ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

COLLEGE OF DEVELOPMENT STUDIES

CENTER FOR ENVIRONMENT AND DEVELOPMENTSTUDIES

KNOWLEDGE, ATTITUDE AND PRACTICES OF STUDENTS ON THE USAGE OF WASTE BIN: EVIDENCES AMONG SELECTED SECONDARY SCHOOLS IN AKAKI KALITY SUBCITY.

ADIS ABABA; ETHIOPIA

THESIS SUBMITTED TO COLLEGE OF DEVELOPMENT STUDIES ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR DEGREE OF MASTER OF ARTS IN ENVIRONMENT AND DEVELOPMENT

BY

MEKONNEN TESHOME: GSE/4702/13

ADVISOR: TESFAYE ZELEKE (PhD)

JUNE, 2023

ADDIS ABABA

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This is to certify that the thesis by Mekonnen Teshome, entitled: Knowledge, Attitude and Practices of Students on the usage of Waste bin: evidences among selected Secondary Schools in Akaki Kality Subcity. Submitted in partial fulfillment of the requirements for Master of Arts Degree in Environment and Development in accordance with the regulation of the University and meets the acceptable standard with respect to the originality and quality.

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Name _____Signature _____ Date _____

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DECLARATION

I, Mekonnen Teshome, hereby declared this thesis entitled "Knowledge, Attitude and Practices of Students on the usage of Waste bin: evidences among selected Secondary Schools in Akaki Kality Sub city submitted by me for the award of degree of Master Arts in Environment and Development, is an original work carried out by me and all other sources are fully acknowledged, and that it has not been submitted to any other Universities for similar Degree awards.

Name: _____

Signature _____

Date _____

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ACRONYMS

BMW- Bio-Medical Waste

EE- Environmental Education

EPI- Environmental Performance Index

ESM- Environmentally Sound Management

ESD- Environmental Sustainable Development

FDRE- Federal Democratic Republic of Ethiopia

JESM- Journal of Environmental Science and Management

MSE- Micro Small Enterprises

MSW- Municipal Solid Waste

MSWM- Municipal Solid Waste Management

3R- Reduce, Reuse and Recycle

SDG- Sustainable Development Goal

SWM- Solid Waste Management

SWASH- School Water, Sanitation and Hygiene

SW- Solid Waste

UN - United Nation

WTP- Willingness To Pay

Abstract

Ethiopia as a developing country is still struggling with appropriate solid waste management due to lack of knowledge, attitude, and practice among individuals for reuse and recycling waste. Thus, the environmental knowledge of students in academic institutions is instrumental in providing a solution to the solid waste menace and other environmental problems in the community. However, there exists a wide gap to measure environmental awareness in relation to waste management among secondary schools. This informed the current study to investigate the knowledge, attitude and practices of students in usage of waste bin in selected schools from Addis Ababa Akaki kality sub city. This study presents the KAP results from a Quantitative cross-sectional survey of 351 students from two schools at Akaki kality sub city. The results show that the knowledge and attitude of the students on solid waste management was very high and practice close to neutral. In a comparison of students KAP with in the two schools revealed that mean knowledge was very high, attitude and practice were high. ANOVA result of respondents' KAP level with in grade level indicated that knowledge and attitude were not statistically significantly different in all four grades (p>.05), while practice was significantly different between test groups (p=.001) and post hoc test later reveals that waste management practice of grade nine was significantly different to the rest three grades with a mean value of 3.4678. In another test between gender category conducted findings showed that the mean value of female students were better in knowledge, attitude and practice on waste management than their male counterpart. This study also revealed that gender as the determinant of Knowledge and Attitude and rank and grade level of students were also found as determinants of practice of students' involvement in waste management activities. Finally the researcher recommended, training regarding the effects of solid wastes on the environment as well as on human life, provide adequate waste bins, follow the 3R rule to increase respect for the environment and participation of students in different extra-curricular activities and integration of environmental/waste management/ education in the curriculum.

Keywords: knowledge; attitude; practice; solid waste; waste bin, Addis Ababa, Ethiopia

Chapter One

Introduction

1.1 Background of the study

All over the world, countries are battling with waste management and governments are investing huge sums of money to tackle waste issues and this is mainly due to the magnitude of rapid urbanization and increasing population growth; which in turn has greatly accelerated municipal solid waste generation rate in the urban environment (Gemechis et al, 2021). Wastes that are often discharged from residential, commercial, and institutional activities make up the majority of municipal solid wastes (MSW). Municipal solid waste generation in urban areas has increased dramatically in recent years as a result of increasing population, urbanization, and improved lifestyles. According to the World Bank, Municipal Solid Waste created in urban areas is currently over 3.5 million tons per day, with that number predicted to rise to around 6.1 million tons per day by 2025 (World Bank, 2019). Various societal variables, such as population growth and rapid socioeconomic global development, have contributed to the rapid expansion in supply and demand for goods and products over the previous few decades.

A door-to-door collection system is widespread in most industrialized countries. But municipalities in underdeveloped countries can only provide this service to a small fraction of the population due to budgetary and administrative constraints (Bezama and Agamuthu, 2019).In several countries in Sub-Saharan Africa, garbage collecting techniques like communal container collection methods appear to be the most prevalent (Odonkor et al., 2020; Lloyd, 2019). Common containers (trash bins) are given at designated sites across neighborhoods for homeowners to drop-off their solid waste under this system. Rubbish collection vans then come, and collect these containers, emptying the trash at authorized disposal sites before returning the containers to their original places. However, this trash collection method is faced with several difficulties most of the time leading to uncollected. Therefore, there is waste overflow, ground dumping at collection sites, and unlawful storage areas (Atkinson et al 2019).

Unplanned placement of communal bins or garbage sites could endanger water resources, especially water sources like rivers and streams. In time, other groundwater sources including hand-dug wells and boreholes will also be impacted (Odonkor et al., 2020). Many urban

residents in developing countries lack access to sewerage systems and efficient municipal waste disposal, which severely pollutes their surroundings (Solgi et al., 2018). In addition, many city dwellers improperly manage and handle their waste products, whether on purpose or accidently aggravating soil and water pollution.

Municipal solid waste management (MSWM) is a multidisciplinary activity that includes administrative activities and solid waste management practices such as the control of waste generation, storage, collection, transfer and transport, processing, reuse, and disposal of solid waste (Chinasho. 2015). Its overall goal is to reduce and eliminate the adverse impacts of waste on human health and the environment and to support economic development and quality of life (USEPA, 2020). Hence, effective MSWM plays a significant role in improving the quality of the environment, human health, and socioeconomic activities of local communities. However, according to the United Nations Environment Program (UNEP 2018), MSWM is a major environmental problem and a public health concern. The negative environmental, social, and economic impacts of solid waste are more severe in developing than in the developed countries (World Bank 2018). Similarly, this municipal solid waste problem is worse in urban areas, where enormous industrial and other activities widely occur. For effective waste management, new strategies are required to develop varied and flexible urban models. Urbanization is currently one of the major contributors to solid waste output in most parts of the world (Kumar and Pandey, 2019; Chen, 2018).

Moreover, Ethiopia is one of the fastest growing countries in sub-Saharan African countries and the second country in terms of population among all African countries. As a result, the municipal solid waste management problems, such as an increasing generation rate of solid waste and open burning and dumping in sub-Saharan African countries, are found at an alarming rate (Sandra and Weghmann , 2019).Most countries are experiencing growing pressure on energy, the atmosphere, and biodiversity as a result of global climate change and economic growth. Pollution of water and solid waste is becoming increasingly severe (Zheng and Ge, 2017).In urban areas, the solid waste composition is more complex and heterogeneous. In most emerging cities, the produced solid waste is not handled properly concerning storage, collection, transportation, and final disposal and leads to serious issues. The basic method of urban garbage management refers to (Diriba and Xiang-zhou 2021) collecting solid waste from the residence,

commercial, and public areas and then conveys it to the landfill. A weak municipal dry waste gathering system could lead to the atmosphere, water, and soil pollution, and risk to public health (Zuberi and Ali 2015).Due to the lack of expertise, capacity, and willingness, the collection phase is described as a key issue. In developing nations, garbage collection services reach up to 50%. Besides huge cost countries incur, municipal solid waste management (MSWM) is strongly influenced by socio-cultural, environmental, political, legal, and economic factors that need to be all addressed to realize a sustainable Municipal Solid Waste Management. However, only careful management will reduce and control the harm done to the ecology and conserve limited resources (Diriba and Xiang-zhou ,2021).

Setting up a waste management system in schools not only provide a clean and healthy environment for students, but also cultivates a deeper understanding of sustainable practices that have a carry-over effect into their later life where they would live and be employed . Environmental projects and involvement in programs associated with education for sustainable development or education for environmental protection is suggested to encourage interest of the students towards environmental problems. Working with schools also has the advantage of educating the students about waste related issues and best management practices. In addition, the educational institutions can pioneer sustainability practices in the society (Rajamanikam . et al, 2019). Furthermore, involving students in environmental activities, such as planting trees, cleaning creeks or neighborhoods, and action research in local communities can augment their understanding and interest in Environmental Education (Colmore.et al, 2016).

Addis Ababa the capital city of Ethiopia and sit for African union is currently experiencing increased levels of environmental pollution in line with rapid socio-economic development and urbanization despite the law on environmental protection and municipal waste management practices. Addis Ababa has one of Africa’s fastest-growing populations. Since its establishment more than 130 years ago, the population has increased from 15,000 to 4.59 million enlarged expansion and increasing of the population in Addis Ababa, combined with a deficiency of resources to deliver basic facilities and urban services, have led to a series of difficulties such as the increased generation of waste and inadequate gathering, conveyance, and dumping of solid waste. This has become the main threat to the urban environment and the well-being of the citizens in Addis Ababa (Fesseha, and Bin, 2015). Despite this accelerated pace of solid waste

production waste collection rates are lesser than 70% in un-industrialized countries. In the same way, in Addis Ababa, the competence of the city's collection and transportation of solid waste, and dumping system remains poor. More than 50% of the leftover gathered is regularly discarded by unregulated open landfilling, while 15% in Addis Ababa is managed by insecure and informal recycling (Ali and Eyasu, 2017). Insufficient city dry waste collection and conveyance system may have significant adverse ecological influences, such as transmittable diseases, contamination of land and water, sanitation barriers, and harm to human health. Its environmental fears including pollution of groundwater and shallow water by leachate, and air pollution from burning of waste that is not appropriately collected and disposed of(Dolamo and Desalegn, 2016).

1.2. Statement of the Problem

Environment nowadays has received maximum concern from the government and non-governmental organizations. It has become a major concern of the whole world. Major environmental problems such as the effect of global warming, globalization, desertification, desert encroachment, flooding, pollution and depletion of ozone layer among others have received primary concern of researchers (Auwalu . et al.,2017). One of the main causes of environmental degradation is improper management in the disposal of solid waste. It is a major cause of pollution and outbreak of diseases in many parts of the world.

These issues have also got much attention in Ethiopia. In Ethiopia environmental problem due to improper waste handling is one of the major issues the country encountered especially across cities. Likewise the problem of thrash production is increasing every day in Addis too as the population continues to grow with human activities. In connection with the country as well as city's environmental degradation and industrial pollution, different proclamations and regulations were made at different levels (both at national and regional levels) to prevent and control the ongoing environmental crisis and restore if possible to their natural systems and for this the constitution of FDRE has set some policies through Articles 44/1,,92/1,92/2,92/4 (Hailu . et al.,2021). However, Solid waste problem has remained a serious problem in capital city, while it consumes a larger portion of municipal budgets (Kassahun , 2018).

Crude dumped solid waste causes environmental pollution, unseparated piles of solid waste in landfills release methane, a greenhouse gas that contributes to climate change. Health problems

arise from the open dumping of mixed wastes, which makes an environment in which disease vectors, such as rats and flies can breed and cause of communicable diseases in schools. According to SWASH (2017) report, it has been estimated that 88% of diarrheal disease was caused by unsafe water supply, and inadequate sanitation and hygiene in schools of Ethiopia. Large to small piles of mixed waste also lend an unpleasant aesthetic to the surroundings and in school compound.

This problem is expected to become more evident as urbanization continues to expand in future. In general, the current Solid WasteManagement practice in Addis Ababa couldn't cope with the fast urbanizing needs of the city (Ali and Eyasu 2017). There is a need to address the issues at the individual level at the early stage requiring individuals to nurture those attitudes which will guide them to environmentally supportive behavior. For individuals to acquire new forms of behavior, shaping attitude, skills, and commitments needed to preserve and protect the environment has to begin at early ages of schooling.

Therefore, the school would be a better place for shaping individuals attitude (Auwalu et al.,2017). In the industrialized countries, long-term environmental education is considered to be an effective method for increasing environmental awareness among children (Thu and Takaaki 2015).

Empirical studies by Filippos, et al,(2020) on environmental education and awareness revealed positive response in assisting the conventional waste management of Viotia (Greece).A study conducted on Chinese high school students indicated that environmental education was essential to ensure that students have required knowledge and positive attitudes toward separation of solid waste on campus(Chuanhui & Hui,2019).Another study carried in Thailand by Piyanpong and Samattanphong(2019) on roles of environmental system knowledge in promoting university students' environmental attitudes and pro-environmental behaviors revealed positive environmental attitudes. Dorina (2015) also conducted study on Knowledge, Attitudes and Behavior regarding Waste Management in a Grammar and a Comprehensive School in England and the result indicated that students had higher levels of knowledge on recycling and more sources of information regarding waste management. Waste reduction was considered important by almost all students according the study.

Similarly, Study conducted by Alula et al(2018) assessed the Knowledge, attitude and practice on hand washing and associated factors among public primary schools children in Hosanna town, Southern. From students participated in the study over all 167(69.9%) students have good and 72 (30.1%) have poor knowledge. According to researchers knowledge of students in this primary school and was affected by grade of student and area of residence. Regarding the attitude of students 142(59.4%) and 97(40.6%) have good and poor attitude respectively. Researchers also concluded that maternal educational status, area of residence, age, sex and grade of student are factors that affect KAP of school children toward hand washing with soap. Fesseha, (2016) conducted study on knowledge, attitude and practice of Bahirdar University undergraduate students towards Environmental issues and findings indicated that respondents have low levels of environmental knowledge, but environmental-friendly attitudes and willingness to commit to environment-friendly practices and no statistically significant difference was found between females and males towards environmental attitudes. Mohammed (2017) conducted study on Environmental Knowledge, Attitude and Awareness of Farmers in Chencha Woreda, Gamo Gofa Zone,South Ethiopia result revealed that, nearly 50% of the respondents had medium level of environmental knowledge and awareness level. The statistical analysis displayed that educational status, age, & information accessibility had statistically significant influence on environmental knowledge, attitude and awareness of famers. Similarly, a study conducted by Mekonnen, et al (2022) on empowering rural society through non-formal Environmental Education in Ethiopia, their result showed that skills and knowledge imparted through Environmental Education were important for implementing community projects, helping to improve community participation in raising environmental quality, thus improving environmental performance, farming methods, and livelihood situation

It is, therefore, believed that if students in schools are adequately oriented, they can develop early awareness and knowledge on environmental problems. The environmental knowledge of students in academic institutions is instrumental in providing a solution to the solid waste menace and other environmental problems in the community.

However, there exists a wide gap to measure environmental awareness of students in relation to waste management among secondary schools

This informed the current study to investigate the Knowledge, Attitude and Practices of students in usage of Waste Bin in selected Schools from Addis Ababa Akaki Kality Sub City.

Even though the study covers limited sample, the result is believed to provide insight around the status of environmental knowledge related to waste management of secondary school students and the result is believed to help for further research in larger scale however the study considers only two selected secondary schools.

1.3. Research Questions

- How are the current knowledge, attitude and practices of students (of two schools) regarding solid waste management?
- How is the knowhow of students concerning solid wastes and environmental issues?
- How they manage solid wastes generated in their schools?

1.4. Objective of the Study

1.4.1 General Objective

The main objective of the study was to assess and compare the Knowledge, Attitude and Practices among two selected Secondary School students regarding Solid Waste Management and Waste Bin usage.

1.4.2 Specific Objectives

1. To assess the Knowledge, Attitude and Practices of students related to Waste Management and Waste bin usage

2. To compare Knowledge, Attitude and Practice of Students related to Waste Management based on School type, Grade level and Sex of Secondary Schools

3. To analyze the determinants of Knowledge, Attitude and Practices of Students' involvement in the Solid Waste Management at Secondary Schools

1.5. Significance of the Study

1.5.1. Development Significance

The goal of sustainable waste management is to reduce the amounts of natural resources consumed, reusing the materials taken from nature as much as it is possible, and creating as minimal waste as possible. Sustainable waste management is a key concept of the circular

economy and offers many opportunities and benefits both to the economy, the society and the environment (Oluwatobi et al 2022). Sustainable waste management involves collecting, sorting, treating, recycling, and when properly facilitated providing a source of energy and resources. It also reduces food wastage, keeps heavy environmental costs at bay, and prevents some human health conditions, thereby improving the overall human life. In this regard, students are considered as the role players as agent for sustainable development and the time has come to harness their potential as a change agent without hesitation. However, Students require some basic competencies to interact constructively and ethically with today's complex and unsustainable environment. Schools, have the responsibility to pioneer the process of building knowledge, and inculcating skills, awareness, values, and sustainable attitudes, in order to enable a sustainable environment. It has been shown that well-educated youngsters may use their role as citizens and change-makers to initiate and promote sustainable development (Oluwatobi et al2022).It is therefore necessary to understand knowledge, attitudes, and practices (KAP) of students in order to make a meaningful transition toward sustainability development. Therefore the efforts should focus in the adoption of circular economy strategies on teaching institutions. Hence the result of this study by measuring students' knowledge can be used as an input for a development endeavor.

1.5.2. Research Significance

The findings of the study is believed to produces valuable insights concerning environmental knowledge of secondary school students in the study area and be used as a reference for government and private teaching institutions.. It may also serve as a spring board for those who will have an interest to conduct further research and studies on students' environmental knowledge and related issues. As a result, this study will provide a base for understanding these issues while contributing to the existing body of literature.

1.5.3. Policy Significance

The environmental knowledge of students in academic institutions is instrumental in providing a solution to the solid waste menace and other environmental problems in the community. Therefore strengthening students with environmental background is important as today's young students are tomorrow's leaders. Thus, the result of the study will be an input for educational policy of the country by eliciting the KAP of students concerning environment and related

issues. This search of KAP of students would enable policy makers determine the right kind of policy to formulate and implement for proper development planning. This study will also be expected to contribute much for policy makers and implementers to understand the gaps and to take corrective actions on the environmental knowledge of students.

1.6. Scope of the Study

1.6.1. Thematic Scope

The study was thematically limited to Knowledge, Attitude and Practice on the Usage of Waste Bin among Akaki Kality Sub city. In addition, the scope of this study also covers issues stated under the objectives of the study.

1.6.2. Spatial/ geographic Scope

The scope of the study is geographically located at Akaki Kality Sub city Weredas 04 and 08 in Addis Ababa

1.6.3. Temporal Scope

This study was temporally limited to Secondary School students of 2022/23 academic year from Akaki Kality Sub city.

1.6.4. Unit of Analysis

The unit of analysis is an important concept whether the research to be conducted is quantitative or qualitative research, unit of analysis is the main subject or entity that the researcher intends to comment on in the study. Therefore, the units of analysis for this study were secondary school students from Gelan Secondary school (Government) and Ethio-National Secondary school (Private) both in Akaki Kality Sub city.

1.7. Limitations of the Study

The study was conducted under several unavoidable limitations. For most, the study was conducted only on two secondary schools at Akaki Sub city. Based on this, there is a need to take care in generalizing the research findings to whole secondary schools of Addis Ababa.

