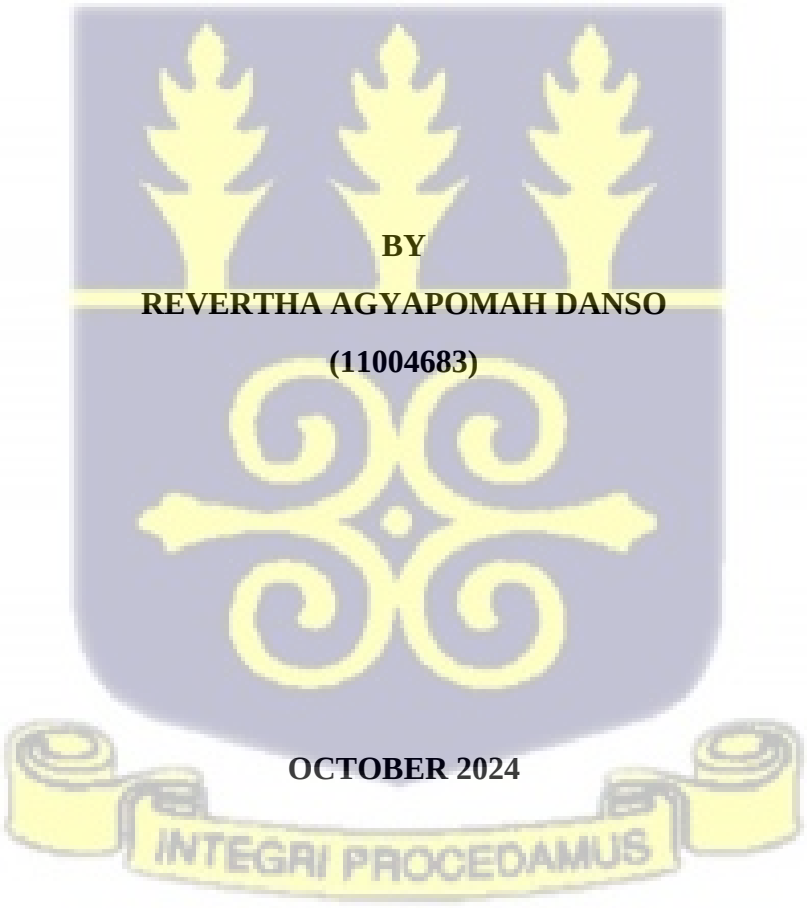
WASTE LITERACY AND SUSTAINABLE WASTE MANAGEMENT PRACTICES AMONG RESIDENTS IN THE ACCRA METROPOLIS

THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MPHIL FAMILY AND CONSUMER SCIENCES DEGREE



BY

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OCTOBER 2024

DECLARATION

I, Revertha Agyapomah Danso hereby declare that except for the references which have been duly cited, the work in this thesis, "**WASTE LITERACY AND SUSTAINABLE WASTE MANAGEMENT PRACTICES AMONG RESIDENTS IN THE ACCRA METROPOLIS**" was done entirely by me in the Department of Family and Consumer Sciences, College of Basic and Applied Sciences, University of Ghana, Legon. This work has never been presented either in whole or in part for any other degree in this University or elsewhere.

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ABSTRACT

The study assessed waste literacy and sustainable waste management (SWM) practices among residents of the Accra Metropolis, Ghana, utilizing the Protection Motivation Theory (PMT) as a conceptual framework. The purpose of this research was to explore the relationship between residents' waste literacy, threat appraisal, coping appraisal, and ownership appraisal, and how these factors influenced their adoption of sustainable waste management practices. The study employed an explanatory sequential design, integrating quantitative data collected from 395 households through structured surveys, and qualitative insights from key interviews with waste management officials. Results from the quantitative phase revealed that 81% of respondents were aware of SWM practices such as reuse and recycling, though infrastructural and educational barriers limited their adoption. Using IBM SPSS for data analysis, the study identified significant correlations between waste literacy and SWM behaviors. The findings also demonstrated that higher threat appraisal, where residents recognized the severe risks of poor waste management, motivated proactive waste reduction efforts. However, coping appraisal, representing individuals' confidence in managing waste, was weaker, indicating the need for capacity-building initiatives. Ownership appraisal revealed a high sense of responsibility among residents, but this did not always translate into effective action due to practical challenges. These findings emphasized the need for enhanced public education, improved waste infrastructure, and stronger collaboration between government and private sectors to improve waste management outcomes. The study has important implications for policymakers, environmental advocates, and stakeholders in Ghana's waste management sector. It is recommended that targeted educational campaigns and infrastructure investments be implemented to strengthen waste literacy and empower residents to take actionable steps towards sustainable waste management in Accra.

