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Assessment of Households' Knowledge, Attitude, and Practice about Solid Waste Management in Gelemso Town

A thesis submitted to the School of Graduate Studies of Addis Ababa University in partial fulfillment of the requirements for the degree of Masters of Science in Biology (M.Sc.)

By

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DECLARATION

I declare that **Assessment of Households' Knowledge, Attitude and Practice about Solid Waste Management in Gelemso Town, West Hararghe Zone, Oromia, Ethiopia** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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Name of candidate Signature Date

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List of abbreviations /acronyms

CPHEEO - Central Public Health and Environmental Engineering Organization.

CWB - Community solid bin.

HHs - Households

MSEs - Micro and Small Enterprises.

MSW - Municipal Solid Waste

OUPI - Oromia Urban Planning Institute.

SPSS - Statistical package for social sciences

SWM - Solid Waste Management

TVTI - Technical and Vocational Training Institute.

UNICEF - United Nations International Children's Emergency Fund.

Abstract

Ethiopia is facing rapid urbanization leading to overcrowding and the development of slums and informal settlements with poor waste management practices. The overall objective of this study was to assess households` knowledge, attitude and practice of solid waste management in Gelemso town, West Hararghe Zone, Oromia Reginal State, Ethiopia. The study was used both the quantitative and qualitative research approach based on the research objectives and research questions. The data was collected from questionnaire survey; it was analyzed using the computer software known as Statistical Package for Social Science (SPSS) 21 version. Descriptive statistics was used to analyze the data. The result showed that most of the respondents (82.9%) had good knowledge and 67.8% of them had positive attitude on solid waste management but their practice was somehow weak. To create a sustainable solid waste management practice in the town, the municipality and other stakeholders should work strongly.

Key words/ Phrases: *Gelemso town, Household, Incineration, Solid waste management.*

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1. INTRODUCTION

1.1. Background of the Study

Waste is defined as unwanted remains, discarded residues and material or by products which are no longer required by the initial user UNICEF (2009). Inadequate collection and improper disposal of solid waste facilitates the production of pathogens which are causing diseases like cholera and diarrhea and provides good breeding site for disease vectors like mosquitoes, flies and rodents (Kassim and Ali,2006; Abul,2010). Dumpsites are good sources of environmental pollution due to the fact that they usually contain almost all types of pollutants from the initial collection sources (Kassenga and Mbuligwe, 2009; Omofonmwan and Eseigbe, 2009). Proper solid waste disposal is a big challenge in urban cities and more so in developing countries. The intensity of the waste management challenge increases with increased population due to the increased human activities and the solid wastes to be removed for disposal. Industries and urban management systems generate massive amount of solid wastes and most often dumping them in open places posing serious detrimental effects on the environment (Safiuddin *et al*., 2010).

The main causes of improper solid waste disposal in urban centers are due to lack of good and enough infrastructures, non-implementation of existing environmental sanitation laws, irregular and unplanned dumping of solid wastes, population and urban growth due to rural-urban migration, insufficient capital to run solid waste management process and lack of new technology in waste disposing (Momodu, 2011). The insufficient coverage of the collection system and methods, lack of institutional arrangement and information resources, inflexible work schedule, and insufficient information on quantity and composition of waste have been reported as the major problems facing the solid wastes management systems (Kyessi and Mwakalinga, 2009; Ogwueleka,2009).

Moreover, lack of awareness and active involvement of the households as the key stakeholders in service provision delay of households to pay collection fees to the organizations concern with collection of wastes and bad relationship between the households and the collectors of solid wastes are other factors hindering the process of proper solid waste management (Kassim and Ali, 2003; Kassim and Ali, 2006).

The proper management of solid wastes generated from individual house is a very important part of environmental health service in a community. If these wastes are not disposed in

Proper way, they create breeding places for insects such as flies, mosquitoes etc.; they provide food and harborages for rats. These insects and rats are health risk in that they are potential disease transmitters. In addition to health problems rats also impose an economic problem (Solid and Liquid Waste Management Extension Package, 2004).

In order to solve the greatest challenge facing many urban and semi-urban areas in many countries during solid waste management several methods have been suggested including creation of special agencies for the collection, solid wastes incineration, and recycling (Awopetu *et al*., 2014; Oloruntade *et al.,* 2014). Also launching of an emergency city clean-up campaign, privatization of solid waste management services, and composting will ensure good management of solid wastes in the urban settings (Skat Foundation, 2003). This should be accompanied with educating households, providing good services, creating good relationship with the households and collecting fees for the service at the light time (Kassim and Ali, 2003).

1.2. Objectives

1.2.1. General Objective

The general objective of this study was:

- to assess the households' knowledge, attitude and practice of solid waste management in Gelemso Town.

1.2.2. Specific Objectives

The specific objectives of the study were to assess:

- the households' knowledge on solid waste management in Gelemso town.
- the households' attitude towards solid waste management in the study area.
- the households' practice towards solid waste management in the town.

1.3. Operational Definition

Solid Waste Management- is the collection, transportation, storage, recycling, or disposal, of solid waste, or the subsequent use of disposal site that is no longer operational.(Solid Waste Management Proclamation No. 513/2007).

Knowledge- is the concepts and information that study subjects have regarding solid waste disposal.

Attitude - is the perception and internal feeling that study subjects have; regarding solid waste disposal which may be positive or negative.

Practice: actions under taken by study subjects on solid waste management.

Composting- is a process of allowing biological decomposition of solid organic materials by bacteria, fungi, worms, insects, and other organisms in to a soil for transforming large quantities of organic materials to compost (humus like materials) (Enger and Smith, 2008).

Landfill- is a facility which is designed for the safe disposal of solid wastes (Alekhya*et al*., 2013).

Sanitary landfill- is a method of solid waste disposal that functions without creating a nuisance or hazard to public health or safety (Chang and Nishat, 2005).

Reuse- is cleaning and using materials over and over or, it is the use of a product more than once in its original form for the same or a new purpose.

Solid wastes- are all those wastes that are useless, unwanted and cast off materials arising from production and consumption or from human and animal activities (Raman, *et al*., 2013).

Vermicomposting - is a system for turning organic waste into nutrient rich soil as it is processed by worms (Manyuchi and Phiri, 2013).

2. REVIEW OF RELATED LITERATURE

2.1. The Concept of Solid Waste

Solid wastes are all those wastes that are useless, unwanted and cast off materials arising from production and consumption or from human and animal activities (Raman *et al*., 2013).Solid waste technically, any solid material disposed of as no longer useful in common usage. Solid (nonhazardous) waste is defined as any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material (Benny, 2005).

2.2. Waste Generation and Characteristics

The quantity and characteristics of solid waste vary from place to place. Factors that influence the quantity and composition are the average income level, the sources, the population, social behavior, climate, industrial production and the market for waste materials (Late and Mule, 2013).

According to Sujauddin*et al*. (2008), the generation of waste is influenced by family size, their education level and the monthly income. Households attitudes related to separation of waste are affected by the active support and investment of a real estate company, community residential committees' involvement for public participation and fee for collection service based on the waste volume or weight.

2.3. Solid waste Composition

Urban solid wastes can be segmented into two major components called biodegradable and non-biodegradable. The biodegradable component of urban solid waste constitutes organic wastes such as food waste, garden waste, and agricultural waste which undergo biological degradation under controlled conditions and can be turned into compost or organic fertilizer. While non-biodegradable wastes includes inorganic materials which can't be decomposed and degraded (Solomon Cheru,2011).In recent times, the rate and quantity of waste generation have been on the increase. As the volume of wastes increases, so also does the variety of the waste increases (Vergara and Tchobanoglous, 2012).

2.4. Solid Waste Management

Proper planning and control is required in order to prevent the negative impact of waste on the environment (Vergara and Tchobanoglous, 2012).Ghiani *et al.* (2014) added that, a proper organization of solid waste management has become an essential task needed to safeguard the

environment. Beranek (1992) argued that the provision of an efficient solid waste management system is now as important as other essential amenities such as electricity. The continuous disposal of waste to landfill is unsustainable. Basu (2009) argues that the processing of waste is a necessary step needed to safeguard health.

Demirbas (2011) describes waste management as a process by which wastes are gathered, transported and processed before disposal of any remaining residues. Similarly, Tchobanoglous *et al.* (1993), describe solid waste management as the effective supervision and handling, keeping, collection, conveying, treatment and disposal of waste in a manner that safeguard the environment and the public. Tchobanoglous *et al. (1993)* added that, solid waste management utilizes skills and knowledge from various discipline such as legal, financial, administration among others in the day to day running of waste management issues. Demirbas (2011) suggested that, the main reason for managing waste is to ensure a safe environment.

Troschinetz and Mihelcic (2009), pointed out that some waste management methods are often preferred than others. For instance, reuse, recycling, composting and energy generation from incineration are often preferred to landfills. However, Dijkema *et al*. (2000) argued that even some of the preferred management methods, often produce some hazardous materials such as incineration residues.

Strange (2002) reported that, land filling is the final destination of most waste produced from waste treatment and processing facilities. Strange, added that, other technologies merely serve the purpose of volume reduction or treatment before final disposal.

Vergara and Tchobanoglous (2012) found that, although waste management might differ between countries, there are some basic processes or paths that waste management needs to follows. The municipal authorities or their agents collect the waste from the point of storage, for transportation to processing or disposal sites. For some instance, the waste generators separate the waste into various materials from where they are collected for recycling by the recycling industries.

The success of a solid waste management strategy is highly dependent upon the type of goods purchased and consumer disposal decisions. Consumers may have positive intentions towards solid waste diversion and recycling; however, actual behavior may not reflect these intentions (Buelow *et al*., 2010). Attitudes towards recycling are a strong driver for recycling behavior and a number of factors shape consumer attitudes. Recycling opportunities, convenience,

access to the necessary recycling facilities, and an understanding of how to recycle can all influence the attitude of an individual. In addition, attitudes can evolve from past experiences, moral norms, and concern for the community and environment (Tonglet, 2004). Public education is crucial for the success of the management plan. Behavioral instruments play a role in waste management strategies through initiatives that inform and educate. Examples of these types of initiatives include waste audits, school programs, advertising, training, and competitions (CEF Consultants, 1994). Education has been shown to be a critical component in encouraging public participation in recycling programs (Bolaane, 2006; Grodzinska-Jurczak *et al., 2006*).

2. 5. Solid waste Collection system

The collection, transfer and transport practices are affected by improper bin collection systems, poor route planning, lack of information about collection schedule, insufficient infrastructure, poor roads and number of vehicles for waste collection and organizing the informal waste collection services (Sharholy *et al*., 2008).

2. 6. Solid Waste Disposal

According to Dasand Bhattacharyya (2013), in most parts of the world today, solid wastes are disposed of either in open dumps or sanitary landfills, or by incineration. As incineration and sanitary land filling are expensive, both in initial investment and throughout their operation, their use is mostly confined to developed countries, while open dumping is the method used in economically developing countries, mainly due to its simplicity and low cost. This is final functional element in solid waste management system. Disposal activities are associated with final dump of solid wastes directly to a landfill site. Today disposal of wastes by land filling or land spreading is the ultimate fate of all solid wastes whether they are residential wastes, or residual materials from materials recovery facilities. "However, in most developed countries this method is officially banned allowing only sanitary landfill for final disposal. Because sanitary landfill is not a dump it is an engineered facility used for disposing of solid wastes on land without creating nuisances or hazards to public health and environment" (Techobanglous, 2002). "Though it is the most common technology around the world, conventional and environmental unfriendly methods such as open-burning, open-dumping, and non-sanitary landfill can still be used as disposal method" (UNEP, 2009).

According to Tadesse Tewodros *et al*. (2008), the factors that influence household waste disposal are waste disposal choice, inadequate supply of waste containers and longer distance

to these containers increase the probability of waste dumping in open areas and road sides relative to the use of communal containers. Insufficient financial resources limit the safe disposal of waste in well-equipped and engineered landfills.

2.6.1. Land filling

Land filling is disposal of waste with different liners and finally with earth cover. It is also the most economical, especially in developing countries where it typically involves pitching refuse into a depression or closed mining site (Daskalopoulos *et al*., 1998). A landfill is a facility which is designed for the safe disposal of solid wastes. The bottom liners and a top cover of the landfill are considered as the most critical components. Landfills produce landfill gases which can harm human and natural systems. Landfill gases (LFGs), produced when methanogens decompose complex molecules, are primarily methane and carbon dioxide (up to 90%),but also include CO, N2, alcohols, hydrocarbons, organosulfur compounds, and heavy metals (El-Fadel *et al*., 1997).