Chapter Two

Literature Review

2.1. Waste Management in Addis Ababa

Wastes are items that are undesired or useless. It might be any substance that is abandoned after its primary purpose, or that is worthless, faulty, and useless. These include municipal waste, commercial waste, and demolition waste; hazardous waste, industrial waste, biomedical waste, and clinical waste; and special hazardous waste, radioactive waste, explosive waste, and electronic waste (e-waste) (Kumar and Kumar, 2020). According to Chinasho (2015), solid waste is everything that isn't liquid or gas that is discharged as undesired, and its management involves storing, processing, transferring, reusing, removing, or the prospective use of a decommissioned dumping site. Waste material generated by human activities on a daily basis must be appropriately handled. As a result, municipal solid waste management has become a global concern (Wilson et al. 2015). According to a recent World Bank (2018) report, the majority of Sub-Saharan African nations' economic progress is accelerating, while population growth and urbanization in Sub-Saharan African countries are increasing.

According to Vital (2015), proper solid waste management practices are an integral component of human settlement environmental infrastructure. These practices include all activities carried out from the time trash is generated till it is disposed of. In most African cities, solid waste management is ultimately the duty of the municipality, whereas garbage is managed and disposed of at the home level in rural regions.

Cities must guarantee a clean and safe environment for inhabitants since quality of life is a crucial component of their competitive advantage. Dealing with pollution caused by inefficient solid waste management should thus be prioritized. In 1886, Addis Ababa was founded as an administrative center. Since, it has served as the focal point for the majority of Ethiopia's economic and political activity. The subject of cleanliness in Addis Ababa may not have been a big concern in its early days because the population was minimal at the time, and households could readily dispose of their garbage and other created wastes. However, as the population grew, the problem worsened, and the government attempted to mitigate the situation by forming a municipality in 1909, as a council of Addis Ababa to oversee the city (Hayal, 2022). The

formation of a full-fledged National Health Service system, namely the Ministry of Health with an environmental health arm, occurred in 1948. To address sanitary challenges, Ethiopia formed the Ministry of Public Health in 1950 with Proclamation No. 147 (Kassahun et al., 2019; Hayal, 2022). Later same year, in 1954, the government gave Addis Ababa a city charter. The garbage creation rate was estimated to be 0.15 to 0.252 kg/capita/day towards the end of the 1990s, with the city's daily waste output being 851 tones or 2,297 m3. Historically, there were three types of collecting systems: communal container collection, institutional collection, and door-to-door collection. In most sections of the city, homeowners and other garbage-generating sources sent their rubbish to containers established by the municipality at different collection stations. Cities' ever-increasing economic, social, and administrative activities create a variety of solid wastes that must be appropriately managed.

Despite this increased rate of dry waste creation, most developing nations have collection rates of less than 70% (Suleman et al., 2015). Similarly, the effectiveness of Addis Ababa's rubbish collection and dumping system has remained low. More than half of collected garbage is frequently disposed of through uncontrolled landfilling, with the remaining 15% managed through insecure and informal recycling (Ali and Eyasu, 2017). It is predicted that 3,200 tons of solid trash are created per day in Addis Ababa (Hayal, 2022). Addis Ababa confronts several issues when it comes to solid waste management. The city creates solid trash, which accounts for 30% of total waste generation (Hayal, 2022). Addis Ababa's rapid expansion and population growth, combined with a scarcity of resources to provide basic amenities and urban services, have resulted in a slew of issues, including increasing trash generation and insufficient solid waste collection, transportation, and disposal. This problem has become the most serious hazard to Addis Ababa's urban environment and residents' health (Fesseha and Bin, 2015).

The contamination of rivers and subterranean water, soil, and air caused by rubbish from many sources has been a growing problem for the local government. Inadequate city solid waste management systems can have serious environmental consequences, such as disease transmission, pollution of land and water, sanitation hurdles, and biodiversity loss. Increasing environmental challenges in Addis Ababa include shifting temperature trends, the removal of green spaces, and unresolved solid and liquid waste problems. However, the primary environmental concerns in Addis Ababa are not the "green" issues (natural resource

deterioration), but the "brown" ones (pollution and other environmental problems) that are threatening the citizens' health and lives (Basha, 2007, in Kassahun et al, 2019). As a result, comprehensive and efficient waste management is a critical component of the country's long-term growth.

In Addis Ababa, there are three types of garbage collection systems: primary, secondary, and street sweeping. The primary collection system is carried out by Micro and Small Enterprises (MSEs) from door to door in households. The block (container) collection method is used by private firms in hotels, hospitals, schools, and other service delivery and production organizations. The third system is the sub-city's street cleaning system (Hayal, 2022). According to Hayal, MSEs presently collect 95% of the city's solid garbage through the door-to-door collection system, with the remainder collected by private enterprises. Vehicles from the City Administration and the private sector transport collected garbage. The current reality in Addis Ababa, where garbage hauling rails are not accessible to the required level, and even some of the available vehicles are not entirely functional (Getnet, 2016). Waste management is likewise reliant on a secure and dependable disposal infrastructure. This technique can be efficiently implemented when the dumping site is located near collection points, is closed and protected from animals, and does not emit a foul odor into the neighborhood (Getnet, 2016).

In Addis Ababa, the major open dumpsite where all collected rubbish is disposed of is known as "Reppi" or "Koshe" and is located 13 kilometers outside the city Centre. About 25% of Addis Ababa's solid trash is still deposited indiscriminately within residential neighborhoods, while the remaining 65% is collected but disposed of in an unhealthy way at the Reppi/Koshe regulated dumping site (Eshetu, 2021). One of the major issues for the solid waste collection system is related to Addis Ababa's geographical and urban structure, as well as the population's socioeconomic condition. Some neighborhoods in the city are inaccessible due to varying topography and a lack of appropriate road networks. However, there is an effort by the municipality to make headway in alleviating the problem and modernizing the city's SWM service delivery system. However, in Addis Ababa, several concepts and principles must be applied in order to establish sustainable waste management. The guiding philosophy for improving a city's inadequate waste management services and environmental quality is sustainable SWM. Sustainable solid waste management recognizes trash as a resource and

employs a hierarchy of solutions. Prevention and minimization are the most recommended waste management options, followed by reuse, recycling, and resource recovery. However, the prevailing waste management practice in Addis Ababa is the least favored choice, consisting of merely collection and disposal. Bottles, papers, plastics, and metals were among the materials found in the solid trash, which may be reused immediately or after certain recycling operations. Furthermore, a considerable portion of solid waste includes organic matter that may be converted into compost (Hayal, 2022). According to Antigegn (2021), waste reduction and recycling play an important part in the contemporary solid waste management hierarchy because they reduce the trash transferred to landfills while also reducing the garbage to be processed, lowering the money required. Adoption of Environmentally Sound Management (ESM) of wastes focusing on the promotion of the 3Rs - Reduce, Reuse, and Recycle is essential (Ali and Eyasu ,2017).

Reduce, Reuse, recycle (3R): Waste reduction, reuse, and recycling are the ideal waste management methods. The application of these approaches can result in several environmental advantages. They minimize or avoid greenhouse gas emissions, pollutant emissions, resource conservation, energy savings, and the requirement for waste treatment equipment and landfill space (Hui et al., 2006 in Antigegn, 2021). The "Waste management hierarchy" is an internationally recognized system for municipal solid waste management and a critical component of integrated solid waste management. It also places the highest focus on waste avoidance and reduction techniques and programmers, with treatment and disposal being the least preferred solutions. The waste management hierarchy's goal is to make waste management practices as ecologically friendly as feasible. Most industrialized nations have embraced it in various ways (Besha, 2019). The hierarchy is an effective policy instrument for resource conservation, coping with landfill shortages, reducing air and water pollution, and safeguarding public health and safety.

However, sustainable solid waste management necessitates a certain level of know-how, which will necessitate significant efforts on the part of both the government and school administration in order to organize workshops and seminars for students, teachers, and administrators that will facilitate efficient sensitization on environmental problems and their consequences (Liu et al, 2020). Environmental education, according to Crompton and Kasser, 2009 in Grace, 2018), supports the development of articulation of literacy in people whose own environmental

concerns are shared for their own benefit and the benefit of future generations. There is a remarkable link between the learners' level of education and environmental management, and its establishment will address the complex environmental challenges by integrating Environmental Education at all levels. Finally, this education will result in a positive shift in behavior and attitude, which is essential for successful participation in environmental management. Current youth education and learning should emphasize the integration of sustainable development concepts and principles, such as natural resource protection and utilization, by striking a balance between economic, social, and environmental components (Abera, 2018). Environmental education (EE) programmers raise public knowledge and comprehension of the importance of their actions and decisions in the state's natural resource and environmental management efforts (Abera, 2018). School-based Environmental Education programs are critical in the current context of global environmental challenges because they may reach and educate a larger audience through the process of intergenerational impact. Students gain pro-environmental knowledge and build skills, attitudes, behavior’s, and methods that will help them safeguard the environment in the future through educated decisions and actions (Eroglu, 2016).These pupils recognize that natural resource conservation and environmental preservation are communal obligations for the well-being of society, country, and the planet.

Figure 2.1 Gelan Condominium /Wereda 04/ Waste storing Site

Source: Study Area Field Survey (2023)

2.2. Types and Sources of Solid Waste

According to Feleke (2015), knowledge of the sources and kinds of solid wastes, as well as data on composition and rate of generation, is fundamental to the design and operation of the functional aspects connected with solid waste management. However, the source of solid waste is determined by the society's socioeconomic and technical levels. Solid wastes are non-liquid, non-soluble, and non-degradable solids that range from municipal rubbish to industrial wastes containing complex and occasionally dangerous compounds (Feleke, 2015). It is all-encompassing, embracing the heterogeneous mass of urban garbage such as vegetables, food items, paper, plastics, rags, glass, as well as the more homogenous accumulation of agricultural, industrial, and mineral wastes (Mundhe et al., 2014 in Ferede et al., 2020).

According to the findings of a study conducted by Hongting Ma et al. (2015), rotting organic matter accounts for more than 50% of urban domestic waste, flammable organic matter accounts for 20% to 40%, inorganic matter accounts for less than 20%, moisture content ranges from 40% to 60%, and the low calorific value ranges from 4000kJ/kg to 6000 kJ/kg. According to Eshetu's (2021) study, the physical composition of municipal solid waste in Addis Ababa was as follows: vegetables 4.2%, paper 2.5%, rubber/plastics 2.9%, wood 2.3%, bone 1.1%, textiles 2.4%, metals 0.9%, glass 0.5%, combustible leaves 15.1%, none combustible stones 2.5%, and all fines (sand, ash, and dust) 65%. However, the contents and volume vary with changes in the society's socioeconomic position and seasonal volatility.

2.3. Storage of Solid Waste and Waste Bins

2.3.1 Solid Waste Storage

According to Ahsan (2002,) in the Antigegn (2021) study, solid waste is first held within the family, but may eventually be changed to a community container before collection and disposal. As a result, main solid waste storage takes place at two levels: the home level and the community level.

2.3.1.1 Household storage of Solid Waste

According to Antigegn (2021), most of the time, rich and low-income families store domestic garbage in containers using sacks, plastic bags, chopped jerry cans, and cardboard boxes.

Domestic garbage storage containers (e.g., sacks, polythene bags, and boxes) used by the poorer urban populace are deposited alongside the rubbish. Household garbage should ideally be placed in a large enough study container that is easy to empty and clean and has a tight-fitting cover. As a result, galvanized steel and plastic bins can meet these requirements; but they are out of reach for most low-income nations.

As a result, the suggested container for waste segregation is of two types and stores the separated waste in two distinct containers: This trash includes biodegradable garbage (green color storage) and this waste: Garden sweeping or garden waste consisting of green/dry leaves, sanitary wastes, green waste from vegetable & fruit vendors/shops and waste from food & tea stalls/shops, etc. Non-biodegradable waste colored through (Blue storage) includes: all types of paper and plastic, cardboard and cartons, containers of all kinds (except those containing hazardous material), packaging of all kinds, glass of all kinds, metals of all kinds, rags and rubber, house sweeping (dust, etc.), ashes, foils, wrappings, pouches, sachets and tetra packs (rinsed), discarded electronic items from offices, colonies viz. cassettes

2.3.1.2.. Communal Storage Container (skip-point)

Street corners, many spots on heavily crowded streets or at the outskirts of neighborhoods or towns accessible to generators, main collectors, and collecting trucks are examples of these points. One of the primary benefits of community skip-points is that they provide a home with continuous access to a disposal site. Containers may overflow and generate difficulties such as odours and insects if a common skip-point receives minimal maintenance. Solid waste managers must grasp the possible tension that arises between the requirement to achieve public convenience and the techniques necessary to maintain cleanliness and sanitary conditions surrounding communal containers in order to practice good communal collection design. They must also plan how to regulate rubbish pickers, odors, animals, and vectors that disrupt the environment near shared containers. A sufficient number of containers dispersed at adequately positioned skip-points is required for good practice. These containers must be simple to use, even for youngsters, who are frequently tasked by their parents with transporting solid garbage to the community skip point. A good practice also needs program managers to commit to collecting and cleaning up overflows when they arise for any cause (Khan and Ahsan, 2002 in Antigegn 2021).

2.3.2. Types of Waste Bins

- Commercial Garbage Bins

These containers are used for enormous garbage pieces, high amounts of rubbish, or both. Commercial garbage cans are ideal for storing huge quantities of paper, bottles, and cans in public spaces such as schools and stadiums (Meaza, 2016).

- Disposable Trash Bins

This style of bin is suitable for any outdoor occasions, and cleaning disposable bins is simple. Containers are inexpensive and may hold as many vessels as you want. Most of these garbage cans are constructed of recycled materials; therefore there is no need to worry about waste because they are environmentally beneficial (Nazak et al 2019).

- Bag dust Bins

The bag dustbin was a flexible, waterproof, and washable bin supported by a steel wire frame. Furthermore, the names and symbols of segregated dry trash such as bottle, paper, and PET were displayed in bag dustbins with a volume of 60 L (Nazak et al 2019).

- Compact Garbage Bins

Because they are available in corner, half-round, or wall hugger forms, they are ideal for packed spaces such as a bustling foyer or a crowded kitchen. A wall can be pressed against the bin's flat side. They also have a capacity of less than 28 gallons.

- Garbage Bags

The bags are leak-proof, contain an odor-inhibiting antimicrobial ingredient that prevents the growth of germs that create odours, and come in small and medium standard sizes. They also have a lovely and fresh scent and may be stored in the refrigerator or freezer.

- Medicinal Waste Bins

These are a step-on can with a metal structure that contains less than 40 gallons and is safe to use in a healthcare setting due to its metal design.

- Bins for Countertops

These little bins often include metal for small waste items such as empty sugar packets or straw wrappers and may be easily put on a table or counter for simple disposal.

- Road Dust Bins (classified)

Classified trash cans are placed at subways, bus stops, residential neighbourhoods, tourist sites, and other locations. Residents' lives are inextricably linked to classified trash cans. On the market, categorised dustbins may be split into stainless steel, fibreglass, ceramic, plastic, wooden, iron, steel wood, steel, galvanised, paper pulp, and other dustbins based on texture. People's environmental consciousness is aided by classified trash cans. The installation of categorized trash cans makes little sense if individuals lack environmental awareness. On the contrary, the popularity and installation of categorized trash cans can increase people's environmental awareness and help consumers completely realize the relevance and necessity of rubbish categorization. The importance of creating categorized dustbins is in allowing people to have a clear grasp of waste categorization to a certain extent, as well as improving certain dustbins in cities with irrational designs (Liu 2018).

- Commercial Wheelie Bins

The wheelie garbage can have two wheels to allow moving huge quantities of trash or several bags around your property easier for your maintenance or cleaning crew. Wheelie bins with capacities of 120L and 240L are now available in a variety of colors (Meaza 2016).

2.3.3 Uses of Waste Bins

- Maintain a safe environment

Waste containers were initially designed to prevent infections from spreading from where rubbish was placed. Waste cans hide waste and most odors while also being environmentally beneficial.

- A clean environment

Initially, waste containers were created to keep illnesses from spreading from where garbage was disposed of, garbage cans help to hide garbage and most smells while also being ecologically friendly.

- Recycling

Trash cans make recycling more effective and convenient. Sorting rubbish into different colors facilitates recycling since containers exist in a variety of colors (Liu 2018).

2.4 Empirical Literature

Essayah et al (2019) conducted study on attitude, perception and willingness of community towards solid waste management in Malaysia especially in Serdang and the result indicated that there was moderate attitude and perception of community towards solid waste management. Another study by Yasmin et al (2020), who assessed the attitude, knowledge and practices at at village level in Penampang (Sabah) has explored the relationship of the independent variables (such as birth date, gender, employment, and education with the dependent variables (KAP) through the use of Kruskal Wallis correlation test. The relationships the KAP were tested at 0.05 levels of significance using Spearman Rho correlation. The results showed that majority of the respondents have excellent levels of KAP. However, none of the independent variables has a significant relationship to the KAP levels. However, the respondents' birth year and education level has a significant relationship to practice level they have. Spearman Rho test also showed that both attitude and knowledge have a positive correlation with each other. Evaristo and Cando III (2022) also assessed the knowledge, attitude as well as the practices related to solid waste management within the households of the urban communities at Butuan City (Philippines). This study explored and evaluated the socioeconomic profile and effectiveness of SWM programs. This study showed very high SWM knowledge (3.80) and attitude (4.52) attributing to high level of educational attainment and income. It also showed that most of the respondents were practicing waste segregation (97.9%), reusing (83.8%), recycling (70.4%) and composting (61.3%). Despite this, low level knowledge on the location (35.6%), functionality (33.7%), and utilization (51.3%) of the materials recovery facilities have been noticed. This indicates the low compliance by local government units to SWM laws and policies. Apart this, significant number of respondents did not practice composting (38.7%) due to unavailability of space and facilities.

Another study by Yasmin et al (2021) on public opinion, perception and knowledge, attitude and practice (kap) level on solid waste management programs in Penampang, sabah: a village-level, research studied the KAP level of 113 respondents in Hubah Village, Penampang and the result indicated that majority of the respondents have excellent levels of KAP. The respondents' gender had significant relationship with their knowledge level, whereas, their attitude and practice were significantly correlated with their educational level which was tested using the Kruskal-Wallis test. Spearman Rho test shows that knowledge and attitude has positive correlation with each

other. Subsequently, the study explored on the respondents' opinion and perception on solid waste management programs implemented locally. It was found out that 74.3 percent of the respondents stated that the provision of waste management services is generally inadequate. Another 75.2 percent showed that the communication tools have to be improved to increase public participation in the solid waste management programs. 78.8 percent of the respondents also agreed that education and awareness programs should be inclusive to all levels of society and not only targeting some certain groups as what have been done previously. 54 per cent of the citizen needed an improvement in the accessibility of officers and policy makers regarding issues on solid waste management, and 51.3 percent agreed that technology should be optimized to acquire the citizens' acceptance and participation through programs of solid waste management.

Mohd Rodzi et al(2019) conducted study on TVET Students of Malaysia on issues related to their awareness on environment, and attitudes towards solid waste management. According to this study, the percentages of pro-environmental awareness and attitudes towards solid waste commitment were 92.1% and 56.4%, respectivelly. The relationship shown between awareness and attitude was not strong at Spearman's rho [rs = - 0.067, sig = 0.000, $p > 0.05$]. Students with high awareness of pro-environmental issues did not necessarily mean that they have a positive attitude. A study by Alfredo et al (2022) studied the awareness, knowledge, attitude and practice of pupils in the context of school-based solid waste management in a Public Elementary School in Philippines. Accordingly, the findings of the research showed a low level of pupils' awareness, knowledge, attitudes, and practices on the management of solid waste. The findings also indicate that the school has introduced the pupils with solid waste management, but they still need to acquire a systematic and well-defined goals and activities to emphasize the significance of solid waste management. Another study by David et al (2020) on Public Perception of Solid Waste Management Practices in Nigeria, the study substantiated the impact of people's attitudes towards waste management, as well as the impacts of monitoring and controlling the management of waste. The results show that some factors such as age, income, and education levels affect the perceptions, practices, and attitudes of the people on the management solid waste.

