



**COLLEGE OF DEVELOPMENT STUDIES
CENTER FOR ENVIRONMENT AND SUSTAINABLE
DEVELOPMENT**

**HOUSEHOLD SOLID WASTE MANAGEMENT PRACTICES IN
LIDETA SUB-CITY; ADDIS ABABA, ETHIOPIA**

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DECLARATION

I hereby declare to school of graduate studies of Addis Ababa University, that this thesis entitled **“Household Solid Waste Management Practices in Lideta Sub-city; Addis Ababa, Ethiopia”** is my original research work for the master’s degree of environment and sustainable development and has not been presented in any university. For the best of my knowledge, all sources of materials pieces of information used in this study are fully acknowledged and referenced based on the standards and regulations of the university.

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LIST OF ABBREVIATIONS AND ACRONYMS

AACG	Addis Ababa City Government
CED	Cumulative Energy Demand
CSA	Central Statistical Agency
EPA	Environmental Protection Agency
HH	Household
HHH	Household Head
ISWA	International Solid Waste Association
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste management
RRR(3R)	Reduce, Reuse, Recycle
SBPDA	Sanitation Beautification and Parks Development Agency
SMEs	Small and Micro Enterprises
SW	Solid Waste
SWM	Solid Waste Management
SWMT	Solid Waste Management Team
UN	United Nation
UNDP	United Nation Development Program
UNEP	United Nations Environmental Program

ABSTRACT

Solid waste management is the science of managing (controlling) the generation, storage, collection, transportation, resource-recovery, recycling and disposal of solid wastes generated from a residence in a way of addressing public health, conservation and environmental concerns. Although there are a variety of mechanisms of solid waste management, it is still poor as a result of many determinants in urban areas of Ethiopia particularly in Addis Ababa. This study tried to investigate the household solid waste management practices in Lideta sub-city by using the case study of two purposely selected woredas. Descriptive research design was employed with both qualitative and quantitative approaches. The data required for the study was collected from 380 household respondents systematically selected from woreda 5 and 7 of Lideta sub-city. The quantitative and qualitative data were collected through structured questionnaires, face to face interview with key informants and field observation respectively. Binary logistic regression model was employed to estimate the effects of factors affecting on household solid waste segregation. Among the total household respondents, 40% (152) were households who practice solid waste segregation, while 60% (228) were those who didn't practice solid waste segregation at household level. The result revealed that household head's level of education, training access and monthly income were statistically significant ($P < 0.01$) and found to have a positive effect on household solid waste segregation. On the contrary, age of household, marital status, housing ownership (kebele rental house & private rented house), household size, household heads job (private business), and monthly payment for disposal were statistically significant and found to have a negative effect on household solid waste segregation. Therefore the result of the study suggested that improving education level of the community, enhancing economic status of households, strategies targeted on awareness creation regarding household solid waste segregation at the source and the effective strategies of solid waste management (reduce, reuse and recycle) should be taken into account by the government, the cleansing management agency and other stakeholders.

Key words: solid waste, solid waste management, stakeholder, household, woreda

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Solid waste is any solid or semi-solid materials generated from household, business institutions, industries, various organizations, garage, street cleaning, constructions, agriculture, animals, and generally from the activities of the society and dumped as it is useless or unwanted (Addis Negarigazeta, No.100/2018).

Solid waste management is defined as the science of controlling the generation, storage, collection, transportation, processing (reusing and recycling) and disposal of solid wastes in a way of addressing public health, conservation, economic, aesthetic, engineering, and other environmental concerns (Alamirew, 2018). According to Ashenafi (2011), Planning, administrative, financial, engineering, and legal tasks are all part of solid waste management. Complex inter-disciplinary relationships among subjects including public health, city and regional planning, geography, demography, political science, economics, sociology, communication and conservation, engineering, and material sciences could help to search out a solution.

Another study also stated that humans have made use of the resources available to them in order to live. In the course of living, humans produce wastes, which they dispose of in the surroundings, although this does not represent a serious concern (Alemayehu *et al.*, 2017). This was due to the fact that the population was limited, and the amount of area necessary for waste assimilation was excessive. However, as the world's population continues to expand, solid waste management has become a severe concern in cities.

In developing countries around the world, solid waste management has become a major challenge for city administration activities. This is mostly owing to rapid urbanization and population growth, which has resulted in a significant increase in the rate of municipal solid garbage output in metropolitan areas (Desta *et al.*, 2014). According to the analysis of World Bank (2018), developing nations spend about \$46 billion each year on municipal solid waste management. By 2025, it is expected that these investments will total more than \$150 billion each year. Due to a lack of sufficient planning, inadequate governance, bad technology, low enforcement of the existed rules and regulations, and a lack of economic incentives, Africa's

solid waste management (SWM) is claimed to be poor. This has a harmful impact on the environment and public health, as well as on long-term development.

Countries adopt a variety of techniques to manage solid waste in order to avoid negative effects on the environment, public health, and long-term development. The increase in solid waste generation in Ethiopia, as in other developing countries, is due to rapid urbanization and population growth. As revealed by Abebe (2017), the volume of solid trash in Addis Ababa and other rapidly rising cities in Ethiopia has been steadily increasing over time, owing due to the country's rapid population growth rate. About 50-60% of the total solid waste discharged by the city's residents was collected, while the rest was left uncollected.

The agency recently improved its coverage to over 85%. As a result of the city's decentralization power delegation, the sub-cities of Addis Ababa now have responsibility for solid waste management within their jurisdiction. The solid waste management teams in each of the 11 sub-cities have been constituted. Sub-city administrations and small-scale firms, who perform solid waste collecting procedures in various locations throughout the sub-cities, provide the most notable solid waste management services such as collection, transportation, and disposal. The population of Addis Ababa's residential areas has risen and become increasing throughout time. As a result, the rubbish generated by these dwellings multiplied and was deposited in various areas of the city such as Highways, rivers, ditches, avenues, open areas, and so on are examples(AACG-SBPDA, 2005).

Air pollution is also caused by rubbish burning in backyards and open places, spontaneous combustion, and haphazard incineration without sufficient treatment for gas emissions. As a result, each of these will have an effect on long-term environmental development. This condition can also be found in Addis Ababa's several sub-cities. Therefore, the focus of this research was on investigating the current solid waste management practices of the households and factors that affect the practice of solid waste segregation in Lideta sub-city.

1.2 Statement of the Problem

Urbanization, population-growth, industrialization, and shifting consumer habits all contribute to the increment of more solid waste and its expansion (Alemayehu, 2017). According to Workneh (2016) in urban places such as Addis Ababa, the situation is more or less severe. Solid Waste is currently expanding beyond the capacity of municipal governors in Addis Ababa; the volume of waste totals more over three million cubic meters per year,

with the likelihood of an annual growth of 2.1 cubic meters per person. However, according to UN estimates from 2020, only 65 percent of the garbage created in the city is collected, with the remainder being dumped in open areas, drainage channels, and rivers. This truth can be seen by moving through Addis Ababa city's streets, where locals may not find it uncommon to witness overflowing garbage skips frequently rendered for their solid waste but on the contrary in Addis Ababa, waste generation is rising at a rate of 5 percent each year.

To solve the above stated problem, the government has formed SMEs and privately owned cleansing service provider agencies to partner with the government's cleansing management agencies to improve solid waste management and reduce related difficulties. Despite this, governments and other stakeholders (service providers) have been hampered by a lack of technology, technical expertise, financial resources, institutional structure, and community awareness (Abebe, 2017).

In addition to this, though the Addis Ababa municipal administration cleansing management agency established a standard of sanitation providing services based on the authority granted, despite the agency's efforts to improve the cities' cleanliness by implementing eight standards ranging from the lowest to the highest and to streamline the work process, the problem persists. As a result, municipalities in Ethiopia were given responsibility for solid waste management (SWM) services to overcome the related problem subjectively and specifically, resulting in insufficient service provision as evidenced by lack of proper collection, poor sanitary facilities, and improper planning and coordination (Alemayehu et al, 2017).

Several local studies have been carried out in various sections of the country. For instance, Alemayehu et al. (2017) focused on the delivery of residential solid waste management services, specifically the role of stakeholders in the Arada sub-city. Inadequate organization, a lack of material and human resources, unequal container distribution, a lack of proper support for the private sector, a lack of awareness-raising and community participation are some of the factors that contribute to the sub-city's poor solid waste management service delivery, but the researcher did not assess all the factors influencing to solid waste management practices at household level.

Asnakew(2017) did another study that focused solely on the social impact of SW, as opposed to the current study, which focuses on SWM practices. Temesgen(2017) conducted another study in the Lideta sub-city that focused on solid waste generation and composition. Despite the fact that the studies are useful for gathering preliminary data, they were not designed to

evaluate the process of SWM practices from source generation to final disposal location in accordance with established criteria. Furthermore in the above mentioned researchers, there is a limitation in properly examining the potential factors affecting the households' solid waste management, particularly households' solid waste segregation practice, such as training access, and household heads income and occupational status. In addition, there is inadequate data on household's solid waste management practices in terms of waste generation, storage, collection, transportation, reusing& composting and disposal should be properly investigated.

Thus, this study tried to fill the gap by addressing the factors affecting households solid waste segregation practices at household level that have not been studied yet by other researchers in Lideta sub-city as well as all over the country. Moreover, most researchers used only descriptive statistics to analyze the data obtained. This does not provide a detailed analysis of the data collected. So, this study employed binary logistic regression model to have a detailed look of the data, which increases the soundness of the result.

1.3 Research Questions

This study were attempted to answer the following research questions:

- How the solid waste management is practiced at the household level in the study area?
- What do the households' attitudes towards solid waste management look like?
- What are the potential factors affecting households solid waste segregation practices in the study area?

1.4 Objective of the Study

1.4.1 General Objective

The general objective of this thesis was to investigate the household solid waste management practices in Lideta sub-city.

1.4.2 Specific Objectives

The specific objectives of this thesis were to:

- assess the existing solid waste management practices of the households
- assess the households' attitude towards solid waste management
- analyze factors that affect households solid waste segregation practices

1.5 Significances of the Study

The findings of this study will play a key role in providing background information that will aid in the development of short and long-term plans to address solid waste management issues. It is critical to provide policymakers, solid waste managers, and environmental protection organizations with guidance on the current state of household SWM practices and the factors that determine the practice of solid waste segregation at household level in Lideta sub-city. It will encourage other researchers to perform additional research in this or other areas of study. Furthermore, the study's findings are expected to fill the information gap and provide small but significant contributions to policy and planning challenges.

1.6 Scope of the Study

To make the study more manageable, delimitations in terms of the geographical area, the type of subjects (respondents) to be studied, the issue to be analyzed and the breadth and depth with reference to the topical scope was made. Therefore, the study was demarcated from the standpoint of manageability. Accordingly, data collection was made based on sample survey to cover more relevant information regarding the household SWM practices in terms of solid waste generation, storage, collection, transportation, reusing, composting and disposal as well as on the attitude of households towards SWM and the factors affecting the practice of SW segregation at household level. The investigation included sample household heads, the cleansing management office staffs and SMEs association solid waste collectors in Lideta sub-city. Efforts were made to cover two purposely selected woredas, with systematic representation of household head respondents and with reference to the study topic.

1.7 Limitation of the Study

There is some limitation that was faced in this research. The limitation envisages are, first, the literacy level of the respondents. This was solved by using simple language or translating the questionnaire into the Amharic language. Secondly, the respondents were not volunteered due to the Covid19 epidemic. It is also mitigated by clearly applying the preventing methods of covid 19 during conducting the questionnaire. Thirdly, the research data was collected only by crosssectional survey; it only shows the current status. Lastly, due to time and resource constraints the study was localized in only two woredas in Lideta sub-city. It would have been better to cover the whole region to increase its generalizability. However, necessary precautions were made so as these limitations not to be affecting the findings of the study.

1.8 Operational Definition of Terms

Household: is refers to any unit of habitual residence where some consumption and or production may be taken in common.

Household head: is refers to the male or female head of one family or household.

Woreda: means the third administrative stratum of the Addis Ababa city which is a unit of the sub city and the lowest administrative unit in Ethiopia.

Sub city: means the second administrative stratum of the Addis Ababa city administration

Agency: means the authorized/responsible organization for solid waste management of Addis Ababa city administration.

Landfill: is refers to the place where the disposals of waste materials are to be put.

Waste:is refers to any material which recapitulates scrap objects, garbage liquid (gas) or other undesirable surplus emanated from application of any substances or objects which requires to be disposed of which has worn out, broken, spoiled or otherwise contaminated.

Solid Waste: is refers to sludge, garbage, refuse and other discarded solid materials resulting from industrial, residential, commercial activities and agricultural operations, but does not include liquid and gaseous materials. In short, it is anything that is neither gas nor liquid and is thrown away as unwanted.

Household Solid Waste: is refers to solid objects identified as unwanted, discarded and segregated for disposal and this materials are sourced from residents home and the responsibility of its management is given to the agency and SMEs private association solid waste collectors.

Municipal Solid Waste: is refers to objects discarded in cities and sub-cities for which municipalities and SMEs private association solid waste collectors are usually responsible for collection, transportation and final disposal.

Municipal Solid Waste Management: is a task of planning and implementation of solid waste controlling elements such as generation, storage, collection, transportation, reusing recycling and disposal of solid waste under management of local government or agency.

Solid Waste generation: is refers to a task involved in segregating solid objects which are no longer usable and are either collected from the sources for systematic disposal or for reusing and recycling purpose.

Solid Waste collection: is refers to an important stage of solid waste controlling mechanism includes tasks such as placing in solid waste collection bins or other storage materials and accumulating garbage in the place where the collection vehicles are emptied.

Composting: it is a process of allowing biological decomposition of solid organic wastes such as kitchen wastes like vegetable peels, bacteria, fungi, worm, insect and other organism in to a soil for converting the large quantity of organic materials to compost humus like materials. The organic materials produce by composting can be added to soil to prepare plant nutrients such as phosphorus, nitrogen, iron, sulfur, potassium and calcium to decrease soil erosion, make clay soil more fertile or increase water holding capacity of sandy soils.

Temporary solid waste collection skip point: is refers to where the solid waste goes from the control of the waste generator to the control of the waste collection enterprises. Another determining element is that the generator is responsible for transporting the solid waste to the temporary solid waste collection skip point/location, and so is worried about the time and effort involved and must be initiated to do it.

1.9 Organization of the Thesis

This thesis report has five chapters. The first chapter of this thesis introduces the background of the study, statement of the problem, research questions, and objective of the study, significance of the study, scope of the study, limitation of the study, operational definition of terms and organization of the research. The second chapter of this study reviews theoretical, empirical and conceptual literatures related to the research title. The third chapter incorporates the methodology of the research in general, including the description of study area, research design and approach, sources of data, data collection instruments, data collection procedures, sampling techniques and sample size determination, ethical considerations, validity and reliability of data, data analysis techniques, model specification and description of independent variables. The fourth chapter of this study presents the results and discussion of the study. The last chapter of this study recapitulates conclusion and recommendation of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Concept and Definition of Solid Waste

Solid waste is defined as any material or object that is generated and disposed of or intended to be disposed of by an individual who has custody of it. However, because of the legislation nature and geographical location of generation, many definitions of solid waste exist dependent on the circumstances in which they were created and sourced (Kebede, 2017).

According to Ashenafi (2011), solid waste is defined as stuff that no longer has any value to its original owner and is disposed. Organic waste (including room waste and garden trimmings), paper, metals, glass, and plastics are the most common solid waste constituents in metropolitan city dwellings. Ash, dust, and street sweepings could make up a significant amount of trash. Solid waste management (SWM) is defined by other authors as the techniques of controlling different waste in a manageable area, which may include waste collection, recycling, treating, and disposal to minimize their impact on the environment and human health in accordance with agreed national or international standards.

According to Horro, (2018) the objective of municipal solid waste management is to advertise the urban environment's standard, produce employment and money, safeguard environmental health, and support the economy's efficiency and productivity. Since the beginning of non-nomadic societies around 10,000 B.C, humans have been mass-producing solid garbage. Public health, security, resource scarcity, and aesthetics have all served as important drivers for waste management systems in the past. Small towns were able to bury solid waste outside of their settlements or dispose of it near rivers or water bodies; however, as population densities diversified, these procedures were no longer effective in tackling the spread of foul odor sickness.

The urban populace in America suffered from equally deplorable conditions. Several projects to clean up the streets were implemented, but all were short-lived due to the poor's focus on feeding themselves, as well as the rich's opposition to paying to clean up for the poor. Due to a lack of resources, some items were mended and reused, and the waste stream was heavily scavenged. Solid waste management success and effectiveness was influenced on by five major factors these were: public health, shortage of resources and waste value, the environment, climate change, and public knowledge and engagement (Horro, 2018).

According to Zerihun (2018), waste is defined as the number, composition, and kind of solid wastes generated from a city residential households and other sources. A significant amount of knowledge and data about the nature of the solid wastes produced in a specific city is required for successful and cost-effective solid waste management. To determine the types and quantities of facilities required for solid waste management and the optimum disposal choices in a given city, specific data on the amounts (generation rate) and nature of constituents of solid wastes produced in the city is required. Even when planning for future facility provision, expected increases in waste source volumes should be estimated.

To identify Municipal Solid waste, it is important to understand the source of the waste, its components, as well as the type and character of the waste. Solid waste can be classified as combustible or non-combustible, decomposable or non-decomposable. According to Horro (2018), Any or all operations of identifying materials as no longer being important and hence are either thrown away or gathered for disposal are referred to as waste generation. Solid Rubbish generation rate, on the other hand, refers to the amount of waste discarded during a certain period of time and hence its quantification entails a variety of approaches, including measurement at the point of generation, vehicle surveys, and records analysis at disposal facilities. The estimated quantity of municipal solid waste (MSW) produced annually in the world is 1.9 billion metric tons, making cities a hazard to the environment. The pace at which solid trash is generated in a particular town/city is determined by demographic expansion, seasonal variation, geographic location, economic development, and people's attitudes, according to the definition of (Horro, 2018; Zerihun, 2018).

According to Horro(2018), the influence of economic development is demonstrated by comparing the gross national product of developed and developing countries with their waste generation rates, and he concludes that the higher the gross national product of a country, the higher the waste generation rate. People's attitudes toward garbage, according to the author, are related to their interest in waste reduction and the extent to which they refrain from indiscriminate disposal and littering.

