ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCE

DEPARTMENT OF ZOOLOGICAL SCIENCE

SOLID WASTE DISPOSAL MANAGEMENT AND ITS IMPACT ON PUBLIC HEALTH IN CITY GOVERNMENT OF ADDIS ABABAAKAKI KALITY SUB-CITY: THE CASE OF WOREDA 04 ADMINISTRATION.

BY

WOINESHET YIRGUE

JULY 2024

ADDIS ABABA, ETHIOPIA

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A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN BIOLOGICAL SCIENCE.

BY

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Declaration

I the undersigned, declare that, this thesis is my original work prepared under the proper guidance of Dr. Adey Feleke. All the sources used for this thesis have been duly acknowledged. I also confirm that, the thesis has not been submitted for any degree.

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Addis Ababa University, Addis Ababa July 2024

Endorsement

This Thesis is submitted to Addis Ababa University School of Post Graduate Studies, school of natural and computational science, department of zoological science for Examination, with My Approval as a University Advisor.

Adey Feleke (PhD) _____

Advisor Signature

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ACRONYMS

AASWMA	Addis Ababa Solid Waste Management Agency
BoFED	Bureau of Finance and Economic Development
CG AA	City Government of Addis Ababa
CSA	Central Statistical Agency
EPA	Environmental Protection Agency
ETB	Ethiopian Birr
FAO	Food and Agriculture Organization of the United Nations
FMoH:	Federal Ministry of Health
GDP	Gross Domestic Product
MSW:	Municipal Solid Waste
SBPDA:	Sanitation Beautification and Parks Development Agency
SMEs	Small and Micro Enterprises
SPSS	Statistical Package for Social Sciences
SW	Solid Waste
SWD	Solid Waste Disposal
UN	United Nations
UNCHS	United Nations Commission on Human Settlements (Habitat)
UNEP	United Nations Environment Program
WHO	World Health Organization

ABSTRACT

Solid waste is any discarded material, trash, refuse, or garbage. It can be categorized by where it comes from, such as municipal wastes, industrial wastes, commercial wastes, construction and demolishing debris, biomedical wastes. Solid waste is a complex mixture of different substances, some of which are intrinsically hazardous to health and human activities. High rate population levels, booming economy, rapid urbanization and the rise in community living standards have greatly accelerated the solid waste generation rate in developing countries. The main objective of this study was to assess solid waste disposal management and its impact on public health in Woreda 04 of the Akaki Kality Sub-City in Addis Ababa. The research design was descriptive in nature and the quantitative method supported by qualitative approach. Data was generated via questionnaire, interview, field observation and document analysis.

Among the 220 sample respondents 93.2% of them filled out the questionnaire 10 respondents were participated and included in this section for analysis. *The data obtained through questionnaire, were analyzed using statistical package for social sciences /SPSS/ and presented using tools such as frequency, count and percentage. On the other hand the data obtained through interview, observation and document analysis were analyzed qualitatively to substantiate the result of the quantitative analysis. The findings of the study showed that a 55.12% of the respondents were relatively qualified in the position they hold currently. The findings also indicated that there was a high level of need to conduct close supervision, monitoring and serious evaluation. Besides these, the resource provision and management, collaboration with stakeholders were weak. Capacity building, lack of stakeholder involvement, infrastructural issues were the major problems of the solid waste disposal management works. Realizing the fact to the great mismatch between the demand for and the supply to the proper solid waste disposal, introducing alternative ways of solid waste disposal approach was unquestionable. Moreover, the solid waste disposal policy of the government should consider multi directional approaches. Such as: Participative planning and implementing campaign that build up understanding and cooperation between the concerned stakeholders are very important. Maintain proper monitoring and evaluation systems and take as early corrective actions for a variation from the bench mark, Applying alternative low cost durable local materials and technology and encouraging different actors involved in the solid waste disposal undertakings are indispensable to address the targets of Woreda 04 of the Akaki-Kality Sub-City to become a clean and sustainable Woreda.*

Keywords: Environment, Garbage, Pollution, Refuse, Solid waste, Woreda 04, Akaki-Kality

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CHAPTER ONE

1. Introduction

1.1. Background of the study

The rapid process of urbanization in developing countries accompanied by lack of acceptable and sustainable waste disposal management system is one of the 21st Century's main development challenges. Like most African countries, the spatial, physical and socioeconomic condition of Ethiopia is by far behind the needed conditions fundamental to sustain the livelihood of the citizens. The agriculture sector which accounts for the average 45% of the country's GDP, is the main stay and a major source of livelihood for about 80% of the country's population (World Bank, 2015).

The current population of Ethiopia is estimated to be 132,650,507 as of September 3, 2024, grounded on Worldometers elaboration of the United Nations data. The Ethiopian population is assumed to be 1.63% of the total world population. Ethiopia ranks number 10 in the list of countries (and dependences) by population. The population density in Ethiopia is 132 per km^2 (342 people per square mile). The total land area is 1000, 000 km^2 (386,102 sq. Miles).22.1% of the population is urban (29,204,015 people in 2024). The median age in Ethiopia is 18.9 of age years (UN. Department of Economic and Social Affairs- Population Division, (WWW.Worldometers.info updated on august 5, 2024).

The fastest increase in urbanization and industrialization in cities has redounded in an increased volume of waste generation. Municipalities both all over the world and especially those from the developing countries are faced with the problem of effective solid waste engagements. It's explained that solid waste problems are global; far and wide collection and handling of garbage was inadequately executed (Eshuhan, 2002).

It has been estimated that about 40%-80% of waste generated by the developing countries is made up of solid waste, while developed countries constitute between 20%-30% (Eshuhan, 2002). Besides it's small in amount developed countries are suitable to manage the colorful

types of waste (solid, liquid and gassy), in contrary developing countries are still struggling to deal with the amount of waste they dispose. The growth rate of urban population in developing countries is high, especially in the poorest regions. For example Ethiopia has an urban growth rate of 4% per year, which is among the highest in the world. With the current rate of urbanization and industrialization solid waste collection and transportation and disposal has been a major problem of several municipalities of the developing countries.

Most studies looked at the characteristics of external solid waste at the final disposal spots. Solid waste disposal and operational strategies are shifted towards extensive recycling determinants the volume and composition of waste at the spot of generation and further recovery of solid waste before disposal.

Collection of solid waste in urban areas is challenging and complex because the generation of domestic and marketable artificial waste is a great process that takes place in every everywhere at homes, apartments, industrial surroundings as well as parks, streets and even in vacant places of every corner surrounding the community. The mushroom like development of suburbs all over Addis Ababa has further complicated the collection task (Agrawal, 2002).

Addis Ababa is located at the navel of the country. It is the capital of Ethiopia, a home for many international, regional and indigenous headquarters like UNDP, UNICEF, FAO, UNHCR, ILO, ITU and others. It's the most densely populated city in the country, with an estimated population of nearly about 3 million (3305135) living in 10 sub cities (Mesfin 2006). In addition to the pull and push factor of the environment as a capital seat of the government administration and center for several business activities resulted in the spring up of a number of people. But the administrations development is unable to meet the demands of the population regarding to the proper solid waste handling which is the major environmental problem in it. The combination of the great population and high expansion of urbanization growth rates coupled with a greater rate of poverty has placed enormous strain on Ethiopian cities. This is especially true in Addis Ababa as it has a share of 30% of the country’s urban population.

The current waste collection capacity and disposal system are problematic in matching with the growing solid waste generation rate. According to (SBPDA 2003) about 41% of SW

which is disposed on to the road and drainage contributed a lot in breeding insects, rodents, vectors and spread of disease (Zurbrug,2004). The majority of improper SW collection that's generated from houses and industries created a range of environmental problems in Addis Ababa.

The situation is aggravated in slums where households cannot make use of community waste bins. In addition to poverty and crowdedness of the society; the major contributor to high morbidity and mortality among the poor is lack of proper SW disposal service. Therefore, in areas especially where there is greatly urbanizing city like Addis Ababa, the practices of solid waste disposal and its impact on public health needs to be studied adequately.

1.2. Statement of the Problem

Addis Ababa is a home for 30% of the urban population in Ethiopia and is one of the fastest growing cities in Africa. It's the growth center for Ethiopia and a major pillar in the country's vision to become a middle- income, Carbon-neutral, and resilient economy by 2025. Addis Ababa's economy is growing annually by 14%.

According to Wikipedia, the free encyclopedia;

Addis Ababa's economy is growing rapidly and become leading among cities in Ethiopia. Over the last two decades, the city shifted to development-oriented programmes and privatization. In late 1990s, the Office for Revision of Addis Ababa's Master Plan (ORAAMP) and National Urban Planning Institute (NUPI) were launched to analyze the economic status of the city. The city covered 29% of Ethiopia's GDP (59.5 Billions $ in 2024) and 20% of national urban development as of 2022. (https://en.wikipedia.org accessed on June 2024).

Despite the strong economic growth trends, Addis Ababa faces significant development challenges. For instance, unemployment and poverty situations in Addis Ababa remain high. It is also estimated that, one in four households are reported to be jobless compared to one in 10 households in other areas, and the informal sector employs about 30% of the labor force in the same area.

The regional government of Addis Ababa is also dedicated to deliver the necessary services to all its residents, the provision of clean water accounts only 44% of the population and sewerage services is below 30%. On the other hand, the physical development patterns

witnessed in recent times are driving up the cost of infrastructure delivery. Addis is expanding in a sprawling manner, with growth in urbanizing extent outpacing population growth. The result of this growth is an estimated 46% of vacant or underutilized land. At the same time, the central area of Addis Ababa has extremely high density (up to 30000 people per km), concentrating around 30% of the population on 8% of the land, generally with poor living conditions.

SWM continues to be a major challenge of urban areas throughout the world particularly in the fast growing areas of the developing world. The consequence results in an ineffective waste management are increased morbidity and mortality in urban areas (Eshuan, 2002). In poor countries, improper SWM causes several diseases that are contagious and parasitic in which result in morbidity. If SW cannot be appropriately collected from both inhabited areas and sanitary utilities, the situation will be conducive to the spreading of diseases. The case is indeed worse in developing countries especially where there is a densely populated area like Addis Ababa.

Despite the clean city initiatives in Addis Ababa, some public spaces still suffer from eye catching piles of garbage, flying festal, rubbish, construction, and moved earth from new construction place, littering the urban space indefinitely. Offensive odors resulting from decomposing solid wastes, semi-liquid and liquid wastes are sickening all citizens. Addis Ababa administration council recognizes six major sources of solid wastes; household, road, commercial institutions, industries, hotels and hospitals.

Medina (2004), stated that the generation rate of SW in most towns of the developing countries is not exactly studied but it's estimated to be between 0.4-0.6 kg/ ca/ day for developing countries. Abera Kume's volumetric study since 1994 has asserted that the Addis Ababa solid waste generation was estimated to be 0.4 kg / cap/ day. Mesfin's case study in Addis Ketema sub-city revealed solid waste generation rate of 0.5 kg/ ca/ day and 0.11 kg/ ca/ day in Arada sub-city (Abera, 1997; Yitayal, 2005 and Mesfin, 2006).

Thus, improper solid waste disposal undertakings and careless disposal of solid waste poses a serious problem which contributes to high morbidity and mortality rate in Addis Ababa.. Reliable and recent data about solid waste handling in Addis Ababa are too few. Some studies

have been carried out in early 1980s and1990s but these studies mentioned the generation rate, composition and density of SW grounded on the socioeconomic status of the many areas were not on the management aspects including its cause.

Unless the problem of Addis Ababa administration solid waste disposal management body properly addresses, the improper dumping and burning of solid waste, breeding of diseases vectors spread of diseases associated with improper solid waste disposal would continue to emerge and thus, would cause to poor community health and degradation of the surrounding.

1.3 Research questions

1. To what extent is the adequacy of SW disposal management, policies, regulatory framework and enforcement?
2. What are the achievements obtained in relation to awareness creation, knowledge and skills?
3. What are the practices of solid waste handling from generating points to the final disposal site?
4. What are the impacts of solid waste on public health due to solid waste disposal management system in Akaki Kalitysub-city woreda 04 administration?

1.4 Objectives of the study

1.4.1 General objective

The general objective of this study was to assess solid waste disposal management and its impact on public health in Akaki Kality sub city:the case of woreda 04 administration.

1.4.2 Specific objectives

1. To identify the adequacy of SW disposal management policies and regulatory framework and enforcement.

2. To identify the achievements obtained in relation to awareness creation, knowledge and skills related to solid waste disposal management.

3. To identify the practices of solid waste handling from generating points to the final disposal site.

4. To assess the impacts of solid waste on public health due to improper solid waste disposal management system in Akaki Kalitysub-city woreda 04 administration.

1.5. Significance of the study

This study is anticipated to be significant in assessing the achievements made so far on the practices and problems encountered in the performances of solid waste disposal management in general and the practices of solid waste disposal in particular in the attempt of acceptable and proper environmental conservation. Additionally, it's hoped to be significant in putting forward recommendations to retain the stylish practices and to overcome the problems and to throw light on the issue hence, draw the attention of the different stakeholders for the successful solid waste disposal administration. More specifically, thus the study is anticipated to be significant;

1. To the households in that it helps them understand the consequences of solid waste disposal and suggests possible answers.
2. To the policy makers in that, it indicates the grass root practices and problems of solid waste disposal administration planning and implementation.
3. To the respective government, in that the result suggests how to undertake community awareness and sense of control towards involving in solid waste management affaires.
4. It'll also be served as a source for individuals who do have an interest to conduct further studies in the same field of studies.

1.6. Delimitation of the study

Thousands of Solid waste disposal spots are available in Addis Ababa and SW disposal is accepted in different cities at different places throughout the country. The overall targets of Addis Ababa city administration solid waste disposal management sector is to collect and dispose of solid wastes generated by all community groups in an environmentally and socially satisfactory manner using the most systematic means available.

Although solid waste disposal management is a nation-wide problem that requires large scale and rigorous study, due to constraints of time, resource and access of information and manageability, to limit the scope and determine the area coverage and the population size is genuinely important. Hence, the study was delimited to Addis Ababa city administration Akaki KalitySub-City Woreda 04 administration solid waste disposal management and its

impact on public health. The study tried to cover the two main and relatively durable dump locations and the other different moderately conditional solid waste disposal spots in Woreda 04 administration. The study is devoted to investigate the subsisting situation of solid waste disposal system by the community, the causes of harmful solid waste disposal, health effects and strategies drawn up for enhancement of performances related to solid waste disposal work.

1.7 Operational definition of terms

Akaki Kality: One of the second levels of administrative structure of the city government of Adis Ababa sub-cities.

Disposal: Final placement of solid waste that is not recycled by the household.

Domestic waste: A household waste or waste generated from any residential building.

Environment: Physical factors of the surroundings of the human beings including land, water, air, climate, sound, odor, taste, the biological factors of aesthetic and includes both natural and the built environment and the way they interact.

Garbage: A solid waste, which includes animal and vegetable wastes resulting from the handling, preparation, cooking and serving of foods. A container where people put things that are being thrown out.

Household: Constitutes a person or group of persons in irrespective of whether related or not who normally live together in the same housing unit and who have common cooking announcement

Pollution: The presence of matter or energy whose nature or location generates undesirable environmental effect.

Population: A group of individuals of the same species often rely on the same resources, are subject to similar environmental constraints, and depend on the availability of other members to persist over time

Primary collection: is the collection of solid waste at the source (from households, business, institutions, etc.) Or from street containers and its transportations to point of transfer

Refuse: Biodegradable and non-biodegradable materials that are discarded or rejected by the original user.

Solid waste: Organic or inorganic wastes produced from households, commercials and industries those are in solid form for example, garbage, plastics, and metals.

Woreda 04: The lower level of administrative structure under Akaki Kality Sub-city.

