West Bank, Palestinian territory, it was revealed that 64.9 of the sample population were aware of the potential problems and health hazards associated with the dump-site and 41.6% thought they were suffering from dumps (Abu Hammad, Al-Khatib, Sharkas, & Chikashi, 2015). Again, these results clearly show that there was low awareness about environmental issues in Mzuzu City despite efforts made by the Departments of Environmental Affairs and Environmental Health to raise it. Furthermore, it can be deduced from the study results that residents of Mzuzu City are not consulted when identifying the communal dump site and do not approve of the dump site. Some people have settled within the location of dump-site claiming that city authorities took away their land to establish the site.

In contrast to these results, Owosu (2010) in a study on social effects of poor waste management on the urban poor, in Accra, Ghana, found that the city of Accra was divided into zones and each zone was apportioned to a private company to provide MSW collection services.

4.1.4 Solid Waste Management at Household Level

Of the sample population, 55% indicated that an adult female was responsible for solid waste management. The study results also show that at their households. (not clear) And, 9% of the sample population indicated that either a maid or a garden boy was responsible. The findings also show that 29% of the sample population said that children were responsible for solid waste management at a household level.

Considering the culture in most communities in Malawi, these results are not surprising as solid waste collection, at a household level, is considered a woman's responsibility. These results also suggest that there has been very little change to bring about equality between men and women at household level despite numerous efforts made by the government and international organizations. In relation to the willingness to pay, it can be argued that it will be difficult for households to pay for improved MSW collection services because women, who are most responsible for solid waste management at the household level, do not make decisions regarding household expenses. From the results, it can be argued that residents of Mzuzu City do not value household solid waste management as they do with drinking water supply, electricity, and transport.

Tadesse (2006) reports that most cultures in Africa view solid waste management at a household level as women's responsibility. NSCT (2015) agrees with these findings. In a study on challenges and opportunities in solid waste management in Malawi Cities, NCST (2015) reports that at a household level, 7 in every 10 households, women and children were responsible for managing household waste. This conclusion comes from the fact that households leave household solid waste management to children and house maids or garden boys who are not decision makers at a household level. This study also strongly suggests that at a household level, there is gender imbalance when it comes to household members' participation in waste management. Moreover, it can also be argued that solid waste management is not getting the attention it deserves from city authorities because men are not actively involved. In most cultures in Africa, men hold more power than women. In Malawi, women are traditionally responsible for cleaning the household and the surrounding (UN HABITAT, 2011). NCST (2015) also observes that women and children are mostly responsible for collecting waste to the communal collection points and skip at a household level. Waste collection at household level reflects gender bias towards women and female children. Vitor et al (2013) found

that gender is an important determinant of willingness to pay for improved solid waste management services. When the head of the household is female, there is a likelihood of 2% more than the household will pay for improved MSW collection services (Hagos et al., 2010).

4.1.5 Major Concerns of MCC Staff About MSW Collection Management

The findings of this study show that Mzuzu City Council authorities (90%) are concerned about the lack of recycling, separation, and reuse of solid waste generated in the city. Again, the study establishes that Mzuzu City Council authorities consider indiscriminate disposal of solid waste as a serious environmental sanitation challenge that the city was facing. Some of the toxic solid waste materials city authorities were concerned about included plastics, metals and electronic gadgets. Mzuzu City Council authorities admitted that those toxic materials entered the waste stream with no precaution to avoid adverse effects on public health and the environment. Ramachandra & Saira (2010) argue that if a cathode ray tube is crushed and burnt it emits toxic fumes into the air. Again, Sergio & Tohru (2005) observe that informal recycling activities put women and children at risk as it is usually carried out without protective gear with the help of non-sophisticated machinery. Moreover, NCST (2015) reports that less than 2 percent of MSW generated in Mzuzu City was recycled or reused. Other studies show that recycling and reuse contribute to a reduction in the cost of MSW collection services and reduce environmental contamination (Raghab et al., 2013; Sebastian, 2010; Rajhi & Oloruntoba, 2009).

The second major environmental sanitation concern for Mzuzu City Council authorities was non-existence of a central sewage system. This situation makes it difficult for the City Council to control and regulate the management of wastewater and disposal of human excreta at a household level. Mzuzu City Council did not have the data on wastewater management and maintenance of localized sewage management systems. Lack of data was an indication that the city council did not have control over wastewater management systems in the city as there was no information on which to base a decision regarding wastewater management.

4.2 Willingness to Pay

4.2.1 Willingness to Pay For MSW Collection Services

Presented with three options of improved MSW collection service, 68% of the respondents choose method C where a vehicle would come in the neighborhood on a scheduled basis and provide a door-to-door service. And, 30% of the respondents preferred method B where a large communal container would be placed in their neighborhood. However, instead of services users being required to carry their waste to the communal container, a door-to-door collection would be arranged for an added fee. Again, only 2% of the respondents choose method A where a vehicle would come to the neighborhood on a scheduled basis and park for a few minutes at each block or road junction to collect solid waste. Method C which most respondents preferred is different from the current practice. This can also be seen as a desire for residents of Mzuzu City to introduce changes into MSW collection services with an objective of improving the services. Among the three proposed approaches, method C was the most expensive and residents still preferred it. It could also be argued that this was an indication that that residents in Mzuzu City wanted to be more involved in managing MSW collection services. From the findings, it can also be seen that majority of the sample population did not want to walk long distances to dispose of their household waste as they mostly preferred method C despite the fact that it was the most expensive. This could be the reason behind snubbing method A. which is similar to the traditional system.

As can be seen from Figure 12 below, the results from the study show that 52% of the sample population was willing to pay for improved MSW collection services and 48% of the respondents were not.

