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DOMESTIC SOLID WASTE MANAGEMENT PRACTICE AND CHALLENGES, THE CASE OF AGARO TOWN IN OROMIA NATIONAL REGONAL STATE ETHIOPIA

A THESIS SUBMITTED TO THE SCHOOL OF POST GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTERS OF SCIENCE IN BIOLOGY

BY: TAMIRAT KEBED

ADVISER:-BIKILA WARKINEH (PHD)

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BY: Tamirat Kebede Senbeta

Advisor: Bikila Workneh (PHD)

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Addis Ababa Ethiopia

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Domestic solid waste management practice and challenges in the case of Agaro town As a thesis research advisor we here by confirm we have ready reviewed the thesis titled" Oromia national regional state, Ethiopia" we recommended that that it be submitted to complete the thesis requirement

Bikila Workneh (PHD) _____ _____

Main advisor signature Date Signature

As the member of the board of examiners of the MSc. Theses open defense examination we certify that we have read it and evaluate the thesis prepared by Tamirat Kebede the candidate. We recommended the thesis be accepted as fulfilling the thesis requirement for the degree of master of science in the filed of biological science .

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ACCRONIAYMS AND ABRIVATIONS

AASBPDA	Addis Ababa Sanitation Beautification and park development Agency
CSA	Central Statistical Agency
EGSSAA	Environmental Guidance for Small Scale Activities in Africa
EPA	Environmental Protection Agency
HHs	Households
MSW	Municipal Solid Waste
MUDC	Ministry of Urban Development and Construction
OUPI	Oromia Urban Planning Institution
PPP	Private Public Partnership
SWMS	Solid Waste Management Systems
UN	United Nation
UNDP	United Nations Developmental Program
UNEP	United Nations Environmental Program
UNESCO	United Nations Educational Scientific and Cultural Organization

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ABSTRACT

Solid waste management is the main challenge of the world. The poor solid waste management practices in developing countries have a great impact on human health and environmental pollutions such as water air and soil.to reduce this risks studying the condition and finding solution is essential Therefore, This study is conducted in Agaro town which is situated in Oromia National regional state, Jimma zone, southwestern part of Ethiopia. According to Ministry of urban and construction report, the town is grouped as the second level large town with estimated population about 89192. The study method was mixed method with descriptive sample survey. Samples have been selected using purposive and simple random sampling methods. Data were gathered through questionnaires; interview, personal observation and measurement. HHs practices on solid waste temporary collection storage, segregation, reuse, composting have treated. Municipality activities on transporting disposing recycling practices and challenges that affect solid waste management have treated. The illegal disposing of solid waste, lack of public awareness, low level public participation, lack of segregation, reuse and recycle and improper handling of solid wastes have seen at the side of HHs. Municipality efforts on solid waste management show un equal access of collection and transportation both in shortage of vehicle and rates, shortage of trained man power, equipment's, enforcing or implementing laws and regulations, lack of encouraging of participation solid waste management, lack of simple technologies low level of payment for solid waste collection services that resulted for shortage of finance were the main factors that affect solid waste management thus we have to work towards healthy and clean environment.

Keywords: - Domestic, Households, Public involvement, Practices, solid waste, solid waste management,

1. INTRODUCTION

1.1. Background of the study

Almost all human activities create waste in some form or another. Most individual items of waste, particularly wastes from household and offices, have less danger to public health rather the improper handling, storage, collection and disposal of these material have higher negative effect. In Ethiopia an estimated 30% to 50% of solid trash generated in highly un regulated (MUDC, 2012).

The spread of endemic diseases is linked to certain viral and other infectious disorders. Additionally, unmanaged trash clogs drainage systems and worsens the health effects of standing water. Furthermore, accumulation garbage presents a constant risk of bodily harm to those in close vicinity, especially kids. . In general, clean and healthy living conditions in cities and towns cannot be achieved without reliable and regular waste collection and adequate disposal systems (Adogue, 2015).

The history of the solid waste management system dates back thousands of years. The ancient Greeks were among the first people to implement waste management techniques in the fourth century A.D. The Greeks had numerous difficulties in coordinating waste disposal systems with an expanding populace, limited land, and issues with sanitation.

Trash was simply gathered and moved to pits outside of the city, a very basic form of waste management. Garbage was not considered a hazard to human and environmental health until after urban populations grew rapidly (Natanson, 2015).

The world has effectively become a collection of rural and urban areas confronting similar environmental difficulties, the majority of which must be addressed on an international scale due to the enormous population growth that has occurred over the 20th century (Smith, 2010).

In African cities, managing solid waste is turning into one of the biggest problems. The majority of municipalities are not able to collect the growing amounts of solid trash, which is essential for safeguarding urban environments, public health, and the reputation of towns and cities. There is an urgent need to address the current issue since a rapid rate of urbanization will make it more difficult to collect and dispose of solid trash in the years to come (UN-Habitat, 2010a).

Adopting the principles of good governance is a top priority for international donors seeking to improve solid waste management. Development objectives as a result center on governance, and in its most recent report, the United Nations (UN) even coined the phrase "good garbage governance" (UN-Habitat, 2010a, 2010b). In an effort to include non-state actors in solid waste management and increase its cost-effectiveness, employment potential, and power distribution to lower levels of city and town administrations, public-private partnerships, or PPPs, and decentralization have been employed as key tactics (Camilla 2013).

Solid waste management is one of the most important environmental challenges since it is a necessary problem that affects both developed and developing countries. Reusing garbage and optimizing environmentally sound waste reuse and recycling at the first phase in waste management became a global agenda item at the United Nations conference on environmental and development in Rio De Janeiro in 1992.

The rapid urbanization of emerging nations has outgrown towns' capacity to provide and administer services, the primary one being solid waste management, in terms of both money and labor. In addition, the current rate of urban population growth in less developing countries not only deteriorates the immediate environment of residents and surroundings, but also significantly impacts the urban poor, women, and children who are susceptible to diseases linked to improper solid waste management (Daniela et al., 2010).

Every day, thousands of tons of solid trash are produced in Africa. The majority of it ends up in open landfills and moist areas, where it contaminates ground and surface water and poses serious health risks. Only a few towns and areas have access to generation rates, which range from 0.5 to 0.8 kg per person per day in developing nations to 1-2 kg per person per day in industrialized nations Due to inadequate waste management budgets for proper solid waste management, equipment failure, mismanagement, and fiscal irresponsibility, the majority of garbage in Africa is not collected by municipal collection systems (EGSSAA, 2009).

For instance, in Addis Ababa, social issues include low public awareness, unlawful dumping, unsanitary conditions for garbage workers, a lack of private sector participation and community involvement, and organizational ineptitude with regard to necessary equipment for operation and staff qualifications. The institutional difficulty is human resource development, training, and unreliable service (Nigatu, et al., 2011).

1.2. Statement of the problem

Sources are carelessly thrown on open ground, and urban environmental issues are a widespread occurrence in both industrialized and developing nations. Poor solid waste management, which is generated by homes, businesses, industrial byproducts, institutions, and construction and demolition activities, is one of the reasons why urban environment problems are so common. Inappropriate solid waste collection and disposal is becoming a major public health In developing nations, the methods used now for managing municipal solid waste particularly for collection, processing, and disposal are deemed ineffective. Low collection coverage and water pollution, the growth of vermin and flies, and the management and control of informal waste picking or scavenging activities are typical issues (Barton, 1995).

Cities have an impact on surrounding environments, and rapid urban growth, particularly in developing nations, frequently strains infrastructure and services to the breaking point. Even in wealthy cities, there are concerns with sewage and waste management, as well as dangerously high levels of air pollution. This demonstrates how the ongoing high population influx into cities and towns, coupled with their rapid urban expansion, increases the volume of waste entering the urban environment and contributes to urban environmental concerns (Barrow, 1999).

The safe, clean, and efficient collection, treatment, and disposal of solid waste is essential to maintaining our quality of life. Inadequate waste management in urban areas can impede urban development by harming the area's reputation, endangering public health, and directing scarce resources toward pointless endeavors. The majority of municipal waste produced by various environmental concern in urban areas of many developing countries, and public sectors in many countries are unable to deliver services effectively (Melaku, 2008).

Among other services, solid waste management has received relatively little attention in developing nations because of the insufficient capacity of the responsible sector, public knowledge of the serious causes of trash, and the sector's meager collection of funding .consequently, the level of services necessary to safeguard the environment and public health are not met (Getahun, 2011).

The issue is particularly severe at the local government level, where there is a weak financial foundation for public services, including solid waste management, due to the underdeveloped local function system. Poor solid waste management has significant detrimental effects on the environment, including air, water, and soil pollution as well as issues with safety and health. The provision of solid waste management services by local governments has proven to be an increasingly challenging task for them to undertake. The issue is made worse by the general public's and garbage generators' ignorance of the detrimental effects of solid waste being deposited in open fields, a practice that is widespread in most municipalities (MUDC, 2012).

Rapid population growth in Agaro Town is a result of both natural population growth and rural-to-urban migration. The town had a total population of 25458 according to the CSA's 2007 national census report; however, in 2011, the Oromia Urban Planning Institute completed a research that assessed the population to be 33439. Agaro municipality reports that 89192 people 2023/2024. The town's rapid development and population growth have led to an increase in the volume of solid trash, which has increased the need for infrastructure, institutional setup, and community involvement in solid waste management. However, the agency in charge of the town's solid waste management operations, the sanitation, beautification, and parks development department, was unable to meet the standards. For instance, the Oromia Urban Planning Institute studied the state of solid waste management in Agaro town in 2011 The study looked into the types and sources of solid waste produced in the town; it did not address household and private institution practices. Instead, it focused on the factors that were reported to affect solid waste management in the town, including a lack of trained personnel, equipment, and workers, as well as the lack of a permitted disposal site. This study has concentrated on filling this gap by evaluating home practices, the state of affairs at the moment, and the variables influencing the solid waste management program

1.3. Research questions

The following inquiries concerning solid waste management's difficulties and practices are addressed

1. How much solid garbage are produced by families number, and what is the physical makeup of that waste?
2. What are solid waste management initiatives does the municipality currently undertake?
3. What procedures do the households follow for managing their solid waste?
4. What issues do homes and municipalities face when it comes to solid waste management?

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1.4. Objectives of the study

1.4.1. General objective of the study

The study main goals are to asses current solid waste management at the municipal and house hold level as well as the factors that affect the solid waste management in the town

1.4.2. Specific objective of the study

- To Identifying the quantity, rate, and physical makeup of solid waste generated in Agaro town;
- To Describing the municipality's present solid waste management status; and investigating home solid waste management practices.
- To investigate the factors challenge solid waste management at households, municipal level
- To Provide Possible Suggestion for the Improvements of Solid Waste Management?

1.5. Scope of the study

The study has investigated the current solid waste management practices and challenges in Agaro town. It concentrate to residential and institutional areas and focus on identifying solid waste sources, amount and composition of solid waste generate per household. The households and municipality and private institutions activities on solid waste storage, collection, transport and disposal practices have examined. It also investigated the factors that challenge the system of solid waste management process Thus the study area delimited in

terms of special coverage on two administrative units of the town which are BirbirsaWaritu and BekeAgalo Kebele that have more service centers such as commercial, institutions and residents, and found at the center of the town where more solid wastes has generated.

1.6 .Significance of the study

The findings of this study could contribute to better solid waste management practices in communities, municipalities, and private establishments. It determined the variables affecting solid waste management at the home and municipal levels and will offer recommendations to decision-makers to enhance present solid waste management procedures and reduce obstacles. This might be accomplished by raising citizens' awareness Residents were able to lessen the detrimental effects of solid waste on their health and the surrounding environment. It will also serve as a resource for academic institutions conducting research to address associated social, economic, and environmental issues in local communities.

1.7. limitation of the study

Numerous factors prevent a more thorough and in-depth analysis of the difficulties and practices of solid waste management in Agaro Town. A few of the contributing problems included: insufficient time to complete the study on schedule; unwillingness on the part of some authorized individuals to provide the essential information, particularly regarding the family's income level;

1.8. Definition of key terms

Litter is defined as anything that has no inherent value, such as glass, metal, cigarette butts, paper goods, food scraps, garden debris, or other items that detract from the area's visual appeal or hygienic conditions (EPA, proclamation number 513/2007).

