ASSESSMENT OF PRACTICES, CHALLENGES AND PROSPECTS OF IN-HOUSE SOLID WASTE MANAGEMENT IN ADDIS ABABA; THE CASE OF YEKA SUB CITY

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ID NO. GSE/0658/07

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JUNE, 2017

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A RESEARCH SUBMITTED TO GRADUATE STUDIES OF FACULTY OF BUSINESS AND ECONOMICS OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT FOR THE AWARD OF MASTERS OF ART IN PROJECT MANAGEMENT.

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External Examiner_____ Signature_____ Date_____

Declaration

The thesis undersigned, I declare that this is my own original work and has not been presented in this or any other university, and all sources of materials used in this thesis has been fully acknowledged.

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Acknowledgement

Above all, I would like to express my sincere thanks to the Almighty God for his inexpressible gift and love as well as his guidance in my life.

My sincere appreciation and thanks goes to my advisor Dr. Teklegiorgis Assefa for the understanding, kindness and most important, very accessible to devote part of his precious time to respond to all my frequent inquiries from the beginning to the end of my study.

I would also like to extend my gratitude for Yeka sub-city municipality workers who spent their precious time to discuss honestly about the overall practice of household solid waste management in the town through interview. I am grateful to the residents of the study sites who gave me their precious time to answer the questionnaires.

Finally, my warm thanks and love also go to my wife, and my children for the care and support they provide to me during this work and the understanding they offered during the times I were not there for them.

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Abstract

The rapid growth of urbanization causes enormous pressure on the environment. The main aim of this study was to assess the challenges and prospects regarding in-house solid waste management in Yeka Sub-City, Addis Ababa, Ethiopia. A total 130 respondents, 10 interviewees and field observations were used in the study. In order to accomplish the objectives, both primary and secondary sources of data were used. The primary data were collected through questionnaires, interviews and field observations. Whereas the secondary data were extracted from different published and unpublished materials. The analysis of this paper was carried out using both qualitative and quantitative techniques. There was very poor and inadequate solid waste management in general and waste handling in particular in the sub-city. Thus the municipality of the sub-city could not be able to provide adequate solid waste management practices. The findings of this study revealed that higher income group's households showed better solid waste management than lower income groups. The level of education of households showed a positive correlation with solid waste management. Location and distance of community waste containers had also direct impact on solid waste management in which the further the location of the storage the lower the level of waste management. The municipality of the town was not able to provide adequate solid waste management service because of the factors related to financial constraints, very poor institutional coordination, weak enforcement of rules and regulations, socio-cultural factors and lack of awareness among the community. Thus it was recommended that to increase awareness of the community, responsible bodies (Government, Community and Health Bureu) should pay attention to the issue in order to improve the current poor solid waste management practices in the town.

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

Urbanization is increasing in both developed and developing countries. The expansion of globalization around the world favors the unprecedented growth phenomena to urbanization. The extreme growth of urbanization on one side brought modernization, economic growth, and strong interrelation among world community. On the other hand, it possesses many challenges that are difficult to manage locally and globally. Cities in most developing countries are encircled by a number of problems. Of such challenging problems are environmental pollution and degradation, solid waste management, poverty, unemployment, urban slums, environmental degradation, social evils, poor sanitation, inadequate transport and communication facilities, inadequate provision of social services in urban areas and wastes. (Hagos, 2007).

The rapid growth of urbanization causes enormous pressure on the environment in that cities import natural resources, which are transformed into goods and services, and in the end are returned to the environment in the form of emissions and wastes. This leads to local, regional and global environmental problems, such as resource depletion, deterioration of air, water and soil quality, noise nuisance, lack of green space, waste generation, and many others (Medina, 2004). Those environmental problems also have socio-economic consequences. Poor environmental quality of cities can deprive citizens of good quality of life by affecting their health and wellbeing. The outcome of rapid urbanization is creating challenges to the growing cities. Cities serve as major growth engines by providing opportunities for employment, education, technology, etc. These conditions, in turn, transfer markets for industrial and agricultural products; consequently, urbanization leads to further expansion of the cities where by their peripheral areas end up in changes of land use. The conversion of farm lands and watersheds for residential purposes has negative results in food security, water supply and the health of the people (Mesfin, 2006).

Hence, this rapid urbanization in the developing world, if ignored, can be a threat to health, as well as environmental and urban productivity. Since cities are engines of economic growth,

about 80 percent of gross domestic product comes out of cities and the corresponding waste also comes out of these cities (World Bank, 2012). The growth of the developing countries is expected to come from cities. The environmental implications of such growth need to be assessed and managed better. The most serious problems facing developing countries of urban population are the health impact that emanates from inadequate water, sanitation, drainage, and poor waste management, poor industrial waste management, and air pollution. This set of problems disproportionately affects the urban poor and takes a heavy toll on urban health and productivity.

In most African cities the situation of solid waste management is insignificant and inadequate that could associate with different factors. The management of solid waste in Africa is often weak due to lack of appropriate planning, inadequate governance, poor technology, weak enforcement of existing legislation and the lack of economic incentives to promote environmentally sound development. The practice of solid waste management in the region is mostly open dumps without proper control over ecologically or hydrologicaly sensitive areas. According, solid waste generation has become an increasing environmental and public health problem everywhere in the world, particularly in developing countries. Consequently, solid waste is not only increasing in quantity but also changing in composition from organic to more paper, packing wastes, plastics, glass, metal wastes among other types, a fact leading to the low collection rates. (United Nations Environmental Program, 2016),

The current waste collection capacity and disposal system are not matching with the growing solid waste generation rate. According to Sanitation Beautification and Parks Development Agency (2003) about 40 percent of solid waste which is dumped on the street and drainages contributed a lot in breeding insects, rodents, vectors and spread of disease (Zurbrug, 2003). Tadesse (2004) also states that inadequate solid waste collection that is generated from houses and industries create a larger range of environmental problems in Addis Ababa and its surroundings. The situation is exacerbated in slums where households cannot make use of community waste bins. Besides, crunching poverty and crowdedness of the society, the major contributor to high morbidity and mortality among the urban poor is lack of basic solid waste

disposal service. Demographic, socioeconomic changes and consumption patterns are the main factors that affect the municipal solid waste management system in Addis Ababa.

There is a need of control that the various waste streams from different sources; for instance, from households, small shops, super markets, industries, health care sectors and numerous other source allow their proper handling, treatment and disposal. In urban areas, especially where there is rapid urbanization expanded growth takes place, open spaces marketing place established, infrastructure services are not well maintained, the solid waste generated increase in volume and its management also becomes poor in relation to the urban center. And its management also is poor in terms of population growth and the amount/volume of waste generated. According to Medina (2004) solid waste is ranked as top of environmental problems in Addis Ababa, and immediately followed by sewerage.

To know the management of solid waste, having the knowledge of its composition and rates of generation is the first and basic requirement to design and operationalize the functional elements associated with the management of solid waste. The sum total of the waste stored is the waste of the individuals. There is a need for a project which optimizes the waste into a good environmental asset. And this is what this thesis is up to.

Finding the root problem of the solid waste stored at “Koshe Sefer” of Addis Ababa by studying the problems from the scratch and then trying to recommend a very suitable project for the community. Therefore, this research is intended to identify and analyze the current practices of solid waste management at household level, the challenges or factors affecting their practices of solid waste management and the future good prospects that should be done to overcome the problem.

1.2. Statement of the Problem

As urbanization lead to rapid growth, the rate of solid waste generation has twice (doubly) grown (generated) than its corresponding population growth (Getahun, 2011). On the contrary, the required appropriate management has not been undertaken in most towns and cities of Ethiopia. In Addis Ababa and larger towns of Ethiopia, the financial, material and human resources

allotted to solid waste management resource is not adequate to cover half of the solid waste generated. In some small and medium level regional towns, there is no or little amount of resource allocated to solid waste management.

Like any other developing countries, Ethiopia has a deep range of solid waste management problem, including inadequate waste collection, transportation systems and inadequate waste handling and improper final disposal that result in urban environmental pollution. These problems are being aggravated by the growing waste generation rates associated with population growth change of composition of waste and economic condition of population (Degnet 2008).

The current rate of solid waste generation is 0.45m^3/cap /day in the city of Addis Ababa (Yeka , 2017). According to this rate the total amount of solid waste generated reached about 176,400 m^3/day from Yeka sub-city only. Accurate information with regard to solid waste is important to establish proper waste management system and for regulatory, financial, and institutional decisions making. There is lack of timely information about the generation and composition of solid waste management in Addis Ababa.

However, the problem of waste management of Addis Ababa which is the same in Yeka sub-city is given little attention both by the government, the community and the intellectuals. No adequate coverage of transportation vehicles, no well-designed disposal site and proper management systems, no scientific way of collecting, transporting, reusing, recycling and disposing of solid waste. Therefore, the household waste generated pollutes the environment and causes ecosystem degradation and human health risk. Solid waste is a threat to human health, causing 22 types of disease to human beings (World Bank, 2012). A considerable amount of solid waste ends up in open dumps, near road sides and/or drainage system, in water or near water, polluting the air with bad smell and poor scenery in Yeka Subcity.

Established institutions and organizations are increasing the amount of solid waste generated per day. The increase of solid waste generation in turn, increases the deterioration of ecosystem of the environment and human health's problems. Therefore, improper handling and on site disposal of solid wastes poses a serious problem, which contribute to high morbidity and mortality rate in the city. The waste at the source itself, uncovered vehicle aided ways of solid

waste transportation in Addis Ababa risks the community to health problem from the origin of the waste through the paths of the vehicle. In municipality solid waste management system, an important starting point is the knowledge of basic data from the sources of the waste that is the domestic such as the generation rate, characteristics, formal and informal operations in place including producers' behavior. Such information is vital for planning, setting targets and evaluating such targets (Rushbrook, 1999). There is lack of reliable and recent data about municipal solid waste management. A few survey and studies were carried out by municipalities in 2010 and 2012 about the generation and composition of solid waste in the town, but not about the management and handling practices at the household level and its causes.

Most studies conducted so far in line with this thesis give more emphasis to the issues like; willingness to pay (Aklilu, 2002) generation rate of the waste (Lemma, 2007; Melaku, 2008) which are very far distant from now and even special emphasis is given to the "determinants of recycling of solid wastes"; which is revolving on developed nations (Sterner and Bartelings, 1999). But such assessments do not guarantee to conclude about the determining practices and the challenges of solid waste management at household level. Therefore, this thesis is intended to fill the current literature gap related to the motive why the households dispose their wastes improperly, in the context with specific factors of the study area.

To reduce the severity of solid waste from its present peaks, the study aims at assessing the nature and level of effectiveness of households' practices of solid waste management, the challenges affecting the effectiveness of the households' solid waste management and it will give a brief idea of a project to eradicate the problem starting from the source of the problem.

1.3. Basic Research Questions

The basic research questions that are expected to be answered by this research are the following.

1. What is the nature and magnitude of the in-house solid waste management problem in Addis Ababa taking Yeka subcity into consideration?
2. What practices are performed by the residents of Yeka sub city for good in-house solid waste management?

3. What are the challenges, socio-cultural as well as economic factors that constrain the effectiveness of participation of in-house solid waste management in Addis Ababa, Yeka sub city?
4. What should be done for effective in-house solid waste management in Addis Ababa, Yeka sub city?

1.4. Objectives of the Study

1.4.1. General Objective:

The general objective of this research is to assess the nature and level of effectiveness of households' practices, challenges and prospects of in-house solid waste management.

1.4.2. Specific Objectives

The specific objectives of the this research paper are;

1. To assess the nature and magnitude of the in-house solid waste management problem in Addis Ababa taking Yeka subcity.
2. To assess practices (the extent to which in-house solid waste management takes place) associated with in-house solid waste management in Addis Ababa taking Yeka subcity.
3. To assess the challenges, socio-cultural as well as economic factors that constrains the effectiveness in participation of in-house solid waste management in Addis Ababa, Yeka sub city.
4. To assess what should be done for effective in-house solid waste management in Addis Ababa, Yeka sub city.

1.5. Significance of the Study

Environment is the common existence for any living creature in the world. However, this common living environment is polluted by activities of human beings. One of the methods that environmental pollution and degradation takes place is in solid waste generation. The solid waste

generated has great negative impact on human as well as other living things in the environment causing health problems.

The management of solid waste generated currently becomes over the control of the municipality, community participation and limited number of stakeholders services in the bigger towns and cities of Ethiopia. In these towns of Ethiopia, these activities are restricted to the management of the stakeholders participation. Addis Ababa is one of such cities identified. The present situation in which the amount of solid waste generated as a result of urban growth and expansion, the momentary participation level of community alone could not be able to manage the magnitude and challenges of solid waste management problem. So that the ongoing (conducting) of research on solid waste management at the locality enable to indicate the problems related to community and individual based solid waste management in the cities and towns with a particular emphasis on its effectiveness and draws effective measures that improves the solid waste management and community participation strengthening through awareness creation and cooperation of concerned stakeholders.

The projects that are to be recommended to be applied after the problem is identified are helpful for Yeka as well as other sub cities of Addis Ababa, and other cities and towns of the country. The investigations are helpful to design best solid waste management systems throughout the cities with large solid wastes.

In addition to this, the finding of the research may be used as a first footstep for other researchers who want to study the problem further in detail showing direction of planning and implementations toward solid waste and the severity of this issue to the municipality.

Finally, it is assumed that the research might help the Yeka Sub-city Parking and Beautification Department, the Health and Sanitation Bureau to look back at the efforts underway and upgrade their working systems.