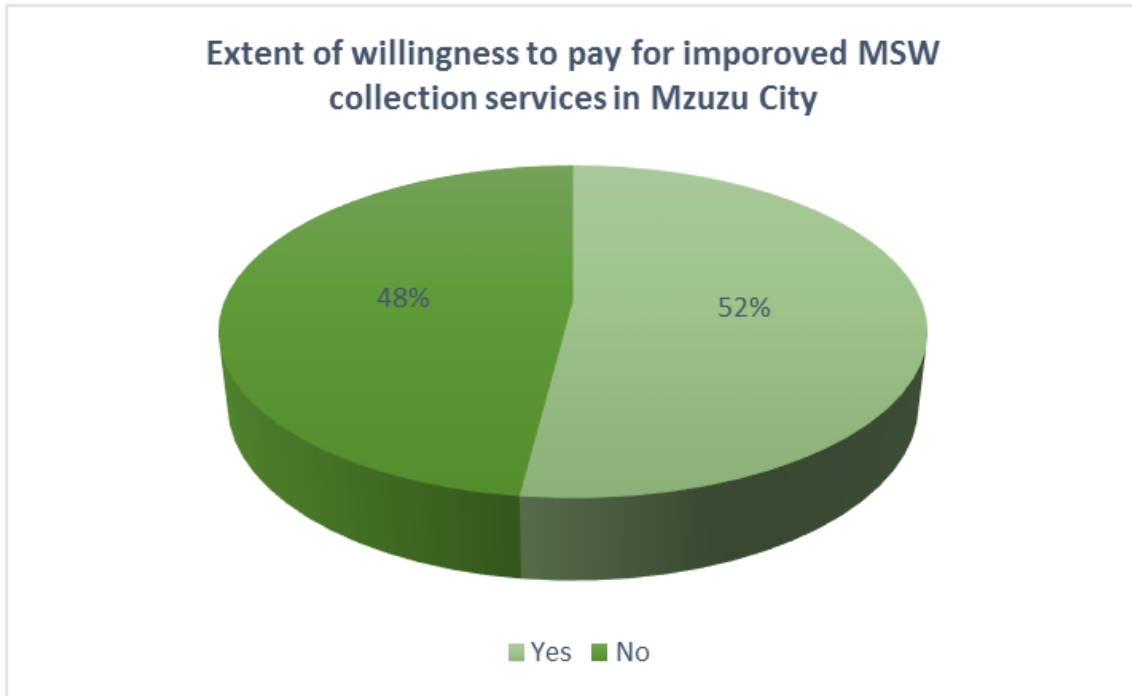


Figure 12: Willingness to pay for improved MSW collection services

Study results showed that almost half of the sample population was not willing to pay for improved services for various reasons. As seen from Figure 13, 32%, 34% 16% and 16% of the respondents who were not willing to pay for improved MSW collection services indicated affordability of the services, belief that existing taxes were enough to cover cost of MSW collection services, belief that extra taxes would not make a difference, and thought that MSW waste collection services are not services deserving to paid for, respectively. These were the major reasons cited for unwillingness to pay for improved solid waste collection services.

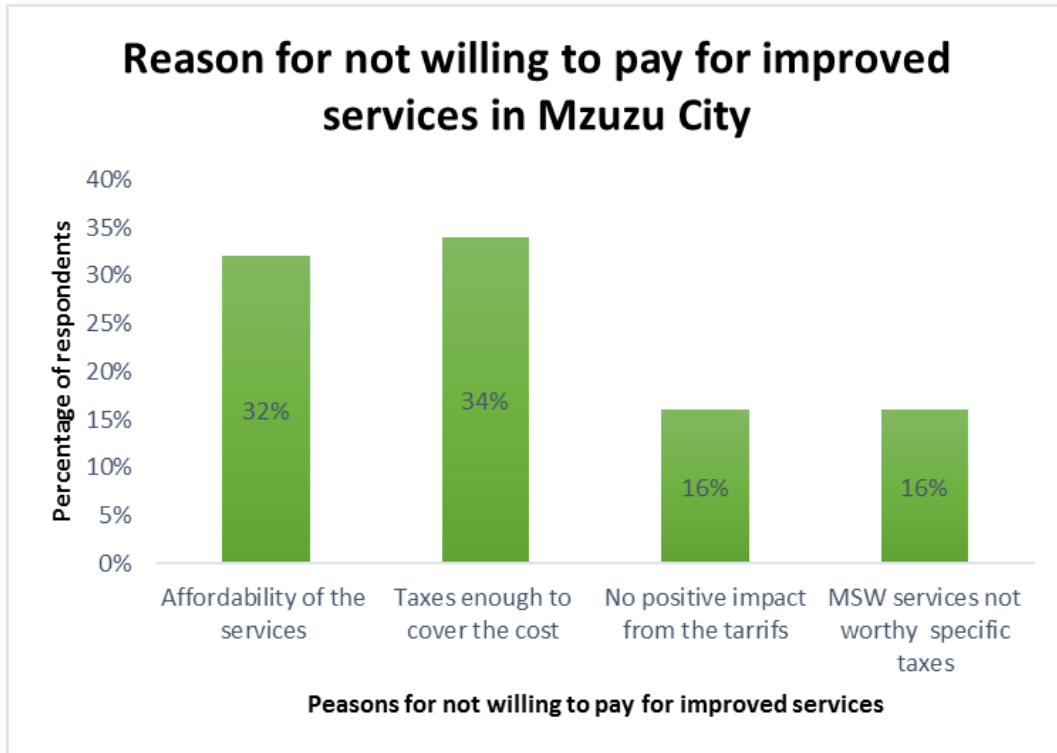


Figure 13: Reasons for not willing to pay for improved MSW collection services

Considering the reasons for unwillingness to pay for improved solid waste collection services, the findings on the level of willingness to pay are not surprising. The reasons cited for unwillingness to pay largely indicate that the respondents do not have trust in the service provider (Mzuzu City Council) to use the resources effectively and prudently. These findings are encouraging considering that with effective education programs on environmental issues and a demonstration of the efficient use of the resources, the level of willingness to pay for improved municipal solid waste collection services would increase by not less than 60%. However, these findings clearly indicate that residents of Mzuzu City have lost trust in Mzuzu City Council on the management of resources for MSW collection services. Cointreau (2004) argues that MSW collection systems in Europe and North America are more efficient and organized due to good governance and strong social accountability. World Bank (2010) found that 31% of city residents in sub-Saharan Africa have lost trust in city authorities to provide effective and efficient MSW management services.

With a standard deviation of K200, the study results show that the mean and the maximum willingness to pay for improved MSW collection services are MWK 1, 800 and MWK 2, 250, respectively. In addition, when asked who they would prefer to manage commercialized solid waste services, the results show that 65% of the respondents preferred Mzuzu City Council and 10% private service providers to provide MSW collection services, respectively. And, 25% of the respondents were not sure on who would provide better services. The study results also show that 71% of the respondents preferred a private institution to collect and manage revenue for commercialized services and only 20% of the respondents preferred Mzuzu City Council while only 9% of the respondents were not sure about who would collect and manage revenue for commercialized MSW collection services.

Earlier studies in sub-Saharan Africa reported even much lower willingness to pay for improved MSW management services. For example, Hagos et al. (2012) found that only 23.3% of the sample population were willing to pay for a study on households' willingness to pay for improved solid waste management services, in Mekelle City, Ethiopia. However, other studies in sub-Saharan Africa seem to agree with the findings from this study. Vitor et al. (2013), in a study on urban Households' Willingness to Pay for Improved Solid Waste Disposal Services in Kumasi Metropolis, Ghana, found that 57% of the sample population was willing to pay. Afroz, Hanaki, and Hasegawa-Kurisu (2009) disagree with what this research reported. Afroz et al. (2009) in a study on willingness to pay for improved solid waste management services observed that low and high-income areas have the same level of willingness to pay. Furthermore, Tadesse (2006) argues that the poor are more willing to pay for improved solid waste management services because effects of poor environmental programs practices affect them more than the rich. Moreover, the study results suggest that if people had good knowledge on the financing of MSW collection services, a higher proportion of people would be willing to pay. According to EPA (2014) States in America used fan education as a community engagement strategy to raise awareness on environmental sustainability. Mzuzu City Council can adapt this approach to educating communities on the financing of environmental sanitation service such as solid waste collection services.

