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College of Development Studies

Center for Environmental & Sustainable Development

Assessment of Solid Waste Management Practices in Addis Ababa;
Ethiopia

The Case of Three Selected Condominium Sites in Yeka Sub city

By: Abemelek Besha

November, 2019
Addis Ababa, Ethiopia

Addis Ababa University

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Development of Addis Ababa University in Partial Fulfillment of the
Requirements for the Degree of Master of Arts in Environment and
Sustainable Development

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Addis Ababa,
November, 2019

DECLARATION

I declare that this Thesis is my original work and has not been presented for a degree in any other university and that all source materials used for the Thesis have been acknowledged thoroughly.

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Abemelek Besha

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Abstract

The general objective of this study was to assess the solid waste management practices in Addis Ababa, specifically in three selected condominium housing sites in Yeka sub city. The study tried to identify the main causes for the ineffectiveness of solid waste management. The study used mixed-method approach. For a quantitative method a structured close ended questionnaire was used and for the qualitative method, key informant in-depth interviews and field observation were conducted to collect the data for this study. A multi staged sampling was used to select the sample households from the three selected condominium sites for the study. From the ten sub cities in Addis Ababa Yeka sub city was purposely selected then Yeka Abado, Yeka Ayat 1 and Yeka Ayat 2 condominium housing sites were again purposely selected. After that 80, 60 and 60 households were randomly selected from Yeka Abado, Yeka Ayat 1 and Yeka Ayat 2 condominium housing sites respectively. Simple random sampling was used to select 4 solid waste management experts and 6 solid waste collection workers for the key informant in-depth interview. Addis Ababa, the capital of Ethiopia, is suffering from lack of effective solid waste management. Condominium housing is a new phenomenon in Addis Ababa in particular and in Ethiopia in general, it is being widely applicable, and large number of condominium houses are currently under construction. Primary data were collected via questionnaires, interview, and field observations. Whereas the secondary data were extracted from different published and unpublished materials. Both primary and secondary sources were used to achieve the objectives. The analysis of this study was carried out using both qualitative and quantitative techniques. The result of the study revealed that the factors contributing to the ineffectiveness of solid waste management basically rely on three major causes: lack of awareness and training based on a study, lack of law enforcement and lack of resource and man power.

Key words: Solid waste, solid waste management, household, condominium housing

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Abbreviations

Addis Ababa - City Administration (AACCA)	
AACG-HCP - Addis Ababa City Government- Housing Construction Project	
AACSBPDA - Addis Ababa Sanitation, Beautification and Parks Development Agency	
CCWL - City & Country Waste Limited	
EU - European Union	
FDRE - Federal Democratic Republic of Ethiopia	
MSSEs - Micro-Small-scale Enterprises	
NCC - Nairobi City Council	
NGO - Non-governmental Organization	
3R - Reduction, Reuse and Recycle	
SWM - Solid Waste Management	
UNDP - United Nations Development Program	
UNEP - United Nations Environmental Program	
UPSBB - Urban Planning, Sanitation and Beautification Bureau	

CHAPTER ONE

1. Introduction

1.1 Background of the study

Almost all human activities produce waste in some way or another. A proper management of the waste insures better health and promotes modern living. Solid waste management is a serious challenge faced by many African cities today. Most cities are unable to manage the alarming increase in volumes of solid waste due to rapid urbanization and population growth. As a result, poor urban environment, poor public health and illegal dumps are evident in the major cities of Africa. In lower-income countries such as Ethiopia, an estimated of 30 to 50% solid waste produced in urban areas is left uncollected according to Urban Planning, Sanitation and Beautification Bureau (UPSBB, 2012). The ever increasing amount of solid waste (SW) generated which is exacerbated by lack of proper waste management system is of growing concern worldwide and in major cities in developing countries due to its social, economic and environmental implications.

Ethiopia is facing rapid urbanization per annum, leading to overcrowding and the development of slums and informal settlements with poor waste management practices. Urban dwellers generally consume more resources than rural dwellers, and so generate large quantities of solid waste and sewage (Tewodros F., 2011). The consequence is that many towns and urban settlements, drainage channels and roads are highly littered. Some people especially in crowded high density areas do not have access to garbage disposal skips and while private collectors are too expensive for these poor households hence forced to practice indiscriminately dispose of garbage in drainage channels, road sides and abandoned buildings.

The rapid and constant growth of urban population has led to a dramatic increase in urban waste generation, with a crucial socio-economic and

environmental impact. Basically, municipalities are giving preferences only on the collection of the waste and dumping it, while the principle of 3R's (waste reduction, reuse and recycle), are not prioritized by the municipalities for a sustainable solid waste management. Increasing public awareness to the necessity of clean environment for good health, at both local and national governments are facing public pressure to the proper management of the municipal waste (Solomon, 2011).

Solid Waste Management in Ethiopia is generally in a poor state. For example, the collection services are often inefficient and don't cover all areas. In general, the unauthorized and most of the authorized dump sites are poorly managed causing significant environmental impacts (Urban Planning, Sanitation and Beautification Bureau, 2012). In general, clean and healthy living conditions in cities and towns cannot be achieved without reliable and regular waste collection and adequate disposal systems.

1.2 Elements of Solid Waste Management System

1. **Waste generation:** refers to activities involved in identifying materials which are no longer usable and are either gathered for systematic disposal or thrown away.
2. **Onsite handling, storage, and processing:** are the activities at the point of waste generation which facilitate easier collection. For example, waste bins are placed at the sites which generate sufficient waste.
3. **Waste collection:** a crucial phase of waste management includes activities such as placing waste collection bins, collecting waste from those bins and accumulating trash in the location where the collection vehicles are emptied. Although the collection phase involves transportation, this is typically not the main stage of waste transportation.

4. **Waste transfer and transport:** are the activities involved in moving waste from the local waste collection locations to the regional waste disposal site in large waste transport vehicles.
5. **Waste processing and recovery:** refer to the facilities, equipment, and techniques employed both to recover reusable or recyclable materials from the waste stream and to improve the effectiveness of other functional elements of waste management.
6. **Disposal:** is the final stage of waste management. It involves the activities aimed at the systematic disposal of waste materials in locations such as landfills or waste-to-energy facilities.

1.3 Statement of the problem

Most human activities certainly result in the generation of waste which tends to increase with rapid urbanization, improved living standards and changing consumption patterns. In addition, the diverse sources of solid waste (SW) generation and the complex nature of its composition make it difficult to manage. As a result, governments and municipalities are facing considerable difficulties to provide adequate solid waste management (SWM) services. Solid waste management remains a serious problem in most of less developed nations, while it consumes a larger portion of municipal budgets (Kassahun Tassie, 2018). This problem is expected to become more evident as urbanization continues to expand in future. In general, the current SWM practice in Addis Ababa couldn't cope with the fast urbanizing needs of the city. There is a need to address the issues. The current condition of SWM in Addis Ababa lacks integrated waste management approach and the systems are not all so effective that wastes are often improperly disposed in undesignated sites. This is mostly attributed to the rapid population growth coupled with unplanned urban expansion and financial scarcity to proper waste management (Hayal Hailu, 2014).

Despite being newly built condominium sites, the three condominium housing sites namely Yeka Abado, Yeka Ayat 1 and 2 lack proper solid waste management system. Walking through the streets of Yeka Abado condominium site, one can observe solid wastes collected here and there, looking unpleasant for the passerby. The problem is also evident in Yeka Ayat 1 and 2 condominium sites. Micro and small enterprises have been set up by the sub city to carry out waste collection service, to collect waste and transport to the municipal waste containers, and help to fill the created gaps in collecting and transporting wastes. However, the collection of the solid waste is becoming beyond the capacity of the enterprises.

1.4 Research Questions

- ❖ What is the current condition of SWMS in the three condominium housing sites?
- ❖ What are the strengths and weaknesses of the current solid waste collection and transportation practice from the three condominium housing sites?
- ❖ What are the main impacts of poor solid waste management?
- ❖ Which factors influence to the ineffectiveness of solid waste management practice in the three condominium housing sites?

1.5 Objective of the study

The general Objective of the study was to assess the current SWM practices among the three condominium sites in Addis Ababa.

Specific Objectives

The specific objective of the study is to:

- ❖ assess the solid waste management practices of households in the three condominium sites.
- ❖ Assess the awareness of the community regarding solid waste.

- ❖ assess present institutional arrangement and capacity of solid waste management in the three condominium sites.
- ❖ identify the major problems hindering the SWM from being effective

1.6 Significance of the Study

Though Condominium housing is a new phenomenon in Addis Ababa in particular and in Ethiopia in general, it is being widely applicable, and large number of condominium houses are under construction. The study will clearly show the current feature of SWM in the three condominium sites, point out challenges affecting its effectiveness and recommend feasible solutions to improve the current SWM system. This is expected to contribute some input to the city administrations endeavor to improve SWM system other NGOs working in this area.

1.7 Limitation of the Study

The study will be limited to the three condominium sites in Addis Ababa due to time and resource constraints. Because of the apartment living nature of condominium houses, the study may not apply to other forms of housing schemes.

CHAPTER TWO

2. Literature Review

2.1 What is Solid Waste?

Solid waste may be defined as solid or semi-solid materials resulting from human and animal activities that are useless, unwanted, or hazardous (Purohit et al., 2006). Similarly, solid waste means any garbage, refuse, sludge, and other discarded solid materials, including solid waste materials resulting from industrial, commercial, and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluents, dissolved materials in irrigation return flows or other common water pollutants (U.S. Code of Federal Regulations, 1995 :243).

In Ethiopia according to the Federal Democratic Republic of Ethiopia proclamation No. 513/2007 Solid Waste Management Proclamation “Solid Waste” means anything that is neither liquid nor gas and is discarded as unwanted. These could be refuses from residential, commercial, or any institutes as yard sweeping, food remains, ash and chat leftover, saw dust, piece of wood papers, glasses, metals, batteries, plastic, grass, and vegetables, bone of animals, dead animals and other materials that cause poor environmental situation.

2.2 Solid Waste Management in Europe

Public authorities carry the main responsibility for the municipal waste management. The services are either delivered directly through the municipal departments or through municipally owned waste management companies, or indirectly through outsourcing to private providers. All EU Member States employ a combination of direct and indirect waste service delivery. However, a

few country specific tendencies can be identified. For example, the collection and transport of municipal waste management the direct service delivery or through a municipally owned management company is common in Germany and Italy. In Germany a further trend towards public ownership can be observed in recent years as more and more local authorities municipalized their waste collection services. In Poland, Romania, Spain, Sweden and the United Kingdom outsourcing the collection and transport of municipal waste to a private provider is far more common Vera Weghmann, (2017).

In the treatment and disposal phase of municipal waste management Italy, Germany and Sweden have a slightly higher share of direct delivery in comparison to outsourced services. In Poland, Romania, Spain and the United Kingdom these services were mostly subcontracted to private companies. In general, private participation was more prevalent in the collection and transport phase than in the treatment phase. Contrary to the commonly held assumption that privatization increases efficiency, several econometric and empirical studies on efficiency and privatization in waste management have found no systematic evidence to support a difference in costs between public and private provision. An overview of the different international and national studies on waste management that show that public waste management either performed as well as or better than private waste management can be found in a PSIRU report on public and private sector efficiency Vera Weghmann, (2017).

It is unsustainable that large amount of materials are buried, dumped out at sea or turned into ash, polluting the environment and creating the need for the extraction of further raw materials. The circular economy promises to overcome that. Instead of disposing materials that are no longer useful, it aims to re-use the existing resources. The trend is to see waste no longer as a problem but as a resource. Hence, the circular economy has not only become a popular policy tool but also a lucrative business opportunity for multinational companies. Companies can profit twice: by disposing the waste and by re-selling it for

further re-use. Treating waste as wealth translates into a scramble for resources in the waste sector Vera Weghmann, (2017).