CHAPTER TWO

2. Review of the related literature

This chapter consists of the literature part related to solid waste management conceptions, definitions, literal background, and other variables like income, educational backgrounds regarding solid waste administration systems which are genuinely essential while analyzing the data collected through different data gathering tools in the coming chapter.

2.1. Definition of Solid Waste

UN Environmental Protection Agency defined solid waste; as more generally known as trash or garbage consists of everyday particulars we use them and disposed out of similar product packaging, grass trimming, furnishings, wearable's, bottles, food scrapes, journals, appliances, paints, and batteries. These come from our homes, schools, hospitals and businesses (UNEP, 1996).

Techobanoglous et al. 1994) defined solid waste as any solid or semi-solid substance or object resulting from people or animal activities which the holder discards or intends or is needed to discard and constitutes a hazard for living beings and all that sustains life.

Solid waste is any type of wastes which is hard or not a liquid form for example used plastic bags, broken bags, leftover food or foods remains and the other similar things. It's a by-product of peoples activities that tends to increase with the rate of urbanization changing patterns of consumption and the enhancement of living norms (ENPHO, 2008). It encompasses household garbage, institutional wastes, street wastes and marketable waste, as well as construction and demolition debris.

2.2. Historical Development of Solid Waste Management

Solid waste commonly called the third pollution after air and water pollution arises from different human activities and is commonly discarded as useless. It consists of the largely miscellaneous mass of discarded accoutrements from the civic community as well as the more homogeneous accumulation of agrarian, marketable and mining wastes (Rao, 1996). Solid waste management may be defined as: The discipline associated with the control of

generation, storage, collection, transfer and transport, processing and disposal of solid wastes in a manner with the finest principles of public health, economics, engineering, conservation, and that's responsive to public attitudes (Techobanoglous et.al 1977). From the days of primitive society, humans and animals have used the resources of the earth to support life and threw their wastes into the roadways for animals to eat or ditched it into areas in close adjacency to where it was produced in streams, streets, rivers, open pits, oceans and vacant land areas. In early times as compared to the present, the disposal of human and other wastes had not a significant problem, for the population was small, the volume of land available for the assimilation of wastes was large and the vast majority of waste generated was composed of organic matter that decomposed speedily in the open air (Pinderhughes, 2004 and Techobanaglous et. al 1977). Of course, problems with the disposal of wastes can be traced from the time when human began to congregate in tribes, villages and communities and the accumulation of wastes get a consequence of life. Littering of food and other solid wastes in medieval cities the practice of throwing wastes into the unpaved streets, road ways and vacant lands led to the breeding of rats, with their attendant fleas carrying the germs of disease, and the outbreak of plague. The lack of any plan for the administration of solid wastes led to the epidemic of plague, the Black Death, which killed half of Europeans in the fourteenth century and caused numerous posterior epidemic and high death tolls. According to (Techobanaglous et.al 1977), it was not until the 19th century that public health control measure becomes a vital consideration to public officers who began to realize that food wastes had to be collected and disposed of in a sanitary manner to control the vectors of illness. Currently, the environment is being poisoned, as none before by the accumulation of solid wastes. Fundamental process associated with urbanization and industrialization have been developed with little concern for their environmental effects, acting in governments, industries, business, and consumers generating lesser volumes of waste which are inorganic and poisonous, (Ellis, 1968 and Pinderhughes, 2004). The manner in which these materials are discarded contributes to the pollution of the whole surroundings the air, the water and the land. The problem associated with the management of solid waste in present's society are complex because of the abundance and diversity of solid wastes, the expansion of squinting in urban areas and boosting the number of population, and the deficit of finance for solid waste administration services in numerous large towns. (Techobanoglous, 1993) thus, municipalities,

environmental scientists and other stakeholders should work genuinely hard not only to minimize but also to recycle the waste materials so that they could make money from it and also conserve the natural resources.

The amount of solid waste generated each year worldwide is staggering. No one really knows how much waste human generates, but much of it originates from developed countries for example United States of America is a leader in energy consumption and pollution. It also produces the highest rate of solid waste per capital. The estimates of the amount of solid waste generated by USA, range from 5.4 to 9.0 billion per metric tons per year. Most solid in USA comes from agricultural mining and industrial operations (Michael & Robert., 1998)

The type and measure of solid waste generated varies from one city to another. In tropical cities, the product of solid waste is advanced than in temperate cities; thus, tropical cities are more prone to the danger of improper solid waste management than temperate cities (Cunningham, 1999).

2.3. Categories of solid waste

Waste composition and characteristics depends up on substantially geographical area the standard of living and society's welfare status of the country with the prevailing climatic condition and type of energy used. Developed countries solid waste differs significantly from developing and middle income countries in both quantity and quality.

The characteristics of solid wastes can be divided into different classifications depending on its physical properties and waste composition. The divisions may fall in one of the following: its moisture content, waste composition and size of the waste particle (Cointreau, 1994).

The kinds of solid waste produced can be categorized in many ways. Some kind of solid wastes are released into the air, water and soil. Some are purposely released, while others are released accidentally. Many wastes that are purposely released are treated before their release. The categories of solid waste generated include the following.

2.3.1 Municipal solid waste

It consists of all the materials that people in a region no longer want because they are broken spoiled or have no further use. It includes waste from households, commercial establishments, institutions and some industrial sources.

2.3.2. Industrial solid waste

It is from manufacturing sources other than mining. It includes a wide variety of materials such as demolition waste, foundry sand, scrap from manufacturing processes, sludge, ash from combustion and other similar materials. These materials are tested to determine if they are hazardous. If they are classified as hazardous waste, their disposal requires special attention to prevent release into the environment.

2.3.3. Agricultural solid waste

It is a form of waste which includes waste from the raising of animals and the harvesting and processing of crops and trees. Other wastes associated with agriculture, such as waste from processing operations (peelings, seeds, straw, stems, sludge and similar materials).

2.3.4. Mining waste

It can be generated in three primary ways:

i) In most mining operations, large amounts of rock and soil need to be removed to get the valuable ore. This waste material is generally left on the surface at the mining site.

ii) Mining operations use various technologies to extract the valuable material from the ore. These techniques vary from relatively simple grinding and sorting to sophisticated chemical separation processes. Once the valuable material is recovered, the remaining waste material, commonly known as tailings, must be disposed of. Solid materials are typically dumped on the land near the mining site and liquid wastes are typically stored in ponds. It is difficult to get vegetation to grow on these piles of waste rock and tailings, so they are unsightly and ‘remain exposed to rain and wind.

iii) The waste that drains or is pumped from mines or that flows from piles of waste rock or tailings often contain hazardous materials such as asbestos, arsenic, lead and radioactive materials or high amounts of acid that must be contained or treated, but often are not.

2.4. The process of solid waste management in high-income countries

In Most industrialized nations today; solid waste management is a multi-billion-dollar business which is also crucial for survival; for example, Toronto City in Canada, Garbage collection agencies remove tons of garbage yearly and sort it for recycling or for ultimate disposal. Most cities require citizens to pay for waste collection, while rural areas have dumps and recycling facilities where citizens bring their garbage to the collection point. The end goal is reduction of the amount of garbage generated; clogging of storm drains in streets and polluting the environment.

As urbanization continues to take place rapidly, the management of solid waste is becoming a major public health and environmental concern in urban areas of many developing countries. The concern is serious in the capital cities which are often gateways to countries. Unsightly visual appearance and general unaesthetic conditions of these cities will have negative impacts on the public, tourist and foreign investment.

Recognizing its importance, a number of developing countries have requested collaboration of external support agencies, both bilateral and multilateral, in improving solid waste management in their cities in the last 2 decades or more.

Although some projects succeeded in providing lasting positive impacts on the management of solid waste in the recipient countries and cities, many failed to continue with the activities after the external support agencies pulled out. This unsustainability of collaborative projects is due to various technical, financial, institutional, economic and social constraints faced by both the recipient countries and external support agencies (Bartone, 1995).

2.5. Solid waste handling and collection processes in low- and middle-income countries

Economic development plays a key role in solid waste management; obviously an enhanced economy enables the community to allocate more for the removal of solid waste, provide a more sustainable financial base. However, developing countries have weak economic base and, hence, insufficient fund for sustainable development of solid waste management.

It is worthwhile to note that the amounts of solid waste generated in many cities in the developing countries has been increasing rapidly over the years, mainly as a result of increases in population and urbanization amongst other factors. Rapid population growth in developing countries has direct implications for human living patterns, leading to a greater concentration of people mostly organized in the form of urban centers.

The increasing complexity and costs of waste management are making it difficult for local authorities in many developing countries, to handle the process efficiently, often solid waste receives scant attention at the municipal planning period in developing countries, while in developed countries, for solid waste managements the allocated budget may account for between 20 and 40 percent of municipal revenues (Cointreau-Levine, 1994).

Though the attention given for solid waste management problems has been increasing in the international circle since the 1990s, solid waste management in developing countries has received inadequate attention from policy makers and academics than that paid to other environmental problems, such as air pollution and waste water treatment. Nevertheless, the improper handling and disposal of SW constitutes a serious problem; it contributes to high morbidity and mortality rate in many developing countries.

Two main reasons accounts for this. The primary reason is the issue of public health. Improper waste collection can lead to filth, stench and the possible spread of disease from vectors perhaps even leading to epidemic.

The secondary for increased attention for swm systems from an environmental point of view, improper handling of solid waste could degrade the environment, create nuisance and make place unsafe for habituation (Obirich-Opareh and Post, 2001). This review chapter reviews

relevant literature in the area of swm in general and solid waste handling at household level in particular.

Mostly in developing countries, the approach to managing wastes has mainly focused on getting rid of the trash, with very little or no attention paid to waste minimization or recovery effort (Cointreau, 1994). If a household can find a nearby site, simply to dump the waste it has solved its disposal problem contributing to ecological degradation and health hazards in most developing countries in general and throughout Africa in particular. Threats to both human and ecological health have also persisted due to economical, technical, legal, social and institutional inadequacies that have been emerged from the use of current solid waste handling approaches. Most of the literature on solid waste issues in African cities focus on collection options and equipment for collecting wastes, and cost recovery through private sector involvement.

A solid waste collection service requires vehicles and labor. For effective and efficient of solid waste collection process development, it is necessary to have a clear understanding of the three main components of solid waste collection (Prabhakar, 2000).

These components include the following:

i) Travel to and from the collection area

ii) The collection process, which includes transfer of the solid wastes from storage to the vehicle and travel between successive collection points and

iii) The delivery process whereby the contents of a vehicle are transported to the disposal site.

Many methods of transferring of solid wastes from storage to a collection vehicle fall into three main categories (Prabhakar, 2000) they are:

i) The direct emptying of a portable storage container into the vehicle, normally used when the vehicle can be positioned close to the container;

ii) The emptying of a portable storage container into a transfer container (usually a large basket) which is then emptied into the vehicle, normally used when the storage container is some distance from the vehicle, in order to avoid the return walk with empty container; and

iii) The transfer of solid waste stored at ground level, which requires that the wastes be raked or shoveled into the vehicle.

These three categories have been set out in ascending order of work content. Thus the first is the most efficient in terms of labor and vehicle productivity; it is also the method that minimizes human contact with the solid wastes.

2.6. Income and Solid Waste disposal management

Income is the major factor, which determines the magnitude of solid waste management at large and solid waste handling in particular. The level of economic development is an important determinant of the volume and composition of wastes generated by residential and at the same time the effective demand for waste management service. The willingness and ability to pay for a particular level of service is also influenced by income level of the residents of the country (Sunni Kumar, 2005).

According to (Medina 2004) there is a positive relationship between community income and the amount of solid waste generated and capacity to remove. This is also true in the case of Akaki-Kality woreda 04 administration in Addis Ababa. Those who consumed more disposed the waste by paying a higher amount of money than low income communities.

Usually low income community residents tend to gather and dump their garbage at the nearest vacant lot public space, near river or simply burnt in their surroundings. These uncontrolled wastes may accumulate on the street and blocked drains when it rains which may cause flooding (Medina, 2004; Eshuan, 2002). Therefore, income size of the household directly affects and influences the proper handling of municipal solid waste.

2.7. Educational Level and Solid Waste disposal management

People's attitude influences not only the characteristics of waste generation but also the effective demand for waste collection service. According to (UNDP 1996) people's attitude towards waste may positively affect their interest and willingness to pay for collection service.

In addition, through awareness campaigns and educational measures attitude may be positively influenced and in turn it can change the negative impact of inadequate waste handling with regard to public health and environmental conditions, such as educational

campaign also informs people of their responsibility as waste generators and of their right as citizens' to waste management services.

Therefore, awareness campaigns should be coordinated with improvements in waste collection, reuse, recycle, composting, and other integrated approaches whether adopted handling systems are similar or not peoples waste handling pattern are influenced by their neighbors. So a collective logic should be involved because improved waste handling practices will only yield significant environmental impact of most households in an area participate in the improvement. Thus, besides general awareness campaign improved local waste management depends up on the availability of practical option for waste handling and a consensus among neighbors.

Solid waste handling by the community is a function of people's attitude and thus the reflection by their socioeconomic characteristics (UNDP, 1999). The attitudes of the society towards sw and their patterns of material use and solid waste handling interest in solid waste reduction and minimization degree to which they separate solid wastes and the extent to which they retain from indiscriminate dumping and littering (SKAT, 2005).

Therefore, attitude towards solid waste may be positively influenced by public information and awareness measures. At the same time improved waste handling patterns cannot be maintained in the absence of knowledge, even practical knowledge is maintained.

Some individuals either due to negligence or dissatisfaction of the existing service delivery systems in a city may take opposite action towards sw management. As a result, their action may have a negative impact on storage, collection and transportation of sw.

2.8. Solid waste collection schemes

Basic collection systems have been involved in relation to the amount of work imposed upon the solid waste generator. The systems are explained under four categories:

i. Communal collection ii. Block collection

iii. Curbside collection iv. Door-to-door collection

2.8.1. Communal collection

This is a storage which may require delivery of the wastes by the solid waste holder over a considerable distance. The organization of solid waste collection is greatly simplified by the use of large communal storage sites. While the use of communal sites appear to be fairly cheap and simple solution, it may transfer much of the burden of solid waste collection on to the street cleansing service and increase total costs, because it is cheaper to collect refuse direct from a house than to sweep it up from the streets.

2.8.2. Block collection

A collection vehicle travels a regular route at prescribed intervals, every two or three days and it stops at every street intersection, where a bell is rung. At this signal the residents of all the streets leading from that intersection bring their solid wastes containers to the vehicle and hand them to the crew to be emptied. Block collection should be operated frequently, as otherwise the weight of solid waste to carry to the vehicle may be beyond the capacity of some of the residents. It has significant advantages over a curbside collection in that bins are not left out on the street for long period. This system is operated, for example, Mexico City, whereby the daily performance achieved by this system is about 3.5 tons/man-day and 7.0/vehicle/day, revealed by study findings (Solid Waste Division of the Sub- Secretariat for Environmental Protection, 2005).

2.8.3. Curbside collection

This is like the Block collection requires a regular service and a fairly precise tune table. Residents must place their bins on the foot way in advance of the collection time and remove them after they have been emptied. It is very important that bins of a standard size/volume should be used, as otherwise it is likely that wastes will be put out in improvised containers, such as cardboard boxes or even in loose heaps. When this occurs some of the waste are inevitably scattered by animals and wind, thus increasing the work of street cleansing

2.8.4. Door-to-Door collection

This is the system in which the households do not work. The collector enters the garden or courtyard, carries the bin to the vehicle, empties it, and returns it to its usual place. It is costly

in labor because of the high proportion of working time spent walking in and out of premises and from one dwelling to the next, but is the only really satisfactory system.

