JIMMA UNIVERSITY

COLLEGE OF NATURAL SCIENCE

DEPARTMENT OF BIOLOGY

Status of Municipal Solid Waste Management in Sibo sub-urban and Bure Town, Bure District,Ilu Aba Bora Zone,South West Ethiopia.

By: Ayele Negesse

Advisor: Mulugeta Wakjira (PhD)

A Thesis submitted to school of graduate studies, College of Natural Sciences, Jimma University in partial fulfillment for the requirement of Master of Science degree (Msc) in Biology

February, 2020

Jimma, Ethiopia

JIMMA UNIVERSITY

APPROVAL LETTER

As thesis research advisor, I hereby certify that I have read and evaluated this thesis entitled '**Status of Municipal Solid Waste Management in Sibo sub-urban and Bure Town,Bure District,Ilu Aba Bora Zone,South West Ethiopia** which is prepared under my guidance by Ayele Negesse. I recommend that it be submitted as fulfilling the thesis requirement.

Mulugeta Wakjira (PhD) _____ _____ _____

Major Advisor Signature Date

As a member of the Board of Examiners of the MSc Thesis Open Defense Examination, I certify that I have read and evaluated the Thesis prepared by Ayele Negesse Abi and examined the candidate. I recommend that the thesis be accepted as fulfilling the Thesis requirements for the degree of Master of Science in general biology.

_____ _____ _____

Chairperson Signature Date

_____ _____ _____

Internal Examiner Signature Date

_____ _____ _____

External Examiner Signature Date

Abstract

Waste management is the specific name for the collection, transportation, and removal or recycling and controlling of waste. Environmentally acceptable management of municipal solid waste has become a global challenge due to limited resources, population booming, rapid urbanization and worldwide industrialization. This study was conducted to assess the current municipal solid waste management practices of Sibo sub-urban and Bure towns in south western Ethiopia. Municipal solid waste management in the study area has not been carried out in a sufficient and proper manner. The result of this research had a great importance in improving solid waste management and providing detail information about waste and the effects of waste in the study area. Data was gathered from 137 sampled households. These were reached through stratified sampling method. Observation, questionnaires and interviews were used for collection of primary data. Secondary data was extracted from different published and unpublished materials. The analysis of the data was carried out both qualitatively and quantitatively. Accordingly, descriptive survey research method was used. The result of data analysis showed that plastic wastes were the major type of solid waste in the study area. From the total respondents' majority (84.7%) of them do not have temporary solid waste storage. Most (70.8%) of them did not have the experience of sorting or separates solid waste at their site of generation. Regarding collection services and transportation activities majority (71.5%) of them replied that there is no collection services and transportation activities in the two study areas. Regarding rules and laws related solid waste management; most (58.3%) did not know that there is no solid waste related laws and regulation available in the study area. The greatest amount of solid waste of the study area (66. %) was generated from residential areas. The report from Gondar town (Mohammed.G, 2015) also confirms the same results. The conclusion of the study indicated that the weak financial status of the municipality to provide solid waste storage materials along with low awareness of the community were the series problem that challenges the practice of solid waste management system in study areas. In general, the municipality should involve the stakeholders to fulfill the required conditions for the waste management in the town and engage in awareness creation campaign to enable the people aware of the importance of safe solid waste disposal for their environment and health.

Key words: Bure Town,Community Participation, Sibo sub-urban, Solid Waste Management.

Acknowledgement

Above all, I would like to express my sincere thanks to the Almighty God for his inexpressible gifts and love. I take this opportunity to express my indebtedness to all those who have extended their help to me in getting it ready. To begin with, my sincere appreciation goes to my principal advisor Mulugeta Wakjira(PhD) who have been very understanding, kind enough, and most importantly, very accessible to devote part of his precious time to respond to all my frequent inquiries from the beginning to the end of my study.

Next to this, I will likely to extend my thanks to Jimma university instructors who devotes parts of their precious time in checking and correction of this paper from the beginning of proposal drafts to the end of my full thesis. Lastly, but not the least my thankful be to the residents of the study sites who gave me their precious time to answer the questionnaire.

Content Table of Contents **page**

List of Tables **page**

List of plates

List of Abbreviations and Acronyms

ADB---------- African Development Bank

CPHEEO---------- Central Public Health and Environmental Engineering Organization

FDRE ----------Federal Democratic Republic of Ethiopia

HH----------Households

MOH----------ministry of health

MSE----------micro and small enterprises

MSWM---------- municipal solid waste management

MSW----------municipal solid waste

NEMA----------National Environmental Management Authority

NGO----------Non-Governmental Organization

PCPDSWGR---------- per capita per day solid waste generation Rate

SBD---------- sanitation, beautification department

SWM----------solid waste management

SW----------solid waste

(UK)---------- United Kingdom

UNEP---------- United Nation Environmental Program

USEPA---------- united states environmental protection agency

WHO----------world health organization

WM----------waste management

CHAPTER ONE

1. Introduction

1.1. Background of the Study

Environmentally acceptable management of municipal solid waste has become a global challenge due to limited resources, an exponentially increasing population, rapid urbanization and worldwide industrialization (Chatterjee, 2010).The problem of managing municipal solid wastes is growing day to day, which results into a direct threat to the public health and to the environment (Chatterjee, 2010).

Solid waste disposal and management is both an urban and rural problem. Every person is a potential generator of waste and thus a contributor to this problem. The report from Uganda defines solid waste as organic and inorganic waste materials produced by households, commercial, institutional and industrial activities that have lost value in the sight of the initial user (NEMA, 2007).Without any doubt whenever human beings exist, there will be waste at the same time. A solid waste management (SWM) system includes the generation of waste, storage, collection, transportation, processing and final disposal. Waste is generated by, and from different sectors; domestic, commercial, industry and others and in many instances; the waste management responsibility has been left to the government or administrative authorities. (Schbelerin *et al.,*1996).

Solid waste management (SWM) is one of the critical concerns facing the developing countries because of the social, economic and environmental implications once not properly managed. Studies show that only 30-50% of the waste generated in developing countries is collected and managed properly (Dawit and Alebel, 2003).The rest is either burned or left to decompose in open space or dumped in unregulated landfills, which is damaging the environment. The base of successful planning for a municipal solid waste management system is reliable information about the quantity and type of material being generated. The quantity and type of waste generated determines the decisions for managing them (Tchobanoglous *etal*., 1977).

Solid waste management became a worldwide agenda at united nation conference on environment and development in Riodejieneiro in 1992 with a great emphasis on reducing wastes and maximizing environmentally sound waste reuse and recycling at first step in waste

management (UNEP, 1996). In developed countries, the daily life of people can generate greater quantity of solid waste than developing countries but most parts of developed nations are efficient in handling waste when compared to developing countries because of their technologically complex, institutionally efficient and cost effective solid waste management systems. On the contrary compared to developed countries, developing countries produce less per-capita solid waste (Solomon, 2006). But the capacity of developing countries to collect, process and dispose waste is limited due to inadequate infrastructure, finance, political instability, inefficient institutional capacity and structure, and low level of awareness. For example, about 30% to 50% of the solid waste produced in urban areas of low-income countries as well as poorest parts of middle-income countries is estimated to be left uncollected (Solomon, 2006).Similarly, the current condition of municipal solid waste management service in different towns of Ethiopia is also becoming a challenge for municipalities. For instance, according to Degnet (2003) study of municipal solid waste management practices of 15 regional cities of Ethiopia, a controlled solid waste disposal system was practiced in only two of them. That means small proportions of the urban dwellers are served and a large quantity of solid waste left uncollected. In addition, a study conducted by MOH (1996) and Gebrie (2009) revealed percentage of solid wastes which are left uncollected and disposed anywhere without due attention regarding their consequences in different towns of Ethiopia. In Ethiopia, the increase of solid waste generation resulted from rapid urbanization, and population booming. The average per capita generation rate, a person generates 0.15kg/day solid waste (MOH, 1996).Municipal Solid Waste Management (MSWM) is one of the basic services that are receiving wide attention in many towns of Ethiopia. This is mainly because SW that is generated in most towns of Ethiopia is not appropriately handled and managed (Solomon, 2011).

Waste is distracting the image of the town and is posing serious threats to human health. It is gradually becoming a breeding ground for a disease in the town. The town is gradually manifesting unhealthy condition for human dwelling in some locations. In general, the negative impacts on the environment, human and animal health is increasing from time to time. Therefore, the purpose of this study is to assess Municipal Solid Waste Management Practices of Sibo sub-urban and Bure towns.

1.2. Statement of the Problem

Currently world cities generate about 1.3 billion tons of solid waste per year and this volume is expected to increase to 2.2 billion tones by 2025, more than doubling in lower income countries (UNICEF, 2009).This may affect adverse health population caused by vector borne disease and risk of fire near where household waste is deposited.

Sibo sub-urban and Bure towns are characterized by rapid population growth caused by natural increase (by birth) and migration. Such rapid increase in population together with rapid development of the town has produced increasing volumes of solid waste and in turn, it induces greater infrastructural demand, institutional setup and community participation for its management. However, the town sanitation, and beautification (SB) which runs the solid waste management activities of the study area could not fulfill the above requirements. In addition to this, there are no public solid waste storage containers and roadside dustbins. Because of this condition, the town had highly suffered from shortage of solid waste management infrastructures and consequently faced unmatched burdens of collection, transportation and disposal of solid wastes. These limitations led to deterioration of the town environment and reinforce incorrect disposal habits to the people. Municipal solid waste management in Sibo sub-urban area and Bure town has not been carried out in a sufficient and proper manner. Most of solid wastes that are generated in the town remain uncollected and simply dumped in open areas, roadsides, and gullies.

The environmental and sanitary conditions of the town have become more serious from time to time, and people are suffering from living in such conditions. Therefore, that urgent need of efficient MSWM on one hand and steady growth of solid waste problem on the other side are still the main features of the study area. Detail study of the overall condition of MSWM service should be the first required for reducing this gap. Therefore, the study focuses on examining the status and spatial coverage of municipal solid waste management service of the Sibo sub-urban area and Bure towns and its institutional arrangement and capacity side by side with household solid waste management.

1.3.Objectives of the Study

1.3.1 General Objective

To document the current municipal solid waste management status for improved solid waste management of Sibo sub-urban and Bure towns.

1. 3.2. Specific objectives

- To determine rate and types of wastes generated in the two study areas.
- To determine the condition of households solid waste management practices in the town.
- To determine the status and coverage of MSWM service in the area.
- To identify the present institutional arrangement and WM governance in the study area.
- To identify the community participation and their willingness to pay to manage the waste generated by them.

1.4. Significance of the Study

This study provides basic information to the municipal solid waste managers and environmental protection agencies about existing situation of municipal solid waste management of Sibo sub-urban area and Bure towns. In addition, the documented information will serve as an input for other researchers who are interested to conduct studies on further comprehensive studies either in Sibo sub-urban and Bure towns or in other towns in the vicinities. Therefore, the result of this research had a great importance in improving solid waste management and providing detail information about waste and the effects of waste in the study area.

CHAPTER TWO

2. Literature Review

2.1. The Concept of solid waste and its generation

Waste is defined as any material that is not useful and does not represent any economic value to its owner, the owner being the waste generator (Maria, 2011).This was supported by Mugambwa (2009).Depending on the physical state of waste; wastes are categorized into solid, liquid and gaseous. Solid Wastes are categorized into municipal wastes, hazardous wastes, medical wastes and radioactive wastes.

Managing solid waste generally involves planning, financing, construction and operation of facilities for the collection, transportation, recycling and final disposition of the waste (Maria, 2011). According to UK environmental protection act (1990), waste is any substance which constitutes scrap materials, an effluent or other unwanted surplus arising from application of any substances or article which requires to be disposed of which has broken, worn out, contaminated or otherwise spoiled. Refers to organic and inorganic waste materials produced by households, commercial, institutional and industrial activities that have lost value in the sight of the initial user (NEMA, 2007). In Ethiopia, according to the Federal Democratic Republic of Ethiopia proclamation (FDRE) No.513/2007 Solid Waste Management Proclamation "Solid Waste "means anything that is neither liquid nor gas and is discarded as unwanted.

2.2. Municipal solid waste and its management

Waste management is the specific name for the collection, transportation, and removal or recycling and controlling of waste. Municipal waste materials produced by human activities and these wastes have their own effect on human health and environment. Therefore, to avoid their effect on anyone they should have to be disposed (Unnisa & Rav,2013).Waste consisting of everyday items used and then thrown away, such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries, which comes from homes, schools, hospitals, and businesses centers(USEPA,2013). Municipal solid waste management is an activity of planning and implementation of solid waste management components such as collection, transfer and transportation, recycling, resource recovery, and disposal of MSW under jurisdiction of local government.

Municipal solid waste management should therefore focus on administrative, financial, legal, planning, and processing of functions that lead to finding solutions to all problems of solid wastes (Tchobanoglous *etal*, 1993).

2.3. Historical Origins of Solid Waste Management

Humans have been mass-producing solid waste since they first formed non-nomadic societies around 10,000 BC (Worrell and Vesilind, 2012; cited in Zerihun, 2018). Small communities managed to bury solid waste just outside their settlements or dispose of it in nearby rivers or water bodies,but as population densities increased, these practices no longer prevented the spread of foul odors or disease (Seadon, 2006; cited in Zerihun, 2018). As waste accumulated in these growing communities, people simply lived amongst the filth (waste).The Greeks had both issued a decree banning waste disposal in the streets and organized the Western world's first acknowledged 'municipal dumps' by 500 BC (Melosi,1981;cited in Zerihun,2018);and Chinese cities had disposal police responsible for enforcing disposal laws by 200 BC. In both Athens and Rome, waste was only relocated well outside city boundaries when defenses were threatened because opponents could scale up the refuse piles and over the city walls (Worrell and Vesilind, 2012;cited in Zerihun,2018). Indeed, the Black Death, which struck Europe in the early 1300s, may have been partially caused by the littering of organic wastes in the streets (Louis, 2004; Tchobanoglous*et al*., 1977; Worrell and Vesilind, 2012; cited in Zerihun, 2018).In America, the urban population lived in similar putrid conditions (Melosi, 1981; cited in Zerihun, 2018). Many initiatives were implemented to clean up the streets, but all were short-lived because the poor were focused feeding themselves and the rich were opposed to paying to clean up for the poor (Wilson, 2007; cited in Zerihun, 2018). However, scarcity of resources ensured many items were repaired and reused, and the waste stream was thoroughly scavenged (Woodward, 1985; cited in Zerihun, 2018). When SWM progress finally began, it was driven by five principal factors: public health, the environment, resource scarcity and the value of waste, climate change, and public awareness and participation.

2.4 Sources and types of municipal solid wastes

Waste can be generated by human beings in any areas of life; like in food processing, health centers, industrial areas and schools. Without any doubt whenever human beings exist, there will be waste at the same time. The industrial and technological enhancement of people´s life is

complicating the types and effects of waste (Jayarama, 2011).Types of wastes can be defined in many ways but according to (Wondafrash, 2017) they can be summarized as follows.

2.4.1. Municipal Solid Waste (MSW)

These kinds of wastes can be generated by everyday activities of households, schools, hotels, businesses center and institutions. These wastes are collected and treated by municipalities; hence, called municipal solid wastes. Much of these wastes include unwanted and useless materials includes street clean-up (plastic, metals, packaging, bottles and others), leaves, food waste, agricultural, commercial, construction and office supplies(Charlotte, 2009).

2.4.2 Construction and demolition waste

Construction and demolition debris and yard wastes are not generally included in the MSW generation rate per capita since: they are highly variable and skew quantity assessments and in addition, they usually require less or no disposal standards that are difficult to meet in comparison with those for other types of SW. These may include wood, steel concrete, stones among other construction materials (World Bank, 1999, 2005 and 2006).

2.4.3 Hazardous Waste

A type of waste, which is toxic or poisonous to human health or the environment and will cause death and serious health conditions, is called hazardous waste. These wastes can be in the form of solid, liquid or gases and generated from chemical productions, hospitals, industrial manufacturing, and even there are household hazardous wastes as well. They include batteries, oils, antifreezes, insect sprays and cleaners, which contain large quantities of toxic ingredients (Jayarama, 2011).

2.4.4 Industrial Waste

After the industrial revolution, the increase in industrial manufacturing is been showing improvements. Because of this increasing number of manufacturing industries like thermal power plants, paper producing industries, sugar companies, automotive companies, electronic companies, high-tech companies and raw materials manufacturing industries; the risk of being affected by their disposal is increasing too fast. Weather the company is a low-tech, middle-tech or high-tech, there is waste generated from any production stage (Jayarama, 2011).

2.4.5 Electronic waste

The electronic waste is being used for unwanted electronic materials that are not giving service for the user and needs to be disposed. The materials can be computers, laptops, mobile phones, CD and DVD players and other electronic materials. Because of worldwide technological and industrial advancements, the number of electrical wastes increasing rapidly (Jayarama, 2011).

2.4.6. Medical waste

Medical waste, also known as clinical waste, normally refers to waste products that are produced from healthcare premises such as hospitals, clinics, doctors' offices, labs and nursing homes (Charlotte, 2012). All types of wastes that are generated from any healthcare facilities such as hospitals, primary health-care centers, burn patient units, veterinary hospitals/clinics, blood banks and medical examination and testing areas are considered as medical wastes (WHO, 2016).

2.5. Effects of poorly managed wastes

Poor waste management starts from the very beginning of unorganized waste collection system to the poor disposal practices. If wastes are not disposed properly, there might be an everlasting environmental, health and economic effect. If waste is managed accurately it can be part of the economy because most of the time, it is the consequence of economic growth. Global warming, ozone layer depletion, acidic rain and bad smelling of the city can be considered as the results of awkward waste management (Jayarama, 2011).

