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ADDIS ABABA UNIVERSITY

COLLAGE OF DEVELOPMENT STUDIES

CENTER FOR ENVIRONMENT AND SUSTANABLE DEVELOPMENT

Plastic Waste Management Practices and Challenges

The Case of Woreda 7, Nifas Silk Lafto Sub-city

Addis Ababa

Dina Kinfe

June, 2023
Addis Ababa, Ethiopia

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Requirements for Master of Arts in Environment and Sustainable
Development

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Declaration

I declare that this thesis is my original work, not submitted for a degree at another university and that all source materials used in the thesis is fully credited.

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Dina Kinfe

Abstract

Plastic waste has become a major environmental and health concern in many parts of the world, including Woreda 7, Nifas Silk Lafto Sub-city, Addis Ababa. In this area, plastic waste is generated by households, businesses, and other entities, and it is often improperly disposed of, leading to environmental pollution and health hazards. To address this issue, this study examines the challenges and practices of plastic waste management in Woreda 7, Nifas Silk Lafto Sub-city, Addis Ababa. The study identifies various challenges, including inadequate waste collection and disposal infrastructure, low public awareness about the negative impacts of plastic waste, and inadequate policy and regulatory frameworks. The study recommends several solutions, including increasing public awareness about the importance of plastic waste management, improving waste collection and disposal infrastructure, encouraging recycling, implementing policies and regulations, and engaging stakeholders in the development and implementation of waste management strategies. These recommendations aim to mitigate the negative impact of plastic waste on the environment and human health, and to promote sustainable waste management practices in the study area. Overall, the study aims to promote sustainable waste management practices in Woreda 7, Nifas Silk Lafto Sub-city, Addis Ababa, and to mitigate the negative impact of plastic waste on the environment and human health.

Keywords: Plastic waste, plastic waste disposal, plastic waste management

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Abbreviations

BTU	British Thermal Unit
EPR	Extended Producer Responsibility
EU	European Union
GDP	Gross Domestic Product
JICA	Japan International Cooperation Agency
MPW	Mismanaged Plastic Waste
MSW	Municipal Solid Waste
POPs	Persistent Organic Pollutants
PVC	Polyvinyl Chloride
SWM	Solid Waste Management
UK	United Kingdom
UNCHS	United Nations Human Settlements Programme
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USEPA	United States Environmental Protection Agency
WEF	World Economic Forum

Chapter 1: Background of the study

1.1 Introduction

Plastic is acquired from the Greek word *plastikos* which means “able to be molded” indicating its unique character. Shell, horns, rubber, and tortoise shell, all naturally occurring substances were used as prime plastic materials before synthetic plastics were introduced. Due to their remarkable physical and chemical characteristics, plastics have become a major commodity worldwide and have several applications in commercial and industrial products. Due to high community demand, the large-scale production of fibers and resins have increased worldwide (Frienkel, 2011).

Plastic production has increased as much as twenty times since 1964. Around 311 million tons of plastic were produced worldwide in 2014, which could double in about 20 years and quadruple by 2050 (WEF 2016). The 2015 World Energy Outlook predicts that the largest application, plastic packaging (26% of the total), will continue to grow strongly, doubling within 15 years and quadrupling to about 2.5 billion tons by 2050.

The rising loads of plastic waste, amplified by the absence of a proper waste management system is a global concern. Dealing with plastic waste is backbreaking for many African cities today. Most cities are unable to manage the alarming increase in volumes of plastic waste due to rapid urbanization and population growth. As a result, poor urban environments, poor public health, and illegal dumps are evident in the major cities of Africa.

Approximately 80% of the generated wastes were reported to accumulate in landfills or the natural environment in Africa (Gourmelon, 2015). The most critical environmental problem related to plastics is improper disposal such as illegal dumping, open burning etc. The use of a large number of plastic products has led to an increasing amount of trash, which led to improper disposal and environmental problem.

In Ethiopia, many researchers showed that plastic wastes were the major type of solid waste generated in some cities Yohanis and Genemo (2015) identified that from the total waste generated in Jigjiga town, 28% of the waste was plastic bottles and bags from both residential and commercial areas. Tesfaye (2020) also identified 64% of the total solid wastes in Addis Ababa city were non-biodegradable organic wastes. The study done by Lema *et al.*, (2019) indicated

the type of wastes generated in Assela include, plastic (34.8%), food residual (31.4%), paper (30.3%), metal wastes (1%), and other wastes (2.5%).

In Ethiopia, plastic waste management is basically in decline. The facilities don't cover a wide range and are unreliable. Both unauthorized and authorized dumpsites are mishandled and cause major environmental impacts. In general, clean and better conditions of living in cities might not be reached beyond reliable and regular waste collection and sufficient disposal systems.

1.2. Problem Statement

Plastic waste is a major environmental problem that affects many cities and communities around the world, and Woreda 7 in Nifas Silk Lafto Sub-city of Addis Ababa is no exception. Despite efforts to improve waste management practices in the area, plastic waste continues to be a significant problem that poses a threat to public health and the environment.

The problem of plastic waste management in Woreda 7 is compounded by several challenges. First, the lack of adequate infrastructure and resources for waste collection, transportation, and disposal makes it difficult for local authorities to effectively manage plastic waste. Second, limited public awareness and inadequate waste segregation practices among households and businesses further exacerbate the problem. Third, the informal waste sector, which involves waste pickers and scavengers, is often excluded from formal waste management systems, leading to unregulated dumping and disposal of plastic waste.

To address these challenges, there is a need to improve waste management practices in Woreda 7. This may involve the implementation of a comprehensive waste management plan that includes strategies for waste reduction, segregation, collection, transportation, and disposal. Additionally, public awareness campaigns and educational programs can be implemented to encourage households and businesses to adopt better waste management practices, such as proper waste segregation and recycling.

There is also a need to involve the informal waste sector in formal waste management systems to ensure that plastic waste is properly collected, transported, and disposed of in a regulated manner. This may involve providing training and resources to informal waste pickers and scavengers, as well as creating formal partnerships between the informal and formal waste management sectors.

Overall, addressing the problem of plastic waste management in Woreda 7 will require a comprehensive and collaborative approach involving local authorities, communities, and other stakeholders. By implementing effective waste management practices and addressing the challenges faced by the area, it is possible to mitigate the negative impacts of plastic waste on the environment and public health.

1.3. Objective

The general objective of this study was to analyze the plastic waste management practice and its challenges the system faces in the case of Woreda 7, Nifas Silk Lafto Sub-city.

Specific Objectives

1. Explore the environmental awareness of the community.
2. Identify household level plastic waste management practices at the in Woreda 7, Nifas Silk Lafto Sub-city.
3. To analyze the value chain of plastic waste management in Woreda 7, Nifas Silk Lafto Sub-city.
4. Identify challenges of plastic waste management practices in Woreda 7, Nifas Silk Lafto Sub-city.

1.4. Research Questions

This research is expected to answer the following questions:

- What is the current condition of the plastic waste management system in the study area?
- What is the weakness of the current plastic waste collection and transportation practice in the study area?
- Which factors influence the ineffectiveness of plastic waste management practice in the study area?

1.5. Scope of the Study

This research is limited in assessing plastic waste management practices and challenges in the case of Woreda 7, Nifas Silk Lafto Sub-city. The data was collected from field observation, questionnaires, and key informant interviews.

1.6. Significance of the Study

The study clearly shows the current feature of plastic waste management in the study area, the challenges affecting its effectiveness and recommends feasible solutions to improve the current plastic waste management. This is expected to contribute some input to the city administration's endeavor to improve the plastic waste management system.

1.7. Limitation of the study

There are several limitations to consider in this study on plastic waste management practices and challenges in Woreda 7, Nifas Silk Lafto Sub-city of Addis Ababa. Some potential limitations include:

Limited sample size: The study may be limited by the number of participants or households included in the sample. A small sample size may not be representative of the entire population, and the results may not be generalizable to other areas or contexts.

Self-reporting bias: The study may be subject to self-reporting bias, where participants may not provide accurate or complete information about their waste management practices or attitudes. This could affect the reliability and validity of the study's findings.

Limited data availability: The study may be limited by the availability of data on plastic waste management practices and challenges in the area. Data collection may be hindered by factors such as limited resources, access, or time constraints.

Limited scope: The study may be limited by its focus on plastic waste management practices and challenges in Woreda 7. The findings may not be applicable to other areas or contexts, and other waste management issues beyond plastic waste may not be addressed.

Chapter 2: Literature Review

2.1. Theoretical Literature Reviews

2.1.1. Definitions of Concepts and Terminologies

What is Plastic?

These days we are accompanied by Plastic in our packaging, serving, and even disposing of all kinds of consumer goods. With the industrial revolution, mass production of goods started and plastic seemed to be a cheaper and more effective raw material.

Plastic is made of a wide range of synthetic or semi-synthetic substances that are soft and capable of being molded into solid objects of diverse shapes. Plastics are typically organic polymers of high molecular mass and they often contain other substances. They are artificial, commonly originate from petrochemicals and many are partially natural LCPP (2011). Nonetheless, all plastics are not identical. Producers use different plastic materials and compounds that acquire unique properties.

2.1.2. Sources of Plastic Waste

Plastic waste is a growing concern in urban areas, including Woreda 7, Nifas Silk Lafto Sub-city of Addis Ababa. Understanding the sources of plastic waste is essential for developing effective strategies to manage and reduce plastic waste in the area.