A study by Seng et al. (2018) on Households' knowledge, attitudes, and practices toward solid waste management in suburbs of Phnom Penh, Cambodia, aimed at assessing the determinants,

how individuals are aware of, think of, and behave, in the models based on the values of estimated coefficient and probability of t-statistics .The logistic regression models presents the remarkable results. About one third of the respondents seem to have acquired insufficient knowledge of waste problems. The residents' educational level, awareness about related topics, and income level are the key determinants of their knowledge. The inadequacy of this experience, otherwise, would cause the illegal dumping, which is a common waste handling of households not using the collection service. Even if the related knowledge is adequate, the improper practice would still take place when the collection service is inaccessible or insufficient to meet the households' satisfaction level. The service users who generate a large volume of waste tend to practice the illegal dumping.

Kofi et al (2021) made a review regarding the gap of environmental knowledge among the youth and the old within developing countries. It showed the contribution of the gap on ecological issues or waste management problems, which resulted to unsustainable development, with significant consequences in low-income countries. To do that, the study made a systematic review with the aim of identifying and analysing environmental knowledge, awareness, attitudes, and practice studies on SWM from 2010 to 2019 in developing countries. The review indicated that the pupils both at secondary and tertiary educational levels have positive environmental attitudes, and high awareness on environmental issues, but lacking practical education from teachers who could guide students to put SWM into practice. The low environmental knowledge of students was associated with inadequacy in practical experience of teachers in SWM for environmental sustainability. A relationship between teachers' and students' knowledge and attitudes towards SWM, and differences in awareness, attitude, and practices of SWM linked with education and age, were also notced. The review work also indicated that the lack of environmental education in most developing countries was caused by fragilities in practical environmental curricula of teachers to respond to contemporary environmental issues for cleaner production and sustainable development.

Sudipta et al (2016) conducted study on Resident Knowledge and Willingness to Engage in Waste Management in Delhi, India, with an objective of understanding the situation in Delhi in relation to the segregation, storage, collection, and disposal of household waste, and assessing the residents' in Delhi, and the willingness they have to engage in solid-waste management.

Their survey findings indicate that 60% of residents do not know the difference between biodegradable and non-biodegradable waste, and only 2% of them segregate waste. Fifty-eight percent of respondents reported that the waste collector mixes the segregated waste, 97% of respondents reported that they sold items to an itinerant waste buyer, and 87% of households are covered by doorstep waste collection services. Abstract knowledge was noticed having a significant correlation with willingness to participate in waste management. The differences between the socio-economic groups indicate that the highest (most educated and wealthy), as well as the lowest socio-economic category (least educated and poor), older age-groups, and women, have greater abstract knowledge. Socio-economic categories who have the higher abstract knowledge could be active participants in decentralized models of waste management.

Yusup (2015) in his study examined factors including gender, education background of parents, and duration of environmental education) which have influence on the environmental knowledge of senior high school students who are senior high school science program students. The study found that the duration of environmental education correlated with their environmental knowledge. However, difference between gender and parent's education background was not seen. The learning duration showed the number of delivered materials. Results suggested that improving environmental knowledge can be achieved through learning in school by adding learning materials. The duration of education was directly related to environmental knowledge through the cognitive abilities of environmental biology. The longer a person learns in school, the more experience he got on environmental knowledge.

Liu, et al. (2020) have investigated how general environmental knowledge determines environmental attitudes, behavioral intentions, and pro-environmental behaviors concerning the general environment. Results of their analysis revealed that environmental knowledge significantly positively affected environmental attitude, which also significantly positively affected environmental behavioral intentions and pro-environmental behavior, and environmental behavioral intention significantly positively affected pro-environmental behavior. Environmental knowledge did not have a significant direct effect on pro-environmental behavior. However, the indirect effects environmental knowledge has on pro-environmental behavior were significant, and the influence of environmental knowledge on pro-Environmental behavior was mediated by environmental attitude and environmental behavioral intentions. They also noticed

that females were having stronger positive impacts of environmental knowledge on environmental attitudes than their male counterparts. Females were more likely to feel uneasy about environmental damage.

Study on attitudes and Practices of Households toward Waste Management and Recycling in Nelson Mandela Bay by Smith (2020) following a quantitative research design, a survey was conducted and self-administered questionnaires were distributed to a convenient sample of 150 selected respondents within the designated population. The attitudes of consumers towards household waste management were found to be neutral or indifferent and strongly dependent on knowledge and awareness about recycling as well as socioeconomic factors. The results further indicated that the main influencing factors for more positive attitudes and increased recycling participation was that household waste management should be convenient, cost-effective and not time-consuming, waste disposal and recycling sites should be easily accessible and incentives would encourage individuals to recycle.

Ferede et al (2020) conducted study on community perception on solid waste management practice in Bedele Town, Oromia region, Ethiopia. Sampled households interview, field observation and key informants were used for data collection. Focus group discussion was also employed to cross check the data collected through interview. Food waste, plastic bags, plastic bottles, papers and cartons, cans and glass were some of solid waste released from each household and disposed to inappropriate disposal site and environment. The determinants of willingness of urban community on solid waste management practice were also conducted using linear regression model and result indicated that age, educational level, awareness and availability of training on solid waste for the urban community affect the attitude and willingness of urban communities to practice solid waste management. Generally the communities had very low thought on the impact of improper solid waste management on the environmental condition. Eshete et al (2023) conducted study on Knowledge, attitudes and practices solid waste management and associated factors at household level in Gelemso. It result was based on 390 sampled households, among these, 61.3% of the households were females. The result indicated that most of the households had good knowledge and positive attitudes towards SWM but low practice was noticed in the study place. About 96% of the households considered solid waste as a source of environmental pollution and close to 92% of them responded that solid waste could be

used for compost preparation. Majority (87.4%) of the households "strongly agreed" about the potential risk associated with improper solid waste disposal and nearly 80% of them also "strongly agreed" that proper SWM is important to have a healthy environment within the community. Nearly 80% had practiced improper SWM. Logistic regression analyses indicated that the absence of experience in sorting solid waste, ways of removal, knowledge about reduce, reuse and recycle, absence of adequate solid waste landfills. Moreover, lack of door-todoor waste collections practices were noticed as factors to have great contribution for the improper SWM practice in the study area.

Kabito et al (2021) conducted study on Knowledge, Attitudes, Practices, and Determinants towards Wastewater Management in Northwest Ethiopia: A Community-Based Cross-Sectional Study was made on 422 participants, and the result indicated that 63.5%, 43.4%, and 48.6% of the participants had better knowledge, attitudes, and self-reported practices regarding WWM, respectively. Knowledge of the participants was significantly associated with house rent (AOR 1.12, 95% CI (1.22, 3.69), civil servant (AOR 5.47, 95% CI (1.87, 8.02), and positive attitudes (AOR 2.69, 95% CI (1.68, 4.30), while space availability (AOR 1.84, 95% CI (1.23, 2.75), and good knowledge (AOR 2.46, 95% CI (1.61, 3.77) were related factors of attitudes. Moreover, good knowledge (AOR 1.32, 95% CI (1.87, 2.02), and positive attitudes (AOR 1.03, 95% CI (1.01, 2.34) were significantly associated factors of self-reported practices. Deress et al (2019) also conducted a study on knowledge attitude and practice about waste handlers in medical waste management in healthcare facilities found in Debre Markos (northwest Ethiopia). A total of 55 medical waste handlers were examined from 12 healthcare facilities. Among the study groups, 25 (45.4%) have diploma and certificate educational level. The majority (69.1%) of the participants did not have proper training. There was a lack of personal protective devices and waste management equipment supplies. Regarding knowledge, attitude, and practices, 25 (45.5%), 43 (78.2%), and 44 (80%) of the study participants had adequate knowledge, favorable attitude, and adequate practice scores, respectively.

Akbar et al (2015) have conducted a questionnaire survey consisting of 2400 householders on Abadan residents to evaluate their knowledge, attitudes, and practices (KAP) towards solid waste (SW) reduction, source separation and recycling, collection and willingness to pay (WTP) for SW services. Their study has also covered the relationship between demographic variables and

KAP towards SW management. The data analyzed revealed that the community under study had a very high positive attitude to take part in SW source separation and recycling plans. However, the respondents showed low intimate knowledge of different steps of SW management and also were weak to take practices about these steps. The KAP of SW source separation and recycling was affected by demographic factors such as age, educational level, gender and occupation. The study further found that education level and occupation were the main significant factors affecting residents. Further, the study found that providing public with MSW infrastructures and improving citizens' awareness about SW source separation and recycling to promote SW recycling programs holds great promise for developing effective public campaigns and behavior-changing interventions.

The study by Ahmad et al. (2015) who studied to establish relationship between students' knowledge, attitude, communication, and perception of their environment using higher educational institution students. Their findings intimate that the students had the basic knowledge about the environment and waste management. However, their knowledge was not transformed to behavior and practice in the actual context. One of the obstacles to its practicality was associated with the lack of waste sorting facilities, as a weak relationship was established between students' knowledge, attitude, and practice.

Adogu et al. (2015) conducted a study in Owerri municipal Imo state residents in Nigeria and found that 90% of the respondents on the questionnaire were aware of the waste management with 97.55% showing a positive attitude toward managing wastes and protection of the environmental health. Further, their results showed 97.1 % of the household wastes comprised of food residues as well as 95.4% being vegetable wastes. Open dumping 66.3% of the sampled population, and burning 62.4% of the population practiced which forms the two poor waste management approaches illustrated in the study. Wheel barrow transportation stood out as the most famous means of waste transportation to the dumping site. The respondents' education and gender significant have impact on attitude, practice, and knowledge, attitude and practice of waste management ($p < 0.05$). Varah et al. (2020) in their study examined the factors influencing attitudes and behaviors of undergraduate students in Delhi about the environment (both rural and urban), determine the link between environmental attitudes and behaviors toward the environment (rural and urban), and also determined the environmental attitudes and behaviors of

the students by department-wise and their district. In their results, they found out that high awareness level acquired through knowledge influences positive attitude and behaviors among the students and they also found out that the students living in rural areas showed a positive environmental attitude than those in urban areas and they also found out that students taking up life science as a subject showed better attitudes toward the environment than the students studying physical science. Kumar et al. (2015) in their study to explore undergraduate students' attitudes towards environment and awareness among gender (boys and girls), result revealed that boys have more Attitude than girls but there are significant difference found in boy and girls Attitude. And girls were found to have more Environmental awareness than boys. There found no significant difference found in Boys and girls Environmental awareness. According to Fernandez-Manzanal et al. (2007) study environmental attitudes provide a good understanding of the set of beliefs, interests, or rules that influence environmentalism or pro-environmental action. Hence it presumes that if schools inculcate in children positive values and attitudes towards environmental conservation they would take an active role in conserving the environment and its resources and hence preserve them for the future generation.

Contrary to the above is by Singh, (2017) in a study conducted on 160 students (80 girls and 80 boys) randomly selected from different schools of Shimla, environmental attitude scale and environmental awareness tests were administered on them and the results revealed that both male and female have equal awareness towards environment and female students were found to have better attitude towards environment than male students..

2.5. Theoretical Framework

2.5.1. Theory of Planned Behavior

Theory of Planned Behavior (TPB) was used in the current study to assess the knowledge, attitude and practice of students' waste bin usage among secondary school students at Akaki kality Sub city. The theory consist of environmental knowledge, attitude, subjective norm (SN) and perceived behavioral control (PBC) that might influence student's intention to perform specific behavior in waste management in daily life(Sharifah 2015). It was developed by Icek Ajzen in 1991, and it was individual paradigm that deals with behavioral intention. This theory was a conceptual extension of Fishbone and Ajzen (1975) Theory of Reasoned Action without "Perceived Behavioural Control "It is now regarded to be beneficial for predicting human

behavior (Tommasetti et al., 2018). When discussing sustainable behavior and waste bin usage habits of students we can use the Theory of Planned Behavior to explain why students make the decisions they do.

The theory assumes that people behave rationally when they consider the implications of their actions. "TPB (Theory of Planned Behavior) hypothesizes that the immediate determinant is the individual's intention to perform or not to perform that behavior (Mahmud, 2010). According to the Theory of Planned Behavior, behavior can be predicted by intentions to behave or act in a certain way (Poškus, 2015); most human behaviors are goal-directed behaviors, thus a person would behave pro-environmentally because they have the "intention" to do so. This "intention" is influenced by the person's "attitude", "subjective norms" and "perceived behavioral control" (Botetzagias, 2015). Intentions are assumed to capture the motivational factors that influence a behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior. As a general rule, the stronger the intentions to engage in a behavior, the more likely should be its performance (Ajzen, 1991). The Theory of Planned Behavior utilizes three conceptually independent determinants of intentions (Ajzen, 1991). To predict whether a person intends to do something, we need to know, whether the person is in favor of doing it ('attitude'), how much the person feels social pressure to do it ('subjective norm') and whether the person feels in control of the action in question ('perceived behavioral control (Francis, 2004). The Theory of Planned Behavior assumes that the behavioral intention is the strongest predictor of behavior. Perceived behavioral control, attitude towards behavior, and subjective norm are the aspects that construct the behavioral intention (Largo-Wight, 2013). By changing the three 'predictors', we can increase the chance that the person will intend to do a desired action and thus increase the chance of the person actually doing it (Francis, 2004).Although there is considerable support for its use, there are concerns that it does not adequately explain recycling behavior, and that additional variables should be included within the model (Boldero, 1995; Cheung et al., 1999; Davies et al., 2002; Macey & Brown, 1983; Terry et al., 1999). The TPB allows for the incorporation of additional variables, provided that these variables make a significant contribution to the explanation of behavior (Ajzen, 1991). Thus, this study has incorporated a number of additional variables which are determinants on the knowledge, attitude and practices of students towards waste bin usage and waste minimization, including Age ,income of parents, students grade level, involvement in clubs, participation in

waste management campaign, place of residence, peer influence and promotion about the use of waste bin.

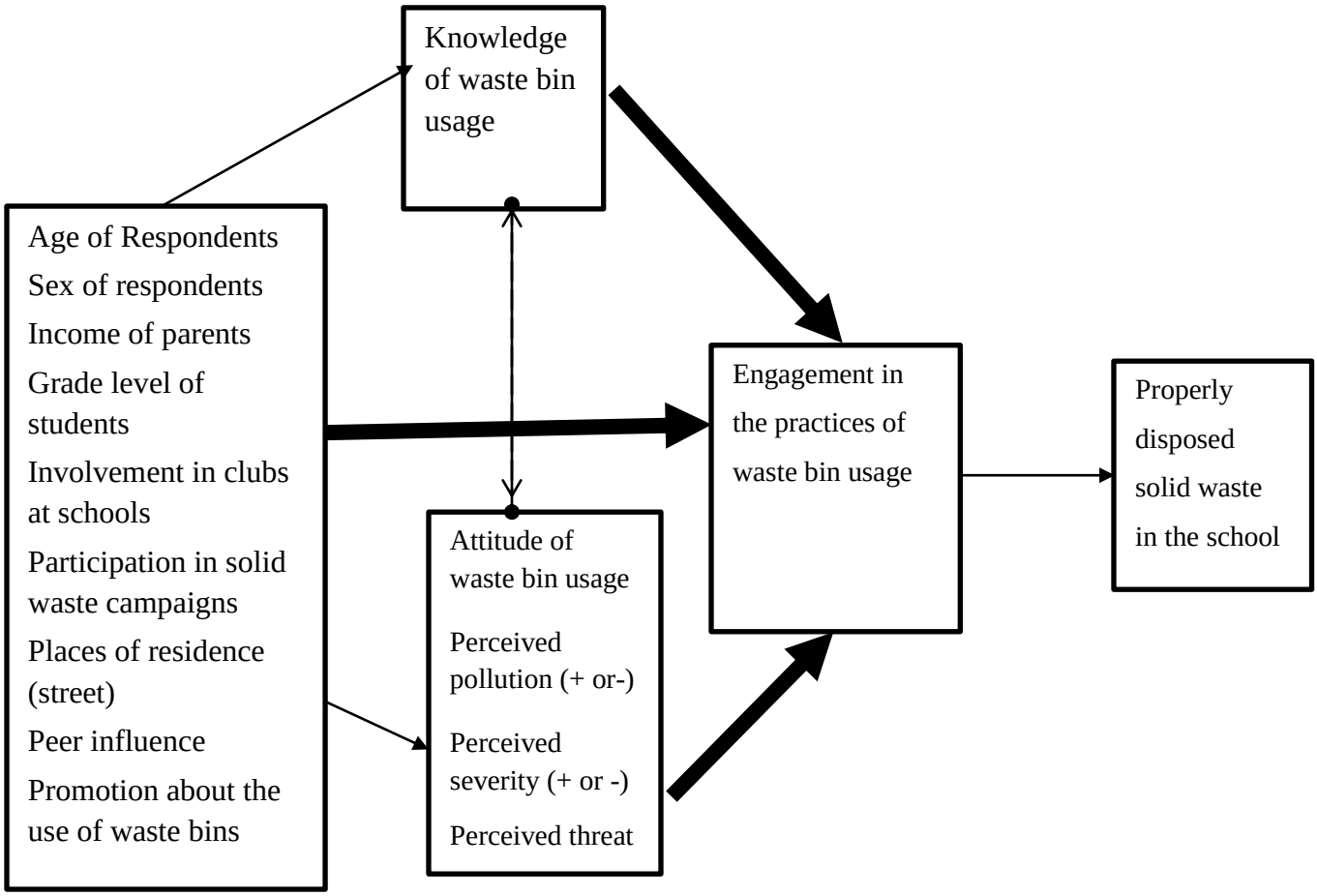
2.6. Conceptual Framework

The conceptual framework is built on KAP-O frame work. Our adapted KAP-O framework illustrates that improving students' knowledge of waste bin usage and attitudes (perceived pollution, severity and threat) towards environment and health, interact with their socio-demographic characteristics including level of education ,age, sex, to influence their practices of waste bin usage engagement This interaction ultimately culminates in desirable outcomes (clean learning compound).Guided by this modified frame work the socio-demographic characteristics considered in the study include sex, income of parents, students; involvement in clubs, peer influence, place of residence, participation in solid waste management campaigns, Effective waste management is a product of high knowledge, good attitude and good practice of waste bin usage. Knowledge of waste bin usage in this context is the awareness and understanding of the sustainable waste management practices. Attitude towards waste bin usage in this context is predicated on perceived status of pollution, perceived severity and perceived threat to health and environment. Good practice of waste bin usage is the engagement in activities such as sustainable waste management practices.

However, Environmental Education is seen as the best instrument in the awareness creation in the students learning process. A study conducted by Agut, et al,(2014) in Kofi, et al (2021) reports that, to achieve sustainable living, early environmental education is necessary to shape youngsters. This is because children build their own identities at a primary age. Given that sustainability education in the primary parts of students' life, it is crucial to equip or build them with the kind of knowledge, attitudes, awareness, and skills to protect the socio-economic environments of both present and future (Kofi ,et al 2021).Several studies have looked into the link between environmental knowledge and behavior such as studies Singh et al.(2018) Boiyo et al.(2015) and Ahmad et al. (2015) have sought to understand the knowledge, attitude, and practice (KAP) of students regarding solid waste and how this influences their environmental behavior. Thus, the more informed a person is, the more concerned he or she will be about environmental issues. According to knowledge–attitude–behavior (KAB) model, environmental knowledge leads to the establishment of environmental attitudes, which later reflect in behavior.