2.6.2. Sanitary Landfill

A sanitary landfill is a method of solid waste disposal that functions without creating a nuisance or hazard to public health or safety. Engineering principles are used to confine the waste to the smallest practical area and volume, and cover it with a layer of compacted soil at the end of each day of operation, or more frequently if necessary. This covering of the waste makes the sanitary landfill "sanitary". The compacted layer effectively denies continued access to the waste by insects, rodents, and other animals. It also isolates the refuse from the air, thus minimizing the amount of surface water entering into and gas escaping from wastes. The most significant possible hazard from a sanitary landfill is ground water or surface water pollution by Leachate. Land filling is necessary for municipal solid waste disposal but every landfill has its own finite capacity. The most common approach to extending the life of landfills is to introduce recycling, composting, and incineration in to the solid waste disposal system (Chang and Nishat, 2005).

2.7. Solid Waste Reduction

2.7.1. Incineration

According to Yohanis Birhanu and Genemo Berisa (2015) as indicated that, incineration is one option for sustainable solid waste management. It is defined as the process of burning solid waste under controlled conditions to reduce weight and volume of solid waste, and often to produce energy. This process is really waste reduction, not waste disposal, though

following incineration ash must still be disposed. It is recognized as a practical method of disposing of certain hazardous waste materials (such as medical waste).Incineration can be carried out both on a small scale by individuals and on a large scale by industry. This facility does not require much area so that it is common in countries like Japan where land is scarce. Similarly, Incineration is a thermal waste treatment process where raw or unprocessed waste can be used as feedstock (Zaman, 2010).Incineration processes takes place in the presence of air and at the temperature of 850°C and wastes are converted to carbon dioxide, water and non-combustible materials with solid residue i.e., bottom ash (Zaman, 2009).

Generally, according to (UNEP, 1996) there are considerations that we should keep in our mind when we want to choose incineration. These are the necessary environmental controls are properly installed and maintained; the facility is properly sized and sited to fit well with other components of the municipal solid waste management and the material to be burned is combustible and has sufficient energy content.

2.7.2. Composting

Composting is a process of allowing biological decomposition of solid organic materials by bacteria, fungi, worms, insects, and other organisms in to a soil for transforming large quantities of organic materials to compost (humus like materials).“The organic materials produced by composting can be added to soil to supply plant nutrients such as nitrogen, phosphorus, potassium, iron, sulfur, and calcium., make clay soils more porous or increase water holding capacity of sandy soils” (Enger and Smith, 2008).

Composting can be carried out in two ways i.e., aerobically and anaerobically. During aerobic composting aerobic micro-organisms oxidize organic compounds to Carbon dioxide, Nitrite and Nitrate. During anaerobic process, the anaerobic microorganisms are metabolizing the nutrients, breakdown the organic compounds through a process of reduction. An anaerobic process is a reduction process and the final product is subjected to some minor oxidation when applied to land (CPHEEO, 2000). Most developing countries which have found success with composting revealed that composting works best when implemented at household level, with some project doing well at community level as well. At municipal level financial commitment required to maintain equipment has resulted in wide spread failures (Zerbock, 2003).

2.7.3. Vermi-composting

Vermicomposting is a system for turning organic waste into nutrient rich soil as it is processed by worms. Vermicomposting should establish environment in which worms can thrive and reproduce. The worms process organic waste excreting them as organic material rich, stable, and plant-available nutrients that look like fine textured soil. Nutrients in vermicomposting are often much higher than traditional garden compost. Vermicomposting is an odorless, dark brown bio-fertilizer obtained from the process of vermicomposting (Chaduri *et al*., 2000; Aalok *et al*., 2008; Abbasi *et al*., 2009; Manyuchi and Phiri, 2013; Manyuchi *et al*., 2013). It is the natural organic manure produced from the excreta of earthworms fed on scientifically semi-decomposed organic waste (Ansani, 2006).

Vermi-composing is on the other hand, a biotechnological process of composting in which certain species of earthworms are used to enhance waste conversion and produce a better product called vermicompost (Khan and Ishaq, 2011). Vermicomposts, which are produced by the fragmentation of organic wastes by earthworms, have a fine structure and contain nutrients in forms that are readily available for plant uptake (Atiyeh *et al*., 2000). Vermicompost contains 5 times high N and 7 times higher K and 1.5 time higher Ca than the first 15 cm top soil (Parkin and Berry, 1994). According to Khan and Ishaq (2011), the exchangeable potassium content of vermicompost is 58 times higher compared to garden soil. The P and K contents of vermicompost were 2 and 3 times higher, respectivelythan that of composts (Hernandez *et al*., 2010).

2.7.4. Bio-methanation

Bio-methanation is the process of conversion of organic matter in wastes to methane and manure by microbial action in the absence of air through a process called anaerobic digestion. The solid wastes from agro-based industries have high organic content and hence its treatment by the process of bio methanation is most viable as it produces useful products like biogas and enriched manure. Biogas consists of methane and carbon dioxide and can be used as fuel or, by using a generator it can be converted to electricity on-site (CPCB, 2007).

2.7.5. Reuse and Recycling

Reuse

Reuse involves cleaning and using materials over and over. In other words, it means the use of a product more than once in its original form for the same or a new purpose. It relays on

items that can be used over and over instead of throw away items. This method is used to decrease the use of matter and energy resources, cuts pollution, creates local jobs, and saves money (Miller, 2007). “Reusing is more efficient and better than recycling and composting methods because cleaning and reusing materials in their present form avoids the cost of energy for remaking them in to something else” (Cunningham,2008).

Recycling

In addition to reuse, recycling is also an obvious treatment of solid waste problem. It is an important way of collecting solid waste materials and turning them in to useful products. Such materials can be reprocessed in two ways: primary and secondary. “Primary recycling is a process in which original waste material is made back into the same material for example, newspapers recycled to make newsprint. In secondary recycling, waste materials are made into different products that may or may not be recyclable for instance, cardboard from waste to newspapers” (Miller, 2007). Recycling is used both environmental and economical issue. Many peoples are motivated to recycle because of environmental concern i.e. it reduces pollution, it also save energy, space and resources, helps to protect biodiversity and reduce litter. Economically, it can save money for items like paper, metals and some plastics.

2.7.6. Sorting

Sorting is an essential component of solid waste management or decreasing the amount or toxicity of the materials. It is a kind of activity which is separating different types of wastes in their respective nature. It makes waste management easy and simple. However, it should not be a onetime activity, rather should be a habit for proper and sustainable solid waste management. Separating different types of waste components helps to sort recyclable materia ls from non recyclable and identify decomposable (organic) materials from non-decomposable. The process is also efficient to prevent household waste causing pollution or damage to human health and in reducing the problem of landfill sites and expenses (Ayele Bacha, 2016).

2.8. Review on Solid Waste Management Experiences

WolaitaSodo town

Large majority (82.0%)of the HHs used synthetic sacs to store solid wastes. Some of those who do not use containers were observed to store the waste in private pit in their compound. Majority of the respondents (93.0%) of HHs reported that the current places where

community containers located in the town are not appropriate sites. The entire study participants (HHs) reported that the number of collection containers located in the town was not enough to collect the generated SW. The result indicated that only about 17.0% of HHs had access to the community waste collection containers at the time of the study. Consistent with the observation result, the reason for such gap might be due to inappropriate location of containers and long distance from HHs in most part of the town and therefore wastes were illegally thrown anywhere in the town. Therefore, the SWM facilities and secondary storage services provided by the municipality was not adequate and satisfactory. About 72.0 % of the HHs reported the presence of community containers without cover which also indicates a poor onsite handling practice of SWs in Sodo. Such poor handling practice may cause multiplication of flies and vermin that can transmit diseases, and also compromise public and environmental health. Results of the study revealed that only 17.7% of HHs practiced SW sorting. Observation of HHs confirmed that only SWs that can be sold, exchanged and, to limited extent, organic wastes are separated. Types of items observe to be sorted by HHs include worn out clothes; old shoes; metals, tin and cans; plastics, glasses, bottles, and some electronic wastes. Forty one percent of HHs practiced direct reuse of SWs at home level. This indicates that 59.0% of the HHs in Sodo town not exercising waste reuses at home level. Only 3.5 % of HHs is doing home composting at the time of the study and from the remaining 2.0 % HHs had no idea about composting. The study revealed that larger portion of HHs was not interested to practice home composting. In general, the main reason behind low practice of sorting and reusing, and absence of recycling activities of the society in Sodo town seems to be due to lack of awareness about sustainable SWM practices, their less interest and very low economic feasibility of reusable and recycled materials. The absence of such activity at municipality level might be attributed to lack of commitment, finance, material, and man power resource. Furthermore, to fill this gap the municipality has not also played any role in organizing, encouraging, and giving incentives to different stakeholders such as informal workers, private investors, NGOs, and community members to participate in such activities (Solomon Soresa, 2018)

Gondar town

According to Abebe Tegegne (2006), as a result of huge generation of solid waste, town residents considered municipal solid waste management as a necessary and vigorous urban service. For instance, from total 165 sample households of the town around 9.1% of them are regarding this service as a burning urban service. This is because absence of qualified and

efficient municipal solid waste management service exposed them to various health, aesthetic and environmental impacts. On the other hand, respondents are also asked to estimate the effort made by municipality to provide efficient municipal solid waste management service compared with other services of the town. And majority 75.5% of them responded that municipality has made weak effort. Gondar town sanitation and beautification gave less attention. For instance, regarding the town residential solid waste composition and generation rate, there has been lack of frequent and ongoing surveys opposed to frequent variation characteristics of it. Furthermore, those available data are also scattered and unorganized.

As Mohammed Gedefaw (2015), households which were not separating solid waste were asked what would make them separate it before disposal. About 50 % indicated that they can only separate waste if there is a market for what is separated, 47.8% said they can separate waste if they are facilitated by giving those containers where to put the separated waste and 2.2% said they can only separate if everyone else is separating the waste. On the other hand, door to door solid waste collection of the town is very insignificant both in spatial coverage and efficiency. As a result, the only solid waste option of majority households is restricted to two choices. The first one is simply burning, hiding, or dumping of solid waste in their compounds. While the second option is throwing of solid waste at roadsides, open fields, nearby rivers, bridges and gullies.

Adama town

Based on findings from the interview, the features of the current SWM practices and the challenges are almost all the interviewees stated that composition of the SW generated in the city are food and related waste, tree trimmings, paper, plastic, metals, glass, clothes/rags, vegetable and fruit flakes. About 65% of them properly manage SW. About 62% of them stated that no effort has been made by the city administration to the current SWM system of the city is very poor because of lack of coordination among stakeholders; insufficient communal containers and even those few containers were not picked when filled; inadequate number of vehicles deployed; and unavailability of performance measurement system in the entire SWM chain. About 92% of the interviewees stated that MSEs and private collectors did not serve the community properly and regularly. Besides, there was lack of control by the city administration. About 87% of the interviewees did not have any idea about the amount of waste generated in the city. In general, almost all the interviewees considered the SWM practice being not up to the mark and the services were not provided to the desired level.

SWM has now been a problem not only to the city but also to rural areas causing impact on the environment and the inhabitants. Data gathered through self-administered questionnaire are about 40% of the respondents were males and the rest 60% were females. About 32% of participants were above 40 years of age while other 43% were between the ages of 26 and 40. Most of the respondents' educational level was above high school (47%). About 75% of the respondents lived in Adama city for more than 10 years. So it was assumed that respondents could give reliable ideas about the issue under discussion. The average monthly income of respondents was also considered as an important variable that could influence people's perception and attitude about SWM system in the city as SW generation rates have direct relationship with income level. Respondents were requested to express their views about the characterization of waste composition and the amount generated, 42% of the households reported that food and food related wastes constituted larger portion of the SW generated followed by SW from plastics. About 17% of the respondents stated that they recycled cloths/rags wastes. It was also found that the use of waste as fertilizer and the concept of disposing waste from the source were minimal. In terms of the type of temporary storage used, majority (85%) of households used sacks. Regarding the waste collection and disposal services, most of the respondents from the households (69%) stated that their waste was disposed by MSEs while the city administration gave the service sometimes. Regarding the frequency of disposal services, most of the time households reported they got the service more than three times in a month. The results indicate that about 34% of the households had containers in their locality and 24% of households replied that the containers were found more than 1km away from their vicinity. In addition, about 51% of the households claimed that the capacity of the containers did not carry all the waste generated by the locality and containers were not picked up by the municipality before the waste overflowed. This view was in line with the interview findings. In addition, about 65% of the respondents told that no training was given about methods of handling SW; while31% replied that sometimes the city administration provi1ded training. In general, in evaluating the current SWM system of the city, 60% of the respondents from the households were either highly unsatisfied or unsatisfied with the current SWM activities and services. Respondents also showed interest to participate in the SWM activities of the city and more than 75% of them revealed that they would like to have more information about the method and types of waste they could compost, reuse, and recycle in order to reduce the amount of SW. (Mengist Hailemariam and Assegid Ajeme, 2014).