DEDICATION

This thesis is dedicated to my family for their unwavering support, to the people of Ghana working towards environmental sustainability, and to all those who have committed their efforts to improving waste management practices for a cleaner and healthier future.

ACKNOWLEDGEMENTS

I am deeply grateful to the Almighty God for His endless grace, wisdom, and guidance throughout this research journey. As Proverbs 16:3 reminds us, "Commit to the Lord whatever you do, and He will establish your plans." This work would not have been possible without His blessings.

I wish to express my heartfelt appreciation to my dedicated supervisors: Dr. Cynthia Gadegbeku and Dr. Fortune Abla Djirackor, for their invaluable guidance, encouragement, and insightful contributions throughout this research. Their unwavering support and counsel have been instrumental in shaping this study.

Special thanks go to my family for their constant love, support, and encouragement, which have been my source of strength. I am also indebted to everyone who offered advice, assistance, and support in various ways towards the successful completion of this thesis.

May God richly bless you all.

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LIST OF ACRONYMS

AMA	Accra Metropolitan Assembly
CBAS	College of Basic and Applied Sciences
EPA	Environmental Protection Agency
IRECoP	Integrated Recycling and Compost Plant Limited
SPSS	Statistical Package for the Social Sciences
UNEP	United Nations Environmental Programme
MESTI	Ministry of Environment, Science, Technology, and Innovation
SWM	Sustainable Waste Management
SSWM	Sustainable Solid Waste Management

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Waste is an unavoidable outcome of human activities. It arises daily in households, workplaces, and communities (Brunner & Rechberger, 2014). Waste management refers to all processes required to handle waste from its generation to its final disposal, including storage, collection, transportation, treatment, recovery, recycling, and monitoring (Van Velden, 2020; Iman et al., 2008; Nathanson, 2020; UNEP, 2020). Waste occurs in various forms—gaseous, liquid, and solid (White et al., 1995). Among these, solid household waste has become one of the most complex environmental problems, as it often results in filthy surroundings, foul odours, breeding sites for vectors such as flies and mosquitoes, and contributes to urban flooding (Siswantini et al., 2022). If unmanaged, it threatens public health and the environment (Odonkor et al., 2020).

Globally, poor waste management is recognised as a critical sustainability challenge with social, ecological, and health consequences (Alam & Ahmade, 2013; Janmaimool, 2017; WHO, 2019a). Despite interventions, waste generation continues to rise, especially in urban areas (Zhou et al., 2022). For instance, developed countries generate waste at rates five to six times higher than developing countries, largely due to consumer culture and disposable lifestyles (Ferronato et al., 2019). It is projected that global waste production could increase fivefold by 2025 if current disposal trends persist (Chen et al., 2020). As a result of its global nature, poor waste management has been highlighted within the Sustainable Development Goals, particularly SDG 11 (sustainable cities and communities), SDG 12 (responsible consumption and production), and SDG 13 (climate

action). This demonstrates its importance not only as an environmental concern but also as a developmental priority.

In developing countries, however, inadequate resources for collection, treatment, and disposal aggravate the problem (Chen et al., 2020). Ghana is no exception. The Accra Metropolis generates about 3,000 metric tonnes of solid waste daily, yet over 90% of waste in low-income contexts is either openly burned or dumped in unregulated sites (World Bank, 2016; Digadam, 2020). Within Accra, areas such as the Ablekuma South Sub-Metro face particular challenges due to the presence of markets, fishing activities, and residential settlements, all of which produce large volumes of waste. Indiscriminate dumping of waste (especially solid waste) in drains and along streets has been directly linked to frequent flooding and outbreaks of sanitation-related diseases in the metropolis.