One of the significant sources of plastic waste in urban areas is packaging waste. Single-use plastic items such as bags, bottles, and food containers are commonly used and quickly discarded, contributing to the plastic waste problem (Ellen MacArthur Foundation, 2016). In Woreda 7, plastic bags are a common source of plastic waste, with many households and businesses using them for shopping and other purposes.

Another significant source of plastic waste in urban areas is the construction industry. Building materials such as pipes, insulation, and packaging can generate significant amounts of plastic waste, which can be difficult to manage and dispose of properly. In Woreda 7, the construction

industry is growing rapidly, and the increasing use of plastic materials in construction is contributing to the plastic waste problem.

Another source of plastic waste in urban areas is the hospitality industry. Single-use plastic items such as straws, cups, and utensils are often provided in hotels, restaurants, and cafes, contributing to the plastic waste problem (Sullivan, 2018). In Woreda 7, the hospitality industry is expanding, and the increasing use of single-use plastic items is contributing to the plastic waste problem.

Finally, plastic waste from household waste and littering is a significant source of concern in urban areas. Improper disposal of plastic waste, including littering and dumping, can result in plastic pollution in waterways, streets, and public spaces (Johri et al., 2019). In Woreda 7, inadequate waste management infrastructure and low awareness of proper waste disposal practices can contribute to plastic waste pollution.

Overall, the sources of plastic waste in urban areas are diverse and widespread, and addressing the plastic waste problem will require a comprehensive approach that involves reducing plastic production and consumption, promoting reuse and recycling, and developing sustainable alternatives to plastic. In Woreda 7, effective plastic waste management strategies will need to take into account the specific sources of plastic waste in the area and the challenges of managing plastic waste in an urban environment.

2.1.3 Adverse Impact of Plastic Waste

Plastic waste has significant adverse impacts on the environment, economy, and human health. Understanding these impacts is critical for developing effective plastic waste management strategies.

Plastic waste has multiple impacts on ecosystems and human health. The specific impacts of plastic waste on terrestrial wildlife are poorly understood, but improperly managed landfills can result in leakage of plastic waste or landfill leachate containing plastic-related chemicals. There are concerns that plastic recycling, especially in developing countries, can release chemicals into the environment, such as burning plastic-coated wires to extract metals. Also, the effects of chemicals that are part of or transported through plastic can be sub-lethal.

Ingestion of plastic can increase fish buoyancy, making it more difficult for mesopelagic fish to return to deep water (Boerger *et al.*, 2010).

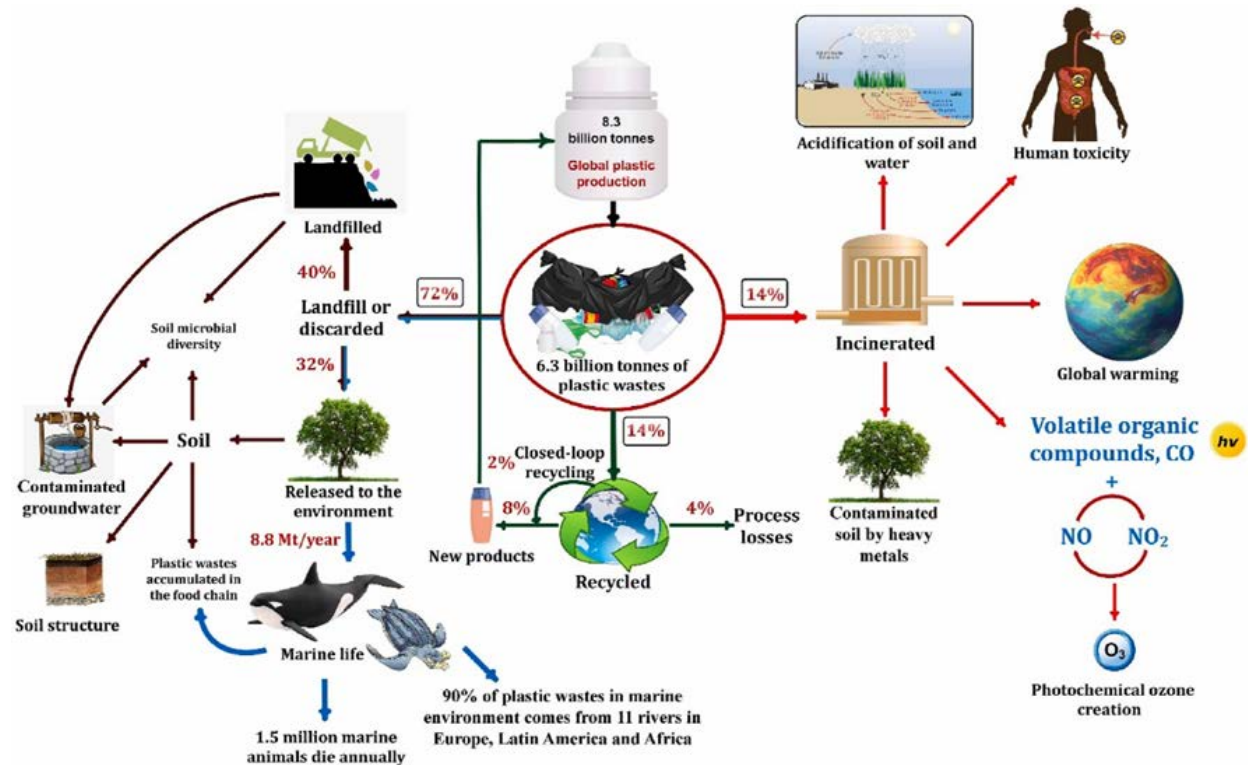


Fig. 1. The adverse impact of plastic materials on the eco-system.

The biggest environmental impact of plastic waste is that it takes years to decompose. In addition, toxic substances are released into the soil when plastic bags perish under sunlight and, if plastic waste is burned, they release a toxic substance into the air causing ambient air pollution (Simons, 2005) suggests that, owing to the unregulated accumulation of carcinogenic compounds, the use of plastic bags may allow inroads into cancerous diseases. Plastic waste is dumped indiscriminately into landfills worldwide that occupy tons of hectares of land and emit dangerous methane and carbon dioxide gases as well as highly toxic leachates from these landfills during their decomposition stage. Waste from plastic poses a serious environmental danger to human and animal health. If plastic waste is not properly disposed of, it can impact the environment by causing littering and storm water drain blockages.

Animals may also get tangled and drown in plastic waste. Animals often confuse plastic for food and consume them, therefore blocking their digestive processes. Animals becoming entangled in marine debris, including plastic bags, may cause starvation, choking, laceration, infection, reduced reproductive success, and mortality (Katsanevakis, 2008). There were instances where large endangered tortoises were found to have suffocated because of the mistaken swallowing of plastic waste combined with seaweed (Thiel *et al*, 2003).

Plastics are ubiquitous in today's marine environment and this declining trend requires urgent action. Plastics have been recognized as a problem in the marine environment since the 1970s, but only recently has the problem of plastic pollution in marine and fresh water environments been recognized as a global problem. As a result, marine pollution from plastic waste has become a major environmental problem for governments, scientists, NGOs, and the international community (Carpenter and Smith, 1972).

The dominance of plastics in the marine environment creates many challenges that inhibit economic development. Plastic waste trapped along the coast poses an environmental problem that is detrimental to tourism. Economic losses are related to reduced tourism revenues, adverse effects on tourism activity, and damage to the marine environment. Plastics trapped on beaches harm maritime infrastructure, power generation, fisheries, and aquaculture (Sivan, 2011).

It is very unfortunate that, although plastic waste has been seen to have reduced agricultural production worldwide, there has been little significant awareness-raising to undertake proper, effective, and concrete proactive action. Indeed, few serious scientific investigations have been made by international organizations and the international community to reduce the ever-increasing consumption of plastic bags.

2.1.4 Plastic Waste Management Options

There is no one-size-fits-all solution to plastic waste management, and the best approach for a nation will depend on the specific context and needs, as well as the available resources and political will. However, some plastic waste management systems that have been successful in various countries include Extended Producer Responsibility (EPR), Deposit-Refund Systems, Zero Waste Cities, and Plastic Bag Bans and Fees.

Extended Producer Responsibility (EPR) is a policy approach that holds producers responsible for the end-of-life management of their products, encouraging them to design products for recyclability and to take responsibility for the collection and recycling of their products, and has been successful in countries such as Japan, Germany, and South Korea (OECD, 2016).

Deposit-refund systems involve consumers paying a deposit on a product at the point of purchase, which is refunded when the product is returned for recycling, and have been successful in countries such as Norway and Germany, where they have helped to increase recycling rates and reduce litter (Zero Waste Europe, 2021).

The concept of Zero Waste Cities involves designing waste management systems that aim to eliminate waste and promote a circular economy, and has been successful in cities such as San Francisco, which has achieved an 80% diversion rate from landfill and incineration (Zero Waste Europe, 2021).

Plastic bag bans and fees have been successful in reducing plastic bag use and litter in countries such as Ireland, Bangladesh, and Kenya, and can be effective in reducing plastic waste (UNEP, 2018).