Bahir Dar city

In solid waste management systems, the municipality of Bahir Dar city collects solid waste using five waste picker cooperatives known as Micro and Small Enterprises (MSEs) and one private limited company called dream light Plc, only 22% of the respondents were satisfied with the existing waste management service. Similarly, the municipality is planned to provide solid waste management services for residents once per week in regular way by MSEs and dream light Plc, only 29% of the sample households received solid waste management services weekly. Contrary to this, 25% of sample households never received solid waste management services. This indicates that there is a gap in monitoring and evaluation of waste management service provision and implementation of the plan. In addition to this, the house to house solid waste collection service of the city is insignificant both in spatial coverage and efficiency. As a result, the only solid waste disposal options of these households are restricted in two choices. The first one is simply burning, burying, or dumping of solid waste in their compounds. While the second option is throwing of solid waste at roadsides, open fields, nearby rivers, bridges and gullies. As a result, 40% of the sample households disposed solid waste at the road sides and open fields; the remaining 60% of sample households practiced burning and burying of the collected waste in their compound. The survey result indicated that 93.7% households had solid waste storage receptacles used to store solid wastes and 6.3% did not have any storage receptacles. About 72% of households stock up solid wastes in sack; whereas, 16.6%, 7.5%, 2%, and 1.9% of households use plastic container, basket, private pit, and metallic container as a storage material of solid waste in their home, respectively (Birara Endale and Kassahun Tassie, 2018).

Gweru city

Study done in city of Gweru in Zimbabwe has shown that the most common method used to dispose the waste is through open dumping of waste by 65% out of the total enterprises and burning of waste is the second most popular method of disposing the waste as reported by 22% of the enterprises. The factors that were cited as influencing open dumping of solid waste are these include lack of solid waste disposal facilities (50% of the enterprises), the nonexistence of penalties for dumping, lack of enforcement of legal deterrents by way of penalties (25% of the enterprises), inadequate information on waste disposal and management in general (22% of the enterprises), and the desire to save on disposal costs. A total of 50% respondents identified absence of municipal solid waste management facilities as the key

factor responsible for open dumping of waste in the informal sector enterprises (Asmawati*et al*., 2012).

Ghana, (Tamale city)

Study done in one of Ghana cities, Tamale has revealed that 92.2% of households used waste bins which suggest that most of the people are concerned about hygiene and the need to keep the environment clean; 6.1% had no specific storage system and therefore disposed their waste directly at a disposal point after collection in the house. This probably accounts for littering of waste around some homes and in the communities. 1.7% stored waste within the house before disposal later. Of the waste bins that were used by respondents, approximately 59.6% were plastics and 38.0% metal. There were also differences in the way in which waste bins were used from one residential area to the other. 51.8% of the waste bins used were covered and 48.2% uncovered (Oluwole, 2014).

Urban Kampala

Moreover, a study made in urban Kampala, Zambia which was entitled ‘Household Knowledge, Attitudes and Practices in Solid Waste Segregation and Recycling: Households were asked what they thought about solid waste separation in their homes. 40 % said it was a good idea while 60% said they did not support it because it is time wasting and a dirty job. This, therefore, should be done at the collection points or at the land fill.This is shown that 59.4% of the households separate some of their waste .Households which were not separating solid waste were asked what would make them separate it before disposal. From a total, 50 % indicated that they can only separate waste if there is a market for what is separated, 47.8% said they can separate waste if they are facilitated by giving those containers where to put the separated waste and 2.2% said they can only separate if everyone else is separating the waste (Banga, 2013).

3. RESEARCH DESIGN AND METHODOLOGY

3.1. Description of the Study Area

3.1.1. Location

Gelemso town is found in west Hararghe Zone of Oromia National Regional State. It is found at a distance of 78km from the zone capital Chiro town and 401km from Addis Ababa. In absolute terms the town extends from $8^0$47'45"N – $8^0$49'30"N, $40^0$29'45"E-$49^0$33'15"E (OUPI, 2010).

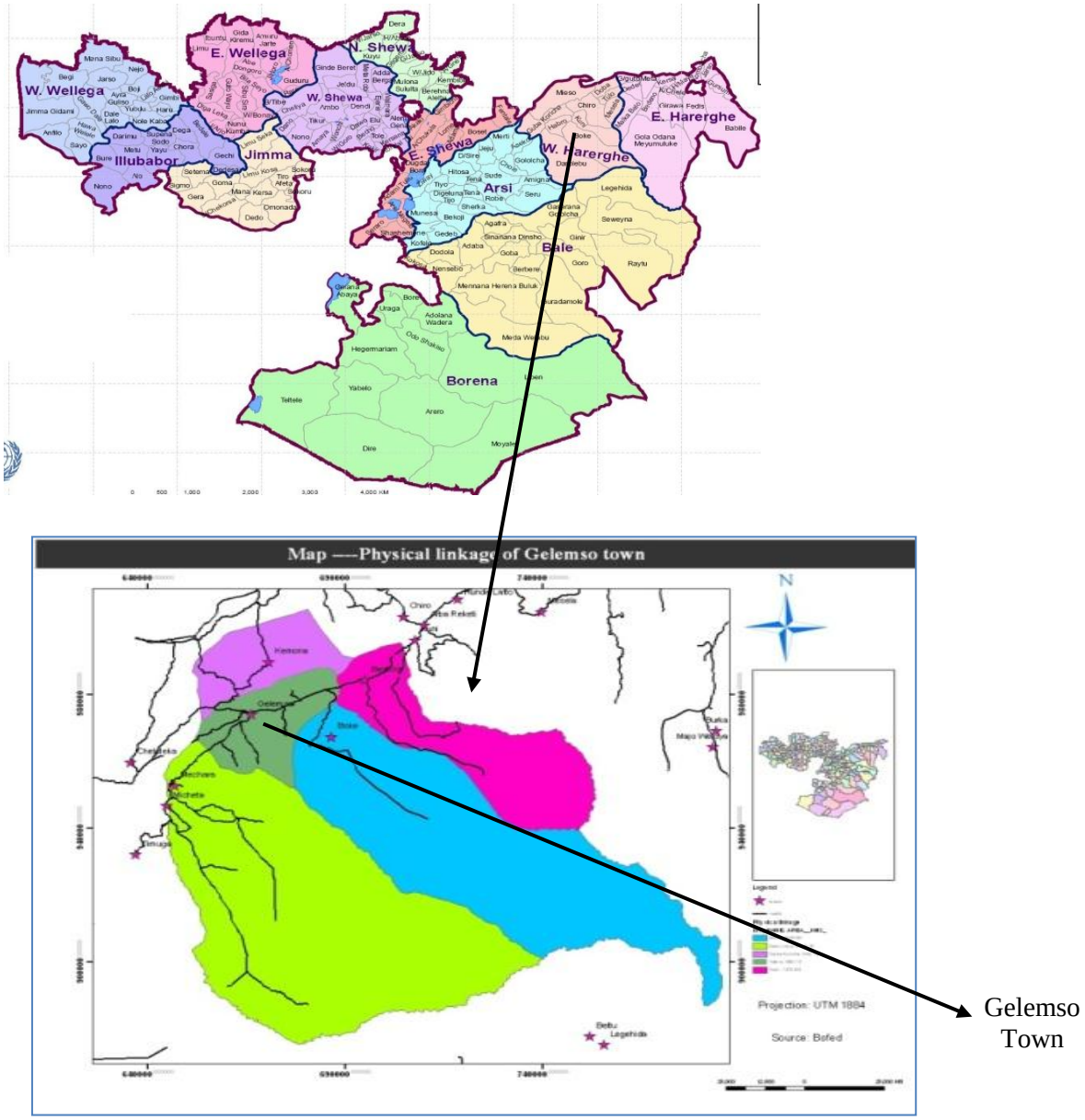

Figure 1 Location map of the study area. **Upper: Map of Oromiya** Source: http://www.ocha-eth.org/Maps/downloadables/OROMIYA, Lower, W. Hararghe showing Gelemso Town

3.1.2. Topography

According to Oromia Urban Planning Institute (OUPI, 2010) study report, the altitude of Gelemso town ranges from 1714m-1930m above sea level. The elevation of the town is increase gradually from the southern part to the northern part of the town. The highest population density is found around the highest land mark of the town. The town total area of land coverage is 2838 hectare.

3.1.3. Climates

The average annual temperature of Gelemso town is 16 -24^{0}c with a predominated *waynadaga* temperature. The annual rain fall distribution of the area is varies from a minimum of about 100mm to a maximum around 2000mm. The town gets biannual rain fall (during summer and spring seasons).

3.1.4. Population

According to Gelemso Municipal Office (2017, the total population of Gelemso town is 43,837, out of which 23,735 males and 20, 102 females.

3.1.5. Physical Infrastructure

There is an access of 24 hours electric power service. Currently; however, street lights in the town are not adequate. The capacity of transformer is also not enough compared to the total population, on the other hand the telephone and postal services are available, but the internet access is poor in the town.

There are three water reservoirs; each has a capacity of 150m^3, 100m^{3}and 500m^3 respectively. However, the current water coverage is only 75%.

3.1.6. Social Infrastructure

In Gelemso town, there is a zonal hospital. It is providing services for the Gelemso town and the surrounding urban and rural population. There are also one governmental clinic, three private clinics, three private pharmacies and six private drug shops in the town. Concerning the educational services there are one TVTI, one Secondary School, one Preparatory School, four Elementary Schools and three Kindergartens in the town.

3.1.7. Economic Activity

The population of the town is engaged in mixed economic activities. The large proportion of trade reflects the greater importance of the town as commercial center followed by urban agriculture (Gelemso Municipal Office, 2017).

3.2. Study Design

Cross- sectional study design was employed for assessing the households' knowledge, attitude and practice of solid waste management in Gelemso town.

3.3 Research Method

To assess the households' knowledge, attitude and practice of solid waste management inthe study town, the study used both the quantitative and qualitative research approach based on the research objectives, i.e., the study used both numeric and non-numeric explanation to describe the findings. In this study, the descriptive type of research was more appropriate.

3.4. Methods of Data collection

Data was collected by questionnaire, interview and observation. Structured questionnaire and interview were prepared in English and translated to Afan Oromo language to ensure clarity. Then data collection task was accomplished by research assistants.

3.4.1Questionnaire

Questionnaire was prepared and administered to household respondents. Closed-ended type of questionnaire was prepared for all households to find out their knowledge, attitude and practice towards solid waste management in the town.

3.4.2. Interview

The researcherinterviewed2municipal officials and conducted face to face interview with 6 members of Micro and Small Enterprises that could be used for collecting additional information.

3.4.3. Observation

Data was also collected by direct observation. The researcher visited the solid waste disposal sites and viewed the whole processes of collection services.

In order to support or strengthen the issue under study, the researcher tried to obtain the total data of population, household numbers and list of names from 2 Kebeles and municipal office and also additional data was collected from documents and other governmental offices.

3.5. Sample Design

Systematic random sampling design was applied among 5144 households of Gelemso town.

3.5.1. Population

The study populations are all the households of the 2 Kebeles.

Inclusion and Exclusion Criteria

Inclusion Criteria:

All household members whose age were 18 and above 18 years and available during the study period were included in the study.

Exclusion criteria:

Households who were excluded from this study were those who could not be available in the study period, and those who could not living in Gelemso town as well as those who had health problem and could not be able to respond to the questionnaire were excluded from the study.

3.5.2. Sampling Frame

The sample frame (N) population was 5,144 households. Furthermore, 2 Kebele leaders, 2 municipal officials and 6 members of Micro and Small Enterprises (MSEs) were purposively included in the study.

3.5.3. Sampling Unit

In this study the sample units were households, municipal officials and Micro and Small Enterprises.

3.5.4 .Sample Size and Sampling Techniques

Sample size and sampling techniques were described as follows.

