Addis Ababa University

College of Business and Economics

Department of Public Administration and Development Management

Assessment of Solid Waste Management Strategies: In Addis Ababa City Administration

By

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A Thesis Submitted to the Department of Public Administration and Development Management of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Masters in Development Management

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This is to certify that the thesis prepared by **Workneh Adem Ahmed** entitled "**Assessment of solid waste management strategy in Addis Ababa City Administration** which is submitted in partial fulfillment of the requirements for the Degree of Masters in Development Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university and that all sources of materials used for the thesis have been duly acknowledged.

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List of Acronyms

SW: Solid Waste

SWM: Solid Waste Management

MSW: Municipal Solid Waste

MSWM: Municipal Solid Waste Management

USEPA: United States Environmental Protection Agency

SPSS: Statistical Package for Social Sciences

HHs: House Holds

MSEs: Micro and Small Enterprises

NGO: Non-Governmental Organizations

ISWM: Integrated Solid Waste Management

UNEP: United Nations Environmental Program

USAID: The United States Agency for International Development

Abstract

Solid waste, which is a result of day-to-day activities of human kind, needs to be managed in a proper manner. Addis Ababa city, faces serious problems associated with poorly solid waste management system. The study identified that the existing solid waste management problems are pronounced due to: no enough system is introduced for sorting wastes, shortage of community bins (shared containers) for collecting household wastes, piles of solid wastes are often found everywhere (along roadsides, underneath bridges, in drainage channels and in other open spaces), weak implementation of government policy, laws, regulations and legislations, the general public has not been motivated to participate actively in solid waste management system, there are low formal and informal as well as private sectors involved in the operation, insufficient financial resources or inappropriate allocation of available resources. This research project aimed at assessing of solid waste management strategy in Addis Ababa city. The study used descriptive design, both quantitative and qualitative data collection method for primary and secondary sources. Most of quantitative information collected through secondary sources and qualitative data were collected from observations and interviews. The findings of this study would be valuable to Ethiopian local governments, particularly City government of Addis Ababa solid waste management agency, in understanding the dynamics of waste management strategy. This study answered how the city government minimize challenges for current solid waste management system in Addis Ababa city, assess solid waste disposal methods and awareness creation about solid waste management to the community in City government of Addis Ababa solid waste management agency. The scope of the study was limited on the assessment of solid waste management Strategies that include solid waste handling, collection, transportation, and disposal system within the boundary of Addis Ababa city by taking all (eleven) sub cities. Finally, the study would address some important recommendations towards implementing the developed strategies to mitigate the existing solid waste management problems.

Key word: *waste, solid waste, solid waste management solid waste management strategy.*

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The term "solid waste" refers to the common goods that are used and thrown away as garbage in underdeveloped countries (David VE, John Y, Hussain S (, 2020)

In Ethiopia, we define solid waste as things that are utilized and discarded by people, families, hotels, small enterprises, and institutions. Waste (paper, packaging, plastic bottles, furniture), food scraps, textiles, manure, batteries, appliances, and paints are a few of them. The amount and complexity of garbage produced has increased, particularly in developing nations, as a result of economic expansion, urbanization, and population growth (Mesfin A, Muktar M, 2017).

In the cities of many developing nations, solid waste management poses serious environmental and public health risks (Guerrero, L. and Hogland, W, 2013)

The public's attitude towards appropriate frameworks for collecting and sorting is poor; as a result, environmental and health-related issues are getting worse in urban areas of developing countries (Vaibhav, S., Rajeev, P. & Pooja, S., 2014)

Collection of waste is only one aspect of waste management. It entails the gathering, moving, processing, recycling, dumping, and supervision of waste products. Numerous elements need to be taken into account, including environmental, economic, technical, legal, institutional, and political concerns (Beliën, J., Boeck, L., & Ackere, J., 2011)

One of the fundamental services that is getting a lot of attention in many Ethiopian communities is Municipal Solid Waste Management (MSWM). This is mostly due to the fact that SWs produced in the majority of Ethiopian towns are not treated and controlled properly (Solomon, 2011).

The complete solid waste management system consists of the following components: waste generation, segregation, storage, collection, transport, disposal, processing, and recovery (Amoah

ST, Kosoe EA, 2014).

1.2. Statement of the problem

In Ethiopian cities, the local government is in charge of handling solid waste, yet this area has received mediocre care due to insufficient technology, human capital, institutional setup, and financial constraints. (Gilbert, 2013)

According to (Vaibhav, S., Rajeev, P. & Pooja, S. 2014), the situation has gotten worse due to a lack of infrastructure for solid waste collection, transportation, treatment, and disposal, improper solid waste management planning, insufficient financial resources, a lack of technical experts, and public attitudes. These factors are causing an increase in a number of environmental and health issues.

The city government lacks a well-organized and accountable solid waste management organization, a sufficient budget, low household incomes, and a negative attitude towards solid waste personnel, according to (Koyachew, 2016).

The fundamental problem with solid waste management is a lack of appreciation for the importance of environmental and waste management competence (Cheru, 2016).

In terms of solid waste management in general and garbage handling in particular, micro and small businesses were in the early stages (they lacked the essential trash collecting facilities to finish their work (Abraham, 2018).

The reuse, recycling, segregation, and resource recovery aspects of the solid waste reduction plan are challenging (Abraham, 2018).

It has been determined that the adoption of efficient waste management techniques is crucial for economic development, particularly in low-income nations. (Scheinberg, 2010)

The city of Addis Ababa is known for its extremely quick urbanization and population growth, which has contributed to an increase in the rate at which solid waste is created in the city. In addition, the quantity and nature of solid waste generated nowadays are occasionally changing.

A lack of adequate infrastructure, a shortage of skilled labor, financial constraints and a lack of institutional arrangements have all contributed to poorly organized and implemented solid waste management strategies in Addis Ababa city.

The purpose of this study is to assess the solid waste management strategy of Addis Ababa city, formulated by City Government of Addis Ababa solid waste Management Agency.