A household is defined as an individual or group of individuals, whether or not they are connected to each other, who typically reside in the same dwelling unit and share a common kitchen area (CSA, 2007).

The term "Integrated Solid Waste Management" refers to all waste management-related operations (UNEP, 1996)

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The phrase "municipal solid waste" refers to the diverse range of waste materials generated in urban areas (Technobanoglous et al., 1993).

Solid waste management (EPA, proclamation number 513/2007) is the gathering, moving, storing, recycling, or disposing of solid waste.

1.9. Organization of the study

This Thesis is divided into seven chapters, each of which has a distinct component. The first section is introduction. It covers the history of solid waste management, people's experiences

with it, and the difficulties that various countries, especially those in Africa, have faced. The study gaps have been explained in the problem statement section.

Both the overarching goal and the particular goals have been identified. The study's limitations, boundaries, and research objectives all provided an explanation of the issues that arose during the investigation. Definitions of relevant terminology and study structure given Part two comprises the literature review. This section includes mentions of many empirical study findings that have been submitted by various academics. This section also includes reviews of theoretical analysis, experiences, and conceptual frameworks for solid waste management. The third section is methodology included a description of the study region supported by a map of the study area, the municipality's organizational structure, the research design, data sampling techniques, data sources, and data collection tools.

The data analysis using data tables, percentages, pi charts, and other visual representation techniques, along with some photography, was included in the fourth section of this study report. The fifth section included a summary that included the study's key findings, conclusions, and suggestions. Appendices and References were included in the sixth and seventh sections of this study report, respectively.

2. LETERATURE REVIEW

2.1. Municipal solid waste concept

Household trash, non-hazardous waste, waste from businesses, institutions, and industries, market waste, yard waste, and material from street sweeping are all considered forms of municipal solid waste and include the tasks of collection, transfer, treatment, recycling, recovery, and disposal (Schubler, et.al. 1996).

Solid waste is whatever we want to get rid of since it is useless and unwanted (Sankoh and Yan, 2014). It originates from unwanted waste in raw materials that the public rejects (Sankoh and Yan, 2014). Since waste generation is dependent on population, population growth and urbanization will contribute significantly to the increase in solid waste, the garbage generated has grown more complicated in character as civilization and human development have advanced (Sankoh and Yan, 2014).

The amount of municipal solid waste (MSW) produced daily worldwide is 1.3 billion tons. But every country in the globe must address this issue in a way that is economically, socially, and technologically acceptable (Achankeng, 2004).

2.2. Solid Waste Management

The following are the suggested and internationally recognized solid waste handling hierarchy in ascending order of preference: open-burning, dumping, landfilling, incinerating, recycling, reuse, and prevention. However, although they are widely used in many developing nations, open burning and dumping are least favored and are actually not advised (Achankeng, 2004).

The scope of the issue of managing solid waste in cities, governments, and areas around the world varies. About one third to two thirds of the solid waste generated is dumped in the streets and drains, contributing to flooding, insect breeding, and the spread of diseases. Currently, an estimated 54% of the world's population lives in urban areas, and this percentage is expected to rise to 66% by 2050. (Awosan, et.al. 2017)

2.3. Source and type of solid waste

Table.1. Technobaglous et al. (1993) categorized solid waste source in to residential communal industrial open areas treatment plant sites agricultural along with generation facilities, activities, and locations connected with each kind.

2.3.1. Residential and commercial solid waste

Both organic (combustible) and inorganic (non-combustible) solid waste from residential and business buildings make up residential and commercial solid waste. Usually, cardboard—also referred to as paper board and corrugated paper—costs money when it comes to the organic portion of residential and commercial solid wastes. monomers of all kinds, fabrics, leather, wood, and yard items. Items like glass, crockery, tin, cans, aluminum, ferrous metal, and garbage that did not break down quickly in urban weather are included in the inorganic component. Putrescible waste is primarily produced by handling, preparing, and eating food often. Decomposition will result in the growth of flies and other vector insects as well as the formation of unpleasant smells. The putrescible nature of these wastes will have an impact on the design and functionality of the solid waste localization systems in many places. Despite the fact that paper can be classified into more than forty categories, the waste paper included in MSW is usually made up of newspapers Books, periodicals, commercial printing, office paper, heard paper, packaging, and various non-packaging paper, including corrugated canard, tissue paper, and towels (Gebrekidan Gebermichael, 2002). Simple family and multifamily detached homes in low-, middle-, and high-income groups produce residential garbage, whereas retail establishments like restaurants and stores produce commercial solid waste. markets office support for hotels lodgings print shops similar stations for fixing Particular garbage from both commercial and domestic sources includes large, heavy things, consumer electronics, white goods, and yard wastes with batteries and oil separated. Typically, the wastes are managed independently of other commercial and residential trash (Medina, 2004).

2.3.2. Institutional Waste

Grocers, mental health facilities, schools, jails, and hospitals are institutional sources of solid wastes. These sources do not include manufacturing facilities, as their solid waste generation is similar to that of municipal solid waste (MSW). In the majority of hospitals, medical wastes are handled and reported separately from other solid wastes. Common solid waste types generated

by institutional premises include paper, cardboard, plastics, wood, food wastes, glass, neutral wastes, special wastes, and hazardous wastes (Zurbrugg, 1998).

2.3.3. Municipal service solid waste

With a shortage of treatment facilities, common locations and activities for the generation of municipal solid trash include street trading, land scalping, catch basin cleaning, parks, beaches, and impossible to forecast where they will be located. Residential sources, which are likewise diffuse but specific in that waste generation is a periodic event, can be compared with nonspecific diffuse sources of wastes (Gebrie Kassa, 2009).

2.3.4. Treatment plant solid waste

Treatment plant wastes are the solid and semi-solid wastes from water and industrial waste treatment facilities; the particular features of trace materials differ. Sludge and waste water treatment facilities are frequently disposed of together in municipal landfills (Ibid)

Table 1.Typical Waste Generation Facilities, Activities, and Locations associated with various Source of Solid Waste

source	Typical location	Types of solid waste
Residential	Single-family and multifamily dwellings, low-medium, and high-rise apartments	Food wastes, rubbish, ashes, special wastes
Commercial//municipal	Stores, restaurants, markets, office buildings, hotels, motels, print shops, auto repair shops, medical facilities and institution	Food wastes, rubbish, ashes, demolition and construction wastes, special wastes, occasionally hazardous wastes
Industrial	Construction, fabrication, light and heavy manufacturing, refineries, chemical plants, lumbering, mining, demolition	Food wastes, rubbish, ashes, demolition and construction wastes, special wastes, occasionally hazardous wastes
Open areas	Streets, alleys, parks, vacant plots, playgrounds, beaches, highway and recreational areas.	Special wastes, rubbish
Treatme	Water, wastes water, and industrial	Treatment plant wastes, principally

nt plant sites	treatment processes	composed of residual sludge
Agricult ural	Field and row crops, orchards, vineyards, dairies, feedlots and farms.	Spoiled food wastes, agricultural wastes, rubbish, hazardous wastes

Source: Technobaglous solid waste management book (1993).

2.4. Composition of solid waste

The term "composition" refers to the distinct elements that comprise a solid waste stream and their proportional distribution, typically expressed as a percentage by weight (Danel Fikreyesus et al., 2010). Evaluating the requirements for systems, programs, and plans for management, as well as equipment, requires knowledge about the composition of solid waste. When assessing the requirements for systems, programs, and strategies for management, waste is a crucial consideration. According to the Addis Ababa Sanitation, Beautification and Park Development Agency (AASBPDA, 2004), residential sources account for 76% of solid waste in Addis, institutional sources account for 18%, and street sweeping accounts for 6%. Information obtained from Jimma Town's municipality indicates that, 54%, 30%, and 16% of the garbage produced in the town is recyclable, biodegradable, and disposable respectively. Food wastes make up 32.1% of all home trash by weight, according to (Melaku Tegegne,2008).

2.5. Solid waste generation rate

People can produce waste as a result of their daily activities. Depending on the person's income and way of life, this generational rate may occasionally rise. The amount of waste produced daily varies along with the way that people live. According to(Fitsum Tsegaye 2007), there is a lack of current and trustworthy data regarding the rate at which solid trash is generated in our nation's capital, Addis Ababa. Since 1982, not many studies have been conducted by various organizations. The findings indicated that, with a 1% annual growth rate and an approximate waste density of 370 kg/m3, the per capita creation of solid trash was 0.15 kg/day/person (Zerayakob Belete, 2002). The second study, conducted in 1986 by Louise Burger International, yielded a 0.20 kg/day/person rate. . In 1994 and 1995, Louise Burger International conducted the third study that was accessible. The 1994 study found that the average daily generation of solid trash per capita was 0.22 kg/day/person and that the density was roughly 336 kg/m3.The study from 1994 and 1995 demonstrates how income levels affect generational reliance. According to

data gathered in 1994, the generation/capital/day for the high, medium, and low-income groups was 0.35 kg, 0.28 kg, and 0. 17 kg, respectively. The data from 1995 indicates that the high, medium, and low weight categories are, respectively, 0.47 kg, 0.236 kg, and 0.26 kg respectively. (Zerayakob Belete, 2002).

Yitayal Beyene, (2005) conducted a quantitative and compositional analysis of the most recent sub-city data available, randomly selecting 197 households from the Arada sub-city. His findings showed that the average density of low, middle, and high income groups was 159.8 kg/m3, with corresponding weights of 116.9, 153, and 162.5 grams per capita per day.

2.6. Functional element of solid waste management

The complexity of managing solid waste in today's society stems from the variety and volume of wastes, urban sprawl, financial constraints on public services in many major cities and towns, the influence of technology, and the resulting shortages of raw materials and energy. the essential elements and interactions required, in order to carry out solid waste management in an effective and organized manner. Six functional aspects have been identified to organize the activities related to solid waste management from the point of creation to final disposal (Techobanglous, 1993).Solid waste collection, creation, separation, storage, and processing Solid waste separation, processing, and transformation; transfer and transportation creation of disposal garbage Processing and storage separation at the source Relationships between the functional components of solid waste management for disposal (Techobanglous G, 1993) is the source.

2.6.1. Solid waste generation

Waste generation includes activities where materials are determined to be no longer valuable and are disposed of by either throwing them away or gathering them together. Based on community estimates of MSW, it is important to predict the amounts of solid waste that will be generated each waste category quantities that are typically determined by the daily waste production of each individual. Rates of waste generation vary on a number of variables. The primary component is population, or the total number of individuals producing trash in the relevant area the larger the population Separation, processing, and transformation of solid waste The more waste is generated, the more it must be transferred and transported Nevertheless, there are other factors that affect waste generation rates. Climate, level of industry, and socioeconomic development all have an impact on waste generation rates (Gebrie Kassa, 2009).

2.6.2. Handling, Separation, Storage, and Processing of Waste at Source

The handling of waste at the source—for example, sorting and storing waste in homes—is included in the solid waste management system. This practice has been shown to be economically advantageous for subsequent recycling procedures. Nowadays, there is a greater awareness of the value of keeping newspapers separate at home. throughout addition to lowering losses throughout the entire waste management system, appropriate storage at the point of generation also addresses aesthetic and health concerns. Primary (individual) and secondary (community) storage facilities are the two categories into which SW storage facilities can be divided. Primary storage facilities are where households primarily keep their solid waste before discarding it in a community container. Containers used to store SW from various primary storages and empty them into disposal sites are known as secondary (or communal) storage facilities (Technobanoglous, 1993).

Figure:-1.Solid waste management hierarchy.