2.2. Types of Municipal Solid Waste and their Sources

Municipal solid wastes can be classified based on its origin, risk potential, or characteristics. Horro (2018)classified solid wastes based on the origin as rubbish, food waste, ashes and residues, municipal service, agricultural waste, industrial process waste, and demolition and construction wastes. Based on characteristics, it also classify as biodegradable and non–

biodegradable. In addition, based on its risk potential, again it can be categorized in to hazardous and non-hazardous wastes (Zelalem, 2006; Besha, 2019). However, solid wastes are usually classified based on their sources (from which they emanate). Based on this benchmark, it can be categorized in to domestic or household, commercial, institutional, industrial, municipal services, construction and demolition, agricultural wastes.

2.3 Composition of Municipal Solid Waste

Urban solid waste can be divided into two major components based on nature of wastes such as biodegradable and non-biodegradable. Basically the composition of solid waste depends on the local factors such as time of the year or seasons, habits of community, educational status, economic status, geographical location and population size (Takel, 2004). The biodegradable components of urban solid wastes comprise organic wastes such as food waste, garden wastes and agricultural wastes which can be turned in to compost through biological process where as non-biodegradable wastes includes inorganic materials which cannot be decomposed and comprises different types of plastics such as plastic bag or festal, highlands, broken pieces of plastic materials, glasses, pieces of metals, discarded old shoes and different old wearing clothes etc (Takel, 2004, Hele, 2017).

In addition to these, construction and demolition wastes generated during the process of construction and destruction activities includes sands, nails, cement concrete, woods are under the category of solid wastes. Similarly various types of medical waste including handbag, syringes, glucose materials from clinics and other health care institutions are considered as solid wastes (Hele, 2017).

2.4 Goals and Principles of Solid Waste Management

According to Schubeler (1996), human activities create waste, and it is the way these wastes are handled, stored, collected and disposed of, which poses risks to the environment and to public health. According to this author, the first goal of MSWM is to protect the health of the urban city inhabitants, specifically those who have low-income groups who suffer most from weak solid waste management. Secondly, MSWM aims to develop environmental conditions by controlling pollution (including air, water and soil pollution) and ensuring the safeguard continuity of ecological systems in the urban region. Thirdly, MSWM assists urban economic growth by providing the demanded solid waste management services and ensuring the efficient use and conservation of important resources and materials. Fourthly, MSWM aims to create job employment and incomes in the sector itself.

To achieve the above goals, it is required to establish sustainable systems of SWM which meet the needs of the entire urban population. The essential condition of sustainability implies that solid waste management systems must be absorbed and carried out by the society and its local communities. These systems must, in other words, be appropriate to the particular circumstances and challenges of the city and locality, employing and developing the capacities of all partnerships, including the households and communities requiring the service, private sector enterprises and workers (both formal and informal), and government agencies at the local, regional and national levels.

The same author emphasized that solid waste management should be approached from the perspective of the entire cycle of material use, which includes production, distribution and consumption as well as waste collection and disposal. Whilst immediate priority must be given to effective collection and disposal, solid waste reduction, reusing and recycling should also be pursued as equally important as longer-term objectives.

The principles of sustainable solid waste management strategies are to: minimize waste generation, maximize waste recycling and reuse and ensuring the safe and environmentally sound disposal of solid waste.

Keeping the solid waste management goals and the necessary strategies in our mind, one cannot assume the goals be achieved through isolated or sectorial approaches. Similarly, Schubeler (1996) expressed that sustainable solid waste management depends on the overall effectiveness and efficiency of urban administrative management, and the capacity of responsible municipal authorities.

2.5 Types (Strategies) of Solid Waste Management

A waste hierarchy can be used to assess procedures/steps that hide or safeguard the environment's resource and energy consumption, from the most useful/efficient to the least useful/efficient acts. To be environmentally sustainable and cost-effective, the waste hierarchy entails reducing material usage and reusing it. The first step in minimizing pollution sources is to reduce waste creation and repurpose materials to keep them out of the waste stream from disposing as unwanted resource (Vandana et al, 2017).

According to Daniel and Perinaz, (2012) explanation the three Rs such as reduce, reuse, and recycle come first in the hierarchy, whereas the fourth R thus are recovery comes later. The hierarchy establishes the most popular program priorities based on a property. Traditional

trash avoidance, re-use, and recycling activities are forbidden in numerous underdeveloped nations; therefore some elements of this hierarchy are already in place (Endalkachew, 2018).

2.5.1 Reduction/ Prevention

The highest priority choice in SWM hierarchy is to stop or reduce the solid waste generation at the supply (source). The waste reduction might occur through the designing, producing, and packaging of products with minimum harmful content, minimum volume of fabric, or extended useful life (Endalkachew, 2018).

2.5.2 Reusing

According to Vandanaetal (2017) the most effective approaches to stop the development of waste are to reduce and reuse. It's well recognized that up to 95% of a product's environmental impact occurs before it's discarded, primarily during manufacturing and the extraction of virgin raw materials.

According to Vandanaetal (2017) recycling necessitates the separation of waste streams, whether at the source or after collection. This strategy also reduces the amount of trash produced as a product, conserves natural resources, and lowers production and manufacturing costs. Reusing items that are no longer needed by someone can help to reduce municipal solid trash creation.

2.5.3 Recycling

Recycling, in addition to reuse, is an obvious solution to the solid waste management problem. It's a crucial approach for collecting solid waste materials and converting them into useful items that can be sold in the market. There are two techniques to reprocess such material: primary and secondary. As a result of environmental concerns, many people feel compelled to recycle. Waste recycling benefits the economy by recovering and repurposing valuable materials. They cut down on the amount of garbage that needs to be collected, transported, and disposed of, as well as extending the life of disposal facilities, saving the agency money (Yohanis&Genemo, 2015).

2.5.4 Processing and Recovery

All procedures, equipment, and facilities used to improve the efficiency of other functional components and to recover useful materials, conversion products, produce energy, and compost from solid wastes are included in this functional element. It also comes with a number of advantages. First, it will help to reduce the overall volume and weight of garbage

that needs to be collected and disposed of. In addition, it lowers the total cost of garbage transportation to its final disposal site. The author mentioned once more that solid waste processing and recovery began with the separation and processing of wastes at the point of generation (Yohanis&Genemo, 2015).

2.5.5 Incineration

Incineration is a mechanism for regulating and completely burning solid waste. One of the most indicative properties of an incinerator that can be employed is the reduction of the initial volume of combustible solid waste by 80-90 percent. This is a waste reduction method, not a waste disposal method, as the ash from the incineration should still be disposed of. It is acknowledged as a viable way of disposing of certain hazardous waste items (such as medical waste) (Yohanis&Genemo, 2015).

2.5.6 Land Filling

According to Mahiteme (2011), the most frequent disposal option for solid waste in Africa is open landfills, with no environmental control, and many of these landfills are practically full, and in most cases the environmental condition is very poor. The landfill was first utilized in conjunction with the creation of cities, and crude dumping was the original method of disposal. Still, as living standards rise, so does the need for better environmental benefits, and dumping rubbish in the open is becoming increasingly unacceptable to a more educated and aware society.

People in most Western countries are gradually realizing the value of energy and raw material recovery, as well as rational land management, and are steadily reducing their use of landfill. In general, waste management hierarchy has the following steps, diagrammatically from most favored option to least favored option.

2.6 The Contexts of Solid Waste Management

According to Schubeler (1996) cited on Ali (2008) Municipal solid waste management is a complex task which depends upon organization and cooperation between households, communities, private enterprises and municipal authorities as it does upon the selection and application of appropriate technical solutions for waste handling: collection, transfer, recycling and disposal. Furthermore, solid waste management is an essential task which has important consequences for public health and social well-being, the quality and sustainability of the urban ecosystem and the efficiency and productivity of the cities and sub-cities economy. As a result, solid waste management, currently, is one of the most valuable urban

services provided under the municipal responsibilities nearly in all countries. Municipal solid waste management is a major responsibility of local governments, typically consuming between 20% and 50% of municipal budgets in underdeveloped nations.

Like other urban services, the effectiveness and sustainability of urban SWM systems depend upon their adaptation to the prevailing context of the city and/or country in which they operate. The most important aspects in this regard are the political, socio-cultural, economic and environmental conditions.

2.6.1 The Political Context

MSWM is influenced in several ways by the political context: the existing relationship among local and central governments (the degree of decentralization, for example), the form and extent of inhabitants' participation in the process of public policy making and the role of party politics in local government administration. All these and other similar factors affect the character of management, governance and the type of urban SWM system.

2.6.2 The Socio-Cultural Context

The functioning of MSWM systems is influenced by the waste handling patterns and underlying attitudes of the urban residents or households, and these factors are, themselves, conditioned by the people's social and cultural context. Programsto disseminate knowledge and skills, or to improve awareness patterns and attitudes regarding SWM, must be based on sound understanding of the social and cultural characteristics.

As expressed by Schubeler (1996), a community may consist a considerable diversity of social and ethnic groups, and this social diversity strongly affects the capacity of communities to organize local solid waste management. At the same time, urban communities often conserve rural traditions of mutual self-help and cooperation, which significantly maximizes the potential for community-based solid waste management.

Generally, the effectiveness and sustainability of urban SWM systems depends on the degree to which the served inhabitants/residents is involved in strategic decision making and leadership of the systems and facilities.

2.6.3 The Economic Context

The level of economic growth is an important determinant of the volume and composition of solid wastes generated by residential and other users. At the same time, the effective demand

for solid waste management services, the willingness and ability to pay for a particular level of service is also determined by the economic context of a particular city, place/area.

Similarly, the character of solid waste management tasks and the technical and organizational nature of appropriate solutions depend, by far and large, on the economic context of the country and/or city in question and, in fact, on the economic situation in the particular place/area of a city. This indicates that the economic growth of a country affects the level, type and effectiveness of SWM service provision.

2.6.4 The Environmental Context

The design of SWM systems in urban areas must take in to account the physical characteristics of such factors as topography, density and nature of population, conditions of roadsetc. of the given area. In addition to the above factors, solid waste management steps and public health situations may be determined by climatic conditions and characteristics of local habitats and ecological systems. This means that the degree to which unmanaged waste dump sites become breeding ground for insects, rodents and other disease vectors and a collecting place for dogs, wild animals and poisonous reptiles depends largely on prevailing climatic and natural conditions(Schubeler,1996).

In practical terms, climate determines the frequency with which solid waste collection skip points must be serviced in order to minimize negative environmental challenges and consequences. According to Schubeler (1996), environment health conditions may also be indirectly affected through the pollution of ground and surface water by leachates from disposal sites. The above cited author further expressed that air pollution is often caused by open burning at dumpsites, backyards, and foul odors and windblown that litter the surrounding. He also mentioned that methane, an important greenhouse gas, is a by-product of the anaerobic decomposition of organic wastes in landfill sites.

2.7 Solid Waste Management in Developing Countries

Though the waste produced by human settlements and the resulting problems are mainly the same, there are differences between regions and locations due to variables such as cultural, climatic, geological, industrial, legal and environmental factors. Hence, the current status of solid waste management is by no means similar in different parts of the world. For the purpose of showing these differences, ISWA (2002) has viewed the globe by dividing into four geo-political areas: these were the European Union, the United States, other high and medium income nations and economically under developed nations.

According to the above classifications, the member states of the European Union are viewed as having reached the most advanced state in solid waste management in the world while the economically developing nations generally lack policies that aimed at the management of solid wastes. In addition, most developing countries do not have latest and modern rules and regulations; the existing rules and regulations are faithout and rarely enforced.

The solid waste management systems in different developing nations vary substantially and are in some cases virtually non-existent (ISWA, 2002). In the meantime, SWM has become an issue of concern for public health and environmental protection sectors in many of these nations. Most developing nations do not have the technical and economic resources to control solid wastes safely. This means that storage at the point of waste sourced is often inadequate and collection services are inefficient and insufficient. Final disposal in these nations was usually a matter of transporting the collected solid wastes to the nearest available open space and then discharging them. In some cases, the solid waste is set on fire in order to minimize its volume and to reduce the attraction of animals and vermin (ISWA, 2002).

Furthermore, developing countries in the process of industrialization are often hosting industries which are hazardous and solid waste intensive such as petrochemicals, oil-refining, pharmaceuticals manufacture and metal production. But the method they employ for waste disposal remains the same as mentioned earlier i.e. uncontrolled dumping. In this regard, as indicated by ISWA (2002), in many developing nations, the rapid population growth and the increasing economic activity combined with lack of training in modern solid waste management practices complicate the effort to improve the solid waste service. Hence, SWM in the developing nations is inadequate and weak, leaving waste uncollected in roads; disposed in vacant lands, drains and surfaces of water, and burnt in the open air is becoming a major public health and environmental concern in urban areas of many developing nations.

Regardless of the need for sustainable and integrated system of management, the effort made by the municipalities in African nations is to solve solid waste challenges mainly by focusing on expensive end of pipe solutions, involving the collection and disposal of solid waste.

2.8 Solid Waste Management in Africa

According to Endalkachew (2018), in most impoverished nations, open dumping with open burning is the standard. In a developing nation, a typical SWM system reveals a slew of difficulties, including inadequate collection coverage and inconsistent collection services.

Solid Waste management concerns on our continent are complicated due to a various causes. Economic, technical, political, and infrastructure factors, as well as organizational/management issues and problems to be solved, are some of the elements to consider) MSWM has frequently been an intractable (stubborn) hindrance in recent years, much beyond the capacity of most state governments, according to the author. This has resulted in garbage heaps (lots) being placed within the urban landscape in heavily populated areas (Endalkachew, 2018)

2.9 Solid Waste Management in Ethiopia

The quality of solid waste management has a significant challenge on the environment and public health in developing nation cities. Solid waste (SW) generation increased in our country, as it did in other developing nations, as a result of rapid urbanization and population growth(World Bank, 2018).

As a result, solid waste management (SWM) is an important part and resource in urban sanitation, as well as one of the most important and resource-intensive services offered by municipalities and other voluntary organizations (Endalkachew, 2018). Solid waste created in Ethiopia's major towns and cities does not appear to be properly treated and managed, owing due to institutional, legislation, economical, technological, and public engagement issues (Mekonnen, 2012).

Municipal solid waste collection is difficult and sophisticated in most cities because the formation of residential, commercial, and industrial waste is a dispersed process that occurs in each house, building, and commercial and industrial site. In addition to the streets, parks, and even the available open spaces within the town (Endalkachew, 2018).

Solid garbage created in Addis Ababa major city and sub-cities does not appear to be properly treated and managed, owing due to technical, institutional, regulatory, financial, and public participation and engagement situations (Mekonnen, 2012). Municipal solid waste collection is difficult and sophisticated in most cities because the formation of residential, commercial, and industrial garbage is a dispersed process that occurs in each house, building, and commercial and industrial site. In addition to the streets, parks, and even the available open spaces within the town.

2.10 Solid waste management in Addis Ababa

According to the report of UNDP (2005), despite the Addis Ababa city establishment is early, the city started its SWM 71 years later after its establishment with the purpose of ensuring the health of its residents. However the city is still faced with a number of solid waste management challenges. Addis Ababa city started its solid waste management in some three decades back. The service cannot meet changing demands. The waste collection service is insufficient and scenes of scattered waste are common in most part of the city.

The current solid waste management of Addis Ababa city is beyond the management capacity of the municipality due to its increasing rate. The volume of the waste being formed per year is more than three million cubic meters with the prospect of increase by a constant rate of 2.1 cubic meters per person annually (Workneh, 2016). However, according to the Urban Planning, Sanitation and Beautification Bureau, an estimated of 30 % to 50 % of solid waste generated in urban areas is left uncollected. According to Van, (2014) the reduction of solid waste generation at the source, reuse and recycle practices of solid waste at household level is very weak in Addis Ababa city. In addition there is no knowledge and skill of support by responsible bodies for such a system regarding waste minimization at household level, to adopt and adhere as a principle.

In Addis Ababa city, several small and micro enterprises have been set up to carry out waste pre-collection service, receiving payment either from the respective beneficiaries or agency to collect and transport solid waste to the municipal SW containers/temporary SW collection skip points over the last few years, and hence it helps to fill the gaps in collecting and transporting solid wastes (Zelalem, 2006; Besha, 2019).

2.11 Theoretical Review

2.11.1 Self-determination Theory

Self-determination theory explains two main types of human motivation; namely extrinsic and intrinsic (Ryan and Deci 2000). Extrinsic motivation is a potential predictor of human behavior. However, intrinsic motivation represents the internal features or behavior of a person rather than external stimuli or characteristics (Skinner and Ch, 2012).

This theory concerned with solid waste management practices such as solid waste segregation at household level, the most important concepts of self-determination theory relatedness, autonomy and competence are not sufficient enough to predict the contribution of motivation

(Thogersen and Folke 2003). For instance, a person observing some persons affected with skin disease walking around his surrounding could understand the problem come due to unhealthy solid waste segregation and disposal mechanisms and this may initiate or motivate him/her to manage and segregatesolid wastes produced around his/her own surrounding or home. Hence, other external elements such as community groups; opportunities; convenience factors; provision of solid waste segregation maps; solid waste management stockpiles; and internal potential elements such as environmental knowhow, feel good factors, heritage, tradition and culture may play a vital role in defining motivation of solid waste sorting practice.