Results from this study suggest that high-income households will pay for MSW collection services. And, low-income households will resist paying for the services. Default rate would be very high in

low- income areas as results show that low-income areas have low willingness to pay for improved solid waste collection services. However, with more civic education on cost sharing for public services, the level of willingness to pay for improved solid waste collection services can increase, creating an opportunity for actors to operate municipal solid waste collection services as a business. Furthermore, if Mzuzu City Council wanted to introduce paid for solid waste collection services, the approach would succeed in high-income areas.

4.3 Determinants of Willingness to Pay

Literature shows that both households’ demographic and socioeconomic factors influence households’ willingness to pay for MSW collection services. Based on the common literature, this section explores factors that could influence willingness to pay for improved MSW collection services in Mzuzu City, Malawi. Some of the factors that are considered as independent variables include age, gender, marital status, and household size, the level of education, household income and concern about environmental degradation. Willingness to pay is the dependent variable for the study. Table 1 explains both independent and dependent variables.

Table 1: Definition of explanatory variables

Variable	Description	Unit Measure	Expected sign
Age	Age of the respondent	Year	-

Gender	Sex of the respondent	Male-1, Female-0	-
Household size	Number of persons staying in the household who are above 18 years of age	Persons	+
Level of education	The number of years the respondent was in school	Year	+
Concern about environmental degradation	Whether one is concerned about the damage caused to the environment due to unsafe disposal of solid waste	Yes=1 and No=0	+
Household income	Average monthly household income	Malawi Kwacha (MWK)	+
Concern about environmental degradation	Awareness about solid waste management and other environmental sanitation issues	Yes=1 and No=0	+
Marital status	The status of the respondent on whether he/she is married or not	Married=1 and otherwise=0	+
Dependent variable			
Willingness to pay for improved MSW collection services	Expressed desire to spend on MSW collection services	Yes=1 and No=0	

Table 2 contains logistic regression model results on interactions between independent variables age, gender, marital status, household size, the level of education, household income, and concern about environmental degradation and dependent variable willingness to pay. Results of the logistic regression equation or model include coefficients, marginal effect coefficients, the level of significance, odd ratios and p-values.

Table 2: Logistic regression equation results

Variable	Coefficient	Marginal Effects coefficients	Significance level	Exp (β)	p (values)
Age	-0.023	0.000	0.301	0.977	0.001
Gender	0.575	0.288	0.288	1.941	0.001
Marital status	0.718	0.644	0.412	0.982	0.891
Access to MSW collection services	0.226	0.006	0.168	1.253	0.007
Concern about environmental degradation	0.651	0.008	0.367	2.101	0.579

Household size	0.017	0.591	0.604	1.120	0.891
Household income	0.010	0.0437*	0.003	1.010	0.578
Level of education	0.041	0.367	0.699	1.042	0.941

Log likelihood	-54.617
Pseudo R ²	0.52134
Observation	96

4.3.1 Age, Gender and Marital Status

The hypothesis for this study was that age, gender, and marital status did not significantly influence willingness to pay for improved MSW collection services in Mzuzu City, Malawi. Studies from other developing countries reported that as one grows in age, WTP for environmental services decreases due to lack of awareness about the concept of cost sharing on public services (Adepoju & Salimonu, 2012). From a study on ‘willingness to pay for improved MSW management services in the Philippines’, Ultra (2013) reported that women cared more about safe disposal of solid waste than men.

Results from the study showed that majority of the sample population (58%) were aged between 25-44 years old. As seen from Figure 13, the results also show that 3% and 28% of the respondents were aged between 18-24 years and 45-64 years, respectively. Furthermore, the results show that only 7% of the respondents were 65 years old and above. These results indicate that the majority of the sample population is still within the active economic development age.

In terms of the marital status of the respondents, the results show that the majority (96%) of respondents were married. However, only 4% were either single or widowed. These results on marital status imply that the majority of the sample population live in family units. In terms of gender, the results from the study show that 55% of the respondents were women and 45% men. Women formed a larger proportion of the sample population as compared to men. Culturally, women are responsible for managing waste at household level in Malawi (Assa, 2014). Therefore, it was important for this study to recruit more women as respondents to understand the level of WTP for improved MSW collection services in Mzuzu City, Malawi.

From the logistic regression model results, age has a negative coefficient of -0.023. The negative coefficient implies that age had a suppressing effect on willingness to pay for improved MSW collection services. The odds ratio of 0.977 implies that an upward movement from one age bracket to another reduces WTP for improved MSW collection services by 0.977 times. Considering the odds ratio and the significance level, it can be concluded that age does not have an effect on willingness to pay for improved MSW collection services in Mzuzu City, Malawi.

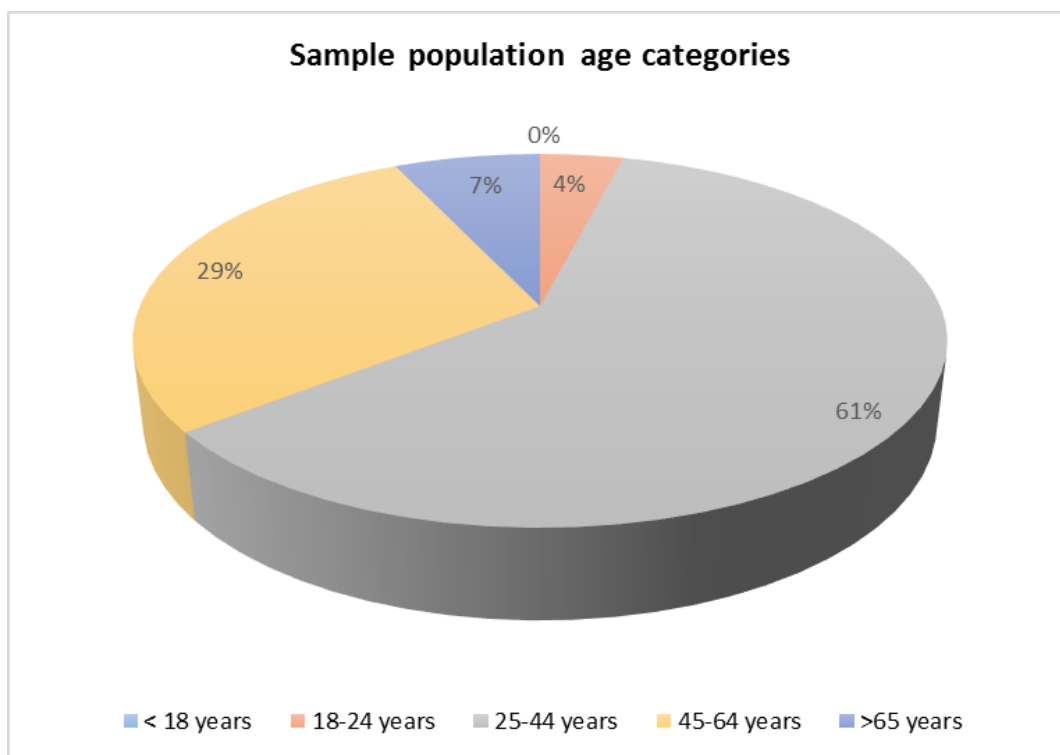


Figure 14: Age categories for the respondents

The results from this study seem to disagree with what was found in other earlier studies in developing countries. Vitor et al. (2013), from a study on ‘Urban households’ willingness to pay for improved solid waste disposal services’ in Kumasi Metropolis, Ghana, found that age was significantly related to WTP for municipal solid waste management services. Niringiye & Omortor (2010) also support what this finding has been contradicted by. In a study on determinants of willingness to pay for solid waste management in Kampala City, Niringiye & Omortor (2010) found a significant relationship between age and WTP for MSW management. The negative relationship between age and WTP from this study does not come as a surprise considering that in Malawi MSW