However, the success of these plastic waste management systems will depend on a range of factors, including policy implementation, public awareness, and infrastructure development, and a comprehensive approach that involves reducing plastic consumption, promoting reuse and recycling, developing sustainable alternatives to plastic, implementing proper waste management practices, and encouraging public participation will likely be needed to effectively manage plastic waste and promote sustainability

Landfills

Landfilling has traditionally been seen as an easy and cheap method for disposing of all material generated by society and therefore has been and remains the dominant waste disposal option. Relatively high abundance of void space in many countries due to past and present excavation activities such as mining and quarrying (i.e. mineral and aggregate extraction) gave rise to void space ideal for waste disposal at low cost. However, problems associated with waste disposal of landfills, the most severe problem at present is that urban

areas of industrial countries land suitable for sanitary landfill is becoming increasingly scarce (Joseph *et al.*, 1975; Williams, 2005). For instance, in countries like France and Japan landfill is being phased out because of high values on land use and environmental quality (Themelis, 2002). This has subsequently led to the realization that the environmental impact of landfills must be considered (Williams, 2005). Therefore, the final disposal of wastes at sanitary landfills is given the lowest priority in an integrated waste management approach (Tamronglak, 2005; Tchobanoglous *et al.*, 1993).

Although synthetic petrochemical-derived plastics are regarded as a minor contributor to gas emissions from landfills. This is due to their relative stability and resistance to degradation from the microbial breakdown (mainly as a result of their chemical composition, stabilizing, antimicrobial and other additives utilized). But plastics do contribute substantially to void space utilization due to their high volume. It has been estimated that around 25% of the void space already utilized within currently operating landfills is taken up by plastic waste (Allane, 1979). One associated problem concerning this high volume of plastic (especially packaging) is that landfill gas can become trapped within the pockets created making extraction and controlled capturing of gases for energy recovery purposes problematic (Williams, 2005).

The conditions within the landfill site also result in the release of additives utilized in the manufacturing of plastic products (Hulse, 2000). On the other hand, data are limited to determine whether additives in the plastic add significantly to the toxicity of MSW landfill leachate. The Franklin Associates study found that plastic additives represent about 2% of the total lead and 30% of cadmium in MSW (Mustafa, 1993). The release of hazardous substances within plastics disposed of in landfills is not restricted to PVC. However, some plastics, which use heavy metal additives or other potentially hazardous substances in their manufacture, have been found to give rise to undesirable substances in landfill emissions (Williams, 2005). Items of electrical and electronic equipment, which are often encased in plastics, also contribute to heavy metals found in leachate and gas.

Incineration

Incineration is a waste treatment process that involves burning solid, liquid, or gaseous waste materials to convert them into ash, gas, and heat. The ash is usually disposed of in a landfill, while the gas and heat produced can be used to generate electricity or heat. Incineration is often used as a waste management option for materials that cannot be recycled or composted, such as hazardous waste or medical waste.

Incineration has become the second most dominant solid waste treatment option. It involves the full oxidative combustion of waste material within controlled conditions. A benefit of incineration over a landfill is that it can accept co-mingled waste without the requirement for extensive separation and reduces the waste volume. The burning of MSW can generate energy while reducing the amount of waste by up to 90 percent in volume and 75 percent in weight (EPA, 2002; Hui *et al.*, 2006). For instance, in the United States in 1988 about 14% of MSW was incinerated because it reduces up to 90% of the volume of disposed MSW (Mustafa, 1993).

One of the main advantages of incineration is that it can reduce the volume of waste by up to 90%, making it a space-efficient method of waste disposal. This can be especially useful in areas where landfills are scarce or where space is at a premium. Furthermore, incineration can be used to generate energy, as the heat produced during the combustion process can be harnessed to produce electricity or to heat buildings. This can help to reduce reliance on fossil fuels and contribute to a more sustainable energy mix.

However, there are also several challenges associated with incineration. One of the main concerns is the potential release of harmful pollutants into the environment, including dioxins, furans, and heavy metals. These pollutants can have negative impacts on human health and the environment, and strict regulations are in place to limit their release. Incineration also requires careful management of the waste materials to ensure that they are properly sorted and screened for hazardous materials, as the combustion of certain types of waste can result in the release of toxic gases and other harmful substances.

In addition, incineration can be expensive to implement and maintain, particularly compared to other waste management methods such as landfilling. The costs associated with building and

operating an incinerator can be high, and ongoing maintenance and monitoring are necessary to ensure that the incinerator is operating safely and efficiently. This can be a significant financial burden for municipalities or other entities responsible for waste management.

Overall, incineration is a complex waste management method that offers both advantages and challenges. While it can be an effective way to reduce the volume of waste and generate energy, it also requires careful management and monitoring to ensure that it is conducted safely and responsibly. As with any waste management method, a comprehensive assessment of the costs and benefits should be conducted before deciding whether incineration is the most appropriate option for a particular situation.

Open Dumping

Open dumping is a waste management practice that involves the disposal of waste in an open area without any protective lining or cover. This practice has been widely criticized due to its negative impact on the environment and human health.

One of the main concerns associated with open dumping is the release of harmful pollutants into the environment. When waste is left untreated in an open area, it can contaminate nearby soil, water, and air. This can lead to a variety of health problems, including respiratory issues, skin irritations, and even cancer. A study conducted by (Rathi *et al.* 2020) found that open dumping sites in India were associated with increased levels of heavy metals and other pollutants in nearby soil and water sources.

Another issue with open dumping is the potential for fires. When waste is left untreated in an open area, it can easily catch fire, particularly during hot and dry weather conditions. These fires can release toxic fumes into the air, leading to respiratory issues for nearby residents. A study conducted by (Nema *et al.* 2019) found that open dumping sites in Nigeria were associated with an increased risk of respiratory illnesses due to the release of pollutants from fires.

One potential alternative to open dumping is the use of sanitary landfills. These landfills are designed to contain waste within a lined and covered area, reducing the risk of contamination and fires. However, the effectiveness of sanitary landfills depends on proper management and maintenance. A study conducted by (Ali *et al.* 2021) found that the lack of proper management and

maintenance in some sanitary landfills in Pakistan has led to similar environmental and health issues as open dumping sites.

Open dumping waste management systems have significant negative impacts on the environment and human health. The use of sanitary landfills can be a potential alternative, but proper management and maintenance are necessary to ensure their effectiveness. Other potential alternatives, such as waste reduction and recycling, should also be explored to further reduce the need for waste disposal.

Recycling

Recycling is a waste management practice that involves the processing of waste materials into new products. This practice has gained significant attention in recent years due to its potential to reduce the amount of waste sent to landfills and its positive impact on the environment.

One of the main benefits of recycling is its potential to reduce the amount of waste sent to landfills. By processing waste materials into new products, the need for raw materials is reduced, leading to a reduction in the amount of waste generated. A study conducted by (Chen *et al.* 2020) found that the implementation of a recycling program in a Chinese city led to a significant reduction in the amount of waste sent to landfills.

Recycling also has a positive impact on the environment by reducing the amount of energy required to produce new products. When waste materials are recycled, they can be used as a source of raw materials, reducing the need to extract new resources from the environment. A study conducted by (Geyer *et al.* 2017) found that recycling plastic waste can reduce greenhouse gas emissions by up to 50% compared to producing new plastic products from virgin materials.

However, the implementation of recycling programs can be challenging. One of the main challenges is the lack of infrastructure and resources required to collect and process waste materials. A study conducted by (Paudel *et al.* 2020) found that the lack of adequate infrastructure and resources was a significant barrier to the implementation of a recycling program in a Nepalese city.

Another challenge is the contamination of recyclable materials. When non-recyclable materials are mixed with recyclable materials, the quality of the recycled products is reduced, leading to a lower demand for recycled materials. A study conducted by (Wang *et al.* 2021) found that the contamination of recyclable materials was a significant challenge in a recycling program implemented in a Chinese city.

Recycling waste management systems have significant benefits for the environment and can reduce the amount of waste sent to landfills. However, the implementation of recycling programs can be challenging due to the lack of infrastructure and resources, as well as the contamination of recyclable materials. Strategies to overcome these challenges should be explored to further promote the implementation of recycling programs.

2.2. Empirical Literature Review

2.2.1 Global Plastic Waste Management Practices

Plastic waste management has become a pressing issue globally due to the negative impact plastic waste has on the environment and human health.

Many countries have implemented recycling programs as a means of managing plastic waste. A study by (Kaza *et al.* 2018) found that 69% of the countries surveyed had implemented national plastic waste recycling policies, with an additional 20% having such policies at the regional level. However, the effectiveness of these programs varies, with some countries facing challenges in collecting and processing plastic waste due to a lack of infrastructure and resources.

Several countries have also implemented plastic bag bans as a means of reducing plastic waste. A study by (Gallagher and Pfeffer 2018) found that 127 countries had implemented plastic bag bans as of 2017, with varying degrees of success. In some cases, the bans led to a reduction in plastic bag usage, while in others, they led to the adoption of alternative single-use plastic products.

In addition to recycling and plastic bag bans, several countries have implemented extended producer responsibility (EPR) programs. EPR programs require manufacturers to take responsibility for the disposal of their products, including plastic packaging. A study by (Linderholm *et al.* 2020) found that EPR programs had been implemented in 50 countries as of

2018, with varying degrees of success. Some countries have seen a reduction in plastic waste as a result of these programs, while others have faced challenges in implementation and enforcement.

However, the implementation of these plastic waste management practices faces several challenges. A study by (Lebreton *et al.* 2017) found that the lack of infrastructure and resources, as well as the difficulty in collecting and processing plastic waste, were significant barriers to effective plastic waste management. In addition, the global nature of plastic waste means that addressing the issue requires coordinated efforts across multiple countries and regions.

Plastic waste management is a pressing issue globally, and many countries have implemented recycling programs, plastic bag bans, and EPR programs to address it. However, the effectiveness of these programs varies, and they face significant challenges in implementation. Further efforts and collaborations are required to address the issue of plastic waste management globally.

2.2.2 Plastic Waste Management Practices in Africa

Plastic waste management is a significant challenge in Africa due to the rapid increase in plastic waste generation and the lack of adequate waste management infrastructure.