While the circular economy provides an opportunity to make Europe more sustainable it also bears the danger of stimulating the creation of ever more, rather than less, waste. Re-use and recycling provide the perfect excuses to stimulate consumption. However, the European Circular Economy agenda not only includes proposals for recycling, repair and re-use. It also emphasizes waste reduction. But the measures to prevent waste are very limited and usually do not go beyond consumer education.

Europe's transition into a circular economy will significantly change the labor market. The circular economy has implications that go well beyond the traditional waste sector. It promises the creation of green jobs. But the conditions of these jobs are seldom discussed. The European circular economy package lacks concrete proposals to protect workers in the circular economy from low-skilled and low-wage employment and poor health and safety standards. Vera Weghmann, (2017).

2.3 Solid Waste Management in Africa

Waste management problems in Africa are varied and complex with infrastructure, political, technical, social/economic, and organizational/management, regulatory and legal issues and challenges to be addressed. Waste is typically disposed off without consideration for environmental and human health impacts, leading to its accumulation in cities, towns and uncontrolled dump sites. Co-disposal of non-hazardous and hazardous waste without segregation is common practice. Municipal Solid Waste (MSW) management has continually been an intractable problem in recent times beyond the capacity of most municipal/state governments.

This has resulted in refuse heaps being dumped in the urban landscape in heavily populated cities as typically only about 40 to 50% of waste is reportedly being collected (Mwesigye et.al, 2009).

Containers overflow with garbage and rain cause streets to flood as a result of the uncollected waste clogging the drainage channels (Davas & Rakodi, 1993). The insufficient handling of solid waste represents a source of water, land and air pollution affecting the urban environment and the health of the people living in the cities and is one of the most critical environmental problems that cities in Africa are facing today. The current capacity of most solid waste management systems in Africa is inadequate and too slow to meet the increasing demand of the solid waste generated (Bjerkli, 2005).

2.3.1 Cairo, Egypt

In Egypt approximately 10 to 15 million tons of solid waste is generated annually with Cairo alone contributing more than 3 million tons. Waste collection and transportation efficiency ranges between 15% and 65%. Approximately one third of solid waste is not collected. Waste management services have already being privatized in some Egyptian cities. Currently, tenders for integrated solid waste management systems have been launched or are in the pipeline. Already, the Governorate of Alexandria has awarded a 15-year contract to the French firm ONYX Vivendi (African Development Bank, 2002).

The Governorate of Cairo is divided into four districts and waste management tender documents have been issued for each of the areas. Cairo has well developed, modern composting plants established by the government and rented out to the private sector. There are less than 10 composting plants in Cairo and 25 plants nationwide. Composting plants, designed and equipped by Egyptian companies, have a chance to become a model for other African countries as a result of their modern design, low cost, high efficiency and satisfactory operation records (African Development Bank, 2002).

Identified gaps and weaknesses of waste management in Cairo includes:

- Lack of alternative mechanisms for collection of service charges;
- The important role of local companies, NGOs and the informal sector (the Zabbaleen) has not been recognized by the municipal and national governments;
- There is a need for implementation of a long-term and focused sanitation awareness campaign and education in the waste management area; and
- Engineered landfills do not exist at this time.

2.3.2 Nairobi, Kenya

The current daily rate of solid waste generation in Nairobi is in the range from 800 to 1000 tons. Daily disposal capacity of the Nairobi City Council (the municipality), which is in charge of waste collection, is about 400 tonnes. Waste collected by the municipality on a regular basis amounts to one third and periodic collection deals with the remaining two thirds of waste. Approximately 70% to 80% of solid waste remains uncollected. The Nairobi City Council (NCC) operates 15 to 19 waste collection vehicles daily. There is a high vehicle immobility rate, up to 70%, due to shortage of spare parts and an insufficient operating budget. The municipal staff carries out manual street sweeping (African Development Bank, 2002).

Mechanical street sweeping is not offered at this time. The private sector is involved in waste collection and disposal in Nairobi. Approximately 50 tons of municipal solid waste is removed daily by such private operators as BINS (Nairobi) Services Limited and Kenya Refuse Handlers. The companies generate income from collection fees and contracts with the NCC (African Development Bank, 2002).

Solid waste recovery and recycling is carried out by many of Nairobi's poor who engage in waste picking as a means of income generation. The estimated

quantity of recovered and recycled items ranges from 20 to 30 tons per day. The NCC does not operate any transfer station or composting plant where commercial waste recovery / recycling could be implemented. All solid waste, except medical refuse, is disposed at the Dandora dumpsite. The site is managed by the NCC and is provided with heavy equipment to manage waste disposal. The Dandora site is not fenced and is therefore accessible to scavengers, recovery operators and cattle growers. Waste cover is not implemented and neither is landfill gas recovery or flaring (African Development Bank, 2002).

Several community based organizations and non-government organizations in Nairobi's low-income areas were found to be undertaking composting as an income generating and environmental management strategy. In cooperation with the UNDP, the Dandora Kuku Womens Group runs compost-making operations. They produce up to 10 tons of compost per year and sell it mainly to urban farmers within the City of Nairobi. Waste management stakeholders in Nairobi include various NGOs, CBOs, the private sector, the NCC, the Department of Environment and its Cleansing Section, the Ministry of the Environment and Natural Resources, and the Ministry of Local Government (African Development Bank, 2002).

To improve waste management practices in Nairobi, the Ministry of Local Government has identified the following priority projects:

- Institutional reconstructing and financial reform;
- Introduction of container system with side loaders, dump trucks, etc.;
- Construction of a new sanitary landfill site at Ruai (first stage) and closing the existing dumpsite;
- Construction of a new transfer station; and
- Implementation of the Community Waste Management Project.

2.3.3 Accra, Ghana

The average waste quantity generated in Accra in the year 1999 was 1,500 tons per day. Approximately 200 tons of organic waste was directed into Accra's composting plant and 300 tons was left uncollected. The remaining 1,000 tons was transferred to the Malami dumpsite. Solid waste collection and disposal in Accra is in the hands of one company, City & Country Waste Limited (CCWL). In 1999, Accra Municipal Assembly (AMA) awarded exclusive rights for waste management to CCWL, initially for five years, with the possibility of a further five year extension. CCWL subcontracted services to 11 private operators. Malami is Accra's regional dumpsite which is supervised, well maintained and organized (African Development Bank, 2002).

About 20 employees of CCWL maintain the site, supervise refused is charge from trucks and the compacting process, organize scavenging activities for up to 50 waste pickers and control vehicle movement. The site will be covered by earth and closed in the near future. An efficient and well managed Malami dumpsite could be used as a demonstration site for landfill/dumpsite managers from other West African countries. The new, properly designed and constructed landfill will be commissioned prior to the closure of the Malami dumpsite. The new landfill is designed for up to 15 years of operation (African Development Bank, 2002).

A number of private waste management companies are registered in Accra. They would like to have better access to waste removal services and are apprehensive with the exclusive rights of refuse collection given by AMA to CCWL. There is an old composting plant in Accra with the processing capacity of 300 tons per day. Because of a limited market demand for compost and deteriorating equipment, the plant is not operating at its full capacity (African Development Bank, 2002).

No significant waste recovery and reuse activities exist in Accra. Waste pickers are involved in a small-scale recovery and reuse operation. The problem in

introducing small-scale resource recovery modules that can contribute to sustainable waste management systems is more a matter of perception than of technology. It requires interdisciplinary co-operation at several levels among various actors, such as municipal and national governments, non-governmental initiators, community representatives, and so on. To improve waste management in Accra, the National Environmental Sanitation Policy was prepared by the Ministry for Local Government and Rural Development and approved by the Cabinet on April 8, 1999 (African Development Bank, 2002).

By adopting the strategic objectives for environmental sanitation it is expected that by the year 2020, all solid waste generated in urban areas will be regularly collected and disposed of in adequately controlled landfills or by other environmentally acceptable means. Waste collection in Tema (near Accra) is organized within the Urban IV Project financed by the World Bank. In contrary to waste management in Accra, contract awards to the private sector are transparent and executed in an open-bidding process. However, the dumpsite serving Tema is not as well organized and maintained as the one in Accra. As well, maintenance and repair of the waste handling equipment (including trucks) by the Tema Waste Management Department is inferior to the CCWL operations (African Development Bank, 2002).

2.4 Solid waste management in Ethiopia

Sustainability of solid waste management is one of the top priorities on the agenda of urban administrations. Municipalities in developing countries are incapable of meeting the demand for urban services. Collecting and managing solid and human waste is an important challenge for countries across the world. This problem is often magnified in cities where a dense concentration of people leads to a substantial amount of waste generation (Zerbock, 2003).

In developing countries like Ethiopia, this problem is exacerbated by an influx of people moving to urban centers. Sustainability of cities in the developing

countries has become a big question and has rightly been placed as the focal point of the Sustainable Development Goals. Since the Rio Summit in 1992, the concept of sustainability extends to basic services such as solid waste management (SWM). Many municipalities in developing countries are incapable of meeting the demand for services, resulting in both direct and indirect negative effects. About 20% to 30% of the waste generated in Addis Ababa remained uncollected and made the city environment aesthetically unpleasant and affected the city's public health. Local initiatives play a key role in creating sustainable urban solid waste management (Tilay and van Dijk, 2014).

Countries with developing economies often experience exhaustive waste collection services that require large amount of human labor and less technology and inadequately managed and uncontrolled dumpsites. The problems are worsening. Problems with governance complicate the situation. Waste management in these countries and cities is an ongoing challenge due to weak institutions, chronic under-resourcing and rapid urbanization. All of these challenges, along with the lack of understanding of different factors that contribute to the hierarchy of waste management, affect the treatment of waste (Wikipedia).

2.5 Solid waste management in Addis Ababa

Addis Ababa is established in 1879 as a capital of Ethiopia. Despite its early establishment, the city started its SWM 71 years later after its establishment with the aim of ensuring the health of its residents. Yet, the city is still faced with a number of waste management problems. Addis Ababa city started its solid waste management some three decades back. The service cannot meet changing demands. The waste collection service is unsatisfactory, and scenes of scattered waste are common in most part of the city (UNDP 2004).

Currently in Addis Ababa, solid waste is increasing beyond the management capacity of the municipality, the volume of waste totals more than three million cubic meters per year with the prospect of increase by a constant rate of 2.1

cubic meters per person annually (Misrak Workneh, 2016). However, according to the Urban Planning, Sanitation and Beautification Bureau, an estimated of 30 to 50% of solid waste produced in urban areas is left uncollected.

The city government changed the system of solid waste management in 2005. It shifted the focus of waste collection, transportation and disposal activities towards government-affiliated cooperatives and micro-small-scale enterprises (MSSEs). Informal private collectors were now excluded, and this resulted in the systematic eviction of pre-existing informal enterprises from their established service areas (Zelalem 2006).

Part of the decision was politically driven, as the MSSEs and cooperatives provided an additional source of employment that the city government and the ruling party could use to distribute patronage to party members. Today, the majority of waste collection, transportation and disposal is carried out by these government-affiliated organizations together with the city, sub-city and district-level governments. The existing waste management system is rated inefficient and characterized by inappropriate collection, lack of provision of containers and collection trucks, illegal dumping, and unclear waste collection fees.

On the other hand, the reuse and recycle practice of waste at household level is too low. Only low income households exercise recycling activities because of economic reasons. Waste minimization as a principle is not really adhered to as there is no knowledge of and support for such a system at the household level (Tilay and van Dijk, 2014). Even though various studies and programs are undertaken to curtail the problem of solid waste management, the service still falls short of the required level (Yami Birke, 1999). Over the last few years, many micro and small enterprises have been set up to carry out waste pre-collection service, receiving payment either from the respective beneficiaries or municipalities to collect and transport waste to the municipal waste containers, and helps to fill the gaps in collecting and transporting wastes.

These enterprises represent a good starting point for building private sector participation and realizing the associated benefits.