3.5.4.1. Sample Size

According to Cochran (1963), the sample size was determined using the following formula: $n= Z^2Pq/d^2$,

Where: n= sample size

Z=Reliability coefficient for the desired confidence interval (CI) of 95%,

P=the proportion of population possessing the character of interest

q=1-p

d=degree of precision=0.05 (allowed probability of error).

Sample size was determined by taking the following assumptions; since there was no previous study in the area, the estimated prevalence rate to be 50%, confidence interval of 95%, margin of error 5%. Since the study population number is less than 10,000 and sample size/study population is greater than 0.05 it is calculated by using the above formula with considering adjustment $n= (1.96)^2 (0.5) (0.5)/(0.05)^2 =384$.

By considering the non response rate of 10% =38.4, which is approximated to 38. The total sample size is 422 but since sample size to study population is greater than 0.05, correction formula **(**n/1+n/**N**) is used to determine the final sample size which =422/1+422/5144=390, which is approximately 390.Next the value of k was calculated by 5,144/390=13.19 which is approximately 13.

3.5.4.2. Sampling Techniques

Systematic random sampling technique was used to select households included in the study population of the two Kebeles. Then the first household was located by lottery method and the next household was selected every $13^{th}(k^{th})$ from the given total list of households as representative sample, where k is 13.

3.6. Sources of Data

Both primary and secondary data were used in this study.

3.6.1. Primary Data Sources

The primary data was obtained from the household respondents 6 members of Micro and

Small scale Enterprises (MSEs), 2 municipal officials, 2 Kebele administrators, other governmental officials and also from site observation were included in order to get in-depth of data sources.

3.6.2. Secondary Data Sources

Furthermore, Secondary data was relevant to assess households` knowledge, attitude and practice of solid waste management. It was obtained from internet, journals, articles, documents and others to show contemporary knowledge on the subject.

3.7. Data Analysis, Interpretation and Presentation

The data were collected using questionnaire, the data were checked for completeness and entered in to and analyzed by Statistical Package for Social Sciences (SPSS) 21 version software. Data were analyzed using descriptive statistics and presented using tables, pie charts and bar graphs.

3.8. Methods of Ensuring Data Quality

To insure the quality of raw data, the questionnaires were revised repeatedly with the help of colleagues. Furthermore, they were pre–tested through pilot test by distributing for 10 respondents and adjustments were made on some of the questions. The questionnaires were translated to local language (Afan Oromo) to avoid language barrier in understanding the questions. Triangulation in the form of multiple data collection approaches were used. Furthermore, data collection procedures were strictly investigated, five assistant data collectors were trained and the investigators strictly investigate the data collection process.

3.9. Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board (IRB) of Addis Ababa University, College of Natural and Computational Sciences. The Committee provided ethical approval after reviewing both the protocol and consent forms. Before data collection, permission was taken from the municipality and 2 Kebeles and written informed consent was obtained from study participants. Confidentiality was insured by collecting the data anonymously and coding the names of the respondents.

4. RESULTS AND DISCUSSION

In data collection process a total of 396 questionnaires were distributed to all sample households. Out of these, 390 questionnaires were successfully collected .Hence, the response rate is 98.5 % .Similarly, and an interview was conducted with 2 municipal officials and 6 micro and small scale enterprises (MSEs).

4.1. Socio-demographic Characteristics of the Respondents

The socio-demographic profile in this study includes Kebele, gender, age, educational background, duration of the households stay in the study town, households' family size, monthly income of the respondent and the employment status. During this study, a total number of 390 households responded the given questionnaires. These variables are important as they play an important role to assess the households` knowledge, attitude and practice of solid waste management.

Table1, indicated that, 231 (59.2%) of the households lived in Kebele 01 and the remaining 159 (40.8%) in Kebele 02. This result shows that Kebele 01 have more population number than Kebele 02.

The finding considered 390 respondents. Out of these the distribution of respondents' sex proportion, 151 (38.7%) were males and 239(61.3%) were females. The result shows that majority of the respondents were females this could be due to more females participated in solid waste management than males. Similarly, the fact that female members of the households were the ones that found at home at the time of the study. Furthermore, husbands preferred their wives to respond the question that is why they are the ones concerned with the handling of solid wastes. Similar results were reported in Adama city by Mengist Hailemariam and Assegid Ajeme(2014), in which the highest percentage of the respondents (60%) was females.

The age variable was assessed by classifying the respondents into four age categories. Most of the households were within the age group range of 31- 45years (46.2%), then followed by age group 46-60years (26.4%) This indicated that, adult households dominantly participated in responding the questions. But, a study conducted by Omar *et al.(*2018) in Mogadishu, the respondents` majority age group category was, 20-25 (49.3%).From this it concluded that, the young age group was the dominant group.

Education is a very important variable that influence the participation level of the households in the solid waste management activities. Thus, respondents level of educational status indicates that,102 (26.2%) of the respondents had primary school, then followed by 90 (23.1%) of them had preparatory school. Likewise, a study was done in Sebeta town by Dinka Chalchisa (2017) indicated that, the majority of the respondents,35.8% had attained primary school education. This suggests that the household members had basic education and therefore likely to adopt new practices and ideas.

The period of stay in the town shows that, 261 (66.9%)of the respondents lived in the town for more than 10 years. Therefore, they might have adequate information about solid waste management in the town. A similar study were conducted in Adama city by Mengist Hailemariam and Assegid Ajeme (2014) reported that, more than 75% of the respondents were lived in Adama city for more than 10 years

The data shows that majority of the respondents` family size 242(62%) is between 4-10 family members. Whereas, the study conducted by Kiran *et al*. (2015) in Kuttar (India) reported that, about 26.7% of households had a total of less than 5 family members, 67.5% had 5-10 family members and 5.8% had more than 10 family members.

The data indicates that, about 35.1% of the households have been earned an average income of more than 5000 birr/month and followed by32.8% from 3001-5000 birr/month. The average monthly income of respondents was also considered as an important variable that could influence people's perception and attitude about SWM system in the city as solid waste generation rates have direct relationship with income level (Mengist Hailemariam and Ajeme Assegid, 2014).

The data indicates that, 235 (60.3%) of the respondents were self-employed. Self-employed persons are those households who are engaged in selling Khat, goods, furniture, coffee, etc in the town. Like education, employment status can influence the level of solid waste management, since it is the means to the sources of income and material. Households can participate in the management of solid waste by providing financial and material support.

Table 1 Socio-demographic Characteristic of the Respondents

No	Demographic Status	Alternatives	Respondent in	
			No	%
1	Kebele	01	231	59.2
		02	159	40.8
2	Sex	Male	151	38.7
		Female	239	61.3
3	Age in year	18-30	87	22.3
		31-45	180	46.2
		46-60	103	26.4
		>60	20	5.1
4	Educational	Non-formal schooling	45	11.5
		Primary school	102	26.2
		Secondary school & Preparatory school	90	23.1
		Certificate	20	5.1
		Diploma	66	16.9
		First degree and above	67	17.2
5	Duration of stay in the town	<2 years	26	6.7
		2-5 years	56	14.4
		6-10 years	47	12.1
		Above 10 years	261	66.9
6	Household Size	<4	121	31.0
		4-6	167	42.8
		7-10	75	19.2
		Above 10	27	6.9
7	Monthly income	<1000	29	7.4
		1000-1500	38	9.7
		1501-3000	58	14.9
		3001-5000	128	32.8
		>5000	137	35.1
8	Occupation	Government employee	113	29.0
		Non-Governmental Organization (NGO)	4	1.0
		Self employed	235	60.3
		Employed in Private sectors	28	7.2
		Others	10	2.6

4.2. Households' Knowledge on Solid Waste Management

Tchobanoglous *et al.* (2012) showed that, solid waste management utilizes skills and knowledge from various discipline such as legal, financial, administration among others in the day to day running of waste management issues. Public awareness and attitudes can affect the solid waste management system. Thus, lack of public awareness and school education about the importance of proper solid waste management for health and well-being of people severely restricts use of community-based approaches in developing countries and also crucial factor for failure of solid waste management service in developing countries (Zurbrug, 2003)

From a total of 390 respondents, 373 (95.6 %) of the households replied positively ("Yes").But the rest of them, 17 (4.4 %) replied negatively ("No") for the question "Does solid waste pollute the environment?". From this result it can be concluded that almost all (95.6 %) of the households showed un managed solid wastes can pollute the environment. A similar study done by Omar *et al*.(2019) in Karan Ditrict, Moqadishu, Somalia, where 84%respondents said that waste pollute the environment.

In the table below, 339 (86.9 %) of the household respondents indicated that burning of solid waste could affect the environment. From the result one can conclude that burning of solid wastes on open space pollutes the environment. Thrirumarpan *et al*. (2015) in Batticaloa district indicated that 82% of the household heads believed that the burning of wastes makes health risk.

Three hundred five respondents (78.2 %) replied "yes"for the question " Do you think waste papers, plastic bags, a piece of metal, wood and clothes are rubbish?" This result indicated that there is a knowledge gap among households. Because some solid wastes are important for reusing, recycling, composting, etc.

As the data shown in the table below, 237 (60.8 %) of the households responded positively ("Yes") for the question "Is solid waste being a resource?". This result showed that the household shave awareness on solid waste as being a resource. This result was disagreed with Omer *et al*. (2019) idea in which the respondents (77.3%)said that waste can't be a resource.

Three hundred ten of the households (79.5 %) said "yes" that solid waste can be sorted and sold. This shows that most of them knew that solid waste could be sorted and sold but the rest not awarded. However, a result in Mogadishu by Omar *et al*. (2018)revealed that 40.7% of

the respondents said yes that waste can be sorted while 59.3% of them said :no" that solid waste can`t be sorted.

Most of household respondents, 358 (91.8 %) said "Yes" for the question "Do you think that compost or organic fertilizer can be prepared from solid wastes?" Mengist Hailemariam and Assegid Ajeme (2014) indicated that wastes are used for fertilizer and the concept of disposing waste from the source was minimal.

Three hundred thirty two respondents (85.1 %) replied "Yes" for the question "Could you reduce the amount of solid waste you generate by reusing plastic bags, bottles, papers, etc? " .This indicates that it is possible to reduce the amount of solid waste by reusing solid wastes .Likewise, Mengist Hailemariam and Assegid Ajeme (2014) reported that more than 75% of the respondents could compost, reuse and recycle wastes in order to reduce the amount of solid waste.

As it can be seen in table 2, 344 (88.2 %) of the participants said "Yes" response for the question "Can some diseases such as diarrhea, typhoid, cholera etc are caused by improper disposal of solid waste?" This implies that some diseases are caused by improper disposal of solid wastes. A study conducted by Thrirumarpan *et al*. (2015) in Batticaloa district revealed that 98% of the household heads had concern about diseases that were related to improper storage and disposal of waste. Moreover, Shahzadi *et al*. (2018) in Pakistan reported that most of the respondents (83%) were known about waste disposal on open places can have harmful effect on human health.

Two hundred eighty seven (73.6 %) of the respondents marked "Yes" whereas 103 (26.4 %) of them marked "No" for the question " Do you think sorting of solid waste at home level could significantly important?". This shows that sorting of solid at home level could be significantly important. Therefore, sorting of solid wastes at household level is important for recycling, reusing, composting and reducing of solid wastes.

Three hundred fifty (89.7 %) of households responded positively ("Yes") whereas 40 (10.3 %) of them responded negatively ("No"). This implies that illegal dumping of solid wastes polluting the rivers, streams and wells. A study was conducted in Pakistan by Shahzadi *et al*. (2018), showed 72% of respondents were aware about adverse effects of improper waste removal and the rest of them (28%) were not aware. Generally, in this study, the researcher concluded that82.9% of the households had good knowledge on solid waste management.

Table 2 Households` knowledge related responses on solid waste management

No	Questions	Response in	Respondent in	
			No	%
1	Does solid waste pollute the environment?	Yes	373	95.6
		No	17	4.4
2	Are burning of solid wastes can affect the environment?	Yes	339	86.9
		No	51	13.1
3	Do you think waste papers, plastic bags, a piece of metal, wood and cloths are rubbish?	Yes	305	78.2
		No	85	21.8
4	Is solid waste being a resource?	Yes	237	60.8
		No	153	39.2
5	Can solid waste be sorted and sold?	Yes	310	79.5
		No	80	20.5
6	Do you think that compost or organic fertilizer can be prepared from solid waste?	Yes	358	91.8
		No	32	8.2
7	Could you reduce the amount of solid waste you generate by reusing plastic bags, bottles, papers etc?	Yes	332	85.1
		No	58	14.9
8	Can some diseases such as diarrhea, typhoid, cholera etc are caused by improper disposal of solid waste?	Yes	344	88.2
		No	46	11.8
9	Do you think sorting of solid waste at home level could significantly important?	Yes	287	73.6
		No	103	26.4
10	Do you think that illegal dumping of solid wastes polluting rivers, streams, and wells?	Yes	350	89.7
		No	40	10.3

4.3 Households` Attitude towards Solid Waste Management

From the table below, 176 (45.1%)of the respondents reported strongly disagree on the statement in which solid waste is anything without value. From this, it can be concluded that most of the respondents had responded the correct answer because solid wastes may be used for recycling, reuse, composting and a source of income.