collection services are free at the household level. However, at the time of the study, Mzuzu City Council was in the process of developing a framework which will guide community awareness on cost sharing from public services including MSW collection services. Considering the fact that the cost of managing solid waste continues to rise, free MSW collection services are not sustainable and will result in an environmental disaster if left unchecked. It could be argued that both young and old have come to understand that free solid waste collection services are not sustainable and, therefore, are willing to support the service provider to deliver efficient service through cost sharing with other service users. In addition, World Bank (2000) criticized past governments, particularly in developing countries, for excluding service users in managing solid waste collection programs.

As seen in Table 2, logistic regression model results show that marital status and gender have positive relationships with WTP for improved MSW collection services in Mzuzu City, Malawi. Marital status and gender, have odds ratios of 0.982 and 1.941 at significant levels of 0.412, 0.288, respectively. Furthermore, results on gender show that female respondents were 1.94 times more willing to pay for improved MSW collection services than their male counterparts. In addition, logistic regression model results show that marital status and gender had marginal effect coefficients of 0.644, 0.288, 0.006, 0.0080, and 0.483 at a p-value of 0.891, 0.001, respectively.

Based on the significance levels and the odds ratios, the null hypothesis that marital status and gender does not have an influence on willingness to pay for improved MSW collection services Mzuzu City is accepted. Marital status has the more weighted positive influence on willingness to pay for improved solid waste collection services than gender. However, the influence is not statistically significant enough to reject the null hypothesis.

The results from the study show that women have less likelihood of willingness to pay for improved MSW collection services than men. In a study on ‘Governance for water and sanitation services in low-income settlements: experiences with partnership-based management in Moreno, Buenos Aires’, Hardy et al. (2012) reported a likelihood of 45% less WTP to pay for solid waste management services for women than men. The argument is that women are less likely to pay for improved MSW collection services than men because they have less power over decisions on household expenses. On the other hand, it could also be said that women have to consult their husbands before making a

decision on whether to pay for improved MSW collection services or not. In the past 10 years, both national and international organizations have made efforts to implement women empowerment initiatives for purpose of gender equality. The result of a relationship between gender and willingness to pay for improved MSW collection services indicate that there has been no progress to empower women. Studies have shown that if not economically empowered, women and girls cannot meaningfully participate in water and sanitation programs (Hairdo et al., 2005). Other earlier studies agree with this line of thought. Findings from a study done by Kwabena and Abbeam (2014) on ‘improving solid waste management services in Dunkwa-on-Offin, Ghana,’ show that female-headed households have more willingness to pay for improved MSW management services than male-headed households did.

4.3.2 Household income, Access to Services and Concern about Environmental Degradation

The hypothesis for this study was that household income, access to MSW collection services and concern about environmental degradation did not influence WTP for improved MSW collection services in Mzuzu City, Malawi. Earlier researchers had reported that household income, access to MSW collection services and concern about environmental degradation influence households’ willingness to pay for improved MSW collection services in urban areas in developing countries (Anjum, 2013; Hagos et al., 2012; Niringiye and Omortor, 2010; Roy and Deb,2013).

As seen from Figure 16, at the time of the study, 37%, 36%, and 8% of the respondents earned between MWK 50, 001-MWK150, 000, MWK150, 001-MWK450, 000, MWK450, 001-MWK 650, 000, respectively. However, 16% of the sample population earn below MWK50, 000. Furthermore, only 3% of the sample population earn above MWK 650, 000. The findings also show that the majority of the sample population (87%) had one income earner at the time of the study. Furthermore, only 13% of sampled population had two income earners where both a man and a woman were earning same income for the household. In addition, 41% of the respondents had employment either in government or in the private sector. Moreover, 6% and 27% were professional consultants offering technical services and skilled or casual labour, respectively, while 21% of the respondents were traders either in manufactured goods or in agriculture commodities.

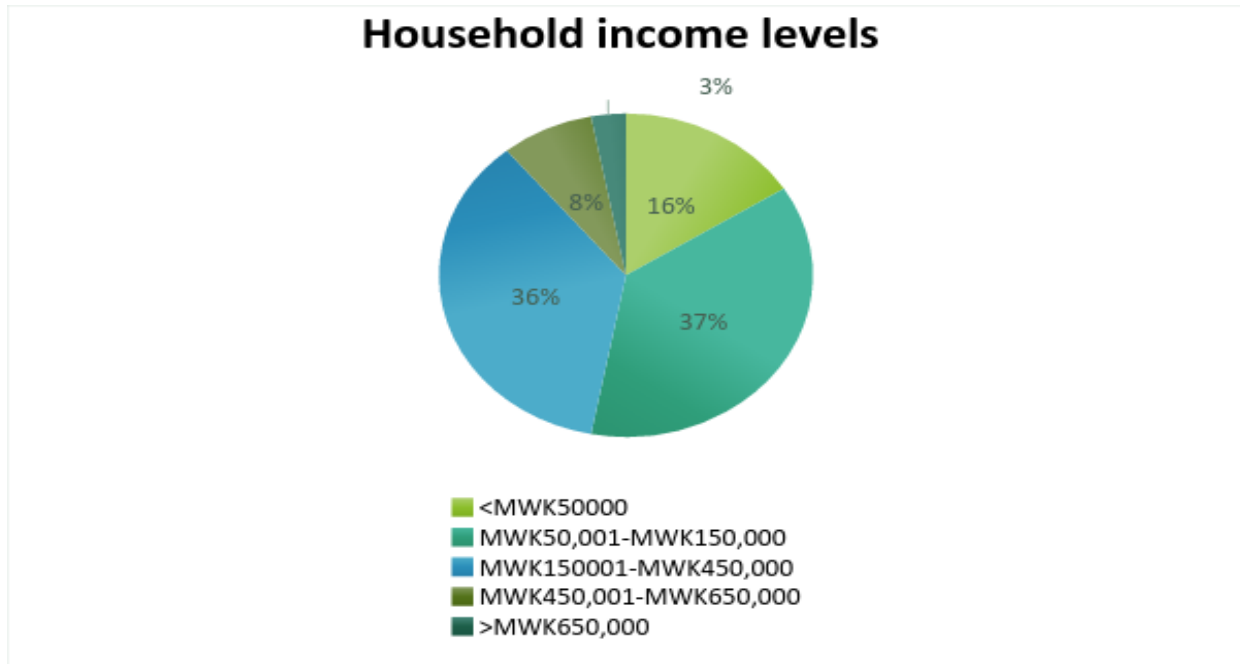


Figure 15: Household income levels

The results from this study also show that the sample population where both a husband and wife earned some income for the household, 98% of them were willing to pay for improved MSW collection services. This finding shows that when women are economically empowered, the likelihood of paying for improved waste management services increases. This finding is not surprising considering that women are traditionally responsible for solid waste collection and disposal at a household level.