Disposal of solid waste on land is by far the most common method and probably accounts for more than 90 percent of the nation's municipal refuse. Incineration accounts for most of the remainder, whereas composting of solid wastes accounts for only an insignificant amount.

2.9. Waste management approaches

i. Sanitary Landfill

Sanitary landfill is the cheapest satisfactory means of disposal, but only if suitable land is within economic range of the source of the wastes; typically, collection and transportation account for 75 percent of the total cost of solid waste management (Senkoro Hawa, 2003). In a modern land fill, refuse is spread in thin layers, each of which is compacted by a bulldozer before the next is spread.

When about 3 meter of refuse has been laid down, it is covered by a thin layer of clean earth, which also is compacted. Pollution of surface and ground water is minimized by lining and contouring proper soil, diverting upland drainage, and placing wastes in sites not subject to flooding or high ground water levels. Gases are generated in landfills through anaerobic decomposition of organic solid waste. If a significant amount of methane is present, it may be explosive but proper venting eliminates this problem.

ii. Incineration

It is the destruction of waste materials by burning. In incinerators of conventional design, refuse is burned on moving grates in refractory lined chambers; combustible gases and the solids they carry are burden in secondary chambers. Combustion is 85 to 90 percent complete for the combustible materials. In addition to heat, the products of combustion are carbon dioxide and water as well as oxides of sulfur and nitrogen and other gaseous pollutants. Non-gaseous products are fly ash and unburned solid residue. Emissions of fly ash' and other particles are often controlled by wet scrubbers, electrostatic precipitators and bag filters.

iii. Composting

Composting operations of solid wastes include preparing refuse and degrading organic matter by aerobic microorganisms. Refuse is presorted to remove materials that might have salvage value or cannot be composted and is ground up to improve the efficiency of the decomposition process. The refuse is placed in long piles on the ground or deposited in mechanical systems, where it is degraded biologically to humus with a total nitrogen, phosphorus and potassium content of 1 to 3 percent, depending on the material being composted. Those of no value in composting can be taken to the tip as cover materials. After about three weeks, the product is ready for curing, blending with additives, bagging and marketing as organic fertilizer. However, this method needs labor, time consuming, and high technology among others to accomplish it.

iv. Open dumping

Solid waste is disposed of, without any precautions, indiscriminately on the land. It could be either disposed of in a chosen area or dumped openly anywhere. Such dumping causes a lot of nuisance and many health hazards arise as a result of their decomposition, as unsightly attracts insects and vermin disease causing vectors; for example, breeding sites for flies, rats and mosquitoes. Although it is commonly practiced in many urban centers, it is a method which must be discouraged by all means.

v. Ocean dumping

Solid waste is taken to the deep sea and dumped there. Solid waste is put into polythene bags and then weights are fixed to each bag in order to make the refuse sink to the bottom. This method is limited in its applicability because it can only be used by coastal urban centers. The boats which take refuse to deep sea water are specially designed. They are equipped with apparatus to enable them to deposit the refuse through the bottom of the boat. The main problem is to find suitable dumping areas which are neither too near or too far. If refuse is dumped too near to the shore where the sea is shallow the bags will not go to the bottom. Currents and tides may bring the refuse back to the shore where it will be unsightly. The recommended distance from the shore is more than 59 km. However, this method affects both aquatic life and human life as well due to pops and other dumped materials such as used fish

nets and plastic which are swallowed by fish. This method must be discouraged as it causes havoc to aquatic ecosystem.

2.10. Causes of improper solid waste management

The quantity of waste generated is increasing because of rapid population growth, economic development, urbanization and living condition in cities. However; in most developing countries like Ethiopia the increasing of solid waste generation can be resulted from rapid urbanization and population booming. This has outpaced financial and man power resource and municipalities to deal with provision and management of service of solid waste. In most cities of the developing world inappropriate handling and disposal of municipal solid waste is the most visible cause of environmental degradation i.e. air pollution, soil contamination surface and ground water pollution…etc. resulted from improper disposal of MSW (WHO, 1996).

There are a number of reasons leading to improper solid waste management. Some of the most common reasons are listed below;

i Lack of awareness about the inherent hazards caused by improper management of solid waste,

ii Insufficient allocation of resources (human and financial) for efficient and effective SWM system.

iii Improper control of the solid waste management system

iv. Absence of a national policy for the solid waste management system

v) Lack of or inadequate regulatory framework

vi. Insufficient evidence on the negative impact of solid waste management

vii. Insufficient information on sound solid waste management options and their benefits. In addition, the lack of political will to develop and implement a proper system plays an important role on the management of solid waste.

2.11. Impacts of Solid Wastes on Human Health

Serious public health problems arise due to uncontrolled solid waste often leading to many infectious diseases such as cholera, dysentery, and diarrhea and so on. Such incidences of

diseases put additional burden on the scantly health services available in resource poorest developing countries. The U.S Public Health Services identified 22 human diseases that are linked to improper solid waste management (Hans Cited in Hoorn et al., (1999). The co-disposal of hazardous and medical wastes with municipal wastes poses serious health threat. Exhaust fumes from waste collection, vehicles dust stemming, from disposal practices and pen burning of waste also contribute to overall health problems (Hoorn et al., 1999).

The magnitude of health problems due to solid waste in case of developing countries are particularly alarming where the proper collection and disposal of solid waste is impeded by paucity of funds and technological capacity. The areas which are not serviced are left with clogged swerves and litters which create serious health problems for the resident population.

Health issues are largely interlinked with the process of rapid urbanization, industrialization, and modernization. There are certain changes in the human environment that increases the incidence of many diseases. In developing countries urbanization and modernization processes without adequate capacity to collect and dispose solid waste proper effluents from the industry and emission from transport are leading to deepening crises due to environmental pollution and damage to human health. These are a result of poor environmental conditions and its association with communicable disease control activities.

In sub-Saharan Africa, 69% of the population does not have access to improved sanitation facilities. Waste management is a growing public concern in Ethiopia. In many cities of the country, waste management is poor and solid wastes are dumped along roadsides and in to open areas, endangering health and attracting vermin. Access to sanitation is also among the lowest in the world. Sixty percent of the population still practices open field defecation. Only 12 percent of the population use improved sanitation facilities (Tefera, 2008).

2.12. Conceptual Framework of the study

A conceptual framework is an analytical tool with several variations and contexts. It is used to make conceptual distinctions and organize ideas. Strong conceptual frameworks capture something real and do this in a way that is easy to remember and apply. A researcher tried to develop a conceptual frame work it is related to the research study area regarding to the concept of solid waste disposal.

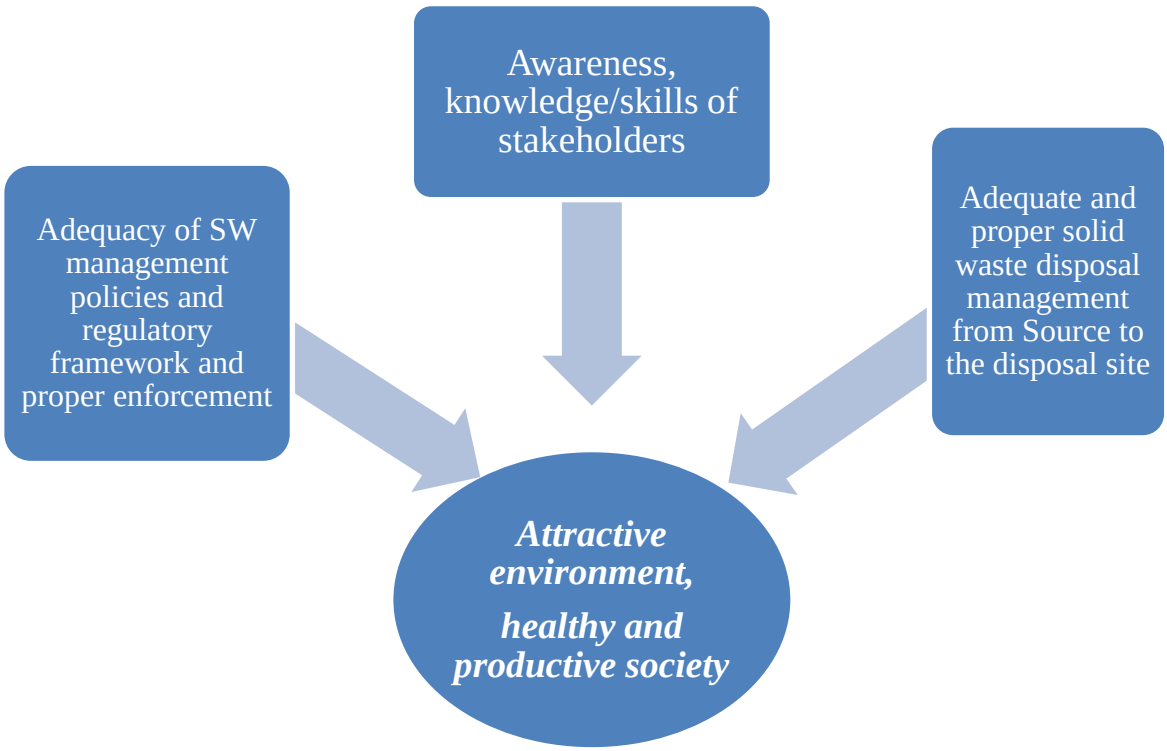

Figure1. Conceptual framework of the study

CHAPTER THREE

3. Material and Methods

3.1. Description of the study area

The study was conducted in Woreda 04 of Akaki Kaliti sub-city at the boundary of Oromia regional state, Addis Ababa, Ethiopia. Woreda 04 is located 31-33 km south west from the center of Addis Ababa City. It is located in Akaki Kaliti sub-city which is bordered on the East by woreda 08, on the North west by woreda 12, on the South West by Oromia Regional State, on the East Akaki River separated from woreda 2&3. The absolute location of Woreda 04 lies between 38°45'0''to 38°47'0'' Longitude to 8°52'0'' to 8°54'0'' Latitude.

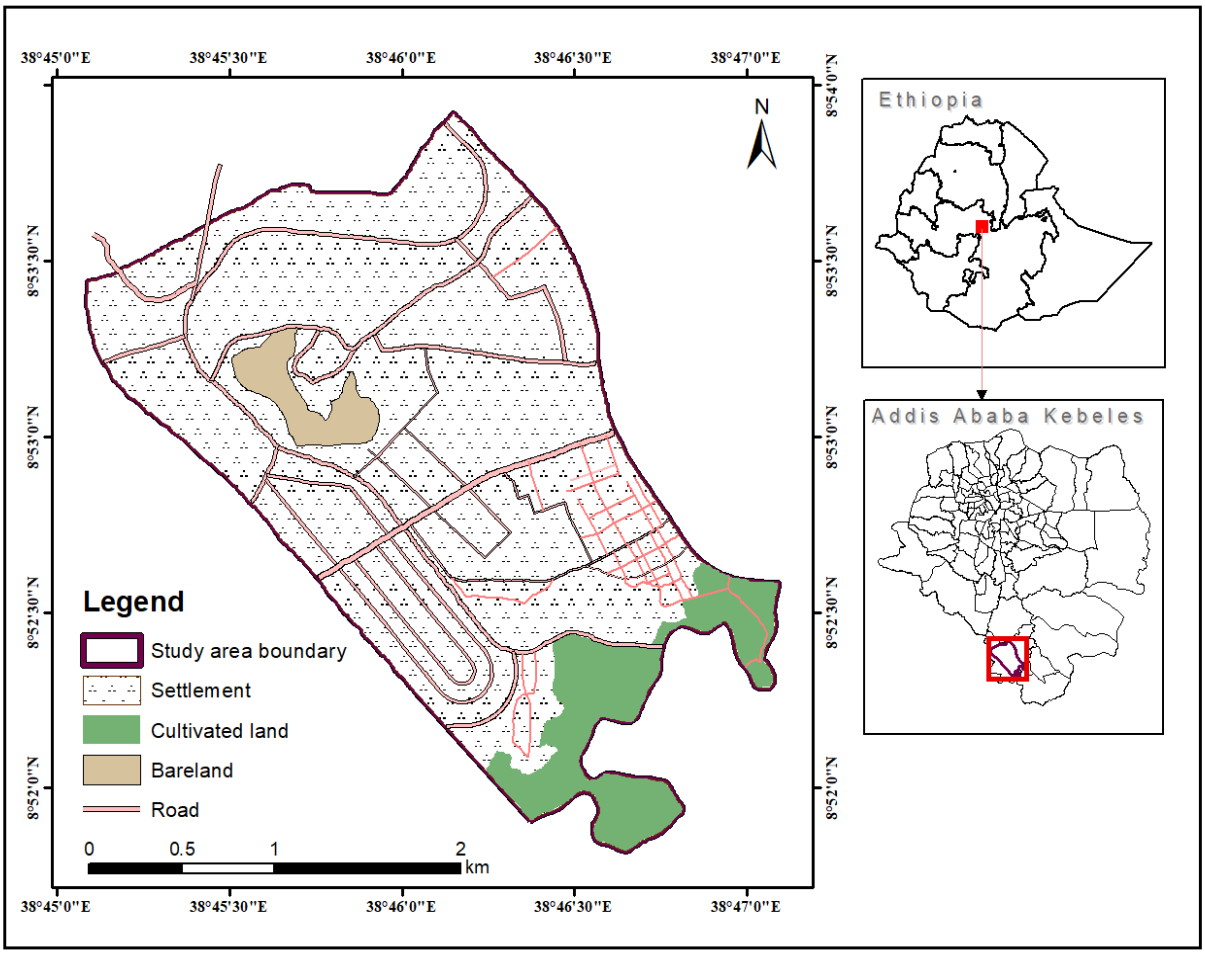

Fig. 2. Map of the study area

Source: Akaki-Kality Sub-city Administration Land management office

3.2. Research Methodology

Research is a systematic process of collecting and analyzing data to increase our understanding of the phenomenon under study. The main objective of this study is to assess the practices of solid waste disposal and its impact on public health in Akaki Kality subcity woreda 04 adminstration. To this end, the study used a blend of both quantitative and qualitative approaches to research. The research method which was employed for the study was descriptive survey of the existing situation regarding the practices of solid waste disposal and its impact on public health.

3.3. Sources of Data

Primary as well as secondary sources of data were used in the study. Primary source of data were firsthand information that were obtained from the respondents. Secondary sources were second hand documents such as description of an event on the basis of what was heard from others, or a summary of more extensive primary information.

The primary sources of data were woreda 04 environment protection officers, woreda 04 sanitary and beautification officers, woreda 04 health officers and environment janitors as well as sanitary workers, selected households who take part in solid waste disposal. The reason to use these subjects as sources of data was based on the expectation that they might have better exposure and information about the practices of solid waste disposal management system.

3.4. Sample Size and Sampling Techniques

Sample size may depend upon the nature of the populations of interest or the data to be gathered and analyzed, subject availability and list factors are legitimate considerations in determining appropriate sample size.

Regarding the target population, environment protection officers, sanitation, beautification and parks development officers, health officers and environment janitors as well as SMEs workers and households (residents of woreda 04) who take part in solid waste disposal were involved in the study. This is because it was believed that those members of the community

can provide relevant information expecting them having better understanding of the issue understudy.

Woreda 04 administration, the total population was estimated to be (55,342) residents of which (26,985) were males and (28,357) were females. More than half of the population were condominium residents. There are rental houses, kebele houses, single family homes, apartments, Condominiums and villas. There are estimates of the total of (9,063) houses in the study area.

3.5. Sample Size Determination

Both quantitative and qualitative methods were employed. For the sake of convenience, the researcher employed judgmental and convenient sampling techniques. Respondents were selected using both sampling techniques assuming that a lot of multi contingent deeds.

The target populations were 442 individuals. In order to selected the sample from the target population the researcher used a simplified formula provided by (Yamane 1967) as cited by (Singh & Masuku 2014).