There are some positive aspects of the existing system in Addis Ababa, such as informal recycling known as "Koralew", composting initiatives and in particular the introduction and expansion of private sector enterprises that carry out pre-collection service from households. These enterprises play an important role in improving waste collection and reducing unemployment at local and regional level (Urban Planning, Sanitation and Beautification Bureau, 2012).

2.6 Factors affecting Solid Waste Management in

Developing Countries

A typical solid waste management system in a developing country displays an array of problems, including low collection coverage and irregular collection services, open dumping and burning without air and water pollution control, the breeding of flies and vermin, and the handling and control of informal waste picking or scavenging activities. These public health, environmental, and management problems are caused by various factors which constrain the development of effective solid waste management systems (Ogawa, 1996). These factors, according to Ogawa, (1996), can be categorized into technical, financial experts, institutional, economic, and social constraints. As discussed below:

2.6.1 Human and Technical Constraints

In most developing countries, typically there is a lack of human resources at both the national and local levels with technical expertise necessary for solid waste management planning and operation. Many officers in charge of solid waste management, particularly at the local level, have little or no technical background or training in engineering or management. Without adequately trained personnel, a project initiated by external consultants could not be sustainable. Therefore, the development of human resources in the recipient

country of external support is essential for the sustainability of the collaborative project Zebenay Kassa (2010).

Another technical constraint in developing countries is the lack of overall plans or system for solid waste management at the local and national levels. As a result, a solid waste technology is often selected without due consideration to its appropriateness in the overall solid waste management system. In some cases, foreign assistance is given to a component of a solid waste management system for which the use of resources may not be most cost-effective. For instance, an external support agency provided its support to improve a general disposal site. However, the coverage of solid waste collection service is so low that solid waste generated is dumped at many undesignated sites (e.g., open areas, water channels, streets, etc.). As a result, improving the disposal site, although it may not be a bad project, would have little impact on the overall solid waste management effectiveness. In such a case, the low collection coverage is a bottleneck in the overall solid waste management system in the city, and it would be most cost -effective to provide resources to upgrade the collection service Tadesse kume (2004).

2.6.2 Institutional Constraints

Though the sub city is in charge of managing solid waste, several agencies at the national level are usually involved at least partially in solid waste management. However, there are often no clear roles/functions of the various national agencies defined in relation to solid waste management and also no single agency or committee designated to coordinate their projects and activities Solomon Cheru (2011). The lack of coordination among the relevant agencies often results in different agencies becoming the national counterpart to different external support agencies for different solid waste management collaborative projects without being aware of what other national agencies are doing. This leads to duplication of efforts, wasting of resources, and unsustainability of overall solid waste management programs.

The lack of effective legislation for solid waste management, which is a norm in most developing countries, is partially responsible for the roles/functions of the relevant national agencies not being clearly defined and the lack of coordination among them.

2.6.3 Economic Constraints

Economic and industrial development plays key roles in solid waste management. Obviously, an enhanced economy enables more funds to be allocated for solid waste management, providing a more sustainable financial basis. However, by definition, developing countries have weak economic bases and, hence, insufficient funds for sustainable development of solid waste management systems Takele Tadesse, (August 2004).

Local industry is producing relatively cheap solid waste equipment and vehicles, will reduce or in some cases could totally eliminate the need for importing expensive foreign equipment/vehicles and save foreign exchange. Such local industry can also supply associated spare parts, lack of which is often responsible for irregular and insufficient solid waste collection and disposal services. However, lack of manufacturing industry for solid waste management equipment and spare parts and a limited foreign exchange for importing such equipment/spare parts are the major problem in many of developing countries UNEP (2005).

Also in small developing countries, waste recycling activities are affected by the availability of industry to receive and process recycled materials. For instance, the recycling of waste paper is possible only when there is a paper mill within a distance for which the transportation of waste paper is economical. The weak industry base for recycling activities is a common constraint for the improvement of solid waste management in developing countries, such as those in the Pacific region where a large volume of package waste is generated Addis Ababa City Administration (AACCA), (2008).

In general, solid waste management is given a very low priority in developing countries, except perhaps in capital and large cities. As a result, very limited funds are provided to the solid waste management sector by the governments, and the levels of services required for protection of public health and the environment are not attained. The problem is acute at the local government level where the local taxation system is inadequately developed and, therefore, the financial basis for public services, including solid waste management, is weak. This weak financial basis of local governments can be supplemented by the collection of user service charges.

However, users' ability to pay for the services is very limited in poorer developing countries, and their willingness to pay for the services which are irregular and ineffective is not high either. An effective strategy for raising funds needs to be searched in any collaborative project to ensure its sustainability UNEP (2005).

In addition to the limited funds, many local governments in developing countries lack good financial management and planning. For instance, in a town in a developing country, over 90% of the annual budget provided for solid waste management was used up within the first six months. The lack of financial management and planning, particularly cost accounting, depletes the limited resources available for the sector even more quickly, and causes the solid waste management services to halt for some periods, thus losing the trust of service users.

2.6.4 Social Constraints

The social status of solid waste management workers is generally low in both developed and developing countries, but in developing countries like Ethiopia people look down on the workers involved in solid waste management. This owes much to a negative perception of people regarding the work which involves the handling of waste or unwanted material. Such people's perception

leads to the disrespect for the work and in turn produces low working ethics of and poor quality of their work Yami Birke, (1999).

Because of insufficient resources available in the government sector, collaborative projects often have attempted to mobilize community resources and develop community self-help activities. Results are a mixture of success and failures. Failed projects with inactive communities usually did not provide people in the community with economic as well as social incentives to participate in activities. The social incentive is based on the responsibility of individuals as part of the community for the improvement of the community, and is created by public awareness and school education programs. The lack of public awareness and school education about the importance of proper solid waste management for health and well-being of people severely restricts the use of community-based approaches in developing countries Bjerkli Camilla Louise (2014).

2.7 Impacts of Solid Waste

If solid wastes are not managed properly there are many negative impacts that may result. In order to give more emphasis for the management work, one must have a good understanding about the effects and risks that may arise from improperly managed solid wastes. The following are lists found to be the most important effects associated with uncontrolled solid wastes (AACG-HCP), (2013).

- Uncollected wastes cause blockage of drains, which result in flooding and unsanitary conditions,
- Flies and Mosquitoes breed in some constituents of solid wastes, and flies are very effective vectors that spread disease,
- Waste dumps are good shelter for rats. Rats consume and spoil food, spread disease, damage electrical cables and other materials,

- Uncollected wastes degrade the urban environment, discouraging efforts to keep the streets and open places in a clean and attractive conditions,
- Dangerous items (such as broken glass, razor blades, needles and other healthcare wastes, aerosol cans and potentially explosive containers) may pose risks of injury or poisoning, particularly to children and people who sort through waste,
- Waste items that are recycled without being cleaned effectively or sterilized can transmit infection to later users,
- Polluted water (leachate) flowing from waste dumps and disposal sites can cause serious pollution of water supplies.
- Waste that is treated or disposed of in unsatisfactory ways can cause a severe aesthetic nuisance in terms of smell and appearance.
- Fires on disposal sites can cause major air pollution, causing illness and reducing visibility, making disposal sites dangerously unstable, causing explosions of cans, and possibly spreading to adjacent property and etc. (AACG-HCP), (2013).

As described by Tchobanoglous et al 1977, public health, aesthetic and ecological concerns are the major impacts associated with the solid waste generation.

2.7.1 Public health concerns

The concerns of public health are related primarily to the infestation of areas used for the storage of solid wastes with mice and insects that often serve as potential reservoirs of disease. The practice of throwing wastes into unpaved streets, road ways and vacant land led to the breeding of rats, with their attendant fleas carrying the germs of disease that result in disease outbreak Addis Ababa City Sanitation, Beautification and Park Development Agency (2003).

The lack of any plan for the management of solid wastes led to the epidemic of various diseases. The most effective control measure for both fleas and rats is proper sanitation. This involves the use of containers with tight lids, the periodic washing of containers, storage areas and periodic removal of biodegradable materials, which is especially important in areas with warm climates.

2.7.2 Aesthetic concerns

Aesthetic considerations are related to the production of odor and the unsightly conditions that can develop when adequate attention is not given to the maintenance of sanitary conditions. Most of the odor can be controlled through the use of containers with tight covers and with the maintenance of a reasonable collection frequency. If odor persists, the container can be sprayed as a temporary expedient. To maintain aesthetic conditions the container should be scrubbed and washed periodically Addis Ababa City Sanitation, Beautification and Park Development Agency (2003).

2.7.3 Ecological Concerns

Ecological impacts, such as water and air pollutions, also have been attributed to improper management of solid wastes. For instance, leachate from dumps and poorly engineered landfills contaminate surface waters and ground waters as it may contain toxic elements such as copper, arsenic etc.

2.8 Sources and Components of Solid Waste

Knowledge on the sources and types of solid wastes, along with data on the composition and rates of generation, is basic for the design and operation of the functional elements associated with the management of solid wastes. Solid waste streams should be characterized by their source, type of waste produced as well as by generation rates and composition (Eliasssen and Tchobanoglous et al., 1977).

The materials that are collected under the term solid waste include many different substances from a multitude of sources. The sources of solid wastes are dependent on the socioeconomic and technological levels of a society. A small rural community may have known types of solid wastes from known sources (i.e. the wastes are more homogeneous). Wastes from industrial and mining areas are also more homogeneous. Urban communities (metropolitan cities) have many sources (The wastes are more heterogeneous) (Takele Tadesse, 2004).

According to the city government of Addis Ababa Sanitation, Beautification and Parks Development Agency (AACSBPDA, 2003); the sources of solid waste are: house holds 76%, institutional /Commercial, factories, hotels and health centers, 18% and 6% from street 8 sweeping. Another study states that from the total waste generated in the city, 71% by households 10% street, 6% industries, 9% commercial centers and institutions, 3% hotels and 1% hospitals (Tadesse kuma, 2004).

Accurate information on the sources, types and compositions of waste is necessary in order to monitor and control existing waste management systems and make regulatory, financial and institutional decisions (AMPRP, 2004).

2.9 Basics of Solid Waste Management System

The basis of modern waste management is to maximize environmentally sound waste diversion to minimize the quantity of municipal solid waste and associated/ compatible waste) disposed to landfill. This is accomplished by reducing the quantity of waste initially produced; and diverting waste material to beneficial reuse, recycling, composting or energy production. Engineered lined landfill systems are constructed to contain the residual waste material in an environmentally secure manner.

The standards address the siting, design, construction, operation, and decommissioning of waste management facilities, to substantially reduce and mitigate adverse environmental impacts associated with management of waste material. These impacts may include: dust, odor or impaired air quality, noise, unsightly conditions, litter, nuisance vectors, rodents, leachate and surface water run-off; and hazardous materials spills, explosions or fire. Effective operations management and good housekeeping practices are always required, in addition to properly trained staff, and current Operations Management/Maintenance manuals/plans, and Environmental Health and Safety Contingency Plans UNEP (2005).

Innovative planning and design is encouraged to maximize safe, efficient and productive use of the property that is dedicated to waste management over the life of a facility; to control the cost of closure/decommissioning and post-closure care; and to allow for future productive use of the site.

2.10 Integrated Solid Waste Management

Integrated Solid Waste Management (ISWM) is a comprehensive waste prevention, recycling, composting, and disposal program. An effective ISWM system considers how to prevent, recycle, and manage solid waste in ways that most effectively protect human health and the environment. ISWM involves evaluating local needs and conditions, and then selecting and combining the

most appropriate waste management activities for those conditions (Shaukat & Sajjad, 2016). It is also recognized at the international level, and they incorporate all the policies, programs, and technologies that are necessary to manage the waste stream. The mix and emphasis of approaches that are taken generally varies from region-to-region and from country-to-country, and depends on local conditions (UNEP, 2005).