Three hundred forty one (87.4%) of the households responded strongly agree on the statement in which solid waste is one of the environmental problems that need an immediate attention. This indicates that households in the study area have positive attitude towards solid waste management. This finding is similar with Thrirumarpan *et al*. (2015) in Batticaloa district, Sri Lanka and Omar *et al*. (2019) in which 52.0%of the respondents were strongly agree that waste is one of the environmental problems that need an immediate attention.

The majority of the respondents 274 (70.3%) illustrated strongly agree on the statement that solid wastes can be reduced, reused, and recycled. Similarly, Sisay Shewasinad *et al*. (2017) in Mizan-Aman town reported that the majority of the households (72.1%) believed that waste should be recycled, reused and reduced for further use.

Out of 390 respondents, 242 (62.1%) said they strongly agree on the statement that every household should have responsibility for the proper collection and disposal of solid wastes. However, Mengist Hailemariam and Assegid Ajeme (2014) in Adama city showed that more than half of the respondents (53.6%) did not accept the idea about every household is responsible for the collection and proper disposal of solid wastes.

More than half of the respondents, 210 (53.8%) responded strongly agree and 136 (34.9%)said agree for the statement "Putting solid wastes into the garbage container is the responsibility of everybody.". From the above results it can be concluded that 88.7% of the residents had positive attitude on the statement that putting of solid wastes into the garbage container is the responsibility of everybody. A study conducted by Thrirumarpan *et al*. (2015) in Sri Lanka reported that 29.3% and 25.3%of the respondents said strongly agree and agree respectively. But the rest of them responded that not sure, disagree and strongly disagree that putting solid wastes into the garbage container is the responsibility of everybody.

In the table below, 307 (78.7%) of the households responded strongly agree for the statement" Proper solid waste management is important for creating healthy environment.". This result shows that most respondents had positive attitude towards proper solid waste management for creating healthy environment. Similar results in Mizan Aman town by Sisay Shewasinad *et al.* (2017) were reported that all of the respondents (100%) said that proper waste management has health and economic importance.

Out of the total households, 213 (54.6%) said strongly disagree and127 (32.6%) of them said disagree on the statement that the municipality gave enough public awareness on solid waste management. This shows that the municipality did not give enough awareness on solid waste

management. Therefore, the concerned bodies should give more emphasis to solve solid waste management challenges. Similarly, a study was done in Gondar town by Mohammed Gedefaw (2015) reported that respondents asked to estimate the effort made by municipality to provide efficient MWM services of the town. Majority of them (75.5%) responded that the municipality has made weak effort.

Two hundred sixty six (68.2%) of the respondents reported strongly agree on the statement in which solid waste management service is a burning issue in our surrounding. This result shows that majority of them had positive attitude on the given idea. Likewise, a study conducted in Pakistan by Shahzadi *et al*. (2018) indicated that 84% of the respondents were responded proper waste disposal is important.

From the total households, 226 (57.9%) and 99 (25.4%) of them disagreed and strongly disagreed respectively on the statement that the municipality can conduct supervision and control on illegal dumping of solid waste in the town. From the finding it can be concluded that 83.3% of the respondents reflected negative attitude. Therefore, for proper management of solid wastes, supervision and control of the municipality should be needed.

Two hundred twelve (54.4%) and 114 (29.2%) of the respondents implied strongly agree and agree respectively on the statement that selling plastic waste for recycling can help to manage solid waste. Therefore, recycling is one of the options to manage solid wastes. Thus, the households had positive attitude on the given statement above.

Generally, in this study, it was concluded that 67.8% of the households had positive attitude on solid waste management.

Table 3 Households` attitude related responses on solid waste management

No	Statements	Alternatives	Response in	
			No	%
11	Solid waste is anything without value.	SA	41	10.5
		A	71	18.2
		D	102	26.2
		SD	176	45.1
12	Solid waste is one of the environmental problems that need an immediate attention.	SA	341	87.4
		A	24	6.2
		D	19	4.9
		SD	6	1.5
13	Solid wastes can be reduced, reused, and recycled.	SA	274	70.3
		A	57	14.6
		D	52	13.3
		SD	7	1.8
14	Every household should have responsibility for the proper collection and disposal of solid wastes.	SA	242	62.1
		A	111	28.5
		D	26	6.7
		SD	11	2.8
15	Putting solid wastes into the garbage container is the responsibility of everybody.	SA	210	53.8
		A	136	34.9
		D	33	8.5
		SD	11	2.8
16	Proper solid waste management is important for creating healthy environment.	SA	307	78.7
		A	50	12.8
		D	22	5.6
		SD	11	2.8
17	The municipality gave enough public awareness on solid waste management.	SA	24	6.2
		A	26	6.7
		D	127	32.6
		SD	213	54.6
18	Solid waste management service is a burning issue in our surrounding.	SA	266	68.2
		A	74	19.0
		D	26	6.7
		SD	24	6.2
19	The municipality can conduct supervision and control on illegal dumping of solid waste in the town.	SA	21	5.4
		A	44	11.3
		D	226	57.9
		SD	99	25.4
20	Selling plastic waste for recycling can help to manage solid wastes.	SA	212	54.4
		A	114	29.2
		D	49	12.6
		SD	15	3.8

Alternatives: SA= strongly agree A=Agree D=Disagree SD=strongly disagree

4.4. Households` Practice towards Solid Waste Management

4.4.1. Access of shared containers (community bins)

As indicated in the figure 2, 364 (93.3%) of the respondents responded negatively ("No") and the rest 26 (6.7 %) responded positively ("yes") for the question "Do you have access for shared container (Community bins) for solid waste?". From this, it is possible to conclude that almost they do not have access for shared containers (community bins) in the town. Therefore, the authorities and concerned bodies of the town should give greater attention to solve the problems.

In contrary, a study done in one of Ghana cities, Tamale by Oluwole (2017) has revealed that 92% of the households used waste bins which suggest that most of the households concerned about hygiene and need to keep the environment clean. Moreover, a study was done in Bahir Dar city by Birara Endalew and Kassahun Tassie (2018) reported that, 93.7% households had solid waste storage receptacles (bins) used to store solid wastes in common. Therefore, the reverse is done in Gelemso town due to the less attention of the municipality and the concerned bodies.

According to Tadesse Tewodros *et al*. (2008), the factors that influence household waste disposal was: waste disposal choice, inadequate supply of waste containers and longer distance to these containers which increases the probability of waste dumping in open areas and road sides relative to the use of communal containers.

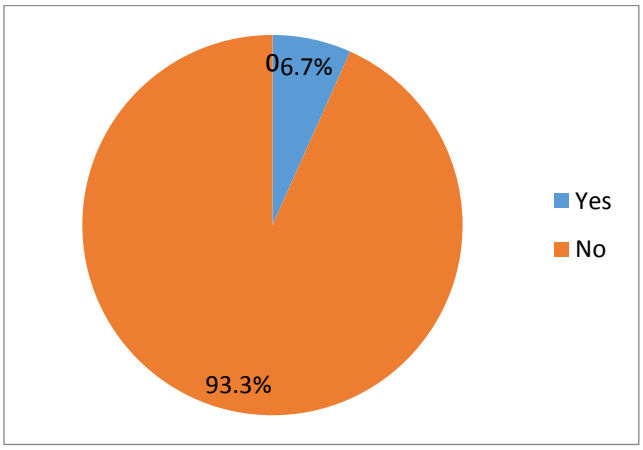

Figure 2 Households` response whether they have access of shared containers (community bins) for solid waste or not.

4.4.2. Solid waste dump sites

Landfill is disposal of waste with different liners and finally with earth cover. It is also the most economical, especially in developing countries where it typically involves pitching refuse into depression or closed mining site. It is also, a facility which is designed for the safe disposal of solid wastes (Daskalopoulos *et al*., 1998).Similarly, Strange(2002) reported that, land filling is the final destination of most waste produced from waste treatment and processing facilities. Strange, added that, other technologies merely serve the purpose of volume reduction or treatment before final disposal.

As it can be seen in table 4 that, 348 (89.2 %) of the respondents replied "No" but 42 (10.8 %) replied "yes"to availability of solid waste dumpsites in Gelemso. This shows that there were not adequate solid waste dump sites in the town.to availability of solid waste dumpsites in Gelemso

Figure 3 Dumpsite of solid wastes in Gelemso town

Source: Survey by researcher.

Table 4 Households` Response whether there are adequate solid waste dumpsites in the town or not.

Alternatives	Respondent in	
	No	%
Yes	42	10.8
No	348	89.2
Total	390	100

4.4.3. Transport of solid waste to communal collection site

Waste management is a process by which wastes are gathered, transported and processed before disposal of any remaining residues (Demirbas, 2011).

Regarding the way of transport of solid wastes to the dump site or landfill, 198 (50.8 %) households responded with in private waste collectors by paying incentives and 17.9 % of them by MSEs. In contrary, a study conducted in Adama city by Mengist Hailemariam and Assegid Ajeme (2014), regarding the waste collection and disposal services, 69% of the respondents stated that their waste was disposed by MSEs. But the result shows that, there was less attention of the Gelemso town municipality to transport solid wastes from every individual house to the dump site by MSEs.

Figure 4 House to house collection of solid wastes by MSEs.

Source: Field survey by researcher.

Table 5 Households` response that in what way they transport solid wastes to the dump site?

Alternatives	Respondent in	
	No	%
By members of the households	70	17.9
Paying for MEPs	70	17.9
Private waste collectors	198	50.8
Other means	52	13.3
Total	390	100

4.4.4. Access of house to house collection and disposal service of solid wastes

As mentioned in table 6, 273 (70 %) of the households replied that, there is no access for house-to house collection and disposal service of solid wastes. It can be concluded that there is less access of house-to-house collection and disposal service of solid wastes due to small number of MSEs and less attention of municipal administration.

Table 6 Households` Response whether they have access of house-to house collection and disposal service or not.

Alternatives	Respondent in	
	No	%
Yes	117	30
No	273	70
Total	390	100

4.4.5. The content and volume of solid wastes

A substantial increase in volume of wastes generation began in the sixteenth century when people began to move from rural areas to cities as a result of industrial revolution (Wilson, 2007). In recent time, the rate and quantity of waste generation have been on the increase. As the volume of wastes increases, so also does the variety of the waste increases (Vergaraand Tchobanoglous, 2012).

From 390 households, 320 (82.1 %) of them replied that increase the content and volume of solid waste changes from time to time. This result shows that the content and volume of solid wastes increased from time to time and it might be due to the movement of people from rural area to the town.

Table 7 Households` Response the question for how is the content and volume of solid waste changes from time to time.

Alternatives	Respondent in	
	No	%
Increase	320	82.1
Decrease	43	11.0
The same	27	6.9
Total	390	100

4.4.6. Burning of solid wastes

According to UNEP (1996), there are considerations that we should keep in our mind when we want to choose incineration. These are the necessary environmental controls are properly installed and maintained; the facility is properly sized and sited to fit well with other components of the municipal solid waste management and the material to be burned is combustible and has sufficient energy content.

Three hundred forty one households (87.4%) said "Yes". This indicates that majority of the households` burnt solid wastes. A similar study in Bahir Dar city conducted by Birara Endalew and Kassahun Tassie (2018) reported that, 60% of sample households practiced burning and burying of the collected waste in their compound. Thus, it can be concluded that,uncontrolled burning of solid wastes may have a negative impact on the environment.

Figure 5 Burning of solid wastes on open areas.

Source: Photo by researcher

Table 8 Households` Response whether they burn solid wastes or not.

Alternatives	Respondent in	
	No	%
Yes	341	87.4
No	49	12.6
Total	390	100

4.4.7. The frequency of burning solid wastes

Majority of the households, 151 (38.7 %) responded that, burning of solid wastes monthly and followed by 134(34.4 %) weekly. This result shows that 73.1 % the households were

burning solid wastes monthly and weekly. Therefore, the concerned bodies should have to give emphasis on how to burn solid wastes and how to change in to energy sources.