$n = N/ [1 + N (e)^2]$

Where; n is sample size, N is the population size and e is the level of precision. With a 95% confidence level, where, N = 442, e= 0.05, is assumed for the purpose of determining the actual sample size. The actual sample size was determined as follows;

$n = N/ [1 + N (e)^2]$

Hence; $n = 442/ [1 + 442 (0.05)^2] = 442/[1+(442x0.0025)] =442/ 2.105 =209.9$

The sample size of the study = 210 individual respondents

To gather reliable data for this particular study the researcher considered the contingency of 5% of the sample population size (n) of the study.

Therefore, Contingency =5% [n]= [5%(210)] = 10.5=10 individuals. Therefore, the actual sample size (n) of which,

n= (n + contingency) = (210 +10) = 220 participants in the study area.

3.6. Instruments of Data Collection

3.6.1. Questionnaire

The questionnaire was used commonly to gather data for descriptive survey. Both open ended and close ended questions were used in the study. The researcher used the questionnaire to address the large number of respondents in an efficient way. The open ended questions were designed to get detailed information on the practices of solid waste disposal and its impact on public health. The close ended questions were comprised multiple choice items that lead to understand the level of agreement, based on Likert scale and the questions were designed to get the desired information about the issue.

3.6.2. Interview

Regarding the participants in the interview, among the selected woreda 04 offices and solid waste disposal sites, managers of offices like environment protection, sanitation and beautification and public health officers and SMEs members as well were participated. The interview questions were used and the questions were focused on the practice of solid waste disposal and its impact on public health, the monitoring and control system of solid waste disposal activities. The purpose of using interview was to collect more information about the interviewee's point of view, to cross check the questionnaire responses.

Concerning the interview questions a semi-structured interview questions were used to gather data from participant respondents. The interview had a set of compiled questions with brief orientation to the participants about the purpose of the interview conducted. Participants were selected using stratified and convenient sampling techniques. In so doing, office managers each from woreda 04 environment protection, sanitation and beautification, public health and SMEs members were selected and the total of the ten participants were involved in the interview.

3.6.3. Field observation

Field observation was employed as a data gathering tool. Using this technique, the infra-structure of the solid waste disposal sites, the availability and adequacy of garbage, bins and

equipment and other inputs necessary for solid waste disposal, the overall situation of woreda 04 solid waste management sites were observed to get adequate information that elicit to what extent solid waste disposal was managed properly.

3.6.4. Document review

Documentation cannot be underestimated as it provides necessary background and much needed context both of which make re-use a more worthwhile and systematic endeavor. Secondary data is obtained through the use of published and unpublished documents of solid waste disposal management performance reports of the Akaki Kality sub-city woreda 04 environments, sanitation beautification and parks development office and different publication of the city of Addis Ababa. Annual work plans, quarterly and annual performance reports dumpsite visit documentation, minutes, stockholder participation documents and other relevant documents like monitoring, control and supervision checklists were also used.

3.7. Pilot test

For setting out the difficult, vague and ambiguous items and concepts, piloting has a paramount importance. So the instruments were tested to check whether they can generate the desired information [validity] and to judge their internal consistency [reliability].Therefore, before the administration of the actual questionnaire to the actual subjects in the study, three woreda 04 public health staff members, One woreda 04 SMEs member dumpsite workers, three woreda 04 environment protection staff members and three residents of woreda 04 adminstration totally, ten participants were involved in the pilot test. In the meantime, participants were invited to forward any comments, suggestions, regarding the clarity of language, terms, spelling and grammar, depth and breadth of the questionnaire, to check the relevance and clarity of each item of the questionnaire. Based on the feedback obtained, the necessary amendments were made for the actual usage.

3.8. Procedures of Data Collection

The researcher employed both qualitative and quantitative methods to address the basic questions. Both quantitative and qualitative data were collected from subject offices and solid waste sites using the selected data gathering tools/ the questionnaire, interview, Field

observations and document analysis. First, the researcher developed the tools and checklists for observation based on the existing literature. After refinements made the researcher settled and distributed the questionnaires, and conduct observation with the collaboration of the selected woreda officers and health professionals and workers. Finally, the data obtained through the tools were analyzed using SPSS for further deed.

3.9. Methods of Data Analysis

The intended methods of data analysis in the study were interchangeably be both qualitative and quantitative methods of data analysis and presentation that were enabled the researcher to forward viable findings about the issue under discussion. Quantitative data were analyzed through the use of SPSS software. The data obtained through questionnaire were first had been categorized and systematically organized in items and tabulated. The questionnaires were analyzed quantitatively using frequency counts, valid and cumulative percentage.

Descriptive statistics like, frequency and percentiles were used to analyze the data. Observations were also employed to cross check the correspondence between what were there actually during the analysis. Lastly, a readymade reference material for the grass root Solid waste disposal practitioners on viable approach of how can be assured the proper solid waste disposal was produced for the front line cutters and builders of assuring the adequate and proper solid waste disposal management of interest elsewhere.

3. 10. Ethical Considerations

Ethics are standards of behavior that guide the moral choices about our behavior and our relationship with others. All parties in research should observe ethical behavior. Research ethics was put into consideration when developing and administering data collection tools and techniques, to avoid any form of destruction or violation. This was done through obtaining consent before the research; ensuring confidentiality of data obtained and learning more about the organization’s culture and project before the research and where necessary absolute sensitivity and caution was exercised.

CHAPTER FOUR

4. Results and Discussion

Among the 220 sample respondents which comprises of environment protection, sanitation, beautification and Parks development office, public health offices, SMEs and woreda 04 residents, 205(93.2%) of them filled out the questionnaire and included in this section for analysis. Data was analyzed using simple descriptive statistics such as frequency/count and percentages and presented using tables.

4.1. Demographic Characteristics of the Respondents

The study discussed respondents' Residential area, sex, age, and educational level, years of services in different offices, and SMEs members.

Residential area of the respondents		Frequency	Percent
Valid	woreda 04	168	82.0
	other woreda	37	18.0
	Total	205	100.0

Table 1 Residential area of the respondents

As it is depicted in the above table, only 37(18%) of the respondents were from other woredas, whereas the large number i.e. 168(82%) of the respondents were the residents of woreda 04 in Akaki Kality sub-city. Since the large number of the respondents leave in the woreda under investigation, they are assumed to have a better understanding about experiences of solid waste disposal management system and the health effects of it due to improper disposal management.

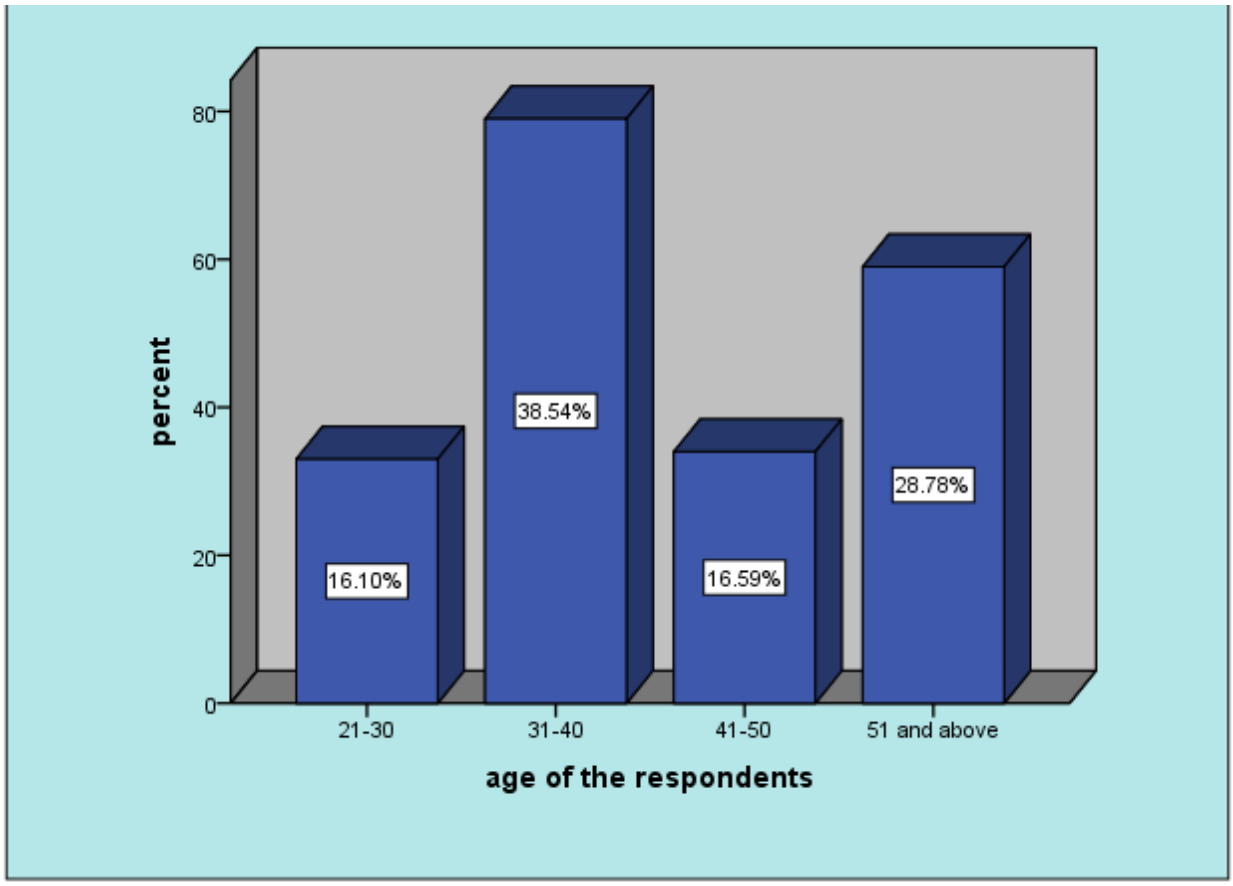

Fig. 3. Age of the respondents

Regarding the age of respondents, out of 205 participants, 79(38.5%) of them were belonging to the age group of 31-40, 59(28.8%) were from the age group of 51 and above, 34(16.6%) 41-50, 33(16.1%) 21-30. This indicates that respondents were mature enough to give relevant data for the purpose of the study. Moreover, majority of the respondents were relatively energetic, matured and fit to take responsibilities. Having reasonably matured age is expected to significantly impacts on solid waste disposal management system.

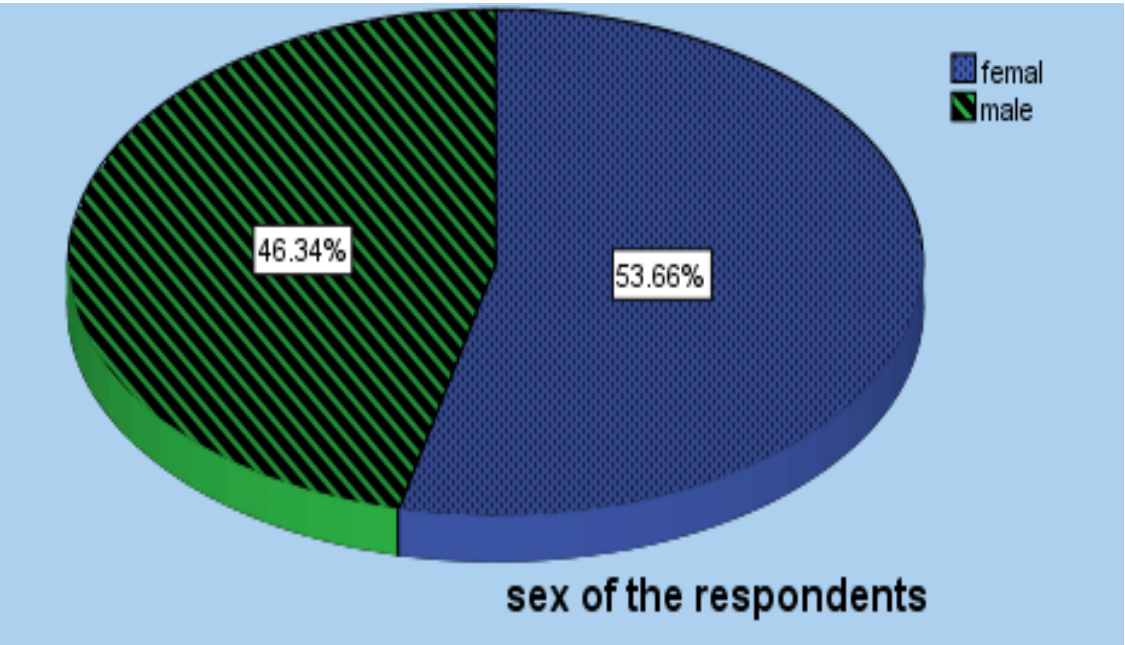

Fig. 4. Sex of respondents

As shown on chart 1 above, out of the 205 respondents, the majority 110 (53.7%) of them were females while 95(46.3%) were males. This implies that the greater majority of the participants in the sample respondents were females. The above data indicates that females were the major actors in solid waste disposal management activities, their participation in solid waste disposal activities were reasonably significant compared to their male counterparts.

Marital status		Frequency	Percent
Valid	single	60	29.3
	married	95	46.3
	divorced	37	18.0
	widowed	13	6.3
	Total	205	100.0

Table 2. Marital status

Regarding the marital status of the respondents, 95(46.3%) them were married, 60(29.5%) were single, 37(18%) were divorced, and 13(6.3%) were widowed. This shows that, the largest majority of the respondents were married so that it is expected that those individuals

give more attention on solid waste disposal management since they are more responsible in family management.

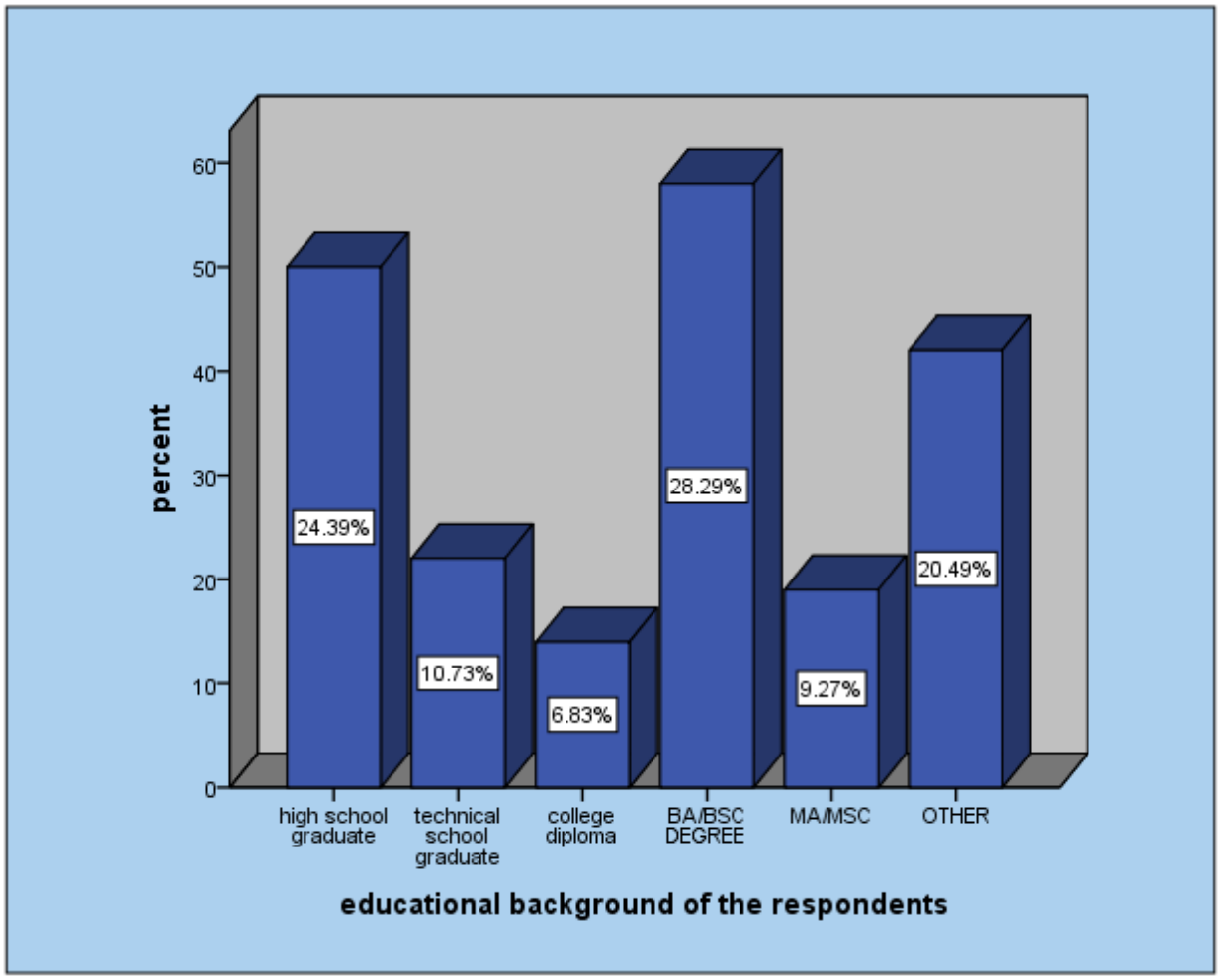

Fig. 5. Educational backgrounds of the respondents

Concerning the educational level of the respondents currently engaged in the solid waste management project sites, 58(28.3%) were first degree holders, 50(24.4%) high school graduates. 22(10.7%) were technical school graduates.19 (9.3%) were MA/MSc holders. 14 (6.8%) were Diploma holders. The rest 42(20.5%) were other certifications or none certified individuals. This implies that most of the participants were qualified enough to the corresponding level. According to (UNDP 1996) people's attitude towards waste may positively affect their interest and willingness to pay for collection service. Educational level

has is the function of rational thinking which influences peoples' attitude towards the governance and good management of waste disposal work.