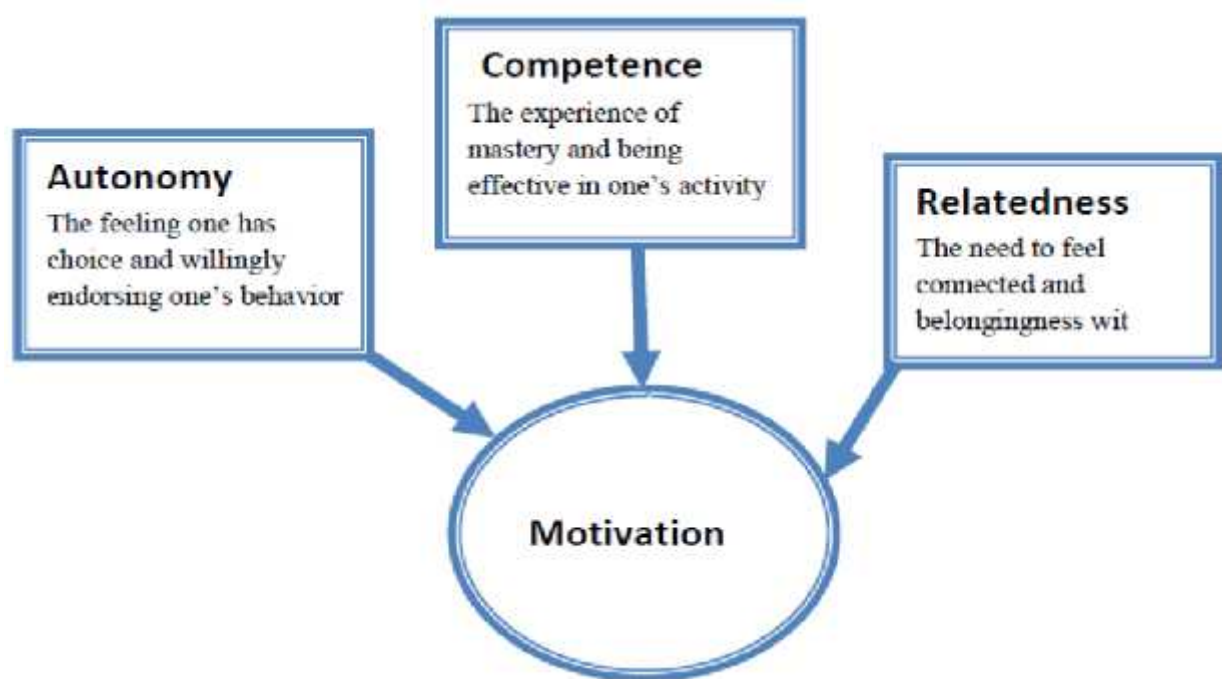


Figure 1: Self-determination theory (adopted from Ryan &Deci, 2000)

2.11.2 Self-Efficacy Theory

According to the perspective of self-efficacy theory actions are determined primarily by individual judgments and expectations of outcomes, and the opportunity to successfully master a skill or cope with a given situation to produce positive results in attaining a goal. According to Bandura and Schunk (1981), stated that people process and weigh various sources of information regarding their ability to manage their character. Thus, self-efficacy theory conceptualizes that individuals are capable of self-regulation and of being active participants in solid waste management practice, such as solid waste segregation at home and environmental protection activities.

The concept of self-efficacy is incorporated in household solid waste management practice, participations particularly in segregation of solid wastes for the purpose of composting, reusing, recycling and for proper disposal activities(Chu and Chiu 2003; Sea cat and Northrup 2010).

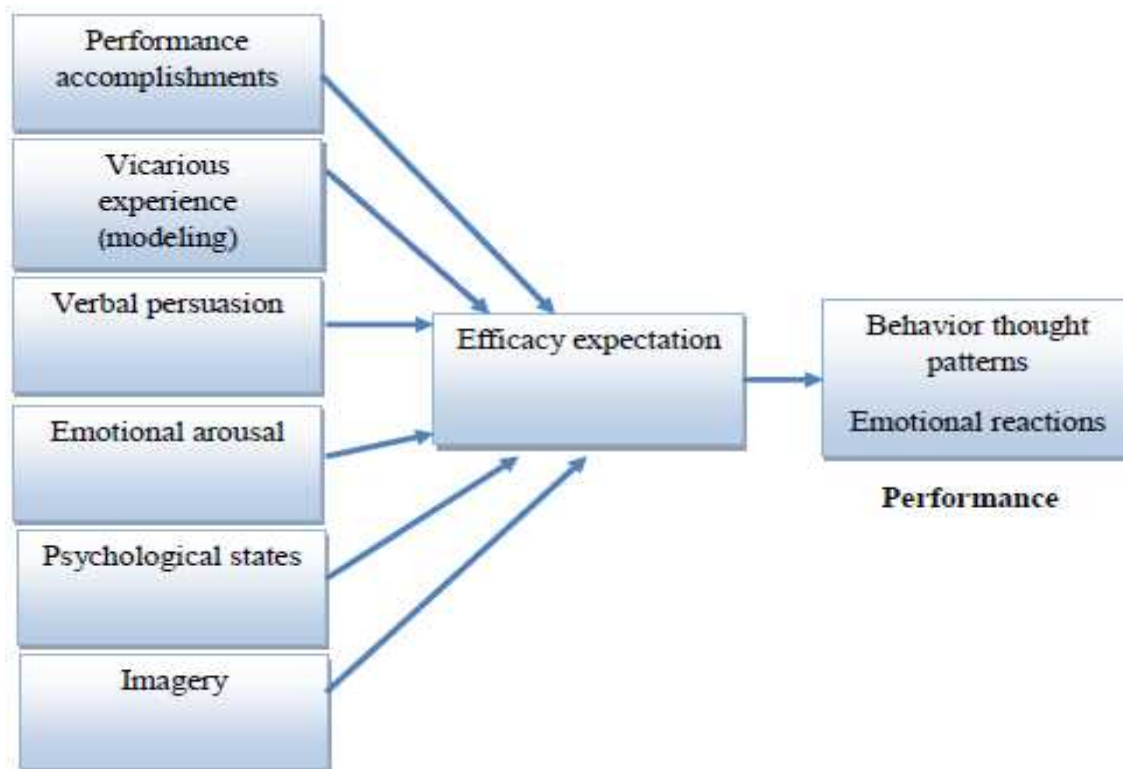


Figure 2: Self efficacy theory (adopted from Bandura, 1977)

2.11.3. Theory of Planned Behavior

Theory of Planned Behavior is a theoretical framework to assist an understanding of perceived effectiveness and public attitudes towards the scheme under study. The theory predicts an individual's intention to engage in a behavior at a specific time and place (Ajzen, 1991).

The use of psychological models in this theory is important to understand the reaction of households to solid waste segregation programs that require supporting this choice. The theory was developed from the previous theory of reasoned action, assumes that people behave rationally and they consider the implications and consequences of their actions/activities (Fielding et al, 2008).The planned behavior provides a theoretical framework for systematically identifying the factors which affect the households decision to segregate solid wastes at their home and as well as their surroundings. Theory of planned

behavior also allowed individuals who have positive attitudes, and think that there is adequate normative support, and perceive that they can easily engage in the waste separation activity, should have strong intentions to perform the behavior.

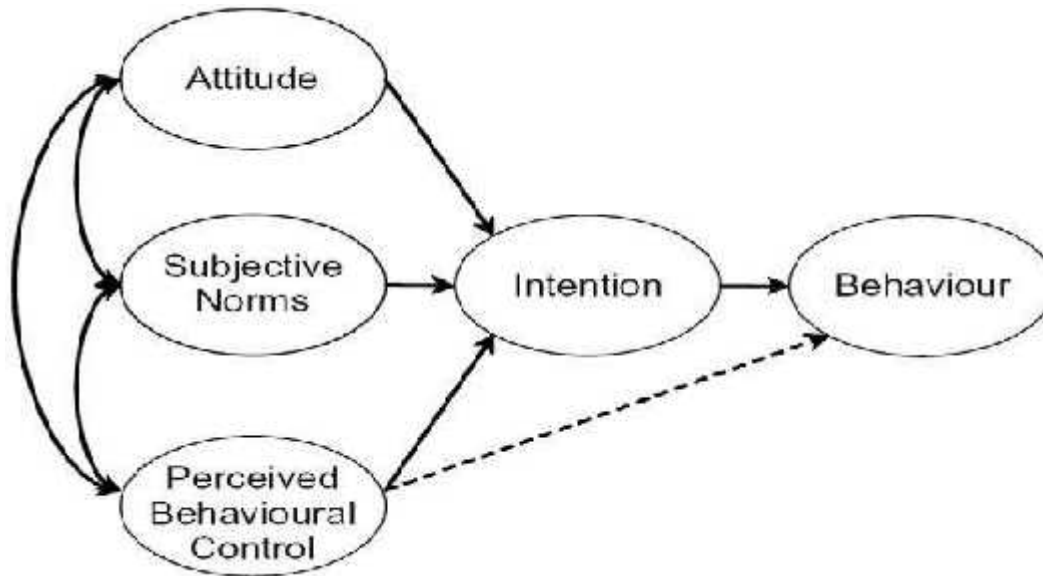


Figure 3: Theory of planned behavior (Adopted from Ajzen, 1991)

2.12. Empirical Studies

2.12.1. Awareness and Attitudes

Public awareness and attitudes to waste can affect the whole municipal SWM system. All steps in municipal SWM starting from household waste storage, to waste segregation, recycling, collection frequency, willingness to pay for waste management services and opposition to siting of waste segregation, treatment and disposal facilities depend on public awareness and participation. Consequently, lack of public awareness and schooling of the importance of proper solid waste management to people's health and well-being severely limits the use of community-based approaches in developing nations and is a key factor in the failure of municipal solid waste management services in developing nations (Eeda, 2016).

People's attitude and awareness influences not only the characteristics of waste generation and handling, but also the effective demand for solid waste collection service. People's attitude and awareness towards solid waste may positively affect their interest and willingness to pay for collection service (UNDP, 2013). In addition, through awareness campaigns and educational measures attitude may be positively influenced and in turn it can

change the negative impact of inadequate waste handling with concerning to public health and environmental situations.

2.12.2 Factors Affecting Households Solid Waste Segregation Practices

2.12.2.1 Demographic Factors

2.12.2.1.1 Sex of household head

Some researchers argued that being male and female may have different attitudes concerning environmental issues. A study conducted in Nigeria by Kayode and Omole (2011) stated that sex has an adverse effect on solid waste generation. Similar study stated that there are some research studies confirming women (female) producing more waste, and yet, many others do not find significant gender effects in waste generation because it is the accumulated result of all family members' behavior (Dalen and Halvorsen, 2011)

2.12.2.1.2 Age of household heads

Age of household head is one of the main influencing factors of solid waste segregation at household level. People might have different waste generation and segregation behavior as the result of their age status. According to Bartelings and Sterner (1999), found that the elderly produce less amount of solid waste, which may be attributed to the rather modest way of life led by the aged. Moreover, Kayode and Omole(2011) noted that the age of the household head was negatively and weakly correlated with solid waste segregation practice. That means as the age of the household heads increases the practice of SW segregation became decreases.

2.12.2.1.3 Marital status

Marital status is one of the demographic factors which contribute to solid waste segregation practice. According to literatures, like other variables marital status might positively or negatively affect a person's solid waste segregation practice. According to Aggrey and Douglasson (2010), married people are likely to be more responsible to keep the environment clean and hence are more likely to be willing to pay more for improved waste management.

2.12.2.1.4 Household size

The number of household members might affect the way solid waste management practices are carried out. The more children in a household, the more likely they are to prefer to clean the environment themselves rather than pay the municipality to do it. On the one hand, the

more people are in the household, the more waste is generated. This can lead to disposal problems. (Niringiye, 2010; Shabani, 2015)

2.12.2.2 Socio-Economic Factors

2.12.2.2.1 Financial /Economic factor

Solid Waste management is a costly service that necessitates significant capital expenditures in both physical infrastructure and long-term operations. SWM services are also crucial to both physical and economic society, according to the author, and are frequently a priority budget item for cities and towns. The most pressing financial issue for most developing countries' cities and towns is frequently covering operational expenditures such as gasoline, labor, and equipment maintenance (World Bank, 2018).

In general, SWM in both developed and developing countries face significant financial challenges, beginning with budgeting and continuing through to the end of the plan for the users. I.e. MSWM, especially in developing nations, is lacking in terms of financial management, planning, and design (Ashenafi, 2011).

The amount of income a community has affects the scale of its SWM such as sorting of wastes. The level of economic activity is a major factor in the volume and composition of solid wastes generated by residential and commercial establishments. This is because businesses generate more solid waste when they are more active, and when they generate more resources and products. At the same time, the need for SWM services is also important. People's income level affects how much they are initiate and willing to pay for a given level of service and the potential to practice solid waste segregation(Kumar, 2002).

2.12.2.2.2 Education level of household head

Lack of public awareness and school education about the importance of proper solid waste segregation for health and well-being of people severely determines use of community based approaches in developing nations and also crucial factor for failure of a municipal solid waste segregation and management service in developing nations (Zurbrug, 2003).

2.12.2.2.3 Housing ownership

House ownership is one of the key factors influencing household solid waste segregation practice according to Shabani (2015), households who have and live in their own houses are expected to be more willing to pay for the improvement of SWM particularly in sorting of

wastes at the source as compared to those who as tenant. This might be due to the reason that if the house belongs to them, they have a higher value for their own properties, thus they may handle it as clean as possible.

2.12.2.3 Institutional Factors

Many national agencies are at least partially involved in solid waste management. However, the many national agencies' functions in relation to solid waste management are often unclear, and no one agency is chosen to coordinate their initiatives and activities. Because of a lack of coordination among the appropriate authorities, completely (different) agencies are sometimes assigned as the national equivalent to various external assistance agencies for various solid waste management cooperatives while being unaware of what other national agencies are working. As a result, there is duplication of effort, wastage of resources, and loss of global organization property when it comes to solid waste management programs (Hirpe&yeom, 2021).

According to Zurbrugg(2009) highlighted that solid waste collection programs in underdeveloped countries are often inefficient. The people who are still without waste collection services are often low-income people who live in urban areas. One of the biggest problems with rapidly growing cities is the amount of solid waste they generate. This showed that, in addition to financial constraints that affect the supply or property of solid waste collection services, operational inefficiencies in solid waste management services, such as insufficient institutional management capacity and inappropriate modern technologies, have an impact on effective solid waste management practice.

2.12.2.3.1 Technical training

Technical expertise and training are the most essential and powerful factors in improving solid waste segregation and management operations. However, most developing countries lack the technical skills required for solid waste segregation and management at both the national and local levels, particularly at the local household level, where most people have little or no technical background on solid waste segregation and management training. This could be one of the key reasons for poor countries' lack of effective solid waste management planning. Solomon (2011) claims that the collection, segregation, management and analysis of solid waste knowledge is often undervalued.

2.12.2.3.2 Temporary solid waste collection skip points availability near home

In these countries solid waste collection is usually takes place from the source to the temporary collection skip points and from temporary collection skip points to temporary storage station and finally from temporary storage station to the final disposal site. The final disposal is mostly at an open dumpsite which is located near the border of the city Dumping sites are usually extensive open grounds where truckloads deposit the waste (Mamoo, 2020). Most of the sub-cities in Addis Ababa practice the open dump system of SW disposal, which was in a more or less uncontrolled manner. Since the system was not highly engineered, it posed numerous challenges to both public health and the environment (Abebe, 2017).

2.12.3 Solid Waste Generation

A study done by Muluken (2007) asserted to plan and implement an integrated and long-term SWM system for the failure of identifying and distinguishing the most important socio-economic, demographic, and physical factors in the SWM process. The city's current SWM system is poor and based on getting rid of trash with little attention paid to waste prevention and recovery at the source, resulting in a lack of policy guidance and a failure to develop policy intervention on SWM in Addis Ababa city. A study done by Zemena (2018) Solid waste, which is generated as a result of human activity on a daily basis, must be appropriately managed. Addis Ababa is dealing with issues related to a poorly managed SW infrastructure.

According to Kuma(2004),the generation sources of solid waste are: households comprises 71%, street sweeping 10%, industries 6%, commercial centers and institutions 9%, hotels and hospitals comprises 3% and 1% respectively. Another study states that from the total solid wastes generated in the city 76% by households, 18 % from institutional(commercial, factories, hotels and health centers) and 6% from street sweeping(CGAA-SBPDA,2003).Hence, this study was motivated by the poor state of SWM in Addis Ababa and as indicated above from the different literatures, the largest portion of solid wastes generated in the city were sourced/emanated from households (residential area), which necessitated research into existing household SWM practices and the associated factors affecting the households solid waste segregation practice in the study area. The success of households SWM practices was described in terms of generation, storage, collection, reusing, composting, transportation and disposal as well as the Socio-economic, institutional, demographic factors that influence the households solid waste segregation practice effectiveness.

2.13 Conceptual Framework

According to Mnyanyi (2014), the study's general focus is represented by the conceptual framework. The figure 4 below shows that relationship between independent and dependent variables. This study tried to assess the existing household SWM practices and also tried to establish facts about at what extent associated factors such as socio economic, demographic, and institutional factors affect households' solid waste management particularly in solid waste segregation practice. Socio- economic factors such as level of education, housing ownership, type of work and income level are expected to affect household SWM practice either positively or negatively. Similarly, demographic factors (such as sex, age, marital status and household size) and institutional factors (such as training access, monthly payment for waste disposal, the distance between temporary solid waste collection skip point & home) are expected to either positively or negatively effects on household SWM particularly in solid waste segregation practice. Attitude of household is considered as moderating variable, which may strengthen or weaken the relationship between independent and dependent variables.

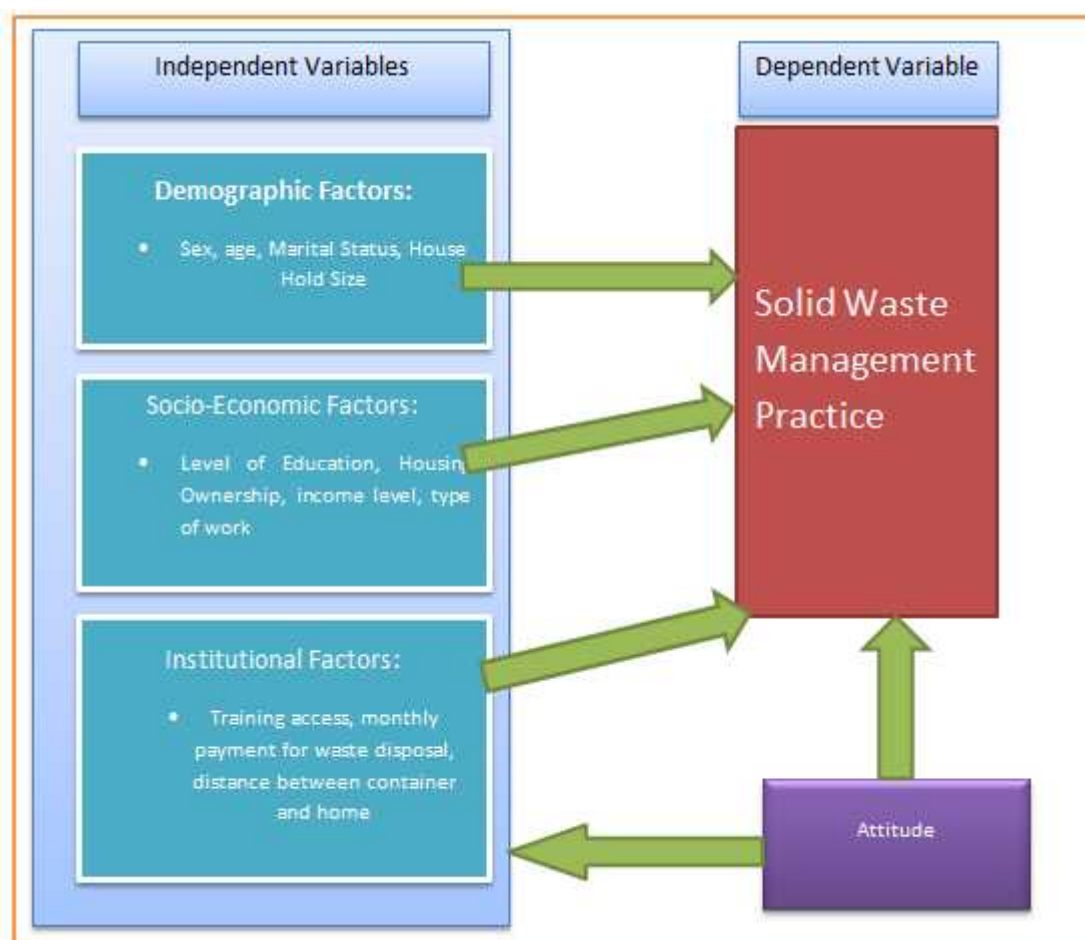


Figure 4: Conceptual framework (Source: Developed by the researcher)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Description of the Study Area

Administrative and Population Status: This study was conducted in Addis Ababa City Administration which is administered by the city council and organized into 11 sub-cities and 116 Woredas, (Addis Ababa city Administration Integrated Land Information Center, 2014). Amongst the 11 sub-cities found in this City Administration, Lideta is one of the sub-cities. Lideta sub-city is situated in the center of Addis Ababa, bordered by Addis Ketema sub-city in the North, by NifasSilk Lafto sub-city in the South, by Kirkos sub-city in the East and by KolfeKeranyo sub-city in the West. The total area of the sub-city is 918.41hectare. Out of this, only 277.77 (30.17%) hectares used for residential while the remaining area is used for social infrastructures and services, and the total population of the sub-city wasfemale 102,513, male 112,283 and the sub total of 214,796 had been living in the sub city (Central Statistical Agency, 2007).