Table 9 Households` response for the frequency of burning solid wastes.

Alternatives	Respondent in	
	No	%
Once in two or three days	52	13.3
Weekly	134	34.4
Monthly	151	38.7
No response	53	13.6
Total	390	100

4.4.8. Collection and disposal service of solid wastes

The collection, transfer and transport practices are affected by improper bin collection systems, poor route planning, lack of information about collection schedule, insufficient infrastructure, poor roads and number of vehicles for waste collection and organizing the informal waste collection services (Sharholy *et al*., 2008).

According to figure 3,236 (60.5 %) respondents indicated that the collection and disposal services of solid waste that was provided by municipality is poor.. Therefore, the authorities and concerned bodies of the town should give more emphasis to solve the problems.

‘Similar results were reported in Gondar town by Mohammed Gedefaw (2015) that respondents are asked to estimate the effort made by municipality to provide efficient municipal solid waste management service compared with other services of the town; majority (75.5%) of them responded that municipality has made weak effort.

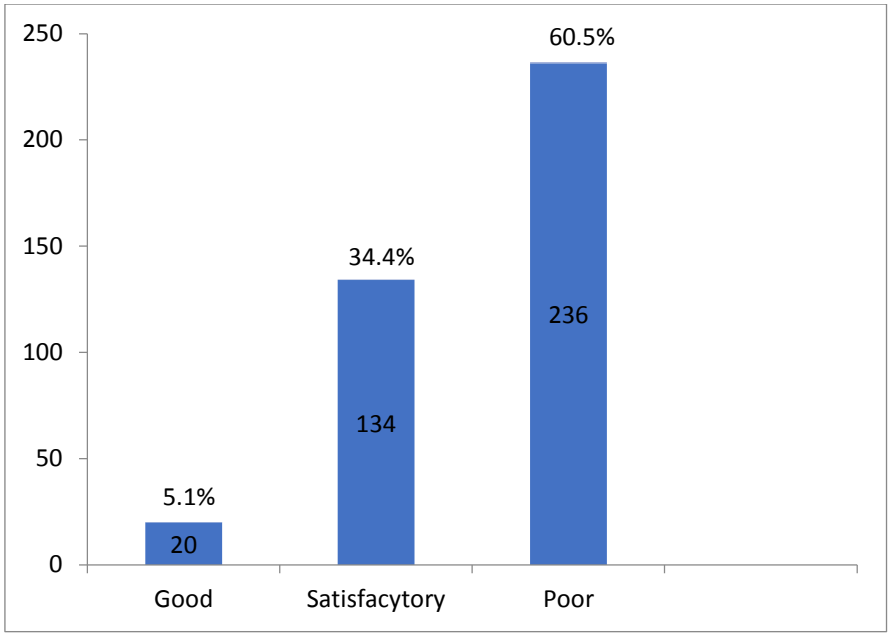

Figure 6 Households` Response on the question for how are the collection and disposal services of solid waste provided by the municipality

4.4.9. Get rid of solid wastes from house

Households responded how they can get rid of solid wastes from their house.The result shows that more than half (57.9 %) of the respondents were get rid and dumped of solid wastes in yard or sacs and the least, 31(7.9 %) of them were get rid and dumped solid wastes at disposal site.Mengist Hailemariam and Assegid Ajeme (2014) indicated that majority (85%) of households used sacs temporarily to store solid wastes. Based on this finding, one can conclude that there is lack of dump sites in the study town. Therefore, the concerned bodies have to prepare legal and enough dump sites.

Figure 7 Dumping of SWs in sacs at home level .Figure 8 Dumping of SWs in valley.

Source: Photo by researcher. Source:Photo by researcher.

Table 10 Households` response how can they get rid of solid wastes from their house.

Alternatives	Respondent in	
	No	%
Dump in yard or sacs	226	57.9
Dump on road or in gully	84	21.5
Dump at disposal site	31	7.9
Bury	49	12.6
Total	390	100

4.4.10. The typical components of household solid wastes

Urban solid wastes can be segmented into two major components called biodegradable and non-biodegradable. The biodegradable component of urban solid waste constitutes organic wastes such as food waste, garden waste, and agricultural waste which undergo biological degradation under controlled conditions and can be turned into compost organic fertilizer. While non-biodegradable wastes includes inorganic materials which can't be decomposed and degraded (Solomon Cheru, 2011).

Two hundred fifty six (65.6 %) of the households responded that the typical component households solid wastes were food waste, shopping bag (plastics) and paper. From the result, it can be concluded that majority of the typical household solid wastes were biodegradable and non-biodegradable solid wastes such as food waste, plastics, *pestals* and papers.

Similar findings were reported in Adama city by Mengist Hailemarian and Assegid Ajeme (2014) that 42% of the households said food and food related wastes constitute the larger portion of the solid waste generated followed by 20% solid waste from plastics.

Table 11 Households` Response for the typical components of the solid wastes in their home are

Alternatives	Respondent in	
	No	%
Food waste, shopping bag(plastics) and paper	256	65.6
Beverage and food cans ,glass and bottle	30	7.7
Leather, metal, textile and others	34	8.7
Others	70	17.9
Total	390	100

4.4.11. Experience and willingness of sorting solid wastes

Sorting is an essential component of solid waste management or decreasing the amount of the materials. It is a kind of activity which is separating different types of wastes in their respective nature. It makes waste management easy and simple (Ayele Bacha, 2016).

Majority of the households sort solid wastes for different purpose in their home. For example, reusing of plastic bags, use plastics for energy purpose in their kitchen, composting of waste for planting different flowers at their home, all of these activities promoting the reduction of solid waste by weight (USEPA, 1990).

Out of 390 respondents, 212 (54.4 %) of them responded negatively ("No"). This result implies that more than half (54.4%) of the respondents didn`t have an experience and willingness of sorting of solid wastes. They might believe that it is time wasting and a dirty job. But, the study made by Banga (2013) in Kampala city indicated that 59.4% of the households were separate some of their wastes.

Table 12 Households` Response whether they have an experience and willingness of sorting solid wastes generated in their home or not.

Alternatives	Respondent in	
	No	%
Yes	178	45.6
No	212	54.4
Total	390	100

4.4.12. The use of solid wastes

Troschinetz and Mihelcic (2009) pointed out that, some waste management methods are often preferred than others. For instance, reuse, recycling, composting and energy generation from incineration are often preferred to landfills.

Table 13 indicates that, 166 (42.6 %) of the respondents were burning of solid wastes and the least43 (11.0 %) of them were composting of solid wastes as fertilizers to increase the fertility of the soil. It can be concluded that most of them 42.6 % were burning of solid wastes and this can pollute the environment. They could also use solid wastes for recycling; reuse and composting were not satisfactory. In similar finding in Urban Kampala made by Banga (2013) reported that 7.2% of the households separated the solid waste to make manure (compost).

Table 13 Households` response for the question what are they doing with these solid wastes

Alternatives	Respondent in	
	No	%
Reusing	107	27.4
Selling for recycling	74	19.0
Composting	43	11.0
Burning	166	42.6
Total	390	100

4.4.13. Exchange of solid waste materials for other purpose

There is little practice of waste reuse for different purposes still the practice is low in the town except some people called "*Koraleos*" who move through the town to buy recyclable items such as glass, plastic, tin cans, metals, shoes etc. from different households, hotels, restaurants, repairs services and sell them to small recyclers and industries. There are people who exchange solid waste materials with new household utensils to people who engaged in types of job locally known as "*Lewach*" (Ayele Bacha, 2016).

From the data, 237 (60.8 %) of the respondents said "Yes". This shows that more of the respondents (60.8 %) exchanged solid waste materials to *Koraleo*.It can be concluded that exchange is a means of income and reduction of solid wastes.

The finding made by Banga(2013) in Urban Kampala showed that the majority of the households (70.1%) separated waste, because they earned an income from the separated waste.

Figure 9 Collection of solid wastes by Koraleo for recycling.

Source: Field observation by researcher.

Table 14 Households` response whether there is any solid waste material they exchange to kuraleo or not.

Alternatives	Respondent in	
	No	%
Yes	237	60.8
No	153	39.2
Total	390	100

The interviewees had mentioned to municipality and MSEs on all of the challenges they faced through their day to day activities related to solid waste management in the town. Interview question was used to collect or gather additional information. The data gathered

through interview method was used for supporting and strengthening the discussion. The interview questions provided for municipal officials and the micro enterprises were more or less similar and their responses were more related to the households' response.

During field observation, the following gaps were identified.

- Low coverage of solid waste collection.
- Lack of fixed solid waste storage like container and community bins.
- Absence of transfer stations and skips.
- Less number of MSEs and labor workers.
- Lack of sanitary municipal supervisor(s).
- Almost, all of the solid wastes are not sorted at home level.

During solid waste disposal practice, the following gaps were observed:

- No sanitary landfill.
- No action for generating gases.
- Unfavorable odors at the temporary dumpsite.
- Insufficient action for hazardous wastes.
- No action for run off control.
- No action for waste reduction at site.
- The disposal sites are neither demarcated nor fenced.

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Solid waste management is one of the important compulsory functions for all societies. From the research it is found that, the knowledge of the respondents was good as well as their attitude about solid waste and its management. However, the municipality did not give enough awareness on solid waste management and the supervision activities were also weak to control the illegal dumping of solid wastes in the town.

The practice of respondents towards solid waste management is relatively poor. Thus, it needs more attention to change the practice of the households' and to protect the environment.

Most of the respondents were incinerating the solid wastes, this may have its own negative environmental impacts, and thus the municipality should give a training and awareness how to incinerate solid wastes.

One of the challenges that faced in the town is increasing the volume and content of solid wastes due to the movement of people from rural areas to the town. Moreover, another problem that is found in the town is lack of initiation of the municipal officials to arrange the best dump site and to organize or to give basic awareness to the households`.

The study is hoped to contribute towards establishing a sustainable environment and public health initiatives in the town.

5.2 Recommendation

In this study, the following points based on the research findings are recommended:

- The municipality should organize continuous awareness campaign to the households on how to manage solid waste properly.
- .Community members should be involved in decision-making regarding their waste management.
- The municipality should prepare standardized solid waste dump site.
- Appropriate facilities such as transporting vehicles, community bins, containers, gloves, safety clothing and other tools must be provided as for the requirement of the waste to be disposed.
- Mass media such as speaker and leaflets should be used to facilitate changes in attitude, practice and perception of the communities towards waste management.

- Taking measures on those who illegally disposed solid wastes at an open space such as roads and ditches.
- Re-establishing and encouraging MSEs to manage in collection and disposal.
- The municipal office should solve all the current solid waste management problems and be able to give better services.

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7. APPENDICES

7.1. ANNEX I.Introduction and Request for participation

Principal investigator of the study: Hailu Eshete

Institution: Addis Ababa University

Supervisor: Dr. Asnake Desalegn

Title of the study: Assessment of Households' Knowledge, Attitude and Practice of Solid Waste Management in Gelemso town.

Introduction: This study is about assessment of Households' Knowledge, Attitude and Practice of Solid Waste Management in Gelemso town and needs your voluntary participation.

My name is Hailu Esthete; I'm doing a Master of Biology at the Addis Ababa University, Addis Ababa, Ethiopia. I'm conducting questionnaire based survey to find out issues related to assessment of Households' knowledge, attitude and practice of solid waste management. I would like to have your time to fill the questionnaire about assessment of Households' knowledge, attitude and practice of solid waste management. Your identity will be treated with confidentiality and the information you provide will be used solely for the purpose of this study. Your name will not be written on the interview note or anywhere else and will never be used in connection with any of the information you tell me. You don't have to discuss issues that you do not want to and you may end the interview any time. If you want to withdraw from the study any time along the study process you will not be obliged to continue or give reasons for doing so. Refusing to participate or withdrawing from the study along the process will not have any consequences on you. However, the information that you provide during the discussions will help understand issues related to the households' knowledge, attitude and practice of solid waste management and might help for future interventions. The findings of the interviews might get published and contribute to understanding of problems associated with the assessment of households' knowledge, attitude and practice of solid waste management in Gelemso town. I would greatly appreciate your positive participation in this study. If you have any questions or anything that is not clear please feel free to ask me.

Thank you very much for taking part in this questionnaire based survey.