Years of services of the respondents		Frequency	Percent
Valid	1-5	52	25.4
	6-10	57	27.8
	11-20	60	29.3
	above 21	36	17.6
	Total	205	100.0

Table 3. Years of services of the respondents

As shown in table above, most of the respondents 60(29.3%), had 11-20 years of experiences in sectors they are serving now or the longevity as a resident in woreda 04, the rest 57(27.8%), 52(25.4%), and 36(17.6%) of them had 6-10, 1-5, 21 and above years of experiences in their sectors respectively. This indicates that most respondents have 11 and above years of experiences in their profession which enable them to easily manage the day to day activities of their own duties and responsibilities and are expected to understand the effects and consequences of improper solid waste disposal management.

In general, the data illustrates that most of the stakeholders have reasonably adequate experiences to carry out their responsibilities and to provide sufficient information about what is going on in their respective duties. Having relevant and adequate work experience definitely attracts and contributes a lot to the delivery of the solid waste management. Besides, an experienced health, environment protection and beautification SMEs sanitary services or in any other professional staff can influence his/her work colleagues to strive to bring and align their efforts in order to bring about the successes of solid waste management.

Monthly incomes of the respondents		Frequency	Percent
Valid	below 3000 birr	65	31.7
	3000-4000 birr	31	15.1
	4000-5000	30	14.6
	above 5000 birr	79	38.5
	Total	205	100.0

Table 4. Monthly incomes of the respondents

Concerning the monthly income of the respondents out of the total 205 respondents, 79(38.5%) of them endorsed that they earn monthly income of more than 5000 birr, 65(31.7%) of the respondents indicated that they earn below 3000 birr, 31(15.1%) earn between 3001-4000 birr and the rest 30(14.6%) earn between 4000-5000 birr. Medina (2004) states that, there is a positive relationship between community income and the amount of solid waste generated and capacity to remove. Usually low income community residents tend to gather and dump their garbage at the nearest vacant lot public space, near river or simply burnt in their surroundings. These uncontrolled wastes may accumulate on the street and blocked drains when it rains which may cause flooding (Medina, 2004; Eshuan, 2002).as it is depicted in the above table most of the participants earn more than 5000 Bir. Due to high rate of inflation this much income cannot afford the daily consumption Therefore, income size of the household directly affects and influences the proper handling of municipal solid waste.

4.2. Responses on waste management frameworks

4.2.1. Adequacy of SW disposal management policies, regulatory framework and enforcement.

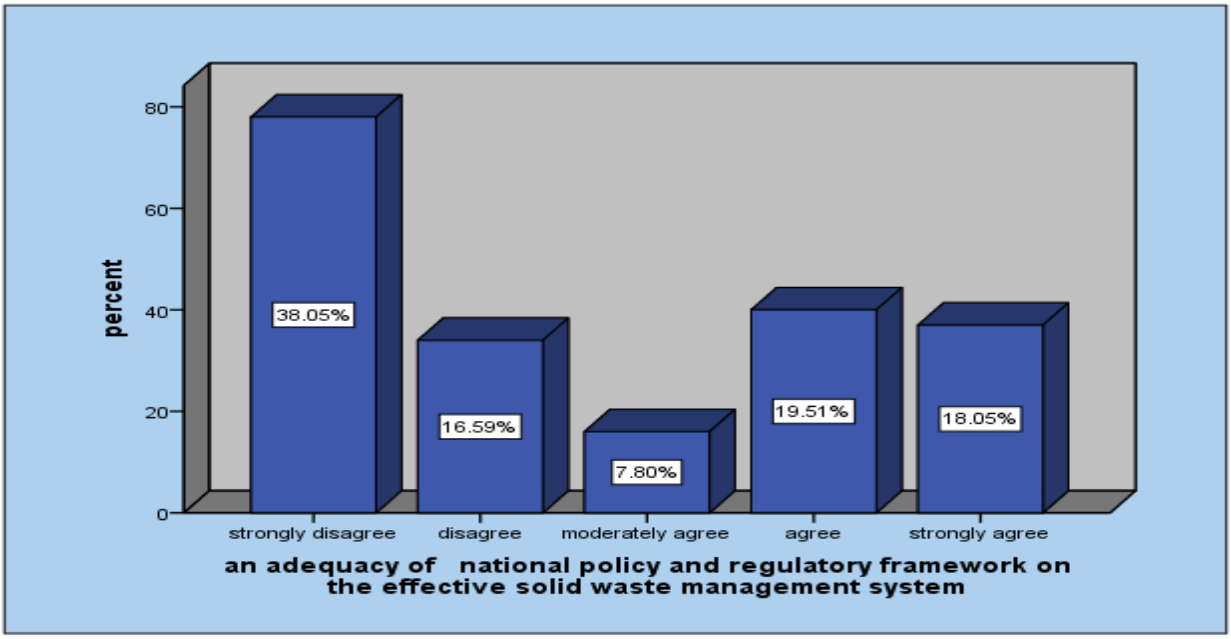

Fig. 6. Adequacy of national policy and regulatory framework on the effectiveness of solid waste management system

As it is depicted in the above chart, among the 220 sample respondents which comprise of woreda 04 administration environment protection officers, public health officers, Sanitation and beautification officers, SMEs as well as residents in woreda 04, 205(93.2%) of them filled out the questionnaire and included in this section for analysis. Data was analyzed using simple descriptive statistics such as, frequencies and percentages.

Respondents were asked to express their level of agreement on a Likert scale whether there is an adequate national policy and regulatory framework on the effective solid waste management system. Among the 205 participants who filled out the questionnaire, 78(38%) of them replied strongly disagree, 40(19.5%) of the total respondents replied agree, 37(18%) of the respondents replied strongly agree, 34(16.6%) replied disagree, 16(7.8%) of them and replied moderately agree on this issue. This indicates that majority of the respondents endorsed that the responsible body of solid waste disposal management body does not have an adequate SW disposal management policies and regulatory frame work enforcements. Most articles in regard to solid waste disposal indicated the direct relationship between Lack of or inadequate regulatory framework and improper solid waste disposal due to the inadequacy of accountability.

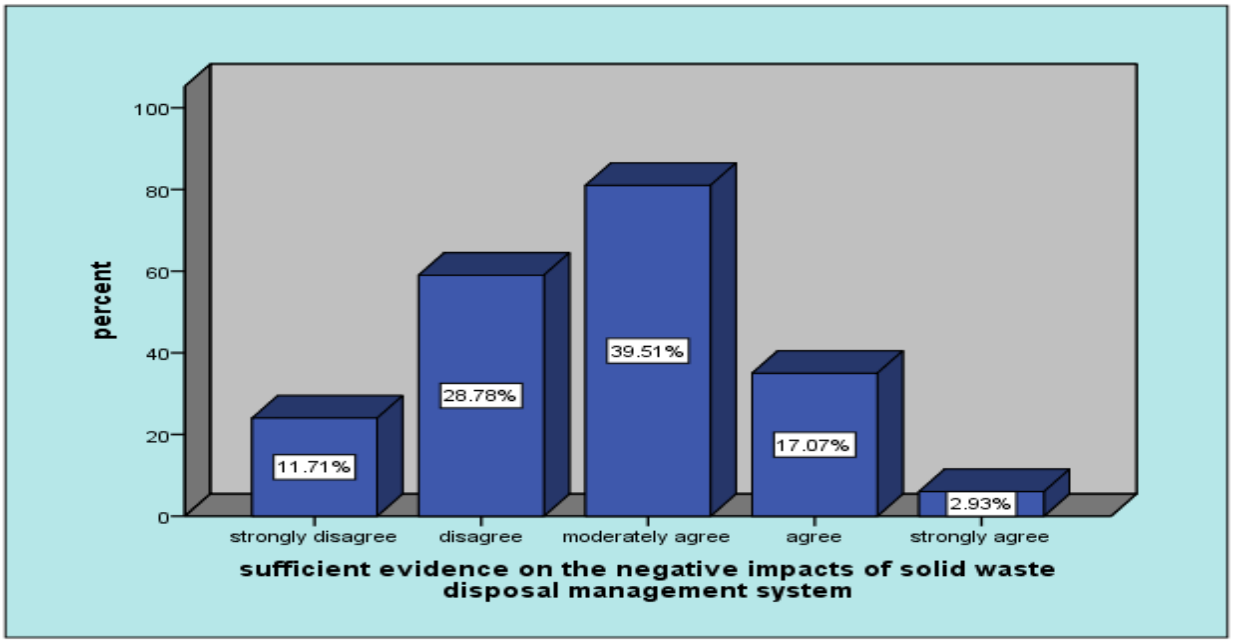

Fig. 7. Showing evidences on the negative impacts of SWMS

When respondents were asked to show their level of agreement on the sufficiency of evidences on the negative impacts of solid waste disposal management system, 81(39.5%) replied moderately agree, 59(28.8%) replied disagree, 35(17.1 %) of the respondents replied agree, 24(11.7%) replied strongly dis agree and 6(2.9%) strongly agree. This implies that there was sufficient evidence on the negative impacts of solid waste disposal management system.

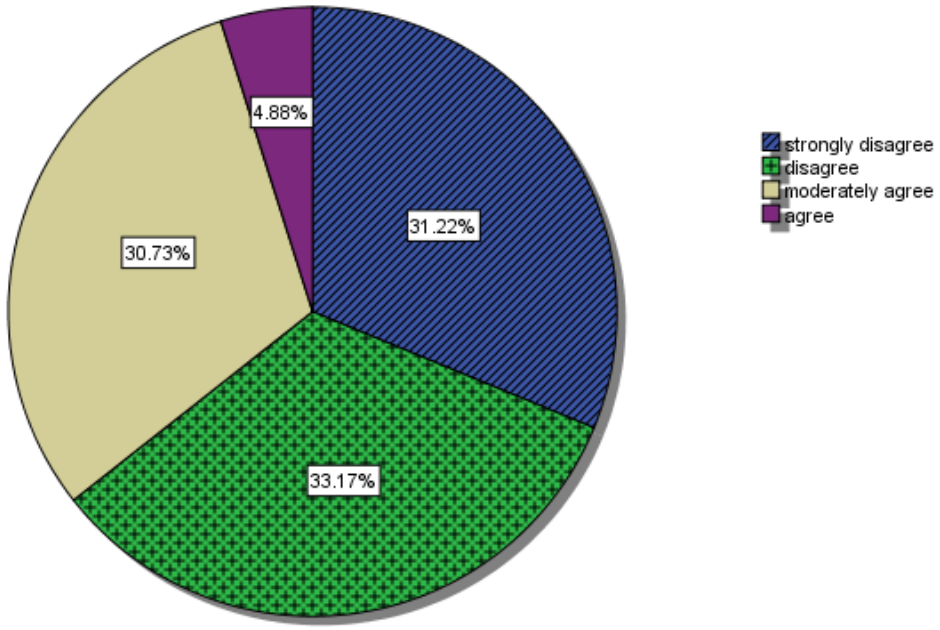

Fig. 8. Showing the Solid waste disposal monitoring and control team recommend preventive and corrective actions to bring the disposal management in line with the planned expectations in the waste disposal plan.

Respondents were also inquired to forward their level of agreement on the extent to which the solid waste disposal monitoring and control team recommend preventive and corrective actions to bring the disposal in line with the planned expectations in the waste disposal plan, 68(33.2%) of the respondents replied disagree, 64(31.2%) of them responded strongly disagreed, 63(30.7%) of them responded moderately agree and 10(4.9%) of other respondents replied agree. This implies that relatively high numbers of the respondents were not agreed on the issue that the solid waste disposal monitoring and control team recommend preventive and

corrective actions to bring the disposal management system in line with the planned expectations in the waste disposal plan.

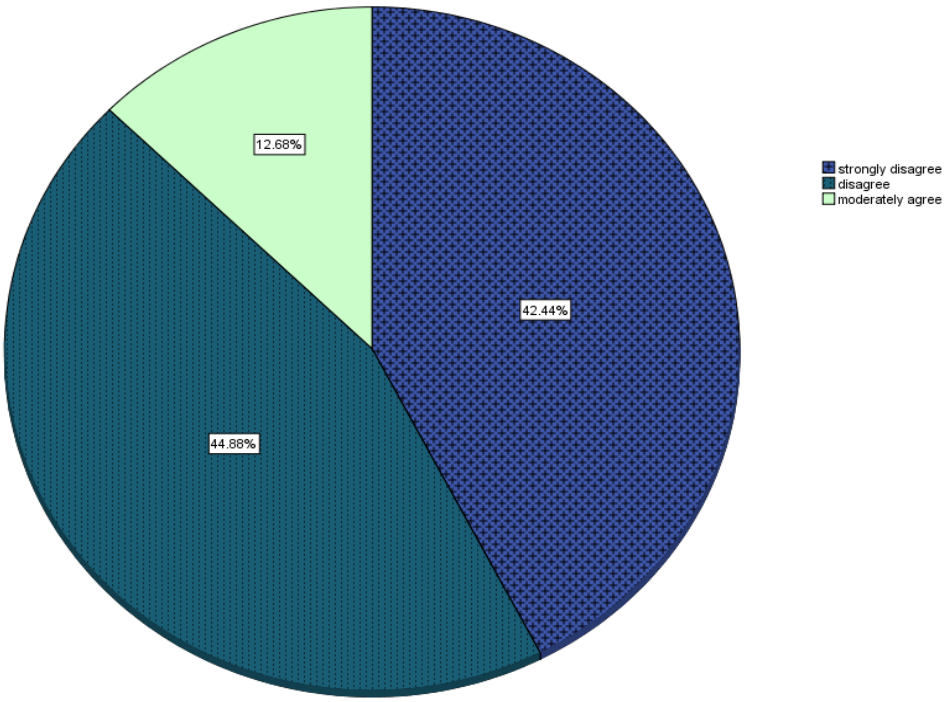

Fig. 9. Showing the adequacy and proper accountability of any one who dump wastes anywhere other than the allocated dumpsites

Regarding the adequacy and proper accountability on any one who dump wastes anywhere other than the allocated dumpsites, 92(44.9%) of them replied disagree, 87(42.4%) of the total respondents replied strongly disagree, 26(12.7%) of the respondents replied moderately agree and none of them responded agree and strongly agree on this issue. This indicates that majority of the respondents endorsed that the responsible body of solid waste disposal management body do not have adequate and proper accountability on any one who dump wastes anywhere other than the allocated dumpsites.