1.3 Definitions of terms

Composting: -When compared to alternative procedures, composting is said to be more economically feasible and successful at reducing the amount of waste that needs to be dumped in landfills (Barr, 2004).

Household solid waste: - consists mostly of plastics, paper, glass, metals, organic materials, wood, and other materials and is classified as a type of municipal solid waste (MSW). These wastes need to be treated correctly in order to preserve environmental quality, human health, and the sustainability of natural resources (Oteng, 2010).

Incineration: - The process of burning burnable trash in an incinerator to reduce waste volume and occasionally turn it into ash (UNCHS, 1995).

Municipal Solid Waste (MSW): - These wastes can be produced by routine activity in homes, workplaces, hotels, schools, and other institutions. Municipal solid wastes are defined as wastes that are gathered and handled by municipalities. Agricultural, commercial, construction, and office supplies are among the many undesirable and pointless things that make up a large portion of these wastes (Charlotte, 2009). Other components include leaves, food waste, and supplies used in agriculture, business, and building.

Open dump: - Wastes have been disposed of in an uncontrolled region in an environmentally harmful manner (Haile, 2005).

Recycling:- is an activity that involves gathering, sorting, and turning used or discarded materials into useable goods to its original form or for other reasons (Agency, 1998).

Solid waste: - Refuse, often known as worthless, undesired, or abandoned commodities, includes

things like garbage, junk, and trash. It is a waste that is either solid or semi-solid and is neither an emission into the atmosphere nor a water waste (Rush, 1999).

Solid Waste Management: - refers to the procedures carried out in urban environments for the collection, transportation, treatment, reuse, recycling, and disposal of solid waste (Atsbaha, 2003).

Waste - is trash or junk that has been discarded because it is worth less. It can be described in terms of the source of generation it had during the development process. Therefore, we can categorize wastes based on their form, such as organic and inorganic, liquid, solid, and gaseous, as well as their potential to harm living things and their environment (Nigussie, 2001). We can also categorize wastes based on their source, such as commercial, industrial, household, and institutional, as well as based on their form, organic and inorganic, liquid, solid, and gaseous.

1.4 Research objectives

1.4.1 General objectives

The general objective of the study would to assessing the management strategy of solid waste in Addis Ababa city.

1.4.2 Specific objectives

The specific objectives of the study include the following: -

1, To minimize challenges of solid waste management strategy of city government.

2. To describe solid waste disposal methods.

3, To assess the practice of awareness creation to the community

1.5 Research question

This section includes questions that will help the researcher focus on the study's goals. As a result, in order to answer the research problem, the study will direct by the research questions below.

1, how to minimize challenges of solid waste management strategy in Addis Ababa city?

2, what are the solid waste disposal methods of Addis Ababa city government of solid waste management agency?

3, how solid waste management agency create awareness to community about solid waste management?

1.6 Significance of the study

The findings of this study would be valuable to Ethiopian local governments, particularly City government of Addis Ababa cleaning management agency, in understanding the dynamics of waste management strategy. More critical data will be providing to policymakers in order to improve waste management plans. Organizations will benefit most from the findings since they will help them identify solid waste management issues.

Academicians will benefit from more information in this important field of waste management, it is worth noting.

1.7 Scope and Limitation of the study

The scope of the study was limited on the assessment of solid waste management Strategies that include solid waste handling, collection, transportation, and disposal system. In doing so, spatially it is confounded within the boundary of Addis Ababa city by taking all (eleven) sub cities. Further, the thematic scope includes the discussion about households and their characteristics with the solid waste management strategy. Other categories are left out from the scope of this paper due to time and resource limitations.

The research is conducted by certain limitation Some of limitations of this study are lack of secondary data, lack of time, financial shortage during data collection and respondents' refusal to provide detailed information. But the researcher will try to minimize these problems and come up with reasonable findings.

1.8 Organization of the Study

The thesis includes four chapters. The first chapter consists of the information about the introductory part which includes background to the study; statement of the problems, objectives of the study, research questions, the significance of the study, limitation & delimitation of the study, and organization of the thesis. The literature review is incorporated in the second chapter. It is concerned with the review of different researchers and related literature about the performance of SWM. The third chapter was contained the methodology part which describes research design, selection of participants and instrumentation, and methods of data collection & data analysis. The fourth chapter consists of the finding and discussion parts of the thesis and The final chapter (chapter five) of the study deals with the summary of major findings, conclusion and the Recommendation parts.

CHAPTER TWO

REVIEW OF LITERATURE

2.1 Introduction on the literature review

This chapter includes an overview of the literature on waste management strategies and their effectiveness.

The study's foundation is waste management in underdeveloped countries. The research examines the literature on waste management in third-world cities, as well as the generation of waste. traditional waste management, wastes and their impact on environmental health technologies, their flaws, and the need for an integrated waste management system model of approach in addition, the chapter discusses waste management solutions such as waste management, trash disposal methods, incineration, landfill, recycling, and open landfill dumps, public awareness, government policy, and privatization are all issues that need to be addressed.

2.2 Solid waste management strategies

The work of managing solid waste involves many different factors, including technological, political, institutional, social, and financial ones (UNDP, 2004)

(Federal Democratic Republic of Ethiopia (FDRE) “Solid Waste Management Proclamation, 2007) on Solid Waste Management states that "Solid Waste Management" refers to the collection, transportation, storage, recycling, and disposal of solid waste, as well as the subsequent use of a defunct disposal site.

Household garbage, nonhazardous waste from commercial spaces, institution wastes, waste from industries, market wastes and waste from street sweeping are all included in municipal solid waste management, which also includes generation, collection, storage and transportation.

2.2.1 On site handling, storage and processing

When we refer to managing solid waste on-site, we mean managing it up until it is disposed of in the storage bins that will keep it till pickup. Transporting loaded containers to the collection point and returning empty containers to the location where they are stored in between collections may also need handling, depending on

the type of collection service (Wilson, D.C. 2007).