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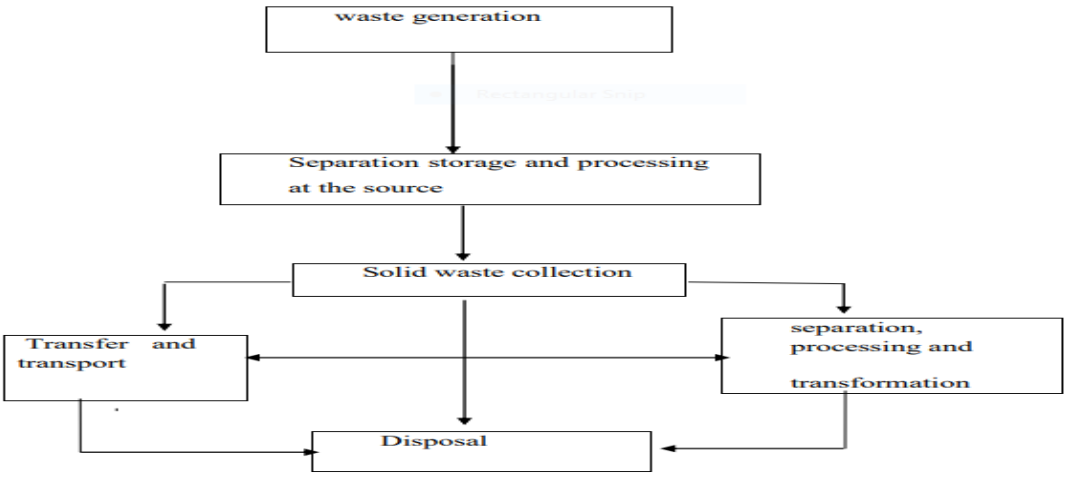


Figure.1:-Solid Waste Management Hierarchy

2.6.3. Solid Waste Collection

This functional component of solid waste management involves not only the collection of recyclables and solid waste, but also the transportation of materials to a transfer station where the collector vehicles are emptied and potentially improved processing facilities are located. or a place where garbage is dumped. The collecting of solid waste typically involves four distinct approaches. These include curbside collection, door-to-door collection, block collection, and communal collection. (Technobanoglous,1993).

Refuse collection vehicles visit these sites on a regular basis to remove accumulated wastes. The distance between any two communal containers should not exceed 200 meters. The method of collection system involves homeowners disposing of their waste at predetermined locations that contain the same type of communal storage facility. (Technobanoglous,1993).

Block collection: under this system, collection vehicles follow a predetermined route at regular intervals, typically every two to three days, and stop at designated locations. When a bell sounds, homeowners are asked to bring their trash containers and give them to the crews, which typically consist of two or more people, and return with the containers (MUDC, 2012).

Curbside (Entrance) collection is a collection system where a crew picks up containers of waste that are left at the curb at regular intervals, usually twice a week. This service is provided in affluent areas where the cost of collecting and returning separated waste materials to drop-off and buy-back centers is relatively high (MUDC, 2012)

Door-to-door gathering The collection team enters each location and removes the sets and containers. once the rubbish has been emptied into collection vehicles. However, the increased labor costs associated with inputting every property outweigh the lack of resident participation in the collection process, making this system more productive when collection occurs frequently. (Camilla, 2013)

2.6.4. Separation, Processing, and Transformation of Solid Waste

The fourth functional component of solid waste management is the separation, processing, and transformation of solid waste. Curbside collection and home owner participation are the methods utilized to recover sources separated waste items.

2.6.5. Transfer and Transport

The functional components of transfer in the context of solid waste management refer to the tools, infrastructure, and accessories utilized to move waste from one place to another—typically a farther away location. Larger cars are utilized to move the waste across long distances to disposal locations, replacing the comparatively small collection trucks When haul distances to processing centers or disposal sites grow to the point where direct carrying is no longer economically viable, transfer and transport operations become essential. They also become essential when disposal sites are situated in isolated areas that are inaccessible by road (Meenakshi, 2005).

2.6.6. Solid Waste Disposal

In addition to garbage management systems include actions that handle garbage where it is generated. For example, it has been determined that it is not economically advantageous to separate and store waste in households in order to facilitate further recycling procedures. Nowadays, there is a greater awareness of the value of keeping newspapers separate at home. e management system, proper storage at the point of generation also addresses aesthetic and public health issues (Techobanglous, 2002).In addition to lowering losses in the entire waste

2.7. Factor Affecting SWM

The decision-making process involved in implementing a SWM system is influenced by numerous factors. Below is a list of some of the elements that should be taken into account while creating a SWM system:

2.7.1. Quantities and Characteristic of Waste

The amount of waste produced by a household is typically influenced by their income level; families in higher income categories typically produce more waste than those in lower income categories. There is a significant association between waste output and per capita income, as evidenced by the quantity, which varies from approximately 0.25 to 2.3 kg per person per day Density is one of the metrics used to determine the composition and properties of trash. It can vary from 150 kg/m3 to 600 kg/m3. The variations are primarily explained by the waste's percentage of paper and packing components. The density is low when this ratio is high, and vice versa. The wastes with high densities indicate lower recycling levels, a comparatively high content of organic stuff, and moisture. (Phelps, 1995).

2.7.2. Physical Characteristics of an urban area

Urban areas, or towns and cities, are defined by the design of their streets and homes to allow for vehicle access and the standard practice of collecting solid garbage from door to door using either a large compaction vehicle or a smaller vehicle However, in inner and older city neighborhoods, where narrow streets make car servicing difficult or impossible, the situation is very different. In addition, there's the issue of urban sprawl in the periphery of the cities, where population growth is alarmingly rapid Because the access ways are winding, uneven, and limited, collecting vehicles cannot use them. In these places, solid waste collection and storage issues are. particularly severe (Ogawa, 2005).

2.7.3. Management and Technical Resources

A diverse staff that can meet system needs is necessary for solid waste management to be successful. A system that fully utilizes native professional talents and crafts and/or makes sure that training programs are in place to offer a self-sustaining supply of skilled labor is the most

effective one for the area. People frequently turn to sociological elements to solve problems when systems fail and issues worsen When it comes to the improper handling of solid waste in developing nations, this has frequently been the case. Numerous scholars contend that since human conduct is the root source of the waste problem, altering that behavior is the only way to find a solution (Milea, 2009).

2.7.4. Lack of Education and Awareness

A significant obstacle that is prevalent in developing nations is the deficiency of knowledge and understanding regarding efficient methods of managing garbage. According to a study conducted in Gaborone, Botswana, people may be aware of recycling and other sustainable waste management practices, but awareness alone does not guarantee that they will take part in environmental initiatives like recycling. Although their poor understanding of these initiatives, they don't seem to have embraced waste management improvements (Bolaane, 2006). Communities develop a culture of disinterest in environmental issues and become less involved in decision-making. Such position strengthens abdication of accountability for waste and pollution problems. In the end, this results in communities that are unaware of or unconcerned about their environmental impact (Poswa, 2001). Ultimately, it could boil down to the distinction between knowledge and information. It might not be possible to influence change if the information is given to someone who does not already know it. These communities might be more open to accepting new information and putting it into practice, though, if it complements their existing understanding of waste management. Researchers have generally recognized that in order to establish sustainable waste systems and to encourage environmental citizenship among community members, there is a need to raise public awareness of and community participation in trash management (Lumbreras Martín and FernándezGarcía, 2014).

People are generally more inclined to engage in waste management practices, such as recycling, when they witness others in their community recycle. Recycling systems are uncommon in underdeveloped nations, therefore the standard for wealthier citizens of the nation is to rely on informal recyclers. (O'Connell, 2011)

According to the findings of a research conducted in Malaysia by Ainis et.al (2002) raising people's consciousness about environmental issues, encouraging sustainable consumption habits, and providing waste management education are all necessary to address the solid waste crisis.

Waste managers should take action to help align the information presented to the public with the knowledge these people already possess. It has been found that environmental awareness and knowledge about environmental conservation positively affect recycling attitude. However, positive attitude may not have resulted in recycling if knowledge about it was poor (Aini et al., 2002).

2.7.5. Lack of a sense of responsibility

Absence of accountability, as seen by the massive build-up of trash in both public and private household waste bins. This kind of issue emphasizes the necessity of putting strong public spaces, including parks, highways, and recreational areas, as well as business establishments Scarlett and Shaw (1999): In other words, individuals who own property have an incentive to take care of it, unlike that which is owned by a large number of people or where there is non-ownership, such as public places. "What is common to many is taken least care of, for all men have greater regard for what is their own than for what they possess in common with others." It seems that this is a "tragedy of the commons" (Hardin, 1968). According to this idea, people behave logically and autonomously in their own self-interest, acting against the interests of the entire group when they deplete a shared resource like a river or, in the case of garbage management, public areas like parks. According to one study, households' collaboration and participation in waste management was disregarded in favor of treating the problem as primarily a technological one in South Africa in the past (WRC, 1995).

2.7.6. None Participation of Community

The result of communities' lack of involvement in trash management was the reckless and thoughtless disposal of waste in public areas, alongside roads and highways, and near shared education programs into place and encouraging greater community involvement (UNESCO, 1996).

2.7.7. The Lack of Effective Legislation for Solid Waste Management

Which is typical in the majority of developing nations, is partly to blame for the unclear duties and responsibilities of the pertinent national agencies as well as the poor coordination between them (Ogawa, 2005). As per his statement, In developing nations, laws pertaining to solid waste management—such as the Public Health Act, Local Government Act, and Environmental Protection Act—are typically disjointed. According to (Zurbrugg et.al 2009), solid trash

collection programs in underdeveloped nations often cater only a small portion of the metropolitan populace. The low-income population residing in peri-urban areas is typically the one left without waste collection services. He claims that one of the primary causes is a lack of funding to handle the huge volume of waste created by the quickly expanding cities. A central municipal budget's insufficient funding combined with frequently insufficient fees paid prevents proper service levels from being provided.

3. RESEARCH METHODOLOGY

3.1 Description of the Study Area

3.1.1. Historical Backgrounds of Agaro Town

The origins of Agaro town may be linked to the seat of the local ruling class, known as Abba Koro Abba Boka. Abba Koro governed the region under the title Abba Koro and established Masaro, which is now known as Agaro, in 1811. The ethnic group that lived there at the time gave rise to the name Agaro. The settlement of Agaro is located 45 kilometers from Jimma, the zonal capital, and 394 kilometers from Addis Ababa. Ever since its founding, Agaro town has functioned as the administrative center of Gomma woreda. The town has its own council and is controlled by urban administration with the designation of special town by being designated under level "B." It was the capital of Limu Awraja from 1935 to 1991 and is currently the capital of Gomma woreda (Temesgen Gudina, 2011).

This Figure is showes the study area of Agaro Town.