Among the 220 sample respondents which comprises of environment protection, sanitation, beautification and Parks development office, public health offices, SMEs and woreda 04 residents, 205(93.2%) of them filled out the questionnaire and included in this section for

analysis. Data was analyzed using simple descriptive statistics such as frequency/count and percentages and presented using tables.

4.2.2. Awareness creation, knowledge and skills by the concerned body on solid waste disposal work

No	Items	Ratings									
		SA		A		MA		D		SD	
		N	%	N	%	N	%	N	%	N	%
1	There is an adequate awareness creation about the regulatory frameworks for the proper solid waste management system			1	0.5	26	12.7	96	46.8	82	40
2	There is an adequate awareness about the inherent hazards caused by improper management of solid waste.			3	1.5	51	24.9	70	34.1	81	39.5
3	There is sufficient information on sound solid waste management options and their benefits			7	3.4	39	19	110	53.7	49	23.9
4	The community in the surrounding of woreda 04 have clear idea on how to use different alternative ways of waste handling (disposal) systems			8	3.9	17	8.3	131	63.9	49	23.9
5	There is a high level of understanding by the community that poor solid waste disposal system has an impact on one's health			1	0.5	19	9.3	122	59.5	63	30.7

Table 5. Awareness creation, knowledge and skills by the concerned body on solid waste disposal work

The respondents were asked to indicate their level of agreement on a Likert scale whether there is an adequate awareness creation about the regulatory frameworks for the proper solid waste management system. 96(46.8%) of them replied disagree, 82(40%) of the total respondents replied strongly disagree, 26(12.7%) of the respondents replied moderately agree, 1(0.5%) replied agree and no one replied strongly agree on this issue. This indicates that majority of the respondents endorsed that there is no an adequate awareness creation about the regulatory frameworks for the proper solid waste management system. As to many different

theoretical reviews, one of the critical causes for improper solid waste disposal management is lack of awareness creation.

When respondents were asked to show their level of agreement on the adequacy of awareness creation about the inherent hazards caused by improper management of solid waste, 81 (39.5%) of the respondents replied strongly disagree, 70(34.110.2%) of the respondents replied disagree, 51(24.9%), of the respondents replied moderately agree, and other 3(1.5%), of the respondents responded agree. The attitudes of the society towards sw and their patterns of material use and solid waste handling interest in solid waste reduction and minimization degree to which they separate solid wastes and the extent to which they retain from indiscriminate dumping and littering (SKAT, 2005). Therefore, attitude towards solid waste may be positively influenced by public information and awareness measures. At the same time improved waste handling patterns cannot be maintained in the absence of knowledge, even practical knowledge is maintained.

Respondents were also enquired to forward their level of agreement on sufficiency of information on sound solid waste management options and their benefits, 110(53.7%) of the respondents replied disagree, 49(23.9%) of them replied strongly disagree, 39(19%) of them responded moderately agree 7(3.4%) replied agree and no one responded strongly agree. This shows that relatively high number of the respondents indicated their disagreement on the sufficiency of the information regarding the different options of sound solid waste management options and their benefits.

Respondents were asked to indicate their level of agreement on the community in the surrounding of woreda 04 have clear idea on how to use different alternative ways of waste handling (disposal) systems. 131(63.9%) of the respondents indicated their disagreement, 49(23.9) indicated their strong disagreement 17(8.3%) of them indicated their moderate agreement, other 8(3.9%) replied agree. This shows that there was a problem with the awareness creation in relation to the use of different alternative ways of waste disposal systems.

Regarding item 5 of the above table, respondents expressed their level of agreement on the level of understanding by the community that poor solid waste disposal system has an impact

on one's health,122(59.5%) replied disagree, 63(30.7%) replied strongly disagree,19(9.3%) replied moderately agree 1(0.5%) replied agree and no one responded strongly agree. This shows that there was no high level of understanding by the community about the poor waste disposal related health effects due to less awareness creation by the concerned body.

4.2.3. Practices of solid waste handling from generating points to the final disposal site

No	Items	Ratings									
		SA		A		MA		D		SD	
		N	%	N	%	N	%	N	%	N	%
1	There is a relevant coordination between the stakeholders to be involved in the solid waste disposal work			33	16.1	129	62.9	25	12.2	18	8.8
2	The community in woreda 04 use different alternative ways of waste handling (disposal) systems			4	2	32	15.6	117	57.1	52	25.4
3	The community have appropriate waste storage for daily generated wastes			25	12.2	73	35.6	82	40	25	12.2
4	The community in woreda 04 stores solid waste at their home not more than a week	20	9.8	165	80.5	20	9.8				
5	There is a sufficient allocation of resources (human and financial) for efficient and effective SWD Management system	31	15.1	66	32.2	84	41	18	8.8	6	2.9
6	The major means of transporting waste from home to the nearby dumpsite is caring it by hands with plastic bags and similar materials	79	38.5	77	37.6	42	20.5	7	3.4	-	-
7	The responsible bodies come and collect solid waste from the dump site properly and regularly	24	11.7	67	32.7	74	36.1	25	12.5	15	7.3
8	The existing waste disposal system by the municipality can be said satisfactory	2	1	6	2.9	79	38.5	69	33.7	49	23.9
9	The solid waste disposal management body properly	-	-	6	2.9	44	21.5	96	46.8	59	28.8

	identified the context in which the solid waste disposal is being executed										
10	The health office managers and solid waste disposal authority properly and periodically keep track of the solid waste disposal progress.	9	4.4	18	8.8	79	38.5	80	39	19	9.3
11	There is a proper and adequate monitoring and control system by the responsible body regarding the solid waste generation and disposal management system			23	11.2	40	19.5	70	34.1	72	35.1
12	There is an adequate corrective measures taken after supervision and inspection of the waste disposal work			1	0.5	48	23.4	127	62	29	14.1
13	The extent to which the monitory and control undertaken by the public health as well as the environment protection and beautification office defend the environment from pollution					31	15.1	82	40	92	44.9

Table 6. Practices of solid waste handling from generating points to the final disposal site

Respondents were asked regarding their perception on the availability of relevant coordination between the stakeholders to be involved in the solid waste disposal work. As indicated on the table above, 129 (62.9%) of the respondents replied moderately agree, 33(16.1%) of the respondents replied agree, 25(12.2%) of the respondents replied disagree, 18(8.8) replied strongly disagree and neither of them responded strongly agree. During document analysis, the researcher cannot find appropriately documented information about the coordination of stakeholders. This indicates that there was a weak coordination between the stakeholders to be involved in solid waste disposal work. (Techobanoglous, 1993) therefore, municipalities, environmental scientists and other stakeholders should work very hard not only to minimize but also to reuse and recycle the waste materials so that they could make money from it and also conserve the natural resources.

Respondents were asked to provide their opinion whether or not the community in woreda 04 use different alternative ways of waste handling (disposal) systems, Accordingly, as it is depicted on the above table, item 2 reveals that, 117(25.4%) of the respondents expressed their disagreement, 52(25.4%) of the respondents expressed their strong disagreement, the other 32(15.6%), 4(2%) of the respondents replied moderately agree and agree respectively. This indicates that majority of the respondents indorsed that there were no alternative ways of waste disposal methods.

Regarding item 3 of the above table, respondents were asked to provide their level of agreement on whether or not the community have appropriate waste storage for daily generated wastes, 82 (40. %) of them confirmed that their disagreement on the availability of appropriate waste storages for their daily generated wastes, 73 (35.6%) of the respondents replied moderately agree, 25(12.2%) and other 25(12.2%) remarked agree and strongly disagree respectively and no one replied strongly agree. This implies that as indorsed by most of the respondents, the community in woreda 04 has not appropriate waste storage facility for the daily generated wastes.

Respondents were asked to forward their view about whether or not the community in woreda 04 stores solid waste at their home not more than a week,165 (80.5%) of them agreed, 20(9.8%) and another similar number of participants which is 20(9.8%) of the respondents replied strongly agree and moderately agree respectively.no one replied disagree and strongly disagree. The above data implies that relatively all the participants indorsed that the duration of the daily generated solid wastes were not more than a week

When respondents were asked to forward their view regarding sufficiency of allocated resources for the efficient and effective solid waste management system, 84(41%) of the respondents replied moderately agree, 66(32.2%) replied agree, 31(15.1%) replied strongly agree, 18(8.8%) of the respondents replied disagree 6(2.9%) respondents replied strongly disagree. This shows that the extent to which the allocated resources to handle solid wastes efficiently and effectively were not sufficient enough. Here it is possible to conclude that there is a lack of attention given and a shortage of resources needed for the betterments to handle solid wastes from the responsible offices at all levels.

Respondents were asked to provide their level of agreement on the major means of transporting waste from home to the nearby dumpsite is caring it by hands with plastic bags and similar materials 79(38.5%), replied strongly agree. Whereas 77(37.6%), 42(20.5%), and 7(3.4%) of the respondents replied agree, moderately agree and disagree respectively and no one responded strongly disagree. This indicates that the major means of transporting wastes from home to the nearby dumpsites were caring by hands with plastic bags and other similar materials that could be difficult to handle.

Respondents were asked to forward their level of agreement as the responsible bodies come and collect solid waste from the dump site properly and regularly,74(36.1%), replied moderately agree, 67(32.1%), replied agree, 25(12.2%), replied disagree, 24(11.7%) replied strongly agree and 15(7.3) of the respondents replied strongly disagree. This indicates that solid waste collectors come and collect the solid waste regularly.

Regarding the existing waste disposal system by the municipality, respondents remarked their level of agreement as,79(38.5%), replied moderately agree,69(33.7%), replied disagree,49(23.9%), replied strongly disagree, and other 6(2.9%), 2(1%) of the respondents replied agree and strongly agree respectively.

When respondents were asked to give their opinion on whether the solid waste disposal management body properly identified the context in which the solid waste disposal is being executed, 96(46.8%) replied disagree, 59(28.8%) replied strongly disagree. 44(21.5%) and 6(2.9%) of the respondents replied moderately agree and agree respectively. No one responded strongly agree. Based on this information, one can conclude that there was a need for a proper supervision regarding the practices of solid waste disposal management body.

Respondents were also asked to provide their view about the health office managers and solid waste disposal authority properly and periodically keep track of the solid waste disposal progress 80 (39 %) replied disagree, 79 (38.5%) of the respondents replied moderately agree, 19(9.3%) replied strongly disagree, and other 18(8.8%) and 9(4.4%) remarked agree and strongly agree respectively. This implies that as it is endorsed by most of the respondents, the health office managers and solid waste disposal authority did not properly and periodically keep track of the solid waste disposal progress.

Respondents were asked regarding their perception on the availability of proper and adequate monitoring and control system by the responsible body regarding the solid waste generation and disposal management system. As indicated in the above table, 72(35.1%) of the respondents replied strongly disagree, 70(34.1%) of the respondents replied disagree, 40(19.5%) of the respondents replied moderately agree, 23(11.2%) replied agree and neither of them responded strongly agree. This indicates that the extent to which the monitory and control undertaken by the responsible body to defend the solid waste disposal system against improper disposal management was inadequate. Solid waste management needs a very close supervision and control system. It also needs a very huge amount of resource, be it financial, infrastructural, human, time and material. Being inadequate in monitoring and control on such a huge investment leads to too much wastage, corruption and bankruptcy and become the main problem for the proper handling of solid waste which also leads to a higher crisis on productivity of the community due to health effects of improper solid waste management.

Respondents were also inquired to provide their level of agreement on the adequacy of corrective measures taken after supervision and inspection of the waste disposal work, 127 (62 %) of the respondents replied disagree 48(23.4%) replied moderately agree,29 (14.1%) replied strongly disagree, and 1 (0.5%) replied agree no one replied strongly agree. This implies that the corrective measures taken after supervision and inspection was inadequate.

Respondents were asked regarding their perception on the extent to which whether or not the monitory and control undertaken by the public health as well as the environment protection and beautification office defend the environment from pollution, 92(44.9%) of the respondents replied strongly disagree, 82(40%) of the respondents replied disagree, 31(15.1%) of the respondents replied moderately agree, and neither of them responded agree and strongly agree respectively. During document analysis there were no proper documentation that indicates the adequacy of proper and regular monitoring and control work by the concerned bodies. This indicates that the extent to which the monitory and control undertaken by the responsible body to defend the solid waste disposal system against improper disposal management was unable to defend the environment from pollution.

4.2.4. Impacts of solid waste on public health due to solid waste disposal management in Akaki Kality sub-city woreda 04 administration

No	Items	Ratings									
		SA		A		MA		D		SD	
		N	%	N	%	N	%	N	%	N	%
1	There is an irritation of eyes in most residents due to improper SWD	106	51.7	99	48.3	-	-	-	-	-	-
2	There is an irritation of the nose in most residents due to improper SWD	131	63.9	74	36.1	-	-	-	-	-	-
3	There is a high rate of diarrhea and dysentery in most residents due to improper SWD	35	17.1	76	37.1	87	42.4	7	3.4	-	-
4	There is a high rate of cholera in most residents due to improper SWD	26	12.7	75	36.6	95	46.3	9	4.4	-	-
5	There is a high rate of coughing in most residents due to improper SWD	142	69.3	42	20.5	21	10.2	-	-	-	-
6	There is a high rate of Typhoid in most of the residents due to improper SWD	96	46.8	24	11.7	85	41.5	-	-	-	-
7	There is a high rate of infections related to intestinal worms in most of the residents due to improper SWD	114	55.6	58	28.3	33	16.1	-	-	-	-
8	There is a high prevalence of respiratory related diseases in the surrounding people due to lack of proper solid waste disposal	159	77.6	40	19.5	6	2.9	-	-	-	-

Table 7 Impacts of solid waste on public health due to solid waste disposal management

The U.S Public Health Services identified 22 human diseases that are linked to improper solid waste management (Hans Cited in Hoorn et al., (1999). The co-disposal of hazardous and medical wastes with municipal wastes poses serious health threat. Exhaust fumes from waste collection, vehicles dust stemming, from disposal practices and pen burning of waste also contribute to overall health problems (Hoorn et al., 1999).

As it is shown by the table above, respondents were asked to indicate their level of agreement on a Likert scale whether there is an irritation of eyes in most residents due to improper SWD, 106(51.7%) of them replied strongly agree, 99(48.3%) of the total respondents replied agree, no one responded moderately agree, disagree and strongly disagree respectively. Participants in the interview were also confirmed that there is a high prevalence of irritation of the nose, eyes and other respiratory diseases. This indicates that majority of the respondents endorsed that there is an irritation of eyes in most residents due to improper SWD system.

When respondents were asked to show their level of agreement on whether there was an irritation of the nose in most residents due to improper SWD, 131 (63.9%) of the respondents replied strongly agree, 74(36.1%) of the respondents replied agree, in this regard moderately agree, disagree and strongly agree were not opted by respondents. During the interview, respondents inquired that there is a prevalence of irritation of eyes and the nose due to improper solid waste disposal. This implies that majority of the respondents remarked that there is an irritation of the nose in most residents due to improper SWD system.