2.2.2 Collection and transport

The collection of municipal solid trash can be done in two ways. Door-to-door collection is the first method, and citywide communal collection using containers is the second. Door-to-door collection is more common than communal collection in Prishtina when compared to other regions (Mbeturinave, 2009).
In Prishtina, rubbish collection takes place primarily overnight, from midnight to six in the morning, while door-to-door services can be provided at other times with advance notice (vitin, 2013). With the help of this arrangement, it will be possible to standardize the collection schedule and avoid collecting extra trash in some locations.

2.2.3 Transfer system

The issue with solid waste transportation arises from the low frequency of transportation, the length of the route for moving garbage, the inadequate capacity of the transport vehicle, and the amount of time required for solid waste transportation. The quantity of waste carried and the caliber of waste services are impacted by this. (sanitasi.net, 2019)

2.2.4 Treatment

Treatment is the process of modifying the material to extract useable resources. Increasing the effectiveness of solid waste management systems, recovering conversion products, and recovering energy are all goals. (1) Mechanical processing techniques are employed. reduction in volume (compaction), chemical volume reduction (incineration), and third Mechanical size reduction (shredding) (4) Manual and automatic component separation
mechanical), (5) drying and dewatering (reduction of moisture content). These are the Since the turn of the century, the first two have been utilized for the processing of solid waste (Heidenstam, 1977)

2,2,4.1 Source reduction and reuse

Source reduction is a strategy that modifies the production, acquisition, and usage of goods to produce less solid waste. MSW source reduction strategies include things like: (a) product packaging and design that makes it simple to using pre-existing packing materials rather than creating new ones; (b) reusing; and (c) extending the product's useful life to reduce the need for replacements, (d) creating disposal alternatives, such as composting of food and lawn wastes, other biodegradable market or farm trash; (e) removing pointless avoiding waste products when reusable alternatives are available (like packaging and (f) batteries and razors). Reusable beverage packaging has had success with reuse use glass bottles and cans rather than single-use plastic (JunD.,Henry R. and Yongsheng Z., 2006)

2.2.4.2 Recycling

In developing countries, it is acknowledged that (85%) the recovery of materials such as iron, steel, copper, lead, paper plastic and glass will decrease the investment in importing these materials and save energy (Tegegn, 2008).

The Chart below indicates that properly managed solid waste is not a health hazard but a real asset. It also earning a lot of foreign currency. (Addis Ababa cleaning management agency,2023)

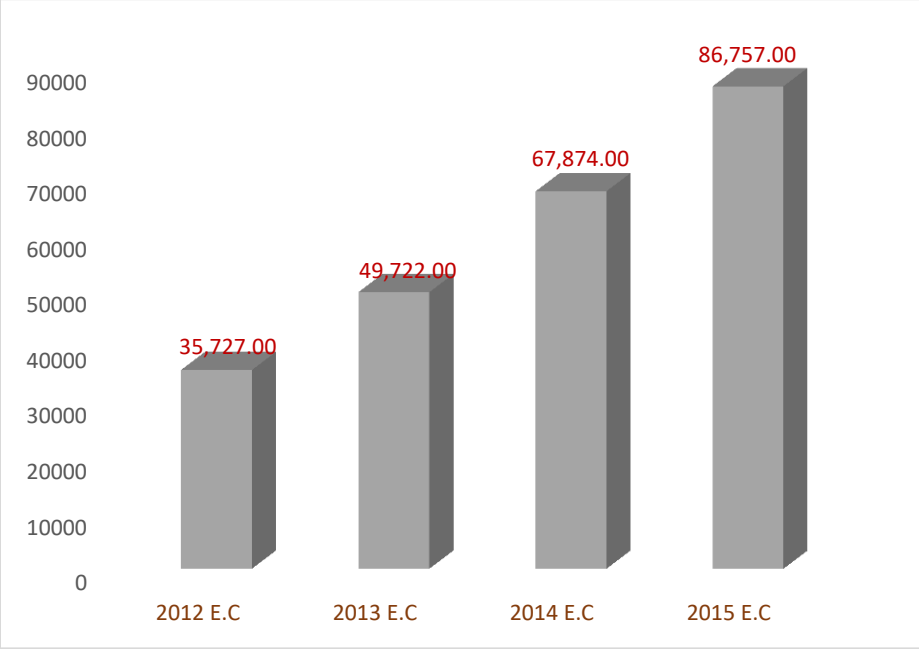

Figure 1 Solid waste for reuse and recycling ton/year from 2012E.C to 2015E.C

Source: Addis Ababa cleaning management agency, (AACMA, 2023)

2.2.4.3 Composting

Composting is a common practice in Western countries, but is less common in Chongqing, one of China's four largest municipalities, for a number of reasons, including the low source separation application rate, the low acceptance of compost by farmers, the limited utility of compost in comparison to chemical fertilizers, and the strict regulations, monitoring, and product quality standards. (Zhuang. S, 2008).

However, the quality of the product depends on a number of factors, including the design of the composting facility, the kind and proportions of feedstock used, the composting process, and the maturation period. One of the most popular uses for the compost created by processing MSW is as a soil conditioner or fertilizer. (Joardar, 2000)

2.2.5 Solid waste disposal

The establishment of the disposal sites takes place without a thorough analysis or consideration of the impact. Without any type of segmentation, residential waste is thrown mixed with other trash. The municipal solid wastes are also used to dispose of some hazardous pollutants (Desta H, Worku H, Fetene A , 2014).

In order to simply get rid of the waste under any circumstances, homeowners and towns burn their rubbish in the open. A waste management technique called incineration is utilized to produce energy and lighten the weight of waste in a tightly controlled environment (Yebalework, 2014)

2.2.5.1 Incineration

In the hierarchy of waste management, waste incineration—rather than landfill disposal—is used more frequently in European and American nations (72.8%). (Kassa, 2009).

Through incineration, the amount of garbage that is dumped in landfills is considerably decreased (by 76–79%), and the heat produced during combustion can be used to create energy (Mugambwa, 2009).

2.2.5.2 Landfilling

The most popular method of solid waste treatment and disposal in developing cities is land filling. It is relatively economical and causes the least amount of road damage when compared to other methods of getting rid of solid trash (Yongsheng, 2014).