Several countries in Africa have implemented plastic bag bans as a means of reducing plastic waste. Kenya was the first country in Africa to implement a plastic bag ban in 2017, followed by Rwanda, Tanzania, and Uganda. A study by (Njoroge and Matu 2018) found that the implementation of the plastic bag ban in Kenya led to a significant reduction in plastic bag usage and littering.

In addition to plastic bag bans, some countries in Africa have implemented recycling programs as a means of managing plastic waste. However, the effectiveness of these programs varies, with some countries facing challenges in collecting and processing plastic waste due to a lack of infrastructure and resources. A study by (Adekunle *et al.* 2020) found that the lack of adequate waste management infrastructure was a significant barrier to effective plastic waste management in Nigeria.

Several initiatives have also been implemented to address plastic waste management in Africa. The African Marine Waste Network, for example, is a network of organizations working together

to address marine waste pollution in Africa. A study by (Saliu *et al.* 2019) found that the network had been successful in raising awareness about plastic waste pollution and promoting sustainable waste management practices.

However, the implementation of plastic waste management practices in Africa faces significant challenges. A study by (Akinola and Nnorom 2011) found that the lack of political will and the inadequate funding of waste management programs were significant barriers to effective plastic waste management in Nigeria. In addition, some countries in Africa face challenges in implementing plastic bag bans due to the lack of alternative packaging options.

Plastic waste management is a significant challenge in Africa, and some countries have implemented plastic bag bans and recycling programs to address it. However, the effectiveness of these programs varies, and they face significant challenges in implementation. Further efforts and collaborations are required to address the issue of plastic waste management in Africa.

2.2.3 Plastic Waste Management Practices in Ethiopia

Plastic waste management is a significant challenge in Ethiopia due to the rapid increase in plastic waste generation and the lack of adequate waste management infrastructure.

Ethiopia has implemented a ban on single-use plastic bags as a means of reducing plastic waste. The ban was implemented in 2019 and prohibits the import, production, and use of single-use plastic bags. A study by (Bekele and Beshah 2020) found that the implementation of the ban had led to a reduction in the use of single-use plastic bags and an increase in the use of alternative packaging options.

In addition to the plastic bag ban, Ethiopia has implemented recycling programs as a means of managing plastic waste. The Addis Ababa City Administration, for example, has implemented a formal waste management system that includes the collection and recycling of plastic waste. A study by (Tadesse *et al.* 2019) found that the implementation of the waste management system had led to a reduction in the amount of plastic waste sent to landfill sites.

Several initiatives have also been implemented to address plastic waste management in Ethiopia. The Ethiopian Plastic Recycling Alliance, for example, is a partnership between government

agencies and private organizations that aims to promote plastic waste recycling in the country. A study by (Teshome *et al.* 2021) found that the alliance had been successful in promoting plastic waste recycling and raising awareness about the importance of sustainable waste management practices.

However, the implementation of plastic waste management practices in Ethiopia faces significant challenges. A study by (Gebremedhin and Tadesse 2019) found that the lack of adequate waste management infrastructure, including collection and processing facilities, was a significant barrier to effective plastic waste management in Addis Ababa. In addition, the lack of public awareness about the negative impact of plastic waste on the environment and human health is a significant challenge.

Plastic waste management is a significant challenge in Ethiopia, and the country has implemented a ban on single-use plastic bags and recycling programs to address it. However, the effectiveness of these programs varies, and they face significant challenges in implementation. Further efforts and collaborations are required to address the issue of plastic waste management in Ethiopia.

2.2.4 Plastic Waste Management Practices in Addis Ababa

Addis Ababa city's solid waste is a threat to the environment as only 65% produced per day is collected and disposed of, 5% is recycled, 5% is composted, and the remaining 25% is uncollected and dumped in unauthorized areas. As municipal wastes are dominated by domestic wastes, their management, and associated environmental impacts are worthy of attention (Ail and Eyasu, 2017).

Addis Ababa city started its solid waste management some four decades back but currently, the service cannot meet the changing demands. The social waste collection service is unsatisfactory, and scenes of scattered waste are common in most parts of the city (UNDP, 2004). According to the existing policy, solid wastes are collected by government employees, private companies based on contractual agreements, and Micro and Small enterprises. However, the principle, stating that the waste producers are subject to putting their wastes into different containers based on the specific type of waste, is not practiced in the city (Hayal *et.al.*, 2014).

Plastic wastes are collected in three different mechanisms. These are:

1. Collection through municipal containers: is a method of waste collection where households and businesses dispose of their waste into designated containers provided by the local municipality. The containers are typically placed at designated locations, such as street corners or communal areas, and are emptied periodically by waste collection trucks.

This method of waste collection is commonly used in urban areas where there is a high population density and a significant amount of waste is generated. It helps to reduce littering and illegal dumping and provides a centralized location for waste collection, making it more efficient for waste collection trucks to collect and transport the waste to disposal sites.

Municipal containers can be used for various types of waste, including general household waste, recyclables, and organic waste. The use of separate containers for different types of waste allows for the easy separation of recyclables and organic waste, which can be processed separately and reused or composted.

2. Collection from different institutions: refers to the process of collecting waste from various institutions, such as schools, hospitals, government offices, and businesses. These institutions generate a significant amount of waste, including both general waste and specialized waste such as hazardous and medical waste. It is often carried out by waste management companies or local municipalities. These organizations typically provide waste collection services to the institutions, which can range from regular collection schedules to on-call pick-up services.

The collection of waste from different institutions is important for several reasons. First, it helps to ensure that the waste is properly disposed of and does not pose a risk to public health or the environment. Second, it can help to reduce the amount of waste that ends up in landfills by promoting recycling and composting. Finally, it can help to reduce the overall cost of waste management by allowing for the more efficient collection and transportation of waste.

Some institutions may have specialized waste streams, such as hazardous or medical waste, that require special handling and disposal. In these cases, waste management companies may provide specialized collection services to ensure that the waste is safely transported and disposed of in compliance with local regulations.

3. House-to-house collection: is a method of waste collection where waste is collected directly from individual households. This is typically done by waste collection personnel who visit each household on a regular basis, often weekly or bi-weekly, to collect the waste. During house-to-house waste collection, households are usually provided with a waste container, such as a bin or bag, in which they can dispose of their waste. The waste collection personnel then collect the waste from each household and transport it to a disposal site, such as a landfill or recycling facility.

House-to-house waste collection is a common method of waste collection in many parts of the world, particularly in urban areas where there is a high population density and a significant amount of waste is generated. This method is often preferred over other methods, such as communal container collection, because it allows for more efficient waste collection and can help to reduce littering and illegal dumping.

One of the benefits of house-to-house waste collection is that it allows for the separation of different types of waste, such as recyclables and organic waste. This can help to promote recycling and reduce the amount of waste that ends up in landfills.

It is typically funded through taxes or fees paid by households to cover the cost of waste collection and disposal.

2.3 Conceptual Framework

The conceptual framework for this study on plastic waste management practices and challenges in Woreda 7, Nifas Silk Lafto Sub-city Addis Ababa is based on the Waste Management Hierarchy and the Plastic Waste Management Value Chain. The Waste Management Hierarchy provides a framework for understanding the different stages of waste management and the priority given to each stage. The Plastic Waste Management Value Chain, on the other hand, provides a framework for understanding the different stages of plastic waste management from production to disposal.

The study examine the factors affecting plastic waste management practices at each stage of the Waste Management Hierarchy and the Plastic Waste Management Value Chain, as well as the challenges faced by local authorities in implementing effective plastic waste management strategies. The conceptual framework for the study is illustrated in the diagram below:

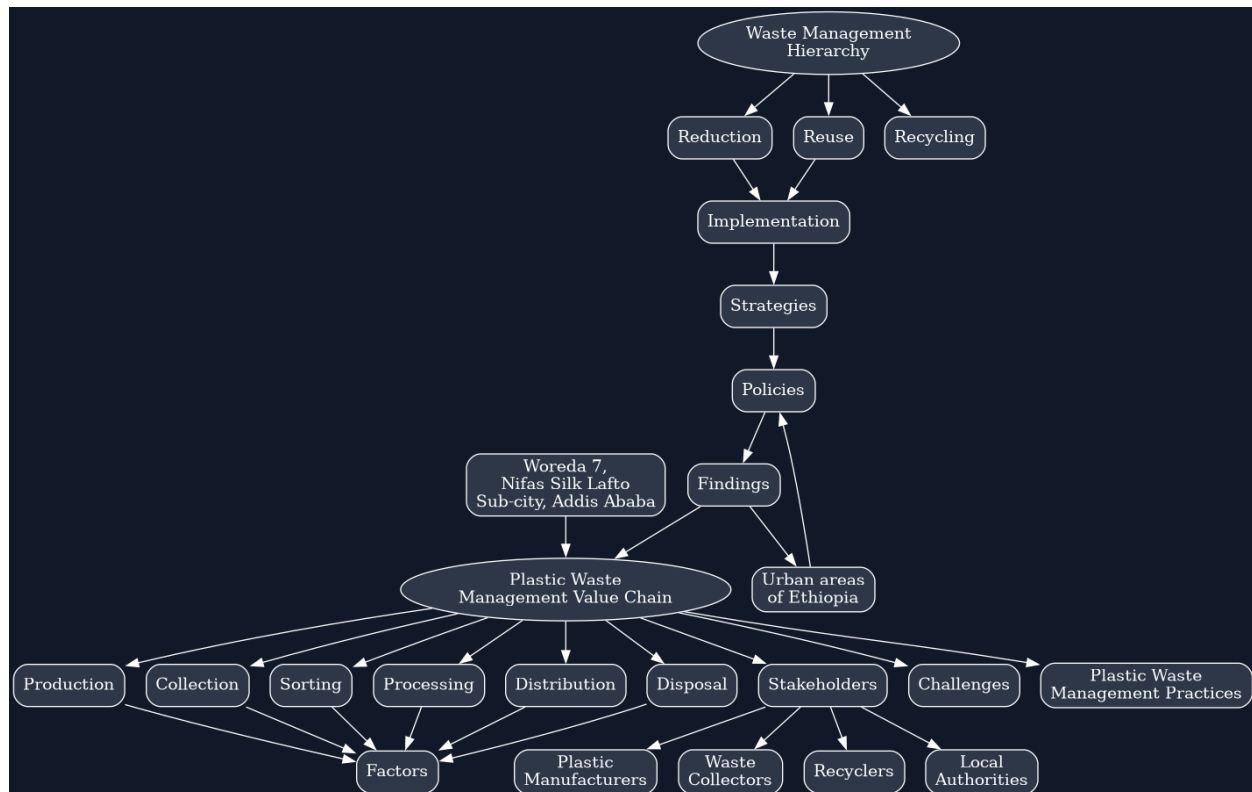


Fig 2. Conceptual Framework

The Plastic Waste Management Value Chain consists of six stages, including production, collection, sorting, processing, distribution, and disposal. The study examines the factors affecting plastic waste management practices at each stage of the Plastic Waste Management Value Chain, as well as the challenges faced by local authorities in implementing effective plastic waste management strategies.

The Waste Management Hierarchy and the Plastic Waste Management Value Chain are interrelated, and effective plastic waste management practices require attention to both frameworks. For example, reducing plastic waste production and promoting the use of reusable products (reduction and reuse stages of the Waste Management Hierarchy) can help to minimize the amount of plastic waste generated and reduce the burden of plastic waste management at the collection, sorting, and processing stages of the Plastic Waste Management Value Chain.

The study also examines the role of stakeholders in the Plastic Waste Management Value Chain, including plastic manufacturers, waste collectors, recyclers, and local authorities. Understanding the roles and responsibilities of each stakeholder is essential to developing effective plastic waste management strategies that can be implemented throughout the Plastic Waste Management Value Chain.

Chapter 3: Research Methodology

This research methodology outlines the approach and methods that was used to investigate plastic waste management practices and challenges in Woreda 7, Nifas Silk Lafto Sub-city Addis Ababa, with the aim of providing insights into the factors that affect plastic waste management practices and the challenges faced by local authorities in implementing effective plastic waste management strategies.

The study employed a mixed-method research design that combines both quantitative and qualitative research methods to collect data and analyze the findings. The study used a random sampling technique to select the study participants, including residents, waste collectors, and local authorities in Woreda 7, Nifas Silk Lafto Sub-city Addis Ababa.

Primary data was collected using a structured questionnaire and in-depth interviews, while secondary data was collected from relevant literature, reports, and policies related to plastic waste management practices. The collected data was analyzed using descriptive and inferential statistics, content analysis, and thematic analysis.

The study aims to provide insights into the plastic waste management practices and challenges in Woreda 7, Nifas Silk Lafto Sub-city Addis Ababa, which can be used to inform policies and strategies to improve plastic waste management practices in the sub-city and other areas in Addis Ababa and Ethiopia. The study is limited to the study area and may not be generalizable to other areas, but it is expected to make a significant contribution to the understanding of plastic waste management practices and challenges in urban areas of Ethiopia.

3.1 Description of the Study Area

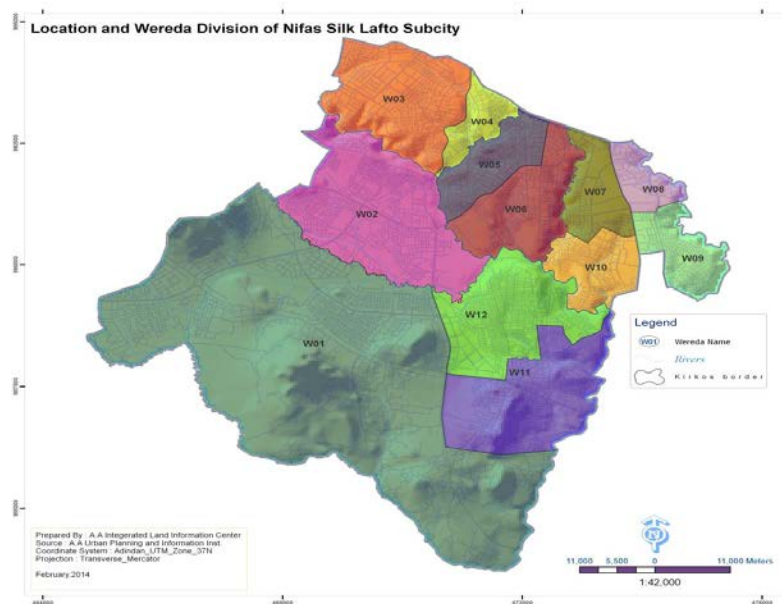
Woreda 7, Nifas Silk Lafto Sub-city is located in the northwestern part of Addis Ababa, the capital city of Ethiopia. The sub-city covers an area of approximately 26 square kilometers and has a population of over 350,000 people, according to the 2007 national census.

Nifas Silk Lafto Sub-city is one of the 11 sub-cities of Addis Ababa and is divided into 10 woredas or districts, of which Woreda 7 is one. The sub-city is a diverse and densely populated urban area that includes both residential and commercial areas.

The sub-city faces several challenges related to waste management, including inadequate waste collection services, illegal dumping, and poor waste disposal practices. The sub-city is also home to several small and medium-scale enterprises that generate significant amounts of plastic waste, which poses a challenge for waste management.

The sub-city is governed by the Addis Ababa City Administration and has a local government structure that includes a sub-city council and woreda-level councils. The local authorities are responsible for waste management in the sub-city, including the collection, transportation, and disposal of waste.

The study area, Woreda 7, is one of the 10 woredas in Nifas Silk Lafto Sub-city and is a residential area that includes both high-rise apartments and low-rise houses. The area is served by waste collection services provided by the local authorities, but there are challenges related to plastic waste management practices that need to be addressed. The study aims to investigate these challenges and provide insights into strategies for improving plastic waste management practices in the sub-city.



Source; Nifas Silk Lafto Sub-city (2015)

Fig 3. Map of Nifas Silk Lafto Sub-city.

3.2 Target Population

The target population for this study includes three main groups:

- 1. Residents:** The study targets residents of Woreda 7 who generate plastic waste in their daily activities. The sample includes both high-rise apartment dwellers and low-rise house residents.
- 2. Waste Collectors:** The study targets waste collectors who are responsible for the collection, transportation, and disposal of plastic waste in Woreda 7. The sample includes both formal and informal waste collectors.
- 3. Local Authorities:** The study targets local authorities responsible for managing plastic waste in the sub-city. The sample includes officials from the sub-city council and woreda-level councils.

The study uses a random sampling technique to select the study participants. The sample size will be determined based on the saturation point, which is the point at which no new information is obtained from the participants. The study will aim to achieve a diverse sample that is representative of the target population.

3.3 Sampling Procedure and Techniques

This study applied a multi-stage sampling technique to come up with a scientifically acceptable level of sample size for the study area. The study employed systematic random sampling. The study area was purposely selected for being the residential place of the researcher, and for having the problem.

The sample size has been determined based on the Yeman formula. The total population in the study area is 45,552 and the confidence level is 90%.

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

Where: n= Sample Size

N= Population under study

e= Margin error, 0.1

$$n = 45,552 / (1 + 45,552 (0.1)^2)$$

$$= 45,552 / (1 + 45,552 (0.01))$$

$$= 45,552 / 455.53$$

$$= 100$$

Therefore, $n = 100$ is the minimum sample size for reliable results.

3.4 Data Source & Collection Method

The data was gathered through three different type of data collecting methods i.e. observation, questionnaire, and key informant interview. First, an observation of the study area was done. The required individuals making at primary data were collected from randomly selected households, cafes, shops, and clinics by conducting a self-administered questionnaire having both open and closed ended questions. Key informant interviews were used to collect qualitative data. Field observation was backed by a checklist which was a part of the data collection method.

Field Observation

The field observation involved direct observation of plastic waste management practices in the study area, including waste collection, transportation, sorting, and disposal.

It was conducted by the researcher and was involved visiting different locations in Woreda 7, Nifas Silk Lafto Sub-city Addis Ababa, including residential areas, commercial areas, and waste collection points. The researcher observed the following:

1. Waste Collection: The researcher observed the waste collection practices in the study area, including the frequency of waste collection, the types of waste collected, and the methods of waste collection used by the waste collectors.

2. Waste Transportation: The researcher observed the methods of waste transportation used by the waste collectors, including the types of vehicles used and the routes taken.

3. Waste Sorting: The researcher observed the methods of waste sorting used by waste collectors, including the separation of plastic waste from other types of waste.

4. Waste Disposal: The researcher observed the methods of waste disposal used in the study area, including the operation and maintenance of landfill sites and other waste disposal facilities.

The field observation was conducted over a period of several weeks to capture different times of the day and different days of the week. The observations were recorded using a standardized form that includes details of the location, time, and type of observation.

The findings of the field observation were used to supplement the data collected through other methods, such as interviews and questionnaires. It provides valuable insights into the actual practices of plastic waste management in Woreda 7, Nifas Silk Lafto Sub-city Addis Ababa, and identify areas where improvements can be made.