It has also been argued as necessary to improve behavior based on the notion that people who are environmentally aware are also aware of associated problems, and so have a greater reason to take constructive action in response to them (Diaz-Siefer, et al 2015). However, this, on the other hand, has been criticized as being superficial because it ignores the interconnections of factors that impact behavior. Therefore, it is critical to test and perform Comprehensive theory-based surveys in schools to clarify the factors responsible for students' involvement in waste management programs

Figure2.2. Conceptual Framework



Source: survey (2023**)**

Chapter Three

Research Methodology

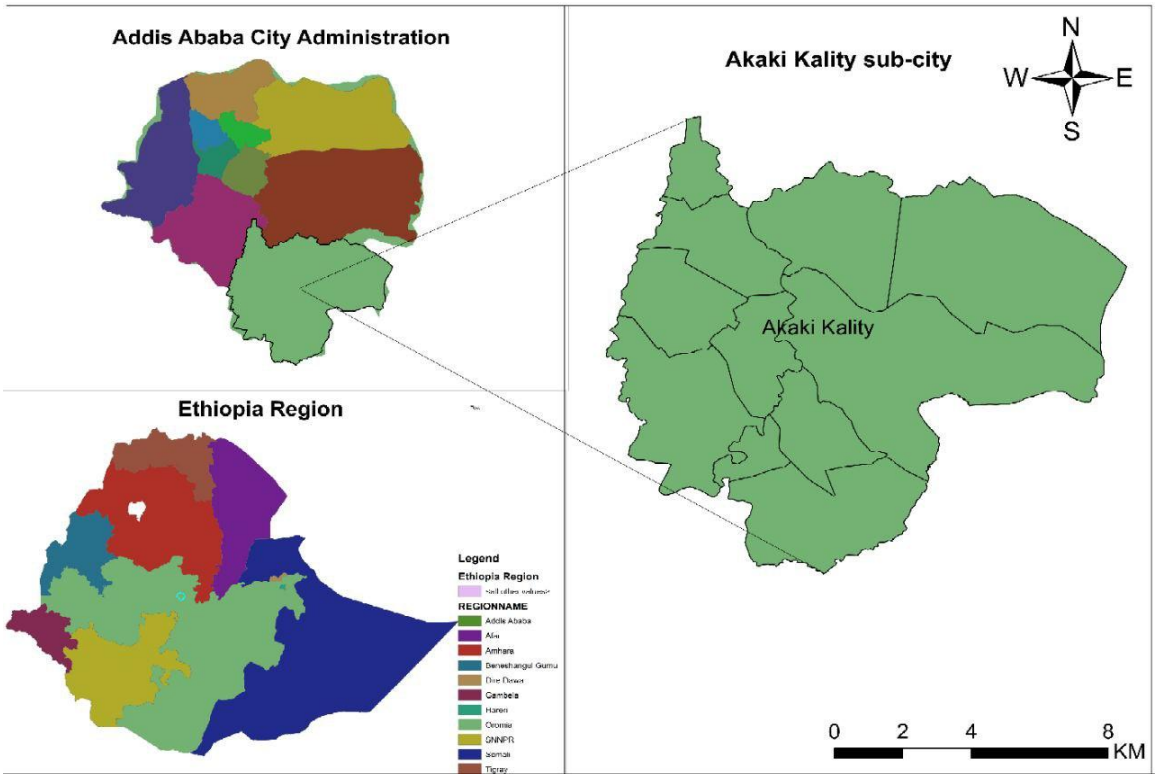
Accordingly, this chapter presents the research design upon which the entire study was built, it presents the research design, sampling design and techniques, method of data collection and ways of analyzing, interpreting, and presenting data were also included on this chapter.

3.1. Description of the Study Area

The study was carried out in Addis Ababa with focusing to Akaki Kality Sub city. Addis Ababa is the capital city of Ethiopia since 1886.Since its establishment more than 130 years ago, the city has developed from a small and dispersed settlement to a metropolitan urban area of 527 km2 (Alemayehu 2005). The city is home to 25% of Ethiopia's urban population and is one of the fastest growing cities in Africa (UN-HABITAT, 2017; World Bank Group, 2015). Addis Ababa is also the political hub being the head quarter for the African Union and United Nations Economic Commission for Africa.

For an ease of administration Addis Ababa is divided into eleven sub cities (kifle ketemas) including the newly designated Lemi kura. There are woredas & ketenas, which are the lowest administrative levels, under each sub city. According to UN-HABITAT (2017), Addis Ababa's rapid and uncontrolled population growth and industrial expansion has caused significant environmental pollution. Akaki Kality is amongst the largest sub-city in the town and the largest industrial area. It covers a total area of 118.08 km2. The GPS coordinates were 8°53 5 N and 38°47 21 E for latitude and longitude. The sub city is bounded to the north by Bole Sub-city, to the North West by Nifas Silk Lafto Sub-city, and to the south and east by Oromia Regional State. Eleven woredas make up the sub-city. According to the Ethiopian Central Statistical Agency's estimated population for 2014-2019, the population of the Akaki Kality Sub-city was 115,736 males and 122,619 females, totalling 238,355 populations. The topography of Akaki Kality sub city is both gentle and sloppy. The boundary of the study area is situated along an elevation range of 2060-2340m (Melis, 2020).

Figure 3.1 Map of study area(Akaki Kality)



Source: Extracted (2023)

The area for this study was Akaki Kality Sub City. According to Akaki Kality Subcity Office of Education there are twenty secondary schools of which eight are privately owned and twelve government owned schools in the sub city.

3.1.1. Solid Waste Management Practices in Schools of Addis Ababa

The characteristics and composition of solid waste in schools may vary depending on socioeconomic status of students. However, the common types of solid wastes found in various schools in less-developed countries include paper, grass, nylon (pure water bags and biscuits, lollypops, ice cream, and sweet or candy wrappers), sugar cane, maize cobs, and groundnut shells. Other forms of wastes may also be found on school premises, and these may not have even been generated directly by pupils and teachers (Adeolu, 2014). In the context of schools of Addis Ababa, solid wastes are items discarded by students and staff and other member of the school community. The major types of solid waste generated in school are garbage, paper, floor sweeping and cleaning materials, cow dung/animal waste if animals are left to graze in school compounds as often observed in many rural schools, vegetable peels leaves, wooden items, metal

scrape, cans, plastic bags, and bottle. But in most school setting, solid waste is not more than waste papers, cartons, plastic bottles, bags container, and jug, generated by students and administration offices and tree branches, leftover from vegetables and fruits from gardens (Getachew--). Studies done on solid waste management system in schools of Addis Ababa are very limited. However, according to Merkeb (2021) study on few schools, waste collection is carried by municipality in one public school (Biherawi Primary School) and one private school (New Grand Primary School). In one of the other public schools (Yelibe Fana Primary School) solid wastes except for toilet paper and menstrual hygiene management wastes are also collected by the same method. However, one private school(Brass Youth Academy) school incinerate wastes in the school premises inside a separated chamber , Although, it was the quickest way to dispose of waste, it pollutes the environment since the outer layer of sanitary pads are non-biodegradable plastics like polypropylene, tend to cause toxic gases which enhances pollution (Kaur et al., 2018).Similarly , 91 (92.9%) of schools had solid waste disposal system, of this 89 (90.8%) collected by municipal waste collectors, 2 (2.1%) incineration, 3 (3%) burned on premise and 4 (4.1%) open dumping(Abayneh, 2020).

Figure 3.2 Picture of Gelan Secondary School

Source: Survey (2023)

Figure 3.3 Picture of Ethio National Secondary School

Source: Survey (2023)

3.2. Research Design

A research design is the overall plan for connecting conceptual research problems. It also describes the procedures for collecting, analyzing, interpreting, and reporting collected data in research studies (Creswell & Clark, 2017). According to Vandamme,(2009) in Oluwatobi, et al.(2022) Knowledge is critical as a major determinant in developing behavioral intentions and attitudes. The knowledge of students of littering and proper waste management is related to the capacity to accept ideas and behavioral patterns related to environmental sustainability. Increased knowledge in this aspect will enhance the student's awareness and attitudes toward the environment. Hoque and Alam (2018) attitudes of students, on the other hand, could influence certain subjective norms, which translate into behavioral patterns. Attitude is found to be a fundamental driver of a student's behavior because it controls how the students will respond to the waste management concerns, and this influences their pro-environmental behavior in acting beneficially towards the environment (Gonul, et al 2016).As a result, the study was descriptive in nature and it involves quantitative supported by qualitative methodologies.

3.3. Approaches of the Study

Mainly quantitative research approach was employed supported qualitative part like interview, observation and text book evaluation.

3.4. Populations and Sampling procedures

3.4.1. Population

According to the Ministry of Education's recently adjusted school system, secondary schools include grades nine, ten, eleven and twelve and Population includes students from these four grades of both selected private and government schools. Accordingly, the total population of students from the two selected secondary schools in Akaki kality sub city in 2022/23 academic year was 2910 students with 1773 from public schools and 1137 from private schools.

Table 3.1 Distribution of Study Population

	Government			Private			G. Total	
Grades	Male	Female	Total	Male	Female	Total	Male	Female
9	257	274	531	132	180	312	389	454
10	176	263	438	139	156	295	315	419
11	146	258	404	106	146	252	252	404
12	175	224	399	115	163	278	290	387
Total	754	1019	1773	492	645	1137	1246	1664

Source: Survey (2023)

3.4.2. Sampling Procedure

The quantitative study employed a range of sampling techniques including, purposive sampling and simple random sampling. Akaki Kality and schools are purposively and purposely selected because of the interest of the researcher for being the residential place of the researcher. Random sampling was employed for questionnaire data collection because students were randomly selected based on gender category from all grade levels. The sample size was determined using equation from Yamane (1967). It provides a simplified formula to calculate sample sizes to obtain a representative sample from a population. This formula was used to calculate the sample sizes in which 95% confidence level and P = 0.5 are assumed. n = N/ [1 + N (e) 2] Where n is the sample size, N is the population size, and e is the level of precision. Which is reliable up to 95% and the deviation factor is less than 0.05 in which the cut-off point is at a 5% chance of sampling error.

3.5. Sample Size

3.5.1 Sample Size for Quantitative Data

Total population from the two selected secondary schools were 2910, using Yamane 1967 Equation

The total sample was =2910/1+[2910(0.05)2]=351 and based on the total number of students of each selected schools ,number of students per grade level and proportion of gender the sample will be as follows.

Since total number of students from Gelan sec. school is 1773 which is 60% of total population, then the sample size for Gelan will be 211 and Ethio National is 1137 which is 40% of total population, then the sample size for EthioNational will be 140.

Table 3.2 Sample Size Distribution of Study Population

Grade Level	Gelan sec.school		EthioNational sec.school	
	Male	Female	Male	Female
9	31	32	16	22
10	21	31	17	19
11	17	31	13	19
12	21	27	14	20 .
	90	121	60	80=351

Source: Survey (2023)

3.6 Data Sources and Methods of Data collection

3.6.1 Data Sources

The data for this study was collected from primary sources to answer the research questions and meet the objectives of the study. The primary data was collected from two secondary schools found in Addis Ababa Akaki kality subcity in which one was from private school and the second from Government.

3.6.2 Instruments of Data Collection

The researcher used structured questionnaires, unstructured interviews, observation, and text book review to obtain critical data for a rigorous and sound analysis of the study. As a result, the following primary data collection tools were applied for this study.

- **Questionnaire**

A structured survey instrument was developed to assess the respondents' profile while a 5-point Likert Scale and yes or no question was employed to measure students' knowledge, attitude and practice of waste management and waste bin usage. The survey instrument was pre-tested to representatives of the school and few respondents from each school prior to the survey proper. This was conducted to ensure its quality, clarity, and content validity. Having their comments and ease of students understanding and collect relevant data the questionnaire was translated in to local language Amharic language.

- **School visit/Observation and Text book Evaluation**

The school visit was also supported by a photography system on waste disposal sites and general school premises. In the meantime text book assessment was conducted for four days in the two schools.

- **Interview /KII/**

The interview type that was used in this research is an open structured key informant interview. This tool was conducted informally with vice director, teachers and coordinator and teachers and students.

3.7 Method of Data Analysis and Presentation

The gathered information from the two school sources was compiled in a way that is easy to manage. The questionnaire survey was coded into the Statistical Package for Social Science (SPSS) version 23 for analysis. Descriptive statistics were used to analyze the quantitative data. The reason for using descriptive statistics was that the researcher summarized demographic characteristics such as sex,and education background of the respondent's parents etc. The result of the analysis was interpreted and discussed using descriptive statistics (frequency, mean, standard deviation) using tables and charts. Qualitative data obtained in the form of interviews and field observation was presented as a supportive to the quantitative data in the analysis and discussion parts. Moreover, questionnaires consisting 35 items were used to assess the

knowledge, attitude and practice of students on waste management and waste bin usage. Cronbach's Alpha was used to test the reliability of the items.

3.8 Ethical Statement

Ethical approval was obtained from Addis Ababa University, College of Development Studies Institutional Review Board (CoDS-IRB) with reference number: 115. Before data collection, all study participants were informed about the purpose of the study and the rights to participate or decline to participate in the study. The respondents were also informed about the confidentiality of their information and assured that all the data will be used for research purposes.

Chapter Four

Results and Discussion

A total of 351 students studying ninths, tenth, eleventh and twelfth classes from two selected secondary schools were participated in the study and there was no missing data from any of the selected respondent. Therefore, the response rate was 100%. Yes or No and Agreement statements were used to measure the KAP of students on solid waste management and waste bin usage .The analysis is divided in to - sections ,the first being respondents characteristics ,second type of solid waste produced in the school premises by the students ,the third were methods of solid waste disposal, the fourth attitude towards solid waste management and waste bin usage ,fifth knowledge of solid waste management and waste bin usage and sixth were solid waste management practice .

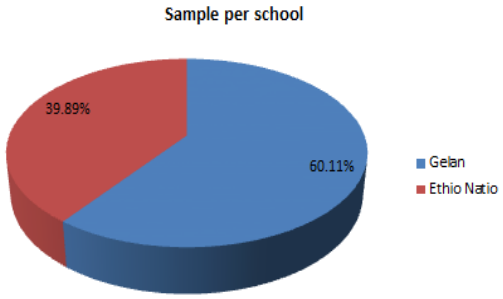
4.1 Students Characteristics

To make the analysis more meaningful for the readers, an initial analysis of the respondents' background information, such as school type, sex, group, grade level, rank in class residential setting and distance from school, educational level of their parents and parents were included. The demographic analysis in this study is used to describe the sample's characteristics, such as the number of respondents, the proportion of males and females in the sample, type of school, and educational level. As a result, tables and figures below discuss the research population's demographic characteristics.

4.1.1. Proportion of Respondents per School

In this study the respondents were from both the public and private schools.

Figure 4.1 Proportions of Respondents per School



Source: Survey (2023)

Majority of the respondents 211(60.11%) were from public school (Gelan secondary school) while 140(39.89%) of the respondents were from private (Ethio-National secondary) school (see figure 4.1)

4.1.2. Grade level and Sex of Respondents

Majority of the respondents 101(28.8%) were from grade nine, whereas 88(25.1%), 80(22.8%) and 82(23.4%) were from grades ten, eleven and twelve respectively. As shown in the table below about 150(42.7 %) of the respondents were male while201 (57.3%) of the respondents were female.

Table 4.1 Grade level, sex and Rank in class of Respondents

Respondents' Characteristics (n=351)		Frequency	%
Grade Level	Nine	101	28.8
	Ten	88	25.1
	Eleven	80	22.8
	Twelve	82	23.4
Sex	Male	150	42.7
	Female	201	57.3
Rank in Class	1—10	133	37.9
	11—20	150	42.7

	21—30	59	16.8
	31+	9	2.6

Source: Survey (2023)

The percentage indicated that females were participated more than males in this study. The data recorded on the rank category of the respondent shown that about 133(37.9%) of the respondents had lie between 1-10 rank interval, while 150(42.7%) and 59(16.8%) were found at 11-20 and 21-30 rank intervals respectively. A small number of respondents 9 (2.6%) had recorded in a rank interval 31 and above (Table 4.1).

4.1.3. Residential Setting and Distance from School

Majority of the respondents 326(92.9%) live in urban area while 25(7.1%) were from rural area. About 133(27.9%) of the respondent travel 11 to 20 minutes to arrive school,90(25.6%) travel 21to 40 minutes ,88(25.1%) travel 5 to10 minutes and 40(11.4%%) of the respondent travel more than 40 minutes to arrive their school(Table 4.2).

Table 4.2 Respondents Residential place and distance from school

Respondents'Characteristics (n=351)		Frequency	%
Residential Setting	Rural	25	7.1
	Urban	326	92.9
Distance from school /minutes/	5—10	88	25.1
	11—20	133	27.9
	21—40	90	25.6
	41+	40	11.4

Source: Survey (2023)

4.1.4. Educational Status of the Respondents 'Parents

Based on the parents educational level, the respondents were categorized into five groups, including read and write, grade one to twelve, diploma, degree and masters and above education .Accordingly, as indicated in table below the educational level of most respondents' parents 137(39.0%) of father and 143(40.7%) of mother were from grade one to twelve. (Table 4.3).

Table 4.3 Respondent Parents' Educational Status

	Read & write	51	14.5
	1—12	137	39.0
Father's Edu. level	Diploma	26	7.4
	Degree	72	20.5
	Masters and above	65	18.5
	Read & write	69	19.7
	1---12	143	40.7
Mother's Edu. Level	Diploma	48	13.7
	Degree	63	17.9
	Masters and above	28	8.0

Source: Survey (2023)

4.1.5. Experiences of students to participate in extra-curricular activities in the school

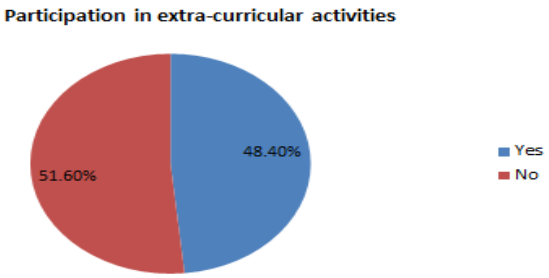
Participation in extra-curricular activities is linked to positive academic outcomes, such as students' grades and educational aspirations, improved attendance, pro-social behaviors and more positive developments in general. Extracurricular activities provide a channel for reinforcing the lessons learned in the classroom, offering students the opportunity to apply academic skills in a real-world context, and are thus considered part of a well-rounded education. Recent research suggests that participation in extracurricular activities may increase students' sense of engagement or attachment to their school, and thereby decrease the likelihood of school failure and dropping out (Claudette 2013). If, indeed, participation in extracurricular activities can lead to success in school, then the availability of these activities to students of all backgrounds becomes an important equity issue.

The type of extracurricular activity affects different components of character development. Students who participate in academic clubs build leadership skills, whereas students who participate in athletic clubs develop problem-solving skills (Fredricks & Eccles, 2008). Students who contribute time performing in the arts record higher levels of positive self-development (Metsapelo & Pulkkinen, 2012) and greater engagement in the school environment (Knifesend &

Graham, 2012) Participating in extracurricular activities is beneficial to students' social development. Group activities build team-work and communication skills, which are necessary for success in the workforce and other future endeavors. Students are continually looking for a greater sense of belonging (Knifesend & Graham, 2012).