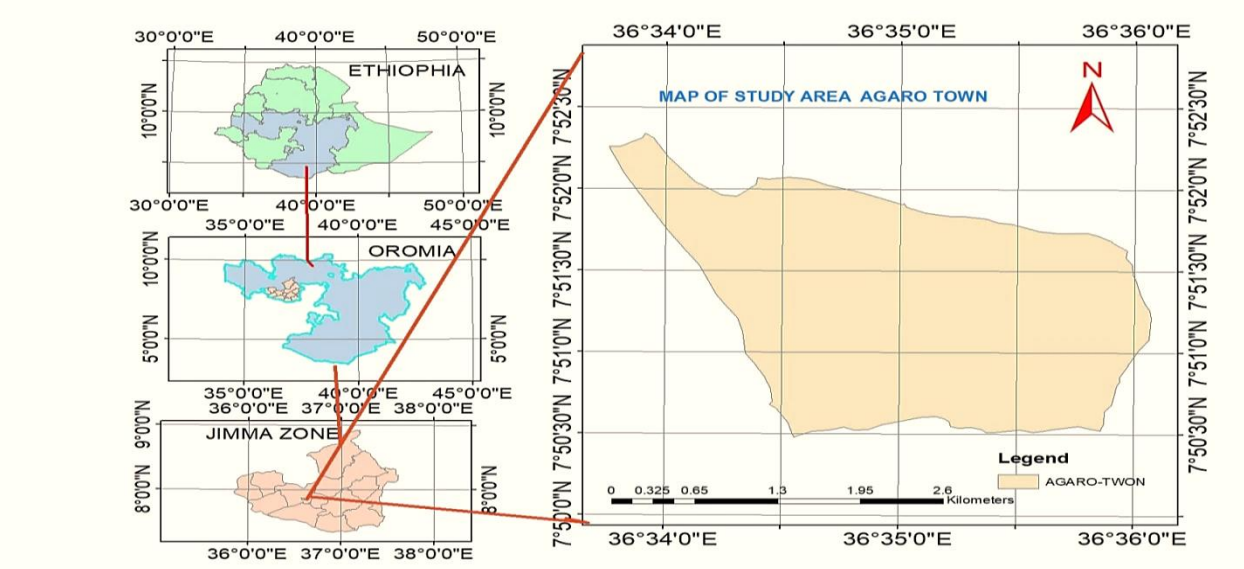


Figure.2:-Map of study area showing Jimma zone and Agaro Town

3.1.2. Geographical Location

Agaro Town: Located in the Jimma zone of Oromia Regional State, Agaro is a unique town with a second level and its own governmental framework. With a total area of 26.104 km2, Agaro's geographic coordinates are 070 50'20" N to 070 52،40N latitude and 360 33؞40؞E to 36037؞00؞E longitude. In south-western Ethiopia, it is the epicenter of known coffee production. In terms of trade, transportation, and social affairs, it interacts strongly with Jimma City and other southern Ethiopian urban centers including Tobba, Dembi, Beddele, Metu, Gore, Gatera, and Sigmo Town in relation to trade activities transportation and social affairs.

3.1.3. Climate of the town

The entire region experiences moderate, temperate weather, with elevations ranging from 1400 meters to 2270 meters above sea level. All year round, the average nighttime temperature is between 9 and 14 degrees Celsius, and the midday high is between 19 and 25 degrees Celsius The average annual rainfall in Agaro Town is between 1400 and 1600 mm, with significant seasonal variations excepted in the four dry months of November, December, January, and February. The remaining months see high percentages of precipitation.

3.1.4. Economic Activity of the Town

The majority of the town's population have been involved in coffee production in the surrounding area, making trade—which is mostly focused on coffee products—small-scale industries, and service delivery operations are the town's most significant economic activity. Strong ties were forged by the consumption and exchange of agricultural products between the townspeople and the rural populace. which consequently developed an appropriate urban-rural connectivity to encourage and expedite regional development (Abel, 2011)

3.1.5. Social Activity of the Town

There are 11 kindergartens, 6 primary schools, and 2 senior schools in Agaro Town. During this time, there is also a technical and vocational education and training college (TVET) and a preparatory school. Health service: Agaro town has one general hospital, two health centers, seven private clinics, one Red Cross pharmacy, 10 drug stores. one post office; and four laboratories. Health service in the town focused on Prevent diseases than cure this is made by keeping clean the environment by making different sanitary activities including safe solid waste collection (OUPI, 2011).

3.2. Research Approach

An approach to mixed methods research was used in this study. According to (Kemper, Springfield, and Teddlie 2009), concurrent mixed method design is the gathering and analysis of two types of data in sequential order, whereas qualitative and quantitative data are collected and evaluated simultaneously. According to (Teddlie.2009), this approach entails applying the same methodology while using mixed data (text and numerical) and other tools (statistics and analysis). Research of this kind employs a qualitative research paradigm during one stage of the investigation and a quantitative research paradigm during another.

3.3. Research Design

In order to collect data appropriately, the current study used a descriptive sample survey approach, which entails tracking the behavior of the research variable without making any changes to it. Additionally, the survey research design used in this study is a quantitative method in which a researcher surveys a representative sample of the public to characterize the attitudes, opinions, behaviors, or features of the population (Creswell, 2012). In addition, the researcher would gather qualitative information through interviews and quantitative information through questionnaires, then statistically analyze the information to test hypotheses or study questions (Creswell, 2012).

3.4. Agaro Town Population and Sample Size

The town is divided into five kebeles. Two kebeles have been chosen for this study. Birbirsa waarituu and Bakee Agaloo. the total populations of these two kebeles are 28,592 and comprised of 5718 house holds

Table 2. Population number of Agaro town 2023/2024

Name of Keble	Male	Female	Total	Households
1/ B/Agalo	7460	7280	14740	2948
2/ B/Waarituu	7200	6652	13852	2770
3/ T/Koyee	11535	10365	21900	4379
4/ T/Qiddilla	11197	10208	21405	4280
5/ T/Jidda	8641	8654	17295	3458
Total	46033	43159	89192	17835

Source;- Agaro Town Administration 2023/24

3.4.1. Sample Size

The Cochran, G. (1997) To determining the sample size. Cochran,G, (1997) sample formula has been used as follow.

$$n=\frac{N\ z2\ pq}{D^2(N-1)+z^2\ pq}$$

Where n = Sample Size

N =Total house hold unit

Z = Confidence interval

P = Housing unit variable =0.8 and q= 1- p= 0.2

d = standard error = 0.05

Hence , n = 5718(1.9)2 (0.8) (0.2)

_____ = 235.9

(O.O5)2 (5718_1)+ (1.962) (0.8) (0.2)

There for , n = 236 The Sample Size of the research = 236

3.4.2. Sampling Technique

Two different kinds of sampling procedures have been applied to this investigation. They were basic random sampling and purposive sampling. Six representatives from the municipality were chosen using purposive sampling, and 230 respondents were chosen through simple random sampling from the list of homes in each Keble.

3.5. Source of Data

Primary and secondary sources were both used as data sources in this investigation. The key sources of information were sample houses, employees and officers of the municipality, and data gathered through surveys, interviews, observation, and measurement.

Secondary data sources include papers on solid waste management that have already been written by other researchers, books on the subject, data on the environment, human health, and sanitation, treatment data from health centers, demographic information, documents on economic and social status, and a map of the study area that is supported by the municipality.

3.6. Instrument of Data Collection

The researcher has used a variety of data collection tools to obtain sufficient information or evidence for this study, some of which are;

3.6.1. Questionnaires

Over 26 closed- and open-ended questions were included in the questionnaires, which were created and given to the household samples over the course of three days. Municipality officials also assisted in the distribution and administration of the questionnaires over the course of two days. The socio demographic background information was requested through these questionnaire items. Every step of the solid waste management process, including the creation, storage, collection, and disposal of solid waste, as well as the difficulties and lessons learned from the past, have been asked.

3.6.2. Interviews

Six (6) municipality personnel were given structured and semi-structured interview items. The interview questions centered on municipal solid waste management initiatives, including past and current solid waste generation rates and composition, secondary storage facilities, collection and transportation methods, disposal techniques, and factors influencing the solid waste management process.

3.6.3. Observation

Examining the households and municipal employees' solid waste generation, storage, collection, and disposal practices requires observation. As a result, observations of how homes and municipal employees store, collect, transport, and dispose of solid trash have been made for a number of days.

3.6.4. Measurement

30 homes were chosen from samples based on their income level, family size status, and employment in order to collect data on the amount, types, and rate of solid waste generation

.Assistant data collectors also took part in measuring the solid wastes from a chosen number of households. Every measurement was done using check lists that were prepared.

3.7. Method of Data Analysis

Descriptive statistics were used to evaluate the quantitative data, while narrative was used to assess the qualitative data. The Statistical Package for the Social Sciences (SPSS) version 23 program was used to code, enter, and analyze the data after they had been personally checked for completeness. Data findings are shown using inferential statistics like correlation and descriptive statistics. The findings were displayed using various charts and graphs, percentages, and frequency tables.

3.8. Validity and Reliability

To ensure reliability, the data collection instrument was constructed through a review of pertinent literature on the subject. The advisor and other local colleagues inspected, verified, and provided feedback on the tools. Experience conducting research on the topic under study was also provided, along with feedback on the data gathering tools that ensured the face and content validity of the information. As a result, the researcher thoroughly and sufficiently gathered and examined the data to support the validity, precision, and applicability of the current study's conclusions. The validity and reliability of the data gathered and examined were guaranteed by the current study. Thus, the researcher was able to obtain accurate and valid data by using a variety of data collection techniques, including questionnaires, interview observation and measurement, and document analysis.

3.9. Ethical consideration

It is true that taking ethics into account during the research process is just as important as other factors because it has a big impact on the study's effectiveness. In this sense, a researcher must take into account the ethical standards of the host community where the study is being done. Therefore, a number of ethical concerns were raised in order to protect the rights of those who are selected to participate in this study. Similarly, similar ethical considerations were carried out beginning with informing the participants of the primary goal of the study and ending with protecting the confidentiality of the data they contributed. By doing this, the researcher was able to obtain a letter of consent for the Agaro municipality from the College of Natural and

Computational Science at Addis Ababa University. The researcher made sure the informants participated in the task after outlining the purpose of the study to them. The participants were free to stop taking part at any moment if they so desired. Since most of the study's informants are Afan Oromo speakers, the interview and questionnaire guidelines were written in English and translated into the language. The researcher took care to guarantee that study participants did not experience any psycho-social discomfort during the data gathering process because the topic under inquiry was delicate

4. RESULTS AND DISCUSSION

The part of this study reports comprised of the socio economic back ground of respondents, the analyzed data with the help of data table, percentage, graphs figures, charts and main solid waste management practices of households and municipality, such as solid waste composition, generation amount (rate) use and type of temporary storage ,communal storage, separation, reuse, recycle, collection, transportation, disposing, practices, awareness, satisfaction and challenges among households and municipality discussed in detail.

4.1. Numbers Sample Selected From the Study Area by sex.

The number of respondents selected from each kebele by sex. Accordingly, a total of 107 males and 129 females have selected as representatives for the total households who lived in both kebeles, 43 male that account 18.2% and 71 female or 30.1% which contained 114 or 48.1% from the total 236 selected from Birbirsa waaritu kebele.122 have selected from Bakee Agalo kebele 64 male and 58 female 27.1% and 24.6% from the 236 samples respectively. All respondents participated and replied their answers

Table.3:-Number of Respondent selected from each Keble

Sex	Keble's name				Total	
	Birbirsa waritu		Bakke agaloo		Freq	%
Male	43	18.2%	64	27.1%	107	45.3
Female	71	30.1%	58	24.6%	129	54.7
Total	114	48.3%	122	51.7%	236	100

Source:- Field Survey 2023/2024

4.2. Socio- Economic Back Ground of Respondent

4.2.1. Age and Educational Level

The age composition of respondents. Range from 15-56 years and above. The majority of the respondent were from 36-45 years 71(30.1) followed by 46-55 years,62(26.3), 26-35,43(18.2%),56 years and above 39(16.5%) and 15-25 years 21(8.5%) iteme1Table 4.The age composition of respondents help to gather plenty of information from each groups

The respondents' degree of education showed that 49(20.8%) have finished basic school education 1 up to 8 grade, 64(27.1%) and 58(24.6%) finished secondary education respectively. There were 24(10.2%) and 11(4.7%) respondents have first degree and MA degree respectively and 30(12.2%) are un able to read and write. depending of the statistics the information obtained un individuals with varying educational back grounds allowed for the comparison and contrast of concepts.

Item 1 of table 4. and item 2 of table 4 shows the age and education level of respondents.

Table.4. Age and, educational status of respondents

Age level	15-25	21	8.9
	26-35	43	18.2
	36-45	71	30.1
	46-55	62	26.3
	56 and above	39	16.5
	Total	236	100
Level of education	Un able to read and write	30	12.7
	1-8 grade	49	20.8
	9-12	64	27.1
	Diploma or level	58	24.6
	First degree	24	10.2
	MA and above	11	4.7
	Total	236	100.0

4.2.2. Occupation, Marital States, Family Size and Monthly Income

The idea for this study brought from respondents who engaged in different fields of occupation, marital status, family size and monthly income determined the composition and amount of solid waste generated in households..