The “Waste Management Hierarchy” is an internationally recognized strategy for management of municipal solid wastes and it is a key element of integrated solid waste management. It also places greatest emphasis on strategies and programs for avoiding and reducing waste, with treatment and disposal being the least favored options. The purpose of the waste management hierarchy is to make waste management practices as environmentally sound as possible.

It has been adopted in various forms by most industrialized countries. Its principal elements are also included in international conventions and protocols, particularly those dealing with the management of toxic or hazardous wastes, and in regional attempts to develop a coordinated policy on the reuse of various byproducts of waste management processes. The hierarchy is a useful policy tool for conserving resources, for dealing with landfill shortages, for minimizing air and water pollution, and for protecting public health and safety. In many developing countries, some aspects of this hierarchy are already in place, since traditional practices revolving around waste prevention reuse, and recycling are prevalent (UNEP, 2005).

2.10.1 Reduce, Reuse, Recycle (3R)

Methods of waste reduction, waste reuse and recycling are the preferred options when managing waste. There are many environmental benefits that can be derived from the use of these methods. They reduce or prevent greenhouse gas emissions, reduce the release of pollutants, conserve resources, save energy and reduce the demand for waste treatment technology and landfill

space (Hui et al., 2006). Therefore it is advisable that these methods be adopted and incorporated as part of the waste management plan.

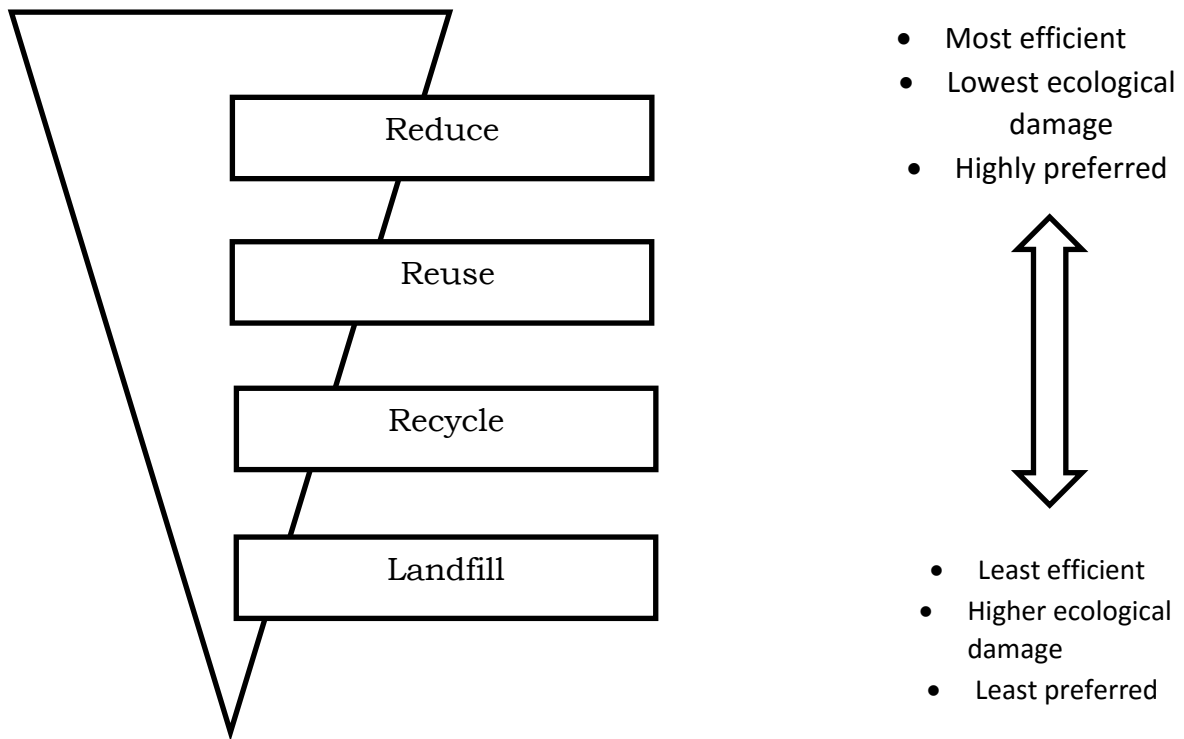


Figure 1: Waste Management Hierarchy (Source: the web)

Waste reduction and reuse of products are both methods of waste prevention. They eliminate the production of waste at the source of usual generation and reduce the demands for large scale treatment and disposal facilities (Tchobanoglous et al., 1993). Methods of waste reduction include manufacturing products with less packaging, encouraging customers to bring their own reusable bags for packaging, encouraging the public to choose reusable products such as cloth napkins and reusable plastic and glass containers, backyard composting and sharing and donating any unwanted items rather than discarding them. All of the methods of waste prevention mentioned require public participation. In order to get the public onboard, training and educational programs need to be undertaken to educate the public about their role in the process (Tchobanoglous et al., 1993).

Recycling refers to the removal of items from the waste stream to be used as raw materials in the manufacture of new products. Thus from this definition recycling occurs in three phases: first the waste is sorted and recyclables collected, the recyclables are used to create raw materials. These raw materials are then used in the production of new products. The sorting of recyclables may be done at the source (i.e. within the household or office) for selective collection by the municipality or to be dropped off by the waste producer at a recycling centers (Onibokun and Kumuyi, 2003).

The sorting at the source requires public participation which may not be forthcoming if there are no benefits to be derived. Also a system of selective collection by the government can be costly. It would require more frequent circulation of trucks within a neighborhood or the importation of more vehicles to facilitate the collection. Another option is to mix the recyclables with the general waste stream for collection and then sorting and recovery of the recyclable materials can be performed by the municipality at a suitable site. The sorting by the municipality has the advantage of eliminating the dependence on the public and ensuring that the recycling does occur. The disadvantage however, is that the value of the recyclable materials is reduced since being mixed in and compacted with other garbage can have adverse effects on the quality of the recyclable material (Onibokun and Kumuyi, 2003).

CHAPTER THREE

3. Research Design and Methodology

3.1 Description of the study area

Addis Ababa is located at the center of Ethiopia with an area of 540 km². Its altitude ranges from 2000m - 2800 masl (AACAA 1998). Addis Ababa is a seat both for Federal Democratic Republic of Ethiopia (FDRE) and Oromiya National Regional State Government. It is bordered with Oromiya National Regional State in all directions. The city has currently a population of about 3.5 million with density of 5936.2 km² and an area of 540 km². The city is sub-divided into three layers for administrative purposes namely City Government, sub-cities administrations and Woreda (local name for District) (AACAA, 1998). There are 10 sub-cities and about 99 Kebeles (AACAA 1998). All the three condominium sites are found in Yeka sub – city, in the eastern side of the city.

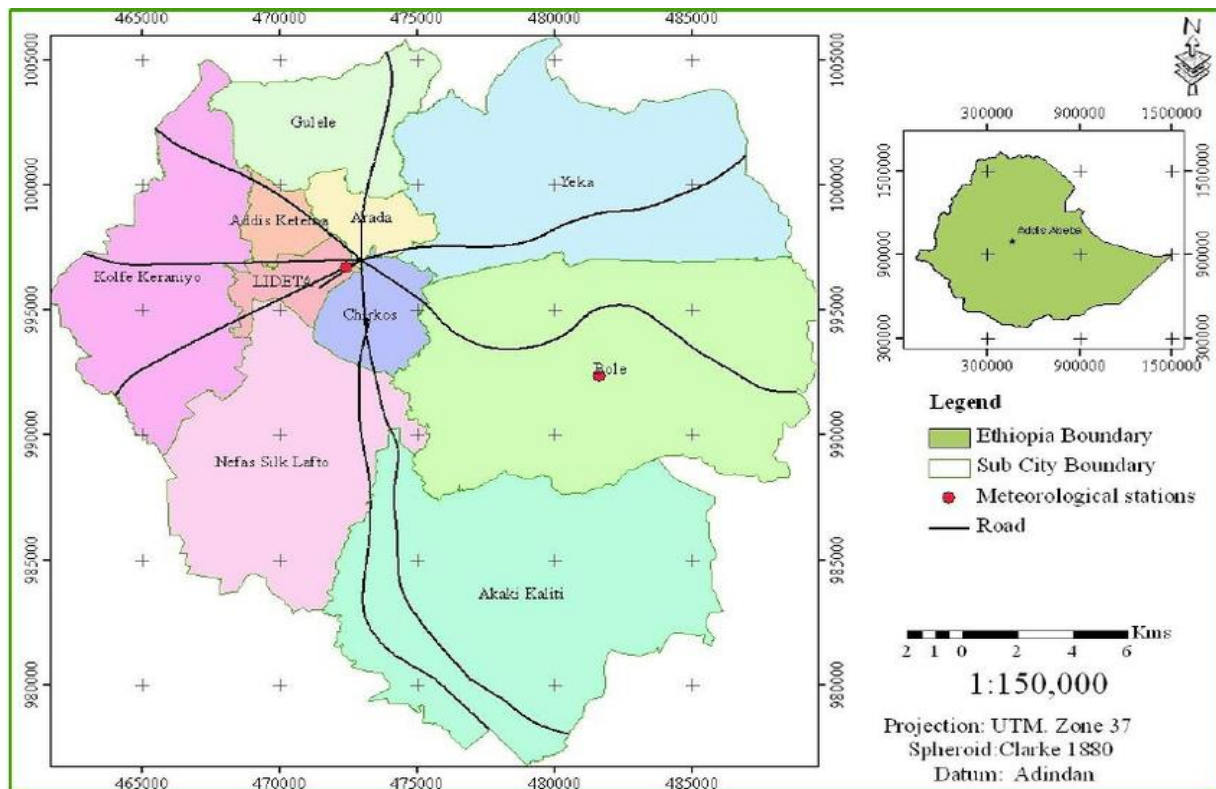


Figure 3.1. Map of Addis Ababa, Yeka sub-city (source: ReaserchGate)

The three condominium sites are recently built apartment houses, they were part of the new 4-year Housing Development Programme being undertaken by the Addis Ababa City Council to alleviate housing shortage in the city. The Yeka Abado condominium housing scheme is spanning 200 hectares on a green-field site located 16km east of Meskel Square, Addis city center. There are 18 thousand houses out of most of them are handed to the city's dwellers by computer lottery system. Containing more than ten thousand houses, the Yeka Ayat 1 and Yeka Ayat 2 condominium houses are found in the adjacent side to the Yeka Abado condominium site on the right and left sides of the main road to Ayat.



Figure 3.2. Yeka Abado Condominium Site, (taken by the researcher)

3.2 What makes condominium houses different?

Condominium housing is a new phenomenon in Addis Ababa in particular and in Ethiopia in general, it is being widely applicable, and large number of condominium houses are under construction right now. It is also believed that it will dramatically decrease the high demand for house in the city. According to Ato Ambaw and Ato Duressa condominium housing has both advantage and disadvantage in relation to solid waste management. The advantages are having an already established active residents' committee which can make the solid waste management easier by mobilizing the community, having a lot of houses in a small distance which specially makes the collection easier, being

relatively a new residential area which can adjust to a new change (reform) faster, etc.

The disadvantages are many of the residents do not take the solid waste management as their own business as many of the residents are not owners but who rented the houses. The other disadvantage is not getting many residents at the time of collection for they are not available during collection days. Many of the condominium residents are available on weekends especially on Sundays in which the collectors don't work.

3.3 Research Design and Method

This study is descriptive in nature. In view of this, in order to understand and deal with the complex phenomena of SWM in the condominium sites. The study involved a mixed approach which is a combination of both qualitative and quantitative methodologies. Data was gathered through self-administered questionnaire, interviews and supplemented by field observation. The analysis of the data employed SPSS software. In addition, secondary data was gathered from documents.