The persistence of these challenges despite government interventions, including the introduction of the 3Rs (reduce, reuse, recycle), monthly clean-up campaigns, and partnerships with private waste contractors such as Zoomlion Ghana Ltd., suggests that infrastructure alone cannot resolve the problem (Akomea-Frimpong et al., 2023; Debrah et al., 2021). Studies show that sustainable waste management depends not only on policies and facilities but also on individual behaviour, which is shaped by knowledge, attitudes, and values (Alhassan et al., 2020; Gyimah et al., 2021). This capacity, often referred to as waste literacy, is critical for ensuring that households understand the consequences of poor waste practices and are empowered to adopt sustainable behaviours.

However, research on waste management in Ghana has largely focused on infrastructural and institutional challenges, with limited attention to the role of waste literacy in influencing household behaviour (Debrah et al., 2021). There remains a notable gap in understanding how residents'

knowledge, perceptions, and sense of responsibility shape their waste practices. This study therefore investigated waste literacy and sustainable waste management behaviour among households in the Accra Metropolis, with specific focus on the Ablekuma South Sub-Metro, where waste management challenges are most acute.

1.2 Statement of the Problem

Ghana continues to experience severe environmental threats largely due to ineffective waste management practices by households, government agencies, and private operators. Although the government introduced the 3Rs (reduce, reuse, recycle) and sanitation by-laws in 2011, these efforts have not yielded the desired results. Rapid population growth, increasing urbanisation, industrialisation, technological advancement, and economic pressures have worsened the problem, particularly in densely populated urban centres such as Accra. As a result, many households resort to poor disposal methods, including indiscriminate dumping of refuse along streets, behind houses, and in drainage channels.

The consequences are evident. Persistent litter and filth remain uncollected or improperly disposed of, contributing to serious public health risks (e.g. sanitation related diseases), polluted water and soil resources, exacerbated flooding in low-lying parts of Accra, and high public expenditure on clean-up efforts. These challenges also deter tourism and private investment, undermining socio-economic development. Existing studies on waste management in Ghana focused mainly on technical and infrastructural aspects, such as collection systems and disposal methods, with limited attention to the behavioural dimensions that drive poor practices (Alhassan et al., 2020; Debrah et al., 2021). However, research suggests that improving waste literacy (the knowledge, attitudes,

and skills individuals possess to manage waste responsibly) could significantly influence household behaviour and promote more sustainable practices.

This study therefore addressed a critical research gap by assessing waste literacy levels and sustainable waste management behaviour among households in the Accra Metropolis, with specific focus on the Ablekuma South Sub-Metro. By situating the study in this urban setting, it contributed to understanding how psychological and behavioural factors shaped waste practices and identified strategies to foster sustainable environmental outcomes in Ghana.

1.3. Aim of the Study

The aim of the study was to assess respondents' waste literacy and their sustainable solid waste management practices.

1.3.1. Specific Objectives of the Study

To achieve this aim, the study was guided by the following specific objectives:

1. Assess respondents' awareness about sustainable waste management.
2. Identify sustainable solid waste management practices (if any) that respondents adopted.
3. Determine respondents waste literacy levels.
4. Identify any barriers or challenges (if any) that residents encounter in adopting sustainable waste management behaviours.

1.4. Research Questions

This research project was guided by four (4) questions.

1. What do respondents understand by sustainable waste management practices?
2. What sustainable waste management practices/behaviour did respondents adopt?

3. What is the waste literacy levels of residents in the Accra Metropolis?
4. What are the primary barriers or challenges residents face in adopting sustainable waste management behaviour?

1.5 Significance of Study

Findings of this study:

1. Added to the discourse on waste literacy and sustainable solid waste management and serve as empirical data or evidence-based insight about the issue being studied.
2. Would inform policy makers in developing tailor-made strategies, interventions and initiatives to improve waste management practices in the Metropolis if published.

1.6. Operational definition of Terms

Awareness:

Awareness refers to respondents having knowledge or being aware of sustainable waste management methods.

Household:

A household refers to a person or a group of two or more persons (related or unrelated) who live together, share housekeeping arrangements (eating, sleeping among others) and recognise one person as the Head of that household (GSS- 2021 Population and Housing Report, 2021).