According to occupational information of table 5 iteme1, 77(32.6%) were government employee. 107(45.3%) were merchants, 35(14.8%) were daily laborers as well as 17(7.2%) were housewives. Table 5 item2 shows marital status.29 (12.3%) Said that they single, the majority 147(62.3%) have married.30 or (12.7) and 30 (12.7%) were divorced and widowed respectively. Table 5 item3 refers the family sizes of respondents ranging 1-7 and above with the mean value 1.75.based on the data in the table above 85 or 36.1% of the respondents had 1-3 family members. The majority116 (49.2%) had 4-6 family members and the rest of the

respondents which consisted of 35 (14.8%) had 7 and above family members. the number of family size determined the composition and amount of solid waste generated in households.

Table 5 item4 implies monthly income of HHs,72(30.5%) earn between 1000-3000 birr permonth,60(25.4%)said they have earned between 3001-5000 birr per month,36(15.3%) of the households earned between5001-7000 birr,41(17.4%)and 27(11.4%) have earned between 7001-9000 and 9001-13900respectively.monthely-income determines the composition and amount of solid waste generated in each households.

Table.5.Shows Occupation, Marital Status, Family Size and Monthly Income of Respondents

Variable	Option	Frequency	Percent
Occupation	Government employee	77	32.6
	Own business	107	45.5
	Daily laborer	35	14.8
	Housewife	17	7.2
	Total	236	100
Marital status	Single	29	12.3
	Married	147	62.3
	Divorced	30	12.7
	Widowed	30	12.7
	Total	236	100
Family size	1-3	85	36.1
	4-6	116	49.2
	7and above	35	14.8
	Total	236	100
Monthly income	1000-3000	72	30.5
	3001-5000	60	25.4
	5001-7000	36	15.3
	7001-9000	41	17.4
	9001-13900	27	11.4
	Total	236	100

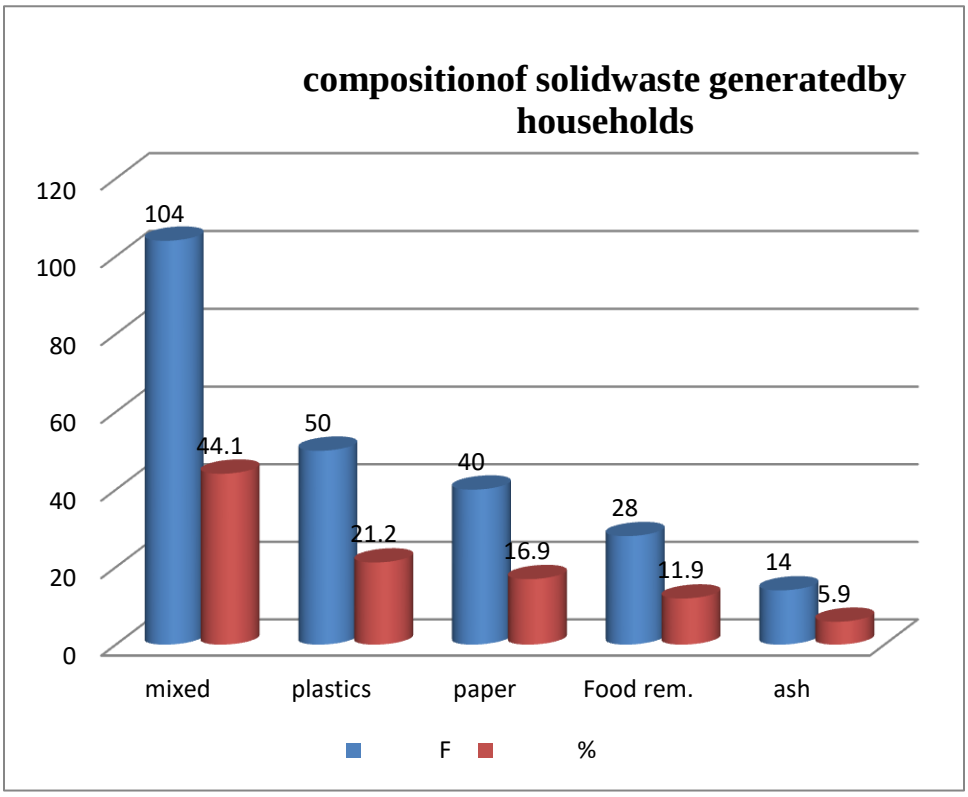
Source Sample Survey 2023/24

4.3. Composition of Solid Waste Generation by house holds

Figure3. Shows Composition of solid waste generated by HHs. Accordingly, 50 (21.2%) of the respondents mostly generated plastics, 28 or 11.9% food over left, 40 or 16.9% and14 or 5.9% of generated paper and ash respectively. The majority of the respondents that accounted 104 (44.1%) generated mixed solid wastes every day. The data implied that the composition

of solid waste differ from house hold to household. Waste generation rates are affected by socio-economic development, degree of family size and income level etc.

This figure 3:- shows the composition of solid waste generation by households



Source;- Sample Survey 2023/24

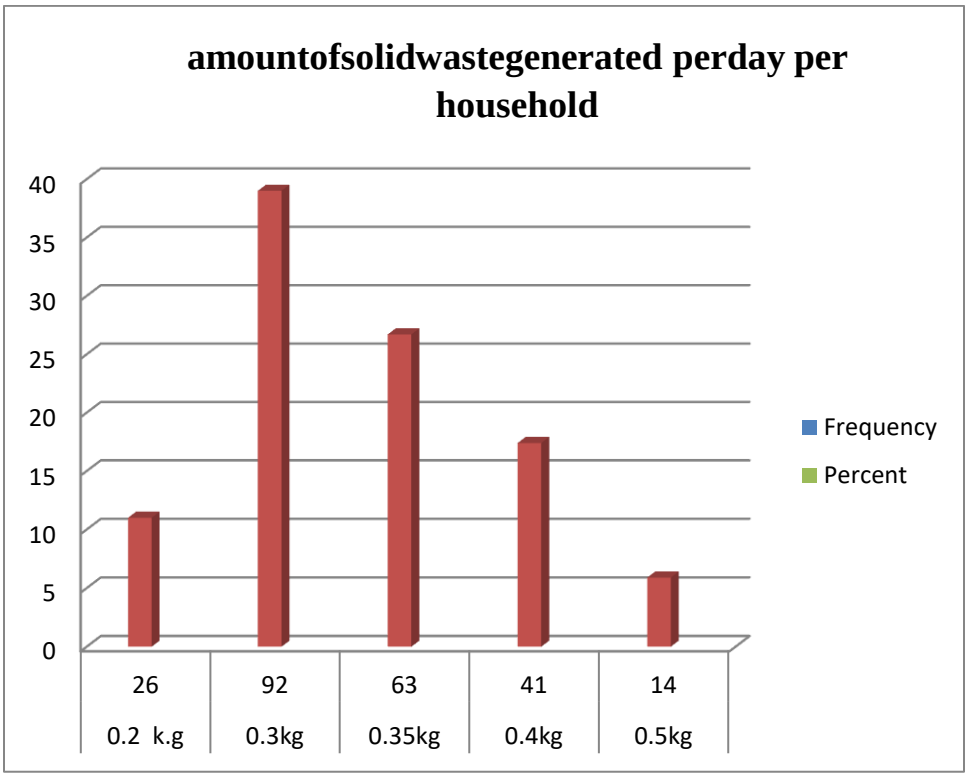
4.4. Estimated Amount of Solid Waste Generation in Agaro Town Per /day

"The World Bank estimates that in 2021, high-income families will generate 0.95 kg/cap/day of solid waste, compared to 0.1 and 0.36 k/g for low and medium-income households." The following represents the over-average generation of solid waste by households.

The amount of solid waste generated per day per households of the study shows 26 households that accounted (11%) of the respondents generated 0.2kg per day, the majority 92(39%) of produced 0.3kg per day, 63(26.7) of the respondents generated 0.35kg every day. 41(17.4%) of the respondents and 14 (5.9%) have generated 0.4kg and 0.5kg respectively.

So the deference in solid waste generation from number of family increase the consumption rate also increased and also the increment of income resulted in variation of both composition and amount of solid waste generated.

Figure 4. Show the amount of solid waste generated per day per households



Source. Sample Survey 2023/24

4.5. Correlation among solid waste generation amount with size of family and monthly income

The degree and/or direction of the relationship between two or more variables are reflected in a correlation. When there is a positive correlation, there is a simultaneous change in both variables.& A negative correlation indicates an opposing change in the variables. Pearson waste generation amount and monthly income, occupation, and family size are correlated.

Table.6:-Relationship among domestic solid waste generation amount with Occupation, Family size, and monthly income.

		solid waste generated	Occupation
Domestic solid waste amount generated	Pearson Correlation	1	.020
	Sig. (2-tailed)		.757
	N	236	236

Occupation	Pearson Correlation	.020	1
	Sig. (2-tailed)	.757	
	N	236	236

		solid waste generated	family size
Solid waste generated	Pearson Correlation	1	-.075
	Sig. (2-tailed)		.250
	N	236	236
family size	Pearson Correlation	-.075	1
	Sig. (2-tailed)	.250	
	N	236	236

		solid waste generated	Monthly income
solid waste generated	Pearson Correlation	1	.174**
	Sig. (2-tailed)		.007
	N	236	236
Monthly income	Pearson Correlation	.174**	1
	Sig. (2-tailed)	.007	
	N	236	236
**. Correlation is significant at the 0.01 level (2-tailed).			

The information demonstrates a positive association between the amount of solid waste generated and occupation. This indicates that there was a modest rise in the amount of solid

waste generated depending on the type of occupation. Family size and the rate of solid waste creation have a negative relationship, but there is a positive association between income and the generation of solid trash; an increase in one variable led to an increase in another.

4.6. Amount of solid waste generated per house hold per day per income level

Total generation rate per household per day is equal to total weight of sample in 10 day divided by the total household conducted. This sample size is comparable with that of similar studies conducted at different areas of developing countries. Households are categorized in to three groups depending on their monthly income. It is well known that per capital income level and solid waste generation rates have direct relationship (Wells, 1996). Households that have better life standard use more consumption materials than low-income households do, through which they generate higher wastes. Therefore, the total generation rate of solid waste which is expressed as the amount of waste (kg) generated by one person on a daily basis would be the total waste collected in ten days divided by total population of the study area in general and it could be 0.42kg'

Table.7:-Solid Waste Generated by house hold

	Low income 1000-5000	middle come 5001-9000	High income 9001-13900	Total/average
Total kg	48.5 kg	23.2kg	27.75kg	99.45kg
No. of HH	132 (55.9%)	77 (32.62%)	27 (11.4%)	236
Kg/HH/day	0.36742424	0.301	1.02	0.42
Population	3198	1527	993	5718
Kg/capital/day	1175kg	459.6kg	1012.865kg	2401.56kg
	0.36741	0.30098	1.02	0.42

Source :- Filed measurement, 2023/24

4.7. Practice of house holds using temporary storage and type of storage

The study of this report is shows the practice of households using temporary storage. Accordingly 199 or 84.3% of the respondents use temporary storage. 37 (15.7%) of the households did not used temporary storages. Regarding the supply of solid waste temporary containers by municipality 62 (26.3%) said there are few containers provided by municipality while 174 (73.7%) of the households said solid waste temporary containers supplied by municipality in their residential areas. The data implied that most of the households used their own temporary storage to store solid wastes until collected by municipality or private solid waste collectors. Most of the containers used by respondents are uncovered. Thus solid waste materials distributed around road and residential areas, the air polluted by bad odors the environment of the residents.