3.4 Sampling technique

This study applied multi-stage sampling technique to come up with scientifically acceptable level of sample size for the study. In the first stage, out of the total 108,482 condominium houses constructed and transferred to Addis Ababa residents until 2013 by the city administration (AACG-HCP, 20 13), the researcher purposely targeted on 60,058 condominium houses which were transferred to residents until 2009.

The study employed a range of sampling techniques including, systematic random sampling, and purposive sampling. Addis Ababa city was purposively selected for the prevalence of the problem and being the interest of the researcher. The three condominium housing sites were purposively and purposely selected for being the residential place of the researcher, and for

having the problem. The second stage was selecting three condominium sites: Yeka Abado, Yeka Ayat I, and Yeka Atat II which all of them are found in Yeka sub-city and with estimated number of houses, 18,000, 7,649 and 8,821 condominium houses, respectively (AACG-HCP, 2013) with a total of 34,470 houses. These sites were purposively selected based on the number of households and the location of the sites.

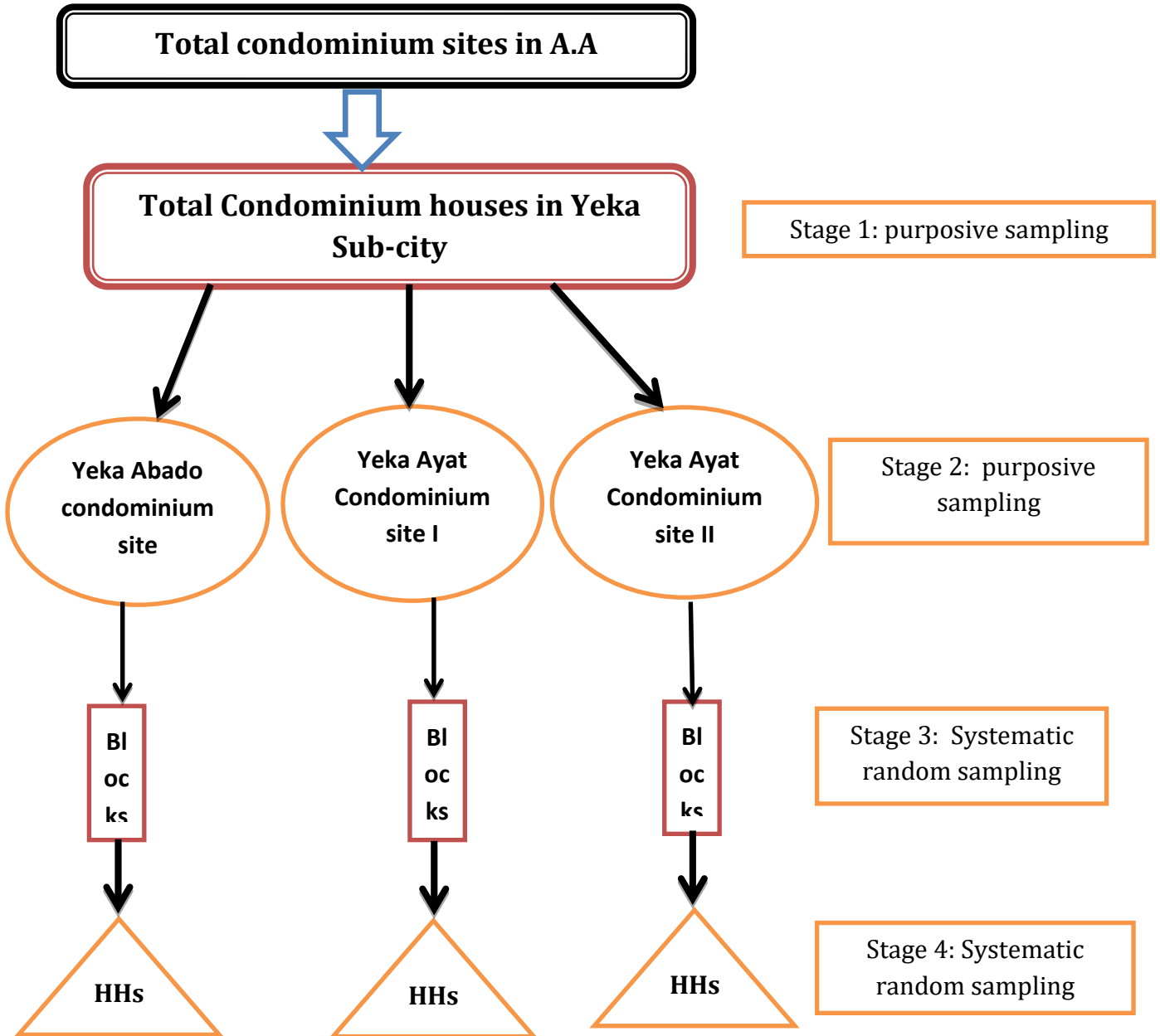


Figure 3.3 Schematic Presentation of Sampling Design by the researcher

3.5 Sample Size Determination

Sample size has been determined based on the standard formula (Cochran, 2002). According to the data obtained from Addis Ababa Housing Construction Project Office, 108,482 houses were transferred to residents up to the end of 2013 in nine rounds. The researcher, then, added up the total number of condominium houses that were transferred in the first four rounds till 2009 to be 60,058 as a sampling frame.

P is considered to be 0.5 as there are no previous studies which show the prevalence of the variable of interest. The standard error of a proportion that will take care of the possible variability for any given value of n is obtained when P is between 0.3 and 0.7 (Cochran, 2002). Thus, the average value is taken for this particular study.

A 95 % level of confidence with a critical value of $Z= 1.96$ in a normal probability table and 0.05 acceptable error including the design effect assumed to be 1.3.

$$n = \frac{NZ^2PQ}{d^2 (N-1) + Z^2PQ}$$

Where n= sample size of housing units

P = Housing unit variable

Q= 1-P

N= Total No of housing units

Z= Standardized normal variable and valued that corresponds to 95% confidence

interval equal to 1.96

d = Allowable error (0.05)

According to data obtained from Addis Ababa City Government Construction and Housing development Bureau the total of condominium houses in the three condominium sites are around 34,470 (N):

$$\text{Hence } n = \frac{NZ^2PQ}{d^2(N-1) + Z^2PQ} = \frac{34,470 (1.96)^2 \times (0.9) (0.1)}{(0.05)^2 (34,470 - 1) + (1.96)^2(0.9) (0.1)} = 156$$

Therefore, $n = 156$ is the minimum sample size of housing units for reliable results.

$$\text{Therefore, } n_1 = 156/3 = 52$$

$$n_2 = 156/3 = 52$$

$$n_3 = 156/3 = 52$$

3.6 Data source, collection and analysis

For the aim of accomplishing the objectives of this research, all required data will be collected from primary and secondary data sources. Primary data will be collected from households by conducting a self-administered questionnaire having both open ended and closed ended questions; key informant interview will also be used to collect qualitative data. Field observation which will be backed by a check list will also be part of the data collection method. Secondary data will be collected from published and unpublished materials, books, websites and reports from different offices in the city. The collected data will be analyzed using IBM SPSS software and discussed thoroughly.

3.7 Data Collecting Instruments

Questionnaire

Questionnaire will be set for selected households. The questionnaire was of two types; open ended and close ended. This was done to get the different views of the respondents.

Observation Field observation on the three condominium sites will be conducted and the data was presented in qualitative way by triangulating with other forms of data gather from questionnaire and key informant interview.

Key Informant Interview (KII)

A key informant interview was conducted with the concerned body of the Woreda in Yeka-sub city in order get information about the governmental and private organizations involved in solid waste management in the three condominium sites.

3.8 Data Collecting Procedure

The data was gathered through three data collecting instruments i.e. observation, questionnaire, and key informant interview. First, observation of the three condominium sites was done. Next to that the questionnaire was delivered to the selected sample households. Finally, a key informant interview was conducted with the concerned body of the Woreda. It is expected that there may be difference as three instruments are planned to be applied. But this will help to triangulate the data in different dimensions. And the data will be measured using percentage and by paraphrasing qualitatively.

3.9 Data Analysis

The data collected was presented in a form of table and qualitatively described in a qualitative method. The raw data obtained from the questionnaire will be interpreted and analyzed using percentage. The data that will be collected through questionnaire was presented in the form of table/chart and it was analyzed and interpreted numerically through using percentage, mean etc. using SPSS software.

The data that was gained from observation was presented through descriptive written report whereas; the raw data that will be gathered through interview can be treated by interpreting and analyzing through deep discussion and the gained response.

CHAPTER FOUR

4. Result and Discussion

Under this chapter the data gathered from the study households using questionnaire, interview from the key informant interview and data obtained by the researcher's observation were analyzed and interpreted.

4.1. Characteristics of the Respondents

In this study, the researcher has tried to constitute different sample households with various demographic and socio-economic characteristics.

4.1.1. Demographic characteristics of the Respondents

The demographic features of the respondents include sex, age structure, household size, income, educational status and marital status.

A total of 208 HHs were included in the study and 184 (88.5%) of them responded to the questionnaire. Among 184 respondents 104 (56.5%) of them were males and 80 (43.3%) were females. Majority of the respondents (81%) of the respondents were within age group of 18-60 years and 19.0% of them were above 65.

Socio-demographic characteristics		HHs n(184) Frequency %	KI n(10) Frequency %
Sex	Male	104 90(56.5)	6 (60)
	Female	80 (43.5)	4 (40)
Age (years)	18- 60	81	90
	> 60	19	10

Table 4.1. sex and age of the study participants (HHs and KIs)

A total of 10 key informants were interviewed in the study and among them 6 (60.0%) were females whereas 4 (40.0%) were males. Ninety percent of them were within age range of 18-60 years and the remaining were above the age of 65 years.

Also from the respondents (47.3%) of HH completed secondary school, 11.0% completed primary school and 23.2% and 13.5% have completed higher education (first degree and above) holders, respectively and lastly (5.2%.) of them were illiterates (Table 4.2). About a third (32.8%) of HHs reported being private employees and the other occupations include merchants (traders) (27.9%), civil servants (18.5%), daily laborers (12.3%), and others (8.5%). However, about 8.2% of the respondents were unemployed at the time of the survey (Table 4.2).

Socio-demographic characteristics		HHs n(184) Frequency %	KI n(10) Frequency %
Educational level	Illiterate	5.2	9.7
	Primary edu.	11	—
	Secondary edu.	51.3	—
	Higher edu.	13.5	73.3
Occupation	Civil servant	18.5	30
	Private employee	32.8	20
	Merchant	27.9	—
	Daily laborer	12.3	30
	unemployed	8.5	20

Table 4.2 educational level and occupation of study participants (HHs and KIs)

The majority of study participants KIs (73.3%) were first degree and above holders. About 17.0% were college diploma holders, 9.7% were illiterates (Table 4.2). Concerning job position of KIs 3 (30.0%) were road SW sweepers; 2

(20.0%) waste management/ environmental experts from the Woreda; 3 (30.0%) community organizers; 2 (20.0%) lawyers.

4.2 Environmental awareness of the respondents

The pace of development of waste management services heavily depend on the level of public awareness of solid waste-related issues and on participation in making improvements happen at the ground level. The public support for any issue can be greatly increased if the public is fully and well-informed about the reasons behind the actions and the intended benefits (van Dijk MP, 2014).

Awareness about the environment is quite low in Ethiopia. Both the benefit of taking care of the environment and the harm of neglecting the environment are not known. The people have fallen into the habit of dumping waste in the rivers, fields, drains and ditches; this is known to be the only approach possible to deal with waste. The harmful impact of such disposal has not been apparent. To take responsibility for the city as they take care of their homes is missing in the society (Meaza Cheru, 2016).

The study clearly indicated that almost close to half of the respondents (46.7%) have never been given any training or awareness raising education on proper waste management (Table 4.2). But 53.3% of the respondents said that they were given training. As Ato Ambaw Yemiyamerew (yeka sub city, Woreda 14 SW Collection, Street cleaning service Main Job Leader) and Ato Duresa Jira (Yeka sub city, Woreda 14 Awareness Creation and Community Participation Main Job Coordinator) this is because many of the residents are not found at home during working days and most people are home on weekends especially Sunday which is not a working day obviously.