Land filling is a recommended and frequently used practice in many countries around the world as a result of these characteristics. This method of garbage disposal, which is common, entails burying isolated produced wastes beneath the ground. (Coad, 2005).

2.2.6 Stockholder participation, public education and awareness

Public knowledge of trash and its management, or education of the public, is essential to bolster the management system (Authority, 2010).

Attitudes can be favorably altered by taking steps to increase awareness of the significance of effective disposal and the negative impacts of insufficient garbage collection on public health and the environment (Consultan, 2010).

The majority of scholars concur that cooperation or a partnership between the community and the organization is crucial to the effectiveness of participation (Oteng, 2010).

Politicians and local authorities may actively promote community partnerships now that they have acquired their cooperation (Nathan, C. and Pragasen, P, 2012).

Working collaboratively to resolve a complex problem by examining possibilities, gathering information, and learning about potential solutions requires the use of collaborative and social learning methodologies (Masood, M. and Barlow, C., 2014).

The effectiveness of awareness campaigns would undoubtedly increase if they were able to fully utilize a community's resources, including its social customs (organizing meetings, considering local behavior for clean-up initiatives), as well as the benefits of the grassroots level of action (Khan, 2011).

The emphasis on civic duty and participation in preserving health and hygiene may raise awareness among the populace. A local government must guarantee that the community will receive clear explanations. This needs to make the community aware of their responsibilities and roles clearly so that they can work together to address the issue of waste management and make the public aware of the services provided by the local government that are limited (Ahsan A., Alamgir M., El-Sergany M., Shams S., Rowshon M. and Nikdaud N., 2014).

2.3 Source and type of solid waste

According to their origins (where they come from), solid wastes are often categorized. In accordance with this benchmark, it can be divided into residential or household, commercial, institutional, industrial, municipal services, building and demolition, and agricultural wastes (Hoornweg, D. & Bhada-Tata, P, 2012).

Source	Typical waste generators	Types of solid wastes
Residential	Single and multifamily dwellings	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g. bulky items, consumer electronics, white goods, batteries, oil, tires), and household hazardous wastes.
Industrial	Light and heavy manufacturing, fabrication, construction sites, power and chemical plant	Housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes
Commercial	Stores, hotels, restaurants, markets, office buildings, etc.	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes
Institutional	Schools, hospitals, prisons, government centers	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes
Construction & demolition	New construction sites, road repair, renovation sites, demolition of buildings	Wood, steel, concrete, dirt, etc.
Municipal service	Street cleaning, landscaping, parks, beaches, other recreational areas, water and wastewater treatment plants	Street sweepings, landscape and tree trimmings, general wastes from parks, beaches, and other recreational area, sludge
Process	Heavy and light manufacturing, refineries, chemical plants, power plants, mineral extraction and processing	Industrial process wastes, scrap materials, off specification products, slag, tailings
Agriculture	Crops, orchards, vineyards, dairies, feedlots, farms	Spoiled food wastes, agricultural wastes, hazardous wastes (e.g.pesticides)

Table 1 Source and type of solid waste.

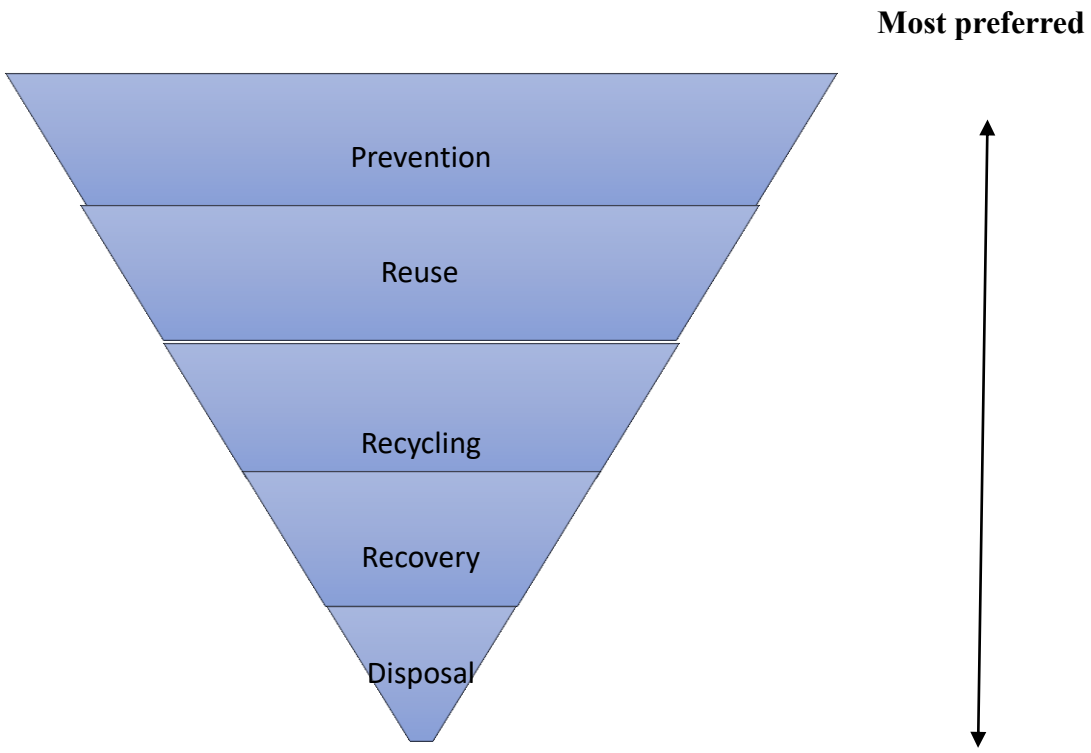

Figure 2 waste management hierarchy, source (UNEP, 2011)

The highest and most preferred rank of this integrated management hierarchy is waste prevention or waste minimization at source, which aims at reducing the amount of the waste produced. It is the most effective way to reduce the quantity of disposable waste, the cost associated with its handling and its adverse environmental impacts. Reuse, recycling and energy recovery technologies then come as moderately suitable technologies. Land filling (waste disposal) is the last option of the hierarchy that involves controlled interment of the residual waste which has no further use. This is the most common practice in many countries.