2.5.1 Health effects of waste

Improper handling of solid waste and indiscriminate disposal in open spaces, road margins, and tank beds give rise to numerous potential risks to human health. Direct health risks mainly concern those working in the field without using proper gloves, and uniforms, a high percentage of waste workers and individuals who live near or on disposal sites are infected with gastrointestinal parasites, worms, and related organisms(CPHEEO,2000).

2.5.2 Environmental and economic effects

Wastes that carelessly disposed and end up everywhere can poison and contaminate the entire world. These contaminations can be surface water contamination, soil contamination, air and water pollution and global warming. Open dumps can seriously damage the environment. Chemicals that are found in trash can run away into soil and water and these chemicals will

damage plants and fish living in lakes. Besides environmental and health effects, waste has economic effects too. If a town/city is not clean, fresh and healthy anyone won´t be eager to live there. There are costs related to waste including collection, transportation, disposal, separation and treatment. A town/city with so much bad smell and uncontrolled wastes can´t attract business investors, tourists and even locals. Because of these reasons, the area will not show good economical improvements (Charlotte, 2009).

2.6. Solid Waste Management in Developed Countries

The problem of solid waste especially MSW in the industrialized countries has been the cause of growing concern in recent years, becoming one of the main areas of the environmental policy debate. But now, because of the growth in waste volumes, the environmental consequences of past disposal practices, there is raised concerns about the economic viability and environmental acceptability of the current waste-disposal methodologies. In Europe, the growth has been in recycling more than in energy recovery, but in the United States, both have grown at the expense of landfill. The U.S. EPA projects that material recovery was more than double again in the 1990s, accounting for 30% of total waste management in the 2000. Energy recovery grow to 21%, leaving only 49% of municipal waste for land disposal (Mohammad, 2015)

2.7. Waste Practices in African Municipalities

Waste management varies from country to country in Africa. For example, in the eastern part of the continent, environmental policymaking remains largely a function of the central government, but implementation of policies and the local governments handle legislations. This form of managing waste further support and accelerate the concept of decentralization which means that responsibilities for performing public services are shifted from the central government to lower authorities or even to private sectors(Robertson W, 2002).The rapid extent and nature of urbanization in developing countries made MSWM as a major issue of concern in those countries. “In the next 35 years, the urban population of world is expected to be double to more than five billion people, and from this 90% of growth is taking place in developing countries”(Ahmed and Ali, 2002). Because of this, the existing MSWM of developing countries fail to catch up with the rapid increase of solid waste production in these countries.

In poor suburban zones indiscriminate disposal of solid waste at riversides, roadsides, and other open spaces are common (Gebrie, 2009).The operational inefficiency of MSWM in developing countries is also further reflected in resource recovery. Although the material recovery from the waste stream has a great potential in economic as well as environmental point of view, municipality and formal private sector contribution in this activities is minimum. Besides this, waste disposal is also a neglected area in many low-income countries and causes for environmental health hazards. These dumps make very uneconomical use of the available space, allow free access to waste pickers, animals and flies and often produce unpleasant and hazardous smoke from slow-burning fires (Zurbrugg, 2003).

2.8. Municipal Solid Waste Management in Ethiopia

Municipal solid waste management (MSWM) is one of the basic services that are currently receiving wide attention in many towns of Ethiopia. This is mainly because SW that is generated in most towns of Ethiopia is not appropriately handled and managed (Solomon, 2011).According to Abebe et.al (2009), Ethiopia is still struggling to deal with the problem of proper management of solid wastes. With the current rate of urbanization municipal solid waste collection, transportation and disposal have been a major problem of municipalities in most of the Ethiopian cities. Collection of municipal solid waste in most of the cities is difficult and complex because the generation of residential, commercial and industrial waste is a diffuse process that takes place in every house, every building and every commercial and industrial facility as well as in the streets, parks and even in the vacant areas available within the community. In addition to this, as stated by (Abebe etal., 2009), many cities face problems such as lack of manpower and equipment and financial constraints.

2.9.History of solid waste management in Sibo sub-urban and Bure towns.

Even though solid waste management is a current issue and worldwide agenda, which causes a negative health and environmental impacts, no research has been done before and there is no documented data regarding waste and waste management in the two study areas.

2.10. Characteristics of Municipal Solid Waste

For effective and efficient management of solid waste generated in a particular area, adequate knowledge and data about the characteristics of solid waste is essential. In order to decide or

determine types of facilities required for solid waste management, best disposal options, and projecting future needs requires precise information about quantities, and compositions of solid waste produced in a an area.

2.10.1 Solid waste generation rate

Solid waste generation varies between different countries, cities and municipalities in Africa. It is hard to get waste generation statistics in quantities and composition for all the countries in the region Achankeng (2003).The rate of solid waste generated in a given town is determined by demographic growth, seasonal variation, geographic location, economic development and people's attitude towards waste. The situation is different in the majority of the African nation where the waste collection and disposable systems are performing poorly. However, a few countries including Morocco, Namibia and Zimbabwe show better collection rates ranging from 90-100% efficiency. Different areas and places have different waste generation capacities. The population and economic factors play an important role for waste generated. Achankegn (2003) estimates the generation rate of MSW in major African cities to range from 0.3 to 1.4kg per capita per day. The average for Africa is about 0.78 and that of the developed countries to be 1.22kg per capita. Daily Solid waste generation rate (DSWGR) of the town as well as per capita per day solid waste generation Rate at household level can be calculated as follows.

$$\text{PCPDSWGR} = \frac{\text{Total Solid Waste generation within 7 days(kg)}}{\text{7 days x total family size of total population survey households}}$$

Adopted from: Melaku.T (2008). Addis Ababa, Ethiopia.

Table 1.Ethiopian municipalities and waste generation rate, 2010.

City	Region	Population	Municipal solid waste generation	Municipal solid waste collection
Addis ababa	Addis Ababa	2,979,100	1,132 tons/day	70% collected
Mekelle	Tigray	261,200	78 tons/day	82% collected
Diredawa	DiraDawa	256,800	77 tons/day	48% collected
Jimma	Oromia	120,960	87 tons/day	30% collected
Adama	Oromia	260,600	59 tons/day	48% collected
Bahirdar	Amhara	170,300	98.8 tons/day	58% collected
Awasa	Snnp	200,400 46	46 tons/day	44% collected
Harer	Harari	108,200	32 tons/day	45% collected

Source: CSA; http://www.imedpub.com/resources-recycling-and-waste-management/

2.10.2 Physical Composition

The quantity of various material types in a particular waste stream is called waste composition. Physical composition of solid waste extremely variable because of different factors. The major once are of the following: a) Economic level difference: higher income areas are usually produce more inorganic waste while low income areas produce relatively more organic waste. b) Demography .c) Locations: includes abundance and type of regions natural resource, and socio-cultural factors, which highly contribute for variation of waste in different areas.

Table 2.Physical Composition of Solid Waste

s/n	Constituent	Percent (%)
1	Vegetables	1.93
2	Paper	2.90
3	Rubber	0.19
4	Leather	0.41
5	Wood	2.89
6	Plastic	1.58
7	Textile	1.39
8	Ferrous metals	0.69
9	Aluminum	0.0
10	Glass	0.79
11	Combustible (leaves, grass, etc.)	26.26
12	Non-combustible (sand, grit, soil, etc.)	26.26
13	Soil/Fines 10 mm	30.82
14	Fines 55 but 10mm	25.87
15	Total	100

Source: Waste generation in Addis Ababa city (global methane.org, 2011)

2.11. Solid Waste Collection and Transport

Waste collection activities in African municipalities differ from the utilization of human and animal drawn carts such as wheelbarrows and pushcarts to trucks and trailers. However, not all generated waste is collected. The rate of waste collection across the continent varies from 20 to 80% (African Development Bank, 2002).

This is because it is only a few areas in the municipalities that can easily be reached when for example trucks and trailers are to be used. This is because most of the streets have not been designed to allow such collection vehicles to pass. Some streets are narrow, unpaved or sloping and slippery during the rain seasons. In such areas, the volume of waste increases and is rarely collected. In Kampala Uganda, for example, approximately more than 80% of the population does not obtain the benefits of the regular collection of household wastes.

2.12. Waste management practices

Several factors facilitate the increase in the volume of solid waste generated. One of the factors that have led to increase solid waste generation is rapid urbanization (UNEP, 2007). Urbanization comes with expansion of towns, which manifests through the growth of social and economic infrastructure/services and industrialization. The growth in such services warrants the increase in population in such areas. An increased population automatically means increased demand for not only social services but also consumables, which potentially present a larger base for waste generation in most cases solid waste. The manufactured products contain materials, which are very difficult to decompose, for example plastics, thus increasing waste volumes uncontrollably (Bournay, 2006).

2.13. Functional Elements of Municipal Solid Waste Management

In the course of municipal solid waste management, there are six functional elements.

2.13.1 On- Site Handling, Storage and Processing

This functional element constitutes activities associated with handling, storage, and processing of solid wastes at point of generation. Onsite waste handling refers to the activities related to the handling of solid wastes until they are placed in the containers used for their storage before collection. Depending on the type of collection service, handling may be required to move the loaded containers to the collection point and to return the empty containers to the collection point

where they are stored between collections (Tchobanglous *etal*., 1993). Factors that must be considered in the onsite storage of solid wastes include type of container, container location, collection methods, and frequency of cleaning houses. Onsite storage is of primary importance of the aesthetic consideration, public health and economic involved. Unsightly containers and even open ground containers are undesirable and often seen in residential areas (Tchobanglous *eta*l., 1977).

2.13.2Waste Collection

Collection involves the process of picking up of wastes from collection points, loading them in to vehicle, and transporting it to processing facilities, transfer stations or disposal site. In most a municipal solid waste management systems, cost of collection accounts a significant portion of total cost. For instance, in industrialized countries collection accounts about 60-70% of total cost, and 70-90% in developing and transition countries (UNEP, 1996). Collection is structurally similar in developing, transition, and industrialized countries, but there are important technical and institutional differences in implementation. In most cases, industrialized countries have more efficiency and effectiveness than developing ones in terms of their approach of collection, role of municipal governments, private-sector participation, and demographic and social factors relevant to collection. In developing countries, collection often involves a face-to-face transaction between generator and collector. The level of service is low, and generators often have to bring their wastes long distances and place it in containers. As a result, many collection activities in developing countries carried out by informal sectors (UNEP, 1996). In general, there are four basic methods of collection described by (Tchobanolous, *et al.*, 1993).

i. Community bin- they are placed in convenient locations where community members carry waste and throw it in. This method is comparatively cheaper than other methods, and most widely adopted method in western countries. For this method to be adopted it is important that bins are covered, aesthetic, attended regularly, kept clean, easy to handle, and separate bins are provided.

ii. Curbside collection – homeowner is responsible for placing containers to be emptied at the curb on collection day and for returning empty containers to their storage location until the next collection.

iii. Block collection- collection vehicles arrive at a particular place or a set day and time to collect waste from households. Households bring their waste containers and empty directly into the vehicle. This method requires a higher homeowner cooperation and scheduled service for homeowner collaboration.

iv. Door to door collection- waste is placed at doorstep at a set time when waste collector arrives. In this method, collector of waste has the responsibility to collect waste separately. This method is very convenient for households, however requires homeowner cooperation.

2.13.3 Waste Sorting

Sorting is an essential component of solid waste management. It is a kind of activity, which is separating different types of wastes in their respective nature. It makes waste management easy and simple. However, it should not be a onetime activity, rather should be a habit for proper and sustainable solid waste management. Separating different types of waste components helps to sort recyclable materials from non-recyclable and identify decomposable (organic) materials from non-decomposable. The process is also efficient in reducing the problem of landfill sites and expenses. Other materials such as wood, bricks, iron sheets, sand, heavy metals, tree branches and grass are disposed in big containers called '*skips*' found in the residential areas (Raili, 2009).

2.13.4 Waste Composting

With regard to composting, the households practicing composting are very few, while a significant amount of this refuse is largely of plant origin /biodegradable/ organic waste (Gardner, 2001) and (Bezaye, 2008), argued that composting is an ancient practice where more cities in the world nowadays are reclaiming the benefits of reusing solid organic waste material. It is a natural way to prepare the waste for reuse.

2.13.5 Waste reuse

Reuse is using an object or material again, either for the same original purpose or for a similar purpose without significantly altering the physical form of that material. In this way, reuse in all spheres prevents objects and materials from becoming waste and can be considered as a waste prevention mechanism. Reuse is an important factor to reduce the amount of waste to be dumped at the final disposal site. In general, as far as waste reuse is concerned, there is no formal practice

in the town except some people move through the city to buy recyclable items such as glass, plastic, tin cans, metals, shoes etc. from different houses, hotels, restaurants, and repairs services and sell them to small recyclers and industries. There are also people engaged in similar types of job known locally as"*Liwach*" who go around the town and exchange used clothes and shoes with new household utensils and sell them to low-income people.

2.13.6 Waste Recycling

Recycling is a process whereby discarded products and materials are reclaimed or recovered, refined or reprocessed and converted into new or different products.

2.13.7 Waste Disposal

This is final functional element in solid waste management system. Disposal activities are associated with final dump of solid wastes directly to a landfill site. Today disposal of wastes by land filling or land spreading is the ultimate fate of all solid wastes whether they are residential wastes, or residual materials from materials recovery facilities. Though it is the most common technology around the world, conventional and environmental unfriendly methods such as open-burning, open-dumping, and non-sanitary landfill can still be used as disposal method (UNEP, 2009).

2.14. Disposal Systems

Waste disposal is the final and unavoidable step in waste management. In most of the urban areas, majority of the waste goes through the municipal waste collection service. This waste has to be transported to disposal sites. There are two main methods of waste disposal, namely, land application (land filling) and incineration (Hoornweg & Bhada, 2012). Incineration can also be categorized into uncontrolled (open) burning and controlled burning.

CHAPTER THREE

3. Materials and Method

3.1 Description of the Study Area

This study was conducted in Sibo and Bure towns, at Bure Woreda,Ilu Aba Bora Zone,South west Ethiopia. Bure Woreda is located on 114 km from Mettu zonal capital, 687 km from Finfine and 96 km from Gambella regional state. The altitudes of the district are ranges from 880 meter to 1650 meter above Sea Level. The highest altitude covers the central, Northern parts and the lowest altitude covers around the southern parts and lies between 5°35’ and 5°63’N latitude and 38°15’ and 38°25’ longitude.

3.1.1 Map of the study area

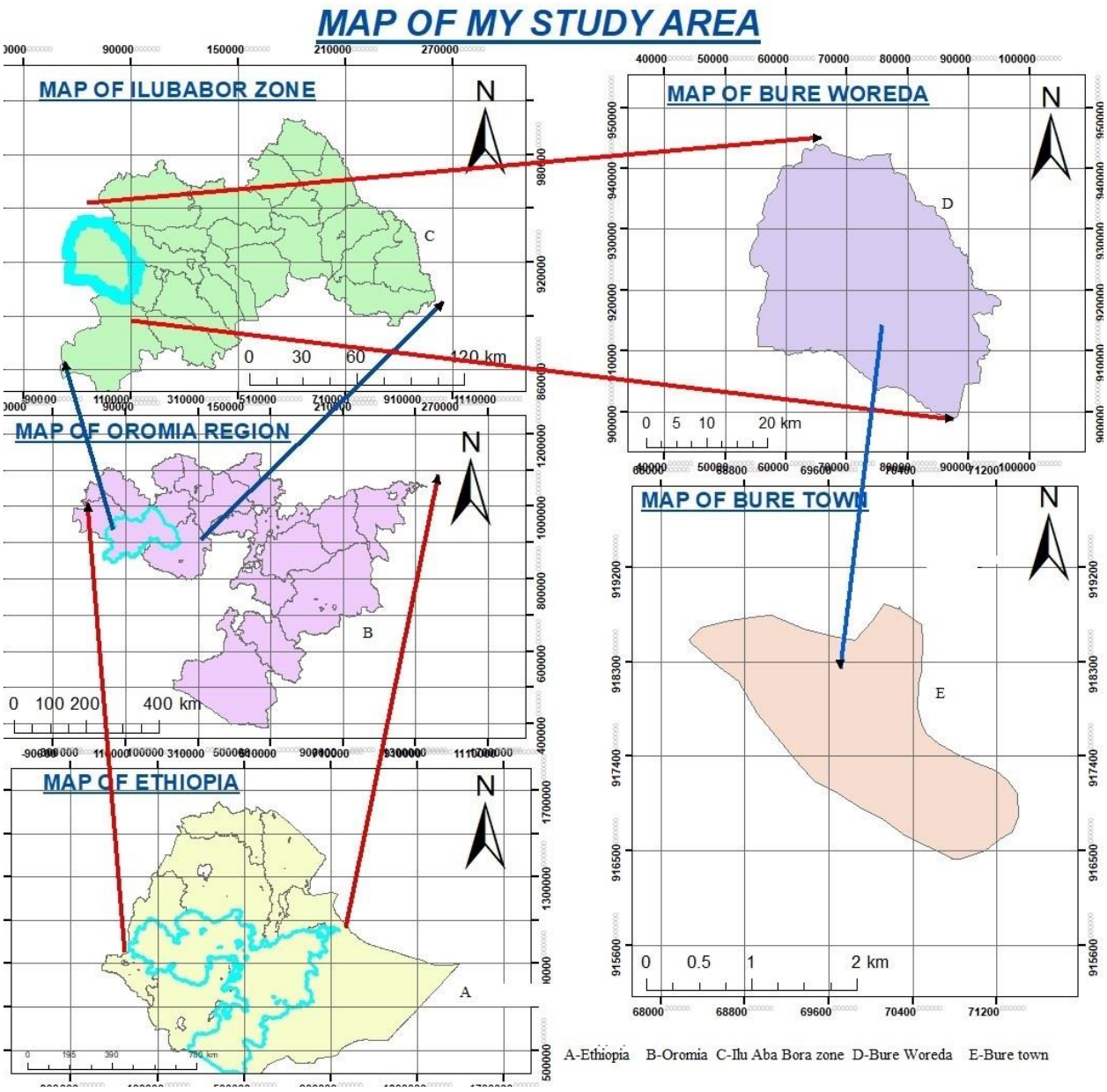

Plate 1.Map of the study area (source: GIS)

3.1.2 Climate

Bure woreda receives its maximum rainfall that ranges up to 1828mm during summer season (June, July and August).The district falls under two agro-climatic zones; mid-land (badda daree)-which cover about 47.4% total land and low land (Gammojjii) that accounts 52.6%. The agro-climatic temperature of the district mean annual temperature ranges 27 ^{0}c.