Table 8:- Shows usage of storage by house holds

Item	Option	Frequency	Percent
do you have temporary storage?	Yes	199	84.3
	No	37	15.7
	Total	236	100
do municipality uses solid waste common containers	Yes	62	26.3
	No	174	73.7
	Total	236	100

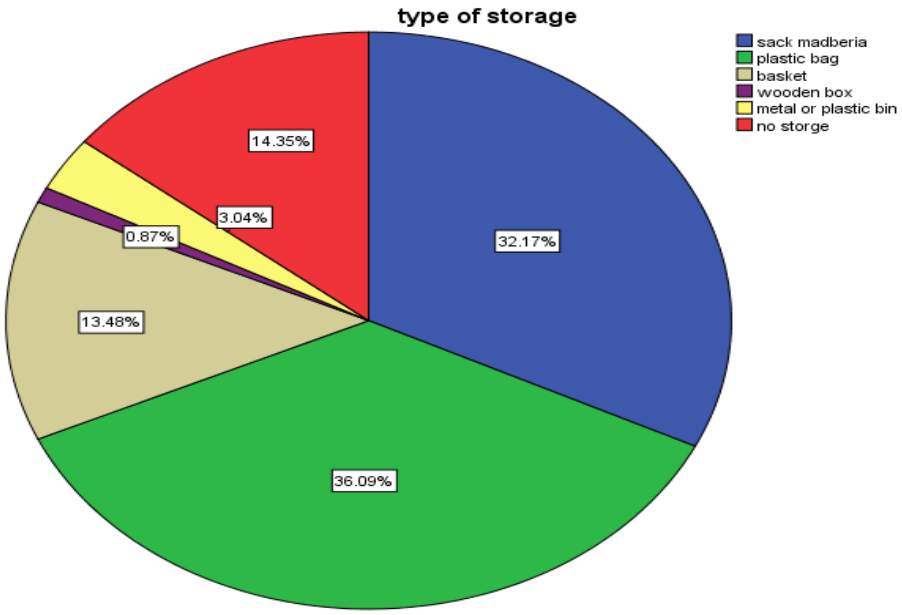
Source ; Sample Survey 2023/24

4.8. Type of Temporary Storage Used by House Holed

Regarding Storage or on-site handling practice of SW (32.17%) of the HHs use synthetic sacks ("*Madaberiya*") for onsite (primary) storage of waste, followed by plastic containers(36.09%) . basket used by (13.48%) of respondents .plastic (polythene) bags, metal or plastic been (3.04%) and a small proportion uses wooden box (0.87%) . 14.35% of the HHs do not use any storage container .According to(Kumar et al. 2005), a key aspect of effective waste management is proper waste storage on the premises where the waste is generated. The survey and observational results of the present study showed that for primary on-site storage of SW, HHs use different types of containers, which is expected to be for different reasons as described by

Techobanglous et al., (1993). Large majority (86.0%) of the HHs used synthetic sacs and this is expected to be due to easily availability in the market, the lowest cost,

Figure:- 5. Shows the type of temporary storage used by house holds



Source ;- Sample Survey 2023/24

Photo 1. Example of Temporary Storage

Photo By Tamirat Kebede 2023/24 Agaro Town.

4.9. Solid waste collection practice

Table 9. Item 1. Shows the type of solid waste collection performed by municipality in residential area. This collection performed that crew enter each premise and take out the containers and sets. It back after emptying the waste in collection vehicles. Accordingly 159(67.4%) said they don't know this type of collection. while 77 or 32.6% of the respondents replied that municipality used door to door collection.

Table 9 item2. Shows that The solid waste collection rate ,Thus49(20.8%) of the respondents said solid waste collected once a week, 50(21.2%) said once a month,53(22.5%) of the respondents said solid waste collected with in more than a month.55 or 23.3% replied there is no fixed time interval 29(12.3%)replied that there was not solid waste collection. . data implied that the collection time interval differ to place to place the late of collection results for dumping solid waste at the road side, in the ditch, in the river, in the forest area.in turn these practice leads to affect human health, due to air and water pollution. Table 9. item 3 .implies solid waste collectors in agro town. Majority 143(60.6%) replied that their solid waste has collected by municipality without fixed time interval ,

60,(25.4%) said solid waste collected by contractors (privet organizations).the rest of respondent 33(14%) said there was no collection access in their residential area. These data indicated that the long time interval of solid waste collection and shortage of vehicles leads to throwing solid wastes anywhere by HHs. Table 9 item 4.explains the Amount of money charged for solid waste collecors.Accordingly19(8.1%) paid 20 -30birr . 68(28.8%)have paid between31-40 birr. 69 (29.2%) of the households paid 41-50 birr.24(10.2%) of households paid 51-60 birr.27(11.4%)have paid 80 and above birr. the rest 29(12.3%)of the respondents have not paid for solid waste collectors.

The lack of proper waste collection equipment and means for subsequent maintenance of them are among the major known issues hampering progress in solid waste collection, disposals of wastes transportation, the municipality used only one bulldozer, one tractor and one small vehicle to load and transport and two small cars for administrative services .compacting trucks the waste collection trucks given to the government cannot be maintained

locally due to a lack of technical knowledge and replacement part MSW dumped in basic open-air dumpsites the dump site also found between villages nearer to the residence area that affects the health of dwellers and harming the environment

Table.9:-Solid waste collection type, rate, amount of charge

Variables	Options	Frequency	Percent
Collection type	Door to door collection	77	32.6
	No collection in my area	159	67.4
	Total	236	100.0
Collection rate	Once a week	49	20.8
	Once month	50	21.2
	More than month	53	22.5
	No fixed interval	55	23.3
	No collection at all	29	12.3
	Total	236	100
Solid waste collectors	Public (municipality)	143	60.6
	Private	60	25.4
	No collection	33	14.0
	Total	236	100
Amount of charge for collectors	20 - 30birr	19	8.1
	31-40 birr	68	28.8
	41-50 birr	69	29.2
	51-60 birr	24	10.2
	Above 80 birr	27	11.4
	No payment	29	12.3
	Total	236	100.0

Source:- Sample Survey 2023/24

Photo:2- Solid Waste Waiting Transport

Photo; by Tamirat kebede 2023/24 Agaro Town.

4.10. Disposal Practice by burning

Households requested about the disposal practice of Municipality153(64.8%) of the respondent said our municipality used open dumping on open places which is found 3km away from Agaro town in rural kebeles, according to information taken from municipality the disposal site has about 2000-3050 m^2 width that established in 2005 E.C. which expected to use about 20 years for the future. 42(17.8%) and 41(17.4%)of the households replied that the municipality used landfill(incineration) and both disposal methods respectively. The response of the municipality sanitation and beautification department officer's ensured that their department used largely open dumping disposal system and small scale landfill (incineration) for medical wastes.

Table:- 10. Practice of burning Solid Waste and Open Dump

Items	Options	Frequency	Percent
Do you burn solid wastes	Yes	173	73.3
	No	63	26.7
	Total	236	100.0
Do you use open dump of solid wastes	Yes	163	69.1
	No	73	30.9

	Total	236	100
What is the disposal method the municipality used	Open dumping	153	64.8
	incineration	42	17.8
	Both	41	17.4
	Total	236	100.0

Source:-Sample Survey 2023/2024

4.11. Solid Waste Burning place

The place of households burn solid waste. Accordingly, majority 85(37%) of the households collected and burn inside the compound.79 (34.3%) said in the forest 62 or 27 % and 4(1.7%) replied they burn solid wastes at or on the road side and in side incineration bin respectively. These implies that an open burning prose's risks to the environment and public health. Smoke pollutes our soil, ground water, lakes, rivers and streams. Burning anything in the outdoors can caused a wildfire. Burning only approved materials and following regulations can minimize the potential for these harmful effects.

Figure 6:- Solid waste burning places practiced by households

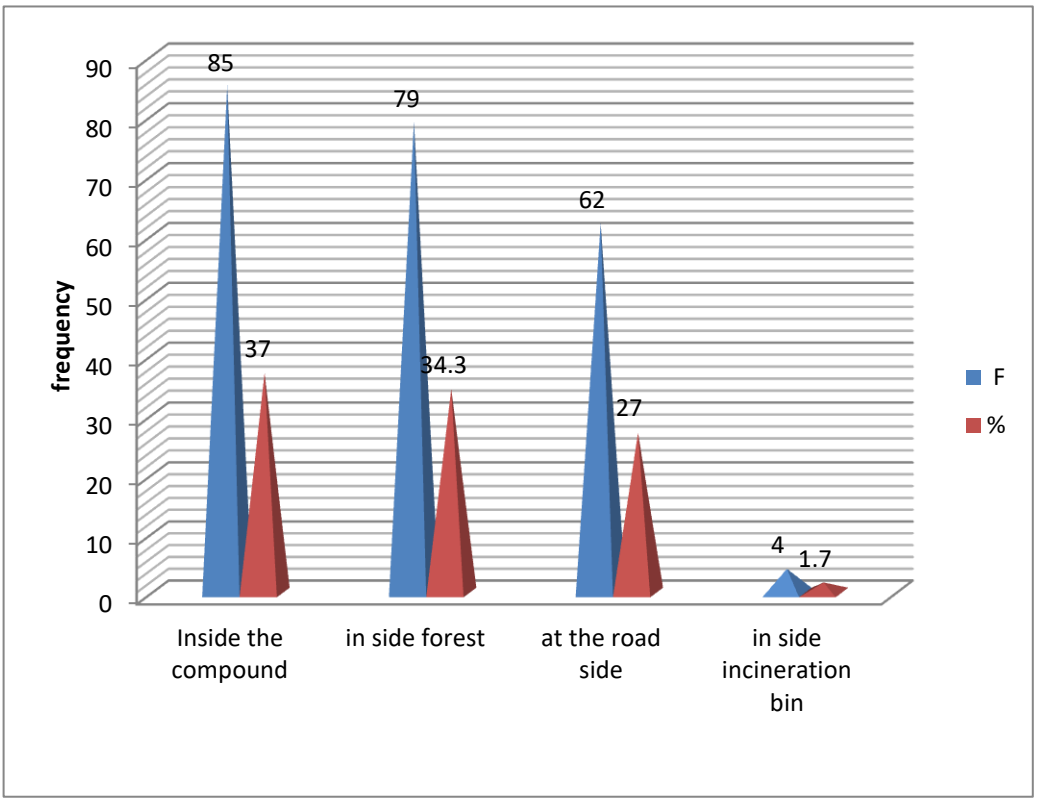


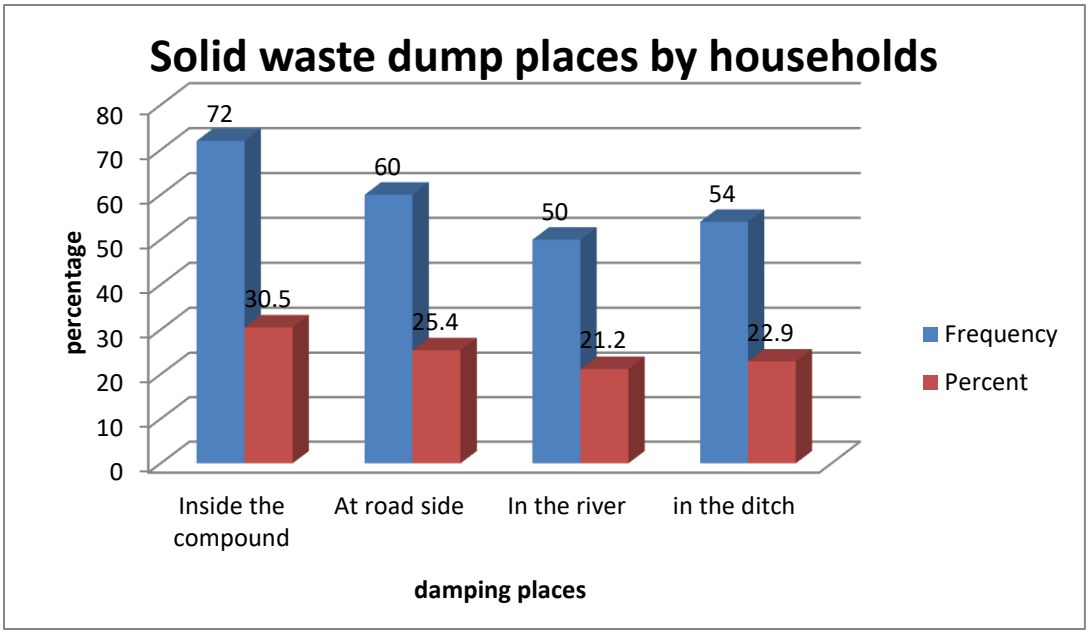
Photo 3. Burning practice of solid waste around the forest place

Photo, By Tamirat Kebede 2023/24 Agaro Town

4.12. Practice of house hold Open dumping

The solid waste dumping practice of households and the area that they dumped, Accordingly, the mjority72(30.5%) dumped their solid wastes in side their compound,60 or25.4% at the road side ,small number of respondents whom accounted 50(21.2%) of the respondents and 54(22.9%) of the households dumped or threw in the river and in the ditches. illegal dumping (fly tipping)is the dumping of waste illegally instead of using an authorized method such as curbside collection or using an authorized rubbish dump. The effects of illegal dumping hurt human and environmental health. The disposal practice of municipality is the open dumping technique of solid waste material without treatment process and open dumping possesses increasing public health hazards to human lives and soil contamination etc.