This has aggravated the waste management problem and challenges. Ato Ambaw and Ato Duresa also pointed out that they are trying to carry out some awareness creation and training. However they said that the Woreda has lack of resource and man power to do training and awareness creation works, but

they said it is included as the main target to focus in their long term plan. W/ro Netsanet Zerihun (Yeka sub city, Woreda 13 Solid Waste Administration Bureau Manager) also described that they are carrying out awareness creation works using brochure, door to door service, other community gatherings, etc. these awareness creation works somehow showed results. But the solid waste management culture of the people shows still more work needs to be done for better achievements.

Regarding environmental impact awareness, more than ninety percent of the respondents indicated that they know the environmental impacts of SW if it is not managed properly (Table 4.2). In addition almost all of the KI respondents told that they think there is good environmental awareness among the people, but there should be organization and mobilization campaigns to initiate and motivate the people to participate actively. Especially one street sweeper said,

“I think most of the people have good environmental awareness. For example if you ask one person on the street they will tell you that litter is bad and it can cause environmental problem. On the other hand you see the same person littering on the street. You don’t see the knowledge applied on the day to day lives of the people. I think carelessness and lack of responsibility is the main problem.”

Almost close to 70% of the study samples responded that they believe solid waste management is a major problem in their area (Table 4.2). This indicated that people have more concern for solid waste management problem than other environmental problems. In addition majority of the KIs told that they believe solid waste management is a number one environmental problem in the area. They even indicated that it is the source of other environmental problem.

Ato Ambaw and Ato Duresa (Woreda 14 experts) also indicated that they are observing changes among the people regarding environmental concern. They indicated that people are becoming proactive to see a clean environment without pollution. W/ro Netsanet Zerihun (Woreda 13) uttered that even though

some changes are being observed still there is a problem of concern and belongingness.

“Some people don’t take solid waste management as their concern. They think the government is the only body that has the responsibility of managing solid waste. Because of this there is lack of cooperation and active participation.”

Environmental awareness of the respondents		HHs n(184)	
		Frequency	%
Have ever been educated or get a training on proper solid waste management?	yes	98	53.3
	no	86	46.7
Are you aware of environmental impacts of solid waste?	Yes	171	92.9
	no	13	7.1
Do you personally think solid waste management is a major problem in your area?	Yes	128	69.5
	no	56	30.5

Table 4.3: Environmental awareness of the respondents

Walking in Yeka Abado Condominium site someone can observe poor solid waste management with litter thrown here and there at the sides of the road according to the field observation of the researcher. This creates bad odor which can be a cause for a number of respiratory diseases and it looks unpleasant for the eye. Even though it is minimal accumulation of waste like papers and plastics on the street, open lands, in drains and in the ditch are disgusting all citizens. However, areas with good solid waste management were also observed.

Various studies in different parts of the world revealed that solid waste takes the lion share among environmental problems. The study revealed that majority (83.2%) of the respondents think that environmental problems will minimize if the solid waste is managed properly (Table 4.3).

It can be inferred from table 4.3 that almost more than 60% of the respondents believe that the current waste disposal system is not polluting the environment. Ato Ambaw and Ato Duresa also told that there is a huge change in recent years that the SW service is improving from time to time. However they also admitted that there are a number of problems and shortcomings on the solid waste management system especially in lack of focus from the Sub city and shortage of professional man power. They pointed out that the work that they are doing and their capacity do not match. They are facing a huge problem in lack of resources and having adequate and qualified man power. According to W/ro Netsanet Zerihun (Woreda 13) the same is true for their Woreda. The Woreda is suffering from shortage of materials and qualified man power.

Table 4.3 revealed that almost more than 90% of the respondents agreed on the inevitability of community participation for local waste collection system and improvement of the environment. It can be inferred that people recognizes without their active participation the system of solid waste management cannot be improved or achieve its targeted outcomes. Urban Planning, Sanitation and Beautification Bureau, Solid Waste Management Manual, April, 2012 states that “Urban Administrations shall ensure the participation of the lowest administrative levels and their respective local communities in the designing and implementing their respective solid waste management plans.”

People's attitude influences not only the characteristics of waste generation, but also the effective demand for waste collection service. According to UNDP (1996) people's attitude towards waste may positively affect their interest and willingness to pay for collection service. In addition, through awareness campaigns and educational measures attitude may be positively influenced and in tum it can change the negative impact of inadequate waste handling with regard to public health and environmental conditions. Such educational campaign also informs people of their responsibility as waste generators and of their right as citizens to waste management services.

Therefore awareness campaigns should be coordinated with improvements in waste collection, reuse, recycle, composting and other integrated approaches. Whether adopted handling systems are similar or not, people's waste handling patterns are influenced by their neighbors, so a collective logic should be involved, because improved waste handling practices will only yield significant environmental impacts if most households in an area participate in the improvement. Thus, besides general awareness campaigns, improved local WM depends up on the availability of practical option for waste handling and a consensus among neighbors (Kumuyi, 1999 and Berry, 1997),

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

Environmental awareness of the respondents		HHs n(184)	
		Frequency	%
Do you think environmental problems in your area will minimize if the solid waste is properly managed?	yes	153	83.2
	no	31	16.8
Do you say the current waste disposal system is polluting the environment?	Yes	40	21.7
	no	114	61.9
Community participation is inevitable for local waste collection system and improvement of the environment, do you agree?	Yes	169	91.8
	No	15	8.2

Table 4.4: Environmental awareness of the respondents

Therefore, attitude towards solid waste may be positively influenced by public information and awareness measures. At the same time improved waste

handling 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 a city may take opposite action towards SW handling. As a result their action may have a negative impact on storage, collection and transportation of SW. Ato Ambaw and Ato Duresa also indicated that there is a team under their supervision that work on awareness creation and community participation. They do door to door education and training campaign. They also carry out mass cleaning program once a month in which all the residents participate. W/ro Netsanet Zerihun also described that their awareness creation and community participation team is carrying out different awareness creation campaigns using brochure, door to door education, different community gatherings, etc.

4.3 Solid waste management

4.3.1 Solid waste sorting practices

Sorting is an essential component of solid waste management. It is an activity which is separating different types of wastes in their respective nature. It makes waste management easy and simple. However, it should not be a one-time activity, rather it should be a habit for proper and sustainable solid waste management.

Results of the present study showed that more than 66% of the HHs practiced SW sorting (Table 4.4). This clearly indicated that the SW sorting culture of the community is developing. About 33% of the respondents do not practice sorting separation at household level. Table 4.4 shows that more than 60% of the respondents revealed that they understand the importance of sorting and they are doing their best to separate their SW every time they hand it to the collectors. However 23% argue that there is no point of separating waste since as collectors come with only one bag and mix all the SW. 12% believed that

they have no reason to do it as they lack the facility. More education should create the awareness about separation and sorting at household level.

Majority of the KI respondents indicated that there is lack of awareness among the society regarding the significance of sorting SW. They also added that lack of responsibility and carelessness are part of the problem. Ato Ambaw and Ato Duresa also indicated that even though they tried to carry out some awareness creation works regarding sorting SW, the practice among the people have not been as expected. They also pointed out that the practice of sorting is showing a good improvement especially in condominium houses. Now a lot of people are trying to sort their solid waste. But still more work is needed so that it could be adapted as a culture among the people. The absence of such practices at HH level, can create a big problem in recycling and composting process; and the municipality will also be subjected to extra expense.

In addition the workers will be affected by a number of health problems because of the bad smell from the SW during sorting. Observation of HHs confirmed that only SWs that can be sold, exchanged and, to limited extent, organic wastes are separated. Types of items observe to be sorted by HHs include worn out clothes; old shoes; metals, tin and cans; plastics glasses, bottles, and some electronic wastes. The Woreda experts told that there must be a health insurance for the SW collectors as so many workers are being sick and left their job. According to Ato Ambaw there are worker who are really sick but still keep works because they don't have other means of income.

Ministry of Urban Development and Construction, Urban Planning, Sanitation and Beautification Bureau, Solid Waste Management Manual, April, 2012 states that, "The head of each household shall ensure that recyclable solid wastes are segregated from those that are destined for final disposal and are taken to the collection site designated for such waste." In addition the manual states that solid waste should be reduced at its source, it is one of the principles of the manual. Therefore, the Woreda should enforce this regulation

and work to create awareness that it is the responsibility of the people to separate waste.

Solid Waste sorting practices		HHs n(184)	
		Frequency	%
Do you practice sorting SW?	yes	123	66.8
	no	61	33.1
Do you understand the importance of sorting SW?	yes	114	61.63
	no	70	8.4
Do you know that it is your responsibility to sort your SW?	Yes	86	47.1
	No	98	52.9

Table 4.4: Solid Waste sorting practices

4.3.2 Solid waste reuse practices

Table 4.5 revealed that around 38% of HHs practiced direct reuse of SWs at home level, and around 61% of the HHs in the three condominiums are not exercising waste reuse at home level. Furthermore all KIs reported that they believe if the reuse culture is developed among the people there will be a great reduction in the amount of SW. This indicates that the Woredas need to give more attention on educating and training the community on reusing SW.

On the other hand almost 90% of the respondents responded that they are aware of from kitchen and vegetable wastes, an organic fertilizer can be made which is good for the environment. When it comes to practice they said it is not convenient for condominium housing styles. Some of the respondents even indicated that they were doing this before they moved to condominium houses. In addition some of the respondents suggested that if they can get a small place to do this they will be pleased to do it.

There are both economic and environmental advantages to source reduction, primarily the reduction in pollution and cost of solid waste management and

disposal. In addition, source reduction activities can result in changes to the composition of solid waste. The total cost of a solid waste management system is associated with collection, processing, and disposal of materials. Source reduction can reduce the costs of SWM in several ways, primarily by reducing the quantity of waste to be managed, avoided purchasing costs, and collecting revenues from resale of items (Tchobanoglous and Kreith, 2002).

Solid Waste reuse practices		HHs n(184)	
		Frequency	%
Do you try to reuse waste materials?	Yes	70	38.4
	No	114	61.6
Do you know that from kitchen and vegetable wastes, an organic fertilizer can be made which is good for the environment?	yes	164	89.1
	no	20	10.8
Do you try to reduce the amount of waste you generate?	Yes	163	88.6
	No	21	11.4

Table 4.5: Solid Waste reuse practices

4.4 Household Waste Generation and Disposal

4.4.1 Solid Waste Composition

Knowing the physical composition of solid waste is important for the selection and operation of equipment facilities, to assess the possibility or feasibility of energy recovery and to design disposal facilities. Its analysis may contain individual component study, moisture content study and density (Takele Tadesse, 2014).

The result of the survey in the three condominium sites showed that municipal waste is a sub total of all substances ready for disposal. The composition of the solid organic waste was almost homogenous in nature across the entire study

households. As it was observed in this study, majority of the waste was kitchen waste (72.2% Table 4.6) which is mostly of plant origin while the animal and the industrial origin was almost minimal in most of the households. Of the plant source, vegetable residues take the greatest portion. Overall the kitchen waste composition includes vegetable peelings, onion seed coats, beef bones, etc.

Plastic waste takes the second place with (14.6 %) which is mainly composed of broken plastics, plastic packaging of different materials (festal), old and useless electronic materials, etc. paper waste cardboards for packaging,

Other wastes (4.1) include soil and dust, pieces of thread, used shoes, pieces of cloth, small bottles, used furniture parts, soot, etc. The waste aggregate more frequent in the whole mass of household waste was house sweeping, which is composed of soil and dust followed by pieces of paper and vegetable peelings. Ash swept out from kitchens is more in quantity than other waste.