3.1.3. Economic activities

The major economic activity of the study area like other rural areas of Ethiopia is agriculture particularly mixed farming (rearing of animals and growing of crops). The most widely cultivated crops in the study area include coffee, khat, different spices, sorghum, and corn seed (maize) Similar to many parts of Ethiopia, the study area is gifted with significant number of domestic animals such as cattle, sheep, goats, horses, donkeys and poultry.

3.1.4 Population size

The population in the study area is alarmingly increasing. Bure town had a total population of 10451 and Sibo, (sub-urban area) had a total population of 6010 based on the reports from 2007 national census. Based on this data the study area had 8799 male and 7662 female, totally 16461 total populations.

3.2 Research Design

The research design in the study was descriptive survey method (Shield *et al*., 2013 cited in Zerihun.A,2018). Because, it was more appropriate to describe the existing situation of MSWM service of Sibo sub-urban and Bure towns by direct observation method and through grasping people and officials' responses, opinions, and perceptions about MSWM. This survey method was helpful for the researcher to describe and obtain relevant and various forms of data concerning the current states of the problems of the study area as well as in cooperating human experiences from several dimensions and could provide a bigger overview as compared to other forms of research designs. In this study, a mixed method approach (Quantitative and Qualitative) was used. The advantage of employing these techniques was to get quantitative data such as socioeconomic characteristics of the households' and investigate the household solid waste generation rate and composition and its management in Sibo sub-urban areas and Bure towns.

3.3 Sources of Data

A relevant and useful data was collected from different sectors of Sibo sub-urban and Bure towns: including health facilities, dumping areas, school, restaurants and hotels, disposed on street, households, and shops. The data was gathered using stratified sampling method. The data for this research was obtained from both primary and secondary sources. The primary source of data was collected through questionnaire, interview and direct observation. Questionnaires(both open and close ended) was held mainly for households to assess their disposal system, their

attitude and awareness towards waste generation and proper management, to identify types of wastes they produce and to identify the causes of SWM problem that they are facing. Secondary data were collected from different sources such as Journal articles, books, and web sites. A key informant interview with municipality officials, waste collector, and elders were also a source of data. It was designed to assess the current SWM system of the town, their contribution, to identify the factors that hinder them to make the town clean and to know the history ofSWM service system in the study area.

3.4. Data Collection Instruments/Tools

In order to collect the appropriate data for this research the following data collection instruments was employed.

3.4.1. Observation

The researcher was used to observe the research area what is going on the real environmental setting and record all the necessary information from the field.

3.4.2. Questionnaire

Both close and open-ended questions were prepared to obtain data from the selected residents of the towns in the study area. It was used this method because it helps to collect data simultaneously from the total population and it takes short period to carry out.

3.4.3. Interview

Interview is another instrument for data collection. It was used structured interview to obtain data from concerned bodies working on the two-study area administrator's because it helps to collect clear, qualified and detail data from the interviewee.

3.5. Data Collection Procedures

The prepared questionnaires were distributed to the principal residents with the necessary instruction. In addition, it was asked interview town's administrative bodies.

3.6 Methods of data Collection

For gathering primary data researcher employs questionnaires, interviews, and field observations. With regard to questionnaires, there are two types of questionnaires (both open and close ended) which was prepared in order to look the MSWM practices and capacities of the

town together with households' solid waste management activities. These questionnaires were first prepared in English but later it translated in to Afan Oromo version for making it easily understandable to respondents. After preparation, around 10 questionnaires were randomly distributed as pre-test in order to correct unclear and misleading questions. Then all questioners were brought to respondents. Apart from these, the researcher used field observation as a major data sources for this study. Field observation was employed for assessing spatial distribution of MSWM infrastructures, households' solid waste handling practices, illegal dumping, solid waste collection and transportation systems and disposal site facilities of the towns. A photograph was taken during field observation for partial exposure of transfer stations, disposal site, illegal dumping of residents.

3.7Sample Size and Sampling Procedures

In order to collect primary data, the researcher used three different sample sizes with different sampling procedures. The first sample size was designed for collection of data from households on their solid waste management practice, and their attitude towards MSWM practice of the town. For deciding this sample size and selecting samples, the researcher used three stages. The first stage was classifying the town in to 3 separate strata namely inner (k1 close to the center), middle (k2 located in the middle distance from the center), and periphery (k3 of the town) based on geographical location, population density and availability of different infrastructures. (ketena1=close to the center, ketena2=middle, ketena3highlight of the town).The second stage was selecting the towns that represent those stratums. The researcher used to select two from each stratum, using random sampling method. This was because; the writer believes that those sub-towns located in each stratum have homogenous characteristics with respect to proximity to the center of the town, population density, and availability of infrastructures. Stratified sampling technique was used due to the variability of the municipal solid waste generation sources. As a result, taking one sub-towns of the town from each stratum can be representative. In third stage, the researcher took a total sample size of137households from three sample regions of the towns in general. This was decided by using scientific statistical method from (Cochran, 1977).The formula that used for determining sample size was the following. According to data obtained from housing development section of the town (2018), there were about 16461 legal housing units (N):Out of these more than 90% (P)/0.9/ were residential and the rest 10%(0.1) (Q) was for commercial activities, offices and for others(P=for residential, and Q=for commercial centers).

$n = \frac{NZ2PQ}{d2(N-1)+Z2PQ}$(Cochran, 1977).

Where,

n = total sample size

N = Total number of sample households (sample frame i.e. 16461 in Table 3)

Z = standard normal deviation at the required confidence level that corresponds to 95% confidence interval equal to 1.96

d = the level of statistical significance (Allowable error) (0.05)

P = Housing unit variable

Q = 1-p i.e.1-0.9= 0.1, so that

n =16461*3.842*0.9*0.1/0.0025 (16460)+3.842*0.9*0.1=5691.88/41.49=137.18 = 137

Therefore, n =137 was the minimum sample size of households for reliable results. Finally, by using proportional allocation method the researcher was decided to take sample households from two towns. These sample households was drawn for data collection using simple random sampling method.

Table 3: Towns specific proposed number of sample households of the study area
(Source: Sibo sub-urban and Bure town municipalities, 2019).

Study area	Total population	Ketena	No. of household	No. of household's sample
Sibo	6010	K1	72	22
		K4	63	19
		K7	50	15
Bure	10451	K2	86	26
		K5	96	29
		K7	88	26
Total	16461	6	455	137

Key: K-ketena

The second sample size determination was used for examining institutional arrangement and capacity of the town sanitation, and beautification, which is responsible for town solid waste management. According to the manual of SB of Sibo and Bure towns, the department has a total

of two employees in Sibo sub-urban area and three employees in Bure town who work on solid waste management aspect. For this study, the researcher took all these as a resource. The final sample size determination was exercised for measuring daily households' solid waste generation rate and physical composition. For this study, the researcher identified 20 households. They were taken from three income categories: higher income, middle income and lower income category. This is because the rate and quantity of solid waste production of households is a direct reflection of their income level or economic performance.

3.8Method of Data Analysis

Both quantitative and qualitative techniques were used for data analysis. Quantitative method was used for close-ended questions. It includes percentages, graphical and tabular analysis. Qualitative method (descriptive survey method) was used for open-ended and interview methods; in order to describe and interpret the current status of the problem in the study area.

3.9Ethical Consideration

All data collections were done by giving special care to the secrets of the local communities of the study area. The researcher informed the respondents that the objective of the research is not for commercial purpose and to expose the practitioners but for research and academic reasons and the research result benefit the community in general.

CHAPTER FOUR

4.0. Results

Under this chapter the data gathered from the study households using questionnaire (open and Close ended), interview from the key informants of Sibo sub-urban and Bure town staff members and data obtained by the researcher observation were analyzed and interpreted.

Table 4.Representative selected sample of the study area(n=137)

Study area	Respondent's sample of the town								
	Sample size (n=137)			Questionnaire 90% (n=125)			Interview 10%(n=12)		
	Male	female	Total	Male	Female	Total	Male	Female	Total
Sibo	35	23	58	32	21	53	3	2	5
Bure	44	35	79	40	32	72	4	3	7
Total	79	58	137	72	53	125	7	5	12

Table 5.Demographic characteristics of the Respondents (n=137)

Item		Respondents by the study area			
		Sibo		Bure	
		Number	Per.%	Number	Per.%
Gender					
	Male	35	60.3	44	55.7
	Female	23	39.7	35	44.3
	Total	58	100	79	100
Type of Respondent					
	Resident	43	74.1	58	73.4
	Daily labor	3	5.2	3	3.8
	Trader	10	17.2	14	17.7
	Other	2	3.4	4	5.1
	Total	58	100	79	100
House Ownership					
	Private	30	51.7	57	72.2
	Rented	28	48.3	22	27.8
	Total	58	100	79	100
Age of respondents					
	15-25	5	8.6	4	5.1
	26-35	20	34.5	30	37.9
	36-45	20	34.5	37	46.8
	46-55	10	17.2	4	5.1
	55 and above	3	5.2	4	5.1
	Total	58	100	79	100

In this study, from 137 respondents, 79HHs (57.7%) were male- headed and the remaining 58HH (42.3) were female-headed. Of sampled population, 101 (73.7%), were residents, 6(4.4%) were daily labor, 24(17.5%) were trader, 6(4.4%) were others. On the other hand, of the total respondents of house ownership, 87(63.5%) were private ownership, and the remaining 50(36.5%) were rented ownership. Beside this, out of the total respondents 9(6.6%) were belong to age group (15-25ages), 50(36.5) were between 26-35 ages, 57(41.6) were between 36-45 ages, 14(10.2%) were between 46-55 ages, 7(5.1%) of sample respondents are belongs to adult age group 55 and above ages.

Table 6.Respondents' Educational level, Occupation, Family size and Monthly income (n=137)

Item		Respondents by the study area			
		Sibo		Bure	
		Number	Per.%	Number	Per.%
Educational Level					
	Never want to school	-	-	-	-
	Primary level	10	17.2	9	11.4
	Secondary level	15	25.9	24	30.4
	College and university	33	56.9	46	58.2
	Total	58	100	79	100
Occupation					
	Government	40	68.9	45	57.0
	Private sector	4	6.9	10	12.7
	Self employed	6	10.3	7	8.8
	Merchant	5	8.6	12	15.2
	Other	3	5.2	5	6.3
Total		58	100	79	100
Family Size					
	1-2	15	25.7	17	21.5
	3-4	38	65.5	50	63.3
	5-9	3	5.2	9	11.4
	>=10	2	3.4	3	3.8
	Total	58	100	79	100
Monthly Income (in birr)					
	1000 or below	-	-	10	12.6
	1001-2000	3	5.2	10	12.6
	2001-3000	15	25.8	18	22.7
	>3001	40	68.9	41	51.9
	Total	58	100	79	100

Key: perc%.=percentage

4.1. Characteristics of Municipal Solid Waste

4.1.1. Types and source of Municipal solid waste generated in Sibo sub-urban and Bure towns

One of the basic services that are currently receiving wide attention in many towns of Ethiopia is municipal solid waste management. This is mainly because solid wastes that are generated in most towns of Ethiopia are not appropriately handled and managed (Gebrie, 2009). However, it is possible to minimize and solve these problems through strictly planning and implementing different municipal solid waste management components. The first and the most prerequisite step for provision of efficient MSWM began by identification of major sources, and determination of generation rate and composition of municipal solid waste. The various forms of solid wastes were collected and sorted from sampled households. In order to fill the gap a researcher investigates household solid waste generation rate and physical composition since the majority of solid waste constituents of the study area comes from households. MSW is usually mixture of various waste components, which could be disposed of by some methods before final disposal such as plastic, metal, paper, glass and textile(EPA,2016).The description in Table 7 below confirms and indicated that the major types of solid wastes regularly generated. Accordingly, the sample households were asked about the types of solid waste mostly produced from their house and, 16(11.7%) responded peels of vegetables; 3(2.2%) responded ash; 34(24.8) paper and card board;61(44.5%) responded plastic; 7(5.1%) responded garden trimmings or leafs; 4(2.9%) responded textile scraps, 5(3.6%) electronic wastes, 4(2.9%) metals and cans, and 3(2.2%) responded other wastes are mostly produced from their houses.

Table 7.Types of Municipal solid waste generated in Sibo and Bure town (n=137)

Types of solid waste	Respondents by the study area			
	Sibo		Bure	
	Quantity(kg)	Percentage (%)	Quantity(Kg)	Percentage (%)
Peels of Vegetables	5	8.6	11	13.9
Ash	2	3.4	1	1.3
Paper and cardboard	15	25.8	19	24.1
Plastic	27	46.5	34	43.0
Garden trimmings or leafs	2	3.4	5	6.3
Textile scraps	1	1.7	3	3.8
Electronic wastes	1	1.7	4	5.1
Metals and cans	3	5.2	1	1.3
Others	2	3.4	1	1.3
Total	58	100	79	100

In addition to this, four major sources of solid waste namely residential areas, Commercial areas, governmental institutions, hotels, and health center were identified by the town administration.Table8 below revealed that 66.1% of solid waste of the study area is generated from residential areas, commercial institutes 18.5%, Governmental institution, 9.2% and hotels and health center 6.2%.

Table 8. Major solid waste sources and their daily and annual generation rate

Source of solid waste	SW generated kg/day	SW generated kg/annual	Percentage share (%)
Household	430	154800	66.1
Commercial institutes	120	43200	18.5
Governmental institution	60	21600	9.2
Hotels, and Health center	40	14400	6.2
Total	650	23,4000	100

4.1.2. Determination of Solid Waste Generation Rate

Solid waste generation rate is the amount of waste join to waste stream from human activities. For making this survey researcher identified 20 households based on their monthly income, ownership status of household residence and housing condition, they were categorized in to higher, middle, and lower income groups. After this, a researcher used to collect wastes from different income categories for seven days and calculate the generation rate as total waste generated within seven days by seven times total population of the study area. The findings of this survey are summarized in table 9 below.

Table 9.Solid waste generation rate in Sibo sub-urban and Bure town (n=20).

Income groups	**No of sample HHs**	**Family size**	**Waste generated(kg)**	**Qt/HH/day(kg)**	**Qt/HH/week(kg)**	**Generation rate of Qt/day/person(kg)**
Higher	7	59	8823	9.2	64.4	0.16
Middle	6	49	5850	6.1	42.7	0.12
Lower	7	36	5275	5.5	38.5	0.15
Total	20	144	19948	20.8	145.6	0.15

Solid waste generation rate of the study area per capita per day at household level was 0.15 kg/capita/day (Quantity HH/day (kg) by family size). Based on this result the daily total solid waste generation of residential areas in the town was calculated as total population of the town (16461) times per capita household solid waste generation rate. Based on the updated per capita household generation rate of the daily total solid waste generation is 2469.2kg.

4.1.3. Composition of municipal solid waste in sibo sub-urban and Bure towns

As it is indicated in review of literature parts of this research, municipal solid waste is a term usually applied to a various mixture of solid waste produced in urban areas. But commonly urban waste can be sub divided in to two major components called biodegradable and non-biodegradable. The biodegradable component of urban solid waste constitutes organic waste such as food waste, garden waste, agricultural waste which undergoes biological degradation under controlled conditions and can be turned into compost or organic fertilizer. While non-biodegradable wastes include inorganic materials, which cannot be decomposed and degraded. Likewise, from the observation in disposal site, illegal dumping areas and in residential areas of Sibo sub-urban and Bure towns, the physical composition of municipal solid waste is also composed of both biodegradable and non-biodegradable components as indicated below. Organic, paper, and plastic are the common major waste in waste composition in Sibo sub-urban and Bure areas. At a household level, source separation is not a common practice in both Sibo sub-urban and Bure towns since the municipality does not provide the necessary practical arrangements. There is no separate collection station in the house or street for different types of waste, so that all the MSW is mixed. Residents do not have high awareness of waste separation, as it is voluntary. They do not separate organic waste, paper, metal, glass and plastic (figure 2). The dominant types of biodegradable solid wastes are vegetable peelings, scrap of chat, market place wastes (vegetable and fruit wastes), papers, cardboard, & paper packing materials. Whereas non bio-gradable wastes of the town includes different types of plastics (like, plastic bags or ‘festal’ plastic packaging materials) glass or bottles, cans, textile scraps, and discard old shoes. By Considering Figure 2 and 3, and (table 7) biodegradable wastes accounts for 41.4% of the total waste volume in Sibo sub-urban area, and 45.6% in Bure town.

Table 10.Composition of residential solid waste (n=137)

Category	Type of solid waste	Qt/day/person in Kg	Percentage share (%)
Bio-degradable waste	Peels of Vegetables	16	11.7
	Ash	3	2.2
	Paper and cardboard	34	24.8
	Garden trimmings or leafs	7	5.1
Non-biodegradable	Plastic	61	44.5
	Textile scraps	4	2.9
	Electronic wastes	5	3.6
	Metals and cans	4	2.9
Other	Dust levels	3	2.2
Total		137	100%

The result of the survey in the study area showed that municipal waste is an aggregate of all substances ready for disposal. The composition of the solid organic waste was almost homogenous in nature across the study households. As it was observed in this study area (figure2 and figure 3), majority of the waste was of plastic origin.