Participation in extracurricular activities demonstrates the importance of community involvement. Students need more exposure to the whole community rather than the smaller school network (Claudette 2013), and participating in extracurricular activities creates a network between individuals and their community, including the elderly and the working class (Claudette 2013).Certain types of extracurricular activities encourage more community involvement than others. Participation in clubs that focus on community involvement, such as community service groups, gives students into how it feels to give back to the community. Clubs that provide entertainment encourage community members to attend and support the event, such as a sports game or a school play. These events foster relationships between schools, students, and community members such as students' parents and friends. Students who have parents and peers who are engaged in the community are more likely to volunteer themselves (Barber et al., 2013). Encouraging students to participate in community-based extracurricular activities will create opportunities for students to experience the benefits of community involvement

Figure 4.2 Participation statuses of students in extra-curricular activities



Source: Survey (2023)

Unfortunately, the result in this study majority of respondent 181(51.6%) indicated that they do not participate in extra-curricular activities in the school, while 170(48.4%) confirmed that they

participate in extra-curricular activities in their school. An interview with selected teachers heads of the schools were conducted guided by open structured question prepared by the researcher and it has been confirmed that no solid waste management and pollution control program which participate students regularly or campaign form, no programs set extra-curricular activities for students, awareness creation program about solid waste management and pollution control however, schools have mini media which can only serve for music transmission during break time.

4.2. Categories of Solid Waste

The respondents were asked put an estimated rank on common waste in their schools in terms of their relative abundance and most respondents (74.4%) indicated that paper waste was found in high amount in their school. 35.1% of respondents indicated that food waste was found in high amount.37.3% also indicated that other wastes was found in high amount.

Table 4.4 Categories of solid waste mostly produced by a student at schools

Category	Very Low Amount	Low Amount	Neutral	High Amount	Very High Amount
Food waste	23.6%	27.4%	14.0%	19.1%	16.0%
Paper waste	7.4%	10.0%	8.3%	32.8%	41.6%
Wood leaves etc	36.2%	26.2%	16.2%	12.0%	9.4%
Plastics	23.4%	28.5%	19.1%	18.2%	10.8%
Pens and pencils	41.3%	22.8%	17.4%	11.4%	7.1%
Pieces of clothes	56.7%	16.0%	17.4%	5.4%	4.6%
Others	13.7%	10.8%	37.9%	16.5%	20.8%

Source: Survey (2023)

According to 51% of the respondents food waste was found in a low amount in their school. 52% of the respondents indicated that plastics waste was found in low amounts in their school. Most respondents (64.1%) indicated that pens and pencil waste was found in low amounts in their respective school. 62.4% of the respondents indicated that wood leaves waste was found in low

amounts in their school. Majority of the respondents (72.7%) indicated that pieces of clothes were found in low amount in their school (table4.4).

4.3 Weight of Waste produced per day (estimate)

From this study majority of respondents 44.2% indicated that estimated daily weight of solid waste generated by the students in their school premises were greater than three kilograms (table4.5) and the overall students' rate of solid waste generation is about 1.03/capita/day which was low compared to 0.32kg/capita/day for Addis Ababa (Adane et al,2015).

Table 4.5 Weight of Waste produced per day

Weight of waste produced per day					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 Kg	15	4.3	4.3	4.3
	About 1 Kg	44	12.5	12.5	16.8
	1 to 2 Kg	59	16.8	16.8	33.6
	3 Kg	78	22.2	22.2	55.8
	Greater than 3 Kg	155	44.2	44.2	100.0
	Total	351	100.0	100.0	

Source: Survey (2023)

4.4. Method of Waste Disposal

Students were asked to put their waste disposal method in in a descending order and we took only the main disposal method. Even though waste disposal varied among schools, major ways of waste disposal were identified

Table 4.6 Method of Waste Disposal

	Frequency	Percent
Composting waste	15	4.4
Open burning of dry waste	155	44.2
Incineration	5	1.4

Dust/waste bins	68	19.4
Dump pits	25	7.1
Municipal buckets/container	60	17.1
Recycling	4	1.1
Don’t know	19	5.4
Others	0	0
	351	100 .

Source: Survey (2023)

.According to155 (44.2%) uses open burning for their dry waste, followed by waste bin 68(19.4%). About 60(17.1%) indicated that they use municipal containers and 25(7.1%) uses dump pits. About 19(5.4%) don’t know where waste was disposed of and another 15(4.4%) indicated that they compost their solid wastes and 4(1.1%) of the respondents use recycling. This was also confirmed from interviewees that there were no wastes bins prepared for waste segregation and disposal and confirmed that the major waste disposal method was open burning followed by communal container dumping of solid wastes that are not able to burn.

4.5 Reliability Test

The reliability was tested through Cronbach’s alpha coefficients. According to Reimers et al (2012), internal consistency of factors with Cronbach’s alpha coefficient greater than 0.60 is acceptable, above 0.70 is considered good reliability and a value greater than 0.80 is very good.

Table 4.7 Reliability Test

Reliability Statistics	
Cronbach's Alpha	N of Items
.834	35

Source: Survey (2023)

For this study, Cronbach’s Alpha was 0.834 for the whole 35 items. Therefore, the reliability of the questionnaire was high, indicating that the data was acceptable.

4.6. Knowledge of Waste Management and usage of Waste Bins

Knowledge about a given issue has been recognized as one of the major determinants that shape the attitude, and practice of students. A positive correlation between students' level of knowledge about issues related to environment and their attitude has been supported by various literatures (Vandamme, 2009).

Table 4.8 Schools' status of Knowledge delivery on Solid Waste Management

Statement	Yes(%)	No(%)
Knowledge of waste Reuse	271(77.2)	80(22.8)
Awareness programs	81(23.1)	270(76.9)
Solid Waste Management Topics	64(18.2)	287(81.8)

Source: Survey (2023)

Now a day's environmental problems in general and mishandling of wastes in particular are among the leading causes for ill-health and impediments for national development. Improper waste management may have health and environmental hazards. Studies showed the relationship of many diseases to improper waste management. Majority of respondents 271(77.2%) confirmed that they know solid wastes produced in the school are resources to be reused. Majority of the respondents 270(76.9%) indicated that there were no awareness programs conducted on waste management in their school Most of the respondents 287(81.8%) indicated that there were no topics in their curriculum on waste management in their grade levels (Table 4.8).

Table 4.9 Knowledge of Waste Management and Waste Bin usage

Statement	S.Disagree	Disagree	Neutral	Agree	S.Agree
waste bins are					
used to maintain	38(10.8%)	7(2.0%)	16(4.6%)	133(37.9%)	157(44.7%)
a safe school					
environment					
waste bins are					
used to maintain	15(4.3%)	18(5.1%)	18(5.1%)	135(38.5%)	165(47.0%)
a clean school					
environment					
Know the					
complications of	20(5.7%)	9(2.6%)	43(12.3%)	161(45.9%)	118(33.6%)
improper SWM at					

schools					
Know about					
environmental problems					
related to	14(4.0%)	13(3.7%)	25(7.1%)	165(47.0%)	134(38.2%)
mismanagement					
of SW in schools					
Know recycling is					
made more efficient	17(4.8%)	14(4.0%)	36(10.3%)	163(46.4%)	121(34.5%)
and easier with					
waste bins					
Know that garbage					
is harmful to the	15(4.3%)	20(5.7%)	34(9.7%)	151(43.0%)	131(37.3%)
school environment.					
Aware that it is					
important to follow					
proper solid waste	15(4.3%)	14(4.0%)	36(10.3%)	159(45.3%)	127(36.2%)
management to avoid					
possible health					
problems at the school					
Know there are					
SWM programs	26(7.4%)	21(6.0%)	51(14.5%)	104(29.6%)	149(42.5%)
in the school					
Mean					**4.05**
Std Deviation					**0.78**

Source: Survey (2023)

Majority of the respondents290 (82.6%) confirmed that they know waste bins are used to maintain a safe school environment. Most respondents300 (85.5%) similarly agreed that waste bins are used to maintain a clean school environment, 279(79.5%) of the respondent knew the complications of improper solid waste management at schools. Majority of the respondents 299(85.2%) agreed that they had knowledge of environmental problems related to mismanagement of solid waste in schools.284 (80.9%) of the respondents knew that recycling is made more efficient and easier with waste bins. Majority of the respondents 282(80.3%) agreed that they knew garbage is harmful to the school environment. Most respondents 286(81.5%) confirmed that they were aware that it is important to follow proper solid waste management to avoid possible health problems at the school and 253(72.1%) of the respondents also confirmed that there were solid waste management programs in the school. The overall mean was 4.05

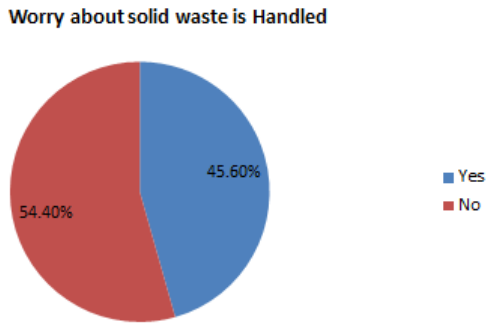
with a standard deviation of 0.78. These findings imply that knowledge was an important determinant of waste management (Table4.9). According to informal interview made with student respondents, they mostly claim that they obtained their knowledge from the media and different sources but never participated in waste management events organized by the school. They also agreed that training should be conducted especially on recycling, composting, and waste segregation.

4.7. Attitude towards Solid Waste Management and usage of Waste Bins

Attitudes are often the results of experience or upbringing. They can have a powerful influence over behavior and affect how people act in various situations The major components of attitude are cognitive, affective and behavioral, which means they incorporate thoughts, feelings and actions(Kendra,2023) As attitude is feeling about something or the way of thinking in a cooperative or uncooperative behavior. Attitude of the individual for solid waste management have positively influenced through knowledge and education and have adequate influence regarding environmental conditions (Gonul et al, 2016). Information and knowledge together with positive attitude have maintained the practical waste disposal options. One of the objectives of integrating environmental issues in the formal education system is to develop positive attitudes of students toward waste management. As stated in the objectives, twelve items were used to assess students' attitude towards waste management and waste bin usage and the results are indicated in the tables. For the first objective of the study item by item analysis was conducted as indicated in the consecutive tables.

Solid waste handling by the community is a function of people's attitude and thus the reflection by their socio economic characteristics. The attitudes of the society towards SW and their patterns of material use and solid waste handling, interest in solid waste reduction and minimization degree to which they separate solid wastes and the extent to which they refrain from indiscriminate dumping and littering. Various studies in different parts of the world revealed that solid waste takes the lion share among environmental problems. Majority of the respondents (54.4%) stated that they were not worried about waste being handled in their respective premises. 45.6% of the respondents indicated that they were worried about waste was handled in their respective premises(Figure4.3)

Figure 4.3 Worriedness of students on solid waste handling



Source: Survey (2023**)**

People's attitude influences not only the characteristics of waste generation, but also the effective demand for waste collection service. According to UNDP (1996) people's attitude towards waste may positively affect their interest and willingness to pay for collection service. In addition, through awareness campaigns and educational measures attitude may be positively influenced and in tum it can change the negative impact of inadequate waste handling with regard to public health and environmental conditions. Such educational campaign also informs people of their responsibility as waste generators and of their right as citizens to waste management services.

Table 4.10 Attitude towards solid waste management and waste bin usage

Statement	S.Disagree	Disagree	Neutral	Agree	S.Agree
Students SWM is					
dependent on	94(26.8%)	128(36.5%)	44(12.5%)	55(15.7%)	30(8.5%)
parents' income					
SWM is my					
responsibility and					
not only that of the	28(8.0%)	22(6.3%)	39(11.1%)	155(42.2%)	107(30.5%)
school support					
staff alone					
SWM is the duty of	101(28.8%)	112(31.9%)	41(11.7%)	63(17.9%)	34(9.7%)

genitors at school					
Every student in the	29(8.3%)	15(4.3%)	21(6.0%)	137(39.0%)	149(42.5%)
school is responsible					
for SWM					
Do not object					
throwingSW around	162(46.2%)	115(32.8%)	30(8.5%)	26(7.4%)	18(5.1%)
my school premises					
andclasses					
Responsible for					
reminding other	23(6.6%)	30(8.5%)	57(16.2%)	144(41.0%)	97(27.6%)
students on proper					
waste bin use at school					
It is important to					
readand share	28(8.0%)	31(8.8%)	59(16.8%)	141(40.2%)	92(26.2%)
information on swm					
with other students					
It is important to					
volunteer in school	32(9.1%)	45(12.8%)	65(18.5%)	142(40.5%)	67(19.1%)
and class cleaning					
activities					
Solid wastedisposal					
is not related to	63(17.9%)	57(16.2%)	52(14.8%)	104(29.6%)	75(21.4%)
one's level of grade					
It is a must to throw					
trash into its					
appropriate	26(7.4%)	17(4.8%)	28(8.0%)	131(37.3%)	149(42.5%)
segregation bins in					
the schooland classes					
There should					
be different dust					
bins to separately	26(7.4%)	4(1.1%)	13(3.7%)	94(26.8%)	214(61.0%)
put solid wastes in					
the school					
Mean					**3.8**
Std Deviation					**0.74**

Source: Survey (2023)

Majority of the respondents 222(63.3%) disagreed that students solid waste management is dependent on parents' level of income (they agreed that solid waste management is not

dependent on parent's level of income), 262(74.6%) of the respondents indicated that solid waste management was their responsibility and not only that of the school support staff alone. 213(60.7%) of the respondents disagreed that solid waste management was the duty of genitors at school. Majority of the respondents 286(81.5%) agreed that every student in the school were responsible for solid waste management in the school. 277(78.9%) of the respondents agreed that they object throwing solid waste around their school premises and classes.241 (68.7%) of the respondents agreed that they were responsible for reminding other students on proper waste bin use at school (pick and dispose waste). Majority of the respondents 308(87.7%) agreed that there should be different dust bins to separately put solid wastes in the school. 233(66.4) of the respondents agreed that it was important for them to read and share information on waste management with other students and majority of the respondents 280(79.8%) agreed that it was a must to throw trash in to its appropriate segregation bins in the school and classes.209(59.5%)of the respondents agreed that it was important to volunteer in school and class cleaning activities and also 179(51.0%) of the respondents agreed that solid waste disposal was not related on one's level of grade. The overall mean was 3.8 with a standard deviation of 0.74. These findings imply that attitude was an important determinant of waste management (Table 4.10).

4.8. Solid Waste Management and usage of Waste Bin Practices

Managements of increasing amounts of solid waste have become a major challenge in Addis Ababa. If solid waste is properly used, it can be valuable resources, but if it is not effectively managed it can result in a serious of adverse impact on environment and public health, therefore it is the way we handle our solid waste that matters most.

Table 4.11 Solid waste management practice

.	Yes(%)	No(%)
Rule of school on waste management	68(19.4)	283(80.6)
Presence of solid waste management club	97(27.6)	254(72.4)
Member of Environmental club	18(5.1)	333(94.9)
Reminding students to collect waste in class when they drop it	100(28.5)	251(71.5)

Source: Survey (2023)

In this study most respondents283 (80.6) indicated that there were no rules in their schools not to dump solid wastes anywhere in the school but in designated waste.254 (72.4% of the respondents indicated that there is no a club in their school that deals with matters of waste and waste management.

Participation in school clubs is one the most important components in the conservation of environment. Active participation helps to build more confident knowledge and helps to spread awareness among the common people. Students who actively participate in environmental activities build a positive attitude towards the environment as they grow older. However, result from this sudymajority333 (94.9%) of the respondents confirmed that they are not a member of the environments club at their school.251(71.5%) of the respondents indicated that they do not remind other students to collect waste in class in case they drop it (Table 4.11).

Practice in KAP surveys of waste bin usage and waste management usually require about the use of measures or activities towards solid waste management in their school, or it yields information on students' behaviors or on what they know should be done. Practice in general refers to the ways in which students demonstrate their knowledge and attitude through their actions.

Table 4.12 Practices of solid Waste management and usage of waste bin

Statement	S.Disagree	Disagree	Neutral	Agree	S.Agree
Highly encourage					
students to use waste	40(11.4%)	42(12.0%)	88(25.1%)	110(31.3%)	71(20.2%)
bins in the school					
Efforts to					
minimize solid waste	29(8.3%)	47(13.4%)	92(26.2%)	109(31.1%)	74(21.1%)
generation at school					
Obeyed the rules					
stated by the school	24(6.8%)	29(8.3%)	88(25.1%)	123(35.0%)	87(24.8%)
about disposal of SWM					
Always use waste bins					
to dispose soft papers	30(8.5%)	40(11.4%)	68(19.4%)	121(34.5%)	92(26.2%)
and other solid wastes					
Participate in the					
environmental club	69(19.7%)	87(24.8%)	122(34.8%)	40(11.4%)	33(9.4%)
of my school					
Involved in the					

promoting of waste	43((12.3%)	61(17.4%)	119(33.9%)	89(25.4%)	39(11.1%)
bin usage in the school					
Practice environmental					
culture in my daily life					
at school including	55(15.7%)	72(20.5%)	119(33.9%)	52(14.8%)	53(15.1%)
green plants					
Always participating					
in our school's solid	51(14.5%)	67(19.1%)	120(34.2%)	67(19.1%)	46(13.1%)
waste management					
campaigns					
Mean					**3.2**
Std Deviation					**0.82**

Source: Survey (2023)

In this survey majority of the respondents 183 (52.2%) agreed that they made efforts to minimize solid waste generation at school.181 (51.6%) of the respondents agreed that they encouraged students to use waste bins in the school. Most of the respondents 213(60.1%) confirmed that they always use waste bins to dispose soft papers and other solid wastes.210 (59.8%) of the respondents confirmed that they had obeyed rules stated by their school about disposal of solid waste and management. Majority of the respondents 156(44.5%) confirmed that they didn't participate in the environmental club of their school and 122(34.8%) showed neutral or indifferent.128 (36.5%) of the respondents confirmed that they involve in the promoting of waste bin in their school and 119(33.9%) showed neutral or indifferent. Most of the respondents 127(36.2%) confirmed that they didn't practice environmental culture in their daily life at school including participation in green plants and 119(33.9%) confirmed neutral respose.118 (33.6%) of the respondents confirmed that they didn't always participating in their school's solid waste management campaigns and 120(34.2%) of the respondents preferred neutral response on this item. The overall mean was 3.20 with a standard deviation of 0.82(Table 4.12).

4.9. Mean Comparisons of Study Variables

The statistical approach used for determining equivalence between variables is analysis of means and standard deviations for the variables of interest. The mean indicates to what extent the sample group on average agrees or disagrees with different statements. According to Journal of Environmental Sciences and Management (2022)), while comparing elements, the mean value

0.01 to 1.00 could be considered as very low, the mean score from 1.01 up to 2.00 would be considered low, the mean score 2.01 up to 3.00 could be moderate, the mean value from 3.01 to 4.00 would be considered as high and value from 4.01 up to 5.00 would be very high (Table 4.14). Data collected with Likert scale were used for further KAP analysis and negatively worded attitude items (1, 3&5) were removed and eight items of attitude, eight for knowledge and eight for practice were transformed into one item each(attitude, knowledge and practice). Therefore, transformed attitude, knowledge and practice items are used for further analysis of KAP of students between schools, sex category and grade level.

Table 4.13 Five-point Likert rating scale with mean range and verbal interpretation for KAP analysis.

Range of Values (mean	
4.01 – 5.00	Very High
3.01 – 4.00	High
2.01 – 3.00	Moderate
1.01 – 2.00	Low
0.01 – 1.00	Very Low

Source: JESM (2022)

4.9.1. Knowledge, Attitude and Practices of Respondents within the two Schools

As indicated in the table below, the knowledge level of both Gelan and Ethio National secondary school students on solid waste management and waste bin usage confirmed as very high with mean value of 4.0391 and 4.0580 respectively. The mean value of attitude and practice of both schools showed high with mean value of 3.7435 and 3.8589 and 3.2210 and 3.1795 for Gelan and Ethio National respectively. However the mean values of practice of both schools were relatively lower than knowledge and attitude values.