1.6. The Scope of the Study

The study draws more of its attention on the practical level that the management and residents of Yeka subcity who contribute to the solid waste management, challenges that influence the effectiveness of in-house participation in solid waste management system of Addis Ababa City. The study restricts its scope on assessing the effectiveness level of household practices in solid waste management practical base. The practical base is observing and evaluating the contribution from different aspects supported with evidences.

The study is restricted to Yeka sub-city because the researcher lives there and is in proximity to the problems related to the practices, challenges and prospects of in-house solid waste management system in the sub-city. For manageability purpose the researcher took *Woreda 05* as its study area by convenient method of non-probability sampling technique and separates this by blocks in the *Woreda.* The respondents and the house-holds that are going to be studied were taken by simple random sampling.

The data collection is restricted to the primary sources which are through questionnaire, interview and observation. The literature review is limited to the materials such as; existing written materials both published and unpublished from Addis Ababa University library stalk and from web sites concerning the title are incorporated.

1.7. Definition of Terms

Combustion: for many years, in developing countries, burning of waste materials in the open land fill disposal site has been economic method of reducing the volume of waste. Combustion refers to the confined and controlled burning which helps to decree the volume of waste disposed on open landfills.

Composting: *is* another way of recycling. According to EPS (Environmental Protection Society), composting is a biological decomposition of organic wastes such as animals and yard wastes into humus, a soil like material.

Recycling: According to EPS, municipal solid waste recycling refers to the separation of collected solid wastes and transformed or manufacturing of solid waste into viable or marketable products.

Solid waste: comprises all the wastes arising from human and animal activities that are normally solid and that are normally discarded as useless or unwanted.

Municipal solid waste: is assumed to include all community wastes with exception of industrial process wastes and agricultural wastes.

Solid waste management: refers to the collection, transportation, treatment, reusing and recycling, final disposal and recycling of solid waste.

Source Reduction: According to Cointreau-Liven, (2000) source reduction defined as to any reduction of waste generated daily in the city/town in the design manufacture, purchase or reuse of materials or products.

Secondary solid waste collection: the collection of solid waste from transfer station to transportation of disposal site (Melaku, 2008).

Primary solid waste collection: is the collection of solid waste from house holds to transfer station.

Environmental degradation: Loss or deterioration of the quality of the environment often expressed by loss of soil, plants and other living things. It is a condition when the existing environment could not hold or support for the continuation of life.

Environment: is the totality of all resources whether in their natural state or as modified, changed by man and *environmental conservation* means to safeguard the environment from all sorts of agents that degrade the environment.

1.8. Organization of the Paper

This study report comprised five chapters. The first chapter includes the introductory part such as background of the study, statement of the problem, objective of the study, significance of the study, delimitation, research questions, and limitation of the study. The second chapter includes reviews literature related to the study, chapter three include research methodology and procedures, chapter four deals with result and discussions, chapter five deals with conclusions and recommendations and at the end references and appendices are attached.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

In this chapter different sources about concepts of solid waste management, nature of solid waste management in both developing and developed countries and the practices of in-house solid waste management are mentioned.

2.2. The Concepts of Waste

Waste - according to UK environmental protection act (1990), "it is any substance which constitutes scrap materials, an effluent or other unwanted surplus arising from application of any substance or article which requires to be disposed of which has broken, worn out, contaminated or otherwise spoiled. "Solid waste - can be defined as "any garbage, refuse, sludge, and other discarded solid materials resulting from industrial, commercial, agricultural operations, and community activities, but does not include dissolved materials". In short "it is anything that is neither liquid nor gas and is discarded as unwanted" (Federal Negarit Gazeta of Ethiopia, proclamation number 513 of 2007).

Municipal solid waste is also known as garbage, trash or domestic waste that is related to the municipality. It is defined as any waste generated by households, commercial and institutional activities and is not hazardous. It refers to materials discarded in the urban areas for which municipalities are usually held responsible for collection, transport and final disposal. It encompasses household refuse, institutional wastes, street sweepings, commercial wastes, as well as construction and demolition debris (Kamaran, 2008).

Solid Waste Management is defined as the control, generation, storage, collection, transfer and transport, processing and disposal of solid waste in consistent with the best practices of public health, economics & financial, engineering, administrative, legal and environmental considerations (Jamal, 2002).

Health issues are largely interlinked with the process of rapid urbanization, industrialization and modernization. In developing countries, urbanization and modernization processes, without adequate capacity to collect and dispose solid waste or proper effluents from the industry and emission from transport are leading a deep ending crisis due to environmental pollution and damage human health. The World Bank (2004) stated that inadequate sanitation is a major cause of degradation of surface and ground waste, and it is a principal cause of high morbidity and mortality. In less developed regions of the world, however, diseases that are associated with poor sanitation face contamination of water and food, contaminated indoor and outdoor air, and infections via insect or animal vectors continue to cause significant mortality.

Moreover, the improper handling of waste, besides being a health hazard has an impact on the environment cleanliness. There are about 22 solid waste affiliated diseases in the world. Among them the following are some: - Chronic bronchitis, Lung cancer, Mumps Influenza, Common cold, Measles, Pneumonia, Diphtheria, Amoebiasis, Hepatitis, Cholera, Dysentery, and the like. Therefore, all these health risk factors unless properly managed, will continue to be difficult subject for public health managers and challenge of developing countries at large where the level of collecting, transporting, and disposing of facilities are inadequately provided.

Today, the process of rapid population growth, industrialization and urbanization is further leading to greater volume of waste generation. Although, according to Medina (2004) globalization and economic growth, population increase and urbanization will seriously affect municipal resource to deal with a booming amount of wastes. With increase in the global population and the rising demand for food and other essentials, there will be a rise in the amount of waste that creates a problem of collection, transportation and disposal or handling of the waste.

Nevertheless, either due to the scarcity of resources or inefficient infrastructure, not all this solid waste is collected and transported to the final disposal site or dump site. Such accumulation can cause serious impacts on health and several other problems to the surrounding environment (United Nations Environmental Program, 2016).

2.3. Nature and Characteristics of Solid Waste Management in Developing Countries

Solid waste management explained the various patterns of solid waste handling in terms of collection, transfer and disposal in developed and developing countries. Mesfin (2006) defines solid waste as material that has been abandoned and discarded because it has no more use for the owner. This type of waste may be solid, semi-solid or liquid. It is made up of household refuse, institutional waste, constructional and demolished debris, residential ashes, street cleaning, maintenance refuse, abandoned dead animals, and bulky waste.

Urbanization is increasing both in developed and developing world. The rapid urbanization which occurred in developed world in the late 19^{th} and 20^{th} centuries is now underway in developing world. In Asia, Africa, and Latin America, cities are growing rapidly caused by larger rural to urban migration and natural increase within the cities. However Asia and Africa are relatively less urbanized, they have very large urban populations and rapidly growing cities. As Economic Research Unit of the Indian Statistical Institute (2003) states the increase of solid waste is, nowadays, a serious problem in urban areas of the world. High rate of population growth and increasing per capita income have resulted in generation of enormous solid waste posing a serious of threat to environmental quality and human health. This is more so in the developing countries where large quantities of solid wastes are dumped haphazardly thereby, putting pressure on scarce land and water resources, and at the same time adversely affecting the health of human being mostly that of the poor who have greater exposure to it.

The changing economic trends and rapid urbanization complicate solid waste management in developing countries. Consequently, solid waste is not only increasing in quantity but also changing in composition from less organic to more paper, packing wastes, plastics, glasses, metal wastes, among other types, leading to low collection rate. In addition, the problem of municipal solid waste management in developing countries include mixing of waste, collection and storage of waste, transportation of waste, indiscriminate burning of waste and illegal disposal of waste (Zerbock,2003).

Solid waste management in developing countries has been given less attention from policy makers and academics than that of other environmental problems, such as air pollution, polluted water treatment. Nevertheless, the improper handling and disposal of solid waste constitutes a serious problem; it contributes to high morbidity and mortality rate in many developing country cities (Martin, 2004)

Currently, collecting, transporting and disposing of solid waste represent a large expenditure for cities of developing countries: waste management usually accounts for 30-50 % of municipal operational budget. Despite these high expenses, cities collect only 50-80 % of the refuse generated. For instance about 50% of solid waste in India, 33% in Karachi, 40% in China, 50% in Cairo and 60% in Addis Ababa was the only amount of solid waste collected in 2000 (Medina, 2004). Usually in low income community, residents tend to gather and dump their garbage at the nearest vacant lot, public space, near river or simply burn it in their surroundings. These uncollected wastes may accumulate on the street and blocked drains when it rains which may cause flooding (Eshuan, 2002). Thus if these wastes are not collected, treated and disposed of properly; health, psychological, aesthetic and environmental conditions will further deteriorate in developing countries. Various measures have been implemented in order to extend refuse collection, upgrade disposal facilities and diminish the risk to human health and the environment associated with inadequate waste management. The measures which are proposed to the problem in solid waste management in these countries have socio-economic, demographic, and institutional features.

Although production of solid waste is minimal, environmental problems are possible to occur due to improper handling and luck of service that result from different characteristics of solid waste in developing countries. Besides, collecting, transporting and disposing, solid waste requires high expenditure which is still scarce in the developing world. Even though small amount of solid wastes are produced in the developing countries, responsible authorities do not properly handle and dispose their solid waste. Thus an adverse effect of improper solid waste handling brings about health and environmental problems in most developing countries. In general based on the literature reviewed, a profound difference exist between developed and developing countries in terms of income, standard of living, consumption patterns, institutional

capacity and capital available for urban dwelling investment. Even in conventional solutions usually do not take into account these differences, resulting in less than optimum outcomes.

2.4. Sources and Types of Solid Wastes

According to Medina, (2004) three general categories of solid wastes are municipal waste, industrial waste and hazardous wastes.

Industrial wastes: are wastes arising from industrial activities. Industrial process wastes include a very wide range of materials and the actual composition of industrial wastes in a country will depend on the nature of the industrial base. Composition of industrial waste depends on the kind of industries involved. Examples of the wastes which may be found under this category are general factory rubbish ashes, organic wastes from food processing, packaging materials, plastics, papers, acids, and alkalis, metallic sludge's, demolition and construction waste, hazardous waste and tarry residues.

Hazardous wastes: a waste or combination of wastes which because of its quantity, concentration, or physical, chemical or pathogenic characteristics may: cause an increase in serious illness, morbidity and mortality.

Municipal solid wastes: urban solid waste also commonly referred municipal refuse as: material for which the primary generator or user abandoning the material within the urban area requires no compensation upon abandonment. With respect to source from which solid waste emanates, Medina (2004) categorized municipal solid waste as household (residential) refuse, institutional wastes, street sweepings, commercial areas wastes, as well as construction and demolition debris. In developing countries, municipal solid waste also contains various amounts of industrial wastes from small scale industries. In these sources there are diverse types of solid wastes. But, some of typical solid wastes of those sources are described by (Dereje, 2001) as follows and urban solid waste materials discarded in urban areas and generally viewed as municipal responsibility:

Table 1: Municipal solid waste characteristic for low, middle and high income countries (% by weight)

Composition	Low income Countries (%)	Middle income Countries (%)	High income Countries (%)
Paper	1-10	15-40	15-40
Plastics	1-5	2-6	2-10
Metals	1-5	1-5	3-13
Glass, ceramics	1-10	1-10	4-12
Leather, Rubber	1-5	-	-
Wood, bones, straw	1-5	-	-
Textile	1-5	2-10	2-10
Vegetables/organic matter	40-85	20-65	20-50
Miscellaneous	1-40	1-30	1-20

Source: (Dereje, 2001)

Household wastes: It is also referred to as residential refuse or domestic waste, this category comprises wastes that are the consequence of household activities. These include: food preparation, sweeping, cleaning, fuel burning and gardening wastes. It also include: old clothing, old furnishing, retired appliances and packaging materials.

Commercial waste or refuse: This category consists of wastes from shops, offices, hotels, stores, fuel service stations, warehouses, restaurants, etc. and typically consist of packaging materials, office supplies and food wastes. In developing countries, markets may contribute the major portion of these waste categories refuse.

Institutional waste: waste from schools, hospitals, clinics, and government offices, police, barracks, religious buildings, military bases etc. and comprise hospital and clinical wastes including potentially infectious and hazardous materials. Where the institution involves residents, such as in camps, the wastes are similar to those from households.

Street sweepings*:* This type of waste always includes dust, dirt, litter, soil, paper, etc. However, in developing countries it may also contain appreciable amounts of household refuse, street sweeping also include fruit and vegetable residues, household wastes dumped along roads, drain cleanings, human fecal, animal manure and plant remains.

Construction and demolition wastes**:** its composition depends on type of construction materials used, but it typically includes soil, brick, stone, concrete, ceramic materials, wood, packaging materials and the like.

The quantity of waste generated is increasing because of rapid population growth, economic development, urbanization and improved living condition in cities and towns. However, in most developing countries like Ethiopia the increasing of solid waste generation is resulted from rapid urbanization and population booming. This has outpaced financial and man power resource of municipalities to deal with provision and management of service solid waste. In most cities of the developing world in-appropriate handling and disposal of municipal solid waste is the most visible cause of environmental degradation, which means air pollution, soil contamination, surface and ground water pollution, etc… resulted from improper disposal of municipality solid waste (Metro Vancouver 2014).

2.5. Municipal Solid Waste Generation Rate

The rate of solid waste generated in a given town is basically determined by demographic growth, seasonal variation, geographic location, economic development and people's attitude towards waste. Nashiimirimana (2004) explained the influence of economic development by comparing gross national product of developed and developing countries with their waste generation rate. And he concludes that the higher the gross national product of a country results in the higher generation of waste.