Plate 2.Solid Waste disposal site of Sibo sub-urban area

Plate 3.Solid Waste disposal site of Bure town

4.2. The condition of Household Solid waste Management practice of Sibo sub-urban and Bure towns

4.2.1. Solid Waste Storage Facility and Its Handling

Studying solid waste storage facilities and their handling has significant impact for improvement of municipal solid waste management activity. This is from the point of identification of type and quantity of storage material to be used, it's appropriate location and deciding the collection method to be used, and avoidance of health, environment and aesthetics impacts of storage materials. Because of this, the researcher collects information about solid waste storage and its handling in Sibo and Bure town was collected and briefly explains in two categories. The first category constitutes primary or temporary storage facility of households. The second category comprises secondary or communal storage facility, which includes public solid waste containers and dustbins. The detail examination of both of these storage facilities is described here below.

4.2.2. Primary solid waste storage facility and its handling

The selected sample respondents were asked first that weather they have temporary solid waste storage material or not and the result showed almost all, 116(84.7%) of sample respondents do not have temporary solid waste storage material while the remaining, 21(15.3%) of sample respondents do have temporary solid waste storage material and with regard to the materials they use to store their solid waste at home by giving them alternatives in the form of multiple choices, and the following results were obtained from the survey households.

Table 11.Solid waste storage material used by sample households

Item I. Possession of Temporary Solid Waste Storage Facility		Respondents by the study area(n=137)			
		Sibo		Bure	
		Number	Per.%	Number	Per.%
Valid	Yes	8	13.8	13	16.5
	No	50	86.2	66	83.5
	Total	58	100	79	100
Item II.Type of storage material(n=12)					
Valid	Basket	1	20	1	14.3
	Plastic material (festal)	1	20	2	28.6
	Sacks(medaberia)	1	20	-	8.3
	I don't have	2	40	4	57.1
	Total	5	100	7	100

Key: perc%.=percentage

As can be seen from Table 11 above item II, a question was asked via interview, residents of Sibo sub-urban and Bure area used a different type of storage materials in their compound which is bamboo basket and sacks local name called 'Medaberia, plastic containers local name 'festal' and others. The result has shown that 2(16.6%) of sample respondents used basket,3(25%) were used plastic materials,1(8.3%) were used sacks local name called 'Medaberia'. while the remaining 6(50%) do not have storage material. It is also observed that most of the households who use the 'Festal', as a storage material for their solid waste at home, but throw it away together with the waste it contains. This experience of the households shows that storage materials are means a one-time use only. This means that no more value is given for the storage materials once they are used for waste storage and, very soon, the storage materials become part of the waste that increases the quantity of non-decomposable solid waste that increasingly littering most part of the town in general.

4.2.3. Secondary solid waste storage facilities and their handling

According to (Solomon, 2011),Secondary storage facilities refers to different types of solid waste containers, which involve keeping solid waste generated from different households at a common or central point from where collection vehicles can pick it and transport to final disposal site. However, based on this definition the researcher found no storage containers including dustbins for collection services in the study area. In addition, this is a very big challenge for waste collection services.

4.2.4. Households' Solid Waste reduction Practices in Sibo sub-urban and Bure towns

The researcher asked some questions concerning practical experience and habits of segregating solid waste through their level of awareness. As indicated in table 12 below among those who responded to this question, 97HHs (70.8%) respond that they do not separate solid wastes and only 31HHs (22.6%) stated that they do the separation and the remaining 9(6.5) don't understand what waste sorting is. As I observed from households' solid waste separation activities in the town that the only sold to exchangeable to "Liwach" are separated. A subsequent question also asked via interview to those respondents that 'what are the reason behind for not practicing waste separation be'? Based on the question, respondents gave their respective answers as 10 (37%) told that they do not have understanding about waste separation; 4 (14.8%) told that they do not visualize the importance of separation; 13 (48.1%) believe that collecting waste is not their responsibility.

Table12.Households who has been involved in waste separation before disposing it off.

Do you think it helps to sort waste before disposing it off?		Respondents by the study area(n=137)			
		Sibo		Bure	
		Number	Perc. %	Number	Perc. %
	Yes	14	24.2	17	21.5
	No	40	68.9	57	72.2
	I don't know	4	6.9	5	6.3
	Total	58	100	79	100

Key: perc%.=percentage

Plate **4. Solid waste sorting at household level for sell**

Plate 5.Solid waste sorting practices in Bure town

'Separating wastes such as plastic bottles and containers at source increases opportunities to reuse or recycle'.

Plate 6.Sorting methods at Sibo study area (photo by the researcher, 2019)

In addition to this, sample households were asked about the availability of solid waste communal Containers in their respective surroundings to check the provision of appropriate solid waste collection and transportation services. Accordingly, the following result was obtained.

Table 13.Availability, Distance and participation on deciding container placement

Category	Response	Respondents by the study area(n=137)			
		Sibo		Bure	
		Number	Perc.%	Number	Perc.%
Availability of Waste Disposal Container near home Location/town	Yes	8	13.8	12	15.2
Distance of the Container from your Home Location	No	50	86.2	67	84.8
	Total	58	100	79	100
	20-50 m	5	8.6	8	10.1
	51-100 m	8	13.8	3	3.8
	101- 200 m	3	5.2	4	5.1
	201-500 m	2	3.4	3	3.8
	>500 m	-	-	-	-
	None at all	40	68.9	61	77.2
	Total	58	100	79	100

Key: perc%.=percentage

As shown in Table 13 above, 117(85.4%) of sample respondents were stated that communal solid waste container is not available and the rest 20(14.6 %) of sample respondents stated that public solid waste container is available.In addition to this, the researcher asked to know the average distance between a residence and a communal container so that, a container is located between 20 -50 meters radius for 13(9.5%) of households; between 51-100 meters for 11(8.0%) of households; between 101-200 meters for 7(5.1%) of households; between 201-500 meters for 5(3.6%) of households, and the remaining 101(73.7%) stated that there is no communal solid waste container available in the town. On the other hand, a subsequent question was asked how they dispose off their solid wastes or what alternative do they have. Accordingly, the following results were obtained from the response of households as presented in the following table 14. As can be noted from Table 14 below, about 47(34.3%) of the respondents use land filling;12(8.7%) of the respondents take their wastes to the collecting center;65(47.4%) of respondents disposing by digging a hole around the house and burn it; 8(5.8%) of the respondents didn't know where waste is taken for disposal, and the remaining 5(3.6%) of respondents use other means of disposing methods like using for daily laborer.

Table 14.Site where households dispose their solid wastes (n=137)

Where is the waste taken for disposal?		Respondents by the study area			
		Sibo		Bure	
		Number	Perc. %	Number	Perc. %
	Land fill	20	34.5	27	34.2
	Collecting center	5	8.6	7	8.8
	A pit for burning	25	43.1	40	50.6
	I do not know	5	8.6	3	3.8
	Other	3	5.2	2	2.5
	Total	58	100	79	100

Key: perc. =percentage

Plate 7.Disposal practices in the study area (photo by the researcher, 2019)

7a).Disposal practice in Bure area 7b).Disposal practice in Sibo area

Table 15.Preferred disposal time by households (n=137)

How many times in a week is waste taken from your home/shop/stall for disposal?		Respondents by the study area			
		Sibo		Bure	
		Number	Perce. %	Number	Perce. %
	Once	4	6.9	6	7.6
	Twice	10	17.2	18	22.8
	More than twice but not daily	2	3.4	5	6.3
	Daily	2	3.4	1	1.3
	I do not know	40	68.9	49	62.0
	Total	58	100	79	100

Key: perc. =percentage

As can be clearly seen from table 15 above, from the total selected households, who disposed their wastes illegally, a number of respondents 10(7.3%) replied that they dispose off their wastes once in a week. Moreover, about 28 (20.4%) of the illegal disposer households dispose their solid wastes twice in a week. The rest 7(5.1%) and 3(2.2%) of those illegal disposers dispose their wastes more than twice and daily respectively. Moreover, 89(64.9%) they do not know and this implies that there is no such solid waste disposing services in the town. The respondents were asked to reveal who takes the solid waste from their premises, for disposal. The biggest proportion of the respondents takes the solid waste for disposal by themselves. Table 16 below reveals that, the response "myself" implied the person who was the one who carries the waste away by themselves. The response "someone else" implied that another person other than the one who was in a residence, or commercial premises, took the waste away for disposal. Moreover, according to this data, there is no private waste collector in the town and the finding reveals that the respondents by themselves take for disposal even though the town council takes lion share.

Table 16.Who takes the waste from the respondents' premises, for disposal (n=137)

Who takes the waste from your home/shop/stall for disposal?		Respondents by the study area			
		Sibo		Bure	
		Number	Perc. %	Number	Perc. %
	My self	32	55.2	40	50.6
	House keeper	3	5.2	7	8.8
	Someone else in the home	20	34.5	20	25.3
	Private waste collector	-	-	-	-
	Town council	3	5.2	12	15.2
Total		58	100	79	100

Key: perc. =percentage

In addition to this the respondents were also asked what means do they use to transport wastes to the disposal sites and the following results were obtained and analyzed here below.

Table 17.Respondent's methods of disposing their wastes (n=137)

What means do you use to transport wastes to disposal sites?	Category	Respondents by the study area			
		Sibo		Bure	
		Number	Per.%	Number	Per.%
	By hands	3	5.2	6	7.6
	Hand cart	53	91.4	72	91.1
	Horse drawn carts	-	-	-	-
	Trucks/vehicle	-	-	-	-
	Others	2	3.4	1	1.3
Total		58	100	79	100

Key: perc. =percentage

As can be seen from table 17 above, the data indicate that 9(6.6%) used their hands to transport wastes, 125(91.2%) used hand carts, and the remaining 3(2.2%) used other methods to transport wastes to its final destination. From this analysis, it implies that waste collectors used handcarts for transporting solid wastes from the collection areas to where it is disposed for final treatment.

4.3. The Existing status and spatial coverage of MSWM Services of Sibo sub-urban and Bure towns.

Solid waste collection and transportation is not an end to solid waste management. Proper solid waste management also requires proper disposal of waste in a proper place. In sight of this in my field observation, Sibo sub-urban and Bure town's solid waste disposal service and its management is inadequate and below the standard. The waste collected was disposed on open field at a place called 'behind Central Hotel, around High Court area called Chore, at the back side of Bure health bureau called Garagant, at the side of Degoye primary school, which is 1.5km,1.4km,2km,and 2.5km respectively far away from the center of the town in Bure Woreda (figure 10) and Sibo sub -urban area has only two disposal sites called as Tele sefer, and Meskid sefer which is 1km and 1.6km respectively away from the center of the study area (figure 8). One of the parameters used in assessing a performance of a waste service delivery is its effectiveness. A given waste management practice is considered to be effective when a waste collection goals such as using indicators like waste collection, transportation and disposal are achieved. An effective waste collection can be recorded when it facilitate enough collection points near to all beneficiaries, increase a frequency of waste pick up, avoid waste spill over and when waste

personnel is fully and frequently trained. The findings reveal that the status and spatial coverage of the service in both Sibo sub-urban area and Bure towns is very unsatisfactory, and only covers residents who are living in the center of the town and along accessible streets.

4.3.1. Waste management options in the study area.

There are a number of waste management options. Of these waste management practices, incineration and traditional land filings have been the most popular options in the study area. Reusing and recycling options were poorly practiced and composting method was not known.

Plate 8: Disposal sites at Sibo sub-urban area (photo by the researcher, 2019)

Plate 9: Disposal practices at Bure Health center (photo by the researcher, 2019)

Plate 10: Disposal sites in Bure town (photo by the researcher, 2019)

4.4. Factors affecting MSWM services in Sibo sub-urban and Bure towns

The information obtained from the sampled respondents and researcher observation was some of the factors affecting the MSWM system was lack of appropriate skilled man power in the area to coordinate SWM activities as well as the appropriate site, absence of labor engaged in daily removal of solid wastes and in street sweeping in the study area affects the sanitary of some parts of the area by making it ugly and smelly, absence of materials to collect solid wastes from the two parts of the study area is the other challenge. The other problem was the municipality did not work a lot on community mobilization and awareness creation regarding SWM system, financial problem. A typical solid waste management system in a study area displays an array of problems including low collection coverage and irregular collection services, and open dumping and burning practices. These problems are caused by various factors that constrain development of effective municipal solid waste management systems.

A).Human and Technical problems

Lack of human resources and technical expertise is a main reason for lack of comprehensive waste management planning. Furthermore, collection and analysis of solid waste were generally not given sufficient attention.

B).Financial problems

MSWM is given low priority in study areas; as a result, very limited funds are allocated. This problem is acute at the local governmental level where local revenue collection system is inadequately developed and financial base for public service including MSWM was weak.

C).Institutional problems

The lack of coordination among the relevant agencies often results in different agencies becoming the national counterpart to different external support agencies for different solid waste management collaborative projects without being aware of what other national agencies are doing. This situation not only hinders effective implementation of waste management operations, but also produces confusion in relation to technical cooperation and assistance projects among donors. Along with these organizational and structural problems, lack of an effective legal system and technical standards constitute a major constraint.

D).Social problems

The social status of solid waste management workers was generally low in both of the study areas. This owes much to a negative perception of people regarding the work, which involves the handling of waste or unwanted material. Such people's perception leads to the disrespect or lookdown for the work and in turn produces low working ethics of laborers and poor quality of their work.

E).Awareness and Attitudes

Public awareness and attitudes to waste can affect the whole municipal solid waste management system. All steps in municipal solid waste management starting from household waste storage, to waste segregation, recycling, collection frequency, willingness to pay for waste management services, and disposal facilities depend on public awareness and participation. Accordingly, awareness creation and attitude about SW management was asked and the following result was obtained.

Table 18.Municipality create awareness on solid waste management (n=137)

Does the municipality practiced to create awareness about SW and its positive and negative consequences to the community?		Respondents by the study area			
		Sibo		Bure	
		Number	Perc.%	Number	Perc.%
	Yes	15	25.8	17	21.5
	No	43	74.2	62	78.5
	Total	58	100	79	100

Key: perc. =percentage

Table 18 Shows that, 105(76.6%) of residents responded that the community members have no awareness about disposal of solid wastes in the town, and the remaining 32(23.4%) of residents were responded the community members have awareness about disposal of solid wastes in the town. This implies that the community members have no enough awareness about disposal of solid wastes as well as the positive and negative consequences in the town.

F).Economic problems

Economic development plays key roles in solid waste management. Obviously, an enhanced economy enables more funds to be allocated for solid waste management.

G).Appropriate laws

This is expected to have a positive relation with the effectiveness of solid waste management. In other words, if the residents have awareness on the existence of solid waste related laws and regulation and the municipality apply it, at least the rate of unauthorized site disposal would be minimized. Having this in mind, the researcher used to ask the respondents about the action and appropriateness of laws and summarized as follows.

Table 19.Enforcement of Rules and regulation on solid waste management

Does the municipality take penalty on individuals who improperly dispose waste?		Respondents by the study area(n=137)			
		Sibo		Bure	
		Number	Perc.%	Number	Perc.%
	Yes	1	20	1	14
	No	4	80	6	86
	Total	5	100	7	100
How do you evaluate the appropriateness of the Penalty?(n=12)					
	Strong	1	20	-	-
	Weak	2	40	2	28.6
	Not at all	2	40	5	71.4
	Total	5	100	7	100

Key: perc. =percentage

From the above table (table 19) the respondents via interview and purposively selected respondents specified that the follow up on rules and regulation in the town be nearest to none. It implies that they did not observe any penalty related action, which is taken by the municipality because of illegal solid waste disposal. Sample respondents also asked another questions (have you ever seen the violators are penalized) and most 10(83.3%) of respondent reported that they did not see when the violators penalized and the rest 2(16.7%) of respondent seen when the violators are penalized. However, from the interview of the mayor of municipal head town there is a penalty on illegal solid waste disposal as 200ET (Ethiopian birr) for merchants and 70ET (Ethiopian birr)for private sector respectively. In addition to this according to impartial enforcement of rules and code enforcement service regulations/ local proclamation number (Demb number BU004/2010 E.C) suggested that every member of the community should collect and manage solid wastes at a diameter of 50m from his/her residential areas. The respondents were also asked to evaluate the appropriateness of the penalty and table 19 shows that 1(8.3%) strong, 4(33.3%) responded that the penalty is very weak and the rest 7(58.3%) respondent stated that penalty is not at all.

From this, one can understand that awareness creation on the existence of solid waste laws and regulation and its enforceability are very poor, it is one of a serious cause or constraint for the performance of solid waste management in the study area. The staff members of SB were also asked question via interview (to what extent the municipality regulate the process of waste disposal by households?) and they replied that the regulation is fair but to triangulate this response and to know its enforceability those staff members were asked another two question again via interview (have you across with solid waste thrown away in the town illegally and what measure did your department take to penalize the regulation violators and to prevent such action in the future?) and their response were Yes and With regard to its enforceability, in principle, it has two steps: warning and then penalize the violator by laws. Another question was asked the respondents that 'what type of waste does someone else picks up for recycling'? and majority 106(77.4%)of them replied plastic,6(4.4%) glass,5(3.6%) paper,8(5.8%) cardboard,6(4.4%) clothing/textile scraps,4(2.9%) metal cans and 2(1.5%) other wastes. The finding implies that from the wastes generated in the area, plastic waste is the dominant wastes that can be recycled in the two study areas (figure 11).