Questionnaire

The questionnaire was used to collect primary data from the study participants, including residents, waste collectors, and local authorities. The questionnaire was designed to collect information on the following:

1. Demographic Information: include questions on the age, gender, education level, occupation, and income of the study participants.

2. Plastic Waste Generation: include questions on the types and quantities of plastic waste generated by the study participants, as well as their knowledge and attitudes towards plastic waste management practices.

3. Waste Collection and Transportation: include questions on the frequency and reliability of waste collection services, the methods of waste transportation used by the waste collectors, and the challenges faced by waste collectors in the collection and transportation of plastic waste.

4. Waste Sorting and Processing: include questions on the methods of waste sorting and processing used in the study area, the challenges faced by waste sorters and processors, and the potential for recycling and recovery of plastic waste.

5. Waste Disposal: include questions on the methods of waste disposal used in the study area, the challenges faced by waste disposal facilities, and the potential for the development of sustainable waste disposal practices.

6. Policy and Regulatory Framework: include questions on the existing policies and regulations related to plastic waste management in the study area, and the study participants' views on the effectiveness of these policies and regulations.

The questionnaire was designed using a combination of closed-ended and open-ended questions to allow for both quantitative and qualitative data analysis. The data collected from the questionnaire was analyzed using statistical software and thematic analysis to identify patterns and themes in the data.

Key Informant Interview

Key informant interview was conducted with the concerned body of the woreda to get information about the governmental and private organizations involved in plastic waste management in the study area. Also, the interview includes plastic waste management experts and individual plastic waste collectors.

3.5 Data Analysis Method

The data analysis involves both quantitative and qualitative techniques. The data collected from the study participants through questionnaires, interviews, and field observations will be analyzed using statistical software and thematic analysis, respectively.

The quantitative and qualitative data was integrated using a mixed-methods approach. The results from the quantitative analysis was used to provide a general overview of plastic waste management practices in the study area and to identify any significant differences between groups. The qualitative analysis was used to provide a deeper understanding of the factors affecting plastic waste management practices and to identify the challenges and opportunities for improving plastic waste management in the study area.

Chapter 4: Assessment of Plastic Waste Management Practices and its Challenges

In this chapter, will provide an in-depth analysis of the data collected from the study participants through questionnaires, interviews, and field observations, and will present the key findings and their implications for plastic waste management in urban areas of Ethiopia.

4.1. Characteristics of the Respondents

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

4.1.1 Demographics of the Respondents

The demographic of the respondents include, gender, and level of education.

A total of 100 respondents were included in the study and all of them responded to the questionnaire. Among the 100 respondents, 70% of them were from a household, 7% were from offices and 23% were from market/trade institutions. The majority of the respondents were females 58% and 42% were males. Also of the respondents, 76% completed higher education, 19% high school, and 5% elementary.

Table: Gender			
Sex	Frequency	Percent	Cumulative Percent
Males	42	42.0	42.0
Females	58	58.0	100.0
Total	100	100.0	

Table: Level of Education			
Academic Ranking	Frequency	Percent	Cumulative Percent
BA	25	25.0	25.0
BSc	19	19.0	44.0
Certificate	3	3.0	47.0
Diploma	21	21.0	68.0
Elementary	5	5.0	73.0

High School	19	19.0	92.0
MA	5	5.0	97.0
MSc	3	3.0	100.0
Total	100	100.0	

Table 1. Category, gender, and education of the participants

Due to major time constraints, the researcher was able to interview 4 key informants in total, from which 3 informants were plastic waste collectors and 1 woreda expert, (woreda 7 cleaning administration department team leader).

4.2 Environmental Awareness of the Respondents

According to the World Bank, Ethiopia generates approximately 2.8 million tons of waste annually, and the majority of this waste is not properly managed, leading to environmental and health hazards. Plastic waste is a significant contributor to this problem, as it is non-biodegradable and can persist in the environment for hundreds of years, causing harm to wildlife, ecosystems, and human health.

Environmental awareness is very low in Ethiopia. People dumps waste into rivers, fields, and ditches. This is known to be the only possible approach to dispose waste. The harmful effects of such disposal are not clear. Taking responsibility for the city while protecting one's own home is lacking in society (Meazacheru, 2016).

The woreda indicates that 82% of the community were given awareness creation, but the study indicated that 89% of the respondent have never been given any training or awareness on proper plastic waste management. Nifas Slik's Woreda 7 cleaning administration department team leader said this is because many of the residents are not found at home during working days and most people are home on weekends, especially Sundays not working days for the officers.

The key informant also points out the woreda is carrying out awareness creation using more than 15 officers in the door-to-door program, Conducting different training programs, and prepare seasonal panel discussions with the society, and distributing different brochures and flyers. The main challenge that encountered during the awareness creation program is; the household owners

are not found at home when the officers give door-to-door awareness and some of the households don't emphasize plastic waste disposal. Outcomes, according to the woreda's assessment 45% of the households in the woreda have sufficient awareness of plastic waste management, and they have adequate skills in separating organic and inorganic solid wastes.

Regarding environmental impact awareness, 99% of the respondents indicated that they know the environmental impacts of plastic waste if it is not managed properly. In addition, all of the key informants' said they think there is good environmental awareness among the people, but there should be organization and mobilization campaigns to initiate and motivate the people to participate actively. Especially one plastic waste collector said, *"Carelessness and lack of responsibility is the main problem, not awareness."*

93% of the study samples responded that they believe plastic waste is a major problem in their area. This indicated that people have more concerned about the plastic waste problem than other environmental problems. The study revealed that majority 93% of the respondents think that environmental problems will minimize if plastic waste is managed properly.

Walking in Nifas Silk Lafto Sub-city woreda 7 one can observe poor plastic waste management with plastics thrown here and there at the sides of the road, drains, and in ditches according to the field observation of the researcher. This creates unpleasantness for the eye and environmental concerns. However, areas with good plastic waste management were also observed.

People's attitudes affect not only the characteristics of waste generation but also the actual demand for waste collection services. According to UNDP (1996), people's attitudes towards waste can have a positive impact on their interest in and willingness to pay for collection services. Additionally, awareness campaigns and educational measures can have a positive impact on attitudes. We can change the negative impact of poor waste management on public health and environmental conditions. Such awareness campaigns also inform people about their responsibilities as waste producers and their rights as citizens to receive waste management services.

Therefore awareness campaigns should be coordinated with improvements in waste collection, reuse, recycling, and other integrated approaches. Whether adopted handling systems are

similar or not, people's waste handling patterns are influenced by their neighbors, so a collective logic should be involved, because improved waste handling practices will only yield significant environmental impacts if most households in an area participate in the improvement. Thus, besides general awareness campaigns, improved local waste management depends on the availability of practical options for waste handling and a consensus among neighbors (Kumuyi,1999 and Berry, 1997).

Therefore, attitudes towards plastic waste may be positively influenced by public information and awareness measures. At the same time, improved waste handling patterns can't be maintained in the absence of knowledge. However, even though practical knowledge is maintained, some individuals either due to negligence or dissatisfaction with the existing service delivery system in a city may take opposite action towards plastic waste handling. As a result, their action may harm the storage, collection, and transportation of plastic waste.

4.3 Plastic waste management

The study on Plastic Waste Management Practices and Challenges: The Case of Woreda 7, Nifas Silk Lafto Sub-city, Addis Ababa identified several challenges associated with plastic waste management in the study area. The main challenges explored in the study include inadequate waste management infrastructure, lack of awareness and education on plastic waste management, and poor waste disposal practices.

Inadequate waste management infrastructure was identified as a major challenge in the study area. The study found that the existing waste collection and disposal infrastructure was insufficient to meet the growing demand for waste management services in the area. This lack of infrastructure has resulted in poor waste collection and disposal practices, which have contributed to the accumulation of plastic waste in the environment. The study proposed that improving waste management infrastructure, including waste collection, transportation, and disposal facilities, could help to address this challenge.

The study also found that the level of awareness and education on plastic waste management was relatively low among the respondents. The lack of awareness and education has contributed to poor waste management practices, such as improper disposal of plastic waste. The study proposed

that community-based education and awareness-raising programs could help to promote the adoption of sustainable waste management practices, including plastic waste reduction and recycling.

Poor waste disposal practices were also identified as a significant challenge in the study area. The study found that the majority of the respondents disposed of their waste in open dumps or burned their waste, which contributes to environmental pollution and health hazards. The study proposed that the adoption of sustainable waste disposal practices, such as composting and recycling, could help to reduce the amount of plastic waste generated and improve waste management practices in the study area.

In conclusion, the study identified several challenges associated with plastic waste management in the study area. The proposed solutions include improving waste management infrastructure, promoting education and awareness-raising programs, and adopting sustainable waste management practices. These solutions can help to promote sustainable waste management practices, reduce plastic waste generation, and contribute to environmental sustainability and public health.

4.3.1 Plastic waste sorting practices

Sorting is a crucial part of waste management. Sorting is separating non-identical wastes in their respective nature. It makes waste management easy and simple. However, it should not be a one-time activity, rather it should be a habit for proper and sustainable waste management.

The study showed that 96% of the respondent, agreed to segregate their plastic wastes in different containers. Also, the key informant mentioned more than 75% of households segregate their plastic wastes from other wastes, and due to that more than 190 tons of plastic waste were collected in the last 11 months of 2013 E.C.

However, plastic waste collectors mentioned that there is a lack of awareness among society regarding the significance of separating plastic waste from other wastes, which makes their job more difficult.