Therefore, an accurate knowledge of quantity and rate of solid waste generation in a given area is essential for preparation and implementation of appropriate solid waste management. Because it provides information on human, financial and equipment resources required for collection and

transportation of waste, to enact appropriate laws on waste reduction, and establish current and future needs for solid waste disposal sites (Abel, 2007).

2.6. Collection of solid waste

Efficient collection and transportation are essential parts of the overall solid waste management program since these two activities constitute about 75% of the total cost. In solid waste collection system, many scholars classified under different categories, one group classified into four and other group into three.

According to United Nations Center for Human Settlement (1985), solid waste collection systems are generally classified under four types;

The first type of solid waste collection system in households is discharging their wastes at predetermined location, the same type of communal storage facility, and refuse collecting vehicle vesting these at frequent interval usually once a day to remove accumulated wastes. This type of waste collection system is **communal collection**.

The second type of collection system is one in which a collecting vehicle travels to a predetermined intervals, usually every two or three days, and stops at selected locations, where a bell is rung and upon hearing the bell, households bring their refuse containers and land them over to the crews, usually consisting of two men, which empty the containers and return them to the households.

The third type is one in which the collection crew collects bins, bags and other containers of refuse which are deposited at curbside (entrance) at fixed intervals, usually on two specific days in the week; when collection takes place. This type of collection is known as **block collection**/**curbside** (**entrance**) collection.

The fourth type of collection system is known as **door-to-door collection**. In this system, the collection crews enters each premise, takes out the containers and sets it back after emptying the

waste into collection vehicles. The four types of collection with the same content as the United Nations Center for Human Settlement, but differ in organizing under title.

2.7. Transportation of Solid Waste

The transporting of solid waste is usually from the collection district to the disposal site by collection vehicle (Italo R.A. 2014). According to this context used in their study transportation of solid waste includes human crews those transport from households to transfer stations and activities being done by human being up on disposal landfill.

The solid waste transport system has been assumed that semi-trailers' provide the mode of transportation for distance hauling. While trucks and semi-trailers most commonly used, railroad cars and barges are also utilized. Human powered collection equipment: This includes pushcarts, pedal tricycles, wheel barrows, and two wheel donkeys with baskets. In general, these equipments require some sort of smooth surface on the corners to be effective.

Animal powered collection equipment: animal powered collection equipment either takes the form of drawn carts or animals may be directly backed with containers such as basket. This type of collection is applicable in the cities where there is no much traffic.

Engine-powered collection equipment: This includes all motorized collection equipments. There exists three broad types of refuse collection systems namely door-to-door, block on communal collection and containers lift trucks, and these ways of collections are used in Addis Ababa solid waste collection systems.

***Door to-door collection**:* the side loading and compacting trucks are usually served for door to door collection systems where container transfer stations are lacking and road accessibility is not limited, in such collection system the disposing people and the truck along accessible street collection points met at a pre-defined time.

***Block collection**:* It consists of large refuse containers from 0.1-8 cubic meters located at the premise of the blocked houses or buildings.

***Container system**:* The public at large gets collection services through a transfer station in a container collection system, which is composed of refuse containers of large capacity located at accessible sites of community where generation of waste is assumed.

In order to manage the growing volume of wastes collected in various ways, proper policies need to be performed and implemented. For instance, in the developed world the approach to waste management is regarded as the most compatible with the environment and sustainable development. Environmentally sustainable approach of solid waste handling reduces pollution, seeks to maximize recovery of reusable and recyclable materials and protect human health and the environment. Integrated waste management aims to socially desirable, economically visible and environmentally sound approach in the process of waste handling (Medina, 2004).

2.8. Reuse, Recycling and Recovery of solid waste

In contrary to its negative impact, solid waste has large economic benefit to the society. Human and animal excreta are used in fish farms and organic fertilizer, in improving soil fertility and increasing agricultural productivity (Vander et al, 1992).

As some research indicates, the reuses of organic solid waste in developing countries have health risks because of shortage of having knowledge of the extent to use. In contrary to this, in one of the town of Nepal, Kathemandu, solid waste can be best reused by transforming it into solid waste fuel briquettes. About 85% of waste by volume and 78% of waste by weight is used. In other words, the same fraction of waste is reduced in the land-fill site for final disposal. At household level, especially in low-income groups, waste is widely used as an economic resource. The dung cakes sold as fuel, appropriate means of recovering the manure and supplying fuel to Addis Ababa population and some equipment from the solid waste separated can be sold in cash or recycled for other users. Such practices have to be encouraged because they contribute to reduce the quantity of waste to be carried to the collection containers and transported to the landfill.

Therefore, the existing ideal approach to solid waste management in the first step is reducing waste at the source and then to recover reusable materials from the waste streams prior to

disposal. This task is accomplished by recycling which is separately out and reusing these components of the waste stream that may have economic value (Melaku, 2008).

The total expenditure for solid waste management in AA is not exceeding 5% of the total municipal annual (budget) revenue (Yeka Subcity 2017). This municipal annual budget is for disposal of 50% city waste and labor accounts for 13% of the costs, while vehicle and plant costs 79%, that is 13 birr /household/ year or a little over 1 birr /household/ month. On the other hand, charges are levied to household for waste collection with water bill including business organizations.

Environmentally sustainable approach of solid waste management has the following structure:

Waste prevention: - this is a preventive action that seeks to reduce the amount of waste that individuals and other organizations generate. By not creating waste; fewer collection vehicles, and fewer number of refuse collectors would be needed; smaller waste handling facilities would be required and ultimately it would extend the life of the land fill (Medina, 2004)

Reuse: Reuse involves cleaning and using materials over and over. In other words, it means the use of a product more than once in its original form for the same or a new purpose. It relies on items that can be used over and over instead of throw away items. This method is used to decrease the use of material and energy resources, cuts pollution, creates local jobs, and saves money (Miller, 2007). Reusing is more efficient and better than recycling and composting methods because cleaning and reusing materials in their present form avoids the cost of energy for remaking them into something else (Cunningham, 2008).

Recycling: in addition to reuse, recycling is also an obvious solution of solid waste problem. It is an important way of collecting solid waste materials and turning them into useful products that can be sold in the market place. Such materials can be reprocessed in two ways: primary and secondary. Primary recycling is a process in which original waste material is made back into the same material. For example, newspapers recycled to make newsprint. In secondary recycling, waste materials are made into different products that may or may not be recyclable for instance, cardboard from waste newspapers (Miller, 2007).

Composting:- it is the process of decomposition of organic waste material considering the high proportion of organic material in waste generated. Composting can be an option to reduce the amount of wastes that are land filled. Composting is usually applied to solid or semi-solid materials and can be carried out under either aerobic or anaerobic conditions. When composting is conducted under controlled condition, it reduces the cost of waste disposal and does not produce odor but produces a clean and readily marketable finished product. Composting also increases nutrients by returning them back to the soil (Melaku, 2008).

Landfill: - landfill is a method of solid waste disposal that functions without creating a nuisance or hazard to public health or safety. Engineering principles are used to confine the waste to the smallest practical area and volume, and cover it with a layer of compacted soil at the end of each day of operation, or more frequently if necessary. The compacted layer effectively denies continued access to the waste by insects, rodents, and other animals. It also isolates the refuse from the air, thus minimizes the amount of surface water entering into and gas escaping from wastes. Land filling is necessary for municipal solid waste disposal but every landfill has its own finite capacity. The most common approach to extending the life of landfills is to introduce recycling, composting, and incineration into the solid waste disposal system (Chang and Nishat, 2005)

Incineration: - Incineration, which refers to the controlled burning of wastes at a high temperature, sterilizes and stabilizes the waste in addition to reducing its volume, and may be used as disposal option or means when land filling is not possible and the waste composition is highly combustible. Incineration is the term used for the combustion of solid wastes. In properly designed and operated incinerator, there is a substantial reduction in the volume of waste material. Thus, equipment for reducing the size of irregular objects is normally a prerequisite at most incinerator plants (World Bank, 2012).

2.9. Disposal of solid waste

The rate of solid waste generated in a given town is basically determined by demographic growth, seasonal variation, geographic location, economic development and people's attitude

towards waste. Nashiimirimana (2004) explained the influence of economic development by comparing gross national product of developed and developing countries with their waste generation rate. He concluded that the higher the gross national product of a country results in higher generation of waste. On the other hand, people's attitude towards waste can also condition solid waste generation rate in the form of their pattern of material use and waste handling, their interest in waste reduction and minimization, and the degree to which they refrain from indiscriminate dumping and littering.

Therefore, an accurate knowledge of quantity and rate of solid waste generation in a given area is essential for preparation and implementation of appropriate solid waste management. Because it provides information on human, financial and equipment resources required for collection and transportation of waste, to enact appropriate laws on waste reduction, and establish current and future needs for solid waste disposal sites (Abel, 2007).

An effective disposal of solid waste can reduce land, water and air pollution. This can be achieved by using different methods. There are five main approaches of solid waste disposal like sanitary landfill, burning or incineration, barging it out into sea, pulverizing and composting (i.e., by digestion of bacteria agony).

Collection involves the process of picking up of wastes from collection points, loading them into a vehicle, and transporting it to processing facilities, transfer stations or disposal site. In most municipal solid waste management systems, cost of collection accounts a significant portion of total cost. For instance, "in industrialized countries, collection accounts about 60-70% of total cost, and 70-90% in developing and transition countries" (United Nations Environmental Program, 2016).

In developing countries, collection often involves a face to face transaction between generator and collector. The level of service is low, and generators often have to bring their wastes long distances and place it in containers. As a result many collection activities in developing countries carried out by informal sectors (United Nations Environmental Program, 2016). Most major cities in Africa have established municipal waste collection system. In the case of Addis Ababa,

Yeka subcity, there are three basic types of collection equipment: Human powered, Animal powered and engine powered.

2.10. Challenges of Solid Waste Management in Developing Country

According to Zurburgg and Schertenlieb, (2002), there are four major problems faced in developing countries on municipal solid waste management such as:

2.10.1 Inadequate service coverage

Zurburgg and Schertenlieb, (2002) implies that solid waste collection service of cities in developing countries generally serve only limited part of the urban population which is found at the heart of the city and high income people. Those who are remained without waste collection services are usually low income living at the periphery. They also argued that the main reason of lack of financial capacity to address the increasing amount of solid waste production associated with inadequate charging methods and inefficient funding from central government.

2.10.2 Operational inefficiency of services and limited use of informal sector

According to Zurburgg and Schertenlieb, (2002), municipal authorities in developing countries usually spent around 20 to 50% of the total municipal expenditure. However, even at such expenditure the level of service is low. Only 40 to 50% of solid waste is collected and served that is less than 50% of the population.

2.10.3 Inadequate management of special wastes (Hazardous waste)

Zurburgg and Schertenlieb (2002) put as the third challenge on their argument. They argued that waste produced from hospital and clinic can be regarded as special waste (non-industrial hazardous waste). Approximately 54% of the total waste generated by hospital and clinics assumed to be non-hazardous wastes, where as 30% of the total waste regarded as hazardous and infectious waste which the remaining 16% considered as non-infectious but hazardous wastes, therefore, it is essential that the generated waste be separated, the nonhazardous from hazardous

and can be treated like any domestic wastes. Hazardous and infectious wastes are sharp needles, scalpels, pharmaceutical and clinical residues and other hazardous wastes (Ibid).

2.10.4 Inadequate land fill disposal

In most developing countries solid waste are disposed off on uncontrolled open dump sites. Thus, unsafe open dumps lay on large plot which is uneconomical. Further, it is exposed to scavengers, informal waste pickers, animal entry and ingesting of waste breeding insects and usually produced unpleasant odor.

Many authors suggested that the main reason to the inadequate land fill disposal is that poor financial and institutional arrangement, especially where local governments are under financed and low level of institutional capacity and rapid continuous population growth.

2.11. Determinants of Municipal Solid Waste Management

Globally, the per capita amount of solid waste generated on daily basis varied based on many factors. Population distribution, mobility, age structure, rate of growth, and other factors affect the environment. These factors affect resource utilization, where, when, how and what extent of solid waste be handled and conserve the environment. A change in population size results in a change in the amount and composition in solid waste which ultimately affect the system of solid waste handling.

Many cities are facing disposal crises as population growth simultaneously produces more solid and use the available land for dumping. In other words, solid waste disposal is another classic case where per capita costs for disposal tend to increase as population grows. The report of Sanitation Beatification and Parks Development Agency in (2013) indicated that out of the then annually generated solid waste management from 838,405 tones only 540,789 (64.5%) tones was disposed in the land fill. The rest 297,616 (35.5%) tones were simply dumped in open places, drainage, channels, rivers and valleys as well as on the street.

2.11.1 Income and solid waste management

The services of collection, transfer and disposal of solid waste in the urban area of developing countries are either sparse or ineffective and the wastes are often improperly disposed. Available studies on this notes that, about 30 to 50% of solid waste produced in urban areas in the lower income as well as poorest parts of middle income countries is estimated to be left uncollected. The same sources indicate that it is less than 30% of the urban population that have access to proper and regular garbage disposal and less than 20% of the waste produced in developing countries is treated properly (Zerbock, 2003).

2.11.2 Household Educational Level and Solid Waste Handling

Public awareness and attitudes to waste can affect the whole municipal solid waste management system. All steps in municipal solid waste management starting from household waste storage, to waste segregation, recycling, collection frequency, willingness to pay for waste management services, and opposing of waste treatment and disposal facilities depend on public awareness and participation. Thus, lack of public awareness and school education about the importance of proper solid waste management for health and well-being of people severely restricts use of community based approaches in developing countries and also crucial factor for failure of a solid waste management service in developing countries (Zurbrugg, 2003).