Practice:

Practice refers to the extent to which respondents actively engaged in sustainable waste management (SWM) practices.

Sustainable solid waste management:

Sustainable solid waste management involves strategies that promote the efficient use of resources and the reduction of waste through environmentally friendly methods.

Waste literacy:

Waste literacy encompasses knowledge about different types of waste, their environmental impact, and strategies for reducing and recycling waste (Debrah et al., 2021).

1.7. Organisation of Study

The research study was divided into five chapters. The opening chapter (Chapter One) included: a background to the study; problem statement; aim of the study; research objectives and questions, as well as significance of the study. The second chapter presented a review of literature in relation to the issue studied (waste literacy and solid waste management behaviour). The third chapter, presented the research methodology of the study. The fourth chapter presented the analysis and a discussion of research findings. The fifth and last chapter presented the summary of key findings, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The objective of this chapter was to present a comprehensive literature review on solid waste management and relevant theories. It presents a review of literature on: pertinent concepts; solid waste component categorization, management, hierarchy, sustainable waste management; waste literacy; conceptual framework.

2.1 The Concept of Solid Waste

Waste is any material that the owner discards or intends to discard, as defined by the EU Waste Directive (Article 1(a) of Directive 75/442/EEC). Lockrey et al. (2016) describe waste as any material identified as such by national legislation or any material deemed unusable for disposal. Waste can be defined in various ways depending on the category or context. Fundamentally, it can be described as any material considered useless because it no longer serves its intended purpose. Waste can be viewed from two perspectives: primary and secondary roles. In terms of its primary function, waste arises when a material can no longer fulfill its original purpose. However, a material that is no longer useful to one person may be valuable to another, as someone's waste can serve as another person's raw material. This illustrates that waste does not have a single, universal definition.

According to DeVroom (2023), solid waste refers to any discarded or unwanted materials. Fujii et. al., (2018) explained that solid waste is composed of organic and inorganic waste materials that are formed as a result of human and animal activities, and are no longer required and must be thrown away, due to their loss of consumer value. There is a perception that solid waste is always

in a solid state, however DeVroom (2023) asserted that solid waste does not have to be physically solid but could be in liquid, semi-solid or contain gaseous materials. According to the U.S. Environmental Protection Agency (EPA), for something to be considered as solid waste, the material must have been: inherently waste-like (e.g. dioxin-containing wastes); abandoned (e.g. disposed of, burned, incinerated or sham recycled); discarded military ammunition (unused or defective, and must be abandoned, rendered nonrecyclable, or declared a waste by an authorized military official) or recycled (e.g. by burning waste for energy recovery or as an ingredient in a process).

2.1.1. Components or Categorization of solid waste

Nearly everything we do generates waste, so it is important to understand the implications of handling and transporting waste safely. This begins with understanding the different types of solid waste generated so as to ensure its proper disposal. Numerous definitions and classifications have been offered in literature. This section presents a review of literature on the component and categorization of solid waste.

Household or domestic waste, industrial waste, municipal waste, commercial waste, agricultural waste, building and demolition waste are all examples of solid waste (Millati et al., 2019). It also includes various items like glass, toys, metals, cans, food waste, sludge from industrial plants, plastics, paper, disposable dishes, textiles and other household trash or discarded materials from commercial, mining, agricultural and industrial operations (Aslani & Taghipour, 2018; Dehghani et. al., 2021; DeVroom, 2023; Han et al., 2018; Zoroufchi Benis et al., 2019). It must be noted that plant and animal waste, such as vegetables, fruit peel, bone, and meat waste, and poultry and fish waste, account for a major portion of domestic waste (Ashokkumar et al., 2022). Paper and

cardboard (e.g. waste newspapers, wrapping paper, notebooks and books) also accounted for a sizable amount of waste. Table 4.1. presents a summary of terminologies (definition and characteristics) used to identify Municipal Solid Waste.