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

4.3.2 Plastic waste reduction and recycling practices

Plastic waste reduction refers to the efforts made to reduce the amount of plastic waste generated in the study area and to increase awareness among the community about the negative impacts of plastic waste.

85% of the respondent do not try to reduce the amount of plastic they use. 15% of the respondents mentioned that they try to reduce the amount of plastic they use by reusing plastic bottles and another plastic packaging, also by avoiding using plastic bags and replacing them with paper bags. The key informant also mentioned that woreda’s plastic waste management system focuses on the disposal of plastic wastes instead of minimizing them at the production level.

The study highlights the need for education and awareness-raising programs to promote plastic waste reduction practices among the community. The study also underscores the importance of community-based initiatives, such as waste segregation and recycling programs, to reduce plastic waste and improve waste management practices in the study area.

Plastic waste reduction is an essential component of sustainable waste management practices, and it is crucial for achieving environmental sustainability and protecting human health. Plastic waste reduction initiatives can also have economic benefits by reducing waste disposal costs and creating opportunities for the development of a recycling industry.

There are both economic and environmental advantages to source reduction, primarily the reduction in pollution and cost of plastic waste management and disposal. In addition, source reduction activities can result in changes to the composition of plastic waste. The total cost of a

plastic waste management system is associated with the collection, processing, and disposal of materials. Source reduction can reduce the costs of plastic waste management in several ways primarily by reducing the quantity of waste to be managed, avoiding purchasing costs, and collecting revenues from the resale of items (Tchobanoglous and Kreith, 2002).

4.3.3 Plastic waste disposal practices

It can be observed 100% of the respondent indicated they have regular garbage collectors, they also mentioned the collectors come once or twice a week. 94% of the respondent indicate the waste disposal practice is free of charge. 77% of the respondent were satisfied with the current disposal system, however, 23% were unsatisfied, 18% due to the frequency of disposal, and 4% other reasons like the behaviour of the collectors, and they also mentioned they only collect from household not from the streets or our surroundings.

95% of the respondent indicated that they dispose of their waste in nearby containers, 3% in open spaces, and 2% near home.

Table: Where do you dispose of your plastic waste?			
Plastic waste disposal	Frequency	Percent	Cumulative Percent
Nearby container	95	95.0	95.0
Open spaces	3	3.0	98.0
Near home	2	2.0	100.0
Total	100	100.0	

Table: Are you satisfied with your current waste disposal system?			
Waste disposal system ranking	Frequency	Percent	Cumulative Percent
Unsatisfied	23	23.0	23.0
Satisfied	77	77.0	100.0
Total	100	100.0	

Table: If you are not satisfied with the current plastic waste management system, what is the main reason?				
Plastic waste management system		Frequency	Percent	Cumulative Percent
	Frequency of disposal	18	18.0	81.8
	Others	4	4.0	100.0
	Total	22	22.0	
Missing	System	78	78.0	
Total		100	100.0	

Table: How much are you currently spending on waste disposal per month?			
	Frequency	Percent	Cumulative Percent
10 to 30 birr	6	6.0	6.0
Free	94	94.0	100.0
Total	100	100.0	

Table 2. Plastic waste disposal practices

4.3.4 Value chain of plastic waste management

The value chain refers to the various stages involved in the production, distribution, and disposal of plastic waste and the actors or stakeholders involved in each stage. The study found that the plastic waste value chain in the study area consisted of several stages, including plastic waste generation, collection, and transportation, sorting, and recycling. The actors involved in the value chain included waste generators (e.g., households, businesses), waste collectors, waste traders, waste sorters, and recycling companies.

The collectors collect the waste from waste generators, the traders will buy the plastic waste from different collectors, thereafter, and the waste is sorted according to polymers. Some are high density and some are low density. After sorting, plastics are weighted and packed to be sold to recyclers.

The key informant mentioned that three formal groups (30 adults) were organized in the woreda to collect plastic wastes, and within the last 12 months these three groups collect 278 tons of plastic

waste and sell to recycling companies and get more than 2.7 million birr. These groups mentioned they are happy with the business opportunity the woreda gave them and they also mentioned they are giving job opportunities to other unemployed adults.

However, the main concern they have is, that they don't have a permanent working place and this caused different conflicts with government law enforcement officers and this enable them to perform effectively, they also mentioned they addressed their concerns to the woreda but still, they are facing the same problem. The key informant indicates that of the three organized plastic waste collectors groups two of them didn't have a permanent place to do their job. But, recently the woreda administration is trying to solve this problem by preparing a permanent place (10x10 meters) for each. The other challenge pointed out was the lack of recycling industries, which is a big problem faced by the country.

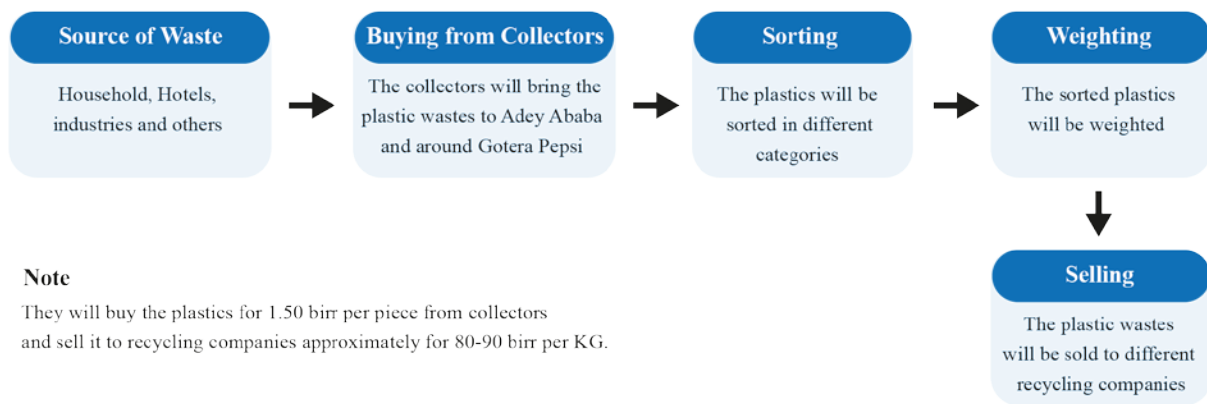


Fig 4. Value chain of plastic waste management (own source)

Results of the study also showed, that 63% of the respondent said the most effective way to manage plastic pollution is by government regulation, 28% said by individual action and efforts, 8% said by actions/campaigns by NGOs, and 1% said by other methods.

Table: According to you what is the most effective way to manage plastic pollution in your woreda?			
Ways to manage plastic pollution	Frequency	Percent	Cumulative Percent
Government regulations	63	63.0	63.0
Actions/ campaigns by NGOs	8	8.0	71.0
Individual action and effort	28	28.0	99.0
Others	1	1.0	100.0
Total	100	100.0	

Table 3. An effective way to manage plastic pollution

4.3.5 Challenges of plastic waste management system

Plastic waste management is a complex issue that requires a multifaceted approach to address the challenges it poses. The case of Woreda 7, Nifas Silk Lafto Sub-city in Addis Ababa highlights some of the challenges faced in managing plastic waste.

One of the major challenges is the lack of proper waste collection and disposal infrastructure. The sub-city lacks sufficient waste collection trucks and designated waste disposal sites, leading to the accumulation of plastic waste in public spaces. This not only poses a health hazard but also contributes to environmental degradation.

Another challenge is the lack of awareness among the general public about the negative impacts of plastic waste on the environment. Many people continue to use single-use plastics without considering their impact on the environment. This leads to the generation of large amounts of plastic waste that are difficult to manage.

Furthermore, the informal sector plays a significant role in the plastic waste management system in the sub-city. However, the lack of regulation and support for the informal sector makes it

difficult for them to operate effectively. This leads to inefficient waste collection and disposal practices that contribute to environmental pollution.

In addition, the sub-city faces challenges in implementing policies related to plastic waste management. The lack of political will and commitment to enforcing regulations related to plastic waste management hinders the effective implementation of policies.

Finally, the sub-city lacks sufficient resources to address the challenges of plastic waste management. This includes financial resources as well as human resources such as trained personnel to manage waste collection and disposal.

Chapter 5: Conclusion and Recommendation

5.1 Conclusion

This study has tried to investigate the status and challenges of plastic waste management in Woreda 7 Nifas Silk Lafto Sub-city in Addis Ababa. Based on the revised literature, the data collected, and the findings obtained, the following conclusions were attempted drawn: an analysis based on the types of plastic waste management such as reduction, sorting, collection, and disposal practiced revealed that the current plastic waste management practice was said to be moderate and needs to improve. Due to these three main reasons:

5.1.1 Lack of awareness of the community

One of the challenges is the low level of knowledge and understanding among the general public about the negative impacts of plastic waste on the environment. Many people continue to use single-use plastics without considering their impact on the environment. This leads to the generation of large amounts of plastic waste that are difficult to manage.

Additionally, there is a lack of awareness about the importance of proper waste disposal practices. Many people dispose of waste, including plastic waste, in public spaces, creating an environmental and health hazard. This is partly due to the lack of available waste disposal infrastructure in the sub-city.

The lack of awareness is also evident in the informal sector, which plays a significant role in plastic waste management in the woreda. Many informal waste collectors and recyclers do not have adequate knowledge about the negative impacts of plastic waste on the environment. This leads to inefficient waste collection and recycling practices that contribute to environmental pollution.