- Prevention: Under this hierarchy, no alternative strategies were identified.
- Reuse: Under this hierarchy, recognize the formal/informal sector as a vital partner one of the identified alternative strategies.
- Recycling: In this hierarchy, set up a Public-Private Partnership and recognize the formal/informal sectors as a vital partner are the identified alternative strategies.

- Recovery: In this hierarchy, promote incineration (burning) and resource recovery processes of generated wastes is an identified alternative strategy.
- Disposal: In the disposal hierarchy which is the least favored options, set up a Public-Private Partnership and outsourcing SWM to private organizations are identified alternative strategies.

Summary

The literature review basically assesses waste management strategies in Addis Ababa cities and the need for an integrated waste management approach model. The literature further shows the need of effective waste management strategies.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The chapter presents a description of the methods the researcher employed to enable investigation of the problem of study. It discusses the research design, selection of participants and instrumentation.

3.2 Research design

Descriptive type of research method used to assess municipal solid waste management strategy in the study area. Descriptive approach applied because it enables to describe the existing situations of the solid waste and the management strategy as it exists broadly Municipal solid waste management.

3.3 Selection of participants

The selection of this research will consider the solid waste management group leaders of city government of Addis Ababa solid waste management agency.

3.4 Instrumentation

3.4.1 Interview

The researcher would conduct structured interviews with the solid waste collection and disposal department head and staff of the Addis Abeba city government's solid waste management agency in order to enhance the data obtained. This interview's goal is to gather ideas that the primary and secondary data won't be able to cover.

3.4.2 Observation

A field trip to specific locations of the city will be conducted in addition to personal life experiences. The main areas of focus will be the following: 1) the reppi solid waste disposal site in the sub city of Kolfe Keranio; 2) the road sides and ditches of the sample sub cities. The observation and experience you gain from merely being a community member will be used to evaluate the goals and research topics.

3.4.3 Focus group discussion

To gain qualitative data, the researcher compiled details on the extent of community involvement and the effects of poor solid waste management. pick three solid waste management experts from

solid waste collection and transportation department of solid waste management agency.

3.4.5 Reliability

Reliability reduce shortcoming and ensure effectiveness of the solid waste management agency report; conduct on different published and un published document of similar characteristics.

3.4.6 Validity

Validation of data will do by using content validity represent particular instrument for a specific domain of indicators.

3.5 Data collection

Both primary and secondary data sources would be used in this investigation. field measurements, and observations would be used to collect primary data. On the other hand, secondary data would come from a variety of places, such as reports from administrative offices, the internet, libraries, and published and unpublished materials.

3.6 Data analysis

In this section, information acquired from the Addis Abeba city government's cleaning management agency office, and field observations were presented, analyzed, and interpreted. The data would be analyzed using both qualitative and quantitative techniques. For interviews, quantitative methods would be used instead of qualitative ones. Percentages, tabular analysis, and frequency distribution are examples of quantitative approaches. Cause and effect linkages, inductive reasoning, and deduction were all qualitative strategies.
With the aid of SPSS computer software, data analyses utilizing quantitative methods, i.e., tables, have been commonly employed to portray the obtained data.

CHAPTER FOUR

RESULTS AND DISCUTIONS

Under this chapter the data gathered from the study Primary and secondary data, structured interview from the key informants of Addis Ababa solid waste management agency staff and data obtained by the researcher observation were analyzed and interpreted

4. Existing solid waste management Strategies in Addis Ababa

Ethiopia has experienced rapid urbanization and increasing urban population in the last few years due to more rural-urban migration and rising per capita incomes (FDRE PCC (Federal Democratic Republic of Ethiopia Population Census Commission), 2008). Presumably, increased demand for infrastructure and public services accompanies this growth, but this has not been the case. Many city/towns in Ethiopia lack the financial resources and institutional capacity to provide the most basic municipal infrastructures and services, including solid waste management.

The solid waste management strategies of Addis Ababa city include increasing community awareness about solid waste management, recycling solid waste, reducing the amount of waste disposed of by using solid waste for power generation and streamlining solid waste service.

4.1 Minimize challenges of solid waste management strategy in Addis Ababa city

According to Addis Ababa Cleaning Management Agency Report (July,2022), There were several factors that affect solid waste management strategies in Addis Ababa city which includes

No scientific waste collection mechanism available, solid waste is either thrown on the streets or burnt in open/for cooking, Drains are clogged with solid waste, Lack of efficient collection mechanism still drives a behavioral tendency to dump garbage at any place, There is no awareness among the residents about the ill-effects of burning dry waste, Awareness (Training of waste unit employees and collection staff, Door-to-door awareness to all the residents, Awareness

sessions in schools), Infrastructure(Setting up composting infrastructure, Setting up solid waste center, Supply of recyclables to recycling units)

No	Sub city	Transported solid waste by ton
1	Nifas Silk	70,543.86
2	Bole sub city	69,387.82
3	Lemi Kura	67,677.39
4	Kolfe keranio	62,684.08
5	Yeka	49,112.82
6	Akaki	46,889.90
7	Addis Ketema	46,231.04
8	Gulele	36,386.64
9	Kirkos	26,303.16
10	Arada	26,034.12
11	Ldeta	25,773.32

Table 2, Nine Month, Solid waste transported from each sub city by ton (AASWMA,2024)

The data refers to the total amount of solid waste that transported to disposed area from each sub city of Addis Ababa, the table shows that amount of solid waste was collected from Nifas silk, Bole, Lemi Kura, Kolfe Keranio, Yeka, Akaki, Addis Ketema, Gulele, Kirkos, Arada and Ldeta sub cities respectively from high to low amount of solid waste.