Table 2. 1: Terminologies used to identify municipal solid waste components

Solid Waste components	Definition and Characteristics
Ash and residues	It includes waste from the combustion of wood, charcoal, coal, and other combustible materials produced at residences, as well as waste from other enterprises and institutions.
Dead animals	These wastes include dead animal carcasses as well as animal waste flesh and bones, particularly near slaughterhouses.
Industrial wastes	These wastes include wastes generated by industries, factories, commercial institutions, refineries, mines, and so on.
Agricultural wastes	Waste from agricultural activities, milk production, slaughterhouses, pastures, and so on is included.
Animal faeces	It encompasses solid and liquid wastes produced by animals. These wastes have the potential to improve soil fertility.
Human wastes	It comprises solid or liquid intestinal remnants that, if not regulated in the environment, might spread diseases like diarrhoea and other intestinal and parasite infections.

Scrapping machines	Iron and scrap machine wreckages, or the remains of unintentional machineries scattered or abandoned throughout cities or along streets.
Demolition and construction wastes	It includes solid waste generated during the construction of new structures or the destruction of old ones.
Treatment plant wastes	It includes solid waste generated during the construction or demolition of new constructions.
Hazardous wastes	wastes that might cause immediate or long-term harm to human health and other living things.

(Source: Suthar & Singh, 2022)

These are other types of waste categorised and defined by DeVroom, (2023) based on their origin, composition and characteristics. These include: hazardous waste, electronic waste, agricultural waste, commercial waste, municipal waste, industrial waste, construction and demolition debris.

i. ***Hazardous Waste:*** These are hazardous materials that pose a risk to human health or the environment due to their flammable, corrosive toxic or reactive nature. It includes items like fluorescent bulbs, pesticides, chemical waste, medical waste and batteries amongst others.

ii. ***Electronic Waste*** (E-waste): This comprises of discarded electronic devices and equipment (e.g. smartphones, computers, radios, televisions among others). E – waste mostly contains hazardous materials including: mercury, lead, and other components that need to be handled and disposed of with special care.

iii. ***Agricultural Waste:*** This kind of waste is generated from farming activities, agricultural waste (e.g. crop residues, animal manure, pesticides) and other waste produced during agricultural processes.

iv. ***Commercial Waste:*** This kind of waste originates from commercial or business establishments (e.g. shops, institutions, offices, restaurants among others) that generate waste including: food waste, packaging materials, paper and other discarded items.

v. ***Municipal Solid Waste (MSW):*** This type of waste includes everyday items discarded by households, such as paper, plastics, food scraps, textiles, packaging materials, yard waste and household hazardous waste like batteries or cleaning products.

vi. ***Industrial Waste:*** This kind of waste is generated through manufacturing activities and industrial processes. It comprises of materials like: sludge, solvents, chemicals, scrap metal and other by-products from production facilities and factories.

vii. ***Construction and Demolition Debris (C&D):*** This type of waste is generated from demolition, construction and renovation activities. Such waste includes: metals, bricks, drywall, concrete, asphalt, metals, wood, among other materials used in building structures.

2.1.2. Management of Solid Waste

Waste management is a broad term that is defined by the EU Waste Directive (2008) as waste collection, transportation, recovery, disposal, monitoring of such activities, after-care of disposal sites and measures taken as distributors or brokers. The abundance and types of natural resources available, citizens' lifestyles and living conditions, contribute to the generation of solid waste (Doaemo et al., 2021; Salazar et al., 2021). The amount of solid waste generated varies from

country to country or region to region due to the variations in their management systems (Ferronato & Torretta, 2019). Comparatively, most developing countries struggle with solid waste management than in developed countries (Ferronato & Torretta, 2019; Idowu et al., 2019). The disparity between developing and industrialized countries is not only due to the form of waste, but also to the quality of waste management services provided (Hettiarachchi et al., 2018; Ikhlayel, 2018). In this regard, the interest of developing countries' is centred on proper collection, treatment, and disposal, whereas developed countries' attention is focused on converting waste into capital (Ferronato & Torretta, 2019). Ghana, like any developing country, is now struggling to efficiently manage its generated solid waste, from collection to treatment and disposal, mainly because waste is not considered a resource (Kyere et al., 2019; Oteng-Ababio & Nikoi, 2020).