.Figure 7. Shows Solid waste open dumping place



Source :-Sample Survey 2023/24. Agaro town

We can conclude from this study that most of Agaro town house hold illegally dumped there waste in to public area including ditches, river banks and roadways several homes claimed to have burned solid waste in certain areas of the alternatively.

Photo 4.Solid Waste Dumped In and Around a Ditch

Photo; by Tamirat Kebede 2023/24 Agaro Town.

There is a significant risk to the local environment from such practices. Pollution of the air, water, and land is the result of improper solid waste management. Surface and ground water supplies are contaminated by the careless disposal of garbage (Mor et al. 2006). Solid waste

blocks drains in metropolitan areas, resulting in standing water that invites insect growth and floods during the rainy season. The uncontrolled burning of garbage is a major source of air pollution in cities.

4.13. Respondents' Agreement on different solid waste activities

Item1 of the table 11. Shows the agreement of respondent on the actives performed by both the municipality and households. They requested that, Municipality teach residents about 3R solid waste management processes. Accordingly, majority of the households 134 that accounted56.8,%explained their disagreement,25(10.6%) they said undecided or neutral, only 47 or 19.9% of the respondents totally agreed on the municipalities public teaching practice about 3R, The men value is 2.02 and the SD is 1.379,that means the number of households who explained their agreement deviated by 1.379 from households that explained their disagreement. The second item of table 13. Asked the agreement of households some people throw solid wastes in the ditch.at the roads, in the forest etc. not decided or they were neutral while 48(20.9%) said they are disagree on the statement The total majority that explained their agreement were 154 (65,2%) agreed ,34(14.4%) did**.**

Item 3 of the above table 11.Asked HHs as Residents respect workers who accomplish tasks on solid waste management .the total of 136 (57.6%) of the respondents they respect the workers who perform tasks on solid waste management. Thirty five or 14.8% said undecided, while 65 (27.5%) replied that they disagree on the respect ion of solid waste management workers. These disrespect attitudes of some household's kill the moral of workers to perform their day to day collection and disposal activities and the households who disrespect the workers may have the habit of practices of illegal disposing.

Item 4 of the above table asked the satisfaction of respondents on solid waste management practice of the municipality. Accordingly 21or 8.9% of the respondents have satisfied on the works of municipality because they said strongly agree the same number of households said agree which also contained 21or 8,9%.fifty or 21.2% said undecided or neutral while the total Majority 144 (61%)of the households did not satisfied by solid waste management practice of municipality.

Item 5 requested HHs agreement on the idea 'The solid waste management practice by municipality is accessible to all residents'25or 10.6% of the respondents replied they are strongly agree, 31(13.1%) of the respondents said agree, 28 or 11.9 % said undecided. while 64(27.1%) and 88(37.3%) of the respondents said disagree and strongly disagree respectively, the data implied that the access of solid waste management was not given to all residents equally.

Item 6 of the table asked HHs' agreement on the statement Households participate in decision making process on solid waste management. Eater than the number of disagreed. This implied that some of the residents dispose solid wastes illegally.

Item 7 of the table asked Municipality implement and enforced laws and regulations correctly the total 50(21.2%)said agreed .49(20.8%) were neutral ,while the majority 137(58%) of the respondents explained their disagreement. the data implied that the power of implementing and enforcing laws and regulations was very law.

Item 8 of the above table asked households In the town there are odors due to bad practice of solid waste dumping everywhere. for these statement 97(41.1%) of the households said strongly agree,63(26.7%) said agree,31(13.1%) replied they did not decided, while 27(11.4%)said disagree and 18(7.6%)of the households explained their disagreement strongly these responses implied that high pollution existed in the town because of improper solid waste management practice of the households and the municipality ,the municipality also lacks implement and enforced laws and regulation to control illegals who exposed the air, water and environment to pollution.

Table 11: Agreement of respondents on solid waste management process

Items	SA		A		UD		D		SD	
	F	%	F	%	F	%	F	%	F	%
1. Municipality teaches residents about 3R swm proc.	20	8.5	27	11.4	25	10.6	30	127	134	56.8
2.Some people throw solid wastes in the ditch	131	555	23	9.7	34	14.4	14	5.9	34	14.4

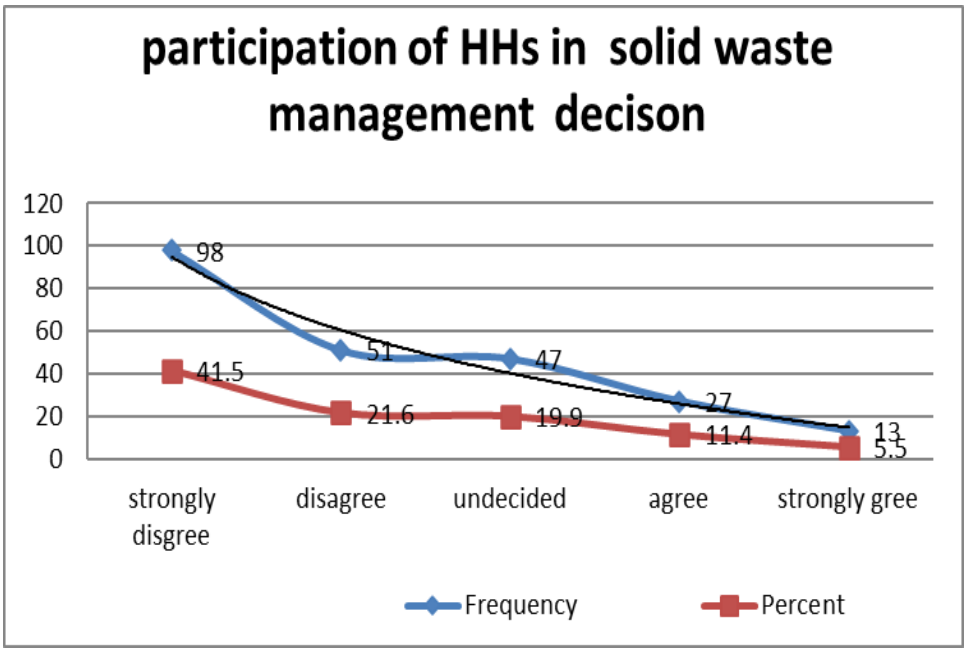
3.Residents respect works who accomplish tasks on swt.	82	347	54	22.9	35	14.8	23	9.7	42	17.8
4.There is great satisfaction on municipality swm. practic	21	8.9	21	8.9	50	21.2	37	157.	107	45.3
5.The swm. practice by muni. is accessible to all residents	25	106	31	13.1	28	119	64	271	88	37.3
6.Households participate in decision making process on swmt.	13	5.5	27	11.4	47	19.9	51	216	98	41.5
7.Municipality implement and enforced illegal sw disp.	22	9.3	28	11.9	49	20.8	55	233	82	34.7
8.In the town are there odors	97	411	63	26.7	31	13.1	27	114	18	7.6

Source :-Filed Survey 2023/24

4.14. Participation of households in decision making

Out of the respondents 13 or (5.5%) and 27(11.4%) said strongly agree and agree respectively. 47(19.9%) of the respondents replied that undecided while, the majority 51(21%) said disagree and 98(41.5%) replayed strongly disagree, the data implied that most of the households did not participated in discussion and decision making. The chart lines value increased from the right to the left that means the positive value of agreement decreases towards disagreements.

Figure 8. Participation of house holds in solid waste management decision making.



4.15. Agaro town municipality solid waste management workers

There are thirty female and forty male employees in total. As a result, there are three administrative employees (4.3%), all of whom are men, and one male public health inspector (1.4%).One (1) mechanic (1.4%), ten (14.3%) male supervisors (two supervisors per Keble), and thirty (30) men daily laborers (78.6% of the workforce) make up the workforce. The quantity of employees is 89192/70, or 1 workers to 1274 residents, is the ratio of workers to residents in the very law.

4.16. Major Function provided by Municipality on solid waste

Type of municipality functions on solid waste management and the responsible department for the specific job. Solid waste management service to domestic premises, commercial/trade premises unction by both own staff and contractors .street sweeping performed by safety net association members. Grass cutting, Removal of dead animals, Removal of garden waste, Recruitment of solid waste management staff, Training of solid waste management staff, Public education and Special solid waste management campaign / project are performed by own staff of the municipality

Table12. Function carried out by the department

No	Function title	Responsibility
1	Solid waste managementservice to domestic premises	Own staff and contractor
2	Solid waste managementservice to commercial / trade premises	Own staff and contractor
3	Solid waste managementservice to industrial premises	No
4	Street sweeping	Safety net
5	Grass cutting	Own staff
6	Removal of dead animals	Own staff
7	Removal of garden waste	Own staff
8	Recruitment of solid waste management staff	Own staff
9	Training of solid waste management staff	Own staff
10	Public education	Own staff
11	Special solid wastemanagement campaign / project	Own staff

Source:- Sample Survey 2023/24

Table,12:-Identifies the department in charge of handling solid waste management for each type of municipality. Solid waste management services are provided by both internal staff members and outside contractors to residential and commercial/trade properties. Members of the safety net association scour the streets. Grass cutting, animal removal, garden waste removal, hiring and training of solid waste management personnel, public education, and special solid waste management campaigns and projects are all carried out by the municipality's own employees.

Photo .5. Transport Service Provided by Individuals

Photo.by Tamirat Kebede 2023/24 Agaro Town

Photo 6. Researcher Filed Visit and Interview With Municipal SWM Coordinator

Photo by Tamirat Kebede 2023/24 Agaro Town

4.17. Challenges affect solid waste management of house holed

The factors that affect solid waste management in the study area shows , majority 102(43.2%) said the problem of inadequate services coverage was high. 87(36.9%) said this problem is medium and 47(19.9%) replied that the problem is law. The data shows the existence of inadequate service coverage.

Item 2 of the above table was regarding the lack of quality SWM services.Majority112 (47.5%) of the respondents said the problem was high 74 or 31.4% said the problem was medium. While 50 or 21.2% said the problem was law. From these responses some assume, even if with the existed problems some of the respondents have got quality of SWM.

Item 3, of table 13. Implied regarding the problem the existence of lack of trained/skilled manpower or human resources. The majority 104 or 44.1% said the problem was high 98 or 41.5%said medium and the least number that contained 34(14.4%0replied law. These responses indicated that there was lack of trained human power. Shortage of trained manpower was one of solid waste management challenged the municipality as indicated below at table 18. Item 4,of table 13,requested the degree of Lack of equipment and vehicles (material

resource.Accordingly,123(52.1%) of the respondents said the problem was high,87 or 36.9%)replied the problem was medium. and 26 or 11% of the respondent said the problem was law. from the data we concluded that the instruments for solid waste management was very small there are only ,30 wheel barrows single tractor. small lorry for loading solid waste one loader and 2 small cars for officials. totally .the shortage of equipment was the main problem to provide solid waste management services to all residents.

Item 5. Of table 13. The degree of Lack of appropriate rules and regulations/legislation and their re-enforcement140 or 59.3% said high,56(23.7%)said medium and 40(16.9%)said the problem was law. from these data we understand that lack of appropriate rules and laws as well as the power of enforcement the laws on people who practiced illegal disposition.