As seen in Table 2, logistic regression model results show that household income, access to MSW collection services and concern about environmental degradation has positive relationships with WTP for improved MSW collection services in Mzuzu City, Malawi. Household income, access to MSW collection services and concern about the environmental degradation have odds ratios of 1.010, 1.253 and 2.101 at significant levels of 0.003, 0.168, and 0.326, respectively. The odds ratio for household income of 1.010 implies that both higher income and low-income households have almost the same level of WTP for improved MSW collection services. Logistic regression model results also show that those respondents who were concerned about environmental degradation were 2.1 times more than those who were not. In addition, logistic regression model results show that

household income, access to MSW collection services and concern about environmental degradation have marginal effect coefficients of 0.0437*, 0.006, 0.0080, and 0.483 at a p-value of 0.578, 0.007, and 0.579, respectively.

Based on the significance levels and the odds ratios, the study establishes that household income, access to MSW collection services and concern about environmental degradation does not have the influence on WTP for improved MSW collection services Mzuzu City, Malawi. However, household income has a more weighted positive influence on willingness to pay for improved solid waste collection services than access to MSW collection services and concern about environmental degradation even though it was not statistically significant enough to reject the null hypothesis.

Hagos et al. (2012) found a positive and statistically significant relationship between WTP for improved MSW collection services and access to the services in Mekelle City, Ethiopia. The researcher did not state the level of user satisfaction with the services and it was difficult to determine factors that contributed to the close relationship. In addition, Medina (2002), in a study on 'Globalization, Development, and Municipal Solid Waste Management in Third World Cities', argues that access to efficient and effective MSW services motivate households to participate in the management of the services. On the other hand, Altaf and Deshazo (1996) agree with results from the present study. In a study on 'Household demand for improved solid waste management: A Case Study of Gujranwala, Pakistan', Altaf and Deshazo (1996) found no significant relationship between access to solid waste management services and WTP for improved solid waste management services. In addition, World Bank (2010) counter argues that satisfactory services influence users' willingness to pay. What has revealed from this study agrees with what World Bank (2010) had argued before. Of those who did not have access to solid waste collection services, 11% were willing to pay and 89% were not. In a study on municipal solid waste management: turning waste into resources, Modak (2010) argues that those who were aware of consequences of bad environmental mismanagement are more willing to contribute toward solid waste management than those who are not.

4.3.3 Education and Household Size

Earlier studies had shown that level of education and household size influences willingness to pay for improved MSW collection services (Eshun & Nyarko, 2011). Again, Nkansah, Dafor & Essel-Gaisey (2015) report a positive and statistically significant relationship between WTP for improved MSW collection services and awareness about environmental issues. The hypothesis for this study was that the level of education and household size does not influence willingness to pay for improved MSW collection services.

As seen from Figure 17, 27%, 33 % and 39% of the respondents attended tertiary, secondary and primary education, respectively. Again, only 1 % of the sample population did not have formal education. As further seen from logistic regression model results in Table 2, the level of education and household size have a positive relationship with WTP for improved MSW collection services in Mzuzu City, Malawi and odds ratios of 1.042 and 1.12 at significant levels of 0.699 and 0.712, respectively. On the level of education, logistic regression results mean that for every additional one year a respondent spends in school, the likelihood of the respondent's WTP for improved MSW collection services increases by a factor of 1.038. Furthermore, on household size, results suggest that for every additional person aged >18 years in the household, the likelihood of willingness to pay increases by 1.12 times.

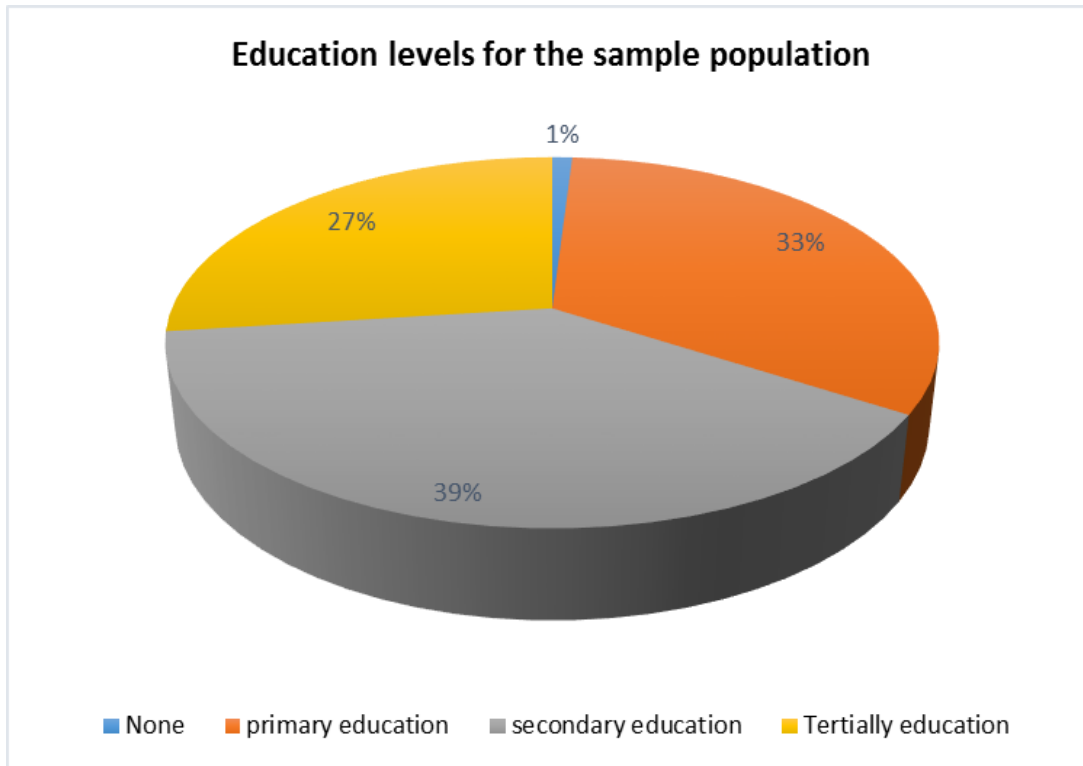


Figure 16: Education level of the sample population

Based on the odds ratio and significance levels, results from the study suggest that level of education and household size significantly influence WTP for improved municipal solid waste collection services in Mzuzu City. Therefore, it can be concluded that level of education and household size can significantly influence WTP for improved MSW collection services in Mzuzu City. Afroz, Hanaki, & Hasegawa-Kurusu (2009) state that population growth is one of the factors influencing solid waste generation rate in urban areas. Earlier authors such as Richardson and Havlicek (1974) and Niringiye and Omortor (2010) report that every additional person (>21 years old) increased household waste generation rate by a factor of 0.51 per day that translated into increased household burden to manage waste. In addition, Fasakin (2000) argues that people appreciate clean environment more when they have more responsibility to manage waste generated because of increased household size.