Table 20.Type of waste does someone else pick up for recycling (n=137)

What type of waste does someone else pick up for recycling?		Respondents by the study area			
		Sibo		Bure	
		Number	Percentage(%)	Number	Percentage(%)
	Glass	1	1.2	5	6.3
	Plastic	46	79.3	60	75.9
	Paper	3	5.2	2	2.5
	Cardboard	5	8.6	3	3.8
	Clothing	1	1.2	5	6.3
	Metal Cans	1	1.2	3	3.8
	Other	1	1.2	1	1.3
Total		58	100	79	100

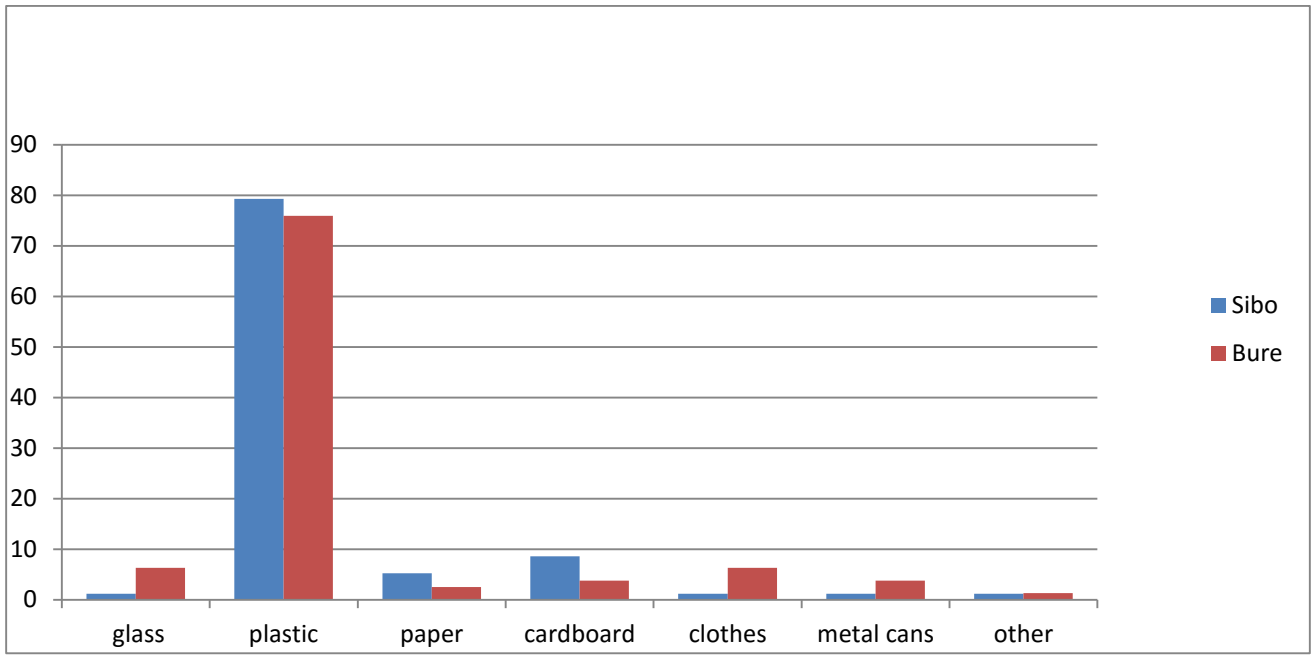

Figure 11: The type of waste that someone else picks up for recycling.

4.5. Community participation on proper solid waste disposal

A direct question was raised to the respondents to establish their practice when they found solid waste that they themselves have not generated. The question was very clear what do you do about waste you find outside your home/shop/business premises? and two alternative responses were given 'pick it and put it in a nearby waste container' and 'move on'. Only 45(32.8) out of137respondents (table 21) reported that they pick such waste and put it in the proper disposal place. The other 92(67.2) respondents said they just move on for as long as they do not generate that waste and it is the responsibility of town's administration(figure 12).

Table 21.The role of community participation on proper solid waste disposal (n=137)

What do you do about waste you find outside your home/shop/business premises?		Respondents by the study area			
		Sibo		Bure	
		Number	%	Number	%
	pick it and put it in a nearby waste container	22	37.9	24	30.4
	move on	36	62.1	55	69.6
Total		58	100	79	100

Key: perc. =percentage

Plate 12.Improper solid waste dumped area at Bure town (photo by the researcher, 2019)

Table 22.Responses to whether it is possible to reduce on amount of waste generated(n=137

Is it possible to reduce on the amount of waste generated?	Response	Respondents by the study area			
		Sibo		Bure	
		Number	Perc.%	Number	Perc.%
	Yes	35	60.3	45	56.9
	No	23	39.7	34	43.1
	Total	58	100	79	100

Key: perc. =percentage

The finding reveal that, 80(58.4%) responded that it was possible to reduce waste generation at their source, while the remaining 57(41.6%) states that it was difficult to reduce wastes as it is always associated with the life as well as consumption of the individual.

In connection with this, respondents were also asked if there were wastes that are reusable but they were not reusing for different purposes and the following results was obtained and organized here in the table 23 below.

Table 23.Respondents on whether there are reusable items but not being reused (n=137)

Is there Reusable waste items but you are not reusing?	Response	Respondents by the study area			
		Sibo		Bure	
		Number	Perc.%	Number	Perc.%
	Yes	30	51.7	32	40.5
	No	28	48.3	47	59.5
	Total	58	100	79	100

Key: perc%. =percentage

The findings show that 62(45.3%) of the respondents could identify some items that are discarded as a waste but could be reused. The respondents who responded "yes" to this question were requested to specify some of these items and they enumerated such items as empty plastic mineral water bottles, metals, paper boxes and empty oil jerry cans. Moreover, the remaining 75(54.7) responded that there is no waste that can be reused from the discarded materials at all. From this analysis, it implies that most of the communities in the study area were poorly aware of about reusable wastes. The other question was asked their willingness to pay to improve SWM service for MSEs in the study area? and the following results was obtained and analyzed here below in (table 24).

Table 24.Respondents willingness to pay to improve the service (n=137)

Are you Willing to Pay to improve SWM service for MSEs in the study area?		Respondents by town			
		Sibo		Bure	
		Number	Perc.%	Number	Perc.%
	Yes	3	5.2	12	15.2
	No	55	94.8	67	84.8
	Total	58	100	79	100

Key: perc. =percentage

The above table (table 24) shows, only 15(10.9%) of the respondents replied that they were willing to pay for solid waste management services. Majority of the participants 122 (89.1%)

were not actually willing to pay to improve the waste collection services. Therefore, based on the findings of the study almost all the respondents were not willing to pay for the service of solid waste management. According to interview with a mayor of municipal head, from the two study areas, there was no MSE in the two study areas regarding solid waste management services, but they use 'Qeerroo' (youth) once in a month for clearing and beautification of the town.

4.6. The present institutional arrangement and waste management governance in the study area of Sibo Sub-urban and Bure towns.

It is a common perception that improves solid waste management means making waste collection and disposal systems more efficient, raising public awareness and enforcing solid waste management laws. However, a precondition for all these factors are a well planned management operating within a permitting institutional framework or arrangement. So in order to build an acceptable and satisfactory level of MSWM service, the responsible institution primarily need to have well organized management that functions within an adequate institutional arrangement, skilled manpower and financial resources, appropriate rule and regulation, short and long term strategy, and good cooperation with different stakeholders. Otherwise, if one or more of the above mentioned resources and frameworks are missing, then MSWM remains unattainable (Solomon, 2011).This is one key reason why MSWM of Sibo sub-urban and Bure town was very poor in terms of status as well as spatial coverage. In line with these issues, the status of the existing institutional capacity of MSWM of Sibo sub-urban area was inadequate because of insufficient work force, financial, and material resources. On the other hand, lack of institutional coordination among different responsible sectors is common.

But, in Bure town Institutional arrangements were classified into two as: the north technical pool and south technical pole and was approved by woreda house of people representatives. However, the Institutions play no vital roles in guiding change and facilitating development.

4.7.Community participation and their willingness to pay to manage solid waste.

Community participation in SWM encompasses several forms of local involvement, including awareness and teaching proper sanitary behavior; contributing cash, goods or labor; participating in consultation, administration, and management functions. Community action is better than individual action. This is because some factors have been observed to be related to the governance of solid waste management systems in place while some are related to the

community itself in general. This cooperation is voluntary, but has aim to create economies of scale for the municipalities and better possibilities to achieve environmental goals. According to the interview with the head leaders of the town, 'collecting and processing the waste generated in the town is not our responsibility, it is a municipalities responsibility'. The dominant resources, which determine an institutional capacity, are human, material, and financial resources.

Table 25.The contributions of solving the problems of solid waste disposal in the town

S.No	Item	Response	Respondents by the study area(n=137)			
			Sibo		Bure	
			Number	Perc.%	Number	Perc.%
1.	In your community, is their removal techniques/means of solid wastes in the town?	Yes	18	31.1	21	26.6
		No	40	68.9	58	73.4
		Total	58	100	79	100
2.	Who get the benefit from the environmental cleaning in the town?	Residents	35	60.3	43	54.4
		Community members	20	34.5	27	34.2
		Community leaders	3	5.2	9	11.4
Total			58	100	79	100

Key: perc. =percentage

According to table 25, items 1, reveals 39(28.5%) of respondents were replied that there was the removal techniques/means of solid wastes in the town, and majority, 98(71.5%) of residents were responded there was no the removal techniques/means of solid wastes in the town. This implies that in the community there was no the removal mechanism of solid wastes in the town. Regarding to table 25,item 2,shows,78(56.9%) of respondents replied that the residents get the benefit from the environmental cleaning in the town, whereas 47(34.3%) of respondents replied that the community members get the benefit from the environmental cleaning in the town, and the remaining 12(8.7%) of respondents replied that the community leaders get the benefit from the environmental cleaning in the town. This shows that the residents get great contributions from the environmental cleaning in the town. Moreover, open-ended items and interview were presented to administrative bodies to express the idea on the problems that encountered throughout the disposal of solid wastes, and the following were indicated: Allocation of

inadequate budget to clean the environment; Low community participation; Low awareness of the community about the impact of solid wastes; and Weak solid wastes management system.

This implies that most of the respondents mentioned that the main problems that there is the impact of solid waste disposal in the town. The town administrative bodies forwarded the following possible solutions to overcome the problems of solid wastes in their town as allocating adequate budget to clean the environment; Strengthening community participation in the community affairs; Creating awareness and discussion with communities about the impact of SW Strengthening solid wastes management system.

Table 26.Attitudes towards waste management (n=137)

Statements indicating actions taken	Category	Respondent s by town			
		Sibo		Bure	
		Number	Perc.%	Number	Perc.%
There is municipality service for managing municipal solid waste	Strongly agree	5	8.6	12	15.2
	Agree	13	22.4	22	27.8
	Not sure	3	5.2	4	5.1
	Disagree	15	25.8	19	24.1
	Strongly disagree	22	37.9	22	27.8
	Total	58	100	79	100
There is micro enterprise organized in the town for collecting solid waste	Strongly agree	2	3.4	4	5.1
	Agree	3	5.2	9	11.4
	Not sure	10	17.2	14	17.7
	Disagree	3	5.2	9	11.4
	Strongly disagree	40	68.9	43	54.4
	Total	58	100	79	100
There are containers and dustbins for waste collection in the town	Strongly agree	10	17.2	2	2.5
	Agree	5	8.6	3	3.8
	Not sure	4	6.8	8	10.1
	Disagree	12	20.7	22	37.9
	Strongly disagree	27	46.5	44	75.8
	Total	58	100	79	100
A household with large family size produces more waste than low family size	Strongly agree	40	68.9	47	59.5
	Agree	10	17.2	20	25.3
	Not sure	5	8.6	8	10.1
	Disagree	2	3.4	3	3.8
	Strongly disagree	1	1.7	1	1.3
	Total	58	100	79	100

Key: perc. =percentage

Table 26Shows the attitude of the respondents, 17(12.4%) of the respondents strongly agree that there is municipality service for managing municipal solid waste, 35(25.5%) agree, 7(5.1%) not sure, while 34(24.8%) disagree and 44(32.1%) strongly disagree. Regarding micro enterprise organized in the town for collecting solid waste,6(4.4) of the respondents strongly agree, 12(8.%7) agree,24(17.5%) not sure,12(8.7%) disagree,83(60.5%)strongly disagree. This implies that there was no MES organized for waste collection in the study areas. Regarding to the availability of waste containers and dustbins for waste collection in the area, 12(8.7%) strongly agree, 8(5.8%) agree, 12(8.7%) not sure, 34(24.8%) disagree, 71(51.8%) strongly agree. This indicates that the coverage and distribution of waste containers and dustbins in the two-study areas were below the standard. Another question was also asked about the family size and waste production that, 87(63.5%) strongly agree, 30(21.9%) agree, 13(9.4) not sure, 5(3.6%) disagree, and only 2(1.5%) strongly disagree. This implies that among the respondents 63.5% were strongly agree that they feel as the family size increases the volume of waste produced per household increases.

Table 27.Perception towards waste management (n=137)

Statements indicating actions taken Variable	Category	Respondent s by town			
		Sibo		Bure	
		Number	%	Number	%
Poor cooperation among the government agencies on solid waste management	Strongly agree	40	68.9	47	59.5
	Agree	12	20.7	15	18.9
	Not sure	3	5.2	10	12.6
	Disagree	3	5.2	5	6.3
	Strongly disagree	-	-	2	2.5
	Total	58	100	79	100
Poor community participation on solid waste management	Strongly agree	35	60.3	44	55.7
	Agree	10	17.2	13	16.4
	Not sure	6	10.3	9	11.4
	Disagree	5	8.6	6	7.6
	Strongly disagree	2	3.4	7	8.8
	Total	58	100	79	100
Poor response to waste minimization (reuse/recycling)	Strongly agree	39	67.2	44	55.7
	Agree	12	20.7	25	31.6
	Not sure	3	5.2	9	11.4
	Disagree	1	1.7	1	1.3
	Strongly disagree	0	-	0	-
	Total	58	100	79	100

Poor solid waste management may causes health and environmental problems	Strongly agree	40	68.9	52	65.8
	Agree	15	25.8	27	34.2
	Not sure	1	1.7	3	3.8
	Disagree	1	1.7	3	3.8
	Strongly disagree	1	1.7	1	1.3
	Total	58	100	79	100

Key: perc. =percentage

Table 27 Shows the Perception towards waste management of the respondents that, 87(63.5%) of the respondents strongly agree that there is Poor cooperation among the government agencies on solid waste management, 27(19.7%) agree, 13(9.5%) not sure,8(5.8%) disagree, and only 2(1.5%) strongly disagree. This implies that there is a poor cooperation among the government agencies for solid waste management. Regarding community participation on solid waste management, 79(57.6%) strongly agree, 23(16.8%) agree, 15(10.9%) not sure, 11(8.0%) disagree, 9(6.6%) strongly disagree. This indicates that the participation of community on solid waste management is very poor. On the other hand, a question was asked about waste minimization reuse/recycling that, 83(60.5%) strongly agree, 37(27.0%) agree, 12(8.7%) not sure,2(1.5%) disagree, and zero percent strongly disagree. From this data, it indicates that there is a poor waste minimization especially on reusing and recycling wastes once again. Regarding waste and its effects on health and environments a respondents replied that, 92(67.2%) strongly agree, 42(30.6%) agree, 4(2.9%) not sure, 4(2.9%) disagree, and only 2(1.5%) strongly disagree. This implies that majorities of the residents are familiar and know that waste has an effect on health and ecological problems.

Table28.Facilities on Solid Waste Management Service(n=137)

Statements indicating actions taken Variable	Category	Respondent s by town			
		Sibo		Bure	
		Number	Perc.%	Number	Perc. %
There is a land fill sites in the town	Strongly agree	35	60.3	38	48.1
	Agree	10	17.2	22	27.8
	Not sure	3	5.2	2	2.5
	Disagree	5	8.6	9	11.4
	Strongly disagree	5	8.6	8	10.1
	Total	58	100	79	100
Lack of equipment	Strongly agree	34	58.6	44	55.7
	Agree	11	18.9	12	15.2
	Not sure	10	17.2	17	21.5

	Disagree	3	5.2	4	5.1
	Strongly disagree	0	-	2	2.5
	Total	58	100	79	100
Lack of trained personnel	Strongly agree	29	50.0	42	53.2
	Agree	20	34.5	22	27.8
	Not sure	5	8.6	10	12.6
	Disagree	2	3.4	4	5.1
	Strongly disagree	2	3.4	3	3.8
	Total	58	100	79	100
Lack of funds /budget for solid waste collection /management service	Strongly agree	38	65.5	41	51.9
	Agree	15	25.8	23	29.1
	Not sure	3	5.2	10	12.6
	Disagree	1	1.7	3	3.8
	Strongly disagree	1	1.7	2	2.5
	Total	58	100	79	100

Key: perc. =percentage

Table 28 shows the Facilities on Solid Waste Management Service of the respondents about land fill sites in the town that most,73(53.3%) strongly agree,33(24.1%) agree,8(5.8%) not sure,14(10.2%) disagree,13(9.5%) strongly disagree. This implies that majority of the respondents have a positive response on the presence of landfill sites. Regarding facility like equipment,78(56.9%) strongly agree,23(16.8%) agree,27(19.7%) not sure,7(5.1%) disagree,2(1.5%) strongly disagree. This indicate that majority of the respondents explain that the availability of the equipments is nearest to null. In connection with this another question was raised whether or not the availability of trained personnel that,71(51.8%) strongly agree,42(30.6%) agree,15(10.9) not sure,6(4.4) disagree,5(3.6) strongly disagree. On the other hand, respondents was asked question about funds /budget for solid waste collection and management service that,79(57.6%) strongly agree,38(27.7%) agree,13(9.5%) not sure,4(2.9%) disagree, and only 3(2.2%) strongly disagree. From this, someone can understand that mostly the respondents strongly agree with lack of funds/budgets for solid waste collection and management services of solid wastes.