There are ten Woredas inside the Lideta sub-city. Woreda 5 and 7 were purposively selected due to the center for compile solid waste in the sub-city is found in between this twoWoredas. Specifically, Woreda5 is found in near to berbere-berenda or around behind Teklehaimanot church and Woreda7 is found in the North-Eastern part of the Lideta sub-city around Golla Michael church. According to the data from Lideta sub-city housing management office there had been about 4372 household heads lived in the Woreda5 out of them 2042 female household heads and 2330 male household heads has been living in the Woreda5. In addition about 3347 household heads lived in the Woreda7, out of them 1,370 female household heads and 1,977 male household heads has been living in the Woreda7.

The total number of the targeted population household heads in the two woredas was 7719, out of them 3412 female household heads and 4307 male household heads. As shown in figure 5 below, the map of the study area have been clearly indicated in figurative manner and by keeping the sequence from which the next figure has been drawn, first to indicate the country in which the research takes place Ethiopia map has been drawn, next from Ethiopia map Addis Ababa map has been drawn and then from Addis Ababa map Lideta sub-city map has been drawn, finally in the map of Lideta sub-city the two woredas(5 and 7) has been indicated in black color.

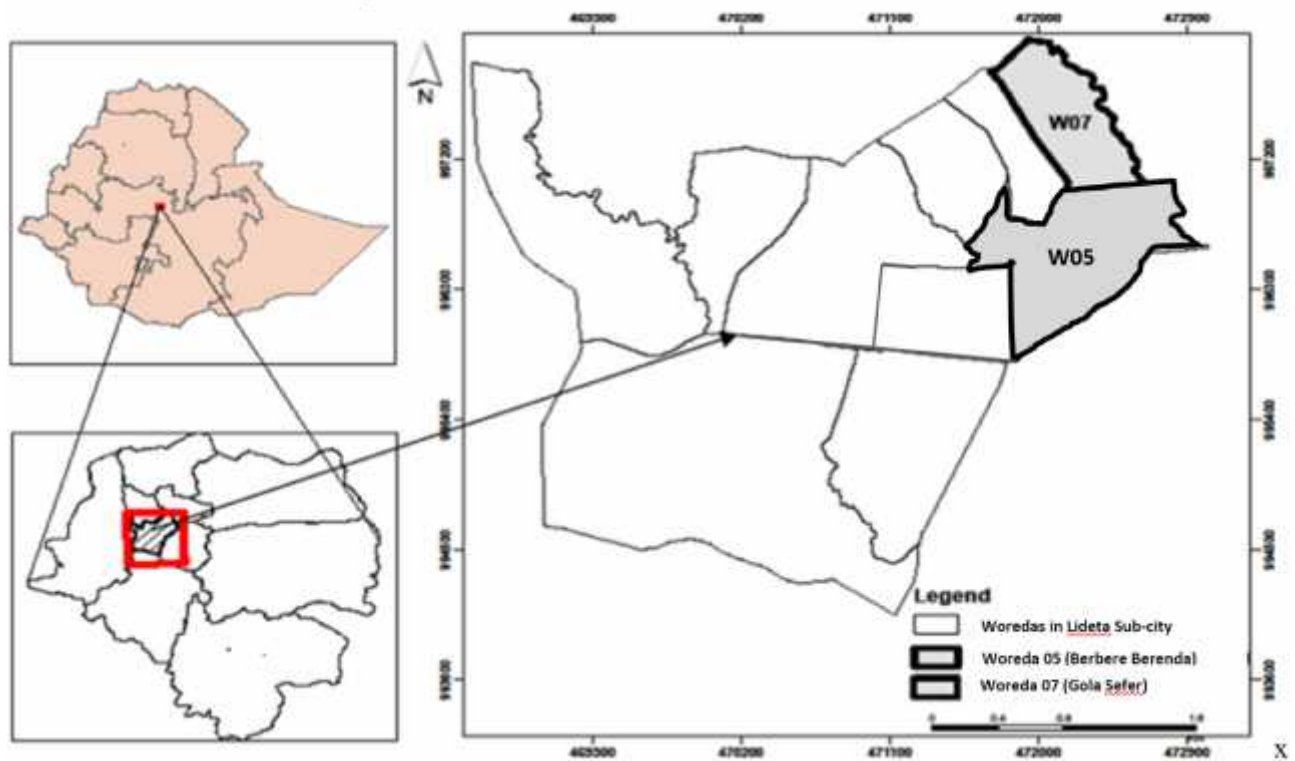


Figure 5: Map of the Study Area (Source:<https://link.springer.com/article/10.1007/s10901-020-097977>)

Climatic Condition:-According to National Meteorology Agency (NMA, 2017), Addis Ababa has sub-tropical highland climate with a constant moderate temperature of roughly with 23°C average maximum and 11°C average minimum throughout the year. The main rainy season, which is locally referred as *Kiremt*, which extend from June to early October, and the second rain (*Belg*) occur between early March and mid-April. The average annual rainfall is about 1,200 mm, out of which close to 80% falls during the main rainy season.

Solid Waste Management: According to Gelan (2021), the existing management practices of municipal solid waste management in the city of Addis Ababa, it is estimated that daily about 0.45kg per capita per solid waste generated. Thus, considering the geographical area and population density, the average waste generation estimated about 330kg/m³ and approximately 6019m³ solid waste generated in the city on daily base. The estimated physical composition of the wastes include: 4.2% vegetables, 2.5% paper, 2.9% rubber/ plastics, 2.3% woody materials, 1.1% bone, 2.4% textiles, 0.9% metals, 0.5% glass, 15.1% combustibles leaves, 2.5% non-combustible stones, and 65% different fine materials (sand, ash, and dust). The produced quantities of municipal solid waste are directed to an uncontrolled land fill site called *Koshe* (Reppi) which has been blamed for possessing serious health and environmental risk including bad smell and leachate to neighborhoods (surrounding) communities.

3.2 Research Design

According to Kothari (2004) research design is regarded as the blueprint and cornerstone of any study. In this regard, research design assists the researcher in planning ahead of time the methods to be utilized for collecting relevant data and the methodologies to be employed during analysis. In this study the researcher utilized a descriptive statistical research design with mixed research approaches to analyze the household solid waste management practices and associated factors. Utilizing mixed research approaches provides to use both qualitative and quantitative data in the research.

3.3 Research Approach

In this study, both qualitative and quantitative research approaches were used to investigate the issue in detail. The main reason behind of using qualitative method of data collection is to understand the underlying opinions, reasons, and also provides insights into the problem. Whereas the reason of using quantitative method is to get meaningful comparison of responses across participants and study sites (Gill *et al.*, 2008)

3.4 Sources of Data

The study used both primary and secondary data sources to ensure its success. Questionnaires, face to face interview with key informants and field observation are the primary sources for learning about adoption behavior. Households, concerned administrative authorities (cleansing management office heads and experts), and those who work for cleansing service providers (SMEs private solid waste collectors) are the primary data sources in this study. Books, research thesis, online websites, manuals and other secondary data sources shall be used. All connected materials generated for some other reason are considered secondary data.

3.5 Methods/Instruments of Data Collection

In research activity, several data gathering strategies are more advantageous than a single data collection strategy. According to Mack (2005), each data collecting strategy has strengths and flaws, and employing multiple data collection approaches allows the researcher to integrate the benefits of each source of data while also correcting some of the weaknesses. The following methods were used to obtain the necessary data for this study:

3.5.1 Questionnaire

Questionnaire have been used for close-ended(multiple choices), open ended questions and a 5-point likert scaled questionnaire (1- strongly disagree, 2- disagree, 3- neutral, 4- agree, and 5 - strongly agree) were delivered to 380 household heads to obtain different perspectives on households solid waste management practices and the associated factors affecting its practice. As a result, data were gathered mostly through open-ended and close-ended questions. The numbers of open-ended questions were raised to allow respondents to jot down their responses and suggestions that they believe and be voluntary to provide. The questionnaires were written in English first, and then translated in to Amharic, and then provided to the respondents.

3.5.2 Key informant Interview

To strengthen the research giving information, interview questions were delivered to cleansing management office head and experts, SMEs solid waste collection personnel using a semi-structured interview guide. These offices and interviewees were selected for the interview because their responsibilities are closely related to solid waste management practices, and thus being asked to provide further information, opinions, and possible recommendations. The experts of the cleansing management office and SMEs solid waste collection service providers were interviewed separately in a manner of confidentiality and following the researcher's ethical considerations in order to keep the data or information collected from different stake holders.

3.5.3 Observation

Field observation has been used to observe the solid waste storage materials, household's solid waste segregation and handling practices, on-site SW handling, collection and transportation Practices, illegal solid waste dumping situations across the study area and disposal sites. Field observation was conducted with the help of a check list, and photographs were also taken during field observation.

3.6 Data Collecting Time and Procedure

The data was gathered through three data collecting instruments, i.e. firstly observation of the two selected woredas was done in the first week of April, 2022. Then, secondly after selection of 20 experts for the data collection (enumerators) from the selected two woredas of cleansing management office, the enumerators were recruited and properly aware for the household survey. The awareness delivery program was focused on survey procedures,

methods, questionnaire and ethical considerations. In order to avoid communication gap among enumerators, respondents and the researcher, the survey questionnaire was translated in to Amharic local language after the English version of the questionnaire was pretested. This helped to reduce the communication gap among the respondents and enumerators. The researcher was exhaustively supervised the survey and it takes the time starting from the beginning second week of April, 2022 up to the end of second week May, 2022. Thirdly, the key informants' face to face interview was conducted by the researcher with the concerned authorized agency (cleansing management office experts) and licensed private partnership (SMEs association solid waste collectors) chair persons and other workers since the beginning of third week up to the end of fourth week in May, 2022. And during the data collection from the key informants were used voice recording and writing notes during the interview time. It is expected that there may be difference as three instruments were planned to be applied. But this was helped to the researcher to triangulate the data in different dimensions. To sum up in this study, household solid waste management practice survey investigation was covered only two months from April, 2022 up to May, 2022.

3.7 Sampling Techniques

As a matter of fact in research, to achieve the objective of the study topic the researchers rational reasoning is crucial in determining sampling techniques for the appropriate selection of the study area as well as the responsible stakeholders in order to acquire the necessary (reliable) data. Hence, in this study purposive sampling technique to select the sub-city as well as the woredas and systematic sampling technique to represent the household respondents were employed.

Even if the degree of effectiveness and quality of implementation in solid waste management practice and the factors that affect the practice of SWM varies among the sub-cities and among the woredas of Addis Ababa city administration, but as the power and system of SWM in all sub-cities of Addis Ababa is similar and this emanated from legislations endorsed to establish as Solid Waste Management Team in sub-cities and woreda administration levels of Addis Ababa under proclamation No.1/2003 and 18/2004 (amendment for 1/2003). Therefore, out of the 11 sub-cities of Addis Ababa, Lideta sub-city was selected purposely due to the researchers' practical proximity because of time and financial constraints, source availability for the problem under study and this enlarges the researchers' degree of confidence.

The rationale reasoning for the purposely selected woredas (woreda 5 and 7) in the sub city were, variables such as seriousness of the problem, the population nature and geographical settlement condition of the study area, existence of the temporary storage station in between the two woredas (woreda5 and 7) geographical location this helps the researcher to get the key informants (SMEs solid waste collectors) in the area, acceptance and recommendation by the authorized agency.

Systematic sampling technique was employed to pick household respondents. A list of household head members was acquired from the woreda offices in order to utilize systematic sampling procedures. The first respondent named in number two was selected from the list of household heads by lottery technique and by adding the skip number ran up to the list household head selected by skip number 20.

$K = \frac{\text{total population}}{\text{sample size}} = \frac{7719}{380} = 20$. For instance the first respondent from woreda 5 which is found by lottery method listed at 2 and the next participant was listed at number 22 (2+20). And the next was 22+20= 42.....n+20= 4317 and similarly worked to woreda 7 of the study area.

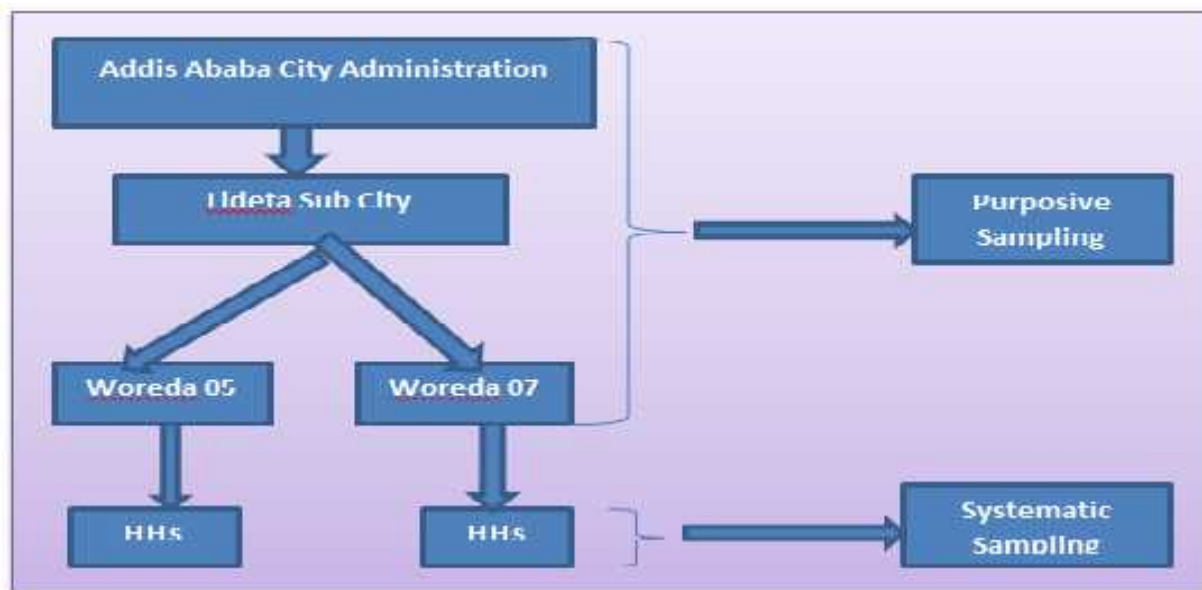


Figure 6: Sampling Techniques (Source: Developed by the Researcher)

3.8 Sample Size Determination

There had been 7719 household heads inside the two study Woredas. The sample size was determined using the simplified formula given by Yamane (1967) as indicated below:

$$n = \frac{N}{1+N(e)^2} \quad n = \frac{7719}{1+7719(e)^2} = 380$$

Where: N = the sample size

N = the number of household heads in the two Woredas (i.e. 7719)

e = the acceptable sampling error (the level of precision), 0.05

Accordingly, a total of 380 household heads were sampled at 5% acceptable standard error (at maximum when $e=0.05$) and 95% confidence level.

With regard to the sample household heads calculated above were 380 respondents and shared between two selected woredas under study Bourley's 1994 population allocation formula cited in Nzelib and Ilegu (1999) as stated below:

$$ns = \frac{n(Ns)}{N}$$

Where ns = sample size of the study area,

n = total sample size

Ns = total number of household heads in each woreda

N = total number of household heads in the study area. The result is given in table 1 below.

Table 1: Sample Distribution

Woredas	No.of HHs	Sample size	Method of selection
Woreda 5	4372	$380(4372)/7719 = 215$	Systematic sampling technique
Woreda 7	3347	$380(3347) / 7719 = 165$	Systematic sampling technique
Sub total	7719	380	--

Regarding the key informants, the researcher purposively selected ten(10) participants from the study area. Out of ten, three experts were invited from the cooperative association of solid waste collectors, three of them were invited from the sub city cleansing management office while the remaining four were distributed to each woredas cleansing management office. The rationale behind selecting those experts was their knowledge and exposure to solid waste management practices.

3.9 Ethical Consideration

since the study was involved human participants, the research proposal and assessment tools were submitted and approved by my advisor on behalf of Addis Ababa University for

compliance with the rules and regulation of the university code of ethics that in line with national and international ethical guidelines. At the same time, before starting the survey/interview, enumerators informed each respondent about the purpose of the study, data management strategy and confidentiality statement and asked for the willingness of each interviewee communicated that they can leave at any time whenever they feel uncomfortable. So that, the enumerators (20 individuals i.e 20 experts from the two sampled woredas of Lideta sub-city were interviewed 380 respondents who gave their full consent for the interview. Additionally, codes were used during analysis and reporting instead of respondents' name or other features that could lead to the identification of the individual. As agreed with respondents, the researcher used all records only for research purpose and kept them strictly confidential at all time, as per national and international ethical guidelines.