Table 4.14 Knowledge, Attitude and Practice status of Students of the two Schools

Report				
Name of school		Knowledge	Attitude	Practice
Gelan sec.school	Mean	4.0391	3.7435	3.2210
	N	211	211	211
	Std. Deviation	.81034	.77615	.91326

EthioNational sec. school	Mean	4.0580	3.8589	3.1795
	N	140	140	140
	Std. Deviation	.72491	.68035	.65670
Total	Mean	4.0467	3.7895	3.2044
	N	351	351	351
	Std. Deviation	.77638	.74059	.81982

Source: Survey (2023)

An independent sample test was conducted to see presence of significant difference in the KAP of students on waste management and usage waste bin within the two schools and the result shows that there is no significant difference between the two surveyed schools (p=.153--.819 >0.05) (Table 4.15)

Table 4.15 Independent samples Test result of the two schools.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Knowled	Equal variances assumed	4.662	.032	-.22	349	.823	-.02	.08475	-.18561	.14774
	Equal variances not assumed			-.23	320	.819	-.02	.08286	-.18195	.14408
Practice	Equal variances assumed	14.54	.000	.464	349	.643	.04	.08947	-.13445	.21747
	Equal variances not assumed			.495	347	.621	.04	.08386	-.12344	.20645
Attitude2	Equal variances assumed	1.797	.181	-1.4	349	.153	-.12	.08061	-.27398	.04309
	Equal variances not assumed			-1.5	323	.142	-.12	.07849	-.26987	.03898

Source: Survey (2023)

4.9.2. Knowledge, Attitude and Practices of Respondents within Grade Levels

The one-way analysis of variance (ANOVA) can be used to determine whether there are any statistically significant differences between the means of three or more independent (unrelated) groups. It compares the means between groups of interest and determines whether any of those means are statistically significantly different from each other. In this study KAP of respondents on solid waste management and waste bin usage were compared with respect to grade level of students. Therefore, the ANOVA result indicated that knowledge and attitude were not statistically significantly different in all four grades (p>.05), while practice was significantly different between test groups (p=.001).Hence, post hoc test was conducted to differentiate the grade which significantly different from the others.

Table 4.16 ANOA of KAP of Respondents within Grade Levels

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Knowled	Between Groups	1.294	3	.431	.714	.544
	Within Groups	209.676	347	.604		
	Total	210.970	350			
Attitude	Between Groups	2.312	3	.771	1.410	.240
	Within Groups	189.655	347	.547		
	Total	191.967	350			
Practice	Between Groups	10.884	3	3.628	5.611	.001
	Within Groups	224.355	347	.647		
	Total	235.239	350			

Source: Survey (2023)

Table 4.17 ANOVA Contrast Coefficients

Contrast	Grade level			
	Nine	Ten	Eleven	Twelve
1	1	2	3	4

Source: Survey (2023)

Post Hoc Tests

A post-hoc analysis was conducted to test for pairwise comparisons and the result reveals that waste management practice of grade nine student was significantly different to the rest three grade levels (p=0.010) with better mean value 3.4678. This explains that educational level, specifically those with lower grade qualification has better practices towards solid waste management compared to those with higher education level (Table4.18)

Table 4.18 ANOVA result on solid waste management practice

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.884	3	3.628	5.611	.001
Within Groups	224.355	347	.647		
Total	235.239	350			

Source: Survey (2023)

Table 4.19 Duncan Mean Value of Four Levels Grade (post hoc test result)

Grade level	N	Subset for alpha = 0.05	
		1	2
Ten	88	3.0526	
Eleven	80	3.0531	
Twelve	82	3.1905	
Nine	101		3.4678
Sig.		.289	1.000

Source: Survey (2023)

4.9.3. Knowledge, Attitude and Practices of Respondents within Sex Categories

Findings show that the mean value of respondents' knowledge were 3.8983 and 4.1573, attitude 3.6900 and 3.8638 and practice 3.1558 and 3.2407 for male and female respectively. From the result female students could be said to have better knowledge, attitude and practice on waste management than their male counterpart. This is plausible when one considers the fact that in most households and schools in developing countries girls do most of the cleaning and sweeping activities at homes and school (Table 4.19).However, as indicated in (table 4.20) below, there is significant difference between the sex categories in terms of knowledge and attitude (Table 4.20).

Table 4.20 Knowledge, Attitude and Practices of Students within Sex Categories

Group Statistics

	Sex of Respondent	N	Mean	Std. Deviation	Std. Error Mean
Knowled	Male	150	3.8983	.76157	.06218
	Female	201	4.1573	.77068	.05436
Practice	Male	150	3.1558	.78457	.06406
	Female	201	3.2407	.84529	.05962
Attitude2	Male	150	3.6900	.73527	.06003
	Female	201	3.8638	.73763	.05203

Source: Survey (2023)

Table 4.21 Independent sample Test for Equality of variances

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Knowled	Equal variances assumed	.452	.502	-3.130	349	.002	-.25900	.08274	-.42173	-.09628

	Equal variances not assumed			-3.136	323.154	.002	-.25900	.08259	-.42149	-.09652
Practice	Equal variances assumed	1.194	.275	-.959	349	.338	-.08484	.08847	-.25883	.08916
	Equal variances not assumed			-.969	332.866	.333	-.08484	.08751	-.25699	.08731
Attitude2	Equal variances assumed	1.033	.310	-2.187	349	.029	-.17381	.07948	-.33013	-.01749
	Equal variances not assumed			-2.188	321.679	.029	-.17381	.07944	-.33010	-.01751

Source: Survey (2023)

However, result from independent sample test indicates that there is significant difference in waste practice between male and female respondents (Table 4.21).

4.10. Correlation between knowledge, attitude and practice (KAP)

Correlation measures relationships existing between indicators, and does not necessarily show causal connections. Pearson's correlation was used to analyze relationships between KAP of students as the value was measured in Likert scale. In addition to this, the sign of correlation coefficient determines whether the correlation is positive or negative. The magnitude of the correlation coefficient determines the degree of strength of the association. Though there is no

commonly accepted standard for range of Correlation coefficients. Tukey, (2014) stated coefficient of correlation standards as:

Weak correlation $0 < |r| < .30$

Moderate correlation. $30 < |r| < .70$

Strong correlation $|r| > .70$

In general, as indicated in the table (4.23) below there exist moderate positive correlation between the three variables with correlation coefficient ranging between0.290 to 0.480. Therefore, Pearson rank correlation test demonstrated a positive linear relationship between knowledge, attitude and practice scores although the strength of correlation was moderate.

Table 4.22 Correlation between knowledge, attitude and practice (KAP)

		Knowled	Attitude	Practice
Knowled	Pearson Correlation	1	.480**	.361**
	Sig. (2-tailed)		.000	.000
	N	351	351	351
Attitude	Pearson Correlation	.480**	1	.290**
	Sig. (2-tailed)	.000		.000
	N	351	351	351
Practice	Pearson Correlation	.361**	.290**	1
	Sig. (2-tailed)	.000	.000	
	N	351	351	351

Source: Survey (2023)

The association between knowledge and attitude suggests that most students value accurate information and use them to determine how they perceive about a particular issue. This result is significant as it would be helpful to recognize areas where information and education initiatives in future programs and policies can be improved. However, the knowledge and attitude level were not enough to persuade the desired change in the behavior of proper waste management practices among the respondents. In this study, we did not explore the reason why knowledge

and attitudes do not translated into practices, but this needs further investigation for future research.

4.11. Determinants of Knowledge, Attitude and Practices of students' involvement in the Solid Waste Management at Secondary Schools

A linear regression model was used to determine the factors of KAP of students' involvement in solid waste management activities. Before analyzing the data, the variance inflation factor (VIF) and the correlation were used to test for multi-colinearity among the continuous and explanatory variables. However, six explanatory variables were included in the analysis because none of them had a multi-collinearity problem. Three of the six independent variables were significant at p<=0.05 on Knowledge, Attitude and Practices of students' solid waste management activities after the explanatory factors were fitted to the model. Grade level, gender and rank in class were the factors considered. The remaining three variables, residential setting, distance from school and parents income were all insignificant.

Table 4.23 Determinant on knowledge of students' involvement on waste management

Variable	R	R Square	Adjusted R Square	Std Error	t	Sig
Sex	0.165	0.027	0.025	0.7668	3.13	0.02

Table 4.24 Determinant factor on attitude of students on waste management

Varible	R	R Square	Adjusted R Square	Std Error	t	Sig.
Ses	0.116	0.014	0.011	0.73662	2.187	0.029

Table 4.25 Determinant factors on waste management practice of students

Variable	R	R Square	Adjusted R Square	Std Error	t	Sig.
Rank in class	0.158	0.025	0.022	0.81071	2.985	0.003

Grade level	0.126	0.016	0.013	0.81447	2.37	0.0018

Source: Survey (2023)

Sex was a key explanatory variable that influences knowledge of the students on waste management. The R square result from the regressed value suggests that sex of respondents has contributed 2.7% effect on the involvement students in waste management of the school. Similarly, it has also influenced by 1.4 % on the attitude of students towards involvement in waste management (Table 4.24). Grade level and rank in class of students were determinant factors on solid waste management practice with 1.6% and 2.5 % respectively (Table 4.25).

4.12. Integration of waste management/environmental/ Issues in Textbooks

Analysis of the contents of Grades 9 to 12 biology and geography textbooks was made to investigate whether the cognitive and affective domains of learning stated in the policy document were also properly translated into teaching materials (textbooks) in order to make students aware and sensitize them on waste management and environmental issues in general. Accordingly, based on teachers guide and recommendation all Grades Biology and Geography textbooks were assessed to see whether the waste management objectives and contents were included and addressed sufficiently in the teaching materials. The results of the analysis of the objectives in the teaching materials of both grades showed that there is almost no solid waste management / environmentally-related objectives which are elaborated the text books. However, in grade nine Biology text book unit four few words and grade twelve Geography text units four "*population of Ethiopia and the Horn*' sub-unit "*Impacts of rapid population growth* 'few words mentioned related to solid waste. According to informal interview made with student respondents, they mostly claim that they obtained their knowledge from the media and different sources but never participated in waste management events organized by the school. Therefore, based on the results it was deduced that the textbooks need revision.

4.13. Discussions

The KAP survey is a rising popular method to assess community psychology and practices related to environmental issues (Oluwatobi et al 2022). In this study, the KAP survey was implemented through a cross-sectional research design, to capture the knowledge, attitude, and

practices of secondary school students, specifically on solid waste management and waste bin usage. Unsuitable solid waste management practices in schools make up one of the major factors leading to declining environmental health conditions. A proper waste management is needed to ensure the protection of the environment and human health. One major way of reducing the environmental impact of solid waste is through improvement of solid waste handling systems that is the use of separation bins which facilitates waste diversion and recovery opportunities, such as recycling with its many advantages. The transition to a circular economy represents a promising passage to sustainable development, which stems from the right knowledge, attitude, and practices of educational institutions, as they are regarded as the frontiers and carriers of knowledge that trickles down to the community at large. Their resourcefulness, inspiration, vigor, and vision are recognized to be highly imperative for a country's development. The management of solid waste is a socio-environmental concern with far-reaching consequences if mismanaged. Improper management of solid waste substance has its economical, ecological/environmental and health problems. This has required organizations and educational institutions to consider it as a very important issue. Therefore, special attention is required from educational institutions, especially secondary schools, in shaping students' attitudes and perceptions. Attitudes and perceptions inform students' environmental behavior, and as such, it is crucial to appraise the environmental awareness level of students in solid waste management in educational institutions. Various studies indicated that demographic characteristics of the household comprising sex, age, level of education, income and occupation are important variables to understand the KAP of SWM (Castagna et al, 2013 and Chu et al 2016).In this study, 60.11% of the respondents were from government school and 39.89% were from private school. Most of 57.3% were female students and 42.7% were male. Most respondents had an age group of 16 to 20 and parents' income of ten thousand and more Birr per month. From the study findings, results indicated that the schools produced paper wastes which was followed by food leftovers, plastics, wood leaves and pens and pencils which are either recyclable or biodegradable which can be changed in to plant nutrient(compost). The most popular methods of waste disposal known to the respondents were open dumping followed by dust/waste bins, municipal buckets, dump pits and composting waste. This had also ascertained during the school premises observation and the two surveyed schools follow similar practices of waste disposal.

Figure 4.4 Solid waste disposal sites of schools

Source: School Survey (2023)

4.13.1 Knowledge of Waste Management and usage of Waste Bin

A positive correlation between student's level of knowledge about issues related to environment and their attitude has been supported by various literatures (Oluwatobi, et al.2022, Evristo and Cando 2022). Now a day's environmental problems in general and mishandling of wastes in particular are among the leading causes for ill-health and impediments for national development. Improper waste management may have health and environmental hazards. Studies showed the relationship of many diseases to improper waste management. The finding of this study concerning the level of knowledge of participants was very high. They understood that using waste bins for waste disposal would be important in maintaining clean and safe school environment and respondents were also aware that solid wastes produced in their school are resources that could be reused. Awareness level of students on the dangers of improper refuse disposal on their health is an important factor in considering issues related to solid waste disposal and health. The students had also been sensitized on complications of improper waste management and knew environmental problems related to mismanagement of solid waste and harmfulness of garbage in their schools and they are also aware on the importance of following proper solid waste management to avoid possible health problems at the school. Recycling of waste which means taking waste materials and transforming them into new products, results in saving natural resources, saving energy, reducing disposal costs, reducing harmful emission to air and water, saving money and creating jobs and respondents are aware that recycling is made more efficient and easier with waste bins as waste bins facilitate at source waste separation (survey, 2023).

4.13.2 Attitude towards Waste Management and usage of Waste Bin

Attitude is a set of values and feelings acquired to motivate and contribute to environmental development and protection (Momoh and Oladebeye ,2010)According to Ahmad et al.(2015), "knowledge forms attitude, and both knowledge and attitude are the building blocks for practice." The same study describes that attitude is measured through students' awareness and beliefs. The way to measure attitudes is by focusing on a person's assessment of whether the participation in the data was positive or negative. Attitude is a critical element that influences SWM participation in schools and communities within developing countries. This is because positive attitudes toward SWM might increase the likelihood of involvement in waste management. From the study results attitude was a determinant of waste management and waste bin usage. This was supported by majority of the respondents believed that waste management is not dependent on parents' level of income and not related to one's level of grade and that solid waste management is their responsibility and not only that of the school support staff alone supported by the idea of Welsch and Kuhling (2010) that attitude towards solid waste management program were more likely to be stimulated by the respondents' experience and observation rather than their socio-demographic traits. The students also agreed that they were responsible for the generation of waste in their school and that they believed that they had a role in minimizing waste in their respective school. In addition, they agreed that they were responsible for reminding other students on proper waste disposal and that it was important for them to read and share information on waste management with other students and that it is important to volunteer in school and class cleaning activities. Most respondents agreed that they object throwing solid wastes around their school premises and classes and it was a must to throw the trash into its appropriate segregation bins in the school and classes and there should be different dust bins to separately put solid wastes this positive attitude

4.13.3 Waste Management and usage of Waste Bin Practices

It appears that the overall mean score relating to the general perceptions regarding students waste management practices cluster around the neutral point (3.20) on the five point Likert-scale with a large variation around the mean scores (standard deviation of 0.82) consistent with EE Smith (2020) who has studied on attitudes and practices of households toward Waste Management and

Recycling in Nelson Mandela Bay. It appears that respondents agree mostly with encouraging students to use waste bins, doing efforts to minimize solid waste generation obeying the rules stated by the school about disposal of solid waste management and usage of waste bins to dispose soft papers and other solid wastes in the school. However, as indicated in table(4.9)) majority of respondents preferred either neutral or disagreement on the last four likert sale questionnaire i.e. participation in the environmental club, involvement in the promotion of waste bin usage, practice of environmental culture including participation in green plants and participation in school's solid waste management campaigns. The result implies that students do not participate on practical activities in their school as Tikka et al (2010) stated in their study as majority of students in the sub-Saharan countries do not have the practical knowledge to empower the practice of correct waste management in their schools and, at home, to impact their family's knowledge due to the absence of practical knowledge from teachers to students. As a result, there existed gaps that lead to low standards in managing waste for sustainability in most developing countries. This is also supported by studies conducted by Babaei et al.(2015) and Yildiz et al. (2011) indicate that awareness and attitude toward SWM problems or environmental issues do not change naturally. The change in a positive attitude toward SWM or environmental issues can occur through practical education, change of perception, social responsibility, and incentives or motivation through students'/teachers' rewards. In addition from the result of observation in both two schools, there was no any waste bin provided for students to dispose of wastes in the school premises. Some students also put this remark on the questionnaire "*We don't have waste bins for our toilet paper leave alone for different wastes*". Lack of waste receptacles could contribute for the low result on waste management and waste bin usage practice of students.

Furthermore, mean result of the two surveyed schools indicates that there are no significant difference in knowledge, attitude and practices of students towards waste management and waste bin usage; this might be due to the fact that the two surveyed schools use similar text books to teach their students. In a comparison of students' KAP based on their grade level, analysis of variance (ANOVA) test results shows that there is a statistically significant difference between the mean levels of waste practice. Hence, Post hoc analysis reveals that waste management practice of grade nine was significantly different to the rest three grades ($p=0.010$). This explains that educational level, specifically those with lower grade qualification has better

practices towards solid waste management compared to those with higher education level. This is inconsistent with López-Mosquera et al. (2015) that stated those with higher educational level has higher attitude level because they were advantaged with information compared to those who did not attend undergraduate and postgraduate education. Yasmin(2020) advocated that it is common for those with lower education to exhibits better attitude towards waste management since they sometimes rely on waste recycling for extra income. Furthermore, in analysis conducted considering sex of respondents, the mean value of female respondents was found to be higher than their male counterpart. This is consistent with (Orume et al 2014) who found that women were significantly more likely than men to be concerned with environmental problems. Females have been consistently shown to have higher environmentally conscious attitudes than men. The common reason advanced for gender differences is the different socialization patterns between boys and girls (Orume et al 2014). More often than not, girls are made to carry out most of all the sweeping and cleaning activities; they are called upon more than their male counterparts to perform maintenance tasks at home or in schools.

Chapter Five

Conclusion and Recommendations

5.1 Conclusion

The study provides discussion about the level of students'' knowledge, attitudes, and practices on their school's solid waste management. The knowledge and attitudes of the students were all a very high and high and they cannot practice what they know due to the absence of a well-defined school solid waste management program, lack of extra-curricular activities and lack of appropriate waste management receptacles like waste bins. Teaching students on environmental sustainability is necessary for a healthy and stronger living environment. This is because children construct their own selfhood at a primary age. Given that sustainability learning in the primary parts of students' life, it is important to equip or build them with the kind of knowledge, attitudes, awareness, and skills to protect the socio-economic environments of both present and future generational leaders. Even though students know how to segregate, they still do not practice it. Awareness is important but it is not enough especially if there is no application. Teachers can employ different strategies to get the students interest to participate in the solid waste management program of the school. Frankly, knowledge may not easily be translated into practices.

The Education sector strategy of 1994, which calls on private sector investment in education, has enticed many investors in to the sector. These investments have certainly helped the government re-direct some of its scarce resources to other sectors, which otherwise would have been invested in the expansion of public schools. These private schools are also expected to producing competent, efficient, knowledgeable and innovative citizens. However, it is not without reason these expectations aroused, it is because of the large school fee parents are paying for their children. In this study one of the objectives were to see the knowledge, attitude and practices of students between government and private schools and the result indicated similar value on likert scale. This might be because of schools utilization of similar educational curriculum. In a similar comparison of mean score based on their grade level, the result indicated that lower educational level students were better in waste management practice of the school. In this case the researcher

believes that the more the students advance in their learning they will have better knowledge but detest waste management. In similar comparison with in gender category, the resulted showed that female students have better and this is plausible when one considers the fact that in most households and schools in developing countries girls do most of the cleaning and sweeping activities at homes and school .