This study establishes that age, gender, marital status, household income, access to services and concern about environmental degradation can have no influence on WTP for improved MSW collection services in Mzuzu City, Malawi. However, the study reveals that age can have a negative

influence on WTP for improved MSW collection services whereas other factors such as gender, marital status, household income, access to services and concern about environmental degradation can influence WTP positively. On the other hand, the level of education and household size can have a significant influence on WTP for improved MSW collection services in Mzuzu City, Malawi.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This research was set out to evaluate households' demand and willingness to pay for improved solid waste collection services in Mzuzu City. In addition, the study was set out to analyze the determinant of willingness to pay for improved solid waste collection services. The researcher used cross sectional data from a sample of 96 randomly selected households in Mzuzu City. Environmental economic theory, literature and in some cases, intuition guided analysis and interpretation of results.

In addition, the findings also show that 63% of the sampled household view inadequate solid waste collection services as one of the serious environmental sanitation problems in Mzuzu City. The findings from this study strongly suggest that residents in Mzuzu City lack access of MSW collection service. Further, the findings strongly suggest that 1 in every 2 of the sampled households were willing to pay for improved MSW collection services. Some of the major environmental sanitation challenges include inadequate disposal of household wastewater, flooding and inadequate drainage of storm water and presence of litters and illegal piles of solid waste in the streets.

Finally, the logistic regression model results show that age, marital status, gender, concern about environmental degradation, and access to MSW collection services do not influence willingness to pay for improved MSW collection services. More importantly, the findings also show that the level of education and household size can have statistically significant influence on willingness to pay for improved MSW services.

5.2 Recommendations

From the study findings and analysis of results, the recommendation is that a policy framework on MSW management should provide for paid for MSW collection services as free services are not sustainable. Every year as the government fails to provide adequate resources. Even though, the findings show that household income does not have the significant influence on willingness to pay for improved MSW collection services, the findings of this study show higher WTP from high-income areas than lower income areas. Therefore, it can be recommended that paid-for solid waste collection services should start with high- income areas after which it can extend to low- income areas after more education on environmental sanitation issues.

Before embarking on commercialization of waste collection services, Mzuzu City Council has to increase efforts to raise awareness about environmental degradation. Awareness about environmental degradation is an important determinant for willingness to pay for improved solid waste collection services in Mzuzu City. In addition, as Mzuzu City Council lacks activities that promote separation of waste at the source, all kinds of waste are left to be disposed of including electronic waste. Future studies, therefore, should focus on evaluating the management of electronic waste in Mzuzu City. Furthermore, there is a need for further research to understand people's perceptions about the location of the dump site as study results reveal that the majority of the sample population who know the location of the dump site are concerned about the environmental acceptability of the site and strongly feel that it was negatively affecting the environment.

5.3 Suggestions for Further Research

A study on household wastewater treatment and disposal may be necessary as study results strongly suggest that inadequate disposal and treatment of household wastewater is one of the environmental sanitation problems in Mzuzu City. Future studies may focus on wastewater disposal and treatment practices in Mzuzu and the impact on the environment.

On willingness to pay for improved solid waste collection services, the findings of the present study clearly show that female headed households had more willingness to pay for improved MSW collection services than male headed households. Future studies, therefore, may focus on how power imbalances between men and women at household level influence willingness to pay for improved MSW collection services. It may be important to explore the influence of gender on the WTP for improved solid waste collection services in communities where women have been fully empowered to make decisions at a household level. Descriptive statistics results showed that only 7% of the sample population had access MSW collection services.

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ANNEXES

Annex 1-Household Questionnaire

Household and establishment Questionnaire

Introduction-Consent form

My name is..... a student at the University of Malawi-The Polytechnic. For academic purposes, we are doing a study on demand and willingness to pay for improved solid waste management services. Your household or establishment has been randomly included in this survey. For you to participate in this survey, you will answer a set of questions that we have prepared. I expect to take 25-30 minutes of your time today.

All information that you can give will be treated with utmost confidentiality. We will only record your answers and not your name. Your participation in this survey is very important as we hope that the information you give will help Mzuzu City Council improve solid waste collection and disposal services to protect the city and residents from adverse effects of environmental degradation.

Please note that your participation in this survey is voluntary and you are free to stop whenever you want.

Background Information

Date of the interview.....

Name of the interviewer.....

Household/establishment code.....

Ward/location.....

Social Economic factors

1. Size of the household or establishment
2. Number of adults.....
3. Number of children.....
4. Gender of the respondent.....M/F
5. Marital status of the respondent

- a. Single
- b. Married
- c. Divorced
- d. Widowed

6. What is your age?

- a. Below 18
- b. Above 18 to 24
- c. 25 to 44
- d. 55 to 64
- e. Over 65

7. What is your level of education?

- a. None b. Primary school c. Secondary education d. Tertiary qualification

8. (If a household) How many children under 15 years of age are in your household?

.....

9. (If a household) How many people in your household contribute to the household income?..... people

10. (If a household) what is your occupation? Or what is the occupation of the principle income earner in the household?

- a. Self-employed as laborer
- b. Self-employed as trader
- c. Self-employed as consultant or professional
- d. Employee of a private company
- e. Employee of government (public sector)
- f. Retired
- g. Other (Please specify).....
- h. don't know

11. (If an establishment) what is the principle commercial activity of this establishment?

- a. Trading in goods
- b. Trading in produce, meat, poultry or fish
- c. Professional services
- d. Manufacturing, food preparation
- e. Repair, maintenance
- f. Restaurant, café, bar, Inn or Hotel
- g. Bank
- h. Other Please describe

12. Major solid waste management concerns:

For this question, present the list in a different order on a random basis to each respondent) "I would like to show you a list of possible problems that might be faced by your household (or establishment):

- a. Difficult access to drinking water
- b. Poor quality of drinking water

- c. Inadequate disposal of residential wastewater
- d. Inadequate disposal of human excreta
- e. Flooding and inadequate drainage of storm water
- f. Poor access for motor vehicles
- g. Lack of public transport
- h. Unreliable electricity supply
- i. Inadequate solid waste collection services
- j. Presence of litter and illegal piles of solid waste
- k. Nuisance from solid waste transfer points
- l. Nuisance from solid waste disposal sites

13. Of these possible problems, which do you consider the most serious problem for your household (or establishment)? Most serious problem (Write letter – a to l.)

Or don't know

14. And which do you consider the second most serious problem (Write letter – a to

l.) Don't know

(If item (i) was not listed)

15. In your opinion, how serious is the problem of solid waste collection in this area?

- a. Very serious
- b. somewhat serious
- c. not serious
- d. don't know

(If item (j) was not listed)

16. In your opinion, how serious is the problem of littering and illegal piles of solid waste in this area?

- a. Very serious
- b. somewhat serious
- c. not serious
- d. don't know

17. (If item (k) was not listed) In your opinion, how serious is the problem of nuisance from solid waste transfer points in this area?