3.10 Validity and Reliability

3.10.1 Validity

Validity of research instrument is the greatest available approximation to the truth or falsity of a particular inference, argument, or conclusion, according to Patton (2001). The extent to which information gathered using a certain instrument speaks to a specific domain or content of a particular notion was measured by this study's content validity. To guarantee that the research tool is measuring exactly what it is supposed to be measuring. The data collection tools were shown to experts who are in close proximity to the issue to give a valuable impute to improve it, and some of the research participants were contacted to get their practical thoughts on the subject. This aided the instrument's improvement and basic alteration and adjustment.

3.10.2 Reliability of Data

According to Creswell (2014), refers to whether scores to items on an instrument are internally consistent or not. In this study, Cronbach alpha was used to investigate the data's consistency. During conducting this study, pilot study was done prior to undertaking the main assessment to test the reliability of data collection tools by using 10% of the respondents in the selected woredas. The result of the reliability of data gathering tools of this study found to be 0.869. According to George and Malley (2003), the Cronbach's alpha coefficients 0.8 to 0.89 considered as good. Thus, since the reliability of data gathering tools of this paper is 0.869, the internal consistency was good.

3.11 Data Analysis Techniques

Both qualitative and quantitative data were analyzed using descriptive statistical analysis. Open-ended questionnaires, filed observation, and interviews were used to collect qualitative data. The raw data received through interview were addressed by analyzing and interpreting through detailed conversation and the gained response, but the data gathered through observation would be provided through descriptive written report. In addition, the open-ended questionnaire were subjectively presented and analyzed in a descriptive manner.

The information gathered from the close-ended questionnaire were presented in the form of a table or chart, and also statistically analyzed and interpreted (in frequency, percentage, mean, and standard deviation) using STATA software.

3.12 Model Specification

Since the dependent variable is dichotomous, binary logistic regression is used in this research as empirical model. The log it model assumes a logistic distribution function. The model uses the maximum likelihood estimation approach after transforming the response variable into log it (Carson, 2008). The dependent variable is a dichotomous taking on a value of 1 if a household segregate solid waste and otherwise it has a value of 0. By transforming the dependent variable into the natural log of the odds (log it), the equation could be written as follows:

$$\ln\left(\frac{p_i}{1-p_i}\right) = X_i'\beta \dots\dots\dots(1)$$

$$P_i = \frac{e^{X_i'\beta}}{1+e^{X_i'\beta}} \dots\dots\dots (2)$$

Where p_i is the probability of segregating solid waste, X_i denotes a set of explanatory variables (i.e. sex, age, marital status, household size, level of education, housing ownership, income level, type of work, training access, monthly payment for waste disposal, and the distance between temporary collection point & home), e is the base of natural logarithm, and β is the vector of the unknown parameters to be estimated from the model.

Finally the estimation method proposed by previous studies (Carson, 2008) the model can be formulated as:

$$P_i = \frac{1}{1+e^{-X_i'\beta}} \dots\dots\dots (3)$$

As shown in the reduced form of equation below, Y is a dichotomous dependent variable that indicates whether the household is segregate solid waste or not; a value of 1 means that the

household segregates solid waste and a value of 0 indicates otherwise. Lastly, X_i stands for independent variables that might affect solid waste segregation.

$$P_i = \log(\text{odd}(\text{event})) = \log\left(\frac{\text{probability}(\text{event})}{\text{probability}(\text{nonevent})}\right) \dots\dots\dots (4)$$

$$Y = \beta_0 + \sum_{i=1}^n X_i + \epsilon_i \dots\dots\dots (5)$$

3.13 Description of Independent Variables

Sex of household head is one of the determining factors of household solid waste segregation practice. According to Noufal et al (2020), stated that sex of household head (being female) plays a significant role in household solid waste management than their counterparts. Likewise age of household head positively affect household solid waste segregation practices as (Noufal et al, 2020). However this finding opposed by Kayode and Omole (2011) who revealed that the age of the household head was negatively and weakly correlated with solid waste management particularly in households' solid waste handling and segregation practices. Therefore, in this study age of household head is expected to either positively or negatively influence the practice of solid waste segregation at household level.

As suggested by Fadhullah et al. (2022); and Aggrey and Douglasson (2010), marital status (married household respondents) are positively correlated with solid waste management practices. Similarly, regarding household size, a family having more children gives more attention for household solid waste segregation and proper storage of wastes to prevent pollution which brings adverse health impacts on their children (Niringiye, 2010; Shabani, 2015). Therefore marital status (Married) and household size are expected to positively influence on household solid waste segregation practice.

Level of education could improve household solid waste segregation practices compared to household heads who are illiterate (Shabani, 2015; Noufal et al., 2020). In this study, household heads' level of education expected to positively influence solid waste segregation practices at household level.

As revealed by literatures, as household heads' monthly income increase, their willingness to pay to improve their home solid wastes segregation practice by the fulfillment of appropriate storage materials and the surrounding environment quality also increase. (Awunyo, et al., 2013). Thus, in this study income level of household expected to increase households' willingness to manage, segregate and store their solid wastes at household level.

Generally, in this study as indicated in table 2 below, the independent variables such as sex, age, marital status, housing owner ship, type of work, monthly payment for waste disposal of household heads and household size were expected to either positively or negatively affect the practice of households' solid waste segregation. However training access, level of income and level of education of the household heads were expected to positively affect the practice of household solid waste segregation. Whereas the distance between temporary solid waste collection skip points and households home were expected to negatively affects the practice of households solid waste segregation. On the other hand the attitude of households was expected to weaken or strengthen the relationship between independent and dependent variables.

Table 2: Description of Independent Variables and their expected effect on household solid waste segregation practices

Variables	Description	Expected sign
Sex of head	Dummy, 1= male, 0= female	±
Age of head	0=18-31years, 1=31- 40 years, 2= 41- 50 years, 3= 51- 60 years, 4=61 and above years	±
Marital status	0=single, 1= married, 2= divorced, 3= widowed	±
Household size	0=2 and below, 1= 3-5 person, 2= 6- 8 person, 3= 9 and above person	±
Level of education of household head	Dummy, 0 = illiterate, 1= basic education, 2= primary education, 3 = diploma & above	+
Housing ownership	0=private owned house, 1= kebele rental house, 2=private rented house, 3=rental house administration	±
Income level	0= below 2000birr, 1= 2000-4000birr, 2= 4001-6000 birr, 3= above 6000 birr	+
Type of work	0=government sector, 1= private sector employee, 2= private business, 3= retired	±
Training access	Dummy, 1= If household got training, 0= otherwise	+
Monthly payment for waste disposal	0= fair, 1= not fair	±
The distance between temporary collection skip point & home	0= below 0.5km, 1= 0.5 -0.9km, 2= 1-1.4km, 3= 1.5km and above	-

Source: (Own survey, 2022)

CHAPTER FOUR

RESULT AND DISCUSSION

4.1 Descriptive Analysis

4.1.1 Demographic and Socio-Economic Characteristics of Households

The demographic and socio-economic variables such as sex, age, marital status, household size, level of education, job type, house ownership and level of income were assessed to know their effects on household solid waste segregation practices.

In this study a total of 380 respondents were participated on the questionnaire prepared, from this questionnaires the response rate was 100% achieved. Of which 82.1% were males and 17.9% were females. As indicated in the table 3 below, among the total number of respondents, 60% (228) respondents reported that, they did not practice solid waste segregation at household level, while 40% (152) respondents reported that, they practice solid waste segregation at household level. This result indicates that over half (above 50%) of the respondents were not able to segregate the solid wastes in their type as biodegradable and non-biodegradable solid wastes rather they mixed in to one union and store in one material in their home. But the householders who practiced solid waste segregation at their home accounts below half (below 50%) of the respondents able to segregate solid wastes in to two unions as biodegradable and non-biodegradable and stored in to two separated materials.

Regarding age, the minimum and maximum age of respondents were 28 and 78 years, and the average age of household respondents was 46.09 years. The p value of age indicated that there is a significant ($P<0.01$) mean difference between households who segregate and not segregate solid waste. Regarding the family size, the minimum and maximum family size of respondents were 1 and 9 respectively. The average family size found to be 4.3, The p value for family size indicated that there is a significant mean difference ($P<0.5$) between households who segregate and not segregate solid waste.

Regarding the average monthly income, the minimum and maximum monthly income of household respondents were 1400 and 23300 birr, and the average monthly income was 5367.29 birr. The p value of t-test for income indicated that there is a significant ($P<0.01$) difference between households who segregate and not segregate solid waste.

Table 3: Descriptive Statistics of Continuous Variables

Variable	Minimum	Maximum	Mean		Std deviation		Total mean	Total std dev.	t-test
			Segregate	Not segregate	Segregate	Not segregate			
Age of household head	28	78	42.99	48.17	8.929	9.135	46.09	9.391	0.00
Household size	1	9	4.05	4.47	1.771	1.782	4.30	1.787	0.026
Average monthly income	1400	23300	6557.63	4573.73	3518.53	2167.97	5367.29	2948.664	0.000

Source: (Own survey, 2022)

Similarly, in regarding marital status of the respondents 20% of respondents were single, 71.1%, 0.3%, and 8.7% were married, divorced and widowed respectively. The chi-square test of marital status indicated that there is a statistical association between marital statuses of households who segregate and not segregate solid waste. On the other hand, 24.7% of respondents have their own house, 21.3% live in kebele rental house, 48.2% of household respondents live in private rented house and the remaining 5.8% live in houses belong to rental house administration. The result of chi-square test indicated that there is a statistical association between households who segregate and not segregate solid waste.

In the same way regarding level of education, 10.3% of respondents were illiterate (households unable to read and write), 30.5%, were those who got primary education, 35.8% were secondary and 23.4% were diploma and above level of education. The chi-square test indicated that there is a statistical association between households who segregate and not segregate solid waste.

Concerning job type of respondents, 29.2% were government employed, the other 36.8%, 32.6%, and 1.3% were private sector employed, those who engaged on private business and retired respectively. The chi-square test for job type indicated that there is a statistical association between households who segregate and not segregate solid waste.

Table 4: Socio-Economic Characteristics of Respondents

Variable	Category	solid waste segregation				Total		X ² test
		not segregate		Segregate				
		No	%	No	%	No	%	
sex of household head	Female	24	10.5	44	28.9	68	17.9	0.000
	Male	204	89.5	108	71.1	312	82.1	
marital status of household head	Total	228	100	152	100	380	100	0.001
	Single	32	14	44	28.9	76	20	
	Married	169	74.1	101	66.4	270	71	
	Divorced	1	0.4	0	0	1	0.3	
	Widowed	26	11.4	7	4.6	33	8.7	
	Total	228	100	152	100	380	100	
House ownership	Own private house	43	18.9	51	33.6	94	24.7	0.001
	kebele rental house	60	26.3	21	13.8	81	21.3	
	private rented house	114	50	69	45.4	183	48.2	
	rental house	11	4.8	11	7.2	22	5.8	
	administration							
	Total	228	100	152	100	380	100	
Level of education	not read & write	39	17.1	0	0	39	10.3	0.000
	Primary	111	48.7	5	3.3	116	30.5	
	Secondary	74	32.5	62	40.8	136	35.8	
	Diploma and	4	1.8	85	55.9	89	23.4	
	Above							
	Total	228	100	152	100	380	100	
job type	government employer	53	23.2	58	38.2	111	29.2	0.018
	private sector employer	93	40.8	47	30.9	140	36.8	
	private business	79	34.6	45	29.6	124	32.6	
	Retired	3	1.3	2	0.9	5	1.3	
	Total	228	100	152	100	380	100	

Source: (own survey, 2022)

4.1.2. The Current Solid Waste Management Practices of the Study Area

In order to understand the current household solid waste management practice, likert scale analysis with five scales was used. Willing (1989), described the mean score ranges as 1 to 1.80 (strongly disagree), 1.81 to 2.60 (disagree), 2.61 to 3.40 (neutral), 3.41 to 4.20 (agree) and 4.21 to 5 (strongly agree).

As indicated in table 5 below, household respondents were asked to rate their responses regarding household solid waste management practices listed under the major solid waste

management practices of waste generation/production, storage, collection, transportation, reuse and composting and disposal. Accordingly, concerning cleaning house regularly, 4.2%, 20%, 34.2% and 41.6% of respondents confirmed as disagree, neutral, agree and strongly agree respectively. The mean score of all responses was 4.13(in the range of agree). This indicates that, most of the respondents clean their house regularly. Similarly concerning the generation of degradable non degradable solid wastes from home every day, 12.4%, 0.8%, 0.8%, 42.1%, and 43.9% of respondents responded as strongly disagree, disagree, neutral, agree and strongly agree. The mean score of all responses was 4.04 (agree). This implies that from most of the respondents house both degradable and non-degradable solid wastes are generated every day.

Regarding identifying the composition of the generated solid wastes as bio-degradable and non-bio-degradable, 0.8%, 13.7%, 15.3%, 32.6% and 37.6% of respondents confirmed as strongly disagree, disagree, neutral, agree, and strongly agree respectively. The cumulative mean score of all respondents was. 3.93 (agree). This signifies that most of the households identify the composition of the generated solid wastes in their home as bio-degradable and non-bio-degradable. The overall mean score of 4.03 implies that household solid waste management incase of waste generation activities are in an agreed condition.

Similarly, regarding the container facility, 2.6%, 10.5%, 14.2%, 39.2%, and 33.4% of respondents confirmed as strongly disagree, disagree, neutral, agree, and strongly agree respectively. The mean score of all responses for this item was 3.90 (agree). This implies that most respondents have a container to store solid wastes in their home. Regarding separating and storing different types of waste at home, 13.4%, 20.5%, 27.9%, and 38.2% of households confirmed as disagree, neutral, agree, and strongly agree respectively. The mean score (3.91) implies that most of the respondents agreed that they separate and store different types of waste at their home. Similarly, regarding separating and storing kitchen waste from other household wastes, 6.6%, 6.8%, 2.6%, 55%, and 28.9% household respondents confirmed as strongly disagree, disagree, neutral, agree, and strongly agree respectively. The mean score for this item was 3.93 (agree). This implies that most respondents agreed that separate and store their kitchen waste from other household wastes. The cumulative result (3.91)implies that household solid waste management regarding storage is in an agreed condition.

In a similar way, regarding the container /collection point availability, 0.5%, 12.1%, 19.7%, 29.2%, 38.4% of household respondents confirmed as strongly disagree, disagree, neutral,

agree, and strongly agree respectively. The mean score for this item was 3.93. This implies that the container/collection point is available near to respondents home to collect solid waste. Likewise, regarding using cooperative partnership association(SMEs) for door to door solid waste collection, .9%, 12.6%, 6.8%, 15.3%, and 61.3% respondents confirmed as strongly disagree, disagree, neutral, agree, and strongly agree respectively. The mean score (4.17) for all responses have implies that most households use cooperative partnership associations (SMEs) for door to door solid waste collection.

Concerning the implementation of solid waste collection schedule the survey result indicates that 0.3% 4.7%, 22.4%, 24.5%, and 48.2% of households responded as strongly disagree, disagree, neutral, agree, and strongly agree respectively. The mean score (4.16) for this item indicates that solid waste collection schedule is appropriately implemented. The investigation result also indicated that, regarding collectors' on time and per schedule solid waste collection, 1.3%, 11.1%, 2.1%, 28.7%, and 6.8% of respondents confirmed as strongly disagree, disagree, neutral, agree, and strongly agree respectively. The mean score of all responses (4.29 /strongly agree) implies that collectors come per schedule and on time to collect solid wastes. Concerning having regular garbage/solid waste collection in their area, 6.8%, 8.7%, 0.5%, 18.2%, and 65.8% of respondents substantiated as strongly disagree, disagree, neutral, agree, and strongly agree respectively. The mean score for all responses was 4.29. it indicated that most households have a regular garbage or solid waste collection area in their surroundings.

Regarding generated waste collection by informal private collectors, 23.7%, 10%, 12.9%, 25%, 28.4% of respondents confirmed as strongly disagree, disagree, neutral, agree, and strongly agree respectively. The mean score for this item was 3.24 (neutral). This implies that most of the respondents were neutral to give response regarding taking of solid wastes by informal private collectors. The total cumulative mean score for solid waste collection (4.01) implies that household solid waste management practice concerning solid waste collection is in an agreed condition. Likewise, concerning sufficient transport means to transport solid wastes, 15.5%, 15.5%, 2.4%, 42.9%, and 23.7% households proved as strongly disagree, disagree, neutral, agree, and strongly agree respectively. The mean score of this item was 3.44 (agree), which indicated that most of the respondents agreed that there are sufficient transport means to transport solid wastes. Regarding convenience of containers/skip points to vehicles used for collection and transport of solid wastes, 2.4%, 18.4%, 43.2%, and 36.1% of respondents replayed as disagree, neutral, agree, and strongly agree respectively. The mean

score for all responses was 4.13 (agree). This indicates that most respondents agree that solid waste containers/skip points are convenient to vehicles used for collection and transport solid wastes from their residence. Concerning regular supervision and control of an illegal dumping of solid wastes by cleansing management office does, 11.1% and 23.7% were replayed an disagree and neutral, whereas 40.3% and 25% of respondents replayed as agree and strongly agree. The mean score for this point (3.79) implies that the cleansing management office does regularly supervise and control of an illegal dumping of solid wastes on the streets, open areas and other areas of your woreda during and outside the time of collection and transportation. The overall mean for transportation (3.79) implies that solid waste management regarding transportation is in an agreed condition.

On the subject of adopting in reusing solid waste generated in home, 17.4%, 28.4% and 37.1% of respondents replayed as strongly disagree, disagree and neutral respectively, while, 11.8% and 5.3% of respondents replayed and agree and strongly agree respectively. The mean score of all responses of this item was 2.59(disagree). This implies that most of respondents did not adopt in reusing solid wastes generated from their house. As regard to having knowledge of recycling and reusing solid waste 10.5% and 54.7% of respondents responded as disagree and neutral. Whereas 16.3% and 18.4% replayed as agree and strongly agree. Mean score for this item was 3.43 (agree). This implies that most of respondents have knowledge of recycling and reusing solid wastes.

Regarding compost preparation from solid wastes, 38.4% and 45.3% of respondents replayed as disagree and neutral, while 15.3% and 1.1% of respondents replayed as agree and strongly agree. The mean score for this point was 2.79 (neutral). This indicates that most of the respondents undecided to give answer regarding preparation of compost from solid waste that can be used as organic fertilizer for crops. Regarding sufficient machines availability, 11.8%, 51.6%, 9.5%, and 8.9% of respondents replayed as strongly disagree, disagree, neutral, agree and strongly agree. The mean score for this item was 2.79 (neutral). This implies that most of respondents are undecided to give response regarding the availability of sufficient machines which crushes solid waste to be easily disposal or recycling of solid wastes.