Table 29.Households Waste Disposal Service (n=137)

Statements indicating actions taken Variable	Category	Respondent s by town			
		Sibo		Bure	
		Number	%	Number	%
In your household, you have a metal or plastic container for storing solid wastes.	Strongly agree	8	13.8	12	21.5
	Agree	5	8.6	9	11.4
	Not sure	2	3.4	3	3.8
	Disagree	25	43.1	31	39.2
	Strongly disagree	18	31.0	24	30.4
	Total	58	100	79	100
There is SW lifting tracks in the town	Strongly agree	-	-	-	-
	Agree	1	1.7	1	1.3
	Not sure	-	-	5	6.3
	Disagree	7	12.1	17	21.5
	Strongly disagree	50	86.2	56	70.8
	Total	58	100	79	100
Lack of planning (short, medium, and long term plan)	Strongly agree	20	34.5	33	41.7
	Agree	15	25.9	25	31.6
	Not sure	20	34.5	15	18.9
	Disagree	2	3.4	4	5.1
	Strongly disagree	1	1.7	2	2.5
	Total	58	100	79	100

Key :perc. =percentage

Table 29 shows the households Waste Disposal Service containing metal or plastic container in their households that,20(14.6%) strongly agree,14(10.2%) agree,5(3.6%) not sure,56(40.8%) disagree,46(33.6%) strongly disagree. The same respondents were asked the availability of solid waste lifting tracks in towns that, there is no any solid waste lifting tracks in the town. Regarding this, I also asked a town municipality leader of the town that “we have no solid waste lifting tracks in town; in future we will have a plan to have at least a Bajaj for solid waste transportation”. In relation with this the respondents were also asked a well organized plan for solid waste collection and management they have is that,53(38.7%) strongly agree,40(29.2%) agree,35(25.5%) not sure,6(4.4%) disagree,3(2.2%) strongly disagree. This implies that majority of the respondents replied that a well-organized plan for waste management is not good at all.

Table 30.Households perception on efforts of Municipality on SWM (n=137)

Who has primary responsibility for collecting your household's solid waste once it is brought outside?		Respondent s by town			
		Sibo		Bure	
		Number	%	Number	%
	local government/municipality	40	68.9	47	59.5
	private company	3	5.2	7	8.8
	neighborhood group	14	24.2	23	29.1
	don't know	1	1.7	2	2.5
	Other	-	-	-	-
	Total	58	100	79	100

Key: perc. =percentage

Table 30 shows the results on the responsibility of solid waste management made by the municipality of the town indicated and the respondents reported that 87(63.5%) the local government/municipality has the primary responsibility for collecting household's solid waste once it is brought outside; 10(7.3%) of the respondents claimed that the private company. While 37(27%) of respondents reported that the neighborhood group and about 3(2.2%) of respondent reported they do not know.

4.8.Comparison of MSWM in Sibo sub-urban area and Bure towns.

The environmental objectives, economic level, waste governance, policy regulation, and environmental awareness of residents could influence the implementation of different MSWM system. Comparing the MSWM system in study area can help us to analyze the existing problems in the MSWM system of the two study areas. The results of the findings can be applied to improve the MSWM system in the vicinity and is illustrated here below in figure (13).

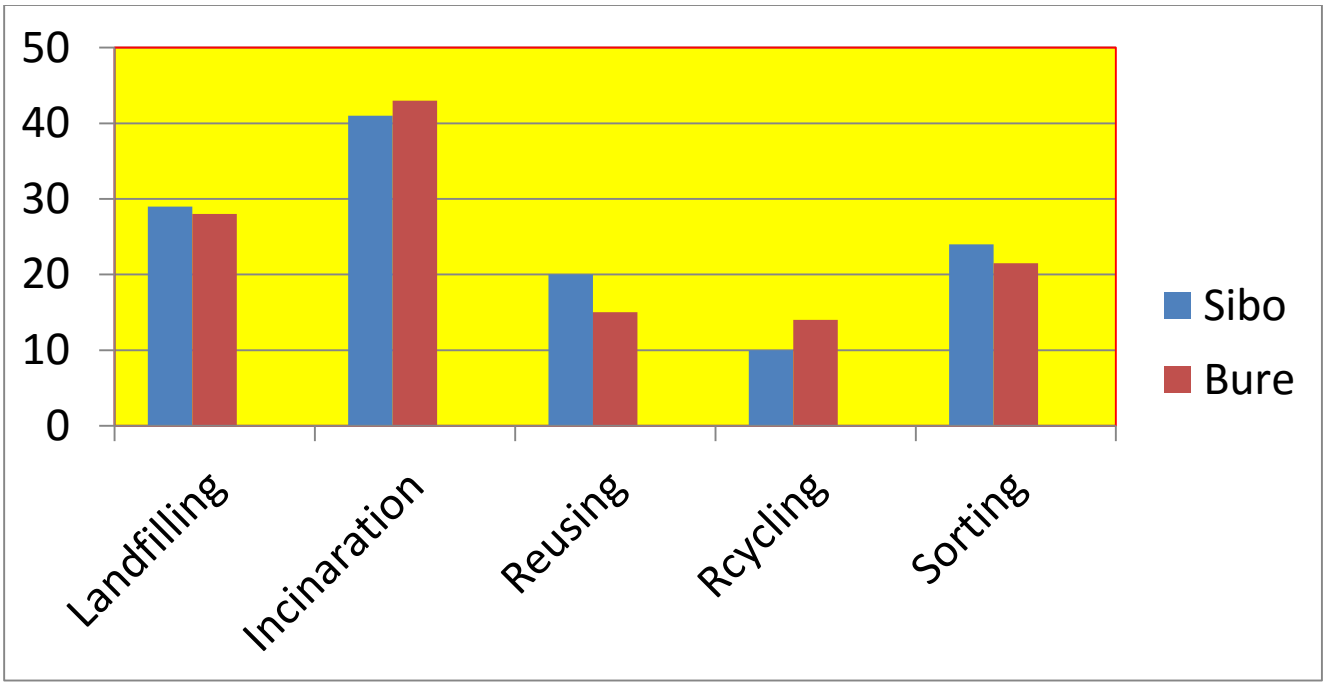

Figure 13.Comparison of disposal methods utilized in Sibo sub-urban and Bure towns

According to the respondents via interview (Figure 13), Incineration is the dominated methods utilized in waste disposal in Sibo sub-urban area, which accounts for (41%) and (42.8%) in Bure town. Landfill is a second dominated method utilized in waste disposal in Sibo sub-urban area, which accounts for (29%) and (28.6%) in Bure. Reusing rate of Sibo area is (20%), while Bure town uses (14.3%) reusing method. On the other hand, recycling waste material is (10%) in Sibo sub-urban area and (14.3%) in Bure towns respectively.

CHAPTER FIVE:

5.0 Discussion

This section presents the analysis of the data that was collected through the questionnaires, interviews and field observation in relation to governance and community participation in solid waste management in case of Sibo sub-urban area and Bure towns.

5.1. Socio-economic status of the Respondents

Even though the proportion of male to female is 57.7% to 42.3%, one does not expect this disparity to greatly influence the people's attitude and perception on household waste management. Recent findings however suggest that gender difference could influence people's perception on solid waste management (E.O.Longe *etal*,2009). Age is expected to play a significant role as maturity could affect level of awareness on environmental health and sanitation .The data on age shows that matured adults whose reasoning level as regard household waste and management is expected to be high and thus facilitate public involvement in solid waste management process. The influence of educational attainments could as well be an important factor that could influence people's perception on SW management. Zero percent of the respondents had no formal education. This percentage even though small, could negatively influence their perception and attitude on SW management in general and affect recovery cost of waste management services in particular. The poor average income of respondents is another challenge considered as a very important variable that could influence people's perception and attitudes negatively on solid waste management system ((E.O.Longe *etal*,2009).From the data obtained, economic consideration also appears to play a major role in people's orientation and perception as well as attitude to solid waste management practices in general.

5.2.The generation rate and composition of wastes in the two study areas.

5a.Solid waste generation rate

Solid waste generation rate is the amount of waste join to waste stream from human activities. The sources of MSW in Sibo sub-urban and Bure towns include residential, commercial center, and institutional location such as business center, schools and health centers. The greatest amount of solid waste of the study area (66. %) was generated from residential areas. The report

from Gondar town (Mohammed.G, 2015) also confirms the same results. This could be due to the similarity in economic level of material they used. The amount of solid waste generated from households in this study area was 0.15 Kg/capita/day which is lower than what have been reported by (Gebrie,2009) in other towns of Ethiopia like in Gondar town that was 0.21kg/cap/day, Mekele 0.27kg/cap/day, Debre Markos 0.22kg/cap/day, and Addis Ababa 0.25kg/cap/day. The possible difference might be due to the fact that solid waste generation rate was estimated from all solid waste sources like wastes from industries in the previous studies. Other reports by MOH (1996) reveal that the average per capita generation rate, a person generates was0.15kg/cap/day, which was similar to obtained in this studies. The findings in the two study areas reveal that, plastic waste is the most generated solid wastes in areas. Concerning the family size, the families with few members produce less waste compared to the families with many members. The data from (table9) shows clearly that the larger the family, the larger the volume of solid waste generated. The report from other towns of Ethiopia confirms similar results.

5b.Solid waste composition

The result of the survey in the study area showed that municipal waste is an aggregate of all substances ready for disposal. The composition of the solid organic waste was almost homogenous in nature across the study households. As it was observed in this study, majority (44.5%) of the waste was of plastic origin while the industrial origin was almost none in the study areas. Of the plastic source, residues of plastic and bags containers take the greatest portion. Overall composition includes paper, vegetable peelings, paper and cardboard, green wastes, textile scraps, ash, and others. The report from Gondar town indicated that solid wastes generated in the area contains both bio-degradable and non-biodegradable solid wastes were generated from the town(Mohammed.G, 2015).this similarity is probably due to high commercial activities in the areas.

5c. **Solid waste Source**

The result from the surveyed households reveals that MSW generation by source and type in study area has the following distribution. It has been revealed that the largest constituent of residential solid waste was residential (66.1%), commercial institute (18.5), governmental institution (9.2%) and the remaining was from health and restaurants (6.2%) respectively. On the other hand, the composition of municipal wastes varies greatly from sector to sectors and

consists of both biodegradable and non-biodegradable wastes. The result obtained from Jigjiga town by (Yohannis.B, *etal*.) also reports the same results.

5.3 The condition of households solid waste management in the two study areas.

5.3.1 Solid waste collection facilities

The condition of household's solid waste management in the area was determined and about 84.7% lack primary solid waste storage facility. When the condition is compared with other town of Ethiopia, the result obtained from my study area is very poor. The other condition of solid waste management in the two-study areas were examining the availability of communal solid waste storage material (skips) and the result reveal that there were no communal solid waste storage materials in the two study areas. The study reveals that a large percentage of the community does not have temporary storage material. However, the report from Gondar (Mohammed.G, 2015) and other towns of Ethiopia reported that most of the community in the study area contains primarily storage materials. This difference might be due to giving less attention by local authority.

5.3.2. Attitudes and awareness on appropriate SWM

Waste sorting was another challenge in the study areas. The finding of this study reveal that majority (70.8%) of the respondents do not separate wastes at their source and were not willing to take part in the process. The report from Kenya also indicates that majority (88%) of the households; do not sort their solid wastes before it is collected for disposal. On the other hand, the study made in Mekelle city, Ethiopia revealed that approximately (83.5%) did not practice any type of waste separation (Tadesse *et al*., 2008 cited in Indunee.W, 2014). The results from the study areas were comparatively the same, which manifests that the attitude and awareness by the community and the local government is on solid waste separation, is very poor.

The majority (47.4%) of the households disposal methods were burning the waste in their environment and (34.3%) use land filling. This implies that more wastes end up land filled or burnt by the households as opposed to proper waste disposal due to low level of participation by households.

5.3.3.Solid waste Collection services

Regarding waste collection and disposal services most of the respondents from the households (89.1%) stated that they collect their wastes and the town administration gave services sometimes. The report from Adama city (60-69%) revealed that waste collection service was

carried out by MSE, which is different from Sibo sub-urban and Bure towns. This difference probably by high budget allocation and high level of awareness by the community in Adama city but low budget allocation in my study areas (Mengist.H.*etal.*,2014). The attitude and culture by households has exerted negative influence on the process of solid waste management in Sibo sub-urban and Bure towns in line with the literature review by Achankeng (2003).

5.3.4. Financial Resource

Lack of financial resources and infrastructure was another challenge faced in study areas. The municipality was facing many difficulties in the area of finance in order to buy waste collection equipments such as dustbins, skips and refuse trucks due to poor funding. This was most probably due to non-institutional organization in the study areas and the local administration pay less attention for solid waste management and collecting revenue for SWM issues. Lack of funds can be caused by inadequate fee collection, too low fee rates, failing fund raising methods, low loan repayment, difficult access to credit, and marketing problems. The report from Addis Ababa sub-city also described that lack of financial management and planning; particularly cost accounting depletes limited resources available for the sector even more quickly and causes solid waste management services to halt for some periods, thus losing the trust of service users (Gebrie, 2009).

5.3.5. Appropriate Laws on proper SWM

This study reveals that the greatest weakness in the management of waste regulation most probably because of the local administration gave less attention on the issue of waste management. The study from Tanzania (Dawood David, 2013) indicated that about 73.3% of the respondents did not know the laws of SWM enacted by the Local government authority. The report from Nefas-Silk Lafto at Addis Ababa also indicated that Lack of adequate implementation of rules and regulation, standards and proclamation have affected the existing status of MSWM.

5.4 The status and spatial coverage of MSW service in the study area.

The status and spatial coverage of MSW service in Sibo sub-urban area and Bure towns is only restricted to the center of the town and accessible roadsides; the collection and management of SWs in the study area was inefficient and below the standard. This is probably because of the two study areas has no its own town plan, so waste pickers collects wastes only which is littering

on main roads (asphalt).The research reported from Gondar town by Mohammed.G(2015) confirms the same result obtained from the study areas of Sibo sub-urban and Bure towns.

5.4.1Solid waste disposal systems

The most and the dominant waste disposal system in the study areas was waste burning which accounts for(47.4%),and open land filling which accounts for(34.3%) .The report from Bule hora by (Adane,2018) indicated that open air burning was (42%) followed by surface disposal(36%).This similarity probably due to the awareness and attitude of the community for the safety of the environment and health.

5.5 The present institutional arrangements and WM governance in the two Study areas

5.5.1Solid waste management Governance

The present institutional arrangements in the study area was very poor; and each sector is working independently. The responsible institutional arrangement, skilled work force and financial resources, appropriate rule and regulation, short, medium and long term planning, and good cooperation with different stakeholders are missing from the study area. Solomon (2011) also reported that for the proper waste management, the institutional frameworks, the stakeholders and financial resources has to be well organized and implemented. Administratively the present structure of waste management does not appear to be proactively working towards achieving goals of waste collection in the Sibo sub-urban and Bure town. The poor institutional arrangements according to this report are related to the weakness of the overall governance of SWM. There was currently insufficient support from the local government to waste management scheme financially. The study area depends totally on their own sources mainly from property taxes collection. In addition, waste management governance (exercising power) on waste controlling issue is very weak because the above-mentioned elements were absent from the two study areas as compared to some other towns of Ethiopia.

5.6 The community participation and their willingness to pay for SWM practices in Sibo sub urban and Bure towns.

5.6.1Community influences on solid waste management

The community behaves as they do based on what they know and what is practiced around. As a result little concern is given to the impact of their action and attitudes. The effect of governance on regulative framework and there is general law awareness from the authorities on waste handling activities and the impacts associated with the improper waste management. The results

shows that community participation is very weak in the study areas, and majority (89.1%) of the respondents were not actually willing to pay to improve the waste collection services. Willingness of the respondents to participate in waste management process is also low. Likewise, the survey data (Table 19) indicated that (83.3%) of respondents do not know about the rules and regulations of SWM in the study areas. The result reported from Bahir Dar city (Koyachew, 2016) also confirms the same result obtained from Sibo sub-urban area and Bure towns. This is probably by the low awareness of the community and absence of training and their low educational level.

CHAPTER SIX

6.0. Conclusions and Recommendations

6.1. Conclusion

Based on the findings, the following conclusions are drawn:

The rate of generation of household solid waste in the study area is increasing with an increase in population that is posting a great environmental and public health problems. Knowledge, lack of access to services (door-to-door waste collection),the family size and household income are the most significant factors affecting the quantity of solid waste from household consumption.SWM in general and waste handling, the contribution of Governance and community participation, in particular, is weak. Disposing wastes by digging a hole around the house and burns it; throw it on an open space, in or on street and disposing on the backyards of their house are other means of disposing methods used by the respondents. Households, who used improper site, mostly preferred to dispose their wastes at open spaces. Besides, sample respondent replied that sometimes the municipality also collects wastes, which are disposed by the households on free space, and remove through open burning. Thus, all the above discussions can be witnessed that solid waste management in the study area was very poor and it need of a solution. The disposal site and its management also found inadequate. This is because the site is at distant location, and there are settlement areas, just adjacent to the disposed sites, all types of Waste nature is indiscriminately disposed with no further treatment. The general awareness and participation of the community in SWM are very low. Very weak enforcement of rules and regulations by the local government are some of the institutional factors that hindering the performance of the towns MSWM.

6.2. Recommendations

Based on the findings of the study and the conclusion drawn, the researcher suggested the following recommendations as a solution measures need to be taken by all stakeholders to solve the solid waste management problems of the study area.