According to United Nations Environment Program (2016), people's attitude towards waste may positively affect their interest and willingness to pay for collection service.

Therefore, attitude towards solid waste may be positively influenced by public information and awareness measures. At the same time improved solid waste patterns can't be maintained in the absence of knowledge. However, even practical knowledge is maintained, some individuals either due to negligence or dissatisfaction of the existing service delivery system in the town may take opposite action towards solid waste handling.

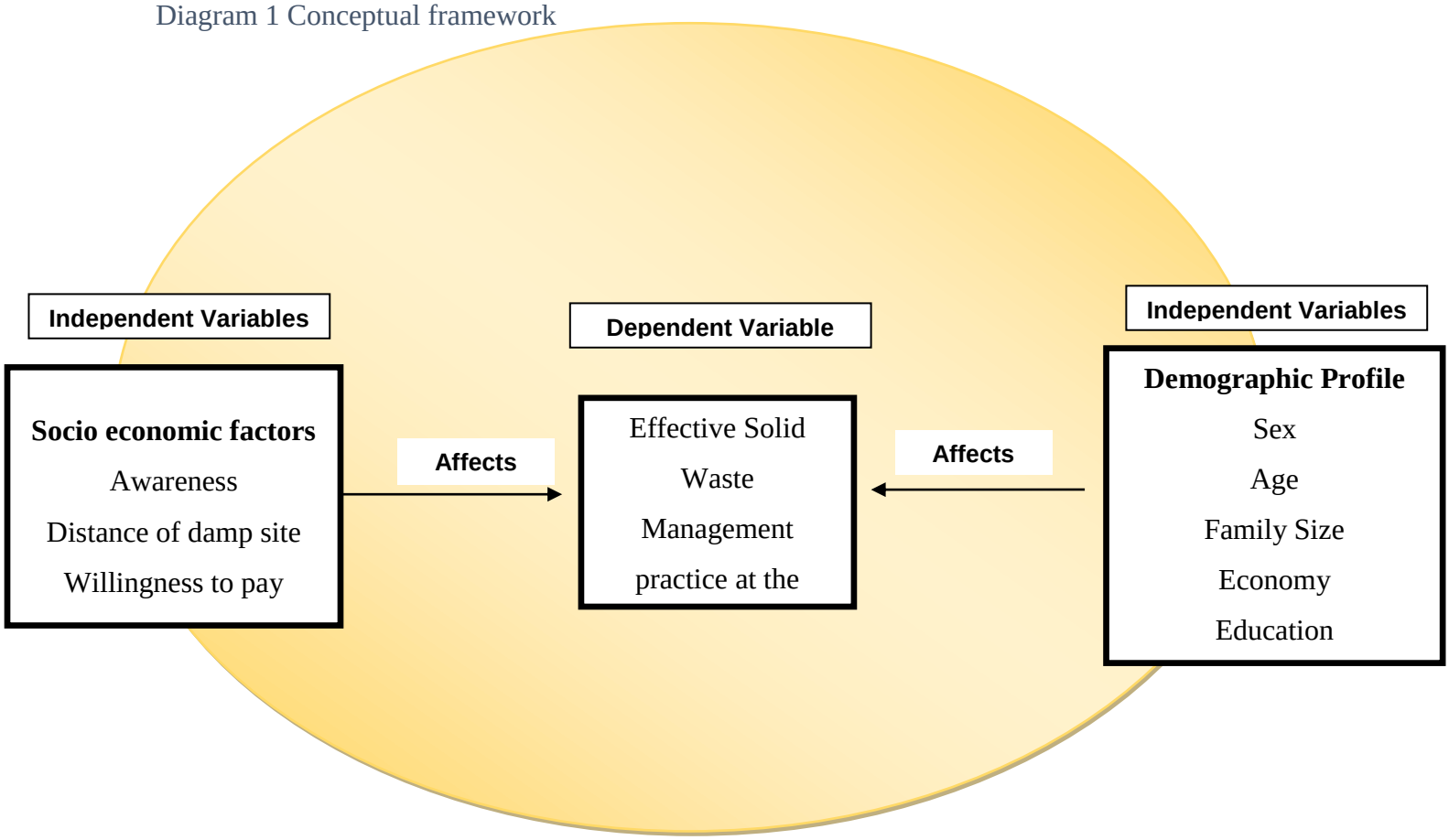
Finally, in this literature review it is assessed that solid waste generated in developing countries differs from that of developed countries, in respect to amount, composition, moisture content and density. As a result its handling approaches varied according to nature and characteristics of the waste; moreover, influencing factors of solid waste management such as income, household size,

educational level and distance of storages from houses have a significant negative or positive impact on solid waste handling.

2.12 Conceptual Framework

Based on the above review of related literature the researcher has developed the following conceptual framework for the purpose of analysis. As stated above, municipal solid wastes are generated from different sources such as from industries, institutions, commercials, households and the like. This particular study was emphasized on demographic, socio economic and physical factors affecting municipal solid waste management practice at the household level. All in all, the main focus and scope or boundary of this study is summarized on the following conceptual framework.

Diagram 1 Conceptual framework



Source: Own survey (2017)

CHAPTER THREE: RESEARCH METHODOLOGY

METHODOLOGICAL APPROACH

This chapter deals with the research methods that were used to collect the desired data so as to attain the objectives of the study. It discusses the subjects, data collection instruments, data collection procedures and the method of data analysis used in carrying out the research.

3.1. Introduction

Research methodology indicates the success of the research beforehand and also guides the research to prepare the main tools that enable a researcher to achieve the objectives, and to answer the forwarded central questions. It's the collecting, analyzing and interpreting of data in order to produce a result related to research problems systematically. Therefore, qualitative and quantitative methods of approach are selected in this study to overcome some barriers with the use of only one approach and to increase validity of the result expected. Methodology is a coherent set of rules and procedures, which can be used to investigate a phenomenon or within a frame work dictated by epistemological and ontological ideas (Kitchin and Tate, 2000). Therefore, it comprises a set of tools to be together to analyze data in order to answer specific questions and solve different scientific or practical problems.

3.2. Study Area

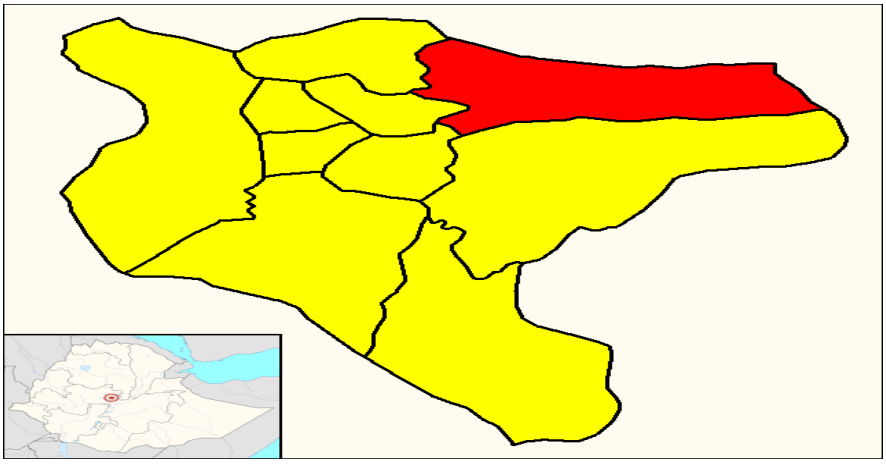
The research area chosen for this study is Yeka-subcity. Yeka is one of the 10 sub cities of Addis Ababa, the capital of Ethiopia. The district is located in northeastern suburb of the city. It borders with the districts of Gullele, Arada, Kirkos and Bole (Yeka City Government Administration, 2012).

Woreda 05 from Yeka Sub-city was chosen because first it is one of neglected area. In addition, one of the big markets resides in Yeka (i.e. Sholla big market). The small scale businesses such as street sellers, retailers, etc. also contribute to the solid waste management challenge in the Kebele as well as in the Sub-City. According to the survey results and my personal experience, I

believe that the solid waste management in this Kebele can represent the situations in most other Kebeles in Subcity. Therefore, purposeful random selection was used to select these sample areas.

Regarding the selection of the sub-city and Kebele officials, availability sampling was used because those subjects were the right resource persons to obtain the required data. On the other hand, the informants from the small and microenterprises (MSSEs) that are involved in solid waste collection and the Kebele dwellers were chosen randomly.

Figure 1: Yeka sub city, the one with the red color



Source: City Government Administration (2012)

3.3. Research Design

There are many types of research designs. Of the existing research designs, the one which meets the research objectives and addresses the question on the nature of the problem is chosen. In addition to this, the type of methods used depend on the scope, type, purpose and focus of the research topic together with its specific context in which a research is undertaken (Kotheri, 2004).

The study is aimed to assess the practices of solid waste management in Yeka sub city community, including the challenges and prospects, contribution in source reduction, collection, reusing, recycling, transporting and disposing activities and similarly material, financial, labor …etc. made in solid waste management contributions by the community.

As the title of the thesis itself dictates, the condition of community participation in solid waste management in terms of the existing practices are peoples' view, beliefs and attitudes towards various aspects of solid waste management system. Hence to investigate such aspects the descriptive survey method of research is employed. Its major purpose in research is described being the states of events as it exist; practices that prevails, beliefs, point of view or attitudes that the researcher has no control over the variables. He can only report what has happened or was happening (Kothari, 2004).

As selected by some authors, most descriptive survey methods of research use questionnaires, interview, field observation, and review of secondary data sources to accomplish the study. Hence the study collects the necessary data and makes analysis of data as the main method of qualitative and quantitative technique.

To measure the adequacy of the tools to collect enough data and to minimize the errors that might occur; measuring (testing) of the variables under the study was done on 20 households out of selected sample taken before actual data collection. The questions that were inadequate and less capable to collect data, and which cause ambiguity was refined and corrected to be effective. Through this evaluation, the necessary remedy and deep insight is made on the tools.

The data collected are analyzed and interpreted in terms of qualitative and quantitative terms with comparison in simple statistical method of descriptive analysis methods using computer by encoding and processing the data obtained. Then the data entered into the computer was tabulated, graphed in different forms of suitable and preferable inference and interpretation.

For qualitative and quantitatively collected data average ranking and percentile expression and analysis was done. The ranking styles are categorized under maximum weighted value of out of

5 or 4. The success of the issue interpreted and decided on the basis of average value obtained or achieved.

3.4. Data Sources

This study used two main streams of data sources. These two sources are primary and secondary data sources. The primary data sources are data obtained from sample survey response, field observation, photographs etc. The secondary data sources are related literature review, website (internet) report, documentation, magazines, books, journals, and articles.

The primary data sources are the households of Addis Ababa, taking the case to be at Yeka sub city Wereda 05. The primary data that was obtained by the questionnaire was taken from the samples that was chosen from the population of Yeka sub city.

3.5. Sampling

A sample is a finite part of a statistical population whose properties are studied to gain information about the whole (Webster, 1985). When dealing with people, it can be defined as a set of respondents (people) selected from a larger population for the purpose of a survey. Sampling is the act, process, or technique of selecting a suitable sample, or a representative part of a population for the purpose of determining parameters or characteristics of the whole population. To draw conclusions about populations from samples, we must use inferential statistics which enables us to determine a population`s characteristics by directly observing only a portion (or sample) of the population. The researcher obtained a sample rather than a complete enumeration (a census) of the population for many reasons. Obviously, it is cheaper to observe a part rather than the whole both in time and cost.

3.5.1 Target Population

The populations of this study about which inferences must be made are quite large. The population for this study contains the households of Yeka sub city. The data was collected by one questionnaire given to one resident in one house hold. This is because only one of the

residents in a house knows all the answers of the questions the same level as the other residents in the house.

And hence the population of this study is the number of households in the sub city. Yeka sub city has 13 *woredas, 127 Ketenas* and about 98,000 households as of May 2017 (Yeka subcity 2017).The number of the households is now increasing every time because of the Condominiums built and transferred to residents in the sub city.

3.5.2 Sampling Technique

The households were selected using random sampling technique among the total population households of 98,000. The number of the sample is determined below for the questionnaire and 20 households conveniently selected households were used to do the pilot test. The experiment is used to aid the questionnaire. There is no sampling technique done for the observation.

3.5.3 Sample Size Determination

Then the sample size was determined by using the following formula (Dixon C and B .Leach, 1978).

$$n' = \frac{n}{1 + \frac{n}{N}}$$

Where $n = \frac{z^2 pq}{d^2}$and

n is the desired sample size.

n' is number of sample size.

Z is 95% confidence limit i.e.1.96.

P is 0.1 (proportion of the population to be included in the sample i.e. 10%).

q is 1-p or 1-0.1 i.e. 0.9.

N is total number of population

d is margin of error or degree of accuracy desired (0.05).

$$n = \frac{1.96^2 * 0.1 * 0.9}{0.05^2}$$

$$n = \frac{86{,}436}{625} = 138.3$$

$$n' = \frac{n}{1+\frac{n}{N}}$$

$$n' = \frac{138.3}{1+\frac{138.3}{98000}}$$

$$= 138$$

And rounded to 140

140 households were selected and asked a questionnaire.

3.6. Data Collection Methods

Good data are essential to understand the existing solid waste management practices. This can be realized only if the tools selected to collect data possess the capacity to bring information that meets the problems of the research. Therefore, three tools to collect primary source of data that are questionnaire, interview and field observation of the researcher were selected.