On the subject of efficient solid waste management practice of cleansing management office, 10% and 14.7% of respondents replayed as disagree and neutral, whereas 34.7% and 40.5% of respondents responded as agree and strongly agree. The mean score for this item was 4.06 (agree). This implies that cleansing management office provide efficient solid waste

management compared with other services of the sub city such as water supply, electricity, telephone etc. The overall mean for reusing and composting of solid wastes indicated that household solid waste management concerning reusing and composting found in a neutral condition.

As regard to being evaluated by responsible bodies to practice rules and regulation of solid waste disposal and penalizing the violators of rules and regulations, 2.6%, 49.5% and 18.7% of respondents replayed as strongly disagree, disagree and neutral. While 7.9%, and 21.3% of respondents replayed as agree and strongly agree. The mean score value of all responses was 2.96. This point out that most of respondents are neutral /refrain from giving response/ regarding being followed up by responsible bodies to practice rules and regulation of solid waste disposal and whether the violators of rules and regulations to be penalized. Concerning being satisfied with the current waste disposal system, 1.8%, 21.8%, 30%, 11.1%, and 34.7% of respondents replayed as strongly disagree, disagree, neutral, agree and strongly agree. The mean score for this item was 3.55% (agree). This implies that most of respondents were satisfied with the current waste disposal system. Regarding giving inhand household solid wastes to SMEs, 1.1% and 22.4% of respondents replayed as disagree and neutral. Whereas 52.1% and 24.5% of respondents confirmed as agree and strongly agree respectively. The mean score (4.00) implies that most household respondents give their solid wastes to SMEs solid waste collectors in hand at the curb sides of roads near their residence.

Concerning disposing household waste by the side of the road and open space near the house, 25%, 53.%, 14.7%, 3.7% and 2.6% Of respondent replayed as strongly disagree, disagree, neutral, agree and strongly disagree. The mean score for this point was 2.05(disagree). This implies that most respondents do not dispose household solid wastes by the side of the road and open space near their house. As regard to disposing household solid wastes in ditches and Drainage Rivers an empty space near the house, 2%, 39.2%, 12.4, 5.5%, and 16.3% of respondents confirmed as strongly disagree, disagree, neutral, agree, and strongly agree respectively. The mean score (2.46) for this item indicates that most of the respondents disagree to household solid wastes disposing in ditches and drainage rivers an empty space near the house.

Regarding the burning of the generated household solid wastes in their compound, 27.4%, 35.5%, 1.1%, 18.2%, and 17.9% of respondents replayed as strongly disagree, disagree, neutral, agree, and strongly agree respectively. The mean score for this item was 2.64

(neutral). This implies that most respondents are undecided to give response regarding the burning of the generated household solid wastes in their compound. The overall mean for disposal (2.94) implies that household solid waste management practice regarding disposal found in a neutral condition.

The solid waste management practices regarding waste generation or production, storage, solid waste collection and transportation found in an agreed condition. However households SWM practices concerning reuse and compositing of solid waste and disposal found in a neutral condition. This indicates that the households regarding solid waste management practice of waste generation, storage, collection, and transportation activities were good and effective than reusing, composting and disposal activities of solid wastes in the study area. But in regarding the mechanisms of solid waste management practices in reusing, composting and the disposal activities of the households in the study area were not that much effective and properly implemented.

Therefore as the households activities in reusing again, composting and recycling solid wastes generated from their home were poor and the disposal activities were not properly implemented. As a result this can be negatively affects the process of SWM practices.

Table 5: Household Solid Waste Management (SWM) practices

SWM Practices	SD	D	N	A	SA	Mean	S.Dv
Waste production						4.03	
Regular house cleaning.	0	16(4.2%)	76(20%)	130(34.2%)	158(41.6%)	4.13	0.877
Different types of solid waste generate in the house.	47(12.4%)	3(0.8%)	3(0.8%)	160(42.1%)	167(43.9%)	4.04	1.263
Waste separation.	3(0.8%)	52(13.7%)	58(15.3%)	124(32.6%)	143(37.6%)	3.93	1.07
Storage						3.91	
Container facility in home.	10(2.6%)	40(10.5%)	54(14.2%)	149(39.2%)	127(33.4%)	3.9	1.062
Separate and store different types of waste at home.	0	51(13.4%)	78(20.5%)	106(27.9%)	145(38.2%)	3.91	1.057
Kitchen wastes	25(6.6%)	26(6.8%)	10(2.6%)	209(55%)	110(28.9%)	3.93	1.086
Collection						4.01	
Collection skip point is near to home.	2(0.5%)	46(12.1%)	75(19.7%)	111(29.2%)	146(38.4%)	3.93	1.054
Use cooperatives (SMEs) for solid waste collection.	15(3.9%)	48(12.6%)	26(6.8%)	58(15.3%)	233(61.3%)	4.17	1.231

Collection schedule is appropriately implemented.	1(0.3%)	18(4.7%)	85(22.4%)	93(24.5%)	183(48.2%)	4.16	0.947
Collectors come per schedule & on time.	5(1.3)	42(11.1%)	8(2.1%)	109(28.7%)	216(56.8%)	4.29	1.035
Regular garbage collection.	26(6.8%)	33(8.7%)	2(0.5%)	69(18.2%)	250(65.8%)	4.29	1.292
Wastes are taken by informal collectors.	90(23.7%)	38(10%)	49(12.9%)	95(25%)	108(28.4%)	3.24	1.543
Transportation						3.79	
Sufficient transport means.	59(15.5%)	59(15.5%)	9(2.4%)	163(42.9%)	90(23.7%)	3.44	1.402
Skip points are convenient to vehicles.	0	9(2.4%)	70(18.4%)	164(43.2%)	137(36.1%)	4.13	0.79
Regular supervision and controlling.	0	42(11.1%)	90(23.7%)	153(40.3%)	95(25%)	3.79	0.942
Reusing and composting						3.13	
Reusing solid waste.	66(17.4%)	108(28.4%)	141(37.1%)	45(11.8%)	20(5.3%)	2.59	1.07
Knowledge on recycling and reusing.	0	40(10.5%)	208(54.7%)	62(16.3%)	70(18.4%)	3.43	0.909
Preparation of compost.	0	146(38.4%)	172(45.3%)	58(15.3%)	4(1.1%)	2.79	0.732
Sufficient machines.	69(18.2%)	45(11.8%)	196(51.6%)	36(9.5%)	34(8.9%)	2.79	1.121
Cleansing management office provide efficient SWM service.	0	38(10%)	56(14.7%)	132(34.7%)	154(40.5%)	4.06	0.976
Disposal						2.94	
Penalize on violators of proper disposal.	10(2.6%)	188(49.5%)	71(18.7%)	30(7.9%)	81(21.3%)	2.96	1.238
Current waste disposal system is satisfied.	7(1.8)	83(21.8)	116(30.%)	42(11.1%)	132(34.7)	3.55	1.222
Solid wastes are given in hand to SMEs collectors.	0	4(1.1%)	85(22.4%)	198(52.1%)	93(24.5%)	4	0.715
Solid wastes are disposed in roadsides.	95(25%)	205(53%)	56(14.7)	14(3.7%)	10(2.6%)	2.05	0.884
Solid wastes are disposed in ditches & rivers.	101(2%)	149 (39.2%)	47(12.4%)	21(5.5%)	62(16.3%)	2.46	1.369
Solid wastes are burned in the compound.	104(27.4%)	135(35.5%)	4(1.1%)	69(18.2%)	68(17.9%)	2.64	1.49

Source: (Own Survey, 2022)

Discussion with key informants selected from woreda and sub-city provides additional information about the types of solid waste management system and or strategies effectively used to manage the households' solid waste. Accordingly key informants from woreda 5 replayed that most households apply reduction in a little bit to prevent or reduce waste generation from the source or the first place. In addition some households practice recycling of degradable solid wastes as a compost for their compound greenery area. Moreover key informants indicated that most households apply reusing of solid wastes to take old items that might be considered as thrown away and thus finding a new method to reuse them again. In this regard they use plastics for decoration purpose in their home and compound. But in some households there have been limitations in the practice of reusing, composting and proper disposal activities. This indicates that there have been a problem in the process of solid waste management practices from fully implemented in the study area.

4.1.3. Attitude of Households towards Solid Waste Management Practices

In order to understand the attitude of households towards solid waste management practice, likert with five scales was used. As indicated in table 6 below, regarding negative consequences of improper solid waste management, 0.3% and 12.6% of households replayed as disagree and neutral respectively. While 52.4% and 34.7% of household respondents replayed as agree and strongly agree respectively. The mean score of this item was 4.22 (strongly agree). This implies most of the respondents believe that improper solid waste management could result a negative domestic health consequences.

According to the study, concerning environmental pollution of poor solid waste management, 2.6%, 10%, 1.3%, 56.6% and 29.5% of respondents confirmed as strongly disagree, disagree, neutral, agree and strongly agree respectively. The mean score for this item was 4.00 (agree). This indicated that most of the respondents believe that poor solid waste management could result a serious environmental pollution. On the subject of minimizing environmental problem with proper solid waste storage, 0.5%, 2.6%, and 26.8% of respondents confirmed as strongly disagree, disagree and neutral respectively. Whereas 48.2% and 21.8% of respondents replayed as agree and strongly disagree respectively. The mean score of this point was 3.88 (agree). This indicated that most respondents think that environmental problems in their area could be minimized with the proper storage of solid wastes. Regarding the pollution of current waste disposal system, 4.2%, 11.8%, 26.3%, 49.7%, and 7.9% of respondents replayed as strongly disagree, disagree, neutral, agree, and strongly agree

respectively. The mean score for this item was 3.45 (agree). This implies that most of respondents confirmed that the current waste disposal system is polluting environment.

Concerning making organic fertilizer from kitchen and vegetable, 0.3%, 24.7%, 7.6%, 27.6% and 39.7% replayed as strongly disagree, disagree, neutral, agree and strongly agree respectively. The mean score for this point was 3.82 (agree). This implies that most respondents know that from kitchen and vegetable wastes, an organic fertilizer can be made, which is good for the environment. Regarding relevance of community participation for solid waste management, 3%, 16.1%, 12.9%, 42.1% and 25.5% of respondents reported as strongly disagree, disagree, neutral, agree and strongly agree respectively. The mean score for this item was 3.70 (agree). This implies that the attitude of household respondents with respect to inevitableness of community participation for waste collection system and improvement of the environment is positive.

Regarding social and environmental impacts of solid waste generated from home, 23.2% and 1.1% of respondents replayed as disagree and neutral. Whereas 40.3% and 35.5% of respondent replayed as agree and strongly agree respectively. The mean score for this item was 3.88 (agree). This implies that most households' respondents understand the social and environmental impacts of solid waste generated from home. According to the investigation, regarding the solid waste which is not managed properly cause health impacts, 0.3%, 0.3%, 12.6%, 63.4%, and 23.4% of respondents replayed as strongly disagree, disagree, neutral, agree and strongly agree respectively. The mean score of all responses of this statement was 4.09. This point out that the respondents agreed with the statement that the solid waste not managed properly cause health impacts.

As the study result indicated, concerning satisfaction with municipal solid waste management service of the sub city and their woreda, 11.8% 16.8% and 3.4% of respondents replayed as strongly disagree, disagree and neutral. Whereas 41.6% and 26.3% of respondents replayed as agree and strongly agree respectively. The mean score for all responses of this statement was 3.54. This implies that most of the respondents satisfied with municipal solid waste management service of the sub city and their woreda which delivered by cleansing management office of the sub city as well as the woreda.

Table 6: Attitude of Households towards Solid Waste Management (SWM) Practices

Attitude statements	SD	D	N	A	SA	Mean score	S. Dv
Improper SWM could result a negative domestic health consequences.	0	1(0.3%)	48(12.6%)	199(52.4%)	132(34.7%)	4.22	0.662
Poor SWM could result a serious environmental pollution.	10(2.6%)	38(10%)	5(1.3%)	215(56.6%)	112(29.5%)	4	0.973
Environmental problems in my area could be minimized with the proper storage of solid waste.	2(0.5%)	10(2.6%)	102(26.8%)	183(48.2%)	83(21.8%)	3.88	0.792
Current waste disposal system is polluting environment.	16(4.2%)	45(11.8%)	100(26.3%)	189(49.7%)	30(7.9%)	3.45	0.947
Producing organic fertilizer from kitchen wastes.	1(0.3%)	94(24.7%)	29(7.6%)	105(27.6%)	151(39.7%)	3.82	1.207
Community participation is inevitable for waste collection system and cleaning the environment.	13(3. %)	61(16.1%)	49(12.9%)	160(42.1%)	97(25.5%)	3.7	1.118
Solid wastes generated in the house can cause social & environmental impacts.	0	88(23.2%)	4(1.1%)	153(40.3%)	135(35.5%)	3.88	1.132
Solid wastes not managed properly cause health impacts.	1(0.3%)	1(0.3%)	48(12.6%)	241(63.4%)	89(23.4%)	4.09	0.622
Dissatisfied with the current SWM system.	52(13.7%)	141(37.1%)	46(12.1%)	107(28.2%)	34(8.9%)	2.81	1.251
Satisfied with municipal SWM service of the sub-city and woreda.	45(11.8%)	64(16.8%)	13(3.4%)	158(41.6%)	100(26.3%)	3.54	1.352

Source: (Own survey, 2022)

4.1.4. Methods of solid waste collection, transportation, storage and its duration

The methods of solid waste collection vary from household to household. As indicated in the pie-chart (figure-7) below, the majority of the households (69.5%) used door to door solid waste collectors to give their household generated solid wastes. The other 5.5% and 5.3% of households used communal method and wheel barrow system respectively to collect their solid wastes. The remaining 19.7% use other solid waste collection method.

A key informant from SMEs private solid waste collectors added regarding the question raised about solid waste collection method, some households give to informal solid waste collectors (quralwos) by selling the important materials like plastics, metals and cartons but the garbage is remain neglected from disposed to the proper place or disposed of in un designated places such as in rivers, opens paces, road sides, ditches etc.

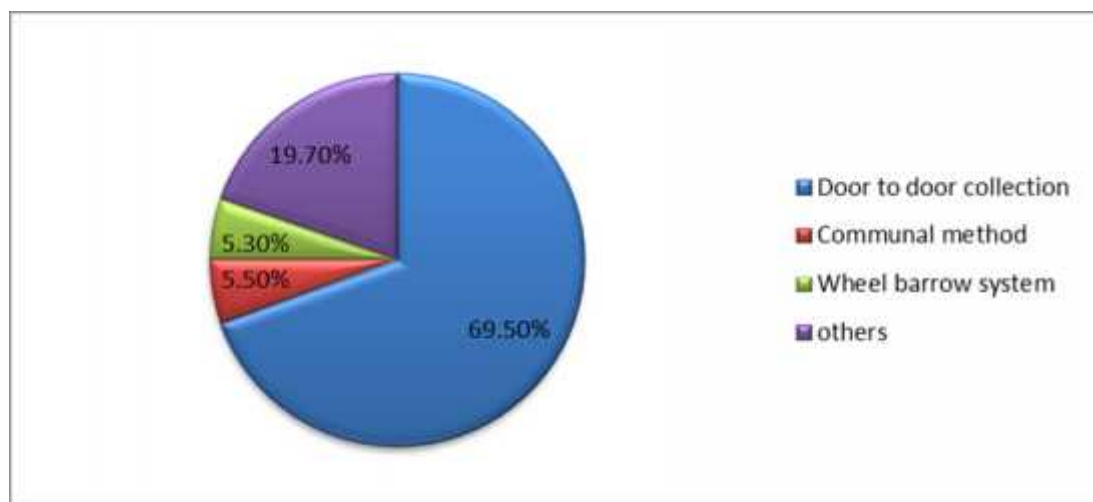


Figure 7: Method of solid waste collection (Source: Own Survey 2022)

A key informant from woreda5 cleansing management office replayed that cooperative partnerships collect solid wastes from household every two days per week. After the cooperatives take the solid wastes from the resident, they separate the waste according to its type as degradable or non-degradable before being transported. However, big organizations such as hotels and hospitals collect their own solid wastes by themselves unlike solid wastes generated from households collected by cooperatives.

As indicated in the figure 5 below, households use different materials to store solid wastes that generated from their house. The majority of households (70.5%) used sacks to store their household generated solid wastes. 5.5%, 1.6% and 12.6% of households used basket, metal container, and plastic container respectively. The rest of the households used other methods to store their household generated solid wastes.

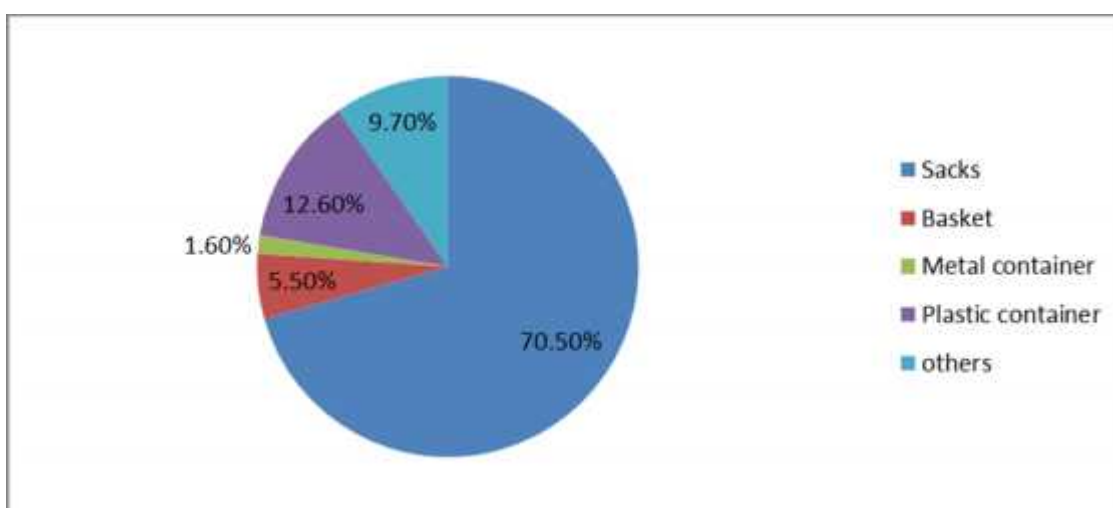


Figure 8: solid waste storage materials(Source: Own Survey, 2022)

The researcher asked key informants to get additional information about how solid waste collection and transportation undertaken in the area. Consequently a key informant from woreda5replayed that; *Most of the Lideta sub city residents handover their household generated solid wastes to two unions separately as organic /composting and inorganic /decomposing solid wastes. However a few residents handover their solid wastes for only one union. Cooperatives (SMEs) use two solid waste collection systems; the first one is from resident's house to a specific solid waste skip points. The other is from illegally dumped solid waste to solid waste skip points. Similarly regarding transportation, they transport solid wastes from solid waste skip points to temporary solid waste storage area using isuzu car and cart.*

According to the information gathered, the majority of respondents (82.6%) replayed that their household generated solid waste stored and stayed at home before disposal for three to five days. About 0.8%, 12.4%, and 4.2% of respondents reported that they stay their solid wastes stored at home before disposal for one to two days, six to seven days, and more than a week respectively.