The present solid waste collection rate of the town is very low which shows that more efforts should be made to change the situation. To improve the collection rate increase the number of MSEs and increase their capacity by providing them waste collection materials and funds by the local administration. The resources needed for this purpose might be injected (involved) by the local authorities or other funding agents.

Along with the proper management of the wastes that must be disposed of, the reuse or recycling of some of the waste items may be considered. This can help to minimize the amount of waste that requires to be disposed of on the one hand and to use recyclable materials for economic benefits on the other.

In the study areas, there was no communal solid waste transfer stations in the town. Therefore, the SB should building communal solid waste storage containers (skips) as well as dustbins at a regular intervals (distances) is recommended to improve the SWM service. The present waste disposal site is an open field and it has negative impacts to humans by affecting human health and environmental problems. Thus, some measures are needed to lessen the negative consequences. One of the important actions to take is avoiding the open dumping system, open burning, and increasing reusing and recycling of non-biodegradable materials and composting biodegradable materials. Since the poor awareness of the community was one of the major factors, SB and other stakeholder's office of the town should engage continuous awareness creating campaign or education for the public through competitions among schools, institutions, businesses center and by using the different media of communication about MSWM in general. The result of this study reported that improper dumping is practiced in both Sibo sub-urban and Bure towns. Besides, there was nothing-appropriate laws related waste management in the study area, which shows a significant impact on effective solid waste management at household level. It means that the law enforcement body of the local government gives little attention .Thus, for laws to be effective people need to know the presence of laws through awareness creation activities and implementers should aggressively work to minimize illegal disposal activities

through continuous follow up. For a waste management system is to be sustainable, it needs to consider all of the operational, financial, social, institutional and environmental aspects. In addition, developing training materials on occupational and environmental health and the risk issues relating to solid waste management for staff and community at all levels.

The government should implement a practical sustainable strategy to give awareness, and providing a storage material for every waste generator to segregate and store the waste generated by them and organizing as well as funding MSEs and other waste collectors. One of the major factors that have contributed to poor waste collection and management in the study area was the carelessly involvement of the town's governmental body and limited community participation in solid waste management. The limited participation has budded from co-ordination and collaboration problems that exist among the three stakeholders in solid waste management like the communities, the government and the private sectors. The local government should create/enhance awareness and improve the services on the issue of SWM.

As a result, effective waste management needs a commitment from both the local people and the town's authorities. On the other hand, the people should use the communal waste containers in the correct way and avoid littering. Finally, the researcher recommend that bodies like NGO and MSEs should be involved and come up with better strategies of handling and disposing the waste with minimal pollution to the environment.

5. REFERENCE

Abebe, B., Worku, L., Triest, L. & Kloos, H. (2009). Urban impact on ecological integrity of nearby rivers in developing countries: the Borkena River in highland Ethiopia,Environmental Monitoring and Assessment, 153(1-4), pp- 461-476

Achankeng Eric, (2004).Sustainability in Municipal Solid Waste Management in Bameda and Yaounde, Cameroon, University of Adelaide.

Achankeng Erick (2003) Globalization, Urbanization and Municipal Solid Waste Management in Africa. 2003 Conference Proceedings – African on a Global Stage. African Studies Association of Australasia and the pacific.

African Development Bank (ADB), (2002) Study on Solid Waste Management Options for Africa. Project Report.Final Draft Version. Sustainable Development and Poverty Reduction Unit, African Development Bank (ADB), Abidjan

Ahmed S, Ali M., (2002). Partnerships for Solid Waste Management in Developing Countries: Linking Theories to Realities a Water and Sanitation Program-South Asia, Bangladesh.

Ali. A (2018) Misconceptions and Inappropriate Solid Waste Management in Small Towns of Ethiopia: Bule Hora Town, Oromia Region, Ethiopia. Int J Waste Resour 8: 324. doi: jh 10.4172/2252-5211.1000324

Bournay, E. (2006) Waste, Recyclers and Recycled. In Planet In Peril: An Atlas Of Current Threats to People And The Environment. Unep/Grid-ArendalAnd Le Monde Diplomatique.

Cunningham, (2008).Principles of Environmental Science Inquiry and Applications. 4th edition,McGraw Hill International Edition, USA

CSA (2007) Central Statistical Authority of Ethiopia, Summery and statistical report of the population and housing censes result of Ethiopia.

Charlotte, A. 2012. A Guide to the Green Revolution: Proper Waste Management. Printed in the USA.

Charlotte, W. 2009.Earth friendly waste management. Minneapolis:Lerner Publications Company.

Chatterjee, R. (2010). "Municipal solid waste management in Kohima city-India". Iran Journal of Environmental Health Science Engineering, Vol. 7, No. 2, pp. 173-180.

Dawit Walelign and AlebeleBayrau, (2003).Improvement of solid waste management in AddisAbaba, a participatory Approach (Draft), Addis Ababa, Ethiopia.

DegnetAbebaw, (2003). Determinants of Solid Waste Disposal Practices in Urban Areas of Ethiopia: A Household-level Analysis. Project Muse Scholarly Journals, Ethiopian Economic Association/Ethiopian Economic Policy Research Institute, vol.xxiv(1), AddisAbaba, Ethiopia. Retrievedfromhttp://www.muse.uq.edu.au/journals/eastern-Africa social-science-research-review/v024/24.1ejigie.pdfCSA (2007) Central Statistical Authority of Ethiopia, Summery and statistical report of thepopulation and housing censes result of Ethiopia.

EPA (2016).Reports on the environment https://www.epa.gov/roe/.

E.O. Longe, O.O. Longe, E.F. Ukpebor (2009).People's Perception On Household Solid Waste Management In Ojo Local Government Area In Nigeria

FDRE (Federal Democratic Republic of Ethiopia) .2007.Federal Negarit Gazeta,Proclamation No. 513/2007.Solid waste management proclamation.13th year No. 13.pp 3524–3531.

Gebrie Kassa,(2009). Management of Domestic Solid Waste in Bahirdar Town: Operational Analysis and Assessment of Constraints that Affect Solid Waste Management, AddisAbaba, Ethiopia.

GeorgeTchobanoglous, Hilary Theisen, Samuel Vigil 1993, Integrated Solid Waste Management Engineering Principles and Management Issues. (e.d. Paul H King, Rolf Eliassen,Emeritus) McGraw-Hill, Inc.

Hasheela Raili,(2009). Municipal Waste Management in Namibia: The Windhoek Case Study. [pdf] Universidad Azteca. Available at: <http://www.the eis.com/data/literature/Municipal%20Waste%20Management%20in%20Namibia.pdf> Accessed June 2016

Hoornweg,D., &Bhada-Tata, P. (2012). What a Waste: A Global Review of Solid Waste Management.(Urban Development Series)Retrievefromhttp://go.worldbank.org/

Indunee Welivita1(2014).Designing an Economic Instrument for Sustainable Solid Waste Management in the Household Sector. University of Portsmouth

Jayarama, R. (2011). Municipal solid waste management. India: Boca Raton, FL: CRC press.

Koyachew Kassie(2016). The problem of solid waste management and people awareness on appropriate solid waste disposal in Bahir Dar City: College of Development Studies, Addis Ababa University, Addis Ababa, Ethiopia.

Plan (2007).Ethiopian Communities Take the Lead in Ending Open Defecation planwebsite.Web. 5 October 2011.

Maria Gaviota Velasco Perez Alonso, Nickolas Themelis.Generation and Disposition of Municipal Solid Waste in Mexico and Potential for Improving Waste Management in Toluca Municipality.Waste-to-Energy Research and Technology Council (WTERT).

Online 2011.

Mengist Hailemariam, Assegid Ajeme (2014). Solid Waste Management in Adama, Ethiopia: Aspects and Challenges. Vol:8, No:9, 2014

Mohammed Gedefaw(2015). Assessing The Current Status Of Solid Waste Management Of Gondar Town, Ethiopia

Mohammad Wasiuzzaman Shohan (2015). A Case Study On Solid Waste Management In Dhaka City

Mugambwa,E.,Kizito(2009).WhatisWasteManagement? Waste-Management&Catid=1:Latest-News&Itemid=59 Accessed 25th April, 2009 319.5864: 761-64.

National Environmental Management Authority (2007) State of the Environment Report for Uganda 2006/2007.Kampala, National Environment Management Authority.

http://www.gdrc.org/uem/waste/swm-glossary.html web page accessed, September 5, 2010.

Robertson,W. (2002). Overview of Decentralization Worldwide: A stepping Stone to Improve Governance and Human Development. United Nations Development Fund 2nd International Conference on Decentralization Federalism: The Future of Decentralizing States.Manila,Philippines.http://www.undp.org/governance/docs/DLGUD_Pub_overview-

Schbelerin, P., Wehrle, K. and Christen, J.1996. Conceptual framework for municipal solid waste management in low-income countries. Working Paper No. 9. SKAT (Swiss Centre for Development Cooperation in Technology and Management) Switzerland.October 2011. Decentralization worldwide-paper.pdf accessed 16/02/08.

Scheinberg, A. (2008). A Bird in the Hand: Solid Waste Modernization, Recycling and the Informal Sector.WASTE, Advisers on urban environment and development, Gouda, Netherlands. Paper Delivered at "Solid Waste Planning in the Real World" CWG-Green Partners Workshop, Cluj, Romania, 22-23 February 2008.

Scheinberg, Anne (2010). Solid Waste management in the Worlds Cities Waste.Web. 5

Shekdar, A. (2009). Sustainable solid waste management: an integrated approach for Asian countries. Journal of Waste Management, 29(4), 1438–1448. http://dx. Doi: 10.1016/j.wasman.2008.08.025

Solid Waste Management Manual (2000). Central Public Health and Environmental Engineering Organization (CPHEEO), Government of India.

SolomonAsrat, (2006). Solid Waste Management: A Case Study of Household Solid Waste Management in Arada Sub-City, Addis Ababa, Ethiopia

Solomon, C. (2011). Assessment of municipal solid waste management service in Dessie town. Master thesis, School of Graduate Studies, Addis Ababa University.

Tchobanoglous G., Theisen H., and Eliassen R., (1977).Solid waste Engineering principles And Management Issues McGraw-Hill Kogakush, Tokyo.

Tchonobanglous G., Theisen., and Samuel N., (1993). Integrated Solid Waste Management Engineering principles and management Issues McGraw – Hill. Singapore.

United Kingdom (UK) Environmental Protection Act, (1990). Definition of Waste: Wikipedia, the Free Encyclopedia. Retrieved from http://en.wikipedia.org/wiki/waste

Unnisa, S. &Rav, S. (2013).Sustainable solid waste management. Toronto: Apple Academic press.

UNEP,(1996). International Source Book on Environmentally Sound Technologies for Municipal Solid Waste Management. UNEP Technical Publication 6, Nov.

UNEP,(2009). Developing Integrated Solid Waste Management Plan: Training Manual for Assessment of Current Waste Management System and Gaps therein, Volume 2, Osaka/ Shiga, Japan.Retrievedfromhttp://www.unep.or.jp/ietc/publications/spc/ISWMplan-vol2.pdf

UNEP,((2007) Global Environment Outlook-4.Environment For Development, Valletta, United Nations Environmental Programme.

US EPA (2013, June 17).Municipal Solid Waste. Retrieved January 15,2013,U.S.EnvironemtnalProtectionAgency:http://www.epa.gov/epawaste/nonhaz/municipal/index.htm

WHO (2016).http://www.who.int/water_sanitation_health/medicalwaste/002to019.pdf

Wondafrash Dibaba(2017).Assessing municipal waste management in Ethiopia: applying the best practices of the Finnish system Laurea University of Applied Sciences.

World Health Organization (WHO).52 Million people in Ethiopia defecate in the open"

WHO/UNICEF(2008).Web. 22 September 2011.

The World Bank, Johannessen, L.,Mikkel& Boyer, G. (1999). Observations of Solid Waste Landfills in Developing Countries: Africa, Asia, and Latin America. Urban Development Division Waste Management Anchor Team.

Yohanis Birhanu, Genemo Berisa. Assessment of Solid Waste Management Practices and the Role of Public Participation in Jigjiga Town,Somali Regional State, Ethiopia. International Journal of Environmental Protection and Policy. Vol. 3, No. 5, 2015, pp. 153-168.doi: 10.11648/j.ijepp.20150305.16

ZerbockOlar,(2003). Urban solid waste management: waste reduction in developing nations.

Houghton, MI:MichiganTechnological University. Web. 3 November 2011.

Zerihun Alamrew(2018).Determination Of Household Solid Waste Generation Rate And Characterization Of Its Composition In Dire Dawa City Administration, Ethiopia

Zurbrug, C. (2003). Solid Waste Management in Developing Countries. Retrieved from http://www.eawag.ch/organisation/abteilungen/sandec/publikationens-swm/downloads swm/basicsofSWM.pdf

Appendix-A

QUESTIONNAIRE FOR SOLID WASTE MANAGEMENT SERVICE SURVEY

1. Introduction

This questionnaire is designed to facilitate the assessment of the current situation of solid waste management service in Sibosub-urban and Bure towns. I am therefore carrying out a study on Governance and public participation of solid waste management in Sibo sub-urban and Bure town. The information collected by this questionnaire for the two study areas, inturn, can be used to evaluate the status of the solid waste management in Bure Woreda. I request you to allow me ask you some questions which you can answer as you feel. The information you will give will be treated confidentially and will be used for the purposes of writing the research report, and will not be used for any other purpose.

PART I.

IDENTIFICATION DATA

1. Type of Respondent.

a) Resident b) day labor c) Trader d) Other (specify)……

2. House Ownership.

a) Private b) Rented

3. Sex.

a) Maleb) Female

4. Age 15-2526 6-4546-55 than 55

5. Family size: a/1-2 b/3-4 c/5-9 d/>=10

6. Employment:government private sector self employed merchant

7. Level of Education.

Never went to school Primary leve Secondary Level college& university

8. What is the monthly average income of your entire household (Ethiopian currency)?

a).1000 or below b).1001-2000c).2001-3000d).>3001

PART II

Role Played By Residents in Solid Waste Management

9. Do you have any waste containers in your home/shop/stall?

a) Yes b) No

10. Do you sort the waste generated in your home/shop/stall?

a) Yes b) No

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

a) Yes b) No

Please Specify……..

12. Who takes the waste from your home/shop/stall for disposal?

a) Myself

b) House keeper

c) Someone else in the home

d) Private waste collector

e) Town council

13. Do you pay for collection of waste from your home/shop/stall?

a) Yes b) No

14. If yes, in your view, is the fee affordable?

a) Yes b) No

15. Where is the waste taken for disposal?

a) Land fill

b) Collecting center

c) A pit for burning

d) I do not know

e) Other (Please specify)……

16. What do you do about waste you find outside your home/shop/stall?

a) Pick it and put it in a nearby waste container

b) Move on

17. Do you think you can reduce the amount of waste you generate in your

home/shop/stall? a) Yes b) No

18. If yes, how?.....

19. Do you think there are some waste items which can be reused but you are not reusing?

a) Yes b) No

Please Specify……

20. Do you think it helps to sort waste before disposing it of?

a) Yes b) No c) I don't know

21. In future, are you willing to pay for collection of the waste that you generate in your home/shop/stall?

a) Yes b) No

22. Do you think it is necessary for you to work together with other residents/traders/market Vendors for better waste management?

a) Yes b) No

23. Do you think it is necessary for you residents/traders/market vendors to work togetherwith the Town Council in managing waste?

a) Yes b) No

24. Do you think the residents/traders/market vendors are capable of managing the waste they generate without help from the Town Council?

a) Yes b) No

PART III.

Solid Waste Disposal Practices

3.1 Do you reuse household wastes? Yes _____ No _____

3.1.1 If Yes,

- Type of reused wastes _____
- Purpose of Reused wastes _____

3.2 Do you compost wastes? Yes _____ No _____

3.2.1 If yes, what type of wastes? _____

3.3 Do you burn (incinerate) household wastes? Yes _____ No _____

3.3.1 If yes what type of wastes? _____

3.4 Do you use open dump as a disposal method? Yes _____ No _____

3.4.1 If yes, where do you dump?

- Inside the compound _____
- Outside the compound _____

3.4.2 What type of waste do you dump? _____

3.4.3 Why you prefer the above method? _____

3.4.4 How far is the container from your home?

- 20-50 meters _____
- 51-100 Meters _____
- 101- 200 Meters_____
- 201-500 Meters_____
- >500 meters _____
- No waste container is found in the town ----------

3.4.5Is there accessible road to the nearest container? Yes ____ No ___

3.4.5.1 What means do you use to transport wastes to containers?

- By hands _____
- Hand pushed carts _____
- Horse drawn carts _____
- Others specify _____

4. Do you dump solid waste in to the river? Yes _____ No _____

4.1 If yes, why? _____

4.2 Do you sell wastes? Yes _____ No _____

4.3 If yes, what type of wastes do you commonly sell?

- Plastics _____
- Metals _____
- Papers _____
- Leaves and grasses _____
- Others Specify _____

4.4 Do you have contractual agreement with Micro and small Enterprises who

Collect and transport wastes to containers? Yes _____ No _____

4.5 If yes, how much do you pay them monthly? _____ Birr.

5. Is there anybody who monitors that waste is properly collected and transported to

The containers? a/ Yes _____ b/ No _____

- If yes, who? _____

6. Is the existing waste management of the municipality satisfactory? Yes ____ No _____

6.1 If no, what measures do you think should be taken to improve?

---

7. Does the municipality practiced to create awareness about SW and its positive and negative consequences to the community?_____

8. What actions does the municipality take on individuals who improperly dispose waste?_____

10. If your solid waste container is placed outside your home, taken to a larger container at the same building, or taken to a communal container, how often is the container emptied by the municipal solid waste service?