Respondents were asked to indicate their level of agreement on whether there is a high rate of diarrhea and dysentery in most residents due to improper SWD, 87(42.4%) of the respondents replied moderately agree, 76(37.1%) of the participants replied agree, 35(17.1%) of them responded strongly agree 7(3.4%)replied disagree and no one responded strongly disagree. This shows that relatively high number of the respondents indicated their agreement on the emergency of high rate of diarrhea and dysentery in most residents due to improper solid waste disposal.

Respondents were asked to indicate their level of agreement on whether there is a high rate of cholera in most residents due to improper SWD 95(46.3%) of the respondents indicated their moderate agreement, 75(36.6%) indicated their agreement, 26(12.7%) of them indicated their

strong agreement, other 9(4.4%) indicated their disagreement, no one replied strongly disagree. This shows that there was a high rate of cholera in most of the residents.

Regarding item 5 of the above table, respondents expressed their level of agreement on whether or not there is a high rate of coughing in most of the residents due to improper SWD,142(59.3%) replied strongly agree, 42(20.5%) replied agree,21(10.2%) replied moderately agree. No one replied disagree and strongly disagree. This shows that there was a high rate of coughing due to improper solid waste disposal management.

Regarding the issue that is whether or not there was a high rate of typhoid in most of the respondents, in woreda 04 participants indicated their level of agreement as, 96(46.8%) of the respondents replied strongly agree, 85(41.5%) of the respondents replied moderately agree, 24(11.7%) of the participants replied agree, no one responded disagree and strongly disagree. This shows that there was a high rate of typhoid in most of the residents due to improper solid waste disposal.

Respondents were asked regarding their perception on whether or not there were a high rate of infections related to intestinal worms in most of the residents due to improper SWD., 114(55.6%) of the respondents replied strongly disagree, 58(28.3%) of the respondents replied agree, 33(16.1%) of the respondents replied moderately agree, and neither of them responded disagree and strongly disagree respectively. This indicates that the extent to which the rate of intestinal infections were high due to improper solid waste disposal.

Respondents were asked to provide their level of agreement on whether or not there was a high prevalence of respiratory related diseases related to lack of proper solid waste disposal. Out of the 205 respondents, 159(77.6%) of the respondents replied strongly agree, 40(19.5%) of the respondents replied agree, 6(2.9%) of the respondents replied moderately agree, and neither of them responded disagree and strongly disagree respectively. During the interview, participants confirmed that most of the residences were suffering from respiratory related diseases due to improper solid waste disposal. This indicates that there was a high prevalence of respiratory related diseases due to improper solid waste disposal management system.

CHAPTER FIVE

5. Conclusion and recommendation

This chapter presents the summary of the major findings, the conclusions drawn on and the recommendations forwarded based on the major findings.

The main purpose of this study was to examine and analyze the practices and problems of solid waste disposal management and its impact on public health in Akaki Kalitysub-city woreda 04 administrations in Addis Ababa. Hence, to find out the current practices and problems, descriptive survey system was employed and data were collected from woreda 04 surroundings protection officers, woreda 04 aseptic and beautification officers, woreda 04 health officers and environment janitor as well as aseptic workers, selected households who take part in solid waste disposal, by using instruments similar as questionnaire and semi-structured interview questions. A sum of 205 repliers for the questionnaire and 10 respondents for the interview were participated in the survey and the data drown from different sources were analyzed using SPSS and statistical tools similar as frequency distribution, valid and accretive percentages.

Solid waste administration takes a new form of disposal performances in our country. It's a strategic response to rapid population growth, high frequency of urban poverty, and urban unemployment in major Ethiopian towns. This implies that besides the massive waste disposal delivery, the project is necessary in creating large number of job openings to reduce current unemployment rate and produce a saving culture in the public. From this point of view, the main purpose of this study was to assess the practices and problems of solid waste disposal operation system in Akaki Kalitysub-city woreda 04 administration Addis Ababa city administration.

5.1 Conclusion

- As it's confirmed from the analysis of data obtained through the data collection tools, most of the occupant settlement of the study area is erratic which laid an obstruction for easy collection of household wastes. Especially, this inadequately planned settlement has caused great problems for micro and small scale enterprise that collect the solid waste on a

door- to- door base by using small vehicles and carts. Due to lack of access road in this inadequately planned settlement, the micro and small scale enterprises couldn't drive their manually pushed carts.

- The responsible bodies of solid waste disposal work with respect to stakeholders were with a great problem in relation to the collaboration among themselves.

- It is obvious that for effective solid waste management system, sufficient amount of resources (financial and human) are a determining factor, the institutional capacity of the sub-city and woreda offices have a shortage of resources so as to run the system. Besides, the officers have loose coordination with other stakeholders and this contributes for its ineffectiveness. In addition to this, due to poor enforcement of the regulatory bodies, the existing law of solid waste management is continuously violated by the residents.

- The present situation with respect to on-site storage varies from one area to another. In most cases, there is a deficiency of on-site storage mainly due to lack of free space to put the container (on-site storage). Moreover, the existing on-site storages are insecure and unsatisfactory which impede effective collection of the system and resulted in health and environmental problems. Most residents with no proper storage bins disposed their wastes on open fields, road sides, etc…Apart from the environmental and health problems, the inefficiency of collection system are resulted in aesthetic problems.

- Age and condition of waste collection vehicles are not in the right position due to various reasons. A lack of financial resource is one of the factors which lead to poor maintenance of vehicles and equipment. Due to the old age of the existing vehicles used for collection service, they have got numerous breakdown and high maintenance costs as a result the collection systems became poor.

- With regard to the health impacts of improper solid waste disposal management system, as it is confirmed from the findings of this study there were a high prevalence of eye and nose irritations, and health problems of intestinal infections and respiratory related diseases**.**

5.2 **Recommendations**

Proper solid waste disposal management system should be continued as one form of environment protection sanitation and beautification major means of projects in the cities especially in Addis Ababa. The combination of high population and high urban growth rates coupled with a high prevalence of urban poverty have placed enormous strain on Ethiopian cites. Currently, in Addis Ababa, there is strong and proper waste disposal demand as a result of the mismatch between the expanding urban population and the limited capacity to alleviate the problem related to solid waste management.

Based on the findings, this study comes up with the following recommendations (possible solutions) that may curb the existing problems.

Realizing the fact to the great mismatch between the demand for and the supply to proper solid waste disposal management, introducing proper alternative ways of waste disposal system approach is unquestionable. Moreover, the waste disposal management policy of the government should consider multi directional approaches. Such as:

- Participative planning and implementing campaign that builds up understanding and cooperation between the concerned stakeholders is very important.
- Applying alternative low cost durable local materials and technology and encouraging different actors involved in the solid waste disposal management system is indispensable.
- Maintain a good monitoring and control systems and take as early corrective actions for variations from the bench mark.
- Provide necessary supervision and inspection program and be committed to take any necessary measures on timely basis on those who are negligent on their duty and responsibility
- To increase the collection system and bring significant change in solid waste management, creating adequate awareness to the community about waste prevention, separation and recycling can help the community by saving them from its expected negative consequences.

- Expanding and modernizing the collection and transferring system as much as possible have also significant contribution. Since the use of modern equipment and vehicles

facilitate the development and effectiveness of the system, it is beneficial to have these within the capacity.

- Providing support to encourage individuals and companies operating in the field of waste collection, separation and recycling by giving incentives in addition to free of tax and assisting them to market their products locally can be a motivational factor and at last this would result in better management.

- Establishing the staff with well trained and sufficient number of workforce aside to building the financial capacity, which can minimize the administrative problems and the service rendered, is essential.

- Additional studies should be done more on challenges that hinder stakeholder involvement on solid waste disposal management systems.
- Comparative studies of solid waste disposal and health effects of improper solid waste disposal management need to be conducted to integrate best experiences among different regions and to adopt global best practices

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Appendix A

Instruments of Data Collection

Questionnaire (English version)

Questionnaire to be filled by Staffs of woreda 04 environment protection office, health office and environment sanitation and beautification office, SMEs and residents of woreda 04 administration

Dear Respondents, first I would like to express my sincere appreciation for your precious time, genuine and quick responses in advance.

This questionnaire is designed to collect primary data about the practices of solid waste disposal and its effect on public health. The information will be used as a primary data to the research I am conducting as a partial requirement of my study at Addis Ababa University in completing my Master ‘s Degree in Biological science. I also want to assure you that this research is authorized by Addis Ababa University and it will only have an academic purpose and your answers will be kept confidential.

General Instructions

- There is no need of writing your name.
- In all cases where answer options are available, please tick **(√)** in the appropriate box.
- For questions that demand your opinion, please briefly explain as per the questions on the space provided.

N: B. If you have any enquiries or need further assistance you can contact me in the following address Woinshet Yirgue Tel. +251913 650372/0911018892

Thank you in advance!

Woinshet Yirgue

1. Background Information

1.1. Respondents residential area

Akaki Kality Woreda 04 ☐ other Woredas ☐

1.2.1. Age,

21-30 ☐ 31-40 ☐ 41-50 ☐ 51 and above ☐

1.2.2. Sex,

Male ☐ Female ☐

1.2.3. Marital status

Single ☐ Married ☐ Divorced ☐ Widowed ☐

1.2.4. Educational Qualification:

High school graduate ☐ Technical school graduate ☐ College Diploma ☐

BA/ BSc Degree ☐ Master ‘s Degree ☐

Other ☐

1.2.5. Years of Services

1-5 ☐ 6-10 ☐ 11-20 ☐ 21 and above ☐

1.2.6. Monthly income of the respondents (in ETB)

Below 3000 ☐ 3000- 4000 ☐ 4000-5000 ☐ Above 5000 ☐

2: Questions related to the adequacy of SW disposal management policies, regulatory framework and enforcement

Please indicate your level of agreement with the statements so that your answers to these questions will enable the researcher to assess the performance of solid waste disposal management practices. Please, use **(**√**)** mark**.**

5. Strongly agree 4. Agree 3. Moderately Agree 2. Dis-agree 1**.** Strongly disagree

No	Items	Rating				
		5	4	3	2	1
1	There is an adequate national policy and regulatory framework on the effective solid waste management system.					
2	There is sufficient evidence on the negative impacts of solid waste disposal management system					
3	The extent to which the solid waste disposal monitoring and control team recommend preventive and corrective actions to bring the disposal in line with the planned expectations in the waste disposal plan					
4	There is an adequate and proper accountability on any one who dump wastes anywhere other than the allocated dumpsite					

5**.** If you have any additional idea please specify----------
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3. Questions related to awareness creation, knowledge and skills by the concerned body on solid waste disposal work

Please indicate your level of agreement with the statements so that your answers to these questions will enable the researcher to assess the performance of solid waste disposal work. Please, use **(**√**)** mark**.**

5. Strongly agree 4. Agree 3. Moderately Agree 2. Dis-agree 1**.** Strongly disagree

No	Items	Rating				
		5	4	3	2	1
1	There is an adequate awareness creation about the regulatory frameworks					

	for the proper solid waste management system					
2	There is an adequate awareness about the inherent hazards caused by improper management of solid waste.					
3	There is sufficient information on sound solid waste management options and their benefits					
4	The community in the surrounding of woreda 04 have clear idea on how to use different alternative ways of waste handling (disposal) systems					
5	There is a high level of understanding by the community that poor solid waste disposal system has an impact on one's health					

6**.** If you have any additional idea please specify----------
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4. Questions related to the Practices of solid waste handling from generating points to the final disposal site?

Please indicate your level of agreement with the statements so that your answers to these questions will enable the researcher to assess the performance of solid waste disposal management practices. Please, use **(**√**)** mark**.**

5. Strongly agree 4. Agree 3. Moderately Agree 2. Dis-agree 1**.** Strongly disagree

No	Items	Rating				
		5	4	3	2	1
1	There is a relevant coordination between the stakeholders to be involved in the solid waste disposal work					
2	The community in woreda 04 use different alternative ways of waste handling (disposal) systems					
3	The community have appropriate waste storage for daily generated wastes					
4	The community in woreda 04 stores solid waste at their home not more than a week					
5	There is a sufficient allocation of resources (human and financial) for efficient and effective SWD Management system					
6	The major means of transporting waste from home to the nearby dumpsite is caring it by hands with plastic bags and/similar materials					

7	The responsible bodies come and collect solid waste from the dump site properly and regularly					
8	The existing waste disposal system by the municipality can be said satisfactory					
9	The solid waste disposal management body properly identified the context in which the solid waste disposal is being executed					
10	The health office managers and solid waste disposal authority properly and periodically keep track of the solid waste disposal progress.					
11	There is a proper and adequate monitoring and control system by the responsible body regarding the solid waste generation and disposal management system					
12	There is an adequate corrective measures taken after supervision and inspection of the waste disposal work					
13	The extent to which the monitory and control undertaken by the public health as well as the environment protection and beautification office defend the environment from pollution					

14**.** If you have any additional idea please specify----------
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5. Questions related **to the impacts of solid waste on public health due to solid waste disposal in Akaki Kality sub-city woreda 04 administration?**

Please indicate your level of agreement with the statements so that your answers to these questions will enable the researcher to assess the effect of solid waste disposal on public health. Please, use **(**√**)** mark**.**

5. Strongly agree 4. Agree 3. Moderately Agree 2. Dis-agree 1**.** Strongly disagree

No	Items	Rating				
		5	4	3	2	1
1	There is an irritation of eyes in most residents due to improper SWD					
2	There is an irritation of the nose in most residents due to improper SWD					
3	There is a high rate of diarrhea and dysentery in most residents due to improper SWD					
4	There is a high rate of cholera in most residents due to improper SWD					
5	There is a high rate of coughing in most residents due to improper SWD					

6	There is a high rate of Typhoid in most of the residents due to improper SWD					
7	There is a high rate of infections related to intestinal worms in most of the residents due to improper SWD					
8	There is a high prevalence of respiratory related diseases in the surrounding people due to lack of proper solid waste disposal					

9. If you have any additional idea please specify----------

Appendix B

Interview Questions

I. Semi-structured interview questions

1. Do you think there is an adequate strategic as well as other subsidiary planning on solid waste disposal management by the responsible body?
2. What is your view on the coordination of staff and other stakeholders regarding the proper solid waste disposal?
3. Is there any training and orientation given by the concerned offices? What is your view regarding the training and orientations given on solid waste disposal management?
4. What is your view regarding the commitment of concerned offices on environment protection and public health?
5. What do you think of the performance of solid waste disposal by the stakeholders?
6. Do you think that there are problems that challenge solid waste management? What do you think are the major ones?
7. Do you think that there is full and well organized information on the proper solid waste disposal related issue?
8. How often does the concerned body monitor and make follow ups about solid waste management?
9. Do you think that there is a high prevalence of irritation of the eyes, the nose and other respiratory diseases due to improper solid waste disposal?
10. What other disease do you think emerged in relation to improper solid waste disposal?