Table 7: Length of solid waste storage time in home

Storage days	Frequency	Percent
One to two days	3	0.8
Three to five days	314	82.6
Six to seven days	47	12.4
More than a week	16	4.2
Total	380	100

Source: (Own survey, 2022)

4.1.5. Descriptive Analysis of Institutional Factors

As indicated in table 8 below, household respondents were asked to know whether they got awareness creation training regarding about how to handle or manage solid wastes generated from their home. According to the investigation, 76.6% of respondents had awareness regarding solid waste management practice whereas, 23.4% of respondents didn't get any awareness about solid waste management. This result indicates that most of the respondents have awareness how to manage the solid wastes generated from their home. However, some of them they don't have awareness about how to manage the solid wastes generated.

Household respondents were also asked to know the fairness of monthly payment for waste disposal. Accordingly, 68.4% of respondents replayed that payment for solid waste disposal was fair. While 31.6% of respondents replayed that payment for solid waste disposal was not fair. This result shows that most of the respondents positively accepted regarding the payment for waste disposal. However, some of the respondents have been negatively response.

According to the investigation, 82.6% of respondents replayed that there is a container /temporary collection skip points near their home. Whereas 17.4% of respondents replayed that there is no any temporary solid waste collection skip point/container near their home. Regarding the distance between the collection skip point and the respondents' home, the minimum and maximum distance between home of household respondents and temporary solid waste collection skip point were 0.1 and 3 kilo meter respectively, whereas the average distance was found to be 1.07 Km.

Table 8: Descriptive Analysis of Institutional Factors

Variable	Category	Solid waste segregation practice				Total		X ²
		Segregate		Not segregate		No	%	
		No	%	No	%			
Training access regarding SWM	no	80	35.1	9	5.9	89	23.4	0.000
	yes	148	64.8	143	94.1	291	76.6	
	Total	228	100	152	100	380	100	
Monthly Payment for waste disposal	Not fair	50	21.9	71	46.7	121	31.8	0.000
	Fair	178	78.1	81	53.3	259	68.2	
	Total	228	100	152	100	380	100	

Source: (own survey, 2022)

According to the investigation indicated in the above table 8, out of the total 380(100%) respondents in the study area 291(76.6%) of them have got awareness creation whereas 89(23.4%) of respondents did not get any awareness about solid waste segregation practice.

The chi-square test indicated that there is a statistical association between households who segregate and not segregate solid waste. Hence, as indicated in table 9 below, among 291 or 76.6% of household respondents who have got awareness creation regarding solid waste segregation practice, 21.4% got awareness through brochures distributed for them, 47.6% of respondents got awareness through door to door education and the remaining 31.1% of respondents got awareness through exhibition presenting good practices in solid waste management, sorting and reusing.

Table 9: Awareness Creation Methods Regarding Household SW Handling

Training methods	Frequency	Percentage
Broachers distributed to residences	62	21.4
Door to door education	139	47.6
Exhibition presenting good practices in solid waste management, sorting and reusing	90	31.1
Total	291	100.0

Source: (Own survey, 2022)

Discussion with key informant clarifies that there are a variety of ways of creating awareness regarding solid waste management and disposal system. For instance there is awareness creation for both residents and businesses in order to make them clean their area with a radius of 2m by 5m. In addition, informing solid waste disposal program, awareness rising regarding cleansing management office policy and strategy and demonstration work regarding solid waste reusing and recycling systems is carried out (key informants from wereda 5 and 7).

A key informant from wereda 5 supplemented additional information that households are aware of how to use the solid waste as a source of wealth, for instance making compost for urban agriculture works is one of the wealth creation method practiced in the wereda as key informant response.

Moreover discussion with sub city experts revealed that there is monitoring and support to wereda residents to clean up their spare, and also awareness creation to bring clean environment and to prevent adverse health effect of poor sanitation and solid waste disposal. The awareness creation was carried through house to house awareness, using different training forums, using different Medias such as Addis TV, face book, telegram, brochures, flyers and banners (Key informant from sub city).

However, awareness creation work still going on by the woreda cleansing management office is not that much enough. In other side, even though households are aware of appropriate solid waste management systems, their solid waste management practice particularly in segregation and proper storage of solid wastes in their home is not satisfactory as per their awareness.

4.1.6. The Role of Different Responsible Bodies in Solid Waste Management

During investigation, household respondents requested to know the role of different bodies contributed for household solid waste management practices. Accordingly, 10.3% of respondents replayed that cleansing management office has the greatest role in the household solid waste management in their woreda. 19.9% of respondents also reported that SMEs association solid waste collectors have the greatest role in the household solid waste management in their woreda. Similarly, 13.2% of respondents replayed that the household themselves have a great role in the household solid waste management in their woreda. Moreover the majority (56.6%) of household respondents responded that all of the above bodies namely cleansing management office, SMEs solid waste collectors and households have a great role in the household solid waste management Practices.

Table 10: The role of different responsible bodies

Responsible bodies	Frequency	Percentage
Cleansing management office	39	10.3
SMEs solid waste collectors	76	19.9
The households	50	13.2
All of the above bodies are responsible	215	56.6
Total	380	100

Source: (Own survey, 2022)

According to the key informant's response from woreda 5, the woreda and sub city cleansing offices work integratively with households to make the environment clean and avoid spread of disease. To achieve this, two weekly programs are organized. The first one is cleaning the compound of governmental and non-governmental organizations on the day of Friday. The second one is cleaning the environment at community level every Saturday.

4.1.7. Physical Composition of Household Generated Solid Wastes

The survey result indicated that the major solid waste type generated from the respondents' home per day was kitchen wastes such as food wastes, fruit and vegetable peels. The kitchen waste comprises of 58.15% of the total household waste generated. This result agree with the study conducted by Besha (2019), who revealed that the major waste generated in Addis Ababa three condominium sites was kitchen waste. The second major waste generated from respondents home was plastic wastes with 20.99%. Paper and other waste types comprises of 10.27% and 10.59% respectively. The analysis indicated that in the sub city, the majority of solid waste generated or produced from household per day is kitchen waste. From the result obtained, kitchen wastes and paper are considered as biodegradable wastes. Whereas different types of plastics generated from household such as *festal and highlands* are non-biodegradable wastes.

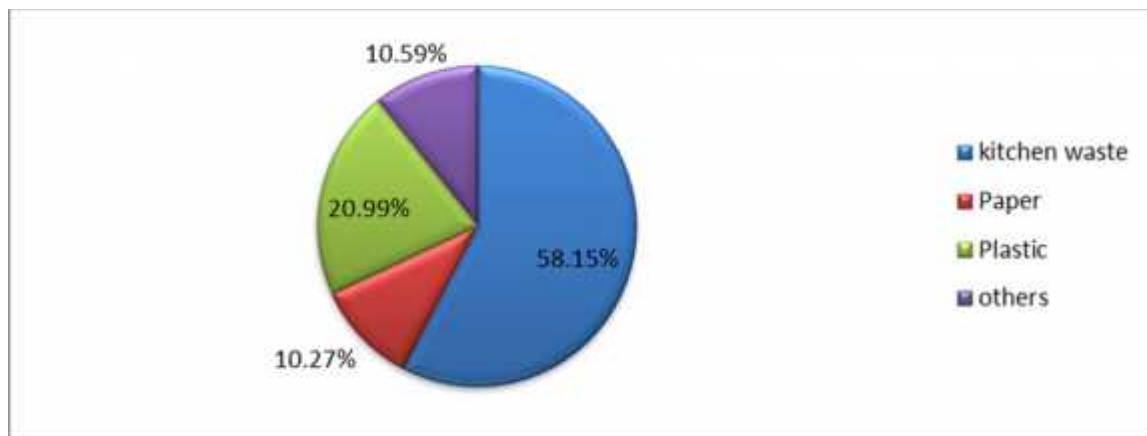


Figure 9: physical composition of household generated solid wastes (Source: Own Survey, 2022)

4.1.8. Reasons of Poor Solid Waste Handling and Disposal Practices

Household respondents were asked to report and indicate their reasons about poor solid waste management practiced in the area. Accordingly, as indicated in table 11 below, 31.3% of respondents reported that poor SWM practices occurred due to the governments/agency stagnant and weak service provision. Similarly, the majority 44.2% of respondents revealed that poor solid waste management in the area occurred due to the society's unchanged behavioral problems (culture, tradition, attitude and awareness) and the remaining 24.5% of respondents said that the current poor solid waste management occurred due to lack of proper resource (trained human & financial capital). This result indicates that the poor solid waste management practices in the study are due to lack of awareness and attitude factors.

Table 11: Reasons of poor solid waste management practice

Reasons	Frequency	Percent
Due to governments (the agency) stagnant service provision	119	31.3
Due to societies unchanged behavioral problems (culture, tradition, attitude, awareness)	168	44.2
Due to lack of proper resource (trained human and financial)	93	24.5
Total	380	100

Source: (Own survey, 2022)

Discussion with key informants from wereda 5 and 7 experts provided additional information regarding the main challenges associated with household solid waste management practices in the woredas. Thus they replayed that there are some challenges related to solid waste management such as car crash during transporting solid waste, solid waste truck transport problem, fuel shortage, miscommunication/disagreement between partnership and the truck transport distribution department.

Another key informant from woreda7 revealed that there are a number of factors challenging household solid waste management in the woreda. Among these factors, there is low awareness of the society about household solid waste management. Lack of monitoring and support of households regarding solid waste management by responsible body and low capacity of the institution are also other problems. Moreover lack of technological aspects to recycle, reuse, and reduce solid wastes are among the challenges influencing solid waste management practices at household level.

4.1.9. Solutions to Improve Solid Waste Management at Household Level

The researcher tried to investigate the solutions to improve households' solid waste management practice. As a result, as indicated in table 12 below, 28.95% of household respondents replayed that solid waste management at household level could be improved through awareness creation and support by the cleansing management office. Similarly 28.95% of respondents replayed that household solid waste management could be improved through recycling and composting of degradable solid wastes. More over the remaining 42% of respondents reported that solid waste management at household level could be improved through using reusable materials and stopping using of the disposable one. From this, we can understand that from all responses given to each respective point, relatively most of respondents believed to used reusable materials and also stopping of using disposable materials to improve solid waste management at household level.

Table 12: Solutions to improve solid waste management at household level

Solutions	Frequency	Percent
Through creating awareness and support by the cleansing management office	110	28.95
Through recycling and composting of degradable solid wastes	110	28.95
Through using reusable materials and stopping using of the disposable one	160	42
Total	380	100

Source: (Own survey, 2022)

Key informants suggested some solutions regarding poor household solid waste management practices. As a result key informants from woreda5 suggested that in order to improve solid waste management in the woreda, there should be fair delivery of trucks; increase access of modern and efficient solid waste transporting truck; landfills should be free from traffic overcrowding, solid waste transport should be given for private companies and more over sufficient fuel should be supplied for transport services.

Discussion with key informants of woreda7 provides the possible solutions to improve poor solid waste management practice observed in some cases. One of the solutions suggested is that the responsible body should aware the households about 3Rs, namely; reduce, reuse, and recycle solid wastes. In addition develop institutions till it develops a capacity to handle its full responsibility is another solution suggested to improve household solid waste management practices.

Moreover household respondents were asked to know whether they know and or aware of the existence of the national solid waste management policy. As a result the majority (62.6%) of respondents reported that they are not aware of the existence and endorsement of national solid waste management policy. While the other 37.4% of respondents reported that they are aware of the existence and endorsement of the national solid waste management policy.

4.1.10. Econometric Results of Factors Affecting Household Solid Waste Segregation Practices

In this study, binary logistic regression was employed to analyze the effects of explanatory variables on household solid waste segregation. The dependent variable of this study was household solid waste segregation. The independent variables were sex, age, marital status, household size, house ownership, heads' level of education, job type, monthly income,

training access, monthly payment for waste disposal, and estimated distance between temporary solid waste collection skip points and the respondents' home.

Before running the regression analysis, pair wise correlation was carried out to check the existence of multicollinearity among explanatory variables. According to Maddala (1992), the correlation result of 0.75 and above between dummy explanatory variables indicates strong relationship between them. Thus, in this study; there is no multicollinearity between explanatory variables (Appendix II).

As shown in the table below, among the eleven independent variables included in the model, nine of them namely; age, marital status (married, divorced & widowed), head education level (unable to read and write & literate), housing ownership (kebele rental house and private rented house), household size, job type (private business), monthly income, training access, monthly payment for waste disposal found to be statistically significant.

4.1.10.1. Age of household head

Age of household head plays a significant role in determining households' solid waste segregation. As shown in table 12, the age of household head found to be statistically significant ($P < 0.01$) and has a negative effect on solid waste segregation. The result of odd ratio indicated that as the age of household increase, households' intention to segregate solid waste in their home decrease by a factor of 0.945 unit. The value of marginal effect indicated that, holding the other variables constant, as households' head get older, their probability to practice solid waste segregation decrease by 0.6%. The result disagrees with Kayode and Omole (2011), who noted that the age of the household head was negatively and weakly correlated with solid waste management practice. This implies that as household heads got older, their productivity decrease to perform household tasks such as solid waste segregation.

4.1.10.2. Marital status of respondents

Marriage is one of the key factors determining households' solid waste segregation practices. It was categorized into four groups namely single, married, divorced and widowed. In the model estimation, marital status (married, divorced and widowed) found to be statistically significant at ($P < 0.05$), ($P < 0.01$), and ($P < 0.01$) respectively, but negatively affect household solid waste segregation. The value of odd ratio indicated that as household heads got married, divorced, and widowed, their probability to practice solid waste segregation decrease by units of 0.387, 0.023, and 0.104 units respectively. The result of the marginal effect indicated that holding the other variables constant, as household heads got married, divorced, and widowed,

the likelihood of practicing solid waste segregation decrease by 11.6%, 39.3%, and 26.6% respectively compared to single household heads. The result implies that household heads who are divorced and widowed might have a negligence to manage their household solid wastes due to small number of household members.

4.1.10.3. Housing ownership

Housing ownership is one of the determining factor of solid waste management practices. This variable has four categories, namely; Private house, kebele rental house, private rented house, and rental house administration. The result in the table below shows that housing ownership (kebele rental house and private rented house) found to be statistically significant ($P < 0.01$) and negatively affect solid waste segregation activity. The result of odd ratio indicated that as households live in kebele rental house and private rented house, their probability to practice solid waste segregation decrease by factors of 0.08 and 0.15 respectively. The result of marginal effect of housing ownership indicated that keeping the other variables constant, as households live in kebele rental house and private rented house, the probability of practicing solid waste segregation decrease by 28.7% and 21.3% respectively compared to households having their own house. This implies that families who live in rented houses such as kebele and private rented houses are not stable and give less attention to solid waste management practices than household living in their own house.

4.1.10.4. Household heads' level of education

Education level of household heads' plays a significant role in determining household solid waste segregation. The result shows that household heads' level of education found to be statistically significant ($P < 0.01$) and has positive effect on solid waste segregation. Odd ration of heads education level indicates that as households heads' education level increase, the probability of practicing solid waste segregation increase by a factor of 47.09. the value of marginal effect indicated that keeping other variables constant, as household heads' education level grow, the likelihood of practicing solid waste segregation increase by 37.1% compared to household heads who could not read and write. This implies that as household heads' level of education increasing, their awareness regarding solid waste management also increase. This result corroborates with the result of previous studies (Shabani, 2015; Noufal et al., 2020), which revealed that the more a family head gets educated and aware of the adverse impacts of poor solid waste management practice, the more it recognizes the importance of

effective management of solid waste such as segregating at source and store with proper storage material.

4.1.10.5. Household size

Household size is one of the key determinants of household solid waste management practice such as solid waste segregation. Household size found to have a negative influence on household solid waste segregation at a statistically significant level ($P < 0.05$). The value of odd ratio pointed out that as family size increases, the probability of practicing solid waste segregation decrease by a factor of 0.8. The value of marginal effect of family size indicated that keeping the other variables constant, as the number of family members increase in a household, the likelihood of implementing solid waste segregation decrease by 2.5%. This implies that a family having more children gives less attention to separate their household solid wastes; instead they give more time in taking care of their children and engaging in their homestead works. This result opposes with previous study (Niringiye, 2010), who stated that the more children in the household, the more they would prefer to use their children to clean the environment than paying more to the Municipal authorities to clean the environment.

4.1.10.6. Household heads' job type/occupation

The households' head job t/occupation type might affect the households' solid waste segregation. It was categorized in to four categories including; government sector employ, private sector employee, private business and retired. The result indicated that job type (private business) found to has a negative and significant ($P < 0.01$) effect on household sold waste segregation. As shown in the table 12 below, the odd ratio indicated that being engaged in private business decrease the probability of practicing solid waste segregation. The value of marginal effect pointed out that keeping the other variables constant, as household heads being engaged on private business, the probability of solid waste segregation decrease by 14.8% compared to government sector employee.

4.1.10.7. Monthly income

Monthly income is one of the key factor determining household solid waste management practices. The result showed that monthly household income found to have a positive effect on household solid waste segregation and statistically significant ($P < 0.01$). Odd ratio of monthly income shows that as monthly income of a household increase, the probability of practicing solid waste segregation increase by a factor of 12.4. The value of marginal effect pointed out that holding the other variables constant, as monthly income of household

increase, the propensity of practicing solid waste segregation increase by 28.4%. The result implies that as household heads' monthly income increase, the households' willingness to pay to improve their home and the surrounding environment quality also increase. This result is consistent with the previous literature (Awunyo, *et al.*, 2013), who point out that there is a general agreement in environmental economics, which revealed that there is a positive relationship between income and environmental quality improvement.