No	Transportation sectors	Frequency in Number	Solid waste transported in ton
1	Government car	62,718	242,344.38
2	Out sourced car	17,740	194,647.11
3	Private company car	17,102	104,299.28
4	Private company car for associations	7,651	90,032.66
	Total	105,211	631,323.43

Table 3, Nine Month solid waste transported by ton and frequency of transportation (AASWMA,2024)

Transportation of solid waste is carried out by out sourced, City Administration and private sector vehicles. The existing reality in Addis Ababa where solid waste transporting tracks are not available to the level demanded and even some of the available trucks don't all fully perform.

The finding shows that there is a high frequency of transportation to deliver solid waste to the disposing area. The average transportation of solid waste is **6 ton/trips**, private company car for associations would have relatively high transportation it was 11.77/trip, solid waste transported by outsourced vehicles was 11 ton/trip, the private company vehicles could deliver 6.1ton/trip, the city administration vehicles delivered 3.9 ton/trip, It provided an indication that the important indicators for effective solid waste transportation (vehicles) are the main deficiency to transport waste in their respective companies. This finding which states the lack of adequate vehicles were the hindering factors to transport solid waste. Hence, current solid waste transportation is less effective.

Figure 3solid waste chat sticks ,leaves, broken plastic and festal.

Source field photograph by the author, 2024

The above figures depicts that there is lack of waste management strategy placed in the study area thus improper disposal is the major characteristics on the municipality.

Figure 4 solid waste transportation by small vehicle and by push cart

Source, field photography by the author,2024

Waste from households is collected and carried to a collection point (Skip Points) by MSEs. The city directly carries it to the disposal site from there. MSEs use push carts or small trucks. The city and private companies use cars specialized for bulk garbage transport such as compactors and container vehicles.

According to the information obtained from the Addis Ababa city observation, there is a good start to involve the private sectors especially MSEs in the collection of MSWs from each HHs and other institutions to a common transfer station and the vehicle of the municipality transported it to the disposal site. local authority of Addis Ababa city has to provide service through training and hiring of qualified personals to improve the management of MSW and disposal.

Figure 5 solid waste thrown in drain, source (SWMAAC), face book page.

Among the factors that are having a negative impact on environmental pollution and floods are various plastic materials that throw randomly and carelessly, along the roads, near drainage lines and bridges.

In particular, plastic containers and containers for bottled water are non-perishable and last for a long time.

Drainage lines get blocked and rainwater flows into the road causing damage and spoiling the appearance of our city, and they cause damage to the noble human body and life.

Therefore, by disposing of solid wastes like plastic materials responsibly and properly after using them; Let's protect our environment from pollution, our life and property from flood risk!

Recycling

In General, in 2016 E.C the recycling sector were used 67,510-ton solid waste for recycling in 9 months.

No	Sub city	recycled solid waste in ton
1	Nifas Silk	5,391
2	Bole sub city	7,093
3	Lemi Kura	4,125
4	Kolfe keranio	4,621
5	Yeka	6,361
6	Akaki	9,079
7	Addis Ketema	11,840
8	Gulele	4,358
9	Kirkos	5,975
10	Arada	3,619
11	Ldeta	5,048
	Total	67,510

Table 4 solid wastes used for recycling in each sub cities (AASWMA,2024)

No	Solid waste type	Recycled in ton	Recycled in percentage
1	Plastics	27,077	40.11%
2	Papers	18,578	27.52%
3	Jerican	11,342	16.80%
4	Metals	9,862	14.61%
5	Bottles	651	0.96%
	Total	67,510	100%

Table 5, Nine Month recycled solid waste by type (AASWMA,2024)

As the data' stated that there is practice of waste recycle in Addis Ababa (all sub cities) like plastic (40.11%), paper waste (27.52%). Jerican waste (16.80%), metals waste (14,61%) and bottles waste (0.96%) This is because each type can be recycled to other short- and long-lasting useful materials.

Figure 6 different type of solid waste collected by korallew and liwach

Source, field photo graph by the author,2024.

The above figure 6, shows that the task of "Korallew" and "Liwach" is inevitable and exemplary. There is a practice of segregating recyclable wastes as per their category and flexibility for further reuse and enhance recycling efforts very well.

No	Sub city	Income generated in birr	Income generated in %
1	Nifas Silk	97,520,442	8.75%
2	Bole sub city	122,289,948	10.97%
3	Lemi Kura	91,491,483	8.21%
4	Kolfe keranio	113,280,352	10.16%
5	Yeka	109,195,332	9.80%
6	Akaki	136,596,904.4	12.25%
7	Addis Ketema	144,629,140	12.97%
8	Gulele	72,686,903	6.52%
9	Kirkos	94,985,820	8.52%
10	Arada	48,602,141	4.36%
11	Ldeta	83,661,088	7.50%
	Total	1,114,939,533	100%

Table 6 Income generated from recycled solid waste of the sub cities within nine months (AASWMA,2024)

In Addis Ababa city It could generate a total of 1,114,939,533 birr from recycled solid wastes within 9 months. Addis Ketema, Akaki, Bole, kolfe keranio, Yeka, Nifas silk, Kirkos, Lemi Kura, Lideta, Gulele and Arada sub cities were ranked from high to low income generated performance respectively.

From individual interview about the recycling of solid waste Ms. Bayush Tadese Directorate Director at solid waste management agency of Addis Ababa city (may, 2024) explained that in the last 9 months, job opportunities were created for 818 unemployed citizens: 2,955 tons of compost were produced and sold by the associations: 67,510 tons of solid waste were recycled and the associations engaged in the sector earned more than 1.1 billion birrs.

4.2 solid waste disposal methods of Addis Ababa city government of solid waste management agency

Waste disposal is one of the most important management activities which need to be carefully planned. With regard to waste disposal, the study identified that almost all solid waste generated in households is disposed together i.e. there is no sorting habit of organic wastes from others at the household level. Therefore, disposing of household wastes into a river system, drainage system and any open place is a common practice and the result is threatening both surface water

and ground water and causing flooding which provides a breeding ground for disease carrying pests and create problems to human health and the surrounding environment due to mismanagement.

In Addis Ababa, 85 percent of the city's collected garbage is disposed of at the Koshe landfill and the rest at the neighboring waste-to-energy facility, Reppie. The Reppi waste incineration plant, the first project of its kind in Africa, was built in 2018 near the dump site.