3.7. Data Analysis Technique

On the basic of the data that was collected from both primary (from sampled households from key informants from field observation) and secondary data sources (from key informants and published and unpublished materials) the researcher was analyzed and interpreted in accordance with the nature of the data replied by respondents. And the data was summarized by a sample descriptive statistics using tables, graphs and figures.

The quantitative data mainly obtained using close-ended questionnaire was analyzed by simple descriptive statistics like percentage, average and etc..., and the result was summarized in the form of table and graph. The qualitative data /perception, opinion, attitude etc) mainly obtained using open ended questionnaire and semi structured interview including the researcher's observation were analyzed, described and interpreted in the form of narration.

After the whole efforts attempted above have been made the researcher was endeavored to identify the prevailing problems, comments and suggestions forwarded concerning the problem understudy and improvements that need to be made over the problem in order to tackle the major

causes of the problem and ensure safe and environmentally sound solid waste management system.

3.8. Validity and Reliability

The data obtained by the questionnaire was cross checked with the data found by the interview. The Linkert scale questionnaire items reliability is checked by the Cronbach-Alpha test using SPSS software, which scored 0.813 as described on table 3.1, below. Thus, the score supports the presence of good internal consistency among the items and promises the reliability and acceptability of the items for the study.

Table 3.1 Reliability Statistics of Cronbach's Alpha

Reliability Statistics

Cronbach's Alpha	No. of Items
.813	130

3.9. Ethical Consideration

First the researcher requested permission from the administrator of the graduate school of Addis Ababa University to conduct the data collection process. After the researcher gets permission, then researcher considered the protection of all respondents' response. For the sake of security of the individuals, the responses of the participants were used without the individuals' names on it. The data collected through the interviews, surveys and observations were used to triangulate the validity of the information. Respondents were informed that their participation was voluntary and was assured of complete anonymity. Furthermore, they were advised that they do not have to answer any question they feel uncomfortable about.

CHAPTER FOUR: FINDINGS AND DISCUSSION

4.1. Introduction

This chapter presents the findings from the study following the different research questions. The data represented in this chapter was collected and processed using quantitative and qualitative techniques. The chapter first gives a summary of the respondents' characteristics in terms of whether they were residents or business people, and then goes on to present the empirical findings following through the research questions.

4.2. Response Rate

Response rate is a percentage of the actual samples participated in responding the study questionnaires of the researcher after completely filling them to the total of the samples that the researcher intended to consult with.

The researcher used the responses of the respondents for answered questionnaires. Out of 140 sample questionnaires only 130 were returned back completely filled. Eight of the questionnaires were not returned totally and two of the questionnaires were returned being negligently filled and were very incomplete and the researcher rejected these two questionnaires.

The researcher found a response rate of 130/140*100% =93%. And a response rate that is greater than or equal to 80% is very good. And hence this research's survey has an excellent response rate.

4.3. Demographic Profile of Respondents

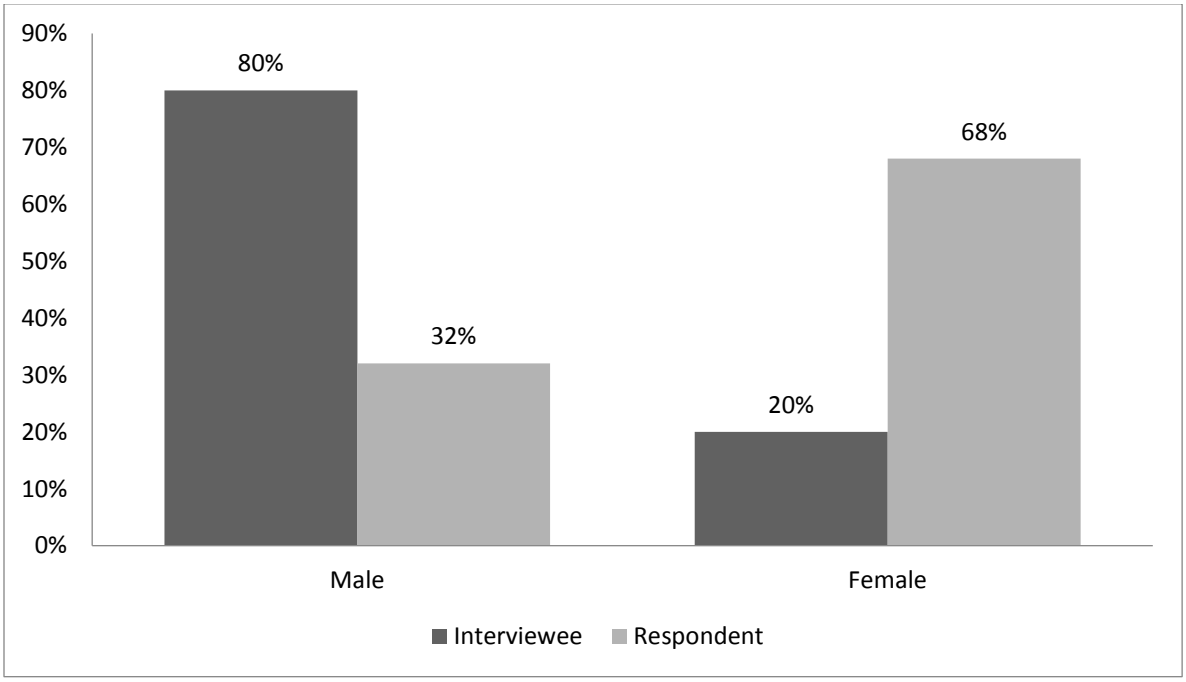
One hundred thirty respondents from the public were given a well-structured questionnaire instrument for quantitative and qualitative data while another 10 (4 from Municipal officials, 2 from Health Bureau and 4 from SMEs of the subcity) were interviewed by semi-structured interview instrument for qualitative data. Solid waste generation and composition shows a great variation related with differences in background and characteristics of households. In

this section, the researcher tried to constitute different sample households with various demographic characteristics.

4.3.1 Gender

The following figure shows the gender profile of the respondents and the interviewees. It shows that, from the major respondent category, more female respondents (68% of the total 130 respondents) were sampled than their male counterparts. On the other hand, 80% of the total 10 interviewees were male respondents. However, this was not purposively done, but was due to the convenience sampling procedure that was adopted in this study. For different reasons, female respondents were more accessible and willing to give information as compared to the male.

Figure 2: Gender Profile of the Respondents in Percentage from a total of 10 interviewees and 130 respondents



Source: Own survey, 2017

According to the collected data of personal information of questionnaire respondents: Sex; 42 (32%) male, 88(68%) females, and conversely the interviewees are 8(80%) male and 2 (20%) female. As a chance the participation of large percentage of female HH in the respondents' of questionnaire, increases the degree of validity and accuracy of the research findings. This is because of the cultural practices of woman proximity to SW collection and house cleaning activity in our country; particularly in the study area. This made women to have more information than men on HH activities.

4.3.2 Age Distribution

The age distribution of the household respondents is also important for determining his/her ability to participate in the process of municipal solid waste management. Table 2 revealed the current age distribution of households.

Table 2: Age Distribution

Title and sub title of identifications		Household		Interviewee		Remark
Age	<20	8	6%			
	20-30	61	47%	5	50%	
	31-40	35	27%	4	40%	
	41-50	20	15%	1	10%	
	51-60	6	5%			
	≥61	-	-			
	Total	**130**	**100%**	**10**	**100%**	

Source: Own survey, 2017

It is indicated that most of the respondents are found in the working age group. Out of the total respondents about 89% of sample respondents and 100% of the interviewees belong to adult age group (21-50 years). This contributes to the accuracy of the information gathered from such respondents. The survey showed that out of 130 respondents 8 (6%) belong to the age group below 20 years, 61 (about 47%) were aged between 20 and 30 years, 35 (27 %) were aged

between 31 and 40 years, 20 (15 %) aged between 41 and 50 years while only 6 (about 5 %) were aged 51 and above years of age.

In general, the age group structure indicates high proportion of the respondents were found in the age of 21 to 50 years, productive age they have even high potential for higher population growth rate that have direct impact on solid waste generation rate and may affect the composition and disposal of solid waste management.

4.3.3 Marital Status

Family is central to income maintenance, economic status and social adjustment. Therefore, marriage statistics has economic and social implications. Table 3: shows the marital status of the respondents and the interviewees.

Table 3: Marital Status

Title and sub title of identifications		Household		Interviewee	
		No.	%	No.	%
Marital Status	Married	85	65.39	7	70
	Single	30	23.08	3	30
	Widowed	8	6.15		
	Divorced	7	5.38		
	Separated	0	0		

Source: Own survey, 2017

As table 3 above illustrates more than half of the questionnaire respondents, 85(65.39%) and interviewee of 7(70%) are married. Widowed occupied the second position of marital status. Therefore, based on the figure in table 3 the largest population gets married. At this status they believed to have adequate knowledge about waste generation and its management experience at home and the sub city. .

4.4. Socio-Economic Profile

In this section the socio economic profile of 130 respondents from the public who were given a well-structured questionnaire instrument for quantitative data and another 10 who were interviewed by semi-structured interview instrument for qualitative data are presented.

4.3.4 Monthly Income

The average monthly income of respondents was also considered as an important variable that could influence people's perception and attitude about SWM system in the city as SW generation rates have direct relationship with income level (D. Wells 2006).

From the socioeconomic conditions, the amount of annual income of the household has an impact on household solid waste management. Information on the income of some household heads was very difficult to obtain due to different reasons such as low level of education which culminates fears of being taxed, inability to keep the record of their sales and irregularity of their income. The researcher categorized and presented the income level in detail according to the following.

Table 4: Monthly Income

Title and sub title of identification of monthly average income		**Household**		**Interviewee**	
		No	**%**	**No**	**%**
Monthly average income (HH)	≤1,000 birr	47	36.16		
	1,001 – 2,000	34	26.16		
	2,001 – 3,000	20	15.38		
	3,001 – 4,000	23	17.69	5	50
	4,001 – 5,000	4	3.08	2	20
	> 5,000	2	1.53	3	30
	Total	130	100	10	100

Source: Own survey, 2017

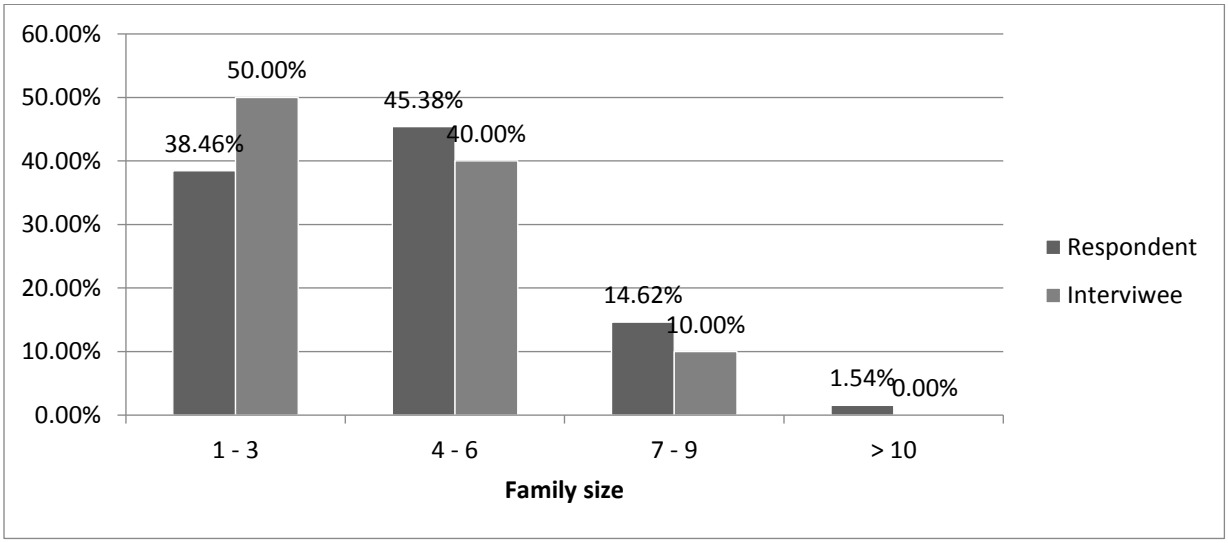
As data of table 4, the monthly average income of HHs peak is between 1,001 – 5,000 birr/month i.e. 81(62.31%) of the total respondent and 47(36.16%) of respondents monthly income is below 1,000 birr/month. On the other hand, the average monthly income of interviewees was totally above 3,000 birr/month. As observed by the researcher during the time of data collection the respondents' housing condition /status/ and facility fulfillments do not categorize some of them under the above monthly income. This may arise from traditionally securing of wealth possessed by Ethiopians.

The income level of HHs can affect the rate of waste generation and collection, transportation and disposal. Low-income contributes low participation which leads to low level of waste management at large.

4.3.5 Household Size

The following diagram shows the average household size in the study area. It is used as a measure of crudeness of population and has great implication on health and collection of solid wastes.

Figure 3: Household Size



Source: Own survey, 2017

The maximum HH family size is 4-6 that accounts for 59(45.38%) of the respondents. This increases their understanding, as the amount of SW generation depends on the size of the HHs. Meaning, increase in the number of family increases consumption which also increases waste generation and contributed to the creation of pressure on its managements.

4.3.6 Educational Status

The majority of the households in the sub city have different educational backgrounds. This educational background of the respondents influences their active participation and handling of house-hold solid waste. Therefore to upgrade their understanding about the problems caused by wastes continues and organized training and awareness campaigns are needed. This problem is seen in the study area. Table 5 shows that the level of education completed by the respondents. It revealed that the respondents who never crossed formal education and cannot read and write properly are the smallest proportion.