Thank you for your cooperation

Appendix C

1. **Check list prepared by the researcher for Document Analysis Regarding Solid waste disposal management system**

No	Item	Availability		Remark
		yes	No	
1	There is an adequate solid waste disposal management policy and regulatory frame work that incorporates stakeholder participation.			
2	Based on the environment protection program, stakeholders like environment protection office, sanitation and beautification and parks development office, public health office, and other stakeholders, are properly organized and have agreement charter to work together.			
3	Each committee has its own guidelines, regulations, annual plans, meeting schedules, minutes and file documents			
4	Documents that show stakeholder participation in			
	✓ stakeholders conference			
	✓ Their duties and responsibility assignment			
	✓ Feedback in the progress report of the Solid waste disposal management work			
	✓ Decision making as an administrative staff and other team members with the necessary documentations like			
	✓ Minutes,			
	✓ files,			
	✓ reports,			
	✓ Solid waste disposal dumpsite visits documentation			

ተቀፅላ ሀ

የፅሁፍ መጠይቅ (የአማርኛ ቋንቋ ቅጅ)

በአቃቂ-ቃሊቲ ክ/ከተማ ወረዳ 04 አስተዳደር ባለሙያዎች በወረዳዉ ነዋሪዎቸ እና የጥቃቅንና አነስተኛ ኢነተርፕሪዞች ልማት ባለሙያ አባላት የሚሞላ መጠይቅ፡፡

ዉድ ተሳታፊዎች በመጀመሪያ ዉድ ጊዜአችሁን በመሰዋት ይህን መጠይቅ ለመሙላት ፈቃደኛ በመሆናቸሁ ያለኝን ልባዊ አክብሮትና ምስጋና ልገልፅላችሁ እወዳለሁ፡፡

ይህ መጠይቅ የተዘጋጀዉ የደረቅ ቆሻሻ አወጋገድና በጤና ላይ የሚአስከትለዉ አሉታዊ ተፅእኖ በሚል ርእሰ ጉዳይ ለሁለተኛ ዲገሪ ማሟያነት ለሚካሄደዉ የዳሰሳ ጥናት ግባትነት መረጃ ለመሰብሰብ ታስቦ ነዉ፡፡ በዚሁ አጋጣሚም በዚህ መጠይቅ የሚሰበሰበዉ መረጃ ለትምህርታዊ ጉይ ብቻ የሚዉል መሆኑን እንጅ ለሌላ ለምንመ ጉዳይ ጥቅም ላይ እንደማይዉል ማረጋገጥ እወዳለሁ፡፡

አጠቃላይ መመሪያ

- ስም መጥቀስ አስፈላጊ አይሆንም
- በመጠይቆቹ ሁሉ ምርጫ ሲያጋትመዎት (√) ምልክት ይጠቀሙ
- ተጨማሪ አስተያየት ለሚያስፈልጋቸዉ ጥያቄዎች አጠር ባለ መልኩ መልሰዎትን ያሰቀምጡ

1. የተሳታፊወች አጠቃላይ መረጃ

1.1 የተሳታፊወች መኖሪያ

ወረዳ 04 ☐ ሌላ ወረዳ ☐

1.2 እድሜ

21-30 ☐ 31-40 ☐ 41-50 ☐ 51 እና ከዛ በላይ ☐

1.3 ፆታ

ወንድ ☐ ሴት ☐

1.4 የጋብቻ ሁኔታ

ያላገባ/ች ☐ ያገባ/ች☐ የፈታ/ች ☐ በሞት የተለየ/ች ☐

1.5 የትምህርት ደረጃ

ሁለተኛ ድረጃ ያጠናቀቀ/ች ☐ ቴክኒክና ሙያ ያጠናቀቀ/ች ☐ ኮሌጅ ዲፕሎማ ያለዉ/ት ☐

የመጀመሪያ ዲግሪ ያለዉ/ት ☐ ሁለተኛ ዲገሪ ያለዉ/ት ☐

1.6 የአገልግሎት

1-5 ☐ 6-10 ☐ 11-20 ☐ 21 እና በላይ ☐

1.7 ወራዊ ገቢ(በብር)

ከ3000 ብር በታች ☐ ከ3000-4000 ብር ☐ ከ4000-5000 ☐ ከ 5000 ብር በላይ ☐

2. ከደረቅ ቆሻሻ አወጋገድ ጋር በተያያዘ ያሉ ህጎች ደንቦችና አፈፃፀም በተመለከተ የቀረቡ መጠይቆች

እባከዎትን ከታች በተመለከተዉ መሰረት ምርጫዎት ላይ (√) በማድረግ መልስዎትን ያስቀምጡ

5. በጣም እሰማማለሁ 4. እስማማለሁ 3. በመጠኑ እስማማለሁ 2. አልስማማም 1. በጣም አልስማም

ተ.ቁ	መጠይቆች	መለኪያ				
		5	4	3	2	1
1	ስለትክክለኛ የደረቅ ቆሻሻ አወጋገድ ስርኣት በቂ የሆነ ሃገራዊ የደረቅ ቆሻሻ አወጋገድ መርህ ደንብ እና የህግ ማእቀፍ አለ።					
2	የደረቅ ቆሻሻ አወጋገድ ስለሚያስከትለው አሉታዊ ተፅእኖ በቂ ሆነ መረጃ ይገኛል።					
3	የደረቅ ቆሻሻ አወጋገድ ክትትል ቡድን ቅድመ መከላከልና ማስተካከያ ስራወች በተመለከተ ተገቢና ወቅቱን የጠበቀ እና በእቅዱ መስረት ተግባራዊ ይደረግ ነበር።					
4	ደረቅ ቆሻሻን በየቦታዉ በሚጥሉ አካላት/ ግለሰቦች ላይ በቂና ተገቢ እርምጃ ይወሰዳል/ ተጠያቂነት አለ።					

5. ሌላ ተጨማሪ ሃሳብ ካለት እባከዎ ያብራሩ ----------

ከእዉቀትና ክህሎት ማጎለበት ጋር የተያያዙ ጥያቄዎች

እባከዎትን ከታች በተመለከተዉ መሰረት ምርጫዎት ላይ (√) በማድረግ ሜል ስ ዎትን ያስቀምጡ

5. በጣም እሰማማለሁ 4. እስማማለሁ 3. በመጠኑ እስማማለሁ 2. አልስማማም 1. በጣም አልስማማም

ተ.ቁ	መጠይቆች	መለኪያ				
		5	4	3	2	1
1	ስለ ደረቅ ቆሻሻ አወጋገድ ህግና መሰረታዊ መርሆዎች በቂ የሆነ ግንዛቤ አለ					
2	ከደረቅ ቆሻሻ አወጋገድ ጋር ተያያዥነት ስላላቸዉበሽታዎች በቂ ግንዛቤ ተፈጥሮአል					
3	በጥሩ የሆነ የቆሻሻ አወጋገድ ዙሪያ ላይ በቂ የሆነ መረጃ ይገኛል።					
4	በወረዳ 04 አካባቢ ነዋሪዎች ዘንድ ተለያዩ የደረቅ ቆሻሻ አወጋገድ ዙሪያ ግልፅ የሆነ ግንዛቤ ተፈጥሮአል።					
5	ተገቢ ያልሆን የቆሻሻ አወጋገድ ዘዴ ስለአለዉ አሉታዊ የጤና ተፅእኖ ከፍተኛ ግንዛቤ በማህበረሰቡ ዘንድ ተፈጥሮአል					

6. ሌላ ተጨማሪ ሃሳብ ካለዎት እባከዎ ያብራሩ ----------

---

4. የደረቅ ቆሻሻ ዉገዳ ተግባራት ከመነሻዉ እስከ መድረሻዉ ሰለአለዉ ክንዉን ግር የተዛመዱ መጠይቆች

እባከዎትን ከታች በተመለከተዉ መሰርት ምርጫዎት ላይ (√) በማድረግ መልስዎትን ያስቀምጡ

5. በጣም እሰማማለሁ 4. እስማማለሁ 3. በመጠኑ እስማማለሁ 2. አልስማማም 1. በጣም አልስማም

ተ.ቁ	መጠይቆች	መለኪያዎች				
		5	4	3	2	1
1	በደረቅ ቆሻሻ አወጋገድ ዉስጥ ተሳታፊ የሆኑ ባለድርሻዎች ሁሉ ተገቢነት ያለዉ ቅንጅት ፈጥረዉ ይሰራሉ።					
2	የወረዳ 04 ነዋሪዎች የተለያዩ የደረቅ ቆሻሻ ማስወገጃ መንገዶችን ይጠቀማሉ።					
3	የወረዳ 04 ነዋሪዎች በየእለቱ ለሚያስወገዱት የደረቅ ቆሻሻ ተገቢ የሆነ ማከማቻ አላቸዉ።					
4	የወረዳ 04 ነዋሪዎች በየእለቱ ለሚያስወገዱት ደረቅ ቆሻሻ በቤት ዉስጥ ከ1 ሳምንተ በላይ አያቆዩም ።					
5	ብቁና ስኬታማ የደረቅ ቆሻሻ አወጋገድን ለማሳለጥ የሚአስችል የሰዉ ሃየልና የገንዘብ አቅረቦት በበቂሁናቴ ይቀርባል።					
6	በየአቅራቢያዉ ባሉ ቆሻሻ ማከማቻዎች ደረቅ ቆሻሻን ለማድረስ በዋናነት ጥቅም ላይ የሚዉለዉ ዘዴ በፌስታልና መሰል ነገሮች በእጅ ማጓጓዝ ነዉ።					
7	የሚመለከታቸዉ አካላት በአግባቡና በመደበኛ ሁናቴ ደረቅ ቆሻሻን ይሰበስባሉ።					
8	እጥጋቢ የሆነ መዘጋጃቤታዊ የደረቅ ቆሻሻ አወጋገድ ሂደት አለ።					
9	የደረቅ ቆሻሻ አወጋገድ አመራር አካላት የደረቅ ቆሻሻ አወጋገድ ሂደቱን አዉዳዊ ሁነት ከቆሻሻ አወጋገድ ሂደት አንፃር በተገቢዉ ሁናቴ ለይተዉ ይረዳሉ ።					
10	የጤና እና ደረቅ ቆሻሻ አወጋገድ ባለሟሎች ወቅታዊ እና ተገቢ በሆነ ሁናቴ የአወጋገድ ሂደቱን ክትትል ያደርጋሉ ።					
11	በቂና ተገቢ የሆነ ክትትል ቁጥጥርና ድጋፍ በሚመለከታቸዉ አካላት ይደረጋል።					
12	ተገቢ ሆነ ክትትልና ድጋፍ ከተደረገ በኋላ ለሚከሰቱ አለመሻሻሎች በቂና ተገቢ የእርምት					

	እርምጃ ይወሰዳል					
13	በወረዳ 04 ጤና ባለሙያዎች እንዲሁም አካባቢ ጥበቃ ፅዳትና ዉበት በኩል የሚደረገዉ የደረቅ ቆሻሻ አወጋገድ ክትትል እና ቁጥጥር አካባቢዉን ከብክለት ተከላክሎታል።					

14. ሌላ ተጨማሪ ሃሳብ ካለት እባከዎ ያብራሩ ----------

5. የደረቅ ቆሻሻ አወጋገድ ስርዓት በማህብረሰብ ጤና ላይ የሚአስከትለዉ ተፅእኖን በተመለከተ የቀረቡ መጠይቆች

እባከዎትን ከታች በተመለከተዉ መሰርት ምርጫዎት ላይ (√) በማድረግ መልስዎትን ያስቀምጡ

5. በጣም እሰማማለሁ 4. እስማማለሁ 3. በመጠኑ እስማማለሁ 2. አልስማማም 1. በጣም አልስማም

ተ.ቁ	መጠይቆች	መለኪዎች				
		5	4	3	2	1
1	በአካባቢዉ በሚከማቹ የደረቅ ቆሻሻ ክምችት ምክንያት በአብዛኛዉ ነዋሪዎች ላይ አይን መቆጥቆት ማቃተል ይታያል።					
2	በአካባቢዉ በሚከማቹ የደረቅ ቆሻሻ ክምችት ምክንያት በአብዛኛዉ ነዋሪዎች ላይ የአፍንጫ መሰርሰርና መቆጥቆት ይታያል።					
3	በአካባቢዉ በሚከማቹ የደረቅ ቆሻሻ ክምችት ምክንያት በአብዛኛዉ ነዋሪዎች ላይ ከፍተኛ የሆነ ቁርጠትና ተቅማጥ ይታያል።					
4	በአካባቢዉ በሚከማቹ የደረቅ ቆሻሻ ክምችት ምክንያት በአብዛኛዉ ነዋሪዎች ላይ የኮሌራ ህማም ይታያል።					
5	በአካባቢዉ በሚከማቹ የደረቅ ቆሻሻ ክምችት ምክንያት በአብዛኛዉ ነዋሪዎች ላይ ከፍተኛ የሆን ሳል ይታያል።					
6	በአካባቢዉ በሚከማቹ የደረቅ ቆሻሻ ክምችት እና ተገቢ ባልሆነ አወጋገድ ምክንያት በአብዛኛዉ ነዋሪዎች ላይ ከፍተኛ የሆነታይፎይድ ይታያል።					
7	በአካባቢዉ በሚከማቹ የደረቅ ቆሻሻ ክምችት ምክንያት እና ተገቢ ባልሆነ አወጋገድ ምክንያት በአብዛኛዉ ነዋሪዎች ላይ ከፍተኛ የሆነ በአንጀት ትላትሎች የተነሳ የሆድ ህማም ይታያል።					

8	በአካባቢዉ በሚከማቹ የደረቅ ቆሻሻ ክምችት ምክንያት እና ተገቢ ባልሆነ አወጋገድ ምክንያት በአብዛኛዉ ነዋሪዎች ላይ ከፍተኛ የሆነ የመተንፈሻ አካላት በሽታዎች ይከሰታሉ።					

9. ሌላ ተጨማሪ ሃሳብ ካለት እባከዎ ያብራሩ ----------

ተቀፅላ ለ

ቃለ መጠይቅ (አማረኛ ቅጅ)

1. በእርሰዎ አስተሳሰብ ስለ ደረቅ ቆሻሻ አወጋገድ በቂ የሆነ የረጅም ጊዜና የአጭር ጊዜ እነዲሁም ተዛማጅ የሆኑ እቅዶች በሚመለከተዉ አካል ተዘጋጅተዋል ስራ ላይም ይዉላሉ?

2. የባለድርሻ አካላት ቅንጅታዊ ስራ ምን ይመስላል?

3. በደረቅ ቆሻሻ አወጋገድ ዙሪያ በቂ የሆነ ስልጠና በሚመለከተዉ አካል ተዘጋጅቶ ይሰጣልን? ከተሰጠ ስለስልጠና አሰጣጡ ምንይላሉ?

4. ሚመለከታቸዉ አካላት በአካባቢ ጥበቃና የማህበረሰብ ጤና ላይ ስለሚያሳዩት የስራ ቁርጠኝነት ምን ይሰማዎታል?

5. በደረቅ ቆሻሻ አወጋገድ ትግበራ ላይ የባለድርሻ አካላት ተሳትፎና አፈፃፀም ምን ይመስላል?

6. የደረቅ ቆሻሻ አወጋገድ ተግባራትን የሚያደናቅፉ ችግሮች አሉ ብለዉ ያስባሉ? ችግሮች አሉ ብለዉ ካሰቡ ዋናዋናዎቹ መሰናክሎች ምን ምን ናቸዉ ይላሉ?

7. ተገቢ የሆነ የደረቅ ቆሻሻ አወጋገድን አስመልክቶ በደንብ የተደራጅ መረጃ አለ ብለዉ ያስባሉ?

8. የደረቅ ቆሻሻ አወጋገድ አፈፃፀምን በተመለከተ የሚመለከታቸዉ አካላት በምን ያክል ጊዜ ክትትልና ቁጥጥር ያደርጋሉ?

9. ከደረቅ ቆሻሻ አወጋገድ ጋር ተያይዞ በአካባቢዉ ማህበረሰብ ዘንድ ከፍተኛ የሆነ የአይን እና የአፍንጫ ማሳከክ/አለርጅ ይስተዋላል?

10.ከደረቅ ቆሻሻ አወጋገድ ጋር በተያያዘ ምን አይነት ህማማት በማህበረሰቡ ዝንድ በብዛት ይከሰታዋሉ?

Plate 1 On-site Street Sanitation work

Plate 2. On-site Collection and Storage of Solid waste

Plate 3 One of the relatively long times storage dumpsite near and in front of Lideta church

Plate 4 Condition of the Waste Collection Vehicles

Plate 5 Solid waste selection and transportation from nearby tentative dumpsite to long time dumpsite