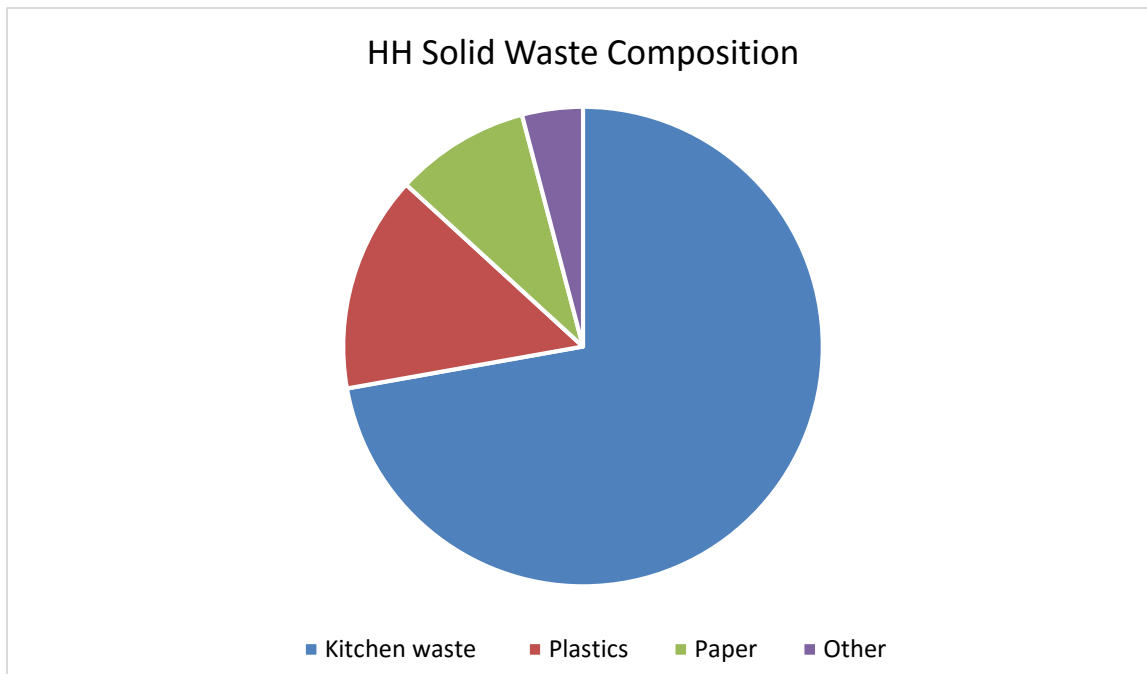


Figure 4.1. HH Solid Waste Composition

As it can be observed from table 4.7 almost 40% of the respondents indicated that they get solid waste collection twice a week. To consider the bulkiness of the work and the capacity and lack of man power and resources of the municipality, it cannot be said that it is a bad frequency. More than 30% of the respondents responded that they get solid waste collection once a week. Since the population of the area is high the accumulation of SW is high too. Therefore once a week is not considered as enough frequency. When the solid waste accumulation is high, the management will be harder to sort it and it creates bad odor that can result in the cause of respiratory diseases like influenza. Most of the KI interviewees also told that the SW collection can be said is good when the population and the municipal capacity is taken into account. Ato Ambaw and Ato Duresa told that they are trying to address every block at least twice a week but their resource and man power is very limited as compared to the bulkiness of the work. W/ro Netsanet also described that they are trying to collect solid waste at least twice a week. However she said there must be a temporary solid waste collection place when the condominium houses are designed.

Frequency of solid waste collection disposal practices		HHs n(184)	
		Frequency	%
Frequency of solid waste collection	twice a week	72	39.1
	once a week	59	32
	once in two weeks	15	8.1
	Irregularly	38	20.6
How often do you dispose your household solid waste?	Every day	28	15.2
	once a week	87	47.3
	once in two weeks	43	23.3
	Irregularly	26	14.1

Table 4.7: Frequency of solid waste collection disposal practices

Table 4.8 revealed that more than 40% of the study respondents responded that they have to travel 400m to get to the nearest solid waste dumping site. Some of the KI interviewees indicated that, the nature of the condominium housing forces that there must be at least one dumping site between two blocks. Because some of the building have 7 floors, so it will be very harder for the people to go far. 34% of the study samples responded that they use open space to dump solid their waste (Table 4.8). This was even witnessed during the field observation of the researcher. The main reason for this is due to the long distance between their house and the nearby container. Therefore this clearly indicated that more containers are needed at a considerable distance. On the other hand Ato Ambaw and Ato Duresa indicated that a new system is developed now which is collecting solid waste door to door at least twice a week. They think this will avoid the problem. W/ro Netsanet also told the door to door collection is somehow fruitful. However problems like some residents not being home during collection days and hours are being seen. Informing residents about the arrivals of the collectors is also another challenge. Some of the condominium buildings especially in Yeka Abado have seven floors which makes the work much harder.

distance of dumping site from house		HHs n(184)	
		Frequency	%
What is the distance between your house and the dumping site?	200m	54	29.3
	400m	79	42.9
	500m	42	22.8
	>500m	9	4.9

Table 4.8: distance of dumping site from house

As it can be clearly inferred from table 2.9, more than 38% of the respondents replied that they dispose their solid waste in the morning. And around 36% of

the respondents responded that evening is a convenient time for them. In addition majority of the KI respondents also indicated that morning or evening are preferable times for collecting and disposing solid waste.

With regard to the preferable frequency of solid waste collection more than 50% of the respondents chose twice a week. This also seems a good amount in consideration of the capacity of the Woredas'. However some of the KI interviewees suggested that it will be good if it is collected at least four times a week to avoid accumulation of the waste and to make the sorting easier. Ato Ambaw also indicated that the Woreda is trying to do the collection twice a week and in regular working times.

Timing of collection or disposal can be highly crucial in the effectiveness of the work. So selecting a time in which majority of the residents can be available is very important especially in the condominium housing sites. Because as it was noticed during questionnaire filling time and field observation of the researcher, most people may not be home during the day time and on working days. Most people are home on weekends especially on Sundays.

time of disposal and preference		HHs n(184)	
		Frequency	%
Generally, when do you dispose your solid waste?	Morning	71	38.6
	Noon	22	19.9
	Afternoon	24	13
	Evening	67	36.4
Frequency of preference for solid waste collection	daily	41	22.3
	twice a week	97	52.7
	Once a weeks	31	18.8
	Once in two weeks	16	8.9

Table 4.9: time of disposal and preference

However, the waste is sometimes left on the side of the road until late in the afternoon or even until another collection day or so until the next round week waste collection. This caused a stink and animals such as dogs, cats, cattle, donkeys and scavengers would spread it on the road seeking to feed from it which is both unhealthy and unpleasant to see. According to the interviews and the HH's data, the waste was not collected on time because of two main reasons. First, the waste collection workers do not come on the day they are supposed to come because of different reasons like some of the workers were sick or their salary was not given on time. Second the places where the waste collectors put the waste sacks were already known by the community members and, therefore, even after the truck picked up the waste and left, some people would bring and leave their waste on the same place so that it would be taken on next round.

Fifty percent of the study respondents indicated that they are not satisfied with the current SWMS (Table 4.10). In addition 44% and 25% of the study respondents said less frequency of disposal and the inconveniency of collection time are their main reason for the dissatisfaction. Woreda. Ato Ambaw and Ato Duresa also witnessed that they are collecting solid waste twice a week but having additional days will be difficult as the Woreda's resource and man power is limited. Regarding the time of collection they stated that the collectors are working on the working hours and days, but some people may not be home during this times and days. However they told that this is out of their control and cannot force the collectors to do without these hours and days.

The solid waste management of collection is most difficult and complex in an urban environment because the generation of residential and commercial solid waste and materials to be recycled takes place in every home, every apartment building, and every commercial and industrial facility, as well as in the streets, parks, and even vacant areas. As the patterns of waste generation become

more diffuse and the total quantity of waste increases, the logistics of collection become more complex.

Household Satisfaction on the current SWMS		HHs n(184)	
		Frequency	%
Are you satisfied with your current waste disposal system?	highly unsatisfied	14	7.6
	unsatisfied	92	50.1
	satisfied	57	30.9
	highly satisfied	21	11.4
If you are not satisfied with the current SWM system, what is the main reason?	Inconvenient collection time	46	25
	Less frequency of	81	44
	High cost	14	7.6
	Other	43	23.3

Table 4.10: Household Satisfaction on the current SWMS

Managers of collection systems must recognize and deal with the concerns of a population paying bills for services that reflect the high cost of fuel and labor. Of the total amount of money spent on solid waste management (collection, transport, processing, recycling, and disposal), approximately 50 to 70 percent is spent on the collection activity. Because such a large fraction of the total cost is associated with the collection operation, a small percentage improvement in the collection operation can affect a significant savings in the overall system cost (Tchobanoglous and Kreith, 2002).

4.5 Institutional Arrangement

The institutional arrangement in the solid waste management system has been undergoing significant shifts in Addis Ababa in the last few years, influenced by decentralization and micro-privatization policies, new working system (the right person to the right place), governmental transition, creating an alternative service delivery mechanism to improve municipal solid waste management. Local government, community and private sector are now more involved. This collaboration ensures that each and every move fits into an integrated and sustainable system designed for promoting service satisfaction, public health, environmental protection, and good governance.

In Addis Ababa, there are different bodies who are directly or indirectly involved in a wide range of solid waste management activity including Non-Governmental Organizations (NGOs), private companies, and individuals/young children from poor households are the pioneers in providing door-to-door solid waste pre-collection service in the city. They provide the service of collecting and transporting solid waste from households to temporary collection sites. The collection of waste through MSIs has provided employment opportunities for many jobless youth in the city. The majority operates in the middle and high-income HHs to collect solid waste using door-to-door collection method. The private sectors have the accumulated experience on waste collection and entrepreneurship due to their close engagement in the sector.

This activity was less attractive to the government officials and easily left to be done by the informal enterprises until the year 2007. It is since then the government officials viewed the sector as one of the potential employment generating fields. Waste collection has gradually attracting the attentions of the municipality officials as one of the untapped employment generating sectors. Now the government organizes those private actors and all are indirectly government employed. The payment for the service is first done by negotiation

between waste workers who are assigned for specific location and individual households in that area.

However, from experience, the government realizes that the private worker collect payment from the households while they dump the waste anywhere after they collect the waste from the households. Hence nowadays, the waste is collected by the waste workers while payment for the service is collected by the government along with water service payment. The payment is done according to the weight of the collected solid waste. According to Ato Dawit (Woreda 13 solid waste expert) some years back the price for a kilo of solid waste was 50 birr but now it is raised to 70 birr.

Following the city administration the higher authority is the agency of the sub city then there are the Woredas and finally we find the macro and small enterprises (MSEs) who are engaged in collection of solid waste. Under Woreda administration there are three divisions: the first one is the solid waste collection and transportation division which focuses on door to door solid waste collection and transporting it to the nearest disposing site, secondly there is awareness creation and community participation division which deals with creating awareness among the people on how to deal with solid waste using different methods like brochures, school clubs, community gatherings and the third one is reuse and recycle division which tries to reuse and recycle the collected solid waste, making compost, in collaboration with other governmental, non-governmental and private organizations.

As Ato Ambaw (Woreda 14 solid waste expert) described, the solid waste management institutional arrangement now it is in a better condition especially after the institution was rearranged under agency as compared to the situation some years back. Ato Ambaw also described that there are partners that take plastic bottles however the problem that they are facing currently is not having an organization or company that can take the collected waste related to metal substances, glasses and plastic packaging materials (festal).