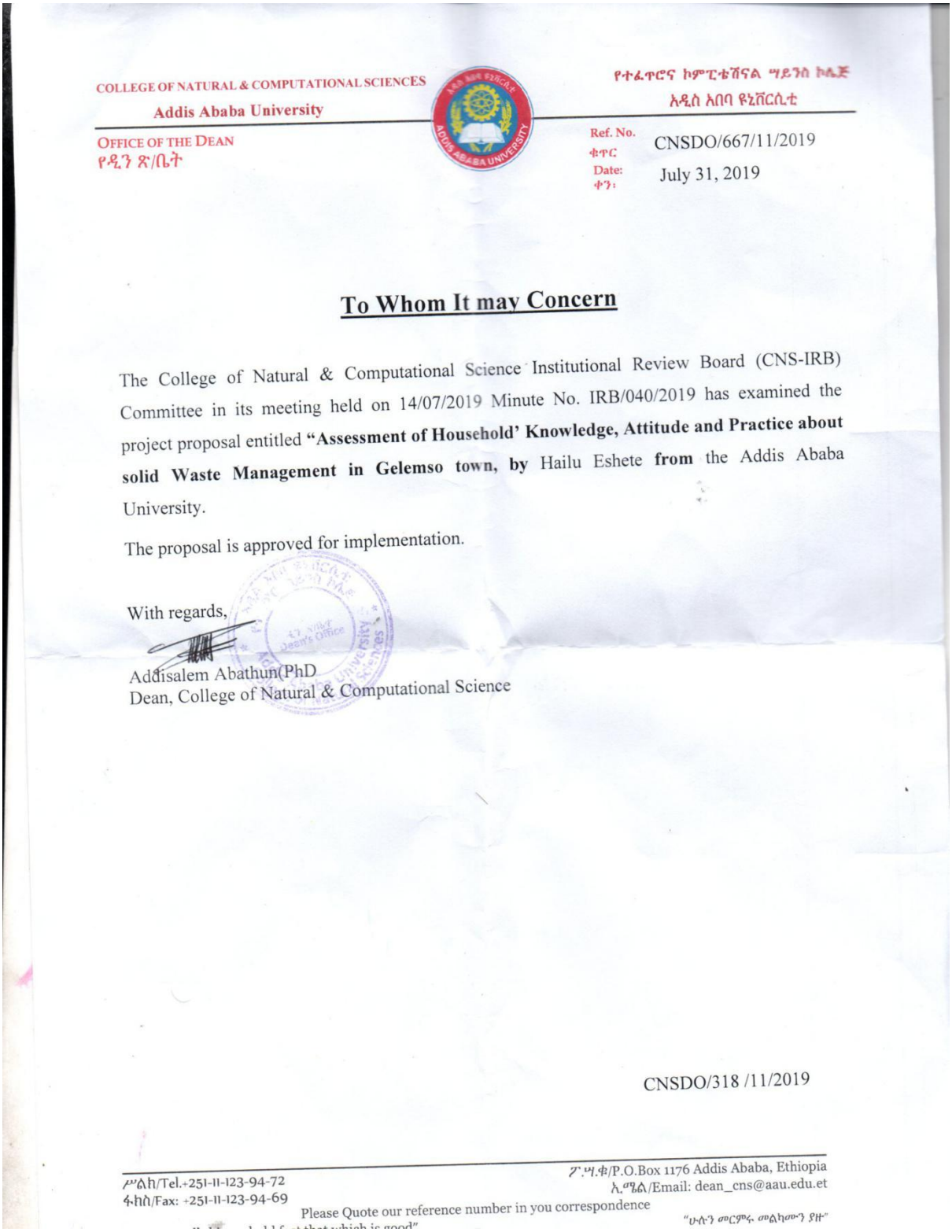
Name: Hailu Eshete **Email**:_____ **mobile phone**:_____

7.2. ANNEX II:Consent Form

I, the undersigned, have been informed that the purpose of this research is to find out issues related to the assessment of households' knowledge, attitude and practice of solid waste management. I have been informed that I am going to have discussions with the researcher about issues related to the assessment of households' knowledge, attitude and practice of solid waste management. I have also been informed that the information that I give will solely be used for this study and the findings may get published, but my identity will be treated with confidentiality and my name will not be used in connection with the information I provide. I have also been informed that I can stop the interview any time I want, and that I will not be obliged to continue to participate in the study or give reasons for doing so. I have also been informed that I can stop participating any time along the study process, refusing to participate or withdrawing from the study will not have any consequences on me. I the under singed study participant understood all the information in the consent form and agree to participate in this questionnaire based survey.

Signature ---------- Date ----------

7.3. Annex III. Ethical Clearance



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የዲን ጽ/ቤት

የተፈጥሮና ኮምፒቴሽናል ሣይንስ ኮሌጅ
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Ref. No. ቁጥር: CNSDO/667/11/2019
Date: ቀን: July 31, 2019

To Whom It may Concern

The College of Natural & Computational Science Institutional Review Board (CNS-IRB) Committee in its meeting held on 14/07/2019 Minute No. IRB/040/2019 has examined the project proposal entitled **"Assessment of Household' Knowledge, Attitude and Practice about solid Waste Management in Gelemso town, by** Hailu Eshete **from** the Addis Ababa University.

The proposal is approved for implementation.

With regards,

Addisalem Abathun(PhD
Dean, College of Natural & Computational Science

CNSDO/318 /11/2019

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"ሁሉን መርምሩ መልካሙን ያዙ"

7.4. ANNEX IV. Questionnaires and Interviews

ADDIS ABABA UNIVERSITY

College of Natural and Computational Sciences Department of

Zoological Science School of Graduate Study

Dear respondents, the aim of this questionnaire is prepared to gather relevant information about the **Assessment of Households' Knowledge, Attitude and Practice of Solid Waste Management in Gelemso town**. So your genuine and correct responses will contribute for my effective work. Your information will be kept confidential and not used for other purpose and hence you are personally not affected. For this reason you are kindly provide the correct information for the following questions.

GENERAL INFORMATION

- Do not write your name.
- Please putting an"X" mark in boxes.
- Circle the correct letter for the choice questions.
- Provide relevant information for open ended questions on space provide.
- Fill the questionnaire without discussing with your friends.

SECTION I. QUESTIONNAIRES FOR HOUSEHOLDS' RESPONDENTS

the information obtained through this questionnaire will be used only for academic Purpose and could not have any effect on the respondents' privacy. **Part I. Respondents' of Personal Information**

1. Kebele; A, 01 ☐ B, 02 ☐

2. Sex: A, Male ☐ B, Female ☐

3. Age in year: _____

4. Educational status: A, None formal schooling ☐ B, Primary school ☐

C, Secondary or Preparatory School D, Certificate ☐ E, Diploma ☐ F, 1st

Degree and above ☐

5. Duration of Stay in the town: A, < 2 years ☐ B, 2-5years ☐ C, 6-10 Years ☐ D, Above 10 years ☐

6. Household size: A, Below 4 B, 4-6 C, 7-10 D, above 10

7. Average household's monthly income in birr: A, Less than 1000 ☐ B, 1000-1500 ☐ C, 1501-3000 ☐ D, 3001-5000 ☐ E, above 500O ☐ 8. Occupation: A, Government employee ☐ B, NGO ☐ C, Self-employed☐D, employed in Private sectors ☐

E, other (specify) _____

Part II. Knowledge of Households towards Solid Waste Management.

Please, choose one of the alternatives by putting an "X" in the given tables.

No	Questions	Alternatives	
		A	B
1	Does solid waste pollute the environment?		
2	Are burning of solid wastes can affect the environment?		
3	Do you think waste papers, plastic bags, a piece of metal, wood and cloths are rubbish?		
4	Is solid waste being a resource?		
5	Can solid waste be sorted and sold?		
6	Do you think that compost or organic fertilizer can be prepared from solid waste?		
7	Could you reduce the amount of solid waste you generate by reusing plastic bags, bottles, papers etc?		
8	Can some diseases such as diarrhea, typhoid, cholera etc are caused by improper disposal of solid waste?		
9	Do you think sorting of solid waste at home level could significantly important?		
10	Do you think that illegal dumping of solid wastes polluting rivers, streams, and wells?		

Alternatives: A= Yes B= No

Part III. Attitude of Households towards Solid Waste management Please, choose one of the alternative scales by putting an "X" in the given tables.

No	Statements	Alternative scales			
		A	B	C	D
11	Solid waste is anything without value.				
12	Solid waste is one of the environmental problems that need an immediate attention.				
13	Solid wastes can be reduced, reused, and recycled.				
14	Every household should have responsibility for the proper collection and disposal of solid wastes.				
15	Putting solid wastes into the garbage container is the responsibility of everybody.				
16	Proper solid waste management is important for creating healthy environment.				
17	The municipality gave enough public awareness on solid waste management.				
18	Solid waste management service is a burning issue in our surrounding.				
19	The municipality can conduct supervision and control on illegal dumping of solid waste in the town.				
20	Selling plastic waste for recycling can help to manage solid waste				

Alternative Scales: A=Strongly Agree B=Agree C=Disagree D=Strongly Disagree

Part **IV. Households' Practice in Solid Waste Management.**

Please, answer by circling one of the alternatives for the following questions:

21 .Do you have access for shared container (Community bins) for solid waste? A, Yes B,

22. Are there adequate solid waste dump sites? A, Yes B, No

23. In what way do you transport solid waste to the container? A, By member of the households B, Paying for micro enterprise C, Private waste collectors D, Other means

24. Do you have access for house-to- house collection and disposal service? A,Yes B,No

25.How are the content and volume of solid waste changes from time to time in the town?

A, Increase B, Decrease C, The same

26. Do you burn solid wastes? A, Yes B, No

27. The frequency of burning your household solid waste will be: A, Daily B, once in two or three days C, Weekly D, Monthly

28. How is the collection and disposal service of solid waste provided by the municipality? A, Good B, Satisfactory C, Poor

29. How can you get rid of solid wastes from your house? A, Dump in Yard or Sacs

B, Dump on road or in Gully C, Dump at disposal site or Garbage bin D, Bury

30. What are the typical components of your household solid wastes? A, Food waste, Shopping bag(plastics) and paper B, Beverage and food cans, glass and bottle C, Leather, Metal, textile and others D, All

31. Do you have an experience and willingness of sorting solid wastes generated in your household? A, Yes B, No

32. What are you doing household solid wastes? A, Re-using B, Recycling C, Composting D, Burning

33. Is there any solid waste material you exchange to Koraleo?A, Yes B, No

Section II. Discussion Points with Key Informant Group (MEPs)

ADDIS ABABA UNIVERSITY

College of Natural and Computational Sciences Department of Zoological Science School of Graduate Study

Dear respondents, the aim of this discussion is prepared to gather relevant information about the **Assessment of Households' Knowledge, Attitude and Practice of Solid Waste Management in Gelemso town**. So your genuine and correct responses will contribute for my effective work. Your information will be kept confidential and not used for other purpose and hence you are personally not affected. For this reason you are kindly provide the relevant information for the following questions.

1. How is the volume and content of solid wastes generated from households year to year in the town?

_____

_____

2. Could you please describe how you collect solid wastes from households?

_____

_____

3. How often do you collect solid wastes from the households in designated area?

_____

_____

4. Is there any sorting of solid wastes at household levels?

_____

_____

5. Do you think that sorting of solid waste at home level could significantly important?

_____

_____

6. Could you please describe where you take the solid wastes you are collected from the households?

_____

_____

7. Do you agree that the municipality has done enough public awareness on solid waste management?_____

_____

8. What challenges do you faced when you are collecting and transporting solid waste from the

households?_____

_____

Section III. Interview questions for Municipal Office Experts (key informants).

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Dear respondents, the aim of this interview is prepared to gather relevant information about the **Assessment of Households' Knowledge, Attitude and Practice of Solid Waste Management in Gelemso town**. So your genuine and correct responses will contribute a great value for my effective work. Your information will be kept confidential and not used for other purpose and hence you are personally not affected. For this reason you are kindly provide relevant information for the following questions.