- a. Very serious
- b. Somewhat serious
- c. Not serious
- d. don't know
- e. (If item (l) was not listed)

18. In your opinion, how serious is the problem of nuisance from solid waste disposal or dumping in this area?

- a. Very serious
- b. Somewhat serious
- c. not serious
- d. don't know

Existing Situation Regarding Solid Waste: “I would like to ask you some questions regarding the collection or removal of solid waste from your household (or establishment).”

19. Does your household (or establishment) have a durable metal or plastic container for storing solid waste?

- a. Yes, we have metal or plastic container
- b. We have basket or carton container
- c. No, we do not have a container
- d. don't know d

20. Does your household (or establishment) receive a collection services of any type?

- a. Yes (Go to Question)
- b. No (Go to Section)
- c. Don't know (Try question)

21. How frequently is your container usually taken out to be emptied?

- a. Several times each day
- b. Daily
- c. Three times a week
- d. Twice a week
- e. Once a week
- f. Less frequently
- g. Don't know

22. Who usually takes the container with its waste contents out to be emptied?
- a. Head of household (or establishment)
 - b. Spouse of head of household (or establishment)
 - c. Another male adult (Please specify)
 - d. Another female adult (Please specify)
 - e. Any male adult
 - f. Any female adult
 - g. Any child between the ages of 6 and 12
 - h. Don't know

23. Where is your container taken to be emptied?
- a. The container is placed beside the road for emptying into a collection vehicle
 - b. The container is emptied into a larger container in the same building
 - c. The container is emptied into a communal container in the neighborhood.
 - d. The container is emptied onto an open pile of waste in the neighborhood.
 - e. The container is emptied at the final disposal, and the waste stays there
 - f. Don't know

24. Approximately how far or how many minutes walking time one-way is it to empty your container?
(If possible the respondent should indicate to the questioner where it is, so that the questioner can later check the distance.)

- a. Meters one-way
- b. Minutes walking one-way.....
- c. don't know

25. If your container is emptied into a larger container in the same building or into a communal container in the neighborhood, how often is that (larger) container emptied?

- a. Daily
- b. Three times a week
- c. Twice a week
- d. Once a week
- e. Less than once a week
- f. Less than once in 2 weeks
- g. Less than once in 3 weeks
- h. Less than once a month
- i. don't know

26. If your container is emptied onto an open pile of waste in the neighborhood, how often is that pile removed?

- a. Daily
- b. Three times a week
- c. Twice a week
- d. Once a week

- e. Less than once a week
- f. Less than once in 2 weeks
- g. Less than once in 3 weeks
- h. Less than once a month
- i. Don't know

27. For how many years has this type of waste collection services been provided to your household (or establishment)?

- a. Less than one year
- b. One to two years
- c. Two to five years
- d. More than five years
- e. Don't know

28. Who collects the waste from the curbside, communal container, or pile?

- a. Local government
- b. Local public authority
- c. Neighborhood group
- d. Private company
- e. Don't know

29. Has the same organization been collecting the waste for the past five years, or has there been a change in who has been collecting your waste?

- a. The same organization for the last five years

- b. There has been a change in the last five years.
- c. Don't know

If there has been a change, please give more details

.....

30. What is your opinion of the services that you are receiving for collection of solid waste from your household (or establishment)?

- a. Very satisfied
- b. Reasonably satisfied
- c. Not satisfied at all
- d. Don't know

31. If you are not satisfied with services, would you state your primary reason?

- a. The services is not reliable
- b. Frequency of services – the interval between collections is too long.
- c. The location of the communal container or pick-up point is unsatisfactory
- d. Lack of clean appearance, odors, flies or fires at the communal container.
- e. The collection workers are rude or impolite.
- f. Lack of clean appearance of the neighborhood
- g. Other problem

Please

explain.....

.....

32. Do you know where the collected waste is taken for final disposal when it leaves your neighborhood?

- a. Yes
- b. Don't know

33. Are you concerned about whether the final disposal is environmentally safe and acceptable?

- a. Yes
- b. Don't know

“Plans are being developed to upgrade the solid waste system in your neighborhood. To understand your preferences, I would like to discuss the options with you. For each of these options, the cost is different. Households and establishments in your neighborhood will be expected to pay a fee for this improved services . The type of services provided will depend on the fee which you and your neighbors can afford and are willing to pay, as well as your preferences.”

34. Demand Assessment:

“Different methods of collecting solid waste have different costs and require different levels of involvement from residents such as you. The vehicles used for collection could be either trucks or tractors, depending on the road conditions in your neighborhood. The main methods of solid waste collection are as follows:

A. Low Cost System

A vehicle would come to the neighborhood on a scheduled basis and park for a few minutes at each block or road junction to collect solid waste. When the vehicle parks, it would ring a bell, sound its horn or play a musical jingle to summon residents to bring their containers out to be emptied. All waste in the neighborhood would be kept inside until the vehicle comes.

B. Medium Cost System

A large communal container would be placed in your neighborhood. However, instead of you and your neighbors being required to carry their waste to the communal container, door-to-door collection would be

arranged for an added fee. The door-to-door collection would be done by a worker using an ox-cart or bicycle, depending on which would work better in your neighborhood.

C. Higher Cost System

A vehicle would come to the neighborhood on a scheduled basis and provide a door-to-door services . At each building, containers of waste, which have been left at the curbside, would be emptied into the vehicle. The emptied containers would be placed neatly at the curb for residents to bring back into their household (or establishment). Residents would be required to adhere to the schedule and bring their waste to the curb in proper containers before the vehicle arrives.”

35. Which of the services options just described do you prefer, giving consideration to the convenience and the cost?

- a. Collection method A(Now go to Question34)
- b. Collection method (Now go to Question 37)
- c. Collection method (Now go to Question 39)
- d. None of the above
- e. Don't know

36. If your preferred collection method (A) were introduced, are there certain times of day when you would find it most convenient to meet the vehicle when it comes to your block to collect waste? (More than one answer may be checked.)

- a. Early morning before 9 a.m.
- b. Anytime in the morning
- c. Anytime in the afternoon
- d. Early evening after 5 p.m.
- e. Anytime during daylight

37. The cost of collection method (A) is 600 MWK per person per month if the collection vehicle comes 2 times per week. For your household (or establishment), which has..... people, the fee would be MWK per month. Would you be willing to pay this fee to cover the cost of the collection services ?

- a. Yes (Now go to Question)
- b. No (Now go to Question)
- c. Don't know (Now go to Question)

38. What is the maximum fee per month that your household (or establishment) would be prepared to pay for the collection method that you have chosen (method A)?

- a. MWK.....per month (Now go to Question)
- b. Won't pay any fee now go to Question
- c. Don't know (Now go to Question)

39. If your preferred collection method (B) were introduced, would you be willing to have the communal container within 20 meters of your house (or establishment)?

- a. Yes
- b. No
- c. Don't know

The cost of collection method (c) is MWK1000 per person per month for collection 2 times per week. For your household (or establishment), which has people, this amounts to per month. Would you be willing to pay this fee to cover the cost of the collection services ?