Mr. Balay Alemayehu, who is an expert in the Directorate of Recycling Centers of the Addis Ababa Sanitation Management Agency and mentioned that 60 percent of the solid waste generated in the city is compostable waste. There are 50 compost unions in the city. He explained that in the half year of 2016, 1733 tons of compost was produced and 12 million 131 thousand birr was earned. He explained that although this is encouraging, it is not enough in terms of the rotting solid waste generated from the city

4.3 Create awareness to community about solid waste management

Solid waste management awareness refers to **the level of knowledge and understanding that individuals have about the practices and methods involved in managing solid waste**. It includes being aware of the importance of waste reduction, segregation, recycling, and proper disposal methods.

No	Sub city	Awareness to households on the use of solid waste management	Making households separate solid waste from the source according to the standards	Making households to produce house to house humor	Awareness messages transmitted through various media	Provide awareness training on the integrated solid waste management system for various entities with in the capacity of sub city
1	Arada	26,800	10,016	1,426	36	912
2	Gulele	33,109	11,689	1,843	36	2,380
3	Addis Ketema	80,064	28,685	4,821	36	2,379
4	Nifas Silk	72,112	26,146	4,235	36	3,190
5	Lemikura	87,234	32,176	4,357	36	2,259
6	Akaki	55,379	32,159	3,727	36	2,740
7	Lideta	36,267	12,611	2,000	36	1,645
8	Kirkos	30,590	12,944	1,399	36	1,579
9	Yeka	49,000	22,896	2,780	36	2,361
10	Bole	45,043	16,033	2,532	36	2,251
11	Kolfe	85,127	28,996	4,239	36	4,350
	Total	**600,725**	**234,351**	**33,359**	**324**	**26,046**

Table 7, Nine Month awareness creation about solid waste management (AASWMA,2024)

According to the Addis Ababa solid waste management agency's data, it was possible to create awareness about the use of household solid waste management for a total of 600,725 households, 234,351 households made separate household solid waste from the source according

to the standards, 33,359 households produced house to house humor, a total of 324 Awareness messages were transmitted through various media and Provided 26,046 awareness training on the integrated solid waste management system for various entities with in the capacity of sub city with in a period of 9 months in Addis Ababa (all sub cities).

Figure 7 Motivational forum prepared by awareness and participation experts at the Adwa victory memorial museum(AASWMA,2024)

Addis Ababa City Cleaning Management Agency organized a stimulation platform for awareness and community participation experts.

Dr. Eshetu Lema, Director General of the Addis Ababa City Cleaning Management Agency, who stated that although the cleanliness of our city is improving from time to time, due to the increasing number

CHAPTER FIVE

5. SUMMARY OF MAJOR FINDINGS, CONCLUSION AND RECOMMENDATION

The final part of the paper deals with the summary of major findings, conclusion and the recommendations forwarded based on the findings. The major purpose of this study was to asses current solid waste management strategies of Addis Ababa solid waste management agency. This investigation was addressed by employing structured interview with head and workers of Addis Ababa solid waste management agency, field observation and reviewing published and unpublished documents. Finally, on the basis of quantitative and qualitative analysis of data, the findings of this study are summarized as follows.

5.1. Summary of major findings

- The main factors that affect solid waste management strategies in Addis Ababa city are lack of efficient solid waste collection mechanism, solid waste is either thrown on the streets or burnt in open place/for cooking, Drains are clogged with solid waste, there is no awareness among the residents (households), lack of Infrastructure (Setting up composting infrastructure, setting up solid waste center, Supply of recyclables to recycling units).
- Various solid waste (plastic) materials that throw **randomly** and carelessly, along the roads, near drainage lines and bridges having a negative impact on environmental pollution and floods.
- Transportation of solid waste is carried out by out sourced, City Administration and private sector vehicles.
- Solid waste transporting tracks are not available to the level demanded and even some of the available trucks don't all fully perform. Hence, current solid waste transportation is less effective.

- The finding shows that there is a high frequency of transportation to deliver solid waste to the disposing area.
- There is no sorting habit of organic wastes from others at the household level.

5.2. Conclusion

Based on the findings, the following conclusions are drawn:

- In general, solid waste reduction, reuse, recycle, and disposal mechanism of the city is insufficient. The result of the study revealed that Addis Ababa solid waste management agency; they did not have sufficient waste collection facilities to do their assignment.
- The general awareness and participation of households in the solid waste management are very low. The participation of households in the SWM activities is insignificant.
- Municipal solid waste collection and transportation activity of the city is inadequate because of Solid waste transporting tracks are not available to the level demanded and even some of the available trucks don't all fully perform.

As a conclusion, this study investigated the main challenges that aggravate the existing poor status of municipal solid waste management strategies in the city. These are: lack of awareness, low infrastructure, and institutional factors.

5.3. Recommendations

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

- Since the poor awareness of the community was one of the major factor , Addis Ababa solid waste management agency and other concerned body of the city should engage continuous awareness creating campaign or education for the public through competitions among schools, institutions, NGOs, businesses and by using popular individuals via the different medium of communication about MSWM in general.
- The result of this study reported that illegal dumping is practiced in Addis Ababa city. Besides, the law enforceability shows a significant impact on effective solid waste management at household level. It means that the law enforcement section of the local

government gives little attention Thus, for laws to be effective people need to know the presence of laws through awareness creation activities and implementers should aggressively work to minimize illegal disposal activities through continuous follow up.

- The study is conducted mainly on the assessment of Municipal Solid Waste Management strategies. But the study is not considered the health and environmental aspect. Hence, further study should be conducted in this aspect.

References

AACMA. (2023). Addis Ababa cleaning management agency report.

Abraham, E. (2018). Assessment of Municipal Solid Waste Management Practices: A case Study of Bishoftu City Administration.

Agency, U. S. (1998). Municipal Solid Waste Source Reduction: Snapshot of State Initiatives, Washington DC, Solid Waste and Emergency Response.