In an analysis of the third objective gender was determinant factor of knowledge and attitude on involvement of students' on waste management activities in their school. Grade level and rank in class were found to be determinant factors on waste management practice. Educating the student about the importance of solid waste management and allowing them to participate in the planning and implementation can help ensure the success of the program. This study is only limited to investigating the respondents' KAP level among a group of respondents that has similar socio-demographic elements. KAP studies should be supplemented with studies that would substantiate their findings and explore other behavioral aspects such as the dynamics affecting students' actions. While knowledge and attitude may have contributed to practice, it has been proven that assuming that knowledge alone leads to practice is incorrect. Variables in the Theory of Reasoned Action such as the behavioral norms that existed in the community should also be part of future KAP studies.

5.2 Recommendations

Based on the findings of the study, the researcher is hereby proposing a more defined and focused SWM Program for the schools. The stakeholders and building of positive attitudes and awareness leading to proper practice of SWM must be highly considered to make a lasting and sustainable program. The following recommendations are hereby proposed:

1. Based on the respondents and observation, there were no waste bins in the school premises. Besides this, the students did not take any training regarding the effects of solid wastes on the environment as well as on human life. Therefore, the researcher recommends that the school should establish sufficient and appropriate trash bins in the schools and establish environmental culture programs.

2. Waste reduction should be encouraged so as to reduce the overall volume of waste generated.. For example, Papers should be reused so as to save resources and investment on the purchase of

new materials. Organic waste materials, such as food leftovers, animal dung and vegetable wastes should be utilized for bioenergy generation, through anaerobic digestion, and organic fertilizer production through composting.

3. Through an intensive awareness program, the students can be sensitized and educated on the best practices to adopt so as to ensure that everyone is carried along in issues concerning Solid waste management. This can be achieved through mini media programs, eco- club, and peer group etc. The school authority should also provide training for its staff and students on various waste management programs so that they can become custodians of the environment. Once the good waste management practices are institutionalized, it will definitely trickle down to the society.

4. Integration of Environmental education in the curriculum that provide opportunities for students and teachers to engage in actions and behavior that impact positively towards achieving a more sustainable school environment.

References

Abayneh M. M, (2020) Assessment of School Water, sanitation and Hygiene status in Addis Ababa, Ethiopia. Ethiopian Institute of Water Resources (Thesis)

Abera H. T, (2018) Integration of Environmental Education into Ethiopian Primary School Curricula with Particular emphasis on Jimma Zone of Oromia Region

Adane S.M,Teferi A, and Dereje H. (2015) Solid Waste Generation Rate and Characterization Study for ten towns in Ethiopia.

Adeolu A.T, Enesi D.O and Adeolu M.O (2014). Assessment of Secondary School Students' Knowledge, Attitude and Practice towards Waste Management in Ibadan, Oyo State, Nigeria.

Adogu, P., Uwakwe,K., Egenti, K., Okwuoha, A. and Nkwocha, I. (2015). Assessment of Waste Management Practices among Residents of Owerri Municipal Imo State Nigeria.

Agut, M.P.M.; Ull, M.A.; Minguet, P.A.(2014) Education for sustainable development in early childhood education in Spain. Evolution, trends and proposals.

Ahmad, J.; Noor, S.M.; Ismail, N.(2015) Investigating students' environmental knowledge, attitude, practice and communication. Asian Soc. Sci.

Ajzen, I. (1991).The theory of planned behavior. Organizational Behavior and Human Decision Processes

Akbar A. B, Nadali A, Gholamreza G, Pari T and Kambiz A,(2015)Household recycling knowledge, attitudes and practices towards solid waste management.

Alemayehu G. (2005) Explaining African Growth Performance; The case of Ethiopia

Alfredo P. Nabor Jr. Ruth A. Ortega-Dela C, (2022) Pupils' Awareness, Knowledge, Attitude and Practice of School-Based Solid Waste Management in a Public Elementary School in the Philippine

Ali M. and Eyasu E. (2017) Domestic Solid Waste Management and Its Environmental Impacts

in Addis Ababa City. Journal of Environment and Waste management

Alula S. B,Dereje E M,Terefe M L, Abinet A S, and Bazie M, (2018) Knowledge, Attitude and Practices on hand washing and associated factors among public primary schools children in Hosanna Town, Southern Ethiopia.

Antigegn G. (2021)Asssessing the Challenges of Urban solid Waste Collectors Performance in Four Selected sub-cities of Addis Ababa: Ethiopia

Ashani.,P.N, Shafiel.M, Karimi.K (2020) Biobutanol production from Municipal solid waste:Technical and Economic Analysis.

Atkinson.A, Davila.J.D,Mattingly.M, (2019) The challenge of Environmental Management in Urban Areas.Routledge

Auwalu R A, Azizah E and Rahimah E, (2017) Investigating the Environmental Awareness Level of Secondary School Students: Effects of Race, School Type, and Location **.**

Babaei, A.A.; Alavi, N.; Goudarzi, G.; Teymouri, P.; Ahmadi, K.; Rafiee, M.(2015) Household recycling knowledge, attitudes and practices towards solid waste management. Resour. Conserv.

Bezama.A, and Agamuthu.P (2019) Addressing the big issues in Waste Management

Botetzagias, I., Dima, A. & Malesios, C. (2015).Extending the Theory of Planned Behavior in the context of recycling: The role of moral norms and of demographic predictors. Resources, Conservation and Recycling,

Chen.Y.C (2018) Effects of Urbanization on Municipal Solid Waste Composition

Chinasho, A. (2015) Review on Community Based Municipal Solid Waste Management and Its Implication for Climate Change Mitigation. American Journal of Scientific and Industrial Research,

Chuanhui L. and Hui L, (2019) Environmental Education, Knowledge, and High School Students' Intention toward Separation of Solid Waste on Campus

Claudette. C, (2013). The Benefits of Participating in Extracurricular Activities

Colmore C, Santosh K. O, (2016) The Perspectives and Experiences of High School Students

towards theEnvironment –The Case of North Alabama

Creswell, J. W., & Plano Clark, V. L., (2017). Designing and conducting mixed methods research. Sage Publications

Deress T, Mohabaw J , Mekonnen G, and Kasaw A,(2019) Knowledge, attitude, and practice of waste handlers about medical waste management in Debre Markos town healthcare facilities, northwest Ethiopia

Diaz-siefer P.,Alexandro N,Juan L.Celis-Diaz,E. S and Siegmar O, (2015) Human- Environment system knowledge: A correlate of pro-environmental behavior.

Diriba D. B and Xiang-zhou M, (2021) Redesign Solid Waste Collection and Transference System for Addis Ababa (Ethiopia)Based on the Comparison with Shanghai, China

Dolamo, B. and Desalegn, T. (2016) Public Awareness of Existing Environmental Health Regulations and Their Application in Urban and Peri-Urban of Addis Ababa, Ethiopia. Africa Journal of Nursing and Midwifery

Dorina K. K, (2015) Knowledge, Attitudes and Behaviour regarding Waste Management in a Grammar and a Comprehensive School in England

Eroglu, S. (2016) High School Students' Perceptions toward Environmental issues: a Phenomological Study

Eshete H, Desalegn A, Tigu F (2023) Knowledge, attitudes and practices on household solid waste management and associated factors in Gelemso town, Ethiopia

Eshetu G, (2021) Municipal Solid Waste Management Practices for Achieving Green Architecture Concepts in Addis Ababa, Ethiopia .

Essayah A. Musbah S, Shadi K. M and Akalpita T, (2019) Community attitude, perception and willingness towards solid waste management in malaysia, case study

Evaristo N. T.and Cando III (2022) Knowledge, Attitude and Practices on Solid Waste Management Among Households in the Urban Communities of Butuan City,

Philippines. Journal of Environmental Science and Management

Feleke A, (2015) Solid Waste Management InDurame Town: Practice and Challenges.

Ferede A ,Fikiru G and Tefera J, (2019) Assessment of Community Perception on Solid Waste Management Practice in Bedele Town, Oromia Region, Ethiopia

Fesseha H, (2016) Knowledge, attitude and practice of Bahir Dar University Undergraduate Students towards Environmental issues.

Fesseha, S.N. and Bin, F. (2015) The Assessment of Solid Waste Products Manage ment in Ethiopians Municipal Urban Areas. International Journal of Social Sciences and Management,

Filippos Z , Iro V , Eleni T , Sotirios B,(2020) Exploring the Attitudes of Secondary Education Students on Environmental Education in Relation to their Perceptions on Environmental Problems: The Case of the Prefecture of Viotia.

Francis,J. J., Eccle, M. P., Johnston, M., Walker, A., Grimshaw, J., Foy, R., Bonetti, D. (2004). Constructing questionnaire based on the theory of planned behaviour: A manual for health services researchers. Newcastle upon Tyne: Centre for Health Services Research, University of Newcastle.

Fredricks, J. A., & Eccles, J. S. (2008). Participation in extracurricular activities in the middle school years: Are there developmental benefits for African American and European American youth? Journal of Youth and Adolescence,

Getachew A. and Associates ( ) A Guide to School WASH Facilities Management in Ethiopia draft final:Federal Democratic Republic Ethiopia, Ministry of Education (MoE)

Getinet Z, (2016) Solid Waste Management Practice and Factors Influencing its Effectiveness: The Case of Selected Private Waste Collecting Companies in Addis Ababa St. Mary's University

Gonul K, C.; Pourreza, S.; Tran, H.; Prybutok, V.R. (2016)Determinants and logistics of e-waste recycling. Int. J. Logist. Manag.

Gratiela D. B,and Sinan S, (2019)Environmental Education and Student's Perception, for

Sustainability , Turkey

Hayal D. (2022)An overview of solid waste management systems in the city administration of Addis Ababa: past to present

Hongting Maa,b, Yang C, Xinyu L, Zequn D,Weiye Z, (2015)Review of Typical Municipal Solid Waste Disposal Status and Energy Technology

Hoque, M.; Alam, M. (2018) What Determines the Purchase Intention of Liquid Milk during a Food Security Crisis? The Role of Perceived Trust, Knowledge, and Risk. Sustainability

Ifegbesan, A. (2010). Exploring Secondary School Pupils' Understanding and Practices of Waste Management in Ogun State, Nigeria. International Journal of Environmental and Science Education

Kabito G ,Henok. D ,Mulat G/H,(2021) Knowledge, Attitudes, Practices, and Determinants Towards Wastewater Management in Northwest Ethiopia: A Community-Based Cross-Sectional Study

Kassahun T.(2018) Assessment of Solid Waste Management Practices in Bahir Dar City Ethiopia

Kendra C. (2023) Overview of Attitude

Knifesend, C. A., and Graham, S. (2012). Too much of a good thing? How breadth of extracurricular participation relates to school-related affect and academic outcomes during adolescence. Journal of Youth and Adolescence

Kofi,J. D ,Diogo G. V, and Maria A. P. D. (2021)Raising Awareness on Solid Waste Management through Formal Education for Sustainability: A Developing Countries Evidence Review

Kumar M. P, Preetam. V , Mansi. G, (2015) The Role of Attitude in Environmental Awareness of Under Graduate, India

Lioyd,J.S (2019) Expanding safe waste management to public health systems.Lancet 393(10168)

Liu L. (2018) Design and Development of Road Dustbins Based on Urban Functional Areas

Liu, P.; Teng, M.; Han, C., (2020). How does environmental knowledge translate into pro-

environmental behaviors? The mediating role of environmental attitudes and behavioral intentions. Sci. Total Environ.,

Mahmud, S. N., & Osman, K. (2010). The determinants of recycling intention behavior among the Malaysian school students: an application of theory of planned behavior. Procedia - Social and Behavioral Sciences,

Meaza C. (2016) Solid Waste Management in Addis Ababa: A new approach to improving the waste management system

Mekonnen H. Z. , Amanuel G. W, Terje S. (2022) Empowering rural society through non-formal environmental education: An empirical study of environment and forest development community projects in Ethiopia

Merkeb, D, H. (2021) Comparative Analysis of Water, Sanitation, and Hygiene (wash) Situation among Public and Private Schools in Kirkos Sub City, Addis Ababa Ethiopia.

Metsapelto, R. L., & Pulkkinen, L. (2012). Socioemotional behavior and school achievement in relation to extracurricular activity participation in middle childhood. Scandinavian Journal of Educational Research,

Mohammed S. A. (2017) Environmental Knowledge, Attitude and Awareness of Farmers in Chencha Woreda, Gamo Gofa Zone, South Ethiopia

Momoh,J.J. and Oladebeye,D.H.(2010) Assessment of Awareness of Attitude and Willingness of People to Participate in Household Solid Waste Management

Nazak A. Kamyar Y. , Mohammad H. D. , Amir H. M , Reza B.(2019) Households' behavior and social-environmental aspects of using bag dustbin for waste recovery in Tehran

Odonkor.S.T,Frimpong.K, Kurantin.N,(2020) An Assessment of House hold Solid Waste Management in a large Ghanaian District.

Oluwatobi M. O, Ratshalingwa M. and Johua N. E,(2022) Student's Knowledge, Attitude and Perception (KAP) to Solid Waste Management: A Survey towards a More Circular Economy from a Rural-Based Tertiary Institution in South Africa.

Pacey A (1990). “Hygiene and Literacy”, in Kerr, C(ed), Community Health and Sanitation, Intermediate Technology Publications, Nigeria

Piyapong J. and Samattaphong K, (2019) Roles of Environmental System Knowledge in Promoting University Students’ Environmental Attitudes and Pro-Environmental Behaviors

Rajamanikam R, Gopalsamy P , Sunil K,(2019) Assessment of solid waste generation and management in selected school campuses in puducherry region, India.

Seng B. Takeshi F, and Vin S, (2018)Households’ knowledge, attitudes, and practices toward solid waste management in suburbs of Phnom Penh, Cambodia

Singh K. K, (2017) Awareness and Attitude of school students towards environment, Department of Education, Himachal Pradesh University, Shimla

Smith EE. (2020) Attitudes and Practices of Households toward Waste Management and Recycling in Nelson Mandela Bay.

Solgi,.E, Sheikhzadeh.H,, Solgi.M(2018) Role of Irrigation Water, Inorganic and Organic fertilizers in Soil and Crop contamination by potential hazardous elements in intense farming systems. Case study from Moghan Agro industry,Iran.

Sudipta B. M. Makiko S. Takashi. M and Bharati .C,(2016) Resident Knowledge and Willingness to Engage in Waste Management in Delhi, India

Suleman Y. Eva T. D and Williams A-Duah (2015) Solid Waste Disposal and Community Health Implications in Ghana: Evidence from Sawaba, Asokore Mampong Municipal Assembly

SWASH (2017) National School Water, Sanitation and Hygiene) Implementation Guideline

Thu Thao P H and, Takaaki K, (2016) Measuring the effect of environmental education for sustainable development at elementary schools: A case study in Da Nang city, Vietnam.

Tikka, P.M.; Kuitumen, M.T.; Tynys, S.M (2010) Effect of Educational Background on students’ attitudes, activity levels and knowledge concerning the Environment. J. Environ. Educ.

Umer, N.; Shimelis, G.; Ahmed, M.; Sema, T. (2019) Solid Waste Generation Rate and

Management Practices in the Case of Chiro Town, West Hararghe Zone, Ethiopia.

UNEP (2018). Africa Waste Management Summary for Decision-Makers.

UN-HABITAT (2017). The state of Addis Ababa 2017: The Addis Ababa we want

USEPA (2020) Best Practices for Solid Waste Management: A Guide for Decision–Makers in Developing Countries

Vandamme, E. (2009) Concepts and Challenges in the Use of Knowledge-Attitude-Practice Surveys: Literature Review; Department of Animal Health, Institute of Tropical Medicine: Antwerp, Belgium,

Varah, F., Mahongnao, M., Francis, D.J., & Shimrah T., (2020), Measuring environmental attitudes and behaviors: a study of undergraduate students in Delhi. Nat Hazards

Welsch, H., & Kuhling, J. (2010). Pro-environmental behavior and rational consumer choice: Evidence from surveys of life satisfaction. Journal of Economic Psychology

Wilson, D.C.; Velis, C.A (2015). Waste management—Still a global challenge in the 21st century: An evidence-based call for action. Waste Management

World Bank (2019) Solid Waste Management. The World Bank Group.

World Bank (2018) What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050.

Sandra, V.N.; Weghmann, V.(2019) Municipal Solid Waste Management Services in Africa.

Yasmin S. B. Mohammad T. M, (2021) Public opinion, Perception and Knowledge, Attitude and Practice (KAP) level on Solid Waste Management programs in Penampang, Sabah: a Village-level Study

Yasmin S. B, Mohammad T. bin M, (2020) Village-Level Knowledge, Attitude, and Practice (KAP) on Solid Waste Management in Penampang, Sabah

Yusup F. (2015) Factors Influencing Senior High School Students' Environmental Knowledge

Zakaria A T , Mounia El F , and Mehdi El M, (2021)The environmental knowledge and pro-environmental behavior of future engineers in Morocco .

Zheng, H., Kou, K.P. and Ge, Y. (2017) Environmental Risk Assessment of the Municipal Solid Waste in a City-State: A Case Study of Macao. Human and Ecological Risk Assessment:

Zuberi,M.J.S and Ali S.F (2015) Green House Effect Reduction by Recovering Energy from Waste landfills in Pakistan.Renewable and Sustainable Energy Reviews.

Annexes

Addis Ababa University

College of Development Studies

Center for Environment and Development Studies

SURVEY QUESTIONNAIRE

This study is designed to assess Knowledge, Attitude and Practices on Waste Bin Usage and Waste Management among Secondary School Students in Akaki kality sub-city, Addis Ababa. Your school has been selected for this study. I am conducting it as a partial requirement for MA studies in Environment and Sustainable Development at the college of Development studies under the supervision of Dr **Tesfaye Zeleke.**

The information from this survey will be used only for my MA research purposes alone. . Hence, your responses to the questions will be kept confidential and will not be used for any other purposes. Please answer the following questions as truthfully as possible.

Kindly note that this is NOT A TEST and there is no right or wrong answers. Your participation in this project is highly appreciated. The survey will only take 25 to 30 minutes alone.

Are you willing to participate? : Yes [ ] No [ ]

Specific Objectives

1. To assess the knowledge, attitude and practices of students in waste management practices and waste bin usage

2. To compare students' knowledge, attitude and practice of waste management based on school type, grade level and gender of secondary schools

3. To analyze the determinants of the **Knowledge, Attitude and Practices** of students' involvement in the solid waste management at secondary schools

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Section A: Respondents' Characteristics

1	Name of school	1=Gelan sec.school 2=EthioNational sec.school
2	Grade level	1=9 2=10 3=11 4=12
3	Sex	1= Male 2=Female
4	Rank in a class	1=1-10 2=11-20 3=21-30 4= >31
5	Experiences to participate in extra-curricular activities in the school	1=Yes 2=No
6	Residential setting	1=Rural 2=Urban
7	Distance from the school in munities/hours	1=5-10min 2=11-20min 3= 21-40min 4=41min and above
8	Parents level of education	1=Reading &writing 2= 1-12 3=Diploma 4=Degree 5=Masters and above

Section B: Types of Waste Produced

Please mark (x) in the box which best describes the level of amount of waste found in your school. Rate your response on a scale of 1 to 5; amount

(1= Very Low Amount; 2= Low Amount; 3= Neutral; 4= High Amount; 5= Very High Amount)

Categories of solid waste mostly produced by a student at schools	1	2	3	4	5
Food waste					
Paper waste					
Wood waste, leaves etc					
Plastics					
Pens and pencils					
Pieces of Clothes					
Others					

Please indicate how much KG, do you generate per day at school in your opinion

1= Less than 1 Kg

2= About 1 Kg

3= 1 to 2 KG

4= 3 Kg

5= Greater than 3 Kg

Section C: Methods for Solid Waste Disposal

Among the below methods of solid waste disposal, which methods do you use to dispose of it- please tick all that you use?