1 .Do you agree that the municipality has done enough public awareness on solid waste management?_____

_____

2. What are the major constituents of solid wastes in your town?

_____

_____

3. How are the content and the volume of solid waste changes from time to time in the town?

_____

_____

4. Are there adequate solid waste dump sites in the town?

_____

5. Have you a plan to encourage the households to reuse and recycle of solid wastes in your town?_____

_____

6. Are the households accepting the decision made by your office on solid waste management in the town?_____

_____

7. What are some of the challenges in dealing with solid waste management?

_____

_____

8. What measures your office has taken to solve solid waste management challenges?

_____

_____

7.5. Annex V. Afan oromo version of Questionnaires and Interview Maxxannee

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Kabajamootoota namoota odeeffannoo naaf kennitan hundaaf galatni kiyya guddaa ta'uu ibsaa kaayyoon kiyya inni guddaan odeefannoo gahaa waa'ee sakatta`insa beekumsa,ilaalchaa fi qabatamaa raawwii hojii haala hoggansa balfaa jajjaboo magaalaa Galamsoo irrattii hojjetamaa jiru sakatta'uuf. Kanafuu yaadanni fi gorsii keessan haala qoronnoo kiyaaf galtee waan naaf ta'uu.Akkasumaas odefannoon keessanif bakka guddaa waanan kennuuf of-qusannoo tokkoon maleetti gaaffileewaan kennaman hunda keessatti deebii akka naafkennitan isin gaafachaa tumsa keessannif duree isin galatoomfadha.

Yaada Waligalaa

- Maqaa keessan hin barreessinaa.
- Saanduqa kenneme keessatti mallattoo "x" kaa'aa.
- Filannoowaan kennamanif deebi ta'a kan jettan itti maraa .
- Gaafilee banaa kennamanif yaada keessan bakka duwaa irratti barreessaa.
- Deebi/yaada keessan marii tokkoon maleetii yaada kessan guutaa.
- Sekshinii I. Gaafannoowwan
- Deebisawwan keessan dandeetti waligalaa haala qoranichaaf kennu gargaaruu malee namoota deebii nuuf kennan irratti dhiibbaa kan geesisu miti.

Kutaa I. Haala waligalaa deebii kennitootaa

1.Aradaa A,01 ☐ B, 02 ☐

2.Saala A, Dhi ☐ B, Dub ☐

3.Umrii _____

4.Haala barnoota A, Barnoota bu'ura ☐ B,Sad 1ffaa ☐ C,Sad 2ffaa fi Qopa`ina ☐
D,waraqaa ragaa ☐ E,Diplooma ☐ F, Digrii duraa fi ol ☐

5.Haala turti Magaala Galamsoo keessa A,waggaa 2 gadi ☐ B,waggaa 3-5 ☐

C, waggaa 6-10, ☐ D. waggaa10 oli ☐

6.Haala baayina maatii A,4 gadi ☐ B, 4-6 ☐ C, 7-10 ☐ D, 10 oli ☐

7.Haala galii maati ji'atti qarshidhaan A, 1000 gadi ☐ B, 1000-1500 ☐

C, 1501-3000 ☐ D, 5000 oli ☐

8.Haala hojii A,Qaxarama mootumma ☐ B, Dhaabbata miti mootumma (NGO) ☐
C,Hojii dhunfaa ☐ D, Qaxarama dhabbata dhuunfa ☐ E, Kan biroo ☐

Kutaa II. Haala Beekumsa Maatii(Abba/Hadha warraa) Hoggansa balfaa jajjaboo irratti.

Bakka duwaa gabatee kenname keessatti mallattoo "X" gochuun agarsisaa.

Lakk	Gafannoowwan	Filannoo	
		A	B
1	Balfaa googan naannoo ni faalaa?		
2	Balfaa gubuun naannoo irratti miidhaa geesisuu ni danda'a?		
3	Kanneen akka waraqaa,plaastika adda addaa, sibilaa xixiqqaa, mukeenfi huccuu balfaa jettee yaaddaa?		
4	Balfaa gogaan qabeenyaa dha?		
5	Balfaa jajjaboo gosaan adda baasuu fi gurgguruun ni danda`amaa?		
6	Balfaa gogaa irraa kompoostii ykn xaa`oo uumamaa tolchuun nidanda`ama jettee yaaddaa?		
7	Pilaastikaa,qaruuraa fi waraqaa irra deebiin itti fayyadamuun hamma balfa gogaa xiqqeessun ni danda'ama		
8	Balfaawwan gogaa bakka hin barbaachisnetti gatuun dhibbeewan garaakaasaa (diarrhea),taayifooyidi(golfaa) fi koleeraa fiduu danda'a?		
9	Sadarkaa maatitti balfaawwan jajjaboo gosaa fi bifaan addaan baasanii kaa`uun barbaachisaa dhaa?		
10	Balfawwan gogaa bakka kamittuu gatuun lageen ,madda bishaani fi bishan bool`aa faaluu ni danda`aa?		

Filannoo: A=Eeyyee B=Lakkii

Haala Kutaa III Ilaalchaa Maati (Abba / Hadha warra) Hoggansa balfaa jajjaboo irratti.

Deebisa keessan bakka duwaa gabatee kenname keessatti mallattoo “X”gochuun agarsisaa .

Lakk	Ibsa	Filannoo			
		A	B	C	D
11	Balfaa jajjaboon wanta faayidaa hin qabne dha.				
12	Balfaa jajjaboon rakkoo guddaa naannoo irratti waan uumuufxiyyeffannaa guddaa barbaada.				
13	Balfaa jajjaboo hir`isu,irra deebi`ani fayyadamuu fi haroomsuun ni danda`ama.				
14	Maatiin kam iyyuu balfaa jajjaboo seeraan funaanee bakka barbaachisaa ta`etti gatuuf ittigaafatamummaa qaba.				
15	Maatiin kam iyyuu balfaa jajjaboofunaanee kuusaa balfaa keessatti gatuuf dirqama qaba.				
16	Balfaa jajjaboo seeraan hogganuu fi to`achuun naannoo fayyaaleessaa uumuuf ahe guddaa qaba.				
17	Manni kurfeessaa hubannoo gahaa waa`ee balfaa jajjaboo irratti hawaasaa naannoof keennee jira.				
18	Tajaajilli hoggansa balfaa jajjaboo dhimma yeroo xiyyeeffannaa barbaadu dha.				
19	Manni kurfeessaa magaalichaa hordofi fi to`annoo balfaa goggoogaa irratti ni gaggeessa.				
20	Balfaawwan plaastikaa irra deebi`anii fayyadamuuf gurgurtaaf oolchuun balfaa jajjaboo to`achuu keessatti gahe qaba.				

Filannoo: A= Haalaan amanuu B= Amanuu C= Amanuu dhisuu D= Haalaan amanuu dhisuu

Kutaa IV. Barteewwan Maatii Hoggonsa balfaa Jajjaboo hoggaruu Irratti

Deebisaa keessan qubee deebii sirri dha jettani yaaddanitti maraa.

21.Haala mijata balfaawwan bakka tokkootti itti gattan ni qabduu? A. Eyye B. Lakki

22.Magaalaa Galamsoo keessatti kuusaa balfaa jajjaboo ykn bakka itti gtan gahaan ni jiraa? A, Eeyyee B, Lakki

23.Haala kamin balfaa gara kuusaa balfaatti geessituu? A,miseensa maatiin B, IMX(intarpraayzii maaykiroo fi xixxiqaa) kafaltiin gachisissuu C,Nama dhunfaaf kaffaluun D, mala biroon

24.Haalli mijjataan manaa manaatti deemuun balfaa jajjaboo guuruun tajaajiluun ni jiraa? A, Eeyye B, Lakki

25.Qabiyyee fi qabeen balfaa jajjaboo magaalaatti yeroo gara yerootti haala akkamiin jijjiramaa dhufee? A, Ni gudataa B, Ni hir`isa C, Garaagarumma hin qabu

26.Balfaa jajjaboo ni gubduu? A, Eeyye B, Lakki

27.Balfaa jajjaboo yeroo hangamitti gubduu? A, guyyaa irran B, guyyaa 2 ykn 3 altokkoC, torbaanitti D, ji'atti

28.Haalli tajaajilaa manni kurfeessaa magaalichaa balfaa goggoogaa hoggaruu irratti godhu. A, Gaariidha B, Gahaadhaa C, yaraa dha

29.Maatiin keessan balfaawwan jajjaboo haala akkamiin hoggaruu? A,Mooraa ykn keeshaa keessatti kuusuu B, Karaa irratti ykn lafa dhooqaatti gatuu C, Bakka balfaan itti gatamuu ykn kuusaa balfaa keessatti darbuu D, Awwaaluu

30.Balfaan mana keessani maalfaa ofkeessaa qabaa? A, hambaa nyaata, pilaastikaa fi waraqaa B,Xaasaa dhugaati fi nyaataa, burcuuqoo fi qaruuraa adda addaa C, gogaa,sibilaa, huccuuwwan fi kan biroo D, Hunda

31.Balfaawwan goggoogaa gosa fi bifaan adda baasuun muuxxannoo fi feedhinnan maatii keessan bira ni jiraa? A, Eeyye B, Lakki

32. Balfaa jajjaboo maatiwwan maal gootuu? A,Irra deebi'ani fayyadamuu B, Haaroomsuun hojii irra oolchuu C, Koompostiif fayyadamu D, Gubuu

33.Balfaawwan jajjaboo haala bifaan addaan baasuun meeshaa birootti ni jijjirtuu? A, EeyyeB, Lakki

Sekshinii II. Marii qabxilee ijoo qaama murteessoo waan (IMX)qaama waldaa gurmaa'ee hojii balfaa jajjaboo irratti hojjetuwaliin gaaffi qomaa.

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1.Qabiyyee fi qabeen haala balfaa jajjaboo waggaa irraa gara waggaatti magaala keessatti maal fakkaataa?

_____

_____

2. Haala balfaa gogaan maatiwwan irraa ittin walitti qabamu nuuf ibsuu dandeessaa?

_____

_____

3.Balfaa goggoodaan yeroo hangamitti maatiwwaan irraa walitti qabamaa?

_____

_____

4.Sadarkaa maatitti balfaa jajjaboo addaan baasani walitii qabuun ni jiraa?

_____

_____

5.Sadarkaa maatitti balfaa jajjaboo addaan baasani walitii qabuun barbaachisaadha jettee yaaddaa?

_____

_____

6.Balfaawwan jajjaboo maatiwwan irraa walitti qabamuu eessaa geessituu nuuf ibsuu dandeessuu?

_____

_____

7.Manni kurfeesaa magaalaa Galamsoo hubannoo gahaa maatiwwaaniif haala balfaa jajjaboo hoggaruu irratti kenneera jettee yaaddaa?

_____

_____

8.Yammuu balfaawwan jajjaboo maatiwwan irraa guurtanii gara kuusaa balfaatti geessitan rakkoon isiin quunname maalii?

_____

_____

Sekshinii III. Gaaffii Qomaa Oggeessotaa Mana Kurfeessaaf Gaafannoo (Interview) dhiyaate.

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Kabajamootoota namoota odeeffannoo nuuf kennitan hundaaf galatni keenya guddaa ta'uu ibsaa kaayyoon keenya inni guddaan odeefannoo gahaa waa'ee madaallii beekumsa,ilaalchaa fi qabatamaa raawwii hojii haala hoggansa balfaa jajjaboo magaalaa Galamsoo irrattii hojjetamaa jiru sakatta'uuf. Kanafuu yaadanni fi gorsii keessan haala qoronnoo kiyyaaf galtee waan naaf ta'uuf. Akkasumaas odefannoon keessanif bakka guddaa waanan kennuuf of-qusannoo tokkoon maleetti gaaffileewaan kennaman hunda keessatti deebii keessan akka naaf kennitan jechaa tumsa keessannif durseen isin galatoomfadha..

1.Wajjiri keessan hubannoo gahaa waa`ee balfaa jajjaboo hoggaruu irratti maatiwwaniif kenneera jettanii yaadduu?

_____

_____

2.Balfaawwan jajjaboo magaalaa keessanii maalfaa of-keessa qabaa?

_____

_____

3.Qabiyyee fi qabeen balfaa jajjaboo magaalaatti yeroo gara yerrootti haala akkamiin jijjiramaa dhufee?

_____

_____

4.Magaalaa Galamsoo keessatti kuusaa balfaa jajjaboo ykn baka itti gatan gahaan ni jiraa?

_____

_____

5.Wajjirri keessan maatiwwan balfaa jajjaboo haroomsuun ykn irraa-deebin akka itti fayyadaman jajjabeessuuf karoora ni qabaa?

_____

_____

6.Maatiwwan murtii waajjirii keessan dhimma balfaa jajjaboo irratti dabarsu amanani ni fudhatuu?

_____

_____

7. Hoggansa balfaa jajjaboo irratti rakkoon isin mudate jiraa?

_____

_____

8. Waajjiri keessan rakkoowwan hoggansa balfaa jajjaboo irratti quunnamu furuuf maal hojjetee?

_____

_____