Ahsan A., Alamgir M., El-Sergany M., Shams S., Rowshon M. and Nikdaud N. (2014). Assessment of Municipal Solid Waste Management System in Developing Countries.

Amoah ST, Kosoe EA. (2014). Solid waste management in Urban areas of Ghana: issues and experiences from Wa. J Environ Pollut Human Health. 110-117.

Atsbaha, A. (2003). The Impact of Quarry Production on the Environment and Human Settlement (The case of Bole-Cotebe District). ECS, Addis Abeba, Ethiopia.

Authority, C. S. (2010). Household consumption and expenditure survey Statistical Bulletin (No. 563). Addis Ababa, Ethiopia.

Barr, S. (2004). Sustainable Household waste management in UK. Sustainable Development.

Beliën, J., Boeck, L., & Ackere, J. (2011). Municipal Solid Waste Collection Problems: A Literature Review. Hub Research Papers 2011/34 Economics & Management.

Charlotte, W. (2009). outgoing waste management. Minneapolis Publications Company Washington DC.

Cheru, M. (2016). solid waste management in Addis Ababa.

Coad, A. (2005). Private Sector Involvement in Waste Management: Avoiding Problems and Building on Successes, CWG publication series no 2, Collaborative Working Group on Solid Waste Management in Low and Middle Income Countries, St. Gallen, Switzerland.

Consultan, G. E. (2010). Implementing market-based municipal solid waste management study in Adama". In collaboration With FDRE Ministry of Urban works and Plan development and Adama C ity administration, Addis Ababa, Ethiopia.

David VE, John Y, Hussain S (. (2020). Rethiking sustainability. A review of municipal solid waste management systems, status and challenges. .

Desta H, Worku H, Fetene A . (2014). Assessment of the contemporary municipal solid waste management in Urban environment: the case of Addis Ababa, Ethiopia. J Environ Sci Technol 7:107–122.

Federal Democratic Republic of Ethiopia (FDRE) “Solid Waste Management Proclamation. (2007). Federal Negarit Gazeta of the FDRE, Proclamation No. 513/2007. Addis Ababa, Ethiopia.

Gilbert. (2013). municipal solid waste management practic.

Guerrero, L. and Hogland, W. (2013). Solid waste management challenges for cities in developing countries. 234-256.

Haile, F. (2005). Sold waste management study existing situation of waste management in urban areas of Addis Ababa, Ethiopia.

Heidenstam, O. v. (1977). Swedish Experience in Separation at Source Solid Wastes." Institute of Solid Waste Management, London.

Hoornweg, D. & Bhada-Tata, P. (2012). What a waste: a global review of solid waste management. Washington D.C, World Bank.

Joardar, D. (2000). Urban Residential Solid Waste Management in India. Issues Related to.

JunD.,Henry R. and Yongsheng Z. (2006). Municipal solid waste management challenges in developing countries. Kenyan case study. Waste management 26:92-100.

Kassa, G. (2009). Management of Domestic Solid Waste in Bahir dar Town: Analysis and Assessment of Solid Waste Addis Ababa, Ethiopia.

Khan, A. (2011). he Feasibility of Waste to Energy Recovery technologies at Lahore,Pakistan, Master Thesis.

Koyachew, E. (2016). The problem of solid waste management and people awareness on appropriate solid waste disposal in Bahir Dar City: Amhara region, Ethiopia. Vol. 3(1), pp. 1-8. DOI: 10.5897/ISAAB-JHE2016.0026.

Masood, M. and Barlow, C. (2014). Status of solid waste management practices in developing countries, a case study at Lahore, Pakistan, waste management. pp. 838 – 839 .

Mbeturinave., G. e. (2009). Retrieved September 15, 2014, from http://www.ammkrks.net/repository/docs/2Raporti_i_mbeturinave_2008.pdf.

Mesfin A, Muktar M. (2017). Solid waste generation rate and characterization study for Laga Tafo Laga Dadi Town, Oromia, Ethiopia.

Mugambwa, E. (2009). Sanitation: "The hygienic means of promoting health" Indian ournal of Public Health. 2(1): 6-11.

Nathan, C. and Pragasen, P. (2012). Biogas prediction and design of a food waste to energy system for the urban environment. pp. 200 – 209.

Nigussie, A. (2001). Urban Nonpoint Source Pollution: Journal of Model Development Application Stockholm. 1(2):3-9.

Oteng, M. (2010). Private sector involvement in solid waste management in the Greater ccra metropolitan area in Ghana.

Rush, B. (1999). Solid Waste Landfills in middle and lower Income Countries, Technica Guide, World Bank.

sanitasi.net. (2019).

Scheinberg, A. (2010). Solid Waste Management in the World's Cities. UN-Habitat's. Third Global Water Sanitation in the World's Cities. Earthscan, London.

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

Tegegn, M. (2008). Household Solid Waste Generation Rate and Physical Composition Analysis, in Jimma Town, Ethiopia.

UNCHS. (1995). Private Sector Participation in Municipal Solid waste Services in Developing Countries, Washington DC.

UNDP. (2004). Urban agriculture: food, jobs, and sustainable cities. New York: UNDP Urban Harvest Working Paper Series, Paper no.1. United Nations Development Programme,

New York .

UNEP. (2011). Waste management hierarchy.

Vaibhav, S., Rajeev, P. & Pooja, S. (2014). Urban solid waste management in the developing world with emphasis on India: challenges and opportunities, Reviews in Environmental Science and Bio/Technology.

vitin, R. i. (2013). (Vol. 346, p. 20). (2013). Prishtine: Kompania Rajonale e Mbeturinave "Pastrimi".

Yebalework, B. (2014). Assessment of municipal solid waste management the case of Hawassa town, Southern nation, nationalities, and people's regional state. College of Social Sciences and Humanities Department of Geography and Environmental Studies, Haramaya University Ethiopi-.

Yongsheng, Z. (2014). Municipal solid waste management challenges in developing countries Kenyan case study.

Zhuang, S. (2008). Source separation of household waste: a case study in China. Waste Management. pp. 2022-2030.