1=daily2=two times a day3=three times a week4=twice a week

5=once a week6=less than once a week7=less than once a month

8=don't know9=other _____

11. What type of waste does your household reuse (canyou indicate more than one)?

a. glass _____b. plastic_____c. paper _____d. cardboard _____

e. compostable _____f. metal cans _____g. other_____

12. What type of waste does someone else pick up for recycling?

a. glass _____b. plastic _____c. paper _____d. cardboard _____

e. clothing _____f. metal cans _____h. other----------

13. Which of the following types of solid waste does your household sell ?

a. glass _____b. plastic c. paper _____d. cardboard _____e. compostable _____

f. clothing __Please Specify……

14. Who has primary responsibility for collecting your household's solid waste once it is brought outside?_____

1=local government/municipality2=private company

3=neighborhood group 4=don't know

15. Who got the benefit from the environmental cleaning in the town?

A. Residents ☐ B. Community members' ☐ C. Community leaders ☐

18. In your community, is their removal techniques/means of solid wastes in the town?

Yes ☐ B. No ☐

PART IV.

Problems encountered in solid waste management service. Please kindly indicate your agreement and tick on appropriate spaces.

S/n	Statements indicating actions taken	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1.	There is municipality service for managing municipal solid waste					
2.	There is a land fill sites in the town					
3.	There is micro enterprise organized in the town for collecting solid waste					
4.	There are containers for waste collection in the town					
5.	There is a lifting tracks in the town					
6.	There is a dust bin availability in the town					
7.	Poor cooperation among the government agencies on solid waste management					
8.	Poor community participation on solid waste management					
9.	Poor response to waste minimization (reuse/recycling)					
10.	Lack of control of hazardous waste					
11.	Lack of equipment					
12.	Lack of trained personnel					
13.	Lack of vehicles					
14.	Lack of funds /budget for solid waste collection /management service					
15.	Lack of planning (short, medium, and					

	long term plan)					
16.	Poor solid waste management may causes health and environmental problems					
17.	A household with large family size produces more waste than low family size					
18.	In your household, you have a metal or plastic container for storing solid wastes.					
19.	All waste is unwanted or useless					

PART V. OPEN-ENDED QUESTION

Please Read the Following Carefully and Answer as You Feel

1. What has been the problem with municipal solid waste management?

2. What do you think are the cause of these problems?

2.1 And in your opinion what should be done?

3. What is the present hierarchy of waste in your municipality and what do you expect to achieve in the future?

4. What would you say about public awareness on the issue of waste management?

5. Is there any type of cooperation that enables for example waste collectors suggest new measures to municipal waste management? If yes, how? If no, why?

- ***Thank you very much in advance for your time and effort put in this work.***

Appendix- B

Yuunivarsiitii Jimmaa, Kolleejjii Saayinsii Barnootaa ,Muummee Saayinsii Uumamaa

Gaaffannoo hawaasaa fi jiraattota naannotif dhiyaate

Kaayyoon gaaffanoo kanaa milka'ina haala qabiinsaa balfa xuraawaa gogaa dhabamsiisuu fi rakkowwan hirmanaa hawaasaa addaan baassuun furmaata rakkoo kana tiif fala kaa'uu dhaf. Bu'uuruma kanaan odeeffannoo sirrii ta'e isin keenitanu argannoo qo'annoo kanaa tiif murteessaa dha. Odeeffannoo fi yeroo naaf kennitaniif durseen isin galateeffadha.

Qajeelfama waliigala

- Maqaa keessan barreesuun hin barbaachisu
- Gaaffannoo kana yeroo guutanu bu'uura qajjelfama kenameetiin ta'u hindagatinaa.
- Bakka (Sanduqa) qopha'ee keessatti Mallattoo deebii (√) ka'uun agarsiisaa.
- Bakka duwaa kenname irratti yaada gabbaaba hubannoo keessanii bareessaa.

KUTAA TOKKO

Odeefannoo dhuunfaa

1.Nama yaada kenne

a/ jiraataa magaalaa b/ daldaalaa c/hojjetaa guyyaa

d/kan biroo (ibsi)----------

2.Qabeenyummaa manaa

a/ kan dhuunfaa b/ kireefataa

3.Saala a/dhiira b/dhalaa

4.Umurii :15-25☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 55 fi ol ☐

5.Baay'ina maatii: a/1-2 b/3-4 c/5-9 d/>=10

6.Gosa qaccarrii hojii: mootummaa ☐ sektara dhuunfaa ☐ hojjetaa guyyaa ☐ daldalaa ☐ kan biraa☐ _____

7.Sadarkaa barnootaa : hin baranne ☐ sadarkaa 1ffaa ☐ sadarkaa 2ffaa ☐

koollejjii fi yuuniversiitii ☐

8.Mindaan ati ji'aan argatu meeqa(qarshii Itoophiyaatin)?

a/1000 gadi b/ 2001-2000 c/2001-3000 d/ > 3001

KUTAA LAMA

Gahee Jiraattonni Magaalaa Xuraawaa Gogaa Magaalaa Keessaa Itti Dhabamsiisan

9.Bakka ykn meeshaa balfa xuraawaa gogaa itti kuustu naannoo mana keetii ykn mana hojii keetii qabdaa? a/ eyyeen b/ lakkii

10.Balfa xuraawaa gogaa naannoo keetii sadarkaa isaanitiin ni keessaa? a/eyyee b/ lakkii

11.Balfa xuraawaa gogaa naannoo kee jiru keesaa kan ati deebiftee itti fayyadamtu jiraa?

a/eyyee b/ lakkii

c/adda baasi ibsi_____

12.Miseensota maatii kee keessaa balfa xuraawaa gogaa naannoo kee keessatti uumame kan dhabamsiisu eenyu? a/ ana b/ waardiyyaa manaa c/namuma mana keessa jiru

d/garee dhuunfaa balfa funaanan e/bulchiinsa magaalaa

13.Balfa xuraawaa naannoo keetti uumameef warra qulqulleesuf qarshii ni kaffaltaa/kennitaa?

a/eyyee b/lakkii

14.Akka ilaalcha keetti yaanni kee eyyee yoo ta'e qarshiin ati kaffaltu/kennitu kun gahaadhaa?

a/eyyeen b/ miti

15.Balfi xuraawaan naannoo keetii funaanamu eessatti geefama?

a/bakkee irratti gatama b/kuusaa xuraawaa keessatti gatama c/ni gubama d/ani hin beeku

e/ kan biraa_____

16.Balfa xuraawaaa naannoo keetti uumame tokko yoo argite ati akka nama tokktti maal goota?

a/kaasen kuusaa balfa xuraawaa keessa buusa b/biran darba c/kan biraa_____

17.Ati akka nama tokkootti balfa xuraawaa naannoo keetitti akka hin uumamne hir'isuu ykn xiqqeesuu ni dandeessaa? a/eyyee b/ lakkii

18.Yoo ni dandeessa ta'e akkamitti?_____

19.Ati akka ilaalch keetitti balfa xuraawaa gataman keessa deebi'anii fayyaduu kan danda'an garuu kan ati deebistee itti fayyaadamaa hin jirre jiraa?

a/eyyeen b/ lakkii

c/yoo jiraate ibsi_____

20.Ati akka ilaalcha keetti balfa xuraawaa naannoo keetii osoo hin dhabamsiisin gosa isaanin adda baasun ni danada'amaa? a/eyyee b/lakkii

21.Ati akka karoora keettti ,gara fuulduraatti balfa xuraawaa naannoo keetti ykn naannoo mana hojii keetti ykn mana kuusaa meeshalee keetti uumameef waarra qulqullesaniif qarshii ni kaffaltaafii? a/eyyeen b/lakkii

22.Ati akka ilaalcha keetti balfa xuraawaa naannoo keetti uumame qulqulleesuu fi hoogganuuf jiraattota magaalaa ,daldaaltota,fi qaama kanneen biroo wajjin hojjechuun ni barbaachisaa?

a/eyyee b/lakkii

23. Ati akka ilaalcha keetti balfa xuraawaa naannoo keetti uumame qulqulleesuu fi hoogganuf bulchiinsa magaalaa wajjin hojjechuun ni barbaachisaa? a/ eyyee b/hin barbaachisu

24.Ati Akka ilaalcha keetti balfa xuraawaa naannoo keetti uumame qulqulleesuu fi hoogganuf gargaarsa bulchiinsa magaalaa malee hojjechuun ni danda'amaa? a/ eyyee b/hin danda'amu

KUTAA SADII

Tooftaalee Balfa Xuraawaan Ittiin Dhabamsiifamu

3.1.Balfa jajjaboo mana keessaa deebiftee ni fayyadamtaa? a/eyyee b/ lakkii

3.1.1 Deebin kee eyyee yoo ta’e

- Gosoota isaa _____
- Faayidaa inni ooluf_____

3.2. Balfa xuraawaa jajjaboo akka isaan bososan ni taasiftaa? a/ eyyee b/lakkii

3.2.1. Deebin kee eyyee yoo ta’e,gosa balfa xuraawaa_____

3.3 Balfa xuraawaa mana keessaa fi naannawa manaa ni gubdaa? a/eyyee b/lakkii

3.3.1 Deebin kee eyyee yoo ta’e,gosoota isaa_____

3.3.2 Eessatti gubda?

a/naannoo keessatti b/naannoon alatti

3.4.Balfa gogaa naannoo keetii iddoo duwwaa banaa irratti ni dhabamsiiftaa? a/eyyee b/lakkii

3.4.1 Deebin kee eyyeen yoo ta’e eessatti awwaalta?

- Naannoo mana jireenyatti_____
- Naannoo mana jireenyatii alatti_____

3.4.2.Gosoota balfaa ati awwaaltu?_____

3.4.3.Maloota balfa itti dhabamsiisan kana maaf filatte?_____

_____

3.4.4.Kuusan balfa xuraawaa naanoo mana jireenya kee irraa hagam fagaata?

- 20-50meters
- 51-100meters
- 101-200meters
- 201-500meters
- >500meters
- Kuusan balfa xuraawaa magaalaa hin jiru

3.4.5 .Karaan naannoo kuusaa balfaatti geessuu mijataadhaa? a/eyyee b/miti

3.4.5.1.Balfa naannoo ati jiraatu keessatti uumamme maalin gara kuusaa balfaatti geesitu?

- Harkaan
- Gaarii harkaatin
- Gaarii fardaatin
- Kan biro yoo jiraate_____

4. Balfa xuraawaa naannawa madda bishaanitti :fkn naannoo lagaatti ni gattuu?

a/eyyee b/lakkii

4.1. Yoo Ni gatta ta'e maalif?_____

4.2. Balfa xuraawaa naannoo keetii gurgurtaaf ni oolchitaa? a/eyyeen b/lakkii

4.3. Yoo Ni oolchita ta'e,gosoota irra caalaa ati gurgurtaaf oolchitu?

- Plaastikoota
- Sibiilota
- Gosoota waraqaa adda addaa
- Bu'aawwan biqilootaa
- Kan biroo_____

4.4.Akka naanoo keetti waliigaltee cimaa fi amansiisaa ta'e MIX balfa gogaa funaananii fi dhabamsiisan wajjin hidhata qabduu? a/eyyee b/lakkii

4.5. Deebin kee eyyeen yoo ta'e gareee kanaaf qarshii Itoophiyaaatin meeqa kaffaltaaf?_____

5. Akka magaalaa ati keessa jiraatutti balfi xuraawaan magaalaa keessatti uumame sirnaan akka qulqullaa'u fi dhabamsiifamuf qaamni hordofu jiraa? a/eyyee b/lakkii

5.1. Jira yoo ta'e eenyu?_____

6.Haalli bulchiinsa magaalaa balfa xuraawaa too'achuu irratti yeroo ammaa qabu gahaadhaa?

a/eyyeen b/miti

6.1.Deebin kee miti yoo ta'e,tarkaanfiiwwan fudhatamuu qaban jettee yaadu maal fa'i?

_____

_____

_____

7.Bulchiinsi magaalaa ykn manni qopheessaa magaalaa ati keessa jiraattuu hubannoo balfa xuraaawaa dhabamsiisuu hawaasa naannoof ni taasisuu? a/eyyee b/lakkii

8.Bulchiinsi magaalaa ykn manni qopheeesaa magaalaa ati keessa jiraatuu nama ykn qaama balfa xuraawaa iddoo maleetti dhabamsiisu irratti tarkaanfii ni fudhataa? a/eyyee b/lakkii

9.Yoo kuusan balfa xuraaawaa naannoo mana keetii jiru,kuusaa balfa xuraawaa kan magaalaa jirutti dabarsuuf tajaajilli bulchiinsi magaalaa ykn mana qopheesaa kennu yeroo meeqafi?

- Guyyaa guyyaan
- Guyyaatti yeroo lama
- Torbanitti yeroo lama
- Torbanitti yeroo sadii
- Torbanitti yeroo tokko
- Kan biroo_____

10.Gosoota balfa xuraawaa mana keessaa fi naannawa manaati argaman keessaa kan irra deebin itti fayyadamtu maal fa'i? lamaa fi isaa ol haala sadarkaa isaanin ibsi?

A/BurcuqqooB/PlaastikiiC/WaraqaaD/Waantoota burkutaa'uu danda'an

e/Meeshaalee qorqqoorroo fi bu'aa isaa

f/Kan biraa_____

11.Balfi xuraawan erga uumamanii bakkee irratti bahanii booda sadarkaa duraa irratti qulqulleesuu fi dhabamsiisuf gahee kan qabu eenyu?

a/,Mootummaa naannoo/mana qopheessaab/Kaaampaanota dhuunfaa

c/Olla fi namoota iddoo tokko jiraatand/Hin beeku

e/Kan biroo _____

12.Bareedinaa fi qulqullina magaalaa irraa enyutu bu'aa argata?

a/jiraattota naannoo b/bulchitoota fi itti gaaafatamttoota naannoo

13.Ati akka hawaasa /jiraataa magaaalaa kanaatti maloonni akka balfa xuraawaa jajjaboon hin uumamne gargaaran jiraa? a/eyyee b/lakkii

c/yoo jiraate_____

KUTAA AFUR

Tajaajila Rakkoolee Balfa Xuraawaa Dhabamsiisuu Fi Too'achuu Ibsu. Gochaalee Armaan Gadii Kana Erga Dubbiftanii Booda Yaada Ilaalcha Keessanii Mallattoo( )Kaa'un Agarsiisaa.

T/l	Gochaalee fi tooftalee balfa xuraawaa gogaan ittin too'atamu	sirriiittin itti walii gala	IttinWalii gala	Itti hin amanu	Itti walii hin galu	Sirriitti itti walii hin galu
1.	Balfa xuraawaa magaalaa dhabamsiisuf manni qopheessaa deeggarsa ni kenna.					
2.	Manni qopheessaa magaalaa iddoo balfa xuraawaa itti gatan ni qaba					
3.	Mayikiroo fi xixiqqaan qindoominaan balfa mmagaalaa dhabamsiisuu irratti ni hirmaatu					
4.	Kuusaan balfa xuraawaa kan magaalaa ni jira					
5.	Konkolaatan balfa xuraawaa magaalaa kaasu ni jira					
6.	Kuusaleen balfa jajjaboo itti kuusan					

	xixiqqan magaalaa keessa ni jira					
7.	Balfa xuraawaa jajjaboo magaalaa dhabamsiisuu irratti hariiron mootummaa fi qaama biro gidduu jiru laafaa dha.					
8.	Balfa xuraawaa jajjaboo magaalaa dhabamsiisuu irratti hirmaannan hawaasaa xiqqaadha.					
9.	Balfa xuraawaa hir'isuuf kaka'umsi jiru xiqqaadha(deebisanii fayyadamuu fi haaromsuu)					
10.	Too'annoo balfa xuraawaa balaa geesisanii xiqqaachuu.					
11.	Hanqina meeshalee					
12.	Hanqina humna nama baratee					
13.	Hanqina konkolaataa					
14.	Hanqina baajataa fi kenniinsa tajaajilaa					
15.	Hanqina karoora yeroo hanga yeroo dheeratti					
16.	Hanqinni too'annoo balfa xuraawaa rakkoo fayyaa fi naannoo fiduu danda'a					
17.	Manni maatii bal'aa qabu balfa xuraaawaa jajjaboo maatii xiqqaa qabu caalaa uumuu ni danda'a					
18.	Mana kee keessatti balfa xuraawaa adda baasun sadarkaa isaatin ni kaa'ama					
19.	Balfi xuraawaa gogaan kamiyyuu faayidaa hin qabu					

KUTAA SHAN

Gaaffilee Armaan Gadii Erga Dubbiftee Booda Akka Yaadaa Fi Ilaalcha Keetitti Deebii Kenni.

1.Rakkoo fi too'annoon balfa xuraawaa gogaa mana qopheessaa magaalaa ati keessa jiraattuu maal ture?

2.Ati akka yaadaa fi ilaalcha keetti rakkoo kana maaltu fide jettee yaada?

2.1 Rakkoo kana bu'ura irraa furuuf maaltu fala jettee yaada?

3.Rakkoo fi too'annoo balfa gogaa mana qopheessaa magaalaa ati keessa jiraattuu furuuf tartiibni ta'uu qabu fi gara fuula duraatti waantoota hojjetamuu qabu jettee ati yaadu tarreessi?

4.Waa'ee hubannoo hawaasaa dhimma too'annoo balfa xuraawaa gogaa maal jechuu dandeessa?

5.Balfa xuraawaa gogaa mana qopheessaa magaalaa ati keessa jiraattuu qabatamaa taasisuuf hariiron bulchiinsa magaalaa/mana qopheessaa fi balfa gogaa funaanan akkasumas hawaasa naannoo gidduu jiraa?

- Yoo jiraate maal fa'i?
- Yoo hin jiraanne maalif sitti fakkaata?

- Sa'aatii Keessanii Fi Humna Guddaa Hojii Kanarratti Baastaniif Galanni Keessan Guddaadha!