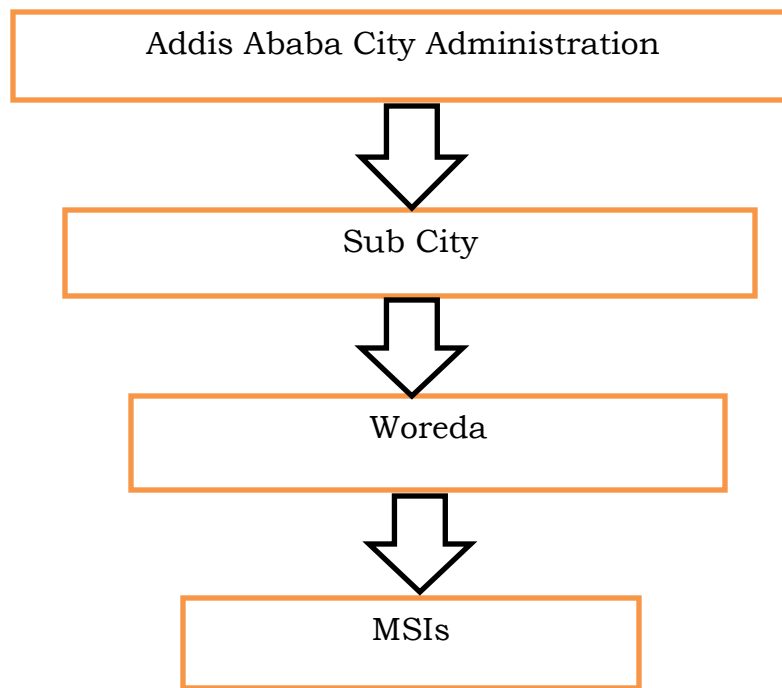


Figure 4.4. Schematic design: Institutional Arrangement of SWM

The other problem they are facing is the sickness of many solid waste collectors. According to Ato Duressa most of them are staying home because of sickness and some of them are working even though they are critically sick because they don't have any alternative means of income to lead their lives. Having a health insurance for the solid waste collectors was suggested as a solution for the problem by Ato Ambaw. According to W/ro Netsanet there are some improvements especially for the government employees of the Woreda like giving incentives for the field experts and additional milk and material bonuses. But still there are things that need to be improved according to Ato Ambaw, they have shortage of man power for instance even though nineteen people are needed for the work there are only five people working right now. Other problems include they were not given scholarship even though they were promised he told. The working condition is also not good. As the researcher observed especially in Woreda 14, the Woreda is working in a house made of corrugated sheet, they have lack of office materials for example the printer was not functional during the interview time.

CHAPTER FIVE

5. Conclusion and Recommendation

5.1 Conclusion

This study has tried to investigate the status and challenges of municipal solid waste management in three condominium sites in Addis Ababa. Based on the revised literature, the data collected, and the findings obtained, the following conclusions were attempted to be drawn: analysis based on the types of solid waste management such as waste reduction, sorting, collection and disposal practiced in the three condominium sites revealed that the current municipal solid waste management practice was said to be ineffective. Due to three main reasons:

5.1.1 Lack of awareness and training based on a study

It is unquestionable that education and training can play a vital role in the way people think and behave. The result revealed that even though the Woreda is trying to carry out awareness creation works using different methods the outcome is not as expected. Therefore education and training based on a study must be given. Particularly the Woreda needs work that each person has the responsibility of managing their solid waste and work hand in hand with different actors in the solid waste management.

Though many of the respondents said that they sort their solid waste, still they don't consider it as their responsibility and don't see the full importance of sorting solid waste. The awareness creation and community participation work has to continue until the people fully develops the culture of separating different solid waste according to their nature.

5.1.2 Lack of law enforcement

The rules and regulations with regard to municipal solid waste collection and disposal are not well known by the community. Despite all the rules and regulations regarding solid waste being good in theory, very little is done to enforce them. In most cases, it is also difficult for the citizens to follow the regulation because they do not have access to a proper solid waste management system that allows them to manage their waste in line with the regulations. Therefore the Woreda needs to work on providing integrated solid waste management system that fulfills all the proper standards.

Even if majority of the people don't follow rules and regulation for the fact that they don't know them, many people act against the rules because of negligence and not wanting to take responsibility. Therefore the Woreda needs to enforce the laws and regulations in cooperation with police.

5.1.3 Lack of resource and man power

It is a plain fact that the management of solid waste cannot be effective without adequate resource and man power. For example lack of separate materials for different types of waste was one of the reasons the residents presented and lack of different materials is another problem faced by the Woreda experts, therefore the government should try to provide different materials to tackle this problem. The human resource the Woreda does not match with the vastness of the work. Especially in Woreda 14 there are only five people despite the work needs nineteen people.

Generally, the solid waste management is not getting the attention it needs to be given from the city administration. As SWM demands a huge resource and skilled man power, the city administration needs to work on allocation of adequate budget and professionals.

5.2 Recommendations

The finding of this study showed that the existing municipal solid waste management practice in the three condominium sites was ineffective and the services given by municipality were inadequate. Therefore, to minimize the problem the following recommendations were forwarded:

- ❖ The community has to be given adequate training to develop awareness on how to handle solid wastes at home starting from reduction, reusing, recycling, sorting, ... of solid waste.
- ❖ The municipality should create awareness about the specified rules and regulations about solid waste management.
- ❖ The Woreda should also strictly enforce the rules and regulations in cooperation with the Woreds' police under close supervision so that the community can be aware of their responsibilities and act accordingly.
- ❖ The city administration should give adequate emphasis for solid waste management in general and requires policy priority and adequate budget allocation to avoid shortage of man power and resource.
- ❖ Finally, integration of different parties such as the government, NGOs, the people etc. is needed for a successful solid waste management system in the three condominium sites.

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Annex I

Questionnaire for Household Survey

Dear respondent,

The goal of this study is to gather preliminary information to assess the current solid waste management system in three condominium sites (Yeka Abado, Ayat 1 and 2). Your response will help policy makers to formulate an informed policy about improved waste management system. The questionnaire will take a few minutes and the answers will be completely confidential and strictly for academic purpose. Thus, please answer the questions honestly and as truthfully as you can. Thank you for your kind cooperation.

A. Household Details

1. Household size

- a. 2 b. 3 c. 4 d. 5 & >

2. Gender

- a. male b. female

3. Average monthly household income

- a. < 2000 b. 2000 – 5000 c. 5000 – 7000 d. >7000

4. Educational qualification of the head of the house hold

- a. Illiterate b. Primary c. Secondary d. Higher

5. Profession of the head of the house hold

- a. Government employee b. Private employee c. Business
d. Housewife e. Retired

6. In which floor are you living?

- a. 1st b. 2nd c. 3rd d. 4th & >

B. Environmental Awareness

7. Have ever been educated or get a training on proper solid waste management?

- a. Yes b. No

8. Are you aware of environmental impacts of solid waste?

- a. Yes b. No

9. Do you personally think solid waste management is a major problem in your area?

- a. Yes b. No

10. Do you think environmental problems in your area will minimize if the solid waste is properly managed?

- a. Yes b. No

11. In your opinion which of these is a priority concern about waste in the area?

- a. Littering and looks bad b. Effect on human health
c. Effect on environment d. Others _____

12. Do you say the current waste disposal system is polluting environment?

- a. yes b. no

13. Do you know that from kitchen and vegetable wastes, an organic fertilizer can be made which is good for the environment?

- a. yes b. no

14. Do you try to reduce the amount of waste you generate?

- a. yes b. no

15. Community participation is inevitable for local waste collection system and improvement of the environment – do you agree?

- a. Yes b. No

C. Household Waste Generation and Disposal

16. Can you roughly identify percentage composition of your generated waste?

- a. Kitchen waste _____ % b. Plastic _____ %
c. Paper _____ % d. Others _____ %

17. Where do you dispose your generated waste?

- a. Nearby container b. Open spaces
c. Near home d. Others, Specify _____

18. What is the distance between your house and the dumping site?

- a. 200m b. 400m c. 500m d. >500m

19. Do you have regular garbage collection in your area?

- a. Yes b. No

20. (If yes for NO.19,) how often?

- a. Daily b. Once a week c. Twice a week

21. Do you separate different types of waste at your home?

- a. Yes b. No

22. (If no for no. 21,) Will you agree to separate your kitchen waste from other household waste?

- a. yes b. no

23. Will you agree if you are given two separate containers to segregate your kitchen waste from other wastes?

- a. Yes b. No c. any other alternative _____
-

24. Are you satisfied with your current waste disposal system?

- a. highly unsatisfied b. unsatisfied
c. satisfied d. highly satisfied

25. If you are not satisfied with the current SWM system, what is the main reason?
- a. distance from home
 - b. Costs too high
 - c. frequency of disposal
 - d. Other _____
-

26. Where is the household waste disposed?

- a. In the dustbin
- b. By the side of the road as there is no dustbin
- c. In an empty space near the house
- d. Inside the house

27. Generally, when do you dispose of your waste?

- a. No definite time
- b. Between 6am to 6pm
- c. After 6pm

28. How often do you dispose of your household waste?

- a. Every day
- b. Twice a week
- c. once a week
- d. Irregularly

29. You dispose your household waste in:

- a. Polythene /plastic packet
- b. Small bucket
- c. Any other container

30. Do people dump their waste alongside the garbage bins instead of putting it inside those?

- a. Yes
- b. No (if no cont. to Q.31)

31. If Yes, Why, in your opinion, people behave like this?

- a. Difficult to put waste inside the bin due to height of the bin
 - b. Difficult to put waste inside the bin due to waste and litter spread around the bin
 - c. Stray animals (dogs, mouse and birds etc.
 - d. Any other reason _____
-

32. How much are you currently spending for waste disposal per month?
- a. 10 to 30 birr b. 35 to 50 birr c. 60 to 80 d. > 100 birr
33. If your waste is collected directly from your house, are you ready to pay monthly fee for the system?
- a. Yes b. No
34. If your waste is collected directly from your house, then it will be suitable if it is collected:
- a. Every day b. Once every two days c. Once every three days
35. When do you prefer for your waste to be collected?
- a. Morning b. Noon c. Afternoon d. Evening

Annex II

Questions for Semi-structured Interview with Woreda experts

Dear respondent,

The goal of this study is to gather preliminary information to assess the current solid waste management system in three condominium sites (Yeka Abado, Ayat 1 and 2). Your response will help policy makers to formulate an informed policy about improved waste management system. The interview will take a few minutes and the answers will be completely confidential and strictly for academic purpose. Thus, please answer the questions honestly and as truthfully as you can. Thank you for your kind cooperation.

Gender _____

Position and responsibility

1. Can you please describe the responsible bodies involved in SWM in your Woreda?
2. How do you describe the current SWMS in the Woreda specifically in the three condominium sites?
3. Has the Woreda conducted any kind of awareness creating programs about solid waste management? And what are its outcomes?
4. What do you think makes condominium houses' SWM different from other forms of housing?
5. How often do you collect solid waste?

6. Is the existing solid waste management of the Woreda satisfactory? Yes
or , No
7. If no. what challenges and problems contributed to this?
8. What are the main challenges of SWMS in the Woreda specifically in the
three condominium sites?
9. What do you think is the solution for these problems?

Annex III

Questions for Semi-structured Interview with Key Informants (KIs)

Dear respondent,

The goal of this study is to gather preliminary information to assess the current solid waste management system in three condominium sites (Yeka Abado, Ayat 1 and 2). Your response will help policy makers to formulate an informed policy about improved waste management system. The interview will take a few minutes and the answers will be completely confidential and strictly for academic purpose. Thus, please answer the questions honestly and as truthfully as you can. Thank you for your kind cooperation.

Gender _____

Position and responsibility

1. How do you describe the current SWMS in this condominium area?
2. Have you ever attended training or any kind of awareness creating programs about solid waste management?
3. How often do you collect solid waste?
4. How do you describe the solid waste sorting culture of the community?
5. Is the existing solid waste management given by the Woreda satisfactory?
Yes or , No
6. If no. what challenges and problems do you think contributed to this?
7. What do you think is the solution for these problems?