Table 5: Educational Status of the Respondents

Title and sub title of identifications		Household		Interviewee	
		No	%	No	%
Educational status	Cannot read & write	5	3.85		
	Read &write only	9	6.92		
	1-8	15	11.54		
	9-12	22	16.92		
	Certificate(10/12+)	30	23.08		
	Diploma	33	25.38		
	Degree	16	12.31	6	60
	Above degree	-	-	4	40

Source: Own survey, 2017

Large number of respondent's educational level falls on certificate and diploma level that enables them to read and understand any written materials, proclamations, policies, etc

concerning SWM and its impact on environmental ecosystem. Education enables to find rational solution towards the problem identified. Most of the respondents and all of the interviewees are above grade 10 and we assume that they could have a better understanding of SWM.

4.3.7 Employment Condition

Employment condition of the respondents and interviewees has a relation in waste type and its management systems.

Table 6: Employment Condition of the Respondents.

Title and sub title of identifications		Household		Interviewee	
		No	%	No	%
Employment condition	Private sector	17	13.08		
	Government/public	30	23.08	6	60
	Self-employee	48	36.92	4	40
	Unemployed/no job	35	26.92		
	Total	130	100	10	100

Source: Own survey, 2017

As table 6 shows the employment status of HH respondents are higher in self-employment 48(36.92%) and followed by unemployment (jobless) 35(26.92%). Employment condition helps to estimate the income level which in turn determines the contribution of society in financial ability to pay to SWM activities. The average monthly income of respondents was also considered as an important variable that could influence people's perception and attitude toward SWM system in the sub-city as SW generation rates have direct relationship with income level.

4.5. Nature and Magnitude of SWM Problem in Yeka Sub City

Solid waste management is influenced by the social status of the community; this is due to pattern of waste generation and handling of the household and other users. Community based waste management and social condition of waste workers are conditioned by the attitude and

culture of the society. Medina, (2004) indicated that in many low income residential areas Community Based Solid Waste Management is the only feasible solution. Therefore, functional links between the community and the municipality is essential. However, community participation in solid waste management was low in the city. This was mainly due to lack of promotion through general awareness building programs as well as focused solid waste management information campaign.

4.5.1 Nature of SWM

To determine the type and way of SWM waste prevention, recycling, reuse, composting and incineration, knowing the composition and characteristics of waste is essential. For instance, according to (Medina, 2004), if wastes have high proportion of organic matter, the possibility of composting and biogas regeneration as means of handling wastes is a better mechanism than incineration, reuse and recycling. Moreover, using incineration as a means of waste disposal has been mostly negative experience due to environmental pollution. Therefore, using the waste in a suitable manner is advisable. To make it sustainable an integrated way of solid waste management system should be practiced in the process of storage, separation, reuse, and recycling of wastes.

In table 7, it is revealed that, about 15.4% of the respondents produced food and vegetable wastes and used some of it for soil enrichment for their gardens. Tin cans, bottles and other packaging materials are being produced by about 42.3% households and 23.6% of households produce paper, wood, plastic and yard trimmings as fuel or fire wood. This is common in developing countries. About 8.50% of households produced ash, dung, and manure 9.80% of the households responded to other types of wastes. And among all, most of them (69.20%) have their own waste storage. The types of wastes include both organic and inorganic materials mainly dominated by (above 95%) are organic one. The components of wastes are agricultural remains like vegetables, grass, fruit, etc. and cartoons, old textile (clothes), plastics, animals manure, and ashes.

In the study area solid waste is mostly stored in temporary containers such as plastic bags, sacks, baskets and others. The type of waste storage used by households has great impacts on solid waste management. According to (Samuel, 2006), those persons that use plastic bucket as a waste storage minimize solid waste generation by increasing service duration of the storage. While those who use non-durable storage will not get long service from the storage, rather they pay costs for disposal of the storage as a waste.

Table 7: Nature of SWM

Description		Frequency	Percentage	Cumulative %
Types of waste produced and reused	Organic or food wastes	20	15.4	15.4
	Paper, wood and plastics	31	23.8	39.2
	Tin cans and bottles	55	42.3	81.5
	Ash, Dung and manure	11	8.5	90.0
	Other	13	10.0	100.0
Have Own waste storage	Yes	90	69.2	69.2
	No	40	30.8	100.0
Solid waste storage system used in your HH	Local basket	17	13.1	13.1
	Sacks (Madaberia)	72	55.4	68.5
	Plastic bag	23	17.7	86.2
	Pill or Pit	18	13.8	100.0
How do you put your daily solid wastes	All together	78	60.0	60.0
	Separated	52	40.0	100.0
The community waste bins stayed without picking	2 days	10	7.7	7.7
	3 days	14	10.8	18.5
	5 days	21	16.1	34.6
	A week	24	18.5	53.1
	more than a week	61	46.9	100.0

Source: Own survey, 2017

It has been observed that majority of the households 55.4% are using sacks *(Madaberia).* This is followed by plastic bag 17.7% and local baskets 13.1%, while others 13.8% of the respondents

claimed to use piles and pits for solid waste storage. For the question raised to HHs concerning the separation of SW generated at HH level, 78(60.0%) responded 'No' and 52(40%) of them separate "sometimes" if not often. Therefore, there is no separation of SW at HH level. Only very few say they separated the SW every time they store it.

It is the way the waste generated is handled, stored, collected and disposed of that can pose risks to the environment and to public health. It has been shown in the above table that the waste stays in the waste bins for longer time which may bring health problem to the residents. According to most of the respondents (65.3%) of the community waste or the HH waste stays in the containers for a week or more.

4.5.2 Magnitude of SWM Problem

There are many factors that affect magnitude of SWM. Income is the major factor, which determines the magnitude of solid waste management at large and solid waste handling in particular. The level of economy is an important determinant of the volume and composition of wastes generated by residents 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. The magnitude of SWM problems are revealed in the following table.

As in table 8 the seriousness of the waste generated in the study area was evaluated by the respondents and was very high. Above 88.5% of the respondents agreed that to the minimum there is a moderate solid waste problem.

The quantity of SW generated is about 7-8kg/HH/month by 35 residents that is 26.92% and average 7.77kg/HH/month or in other words 7-8kg/HH/month interval of SW generated. As estimated by respondents, out of the SW generated from HH, very small amount of it is reused. Out of the total respondents 113(86.92%) reused the SW in part and 10(7.7%) completely not reused. The interview and suggestion of some respondents pointed out that the very small amount of reuse activity is mostly done by waste collectors during the separation of waste for

transportation process and the insignificant amount is done around HH by low income social groups and scavenging by street dwellers.

Table 8: Magnitude of SWM problem

Description		Respondents (N=130)		
		Frequency	**Percent**	**Cumulative %**
How do you evaluate the problem of solid waste in your city?	Very high	21	16.2	16.2
	High	62	47.7	63.8
	Moderate	32	24.6	88.5
	Little	15	11.5	100.0
	No problem	-	-	
Quantity of SW generated in kgs/HH/month	0-2	2	1.5	1.54
	3-4	11	8.5	10.0
	5-6	26	20.0	30.0
	7-8	35	26.9	56.9
	9-10	26	20.0	76.9
	>10	30	23.1	100.0
Of generated SW amount how much is reused and recycled:	Almost all	-	-	
	¾ of it	-	-	
	Half of it	-	-	
	Quarter of it	7	5.4	5.4
	Very small	113	86.9	92.3
	None of it	10	7.7	100.0
Average birr paid by HH in SW per month:	<5 birr/HH/month			
	6-10	20	15.4	15.4
	11-15	104	80.0	95.4
	16-20	6	4.6	100.0
	>20	-		
	No payment	-		

Source: Own survey, 2017

As the data on table 8 shows the finding of the research indicates that the HH paid 11-15 birr/HH/month with 104(80%) response. As suggested by most of the respondents this is paid with water bill and the amount is an average estimation.

The magnitude of the problem of disposal system is shown in the following table.

Table 9: The magnitude of the problem of disposal system

Ranking Alternative ideas		**No. of respondents selected at each level**					
		1	**2**	**3**	**4**	**5**	**Rank**
The type of disposal systems used by HH in sequence is:	Burning	17	45	15	6	4	2
	Burying	2	5	7	10	24	7
	Burning and burying	22	17	16	22	28	6
	Open space /illegal	11	28	47	24	20	3
	In River	4	7	11	26	30	5
	In ditch	-	4	22	35	20	4
	Left for collection	74	24	13	7	4	1

Source: Own survey, 2017

To evaluate the type of disposal system used by the HH in table 9, it indicates that the first rank "left for collection" is chosen by 74 respondents. Which means that large amount of waste is stored in pits or piles for waste collectors in order to be taken to disposal site or transfer station. The second system of disposal selected is "burning" by 45 respondents and at the 3rd ranking level where no alternative than the former two systems disposing at open space illegally at night are chosen by 47 respondents as the 3rd alternative. The disposing of SW in ditches and water body are selected respectively occupying the position of 4th and 5th.

4.6. Household Level Practices of SWM

The bad practices of a community in respect to solid waste management in most urban areas of the country have been manifested mainly in three ways: dumping of solid waste illegally anywhere in the city, improper handling of waste at home, and improper use of community waste bins. Municipal solid wastes are generally poorly treated or handled at home, and this has partly aggravated the problem of solid waste management in cities and towns. Therefore, the bad practice of the community has greatly contributed to the poor solid waste management. In fact, for most of the bad practice of the community, the poor and inadequate solid waste management practice has contributed much for the occurrences of most of the bad practices of the community. But it may not be the only reason; sometimes negligence or lack of awareness among the community towards solid waste management may have also play a role for poor solid waste management practice.

The participation level of HH “strong and above strong” in source collection are 29(22.3%) and below average 40(30.78%), the remaining 61(46.92%) is average. However, the overall average obtained by the finding is 2.53 out of 5. That is above average or more than half, and in activity of source collection a good participation was observed.

The participation of HH in **primary collection** of SW is almost none 107 (82.3%) because the paid informal SW collectors collect from its place of storage of HH. The average achieved value is 0.8/5 which is almost none.

Table 10: the area and extent of community HH level SWM

Area of activity		HH Participation Level						
		Very strong(5)	Strong (4)	Average (3)	Poor (2)	Almost none (1)	Not at all (0)	mean
I collect waste from the beginning / source	Nº	7	22	61	28	12	-	2.9
	%	5.38	16.92	46.92	21.55	9.23		
I properly store all the wastes at home.	Nº	28	36	46	14	6	-	3.5
	%	21.54	27.69	35.38	10.77	4.62	-	
I recycle and reuse the solid waste from my home	Nº	-	-	9	37	74	10	1.3
	%	-	-	6.92	28.46	56.92	7.70	
I burn the waste from my home	Nº	11	23	36	40	13	7	2.62
	%	8.46.	17.69	27.70	30.77	10	5.38	
I bury the waste from my home	Nº	-	-	-	5	24	101	0.25
	%				3.85	18.46	77.69	
I transport and dump the stored waste myself	Nº					25	105	0.18
	%					19.23	80.77	
Total	Nº	46	81	152	124	154	223	1,81
	%	4.97	8.76	16.53	13.64	18.65	37.45	

Source: Own survey, 2017

The household practice to **store SW properly** is 64(49.23%) and 20(15.39%) above average and below average respectively, and the average achieved value is 3.5 out of 5 is at better performance of participation.

The finding above indicates that in recycling/reusing, burying, transporting and disposing to disposal site of solid waste, the community participation is very poor or weak. Therefore, their average achieved value out of 5 is 1.3, 0.25 and 0.18 respectively. Burying, transporting and disposing at disposal site are at very poor participation level. As an average of overall seven participation variables of in-house SWM practices, the residents achieve 1.81 out of 5. This can be considered as weak.

And the extent and the area of contribution of the respondents are revealed in the following table.

Table 11: Types of actions that community contributes in SWM at HH level

Area of contribution		Table HH Participation Level						
		5	**4**	**3**	**2**	**1**	**0**	**Mean**
I have contributed financially	№	27	33	61	7	2		3.6
	%	20.7	25.38	46.92	5.38	1.55		
I have contributed materials used for SWM	№	-	-	-	9	70	51	0.65
	%	-	-	-	6.92	53.8	39.23	
I have contributed labor	№	-	5	24	54	45	2	1.92
	%	-	3.85	18.46	41.5	34.6	1.53	
I have given consultation	№	15	32	36	33	5	9	3.02
	%	11.5	24.62	27.69	25.3	3.85	6.92	
I participate in awareness creation	№	7	20	52	34	14	3	2.73
	%	5.39	15.38	40	26.1	10.7	2.31	
Total	№	49	90	173	137	136	65	2.38
	%	7.54	13.84	26.62	21.0	20.9	10	

Source: Own survey, 2017

The numbers on the header row means; 5=Very high, 4=High, 3=Moderate, 2=Less, 1=Least, 0=none

As the data of **table 11** above shows the extent and types of community participation in SWM at HH level; findings are the financial, consultation and awareness creation contribution of the community (HHs) are better status with an average achievement value of 3.46, 3.19, and 3.03 out of five (5) respectively.

In contrary to this, the material and labor contribution of the community are at lower level with the achievement of 0.65, and 1.11 mean out of 5. The average of overall participation of the households of the locality in the five above action types is considered as the average value

obtained as 2.38 out of 5. This indicates the overall community of the districts is about an average level of contribution.