- a. Yes (Now go to Question)
- b. Don't know - Now go to question E12

40. What is the maximum fee per month that your household (or establishment) would be prepared to pay for the collection method that you have chosen (method c)?

- a. MWK...per month (now go to Question)
- b. Won't pay any fee (Now go to Question)
- c. Don't know (Now go to Question)

41. If your preferred collection method (C) were introduced, what type of containers do you think that you and your neighbors should use for putting out your waste at the curbside?

- a. Metal dustbins
- b. Plastic dustbins
- c. Plastic or nylon bags

42. The cost of collection method (C) is MWK2000 per person per month for collection of your waste from the curbside 3 times per week. For your household (or establishment), which has people, this amounts to MWK per month. Would you be willing to pay this fee to cover the cost of your preferred collection method?

- a. Yes (Now go to Question)
- b. No(Now go to Question)
- c. Don't know (Now go to Question)

43. What is the maximum fee per month that your household (or establishment) would be prepared to pay for the collection method that you have chosen (method C)?

- a. MWK.....per month (now go to Question)
- b. Won't pay any fee (Now go to Question)
- c. Don't know (now go to Question)

44. What is the reason that you are unsure or don't want to pay for a collection services ?

.....
.....
.....

(For those who stated that they are unsure or don't want to pay for the collection services from government, or are not willing to pay the government enough to cover the full cost of services .) Would you be willing to pay the full cost of the collection services if a private company was providing the services and collecting the fee directly from you?

- a. Yes (Now go to Section)
- b. No (Now go to Question)
- c. Don't know (Now go to Section)

45. What is your reason for not being willing to pay a fee to cover the full cost of a waste collection services from the government or a private company?

- a. Can't afford to pay for the full cost-Now go to Question
- b. Don't believe that the services will be reliable (Now go to Question)
- c. Don't consider the services important enough to pay for (Now go to Question)
- d. Believe that general taxes should cover the cost of this services (Now go to Question)
- e. Please explain (Now go to Question)

For those who stated that they would prefer none of the above. Would they explain the solid waste collection method they are thinking of?

46. Explanation of the alternative method.....
.....
.....

47. If you have said that you are willing to pay for a collection services , whom would you prefer to provide the services to you?

- a. The local government
- b. A private company
- c. Either private company or local government difference
- d. Don't know

48. If you have said that you are willing to pay for a collection services , to whom would you prefer to pay the fee?

- a. To a government fee collector
- b. To a fee collector working for a private company
- c. To a neighborhood leader
- d. They are all equally suitable
- e. Don't know

Thank you for your contribution to this survey. We hope to use these results to determine how best to provide affordable and desirable services to the people of Mzuzu City

Annex 2-key informants semi structured questionnaire

1. The Director of planning and development-Mr Chirambo
2. The Mayor or his deputy
3. The head of finance
4. Director of Health
5. The Cleansing Officer

Introduction

My name is Misheck Vwemu an MSc in Infrastructure development and management student at University of Malawi-The Polytechnic. I am doing a research on “demand and willingness to pay for solid waste management system in the city of Mzuzu. For better understanding of solid waste management in Mzuzu, I would like to ask you some questions. To solve problems associated with solid waste management is a collective responsibility and we do recognize that your office is a key player. Our interview may take 15-20 minutes.

Questions

How are you involved in solid waste management in Mzuzu City?

Who are you key stakeholders and how are they involved?

In a month, how many people do you reach with solid waste management services and what is the cost per month per person?

How accurate are estimated cost for solid waste collection and disposal services?

Is there willingness to pay for services at household level?

Is the financing mechanism for solid waste management reliable?

What does the policy say on financing of solid waste management?

If the private sector was involved in solid waste management, how do you rate the risk?
in the city? (Ask for the policy or act)

Are development partners or the private sector willing to provide coordinated support in order to improve solid waste management system of your city?

What is the frequency of solid waste collection? (As for the schedule Collection and disposal systems)

In your opinion do you provide satisfactory solid waste management to the residents of Mzuzu City?

Are there any areas you would like to improve in the way Mzuzu city is managing its solid waste?

How do you ensure quality solid waste management services are provided?

What challenges do you face with solid waste management in Mzuzu City?

In general what is your main concern for Mzuzu City with regards to solid waste management?

Do you collect fees for solid waste collection? If yes, how much do you collect and how? And what the fee structure?

What are your plans for solid waste management in Mzuzu City?

Annex 3: Letter of Introduction



PRINCIPAL
Grant Kululanga, PhD. Eng., MSc. Eng., BSc. Eng., MASCE

Our Ref.: **EB/MZCZ/2016**

Your Ref:

Date: 10th March 2016

MZUZU CITY COUNCIL6
P.O. Box 1
MZUZU

Dear Madam/Sir,

REQUEST FOR PERMISSION TO CONDUCT ACADEMIC RESEARCH

Mr Misheck Vwemu is a Master of Science in Infrastructure Development and Management (MSc.IDM) postgraduate student at the Malawi Polytechnic. As part of the requirements for

Please address all correspondence to the Principal
The Malawi Polytechnic
Private Bag 303
Chichiri
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Tel: (265) 01 870 411
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E-Mail: principal@poly.ac.mw

obtaining the Master's degree, Mr Vwemu is required to submit a dissertation on a relevant research study pertaining to Infrastructure Development and Management.

Ephraim intends to study **“Households’ demand and willingness to pay for improved solid waste management services in Mzuzu City”**. The office of the Dean for the Engineering Faculty in conjunction with the Dean of Postgraduate Studies and Research would, therefore, like to ask for permission for Mr Vwemu to conduct the academic research with your organisation's approval.

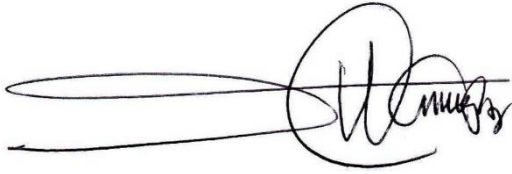
The Purpose of the study is to investigate and analyze issues that impede or or that may facilitate a sustainable management of solid waste in Mzuzu City. Although the results of this study are for academic purposes, an examination of the customer perspectives will provide insights into the existence and extent of gaps relating to solid waste management in Malawian cities. Further, the study will contribute to raising awareness to responsible authorities on how to optimally integrate the attributes of “best practice” in solid waste management within our institutions.

Mr Vwemu intends to meet and source information from a number of stakeholders within Mzuzu City. The Postgraduate Office would therefore like to request that you assist Mr Vwemu accordingly.

Please note that the information provided will be used for education purposes only, unless otherwise authorized by yourselves. Further, although direct quotes may be used in the dissertation, the names of participants will be kept confidential and anonymous. The research (data collection) is expected to be done from 11 – 17 March, 2016.

In case of any clarifications, please do not hesitate to contact the office of Dean – Postgraduate Studies and Research on 01870411, e-mail @ dean-postgraduate@poly.ac.mw.

Your favorable response to this request is highly appreciated.

A handwritten signature in black ink, featuring a large, stylized initial 'U' followed by the name 'Mughogho' in a cursive script.

Ucizi BG Mughogho

Dean Postgraduate Studies and Research