Item 6.of the same table requested the level of poor community participation and cooperation .the challenge was high replied by 87(36.9%) 68 or (28.8%) said the problem was medium and 81(34.3%) replied low. From the data we concluded that the participation of community was uneven. Some people participated but most of them became low.

Item 7, of the same table asked the degree of poor response to waste reduction (reuse/recycling) accordingly, 179(75.8%) replied it was high, 42(17.8%) said medium and 15(6.4%) said the problem was low. The responses implied that residents have low responses to reduce or recycle solid wastes, these in turn increases the generation of solid wastes. Item 8.of table 13 .requested the level of information gaps and low level of public awareness .majority 132or 55.9% said the problem was high, 91 or 38.6% said the problem was medium and 13 or 5.5% percent said the problem was law.as the responses implication there was information gaps among the public and the municipality, the effort of municipality to create alertness among the public about solid waste management process.

Item 9 of table 13 .asked households to level the existence of poor cooperation of government agencies/stakeholders .Accordingly, majority 115(48.7%) of the households replied the problem was high, 76 or 32.2% replied that the problem was medium and 45 or 19.1% of the respondents said the problem was low. Generally, there was poor cooperation of government agencies, NGOs and private organizations to solve the problem of solid waste management in the town, the town

needs appropriate solid waste management services because there is high boom of population due to high birth rate and rural to urban migration as indicated by municipality officials.

Table:13 Solid waste management challenges faced by house holed

No	Types of challenges	3		2		1	
		High		Medium		Low	
		F	%	F	%	F	%
1	Inadequate service coverage	12	43.2	87	36.9	47	19.9
2	Lack of quality SWM service	12	47.5	74	31.4	50	21.2
3	Lack of trained/skilled man power (hr)	104	44.1	98	41.5	34	14.4
4	Lack of equipment and vehicles (material resource	13	52.1	87	36.9	26	11
5	Lack of appropriate rules and regulations/legislation and their re-enforcement	140	59.3	56	23.7	40	16.9
6	Poor community participation and cooperation	87	36.9	68	28.8	81	34.3
7	Poor response to waste reduction (reuse/recycling	19	75.8	42	17.8	15	6.4
8	Information gaps and low level of public awareness	132	55.9	91	38.6	13	5.5
9	Poor cooperation of government agencies/stakeholders	115	48.7	76	32.2	45	19.1

Source:-Sample Survey 2023/24

4.18. Challenges of solid waste management that affect Agaro town municipality

The town beautification and waste management department officials were given about 26 questions regarding solid waste management challenges. The questions had four possible answers: 4. Very serious, 3. Serious, 2. Not very serious, and 1. Not a problem. Based on their responses, it was determined that the municipality faced very serious problems. These eleven

really significant issues made up 42.3% of all the queries. The challenges that the municipality faced in performing solid waste management in Agaro Town are shown in tables 18.19 and 20, which were provided by officials in the municipality's solid waste management department. The challenges are categorized into three categories based on their severity: very serious, serious, and least serious. Difficulties included, for example, a lack of funding, a lack of equipment, an inadequate institutional framework for solid waste management services, a lack of legislation to penalize illegal solid waste dumpers, a lack of enforcement tools and resources, an uncontrolled spread of squatter settlements, a lack of public cooperation, and an inadequate response to waste minimization (reuse/recycle).

Table14:- Very serious type of challenges

No	Types of challenges	Level challenges
1	Lack of finance	Very serious
2	Lack of equipment	Very serious
3	No proper institutional set-up for solid waste management services	Very serious
4	Lack of legislation	Very serious
5	Lack of enforcement measure and capability	Very serious
6	Rapid urbanization outstripping service capacity	Very serious
7	Uncontrolled proliferation of squatter settlements	Very serious
8	Poor public cooperation	Very serious
9	Poor response to waste minimization(reuse / recycling	Very serious
10	Lack of control on hazardous waste	Very serious
11	Uncontrolled use of packaging material	Very serious
	Total	

Source;- Sample Survey 2023/24

Nine out of the 26 questions or 34.6%that the municipality's SWM department heads submitted were judge to be major issues.

Table 15.:Serious challenges faced the solid waste management process of the municipality

No	Serious problems	Level
1	Inadequate service coverage (some people not given service	Serious
2	Lack service quality (not frequents enough, spill, etc.)	Serious
3	Lack of authority to make financial and administrative decision	Serious
4	Lack of financial resources	Serious
5	No standardization of vehicle / equipment	Serious
6	Difficult to obtain spare parts	Serious
7	Difficult to locate and acquire landfill site	Serious
8	Difficult to obtain cover material	Serious
9	Difficult to control contractual service	Serious

Source:- Sample Survey

Table 16: Least challenging problems

No	Types of challenges can solved by municipality
1.	Lack of trained personnel
2.	Lack of vehicles
3.	Old vehicle / equipment frequent breakdown
4.	Lack of capability to maintain / repair vehicle equipment
5.	Lack of planning (short, medium and long term plan)
6.	Lack of qualified private contractors

photo 8 .Photo disposal place and solid waste pickers

Photo by Tamirat Kebede 2023/24

5. CONCULUSION AND RECOMENDATION

5.1. Conclusion

According to the report, Agro Town's population has grown since the 2007 census .From 25458 to 89192, it increased by 350.34%. The population growth led to an increase in the generation and composition of solid trash. This solid garbage was then carelessly dumped on roadways in forested areas and riverbanks, polluting the surrounding air and water and detracting from the town's aesthetic appeal.

According to the study, the town generates 0.42 kg of solid trash per capita and 0.56 HH of solid garbage per household every day, on average. The town produces 99.12 kg of household solid trash per day for the entire inhabitants in the study area. Other streams of municipal solid trash are not included in this.

People are discouraged from disposing of their waste in the communal containers because of the inappropriate and insufficient location, as indicated by the survey analysis and visual observation. They much preferred to dispose of the rubbish close to highways and open spaces. There was virtually little public understanding of the 3Rs (reduce, reuse, and recycle). Additionally, public education is present at a minimal level. The general population knew very little about laws, regulations, and how municipalities implemented them. Lack of transportation infrastructure for the collection, transportation, and disposal of waste, as well as irregular collection times

5.2. Recommendation

This study presents one of the most comprehensive sets of Agaro Town municipal solid waste statistics; however, the data is to be considered as approximate, even though it is more accurate than most, because of variations in data recording, definitions, collecting techniques, and changes in the season. However, the information provided in this study should be adequate for planning.

• Based on generation rates, municipalities ought to charge fees for waste management prior to disposal, as well as for collection, transfer, and transportation.

• The town produces organic trash (food waste), yard waste, ash, plastics, and papers as solid waste components. Residents and municipalities must practice segregating and reusing solid waste products.

• The municipality should encourage the residents to contribute to disposal costs that are determined by the quantity or mass of waste produced in every family. If so, there won't be as much trash.

• There are no containers in the town that are used by the communities to transfer waste. Enough containers are available to manage and accommodate any waste produced. Using community containers reduces the amount of rubbish that is thrown into the road. Therefore, it is strongly advised to use an adequate number of containers in the river, ditch, and other public areas.

• Since open dumping practices polluted the surrounding people' land, water, and ecosystem, the town administration need to consider management options for the solid waste disposal sites.

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APPENDEX

Annex 1

THE DEPARTMENT OF ZOOLOGICAL SCIENCE AT ADDIS ABABA UNIVERSITY OF NATURAL AND COMPUTER SCIENCE

This questionnaire was created for academic purposes in order to complete the requirements for the MSC in biology. The study's specific goal is to examine how municipalities and households handle solid waste, and it examines the situation in Agaro Town.

This study examined the techniques of solid waste collection, storage, and separation as well as the content and rate of solid trash generated per home. transportation deposits in the study region, look at the difficulties, draw conclusions, and offer suggestions for enhancing Agaro Town's solid waste management. As a result, your answer is crucial to the study's success because it influences the research's analysis and conclusion in every way. .

Thank you in advance !

1. Demographic characteristics of the respondents

1. Age Group 1. 15–25 2. 26-35 3. 36-45 4. above 45

2 .Gender 1.male 2. female

3. Educational status 1. Unable to read and write 2. Able to read and write 3 .primary education 1-8 grade 4. Grade 9–12 complete 5. diploma 6. First degree 7. MA degree and above

4. Occupational status 1. Government employee 2 . Own business 3. Daily laborer 4. House wife

5. Marital status 1.single 2 .married 3.divorsed 4.widowed/er

6. Family size 1. 1–3 2. 4–6 3. 7–9

7. Monthly income ETH BIRR 1. Low income <1085 2 . Low middle in com 1086-5000 3. Upper middle income 5001-13205,

A. Composition of solid waste generation rate per household

8. What type of solid waste composition in your home?

1.Food residue 2.plastic wastes 3.paper 4.ash 5.mixed

9. Do estimate generated solid waste per day in gram?

1. 0.2 kg 2. 0.3kg 3. 0.4kg 4. 0.5kg 4. 0.8kg 5. 1kg and above

10.Do you have temporary storage container for generated refuse at home?

1. Yes 2. No

11. If yes, what is the container type?

1. Sack (madaberiya) 2. Basket 3.Plastic Bag 4. wooden box 5.metal or plastic bin

12. Do you separate different type of solid waste at your home ? 1.Yes 2.. No

B .Solid waste collection practice

13 .How far is the container from your home?

1.20-50 meters 2.51-100 Meters 3.101- 200 Meters 4.201-500 Meters 5. > 500 meters

14.How often do you use the collection service?

1. Once a week 2 . Once a month 3 . More than a month

4. No fixed interval 5. No serve at all

15. Which collection service do you use?

1. Public 2. Private 3. Association

16. How much do they charge per one trip?

1.< 20 birr 2 .21-40 Birr 3. 41 -60 birr 4. 61-80 Birr 5. above 80 birr

17. Have you willingness to pay for solid waste collector's? *1.Yes* *2,No*

C. Solid waste transportation and disposal practice

18.What means do you use to transport wastes to containers?

1. By hands 2 . Hand pushed carts 3, Horse drawn carts

19.Do you burn (incinerate) household wastes? 1. Yes 2. No

20. Where do you incinerate/

1. Inside the compound 2 .at the road side 3in side the forest 4.in side incineration bin

21. Do you use open dump when collectors late? 1.Yes 2.No

22. where do you dump solid wastes when collectors late?

1.Iinside the compound 2. .At road side .3. In the river 4. In the ditch

23 Do you reuse household solid wastes? 1.Yes 2. No

24 .what type of solid waste do you reuse?

1.plasti bags 2.plastic bottles 3.chat /Kat garbage 4.metal

25. How much do you know about 3R.?

1.very good 2.good 3.fair 4.I don't know

26,do you know about solid waste management laws and regulation?

1.Yes *2.No*

2. Please explain your agreement for the following situation and put X mark in the box accordingly.

5.SA = strongly agree 4.A = Agree 3.UD = undecided 2.D =disagree 1.SD=strongly disagree

No	Variables	Options				
		5 SA	4 A	3 UD	2 D	1 SD
2.1	Some people throw solid wastes in the ditch					
2.2	There are different animals at the dump site					
2.3	In the town there are odors due to pad practice of solid waste dumping every where					
2.4	Residents respect works who accomplish tasks on solid waste					
2.5	There is great satisfaction on municipality solid waste management practice					

2.6	The solid waste management practice by municipality is not accessible to all resident					

3. Rate the challenges of solid waste management in your town

No	Types of challenges	3 High	2 medium	1 low	Remarks
3.1	Inadequate service coverage				
3.2	Lack of quality and satisfactory WM service				
3.3	Lack of trained/skilled manpower (human resource)				
3.4	Lack of equipment and vehicles (material resource				
3.5	Lack of appropriate rules and regulations/legislation and their re-enforcement				
3.6	Poor community participation and cooperation				
3.7	Poor response to waste reduction (reuse/recycling				
3.8	Information gaps and low level of public awareness				
3.9	Poor cooperation of government agencies/stakeholders				

Annex 2. Observation check list

House code	Date										
	1	2	3	4	5	6	7	8	9	10	Average
1											
2											

3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
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