4.7. Factors Affecting Effective SWM

4.7.1 Poor Coordination

Poor institutional coordination is a challenge that leads to poor solid waste management in almost all parts of the country. As the researcher observed during the interviews of the institutional officials, there is very weak coordination between the municipality officials of the sub city and other stakeholders involved in the environmental protection issues. Municipal waste management is a complex task that requires appropriate organizational integration between numerous stakeholders. The findings of **table 12** shows that there is poor coordination; the coordination being done by anybody, whether socially at local level or any governmental structure affects the SWM at household level "strongly and very strongly" is 49(37.69%), average 50(38.46%) and below average 31(23.85%) responded, and the average weighted value is 2.32 out of 4, which is under category of strong influential factor. And also lack of awareness and unreliable service provision are the strong influential factors that hinder community participation in solid waste management with the average weighted value of 2.32 and 2.85 respectively out of 4.

Especially households getting unreliable service or inability to get the necessary service in SWM from municipality or government officials has strong factor on community participation. Moreover, the poor performance of the municipalities in this respect is rooted in short supply of funds, inappropriate equipment, inefficient management and unskilled personnel. Other important managerial problems are those related to financial issues, because these determine reliability and sustainability of a service for a major part, notable inadequate fee collection.

Table 12: Factor Affecting Effective SWM

Factors		Factor Level					Mean
		Very strong factor (4)	Strong factor (3)	Average factor (2)	Less influence factor (1)	No influence (0)	
Poor coordination	No	15	34	50	31	-	2.3
	%	11.54	26.15	38.46	23.85	-	57.
Lack of awareness	No	16	38	60	10	6	2.3
	%	12.31	29.23	46.15	7.7	4.61	57.
Financial shortage/economic poorness	No	9	7	52	41	21	1.4
	%	6.92	5.38	40	31.54	16.1	37.
Lack of rules and regulation	No	-	-	20	29	81	0.5
	%	-	-	15.38	22.31	62.3	13.
Lack of initiative	No	-	-	25	63	42	0.8
	%	-	-	19.23	48.46	32.3	
Unreliable service	No	45	38	29	14	4	2.8
	%	34.61	29.23	22.31	10.77	3.08	71.25
Others	No	-	-	-	-	-	-

Source: Own survey, 2017

4.7.2 Lack of Awareness

Public awareness and attitudes toward waste can affect the whole municipal solid waste management system. All steps in municipal solid waste management starting from household waste storage, to waste segregation, recycling, collection frequency, willingness to pay for waste management services, and disposal facilities depend on public awareness and participation. Thus, lack of public awareness and training about the importance of proper solid waste management for health and well-being of people, severely restricts use of community based approaches in developing countries, and also crucial factor for failure for SWM practices in the sub city as it is the case in most parts of the towns in the country. Most proportions of the respondents agreed

that lack of awareness has effect on good SWM. The mean greater than two indicates it has an effect hence the average is taken to be two.

4.7.3 Financial Constraint

According to the interviewees, municipal solid waste management is given low priority and very limited funds are allocated to the sector by government. In addition to limited funds, many local governments in developing countries lack good financial management and planning. Lack of financial management and planning, particularly when this limited resources available for the sector are completed quickly and causes solid waste management services to halt for some periods, will result in losing trust of service users. Therefore financial constraint is one of the factors affecting effective SWM as shown in the table above.

4.7.4 Lack of Rules and Regulations

The study has found that lack of adequate legislation makes it difficult to assign clear mandates to different sectors connected with waste management services. The rules and regulations and their implementation program at Yeka sub city was weak. On the other hand, there was no enough effort made to create awareness about solid waste management in the community including the rules and regulations and associated penalties in a regular basis. Factors like lack of rules and regulation, the least of all effect, lack of incentive is the 2nd least, and financial shortage is the 3rd influential factors specified. Therefore, as to these findings lack of rules and regulations and lack of incentive cannot be considered as influential factor, or feeble factor.

As the finding of analysis, the six factors mentioned in **table 12** above when observed as a whole of one influential factor the average weighted value is 1.73 out of 4, and the achieved weighted value covers 43.13% of factor that affect and influence SWM in the locality.

4.7.5 Distance

The other variable which was associated with SWM was distance of storage from HH residence. Distance was taken as independent variable and SWM as dependent variable. Table 13 shows this distribution.

Table 13 Distance of Waste Dump

Title /issues		Respondent in		Interviewee
		No	%	
The distance of transfer station/container/ from HH in meter	- < 100	-	-	400 to 500m
	- 101-200	-	-	
	- 201-300	-	-	
	- 301-400	-	-	
	- 401-500	-	-	
	-501-600	7	5	
	- >600m	123	95	

Source: Own survey, 2017

To evaluate the distance of transfer station of SW from HHs, the response achieved above 600m is 123(95%). This clearly indicates most of the respondents have to move a distance over 600 m from their house to put off the waste.

Table 14 Correlation between income, educational level, and distance of the storage and Effective SWM.

Description		Properly managed		Improperly managed		Total		Ratio
		No.	%	No.	%	No.	%	
Income	< 1,000	14	10.8	33	25.4	47	36.2	0.4
	1,001 to 3,000	26	20.0	28	21.5	54	41.5	0.9
	3,001 to 5,000	17	13.1	10	7.7	27	20.8	1.6
	Above 5,000	2	1.5	0	0.0	2	1.5	2.0
	Total	59	45.4	71	54.6	130	100.0	
Education Level	Never read and write/read&write	2	1.5	12	9.2	14	10.8	0.2
	Primary	4	3.1	11	8.5	15	11.5	0.4
	Secondary	10	7.7	12	9.2	22	16.9	0.8
	Advanced	44	33.8	35	26.9	79	60.8	1.3
	Total	60	46.2	70	53.8	130	100.0	
Distance	Below 600m	5	3.8	2	1.5	7	5.4	2.5
	Above600m	55	42.3	68	52.3	123	94.6	0.8
	Total	60	46.2	70	53.8	130	100.0	

Source: Own survey, 2017

Solid waste management practice of households was associated with monthly income in order to measure the relationship between these two variables and to see its impact on SWM. The ratio of frequencies of properly managed to improperly managed result shows (Table 14) a significant positive association between income of the household and SWM. The ratio is increasing as income gets better. The study also asserted that as the amount of income of households increase the capacity of proper solid waste management increased and vice versa. This was strongly mentioned by (Mesfin, 2006) that enhanced economy enables the community to allocate more for SWM practice, by providing more sustainable financial base. The possible explanation for the positive relationship between income and SWM in the survey are explained below. The

primary function of consumption pattern and its consequence of proper handling were influenced by socioeconomic patterns of the community

Solid waste management of the sample households was associated with the level of education of the heads of households. SWM as a dependent variable and educational level of the household heads was taken as independent variable. The result described that the proportion of these respondents which were used proper solid waste management increased and the ratio result increased from 0.2 to 1.3 indicating proper management increase with advancement in Educational level. But the properly managed SW is very small.

Solid waste generation and management is conditioned by people's attitude toward solid waste, their pattern of material use and solid waste practices, interests to minimize the degree to which they separate wastes and the extent to which they refrain from careless dumping and littering. These are influenced by public information and awareness creation measures; at the same time education speed up the ability to gather information and develop positive attitude towards solid waste management.

The other variable which was associated with SWM was distance of storages from houses. Distance was taken as independent variable and SWM as dependent variable. There is a significant relation between the two. Because proper management to improper management ratio decreased as the storage got further.

4.8. Measures to be taken

For questions asked to raise community participation in SWM "what actions must be taken sequentially to be ranked are responded as follows" (See table below). Nineteen respondents are selected taking punitive action in the first rank, and 17 respondents select "the government support in materials, financial and human resource is recognized. The increasing of awareness creation through educating and training community, creating means of initiation, …etc are taking sequential positions. Therefore, the respondents agree strongly on penalizing the HHs who dispose SW illegally, those who did not keep their surroundings clean and those who do not participate in campaign of solid waste management.

Table 15 Measures to be taken

		No of respondents select at each level					
		1	**2**	**3**	**4**	**5**	**Rank**
To raise community participation actions to be taken:	- Increasing awareness creation	30	28	35	17	7	3
	- Revision of policy and regulation	-	4	16	24	26	7
	- Transferring SWM totally to informal social organization	4	11	22	28	33	5
	- Taking strong punitive action	42	26	9	7	11	1
	- Need designation of new rules and regulation with community	13	17	22	24	28	6
	- Creating means of initiation	11	7	15	30	22	4
	- Increasing governmental support in material, financial and human resource	30	37	11	-	3	2
Total		**130**	**130**	**130**	**130**	**130**	

Source: Own survey, 2017

4.9. Result From Field Observation

Despite the present concerns of individuals and the government about waste management in Ethiopia, the practices are seen insignificant. Addis Ababa still is facing serious SWM problems. From observation, domestic and municipal solid wastes are commonly seen in the study area Yeka Sub-City. Most of the domestic wastes come from activities such as cooking and household activities. Municipal wastes come from the trashes from commercial establishments, small industries, and households. These include tins, plastic products, and polythene bags.

Solid waste, when treated well, can be turned into a resource, but the greater part of wastes generated in Yeka Sub city seem not to undergo any treatment before their final disposal sites. Solid wastes generated in Yeka Subcity are most often disposed off in open dumps, gutters, and at back of houses probably due to the inadequate solid waste management equipment or the long distances to the sanitary sites.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1. Summary

The study has been carried out to assess practices, challenged and prospects of solid waste management in Yeka Sub-City of Addis Ababa. It is obvious that improper solid waste handling and disposal leads to substantial negative environmental and health impacts. The objective of this study was to assess nature and magnitude of the solid waste management problem, assess practices of households towards SWM, and assess factors that constrains the effectiveness of SWM in Yeka Sub City. One hundred thirty respondents were selected based on random sampling. Information was collected through questionnaire, interview and observation. Each sample households were categorized according to their sex, age, educational level, per capita income, household size and marital status to assess associations with solid waste management.

Waste handling and processing at source are an essential element of solid waste management, however, in Yeka Sub City there is poor solid waste handling and processing at sources. Most of the residents do not perform the waste separation at home. That makes waste handling in the study area improper both environmentally and socially. In addition to this improper waste handling, lack of proper waste collection and disposal services have resulted in waste accumulation and unsanitary environmental conditions in the town.

The main demographic and socio-economic factors which determine SWM are educational level of the households, average monthly income of the households, location of Waste Containers and its distance from the house and household size had shown a reasonable correlation and impact on SWM. Moreover, institutional involvement on solid waste management particularly from collection sites was poor and disintegrated. Major institutional and social factors responsible for the poor solid waste management are problems related to lack of institutional coordination, financial constraint, and low priority given to the issue, socio-cultural factors, lack of rules and enforcement specific to the issue, and lack of awareness creation.

5.2. Conclusion

This study has been conducted to address the demographic, socio-economic and institutional factors affecting HH solid waste management. Based on the literature revised, the data collected, the analysis made, the findings obtained and discussions helps to develop necessary and important conclusions drawn as follows:

Analysis based on the key elements of solid waste management such as waste handling and processing, waste collection and disposal practiced in the town shows that the current municipal solid waste management practice was ineffective and inadequate. In the study area solid waste management in general and waste handling in particular is very poor, there is a problem of solid waste segregation, collection, reuse, recycling, composting and disposal. Majority of respondents who live along the borders of rivers dispose their solid wastes inside drainage channel and some others on the street and other vacant places.

The SWM lacks integration of different actors like government, municipality, formal and informal community participation, … etc is bottleneck for sustainable solution for SWM in the city. Yeka subcity Cleaning and Sanitation office does not have the mandate to penalize residents if there is improper disposal of wastes even if it is clearly put on the Proclamation. Due to inadequate existence of institutional arrangement, practicality of policies, laws, rules and procedures of challenges associated with the present condition of SW collection, storage, transportation and disposal, action oriented approach is employed to address the research problems. The reuse or recycling of SW as a source of income and benefits are not well understood and deep rooted in the community. So that it is found at lower level of utilization in the urban community. This in turn made the management of SW problematic at different levels of processing until disposal site and its compaction. Consequently the inadequate management of SW results in environmental degradation and human health risk.

These problems can be minimized and resolved only when SWM stakeholders/actors of responsible bodies are coordinately participate upon it in planning, implementing, monitoring, deciding and arriving at common consensus on SWM; especially the community participation is

the basic and core to reduce from its source, reuse or recycling of SW; in addition to the government effort.

On the other hand the research findings observed that there is no waste separation activity around HHs. This indicates that in addition to no reuse and recycling, different types of wastes storage and disposal at the same place without necessary precaution measure taken exacerbates the degradation, pollution and health problem on the environment and human beings through intake mechanism (as food, air, etc).

However, the financial contribution made by community alone not covers the management of SW generation increase from time to time. So the indicated insufficient human resource and budget allocation through the government/municipality observed has to be improved and the awareness creating activity to the society has to be strengthen.

The study also indicates that the major problems aggravating HH level solid waste management in the town which includes: lack of institutional coordination, insufficient and unskilled man power, very low financial capacity, weak enforcement of rules and regulations, socio-cultural factors and lack of awareness among the community.

5.3. Recommendations

5.3.1 To municipality/government

Improving the standards of SWM system will have a great effect on the issue of environmental protection. Therefore the city needs proper organizational structure that enables to manage SW and attain clean environment that suites to live in. This can be achieved only if sufficient skilled man power and adequate budget and material allocated to it. Therefore, assignment of skilled man power and enough budget is the fundamental factors that affects management of SW in Yeka subcity.