4.1.10.8. Monthly payment for solid waste disposal

Payment for solid waste disposal found to have a negative effect on household solid waste segregation at a statistically significant level. The odd ratio pointed out that as monthly payment for solid waste disposal increase by one unit (birr), households' propensity to segregate solid waste decrease by a factor of 0.14. The result of marginal effect shows that, keeping the other variables constant, as monthly payment for waste disposal increase by one birr, the probability of segregating solid waste decrease by 23.9%. This implies that households particularly living with low income unable to pay more to dispose their household generated solid waste and thus they choose to drop the waste along road side, open areas, ditches and so on which results polluted environment.

4.1.10.9. Training access

Access to training found to have a positive effect on household solid waste segregation and statistically significant ($P < 0.05$). The result of odd ratio indicated that as household heads got training access, the probability of segregating solid waste increase by a factor of 7.01 compared to household heads who didn't get training access. The value of marginal effect indicated that holding the other variables constant, as household heads got training access regarding solid waste segregation practices, the probability of practicing solid waste segregation increase by 21.4%. The result implies that training regarding solid waste segregation/sorting at household level provides the households to have a better awareness about their home as well as environment to be free from any hazardous home generated solid wastes, better opportunity for compost preparation from biodegradable solid wastes used for home garden/greenery and urban agricultural practicing and segregated solid wastes in home at the source are easy to dispose by implementing the best waste disposal mechanisms as well as preparation of important materials for income purpose/ market.

Table 13: Binary logistic regression analysis of explanatory variables

Explanatory variables	Odds ratio	Robust Std. Err.	P> z	Marginal effect (dy/dx)
Sex (male)	.535783	.2868106	0.244	-.0721437
Age	.9447089	.0193356	0.005	-.0064135
Marital status				
Married	.3868975	.1817651	0.043	-.1166044
Divorced	.0233974	.0227439	0.000	-.3931217
Widowed	.1039921	.0734366	0.001	-.266309
House ownership				
kebele rental house	.0763624	.0486642	0.000	-.2872306
private rented house	.1505416	.0685763	0.000	-.2132603
rental house administration	.3488652	.2657963	0.167	-.1161086
Head education (literate)	47.0882	50.92224	0.000	.3713705
Household size	.8013083	.0787817	0.024	-.0249769
Job type				
private sector employer	.5396676	.2709264	0.219	-.0718892
private business	.2712796	.1258989	0.005	-.1484558
Retired	.9630423	1.002413	0.971	-.0044022
Log monthly income	12.39638	11.75878	0.008	.2838567
Monthly payment (fair)	.1427322	.0653778	0.000	-.2393584
Training access (yes)	7.013696	4.465026	0.002	.2139095
Estimated distance	.6681641	.2008027	0.180	-.0454663
_cons	.0030344	.0126244	0.163	

(solid waste segregation) Binary logistic regression
Number of obs = 380
Wald chi2(13) = 102.40 chi'
Prob > chi2 = 0.0000
Log pseudo likelihood = -133.07771
Pseudo R2 = 0.4796

Source: (STATA Soft Ware)

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1. Conclusion

Managing solid wastes generated from home properly has a paramount importance to address health and environmental issues in any nation whether developed or developing. This study was conducted to investigate the household solid waste management practices and associated factors affecting the practice of solid waste segregation in Lideta sub-city by using the case study of two purposely selected woredas (woreda5 and 7). Of the total household respondents, 40% (152) of them found to apply solid waste segregation practice, while 60% (228) of them didn't practice solid waste segregation. In the study area, solid waste management practices regarding waste generation or production, storage, solid waste collection, and transportation, found in an agreed condition. However household solid waste management practices concerning reusing and composting of solid wastes and the activities of disposal found in a neutral condition. The overall attitude of households regarding solid waste management indicated that improper solid waste management could result a negative domestic health consequences and environmental pollution. Furthermore, most respondents believe that environmental problems in their area could be minimized through community participation in solid waste segregation, proper storage and disposal of solid wastes.

The majority of the households used door to door solid waste collectors to give/dispose their household generated solid wastes. Similarly most households used sacks to store their household generated solid wastes. Regarding length of storage time in home, the majority of households store their household generated solid waste for three to five days. Regarding the physical composition of solid wastes generated in home per day, kitchen waste comprises the largest portion.

In this study, binary logistic regression model was employed to estimate the effects of demographic, socio-economic and institutional factors on household solid waste segregation practices. The result revealed that the age of household head, marital status (divorced, & widowed), housing ownership (kebele rental house and private rented house), household heads job/occupation (private business), monthly payment for waste disposal found to have a negative influence on household solid waste segregation practices at a statistically significant level ($P < 0.01$). Similarly, marital status (married), and household size have a significant ($P < 0.05$) and negative effect on solid waste segregation practice. On the other hand,

education level of household head, monthly income, and training access found to have a positive influence on household solid waste segregation practices at a statistically significant level ($P < 0.01$).

5.2. Recommendation

Based on the findings of the study, the investigator would like to suggest the following recommendations are forwarded for the improvement of the household solid waste management practices in Lideta sub-city:

Policy options targeted on upgrading household heads education level have a multitude of effects on changing behavior of human beings. Education changes the attitude and increases awareness of somebody in understanding up on specific issue such as the importance of segregating solid wastes at household level and thus provides to have a new look at. Moreover education increases awareness regarding health and environmental consequence of poor solid waste management. Therefore, the municipality and other concerned body should target and work on education of adults as well as youths in order to familiarize the solid waste segregation practice at household level of the community by developing curriculum which would be offered in schools or universities.

Improvement of households' income enhances their overall wellbeing including proper handling of solid wastes. Therefore assisting households to have sufficient income leads them to invest on improving their household generated solid waste segregation and by storing properly with appropriate storage material and paying the required amount of money for disposal. Therefore the sub-city administration, cleansing management office and other organizations engaged on development should create income generating jobs, such as encouraging the households on practice of segregating solid waste by creating linkage with partnerships and recycler industries.

Households who were trained or being aware about solid waste management are more likely better than households who were not aware in segregating/sorting of solid wastes generated from their home and other solid waste management methods or strategies in any means is a crucial one to address environmental and health impact of poor solid waste management. Therefore the woreda and sub-city cleansing management office should provide sufficient training program, material support and allocating budget in the annual plan at least by engaging relevant stakeholders.

The sub-city cleansing management office has to recognize the role of various stakeholders by supporting, rewarding and applying incentive schemes. For example, giving material or financial reward particularly for households and SMEs partnership associations who have practiced good segregation and handling of solid wastes in recognition to the role they have played in effective and exemplar practice will initiate them for further and better performance in the future.

As the study findings revealed, there is no households or project which is applying the important methods of waste reduction. Applying waste reduction strategies play a role not only in protecting environmental pollution but also in the economy also. Therefore, the Lideta sub-city cleansing management office should support the “waste management hierarchy” by giving the preference to prevention and reduction of solid waste production, source-separation, composting, reusing and recycling than mere collection and disposal activities.

There need to be further research for hazardous wastes how to dispose at the special landfill after segregated and on the current environmental and health effect of non-segregated plastic bag that mixed with decomposable material at the landfill.

Finally, In general integration of different responsible bodies/relevant stakeholders such as cleansing management office staff, SMEs private partnership association solid waste collectors, the community/households, and other stakeholders in a sustainable manner is required for a successful household solid waste management practice in the study area.

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APPENDIX I



COLLEGE OF DEVELOPMENT STUDIES CENTER FOR ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

Questionnaire for Household Survey

Dear respondent, the main objective of this questionnaire is to gather your opinion regarding the **Household solid waste management practices in Lideta Sub city (with in particular reference of woreda 5 and 7)**. The data and opinion gathered will be used for partial fulfillment of the requirement for master's degree in Addis Ababa University, college of development studies center for environment and sustainable development. Your faithful and quick response will make the research fruitful. The information you provide will be kept confidential. No need of writing your name and circle your answer. Thank you in advance for your collaboration.

Part I: General Information of Respondents (Factors affecting SWM Practices)

Interviewee ID: _____ Woreda: _____ Name of enumerator: _____

- 1) Sex: 1. Male 2. Female
- 2) Age: 1. 18 -30 2. 31- 40 years 3. 41-50 years
4. 51-60 years 5. 61 and above years
3. Marital status: 1. Single 2. Married
3. Divorced 4. Widowed/widower
4. Household Size: 1. Less than or equal to 2 2. 3-5 3. 6-8 4. 9 and above
5. Level of Education:
1. Illiterate 2. Primary 3. Secondary 4. Diploma and above
6. House ownership condition: A. Own private house B. Kebeles rental House
C. Private rental House D. Rental House Administration
7. Types of job of the household head:
1. Government employee 2. Private sector employee 3. Private business 4. Retired
8. Average monthly household income:
1. < 2000 birr 2. 2000 – 4000 birr 3. 4001 – 6000 birr 4. >6000 birr

Part II: The Practice of Households Solid Waste Management

Dear respondents the following statements are designed to collect your level of agreement on the practice of solid waste management. Thus, put (√) mark on the statement that agreed with. The numbers in the table are stands for:

1. Strongly disagree (SD) 4. Agree (A)
 2. Disagree (D) 5. Strongly Agree (SA)
 3. Neutral (N)

SN	Households Solid Waste Management Practices	1	2	3	4	5
	Waste generation /production					
1	I clean my house every day properly					
2	Different types of degradable and non-degradable Solid wastes generate from my house every day					
3	Iproperly identify the composition of my generated wasteas bio-degradable and non-bio-degradable					
	Storage					
4	I have a container facility in my home for storing the identified/sorted solid wastes.					
5	I separate and store different types of waste at my home					
6	I separate and store my kitchen waste from other					
	Collection					
7	The container/collection point is available near to my home to collect solid wastes.					
8	I used cooperative partnership association(SMEs) for door to door solid waste collection from my residence					
9	I think that the solid waste collection schedule is appropriately implemented					
10	ome per schedule and on time to collect solid wastes					
11	I have regular garbage or solid waste collection in my area per schedule					
12	The generated solid wastes are taken by informal private collectors					
	Transportation					
13	In my area there are sufficient transport means tottransport the solid wastes					

14	The solid waste containers/skip points are convenient to vehicles used for collection and transport solid wastes from our residence.					
15	Cleansing management office do regularly supervise and control an illegal dumping of solid wastes on the streets, open areas and other areas of your woreda during and outside the time of collection and transportation programs					
	Reusing & Composting					
16	adopt in reusing solid waste generated from my house (used paper, used glass and glass materials, used material, used metallic materials and used plastics and plastic materials and worn cloths)					
17	I have knowledge of recycling and reusing solid waste					
18	I adopt and do prepare compost from solid waste produced and can be used as organic fertilizer for crops prepared from solid waste					
19	There are sufficient machines which crushes solid waste to be easily dispose or recycle					
20	Cleansing management office provide efficient solid waste management compared with other services of the sub city such as water supply, electricity, telephone etc.					
	Disposal					
21	I have noticed that the follow up by responsible bodies to practice rules and regulation of solid waste disposal and the violators of rules and regulations are punished.					
22	I am satisfied with the current waste disposal system					
23	I give in hand to SMEs solid waste collectors of my household waste at the curb sides of roads near my residence					
24	I dispose my waste by the side of the road and open space near the house					
25	I dispose household solid wastes in ditches and drainage rivers					
26	I burn generated household solid wastes in my compound.					

Part III: Questions to assess the attitude of household respondents towards solid waste management

SN	Attitude statements	1	2	3	4	5
27	Improper solid waste management could result a negative domestic health consequence.					
28	Poor solid waste management could result a serious environmental pollution					
29	I think environmental problems in my area is minimized with the proper storage of solid waste					
30	Current waste disposal system is polluting environment.					
31	I know that from kitchen and vegetable wastes, an organic fertilizer can be made which is good for the environment					
32	Community participation is inevitable for local waste collection system and improvement of the environment					
33	olid wastes generated in my household can cause social and environmental impact.					
34	I know that the solid waste can cause health impacts if not managed properly.					
35	I am not satisfied with the current SWM system because of the distance from home Costs too high and frequency of disposal is low.					
36	I am satisfied with municipal solid waste management service of the sub city and my woreda which delivered by cleansing management office of the sub city as well as the woreda					

Part IV: circle the best alternative answer for multiple choice questions

37. Did you get training regarding solid waste handling/management? 1. Yes 2. No
38. Do you segregate solid wastes in two unions as decomposable and non-decomposable?
1. Yes 2. No
39. What are the favorite methods of training to increase your understanding?
1. Brochures distributed to residents
2. Door to door education
3. Exhibitions presenting good practices in solid waste sorting, reusing and composting
40. Monthly Payment for waste disposal is: 1. Fair 2. Not fair
41. Is the container(temporary collection place) available near to your home? 1.Yes 2. No
42. If your answer is yes how far is the estimated distance between the collection point and your house? 1. Less than 0.5 km 2. 0.5km - 0.9km 3. 1km -1.4km 4. 1.5 km and above
43. Who has the greatest role in the household solid waste management in your woreda?
1. Cleansing management office 2. SMEs solid waste collectors
3. The household heads 4. All of the above bodies are responsible

44. Which collection method is adopted to collect the solid wastes accumulated at the households?

1. Door to door collection 2. Communal method 3. Wheel barrow system 4. Others

45. Can you roughly identify physical composition of your generated wastes in percentages?

1. Kitchen waste _____ % 2. Paper _____ %
3. Plastic _____ % 4. Others _____ %

46. What type of solid waste storage material do you mainly use in your house?

1. Sack (medaberya) 2. Basket
3. Metal container 4. Plastic container
5. Private pit 6. If others _____

47. For how long do you store solid wastes in your house?

1. One day 2. Two days 3. Three days 4. a week 5. More than a week

48. Which reason is the most important for the poor Solid Waste Management practice?

1. Due to the agencies stagnant service provision
2. Due to the societies unchanged behavioral (attitudinal) problems
3. Due to lack of proper resources (trained human and financial capital)

49. Which method of solution is important to improve the management practice of solid wastes generated in your home?

1. Through creating awareness and support by the cleansing management office
2. Through recycling and composting of degradable solid wastes
3. Through using reusable materials and stopping using of the disposable one

50. Do you know or aware regarding the existence and endorsement of the national solid waste management policy? 1. Yes 2. No

51. What basic factors that affect the practice of the household solid waste segregation?

51. What solutions do you recommend to improve the current solid waste management system?

Thank You in Advance!



**COLLEGE OF DEVELOPMENT STUDIES
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Questions for Semi-structured Interview with cleansing management office experts

The main objective of this interview is to gather your opinion regarding the **Household solid waste management practices in Lideta Sub-city (with in particular reference of woreda 5 and 7)**. The data and opinion gathered will be used for partial fulfillment of the requirement for master's degree in Addis Ababa University, college of development studies center for environment and sustainable development. Your faithful and quick response will make the research fruitful. The information you provide will be kept confidential. Thank you in advance for your collaboration.

Sex: ----- Position and responsibility: -----

1. How the solid waste management is practiced at the household level in lideta sub city /your woreda?
2. What is the solid waste collection and management practices of cooperative partnership association? Do regularly collect and transport solid wastes from the households?
3. What technical support does the cleansing management office in households solid waste sorting and disposal practices?
4. Which types of solid waste management system and/or strategies are effectively used to manage the household solid wastes?
5. Does the sub-city/woreda conducted any kind of awareness creating programs about solid waste management practices? And what are its outcomes?
6. How does the sub-city or woreda work integratively with households/residents to bring clean environment and avoid spread of disease? In what way?
7. Is the existing solid waste management practice of the sub-city /woreda satisfactory?
8. What are the main factors affecting (challenges) associated with in the household solid waste segregation practice in the sub city?
9. What do you think are the solutions to improve the current solid waste management system?

Thank You in Advance!



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Questions for Semi-structured Interview with SMEs cooperative partnership Association

The main objective of this interview is to gather your opinion regarding the **Household solid waste management practices in Lideta Sub-city (with in particular reference of woreda 5 and 7)**. The data and opinion gathered will be used for partial fulfillment of the requirement for master's degree in Addis Ababa University, college of development studies center for environment and sustainable development. Your faithful and quick response will make the research fruitful. The information you provide will be kept confidential. Thank you in advance for your collaboration.

Sex:----- Position and responsibility:-----

1. How do you describe the households' solid waste management practice in Lideta sub-city?
2. Have you ever attended training or any kind of awareness creating programs about solid waste management?
3. How and when often do you collect solid waste? And what are the major problems your member small and micro enterprises association can face when they collect solid waste door to door and what do think is the solution?
4. Do you think residents of the woredas you work have clear and adequate awareness about solid waste management systems/strategies?
5. How do you describe the solid waste sorting culture of the community?
6. What are the physical components/types of solid waste being generated from households?
7. Do you think the controlling mechanism of cleansing management office of the sub city and the woredas is effective? If your answer is no what do you think the reasons?
8. What are the basic factors that affect the practice of the household solid waste segregation?
9. What do you think should be done/solutions to improve the situation of sub city solid waste management practice in general?

Thank You in Advance!

APPENDIX II

Correlation between independent variables (Multi-collinearity test)

. correl
(obs=380)

	sex	Age	marital_status	House_ownership	Level_of_education	household_size	job_type	monthly_income	training_years	Monthly_payment	Estimated_monthly_payment
sex	1.0000										
Age	0.3531	1.0000									
marital_status	0.2259	0.1826	1.0000								
House_ownership	-0.1890	-0.3248	-0.2748	1.0000							
Level_of_education	-0.1968	-0.1935	0.0627	-0.3791	1.0000						
household_size	0.2322	0.0456	0.1297	0.0774	-0.0294	1.0000					
job_type	0.0514	0.4062	0.1110	-0.4506	-0.0298	-0.0688	1.0000				
monthly_income	-0.0438	-0.1943	0.0751	-0.2860	0.6097	0.1224	0.1132	1.0000			
training_years	-0.0636	-0.1268	0.0159	-0.1008	0.4282	-0.0488	0.0258	0.4603	1.0000		
Monthly_payment	0.1525	0.1086	0.1839	-0.0657	-0.0328	-0.0379	0.1682	-0.0085	0.2489	1.0000	
Estimated_monthly_payment	-0.2055	0.0415	-0.2241	0.1859	-0.2273	-0.0428	-0.2778	-0.3108	-0.4414	-0.3988	1.0000

APPENDIX III

Sample Photos during Observation



Solid waste properly sorted and stored as degradable and non-degradable by households



Solid wastes not properly separated and stored as degradable and non-degradable



Degradable Solid wastes used as compost for home garden/greenery



Solid wastes/unused materials reused to grow home garden or vegetables



Illegal waste disposal observed on the road side



Illegal waste dumping in the river



Road side illegal solid waste disposal



Temporary Solid waste storage collection area/station