- Composting waste [ ]
- Open burning of dry waste [ ]
- Incineration [ ]
- Dust/waste bins [ ]
- Dump pits [ ]
- Municipal buckets/container [ ]
- Recycling [ ]
- Don't know [ ]
- Others; [ ]

If „Others" Please specify

……

……..

Section D: Attitude towards solid waste management

Are you worried about how solid waste is handled around your school premises?

Yes [ ] No [ ]

Please mark (x) in the box which best describes the extent to which you believe and agree with each of the following statements.

Rate your response on a scale of 1 to 5;

(1= Strongly Disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly Agree)

Statements on Attitude	1	2	3	4	5
I believe students solid waste management is dependent on parents' income					
I believe solid waste management is my responsibility					

and not only that of the school support staff alone					
I believe solid waste management is the duty of genitors at school					
I believe every student in the school is responsible for solid waste management					
I do not object throwing solid wastes around my school premises and classes					
I'm responsible for reminding other students on proper waste bin use at school (pick and dispose in the waste bin)					
I believe it is important to read and share information on solid waste management with other students					
I believe that it is important to volunteer in school and class cleaning activities					
I believe that solid waste disposal is not related to one's level of grade					
I believe that it is a must to throw the trash into its appropriate segregation bins in the school and classes					
I believe there should be different dust bins to separately put solid wastes in the school					

Section E: Knowledge on solid waste Management

Are solid wastes produced in the school are resources to be reused?

Yes [ ] No [ ]

Is there any awareness programs conducted on solid waste management in your school?

Yes [ ] No [ ]

Do you have topics in your curriculum on solid waste management in your grade?

Yes [ ] No [ ]

Please mark (x) in the box which best describes the extent to which you believe and agree with each of the following statements.

Rate your response on a scale of 1 to 5;

(1= Strongly Disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly Agree)

Knowledge Statement	1	2	3	4	5
I know waste bins are used to maintain a safe school environment					

I know waste bins are used to maintain a clean school environment					
I know the complications of improper solid waste management at schools					
I know about environmental problems related to mismanagement of solid waste in schools					
I know recycling is made more efficient and easier with waste bins					
I know that garbage is harmful to the school environment.					
I am aware that it is important to follow proper solid waste management to avoid possible health problems at the school					
I know there are solid waste management programs in the school					

Section F: Solid waste Management Practices

This subsection is concerned with assessing practices and its relationship with waste management

Are there rules for not dumping solid wastes anywhere in the school but in designated waste bins?

Yes [ ] No [ ]

Is there a club in your school dealing with solid waste management?

Yes [ ] No [ ]

Are you a member of the environments club at your school?

Yes No

Do you remind other students to collect waste in class in case they drop it?

Yes [ ] No [ ]

Please mark (x) in the box which best describes the extent to which you agree with each of the following statements.

Rate your response on a scale of 1 to 5;

(1= Strongly Disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly Agree)

Practice statements	1	2	3	4	5
I highly encourage students to use waste bins in the school					
I made efforts to minimize solid waste generation at school					
I obeyed the rules stated by the school about disposal of solid					

waste management					
I always use waste bins to dispose soft papers and other solid wastes					
I participate in the environmental club of my school					
I involved in the promoting of waste bin usage in the school					
I practice environmental culture in my daily life at school including participation in green plants					
I am always participating in our school's solid waste management campaigns					

INTERVIEW CHECK LISTS

Thank you for your cooperation

1. How do you evaluate students' participation on solid waste management program?
2. Do you have periodic waste management and pollution control campaign in your school?
3. Do you have programs to participate your students on extra-curricular activities in your school?
4. Can you please describe the responsible body/bodies/ involved in solid waste management in your school?
5. Do you have any kind of /regular, irregular or curriculum based/awareness creation program about solid waste management and pollution control?

   IF yes, enumerate few of them?
6. What method(s)of waste disposal do you use in your school?
7. Do you use waste bins for waste handling and disposing? If yes, how is the provision of waste bins for different categories of wastes?
8. Do you do waste segregation while collecting and disposing solid wastes? Or indiscriminately disposed of?
9. What type(s) of clubs do you have for your students in your school?
10. Do you have students –community outreach programs concerning waste management and environmental control in your school

አዲስ አበባ ዩኒቨርሲቲ

አገር ልማት ጥናት ኮሌጅ

አካባቢ ልማት ጥናት ማእከል

<u>በጠይቅ</u>

ይህ ጥናት በአዲስ አበባ አቃቂ ቃሊቲ ክ/ከተማ ባሉ ት/ቤቶች ተማሪዎች የደረቅ ቆሻሻ አያያና አወጋገድ እውቀት፤ጠባይ እና ልምምድ(ድርጊት) ግምገማ ላይ የተመሠረተ ሲሆን ለዚህም የእናንተ ት/ቤት ለናሙና ተመርጣል ፣ይህን ጥናት ለመመረቂያ ጥናት በዶ/ር ተስፋዮ ዘለቀ ክትትል ስር የሚከናወን ይሆናል። ስለዚህ የሚሰበሰቡት መረጃዎች ለዚሁ ጥናት ብቻ የሚያገለግሉ መሆኑን አሣውቃለሁ። ይህ መጠይቅ ፈተና አይደለም በመሆኑም ትክክልም ሆነ ስህተት መልስም የለውም። ስለዚህ የእርስዎ ተሣትፎ በእጅጉ ይፈለጋል። መጠይቁን ለመመላት ከ25-30 ደቂቃ ብቻ ይወስዳል.

ፍቃደኛ ነዎት፤ አዎ------- አይደለሁም----------

ክፍል1.የ ተሚዎች የ ግል ሁኔ ታ

1	የት/ቤቱ ስም	ሀ. ገላን ሁ/ደ/ት/ቤት ለ.ኢትዮ ብሔራዊ ሁ/ደ/ት/ቤት
2	ክፍል	ሀ. 9 ለ, 10 ሐ., 11 መ, 12
3	ፆታ	ሀ.ወንድ ለ.ሴት
4	ደረጃ	ሀ.1-10 ለ.=11-20 ሐ=21-30 መ= >31
5	በትርፍ ጊዜ በተለያዩ እንቅስቃሴዎች ላይ የመሳተፍ ልምምድ	ሀ.አለ ለ.የለም
6	መኖሪያ ስፍራ	ሀ.ገጠር ለ.ከተማ
7	መኖሪያ ርቀት ከት/ቤት	ሀ=5-10ደቂቃ ለ=11-20ደቂቃ ሐ= 21-40ደቂቃ መ=41ደቂቃ እና በላይ
8	የአባት ትምህርት ደረጃ	ሀ.ማንበንና መጻፍ ለ.1-12 ሐ.ዲፕሎማ መ.ዲግሪ ሠ.ማስተርስና ከዚያ በላይ
9	የእናት ትምህርት ደረጃ	ሀ.ማንበንና መጻፍ ለ.1-12 ሐ.ዲፕሎማ መ.ዲግሪ ሠ.ማስተርስና ከዚያ በላይ

ክፍል 2.የቆሻሻ አይነት

እባክዎ በት/ቤታችሁ የሚፈጠረውን የደረቅ ቆሻሻ አይነት ከ1–5 በተቀመጡ ቁጥሮች ግርጌ ግምትዎን ያስቀምጡ

1.በጣም ዝቅተኛ መጠን 2.ዝቅተኛ 3. አላውቅም 4.ከፍተኛ መጠን 5.በጣም ከፍተኛ መጠን

በተማሪዎች የሚፈጠር የቆሻሻ አይነት በደረጃ	1	2	3	4	5
የምግብ ትራፊ					
የወረቀት ቆሻሻ					
እንጨት ፡ቅጠላቅጠል ወዘተ					
ላስቲክ					
እስኪቢርቶና አእርሳስ					
ቁርጥራጭ ጨርቅ					
ሌሎች					

በግምት በቀን ምን ያህል ደረቅ ቆሻሻ ት/ቤታችሁ ግቢ ይኖራል/ይፈጠራል ብለህ ታምናለህ

1.ከአንድ ኪሎ በታች 2.አንድ ኪሎ ገደማ 3.ከአንድ እስከ ሁለት ኪሎ 4.ሶስት ኪሎ 5.ከሶስት ኪሎ በላይ

ክፍል 3. የደረቅ ቆሻሻ አያያዝና አወጋገድ ዘዴ

በት/ቤቱ በየትኛው የደረቅ ቆሻሻ አወጋገድ ዘዴዎች ትሳተፋለህ/ሽ/

1. አበስብሶ ለማዳበሪያ መጠቀም ( )

2. ሜዳ ላይ.ማቃጠል ( )

3. በማቃጠያ ማቃጠል ( )

4. ቆሻሻ መጣያ/ማጠራቀሚያ/መጠቀም ( )

5. በጉድጋድ መቅበር ( )

6. የመዘጋጃ ማጠራቀሚያ መክተት ( )

7.መልሶ መጠቀም ( )

8. አላውቅም ( )

9. ሌላ ( )

ሌላ ካለ ይገለፅ----------

ክፍል 4.የደረቅ ቆሻሻ አያያዝና አወጋገድ ጠባይ

1.በት/ቤትህ የተማሪዎች ደረቅ ቆሻሻ አያያዝና አወጋገድ አሳስቦህ ያውቃል

ሀ.አዎ ለ.አያውቅም

እባክዎ በሚስማሙበት ልክ ከተቀመጡት አማራጮች በቁጥሮቹ ግርጌ ባለው ሣጥን ውስጥ(x)ያድርጉ

1.በሀይል አልስማማም 2.አልስማማም 3.ገለልተኛ 4.አስማማለሁ 5.በሀይል እስማማለሁ

የደረቅ ቆሻሻ አያያዝና አወጋገድ ጠባይ	1	2	3	4	5
እኔ የተማሪዎች ቆሻሻ አያያዝና አወጋገድ በቤተሰብ ገቢ ላይ የተመረኮዘ ነው ብዬ አምናለሁ					
እኔ ት/ቤቴን ማፅዳት የእኔ ኃላፊነት እንደሆነና የት/ቤቱ አጋጆ አባላት ብቻ አይደለም ብዬ አምናለሁ					
ት/ቤቴን ማፅዳት የፅዳት ሰራተኞች ግዴታ ነው ብዬ አመናለሁ					
ማንኛውም ተማሪ የት/ቤቱን ፅዳት መጠበቅ አለበት ብዬ አምናለሁ					
ቆሻሻ በክፍል ውስጥም ሆነ ት/ቤት ግቢ ውስጥ እንደተፈለገ ቢጣል ምንም አይመስለኝም/አልቃወምም/					
ተማሪዎች ቆሻሻ እንዳያዝረከርኩና በተገቢው ቆሻሻ መጣያ እንዲጥሉ የማሳወቅ/መንገር/ ኃላፊነት አለብኝ					
ስለቆሻሻ አያያዝና አወጋገድ ዘዴ ማንበብና የተረዳሁትን ለጋደኞቼ ማስረዳት አለብኝ ብዬ አምናለሁ					
በት/ቤት ገቢና ክፍል ፅዳት ለመሳተፍ አለብኝ ብዬ አምናለሁ					
የደረቅ ቆሻሻ አወጋገድ ስርአት በክፍል ደረጃ ይወሰናል ብዬ አላምንም					
ደረቅ ቆሻሻን በአይነት ለይቶ በተገቢው ማጠራቀሚያ መጣል ኃላፊነት አለብኝ ብዬ አምናለሁ					
በት/ቤታችን የተለያየ የቆሻሻ ማጠራቀሚያዎች መኖር አለበት ብዬ አምናለሁ					

ክፍል 5.ደረቅ ቆሻሻ አያያዝና አወጋገድ እውቀት

1. በት/ቤትህ እየተፈጠ ያለውን ደረቅ ቆሻሻ ወደ ሃብት/ገንዘብ/ መቀየር ይቻላል
   ሀ.አዎ ለ.አይቻልም
2. በት/ቤታችሁ ስለ ደረቅ ቆሻሻ አያያዝና አወጋገድ የተሰጠ ትምህርት/ግንዛቤ ማስጨበጫ /አለ.
   ሀ.አዎ ለ.የለም
3. በክፍል ስርዓተ ትምህርት ስለደረቅ ቆሻሻ አያያዝና አወጋገድ ግንዛቤ የሚሰጥ የትምህርት ክፍል/ርዕስ/አለ
   እዎ የለም

እባክዎ የሚስማሙበትን ልክ ከተቀመጡት አማራጮች በቁጥሮቹ ግርጌ ባለው ሣጥን ውስጥ(x)ያድርጉ

ለመጠይቁ የሚገባውን ከ1-5 ባለው በሚስማሙት ልክ ይሙሉ

1.በሀይል አልስማማም 2.አልስማማም 3.ገለልተኛ 4.አስማማለሁ 5.በሀይል እስማማለሁ

ደረቅ ቆሻሻ አያያዝና አወጋገድ እውቀት መጠይቅ	1	2	3	4	5
ደረቅ ቆሻሻ መጣያ መተቀም ት/ቤታችን ግቢ ለጤና ምቹ እንዲሆን እንደሚያደርግ አውቃለሁ					
ደረቅ ቆሻሻ መጣያ መጠቀም ት/ቤታችን ግቢ ንፁህ እንዲሆን እንደሚረዳ አውቃለሁ					
በት/ቤታችን ደረቅ ቆሻሻን በአግባቡ አለመያዝና አለማስወገድ የሚያስከትለውን መዘዝ ጠንቅቄ አውቃለሁ					
የቆሻሻ አያያዝ ችግር በአካባቢያችን ላይ የሚያስከትለውን ችግር አውቃለሁ					
ደረቅ ቆሻሻን ለይቶ በአይነት ማስቀመጥ መልሶ ለመጠቀም እንደሚረዳ አውቃለሁ					
አለአግባብ የተጣለ ቆሻሻ ለት/ቤት ግቢያችን ጠንቅ እንደሆነ አውቃለሁ					
ሊከሰት የሚችለውን የጤና ችግር ለመከላከል ትክክለኛ የደረቅ ቆሻሻ አያያዝና አወጋገድ ስርአት መከተል እንደሚገባ አውቃለሁ					
በት/ቤታችን የደረቅቆሻሻ አያያዝና አወጋገድ ችግር እንዳለ አውቃለሁ					

ክፍል 6. የደረቅ ቆሻሻ አያያዝ ና አወጋገድ ልምምድ

1.በት/ቤታችሁ ደረቅ ቆሻሻ በማጠራቀሚያ ብቻ እንዲጣል የሚያስገድድ መመሪያ አለ

ሀ.አዎ ለ.የለም

2.በት/ቤታችሁ ስለደረቅ ቆሻሻ አያያዝ ና አወጋገድ የሚያስተምር ክለብ አለ

ሀ.አለ ለ.የለም

3.አንተ የት/ቤቱ የአካባቢ ትበቃ ክበብ አባል ነህ

ሀ.አዎ ለ.አይደለሁም

4.በት/ቤት ግቢ ተማሪዎች ቆሻሻ አንዳያዝረከርኩ ትነግራቸዋለህ/አንሱ ትላቸዋለሁ/

ሀ.አዎ ለ.አልላቸውም

እባክዎ የሚስማሙበትን ልክ ከተቀመጡት አማራጮች በቁጥሮቹ ግርጌ ባለው ሣጥን ውስጥ(x)ያድርጉ

(1.በሀይል አልስማማም 2.አልስማማም 3.ገለልተኛ 4.አስማማለሁ 5.በሀይል እስማማለሁ)

የደረቅ ቆሻሻ አያያዝ ና አወጋገድ ልምምድ	1	2	3	4	5
እኔ ተማሪዎች ደረቅ ቆሻሻ መጣያ እንዲጠቀሙ አበረታታቸዋለሁ					
እኔ በት/ቤት ግቢ በተቻለመጠን ቆሻሻ እንዳይበዛ እጥራለሁ					
እኔ የት/ቤቱን የቆሻሻአያያዝናአወጋገድ መመሪያ አከብራለሁ					
እኔ የተጠቀምኩበትን ሶፍትና ሌላ ቆሻሻ ለምስወገድ ሁልጊዜ የቆሻሻ መጣያ/ማጠራቀሚያ/እጠቀማለሁ					
አኔ በት/ቤቱ አካባቢ ጥበቃ ክበብ አሳተፋለሁ					
እኔ ተማሪዎች ደረቅ ቆሻሻ መጣያ/ማጠራቀሚያ/ አንዲጠቀሙ አደርጋለሁ					
እኔ በት/ቤቱ አረንጋዴ ልማት በመሳተፍ የአካባቢ ማዳበር/ማበልፀግ/ ስራ አሰራለሁ					
እኔ በት/ቤቴ ደረቅ ቆሻሻ ዕዳት ሥራ እሳተፋለሁ					

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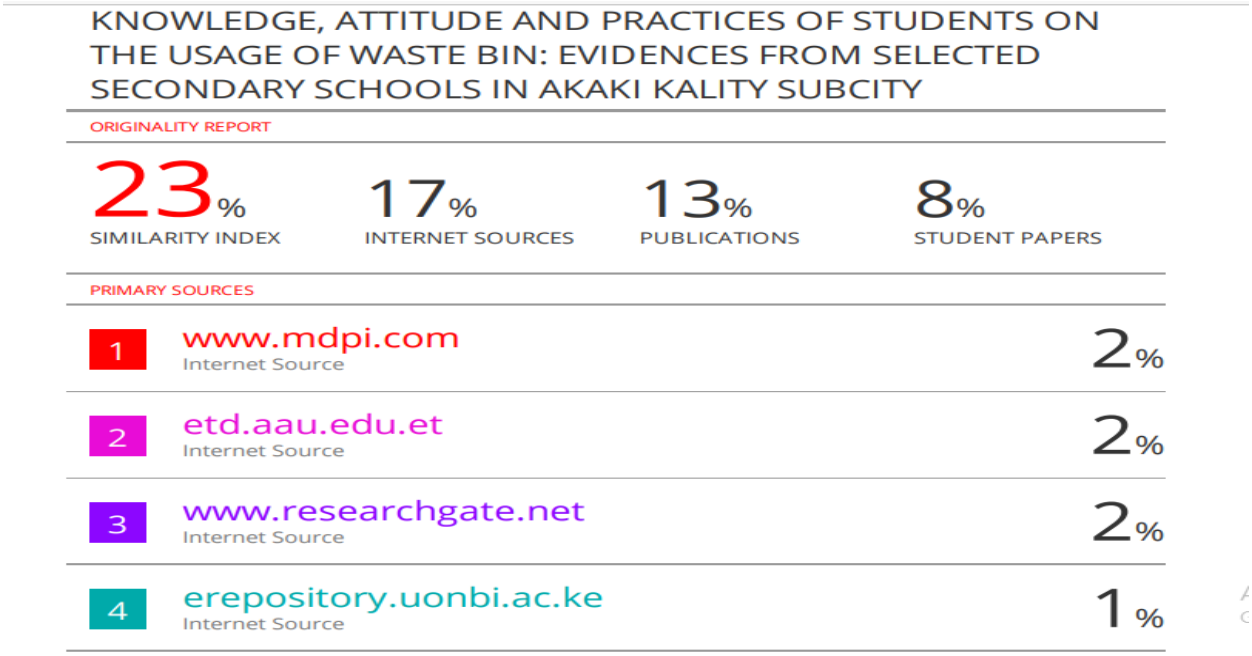
by Mekonnen Teshome



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