In addition to the above fundamentals the enforcement of the existing policies, rules and regulations to act as desired is the one side role of the government and municipality. Besides to this, the participating role of community in planning, acting, decision making, awareness

creation and training are the activities that should be done by this responsible body. Especially the activities of training and awareness creation are the main tools to reduce SW from its source and strengthen the reuse and recycling of SW. Through continues monitoring and evaluation, the effective remedy measure must be taken.

One of the basic obstacles to proper solid waste management in the city was inefficiency and inaccessibility of storages. Therefore, the municipality should establish additional disposal containers in every 500 to 1000 m interval.

Many of the problems associated with municipal solid waste management practice in the town are related to the lack of adequate emphasis from the responsible body. Therefore, solid waste management in general requires policy priority and adequate budget allocation. The locals and municipals should prepare specified rules and regulations that focuses on local problems such as institutional issues about the town's municipal solid waste management services. Responsible bodies, stakeholder's participation and sustainable solid waste management options should strictly enforce these rules and regulations under close supervision and inter organizational linkage.

5.3.2 To Community

Even if the waste collection services are provided by the municipal authorities, user participation is essential regarding such factors as proper storage of HH waste, waste separation and placement of HH containers and discipline in the use of public collection. Therefore, the community has to stand safeguard to keep the surrounding clean. This must be the responsibility of each community member in controlling of the illegal waste dumping individual and enforcing to be penalized for his acts as well as provision of advice and education.

The separation, reuse and recycling of SW has economic benefit and source reduction of it. The source reduction also possesses many advantages for the community in economic, social, political aspects. Since the overall municipal solid waste management in the town was poor. Establishing municipal structural organizations at Woreda level to work to mobilize the community at large is essential.

It is clear that the practice of municipal solid waste management is a complex activity that involves collection, segregation, transportation and final disposal. It needs strong coordination among concerned institutions with a brief roles and responsibilities. So that the community has to develop awareness on SWM in order to benefit from the recommendations.

5.3.3 To Health Offices

The community has to be provided with adequate education and develop awareness how to handle its solid wastes at home and about the consequences of disposing solid wastes everywhere illegally, and not placing of solid wastes into the disposal sites properly.

The improper management of SW in the urban environment creates an environmental degradation and disturbance of ecosystem. Human health risk fall under this influence of SW generated diseases. Therefore, it is the responsibility of health sectors to control and avoid means of disease transmission and eliminating from the source. To do so the health sector should form strong bond with community on the basis of close relation to reduce the SW generated and improve its management through effective planned approach.

5.3.4 Direction for Future Work

There are problems in in-house solid waste management system both in areal coverage and the depth of the study. This study is limited to Yeka sub-city Woreda 05 only. It would be good if the problems of solid waste management systems are deeply studied in all the sub-cities so that there would be a good project system that can be efficiently developed for efficient waste disposal system of Addis Ababa.

Effective solid waste management is an important component of public service provisions that should be given more attention, but it is not adequately recognized and has been ignored in almost all parts of Addis Ababa. Investigation of the existing management practices should be studied very deeply starting from the structure. Since they are influential bodies if proper organizational structure is implemented it would be important to gain understanding of the

challenges and issues involved in municipal solid waste management and give solution soon. This needs to be studied. Immediately after every problem is studied it would be better a project is planned, analyzed and executed by the concerned body.

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APPENDIX

APPENDIX A: QUESTIONNAIRE

ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
DEPARTMENT OF PROJECT MANAGEMENT

Dear Sir/Madam,

This is a research work being undertaken aiming to assess the nature and level of effectiveness of households' practices, challenges and prospects of in-house solid waste management in Yeka sub city. This work will be for the Partial fulfillment of the Requirements for the Award of Master's degree in project management in Addis Ababa University. It focuses on assessing the solid waste management of Yeka sub city in Addis Ababa. Any information given will be kept confidential.

Thank you for your co-operation.

<u>Part I</u> Questions concerning the Demographic and socio Economic profile of the respondents (Please, put "X" at the appropriate response of space provide)

1. Sex: □ Male □ Female

2. Age: □ below 20 □ 20-30 □ 31-40 □ 41-50 □ 51-60 □ 61 and above

3. Marital Status: □ Married □Single □ Widowed □ Divorced □ Other

4. Monthly average HH (household) income in birr. □ 1,000 and less □ 1,001 to 2,000

□2,001 – 3,000 □ 3,001 – 4,000 □ 4,001 – 5,000 □5,001 and above

5. Family size: □ 1 to 3 □ 4 – 6 □ 7 – 9 □ 10 and above

6. Educational status: □ Cannot read & write □ Can read & write only □ (1-8)
□ (9-10/12) □ Certificate (10/12+1) □ Diploma □ Degree □ Above degree

7. Employment condition: □ Private sector □ Self-employee □ Government (Public) □ Unemployed

Questions related to nature and magnitude of the solid waste management problem in Yeka sub-city.

Nature:

1. Types of wastes produced and reused in your HH: □ Organic or food wastes
   □ Paper, wood and plastics □ Tin cans and bottles □ Others
2. Do you have waste storage for your daily generated wastes? □ Yes □ No
3. How do you put your daily solid wastes? □ All together □ Separated
4. Which of the following solid waste storage system is used in your HH? □ local basket
   □ Sacks (Madaberia) □ Plastic bag □ Plastic bucket □ Pill or Pit
5. For how long the HH waste stayed without picking? □ 2 days □ 3 days
   □ 5 days □ A week □ more than a week

Magnitude:-

6. How do you evaluate the problem of solid waste in your town? □ Very high □High □ Moderate □ Little □ No problem
7. How much kilogram SW per month do you generate? □ 0-2 □3-4 □ 5-6 □ 7-8 □ 9-10 □ Above 10
8. How much of SW generated from your HH did you use it (Reuse and recycling)? □ Almost all □ ¾ of it □ Half of it □ Quarter of it □ Very small □ none of it
9. How much birr did you pay for SWM per month? □ Below 5 □ 6-10 □ 11-15 □ 16-20 □ Above 20 birr □ No payment
10. Which disposal system do you use around your residence? (Ranking them in their sequential order in a box: □ Burning □ in River (ditch) □ Burying □ Open space □Left for collection □ Other, specify

Questions related to the degree to which the town administration is organized and capable of carrying out effective SWM.

11. How do you evaluate your Kebeles' service provision in SWM system? □ Very good (4) □ Good (3) □ Fair (2) □ Poor (1) □ None (0)
12. Do you have local rules and regulation concerning SWM with your neighborhoods? □ Yes □ No
13. If your answer for question 12 is 'Yes' how is it's practicality? □ Very strong □Strong □ Moderate □ Weak □ Not practical
14. Is there rules and regulations concerning SWM in municipality and government level? □ Yes □ No
15. If your response for your question No 14 above is 'yes' how do you evaluate its application level? □ Very strong □Strong□ Moderate □ Weak □ Not to mention□ Completely no

Questions Related To Practice

To what extent and area of activities below is your HH doing in SWM activities. (Indicate by making 'X' at available level).

	Extent of Participation					
	Very strongly (5)	**Strongly (4)**	**Averagely (3)**	**Poorly/weakly (2)**	**Almost No participation (1)**	**Not at all**
I collect waste from the beginning / source						
I properly store all the wastes in home.						
I recycle and reuse the solid waste from my home						
I burn the waste from my home						
I bury the waste from my home						
I transport and dump the stored waste myself						

16. How do you evaluate your HH contribution in SWM in the following aspects. (Make 'X' at the level you agree)

Area of contribution (participation)	Degree of contribution agreement					
	Very high (5)	**High(4)**	**Moderate(3)**	**Less(2)**	**Least(1)**	**No participation**
I have contributed financially						
I have contributed materials use for SWM						
I have contributed labor						
I have given consultation						
I participate in awareness creation						

Questions related to the main policy and socio-cultural as well as economic factors that constrain the effectiveness of community participation in SWM in Yeka sub-city.

17. How far does the transfer station (SW container) from your HH in meter?

□ Below 100 □ 100-200 □ 201-300 □ 301-400

□ 401-500 □ 501-600 □ Above 600

18. Tick under your choice of degree of agreement in the table below about factors affecting effective solid waste management in your area.

Factors	**Factors level**				
	Very strongly (4)	**Strongly (3)**	**Average (2)**	**Less influence(1)**	**No influence(0)**
Poor coordination					
Lack of awareness					
Financial shortage/economic poorness					
lack of rules and regulations					
Lack of initiative					
Unreliable service					
Others					

19. How is waste managed in your house? □ properly Managed □ improperly managed

20. To raise community based SWM what action should be taken? Rank them in assigning numbers for the best means 1, to the next better 2, and so on including what you assume as a means out of those below:

□ Including awareness creation □ Reusing the existing policy and regulation,

□ Transferring totally SWM to informal social organization, □ Taking punitive action,

□ Designing new rules and regulation in participating of community, □ Creation means of incentive, □ Increasing governmental support in finance, materials and human resources,

□ Other

APPENDIX B: INTERVIEW GUIDE

1. How much Kg of SW is generated per month from Yeka subcity?
2. How much of SW generated from the town per month is reused, recycling, disposed in kg?
3. In what mechanism is the SW generated from the town collected, separated, transported and disposed.
4. How much budget allotted to town SWM in this year (2008)?
5. What types of equipment are used to transport SW from HH to transfer stations land fill site? Who cover the cost of it?
6. How do you evaluate the subcity community participation in SWM?
   a. Extremely high ☐ b. Very high ☐ c. good☐ d. fair ☐ e. No ☐
7. In which types of SWM activities do the Community Participate? (Collection, storage, recycling, reusing, transporting, financing, other)?
8. How many transfer stations for SW exist in the town? How much distance are they apart?
9. In how many days the HH waste collected?
10. Do community have rules and regulation locally in SWM? If there exist to what extent it is practical?
11. To what extent do communities participate in SWM activity?
12. Do you have training program in SWM? How many people are trained? For how long?
13. What problems exist concerning the SW container and transfer site?
14. What are the main problems concerning SWM?
15. What are the factors that negatively affect community participation?
16. What effective measures should be undertaken to raise community participation in SWM?

□□ □□□ □□□ □□□ □□□□□□ □/□□ □□□□□ □□□□

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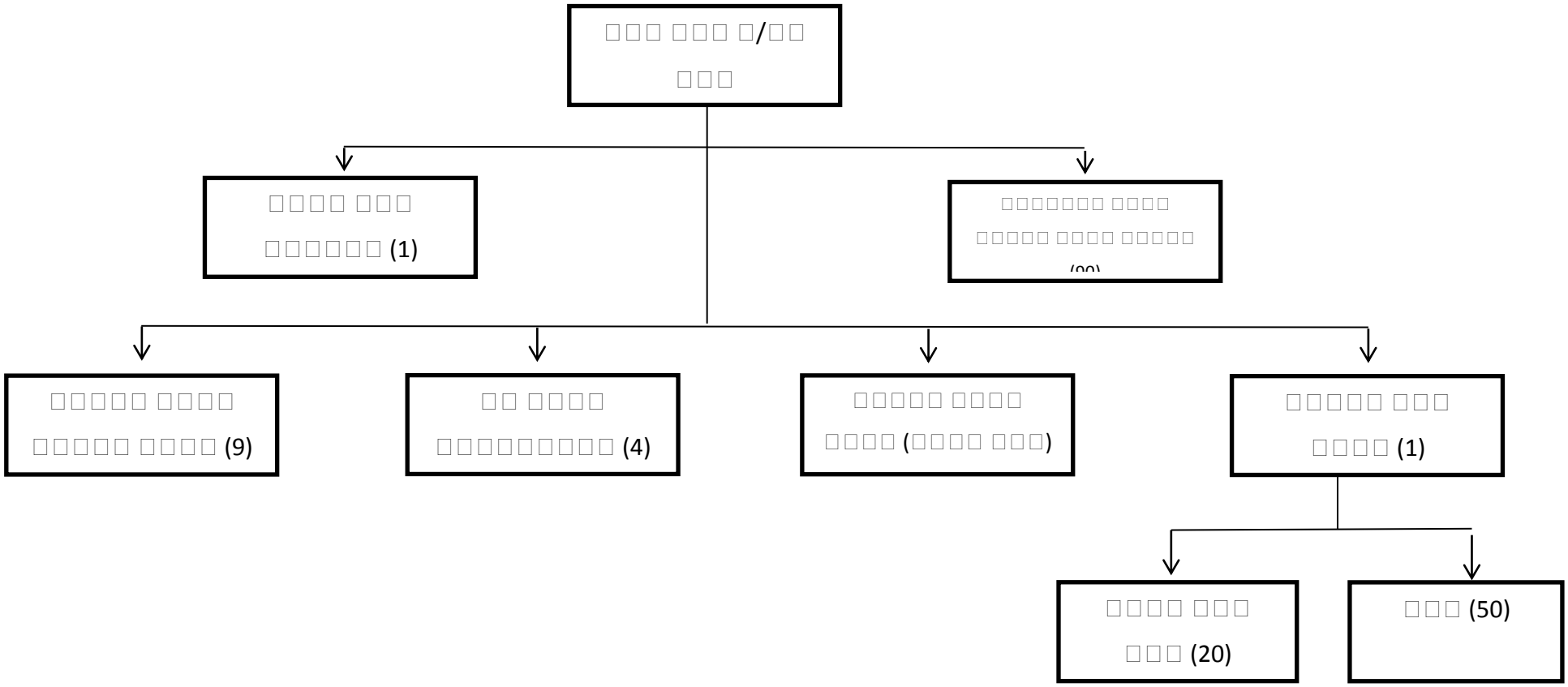

Source: Yeka subcity administration (June 2017)