How solid waste is managed depends on its regulations, composition, characteristics, available infrastructure and feasibility of recycling. Thus, various types of solid waste require the use of different management approaches (DeVroom, 2023). The types include: incineration (closed burning), composting, recycling, landfill disposal or other specialized treatments to minimize their environmental impact and promote sustainable waste management practices (DeVroom, 2023). A few of these strategies derived from DeVroom, (2023) would be discussed in this sub-section.

i. ***Landfill Disposal:*** These are designated areas where waste is deposited and covered with soil to minimize environmental contamination. Properly engineered and managed landfills use liners and systems to collect the liquid formed as waste decomposes (leachate) and methane gas, thus reducing potential groundwater contamination and methane emissions. It is worth noting that landfills could pose environmental risks if not managed correctly and could contribute to soil and water pollution.

ii. ***Specialized Treatments:*** Some types of waste (including industrial by-products, hazardous waste) require specialized treatment methods to neutralize or detoxify hazardous components before disposal. These treatments may include physical, biological or chemical processes to render the waste less harmful to the environment.

iii. ***Composting:*** Composting is the biological decomposition of organic waste (e.g. paper products, yard waste and food scraps) into nutrient-rich soil amendments. It is also described as a natural process that produces a valuable resource for enriching soil fertility and enhancing plant growth known as compost. Composting decreases the need for chemical fertilizers and reduces methane emissions from landfills.

iv. ***Incineration:*** this can simply be described as enclosed burning of waste. It is also known as "waste-to-energy." It involves enclosed burning of solid waste at high temperatures in controlled settings to generate heat or electricity. The advantage of using this kind of method is to reduce the volume of waste and produce energy. A disadvantage of using this method is that although it is closed burning, it still results in greenhouse gas emissions, air pollution and release of other toxic substances if not properly managed.

v. ***Recycling:*** Recycling involves the collection, sorting, processing and conversion of waste materials into new products. Recycling helps reduce the amount of waste sent to incinerators or landfills, conserve natural resources, and decreases energy consumption when compared to producing new materials from raw resources. Items that can be recycled include: plastics, glass, types of electronics and paper among others.

For effective solid waste management, there is a need to combine these methods explained above. Individuals and waste management organizations must prioritize waste reuse, recycling and reduction where possible.

Waste management is both a formal and an informal programme method in developing countries (Tong et al., 2021; Yang et al., 2018). The formal system is managed by the government, and municipals with responsibilities provided to ensure safe, efficient, and cost-effective collection and disposal of solid waste. This frequently requires large financial resources and this makes waste management issues difficult to deal with (Hettiarachchi et al., 2018; Priti & Mandal, 2019; Sharma & Jain, 2020). The informal programme methods on the other hand involve individuals or private dealers, such as scavenger groups and private associations (Ogwueleka, & Naveen, 2021).

The waste management problem in Africa is not only the accumulation of waste in cities or streets, but also the ineffectiveness of waste management authorities and the government lack of dealing with the waste problem (Aryampa, 2019; Chisholm et al., 2021; David & Hussain, 2020; Hirpe & Yeom, 2021; Nyampundu et al., 2020). To comprehend waste management challenges, it is necessary to examine the policy structure, implementation techniques, and the country's economic framework (Zorpas, 2020). Effective governance to handle waste management challenges requires adequate management and organizational structure, accountability, and transparency in decision-making (Fatimah et al., 2020).

2.1.3. Hierarchy of Solid Waste Management

Currently, sustainable solid waste is explained using the 'waste management hierarchy' principles, that serves as a globally accepted guidelines for prioritizing waste management methods (Ali et. al., 2021; Yakubu & Zhou, 2019). The hierarchy is illustrated in various ways, with the main

foundation being to drive waste management 'up the hierarchy', using the 3Rs (reduction, reuse and recycling) nearer the 'top' of the hierarchy and reducing to the practice of waste disposal. It can be seen that the hierarchy outlines the preferred sequence of waste management practices, ranking them from the most favourable to the least preferred (Ahmad et al., 2019; Siddiqua et al., 2022). This is presented diagrammatically in Figure 2.1.