To address these challenges, there is a need for community education and awareness-raising campaigns about the negative impacts of plastic waste on the environment. The campaigns should emphasize the importance of reducing the use of single-use plastics and proper waste disposal practices. The campaigns should also target the informal sector, providing training and support to improve their waste collection and recycling practices.

5.1.2 Lack of law enforcement

Lack of political will and commitment to enforcing regulations related to plastic waste management is the other challenge. Although there are regulations in place to manage plastic waste, the enforcement of these regulations is weak. This leads to non-compliance by the public and the informal sector, contributing to environmental pollution.

Another challenge is the lack of penalties for non-compliance with plastic waste management regulations. The absence of penalties makes it difficult to enforce the regulations effectively, as there are no repercussions for non-compliance.

Furthermore, the informal sector plays a significant role in plastic waste management in the sub-city. However, the lack of regulation and support for the informal sector makes it difficult to enforce plastic waste management regulations. This leads to inefficient waste collection and disposal practices that contribute to environmental pollution.

To address these challenges, there is a need for political will and commitment to enforcing plastic waste management regulations. This includes the establishment of penalties for non-compliance with regulations and the provision of resources to support the enforcement of regulations. The informal sector should also be regulated and supported to improve their waste collection and recycling practices.

5.1.3 Lack of disposal infrastructure

One of the primary challenges is the insufficient number of waste collection trucks and designated waste disposal sites. The sub-city generates a significant amount of plastic waste, but the current waste collection system is inadequate to handle the volume of waste produced. This leads to the accumulation of plastic waste in public spaces, contributing to environmental degradation and posing a health hazard.

The lack of a proper waste disposal site is another significant challenge. The woreda does not have a designated landfill site for plastic waste disposal. As a result, plastic waste is often disposed of in open spaces, including rivers and other water bodies, creating an environmental and health hazard.

To address these challenges, there is a need to improve waste collection and disposal infrastructure in the sub-city. This includes increasing the number of waste collection trucks and establishing designated landfill sites for the disposal of plastic waste. It is also essential to educate the public about the importance of separating waste at the source to facilitate effective plastic waste management.

5.2 Recommendation

The finding of this study showed that the existing plastic waste management practice in Woreda 7, Nifas Silk Lafto Sub-city and the services given by the municipality was moderate, and needs to improve. Therefore, the following recommendations are presented:

- **Increase public awareness:** There is a need to increase public awareness about the negative impacts of plastic waste and the importance of proper waste management practices. This can be achieved through educational campaigns targeting households, schools, and businesses, as well as the use of social media and other communication channels.
- **Improve waste collection and disposal:** The local government should invest in improving waste collection and disposal infrastructure, including the construction of waste transfer stations and the expansion of waste collection services. This can help to ensure that plastic waste is collected and disposed of properly, reducing the risk of environmental contamination.
- **Encourage recycling:** Recycling is an effective way to reduce the amount of plastic waste that ends up in landfills or the environment. The local government can encourage recycling by providing incentives for businesses and households that recycle, as well as establishing recycling centers and promoting the use of recycled plastic products.
- **Implement policies and regulations:** Policies and regulations can help to ensure that plastic waste is managed properly. The local government should consider implementing policies and regulations that require businesses to reduce their use of plastic or to use biodegradable alternatives, and that establish penalties for improper disposal of plastic waste.

- **Engage stakeholders:** Effective plastic waste management requires the involvement of multiple stakeholders, including government agencies, businesses, civil society organizations, and the public. The local government should engage these stakeholders in developing and implementing waste management strategies.

In conclusion, plastic waste management is a complex issue that requires a coordinated effort from various stakeholders. By implementing the recommendations outlined above, Woreda 7, Nifas Silk Lafto Sub-city, Addis Ababa can improve its plastic waste management practices and reduce the negative impact of plastic waste on the environment and human health.

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Annex I

Respondent Code: _____

1. Introduction

Dear Respondent,

Good day! This is a questioner survey to collect primary data to examine Assessment of Plastic Waste Management Practices and Challenges the Case of Nifas Silk Lafto Subcity, Woreda 7 Addis Ababa. Through this brief survey, your answers will help enhance plastic waste management. Your response will only be confidential and will be used for educational purposes. All responses will be compiled together and analyzed as a group. It should take about twenty minutes of your time.

2. Demographic Data

Category: Household ☐ Offices ☐ Market/ Trade institutions ☐

Respondents Age: _____

Sex: _____

Level of Education: _____

Type of Education: _____

Questionnaire for Household Survey

1. Household size _____
2. Average monthly household income
A. < 2000 B. 2000 – 5000 C. 5000 – 7000 D. >7000
3. Have ever been educated or gotten training on proper plastic waste management?
A. Yes B. No
4. Are you aware of the environmental impacts of plastic waste?
A. Yes B. No
5. Do you personally think plastic waste management is a major problem in the area?
A. Yes B. No
6. Do you think environmental problems in your area will minimize if the plastic waste is properly managed?
A. Yes B. No
If yes, how? _____
7. Do you try to reduce the amount of plastic you use?
A. yes B. No
If yes, how? _____
8. Where do you dispose of your plastic waste?
A. Nearby container B. Open spaces C. Near home
D. Others, Specify _____
9. Do you have regular garbage collection in your area?
A. Yes B. No
If yes, can you explain? _____

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

A. Yes B. No

C. Any other alternative _____

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

A. Highly unsatisfied B. Unsatisfied C. Satisfied D. Highly satisfied

12. If you are not satisfied with the current plastic waste management system, what is the main reason?

A. Distance from home B. Costs too high C. Frequency of disposal

D. Other _____

13. How much are you currently spending on waste disposal per month?

A. 10 to 30 birr B. 35 to 50 birr C. 60 to 80 D. > 100 birr E. Free

14. How many plastic items do you buy/use per week?

A. 0 B. 1-5 C. >10 D. I am not sure

15. Which plastic products do you use most often? *Check all that apply.*

☐ Plastic bags

☐ Plastic bottles

☐ Plastic buckets, bins, barrels, Storage containers

☐ Plastic disposables (Straws, plates, spoons, glasses and others)

☐ Packaging (bottles, sachets, food container from food delivery, cling wraps, cosmetic containers)

☐ All of the above

Other: _____

16. According to you what is the most effective to manage plastic pollution in your woreda?

A. Government regulations

B. Actions/ campaigns by NGOs

C. Individual action and effort

D. Other: _____

Questionnaire for Offices and Market/ Trade Institutions Survey

1. Employee size _____
2. Have ever been educated or gotten training on proper plastic waste management?
A. Yes B. No
3. Are you aware of the environmental impacts of plastic waste?
A. Yes B. No
4. Do you personally think plastic waste management is a major problem in the area?
A. Yes B. No
5. Do you think environmental problems in your area will minimize if the plastic waste is properly managed?
A. Yes B. No
If yes, how? _____
6. Do you try to reduce the amount of plastic you use?
A. yes B. No
If yes, how? _____
7. Where do you dispose of your plastic waste?
A. Nearby container B. Open spaces C. Near home
D. Others, Specify _____
8. Do you have regular garbage collection in your area?
A. Yes B. No
If yes, can you explain? _____
9. Will you agree if you are given two separate containers to segregate your plastic waste from other wastes?
A. Yes B. No

C. Any other alternative _____

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

A. Highly unsatisfied B. Unsatisfied C. Satisfied D. Highly satisfied

11. If you are not satisfied with the current plastic waste management system, what is the main reason?

A. Distance from home B. Costs too high C. Frequency of disposal

D. Other _____

12. How much are you currently spending on waste disposal per month?

A. 10 to 30 birr B. 35 to 50 birr C. 60 to 80 D. > 100 birr E. Free

13. How many plastic items do you buy/use per week?

A. 0 B. 1-5 C. >10 D. I am not sure

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☐ Plastic disposables (Straws, plates, spoons, glasses and others)

☐ Packaging (bottles, sachets, food container from food delivery, cling wraps, cosmetic containers)

☐ All of the above

Other: _____

15. According to you what is the most effective to manage plastic pollution in your woreda?

A. Government regulations

B. Actions/ campaigns by NGOs

C. Individual action and effort

D. Other: _____

Annex II

Introduction

Dear Respondent,

Good day! This is a questioner survey to collect primary data to examine Assessment of Plastic Waste Management Practices and Challenges the Case of Nifas Silk Lafto Subcity, Woreda 7 Addis Ababa. Through this brief survey, your answers will help enhance plastic waste management. Your response will only be confidential and will be used for educational purposes. All responses will be compiled together and analyzed as a group. It should take about twenty minutes of your time.

Questionnaire for Key Informants

Name _____

Gender _____

Position and responsibility _____

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

Annex III

Introduction

Dear Respondent,

Good day! This is a questioner survey to collect primary data to examine Assessment of Plastic Waste Management Practices and Challenges the Case of Nifas Silk Lafto Subcity, Woreda 7 Addis Ababa. Through this brief survey, your answers will help enhance plastic waste management. Your response will only be confidential and will be used for educational purposes. All responses will be compiled together and analyzed as a group. It should take about twenty minutes of your time.

Questionnaire for Woreda Experts

Name _____

Gender _____

Position and responsibility _____

1. Can you please describe the responsible bodies involved in Plastic waste management in your Woreda?
2. How do you describe the current plastic waste management system?
3. Has the Woreda conducted any kind of awareness-creating programs about plastic waste management? And what are its outcomes?
4. Is the existing plastic waste management of the Woreda satisfactory?
 - a. Yes b. No
5. If no. what challenges and problems contributed to this?
6. What are the main challenges of the Plastic waste management system in the Woreda?
7. What do you think is the solution to these problems?