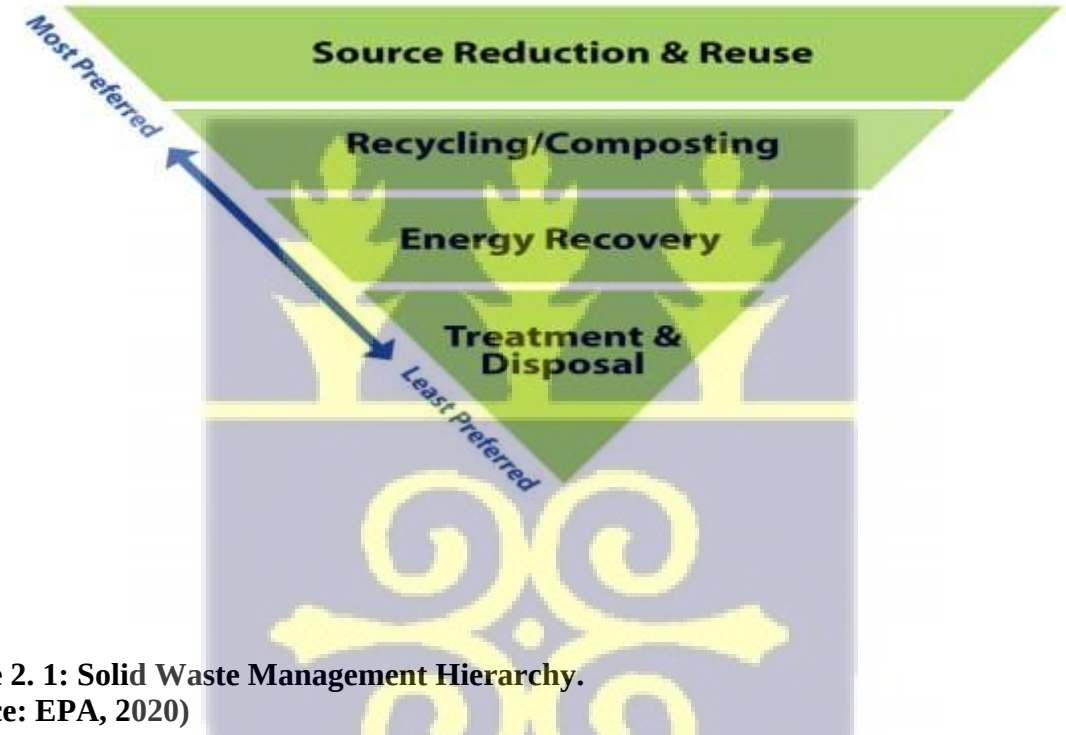


Figure 2. 1: Solid Waste Management Hierarchy.
(Source: EPA, 2020)

It must also be added that the most practical benefits derived during waste management is by reducing waste (Ali et al., 2021). This as shown in the diagram is the first stage of the solid waste management hierarchy known as reduction. For instance, instead of collecting polythene bags when you go shopping in supermarkets or neighbourhood, you use a basket brought from home. When reduction is done, it is advantageous since it results in more efficient resource use, lower

disposal/treatment costs, conservation of natural resources, and the resolution of environmental issues (Ali et al., 2021). So, individuals or organizations must think more about waste reduction and not just waste disposal as the most favored waste management strategy. Secondly, waste reuse is encouraged. Instead of disposing of outdated objects that have lost their worth or utility, old materials are reused (Agamuthu & Babel, 2023; Ali et al., 2021; Bissmont, 2020; Faulkner & Watson, 2018). For example, empty bottles could be used to store cooking oil; or polythene bags provided in supermarkets used for storage of food items in the fridge instead of being discarded; or giving them out items like old clothing or furniture to others who may need them.

The third step of the waste management hierarchy is recycling. It is the process of converting waste materials into new materials, products, objects or substances, either for their original purpose or other purposes. Recycling also referred to the process of extracting resources or value from waste, encompasses various methods aimed at recovering and reusing materials, thus reducing the need for virgin resources (Morseletto, 2020). Recycling is a daily routine in households (Ali et al., 2021). Most waste generated in homes like plastics, paper, aluminum, steel, and glass are all recyclable materials (Ye et al., 2020). Additionally, innovative initiatives, such as using scrap materials for artistic creations (interior or exterior décor) or repurposing them for functional items like floor tiles, showcase how recycling can contribute to sustainable waste management (Nsalasatta, 2022). These practices not only divert waste from landfills but also promote resource conservation and creative reuse within communities

Another stage or step in the hierarchy to waste disposal was energy recovery. This involves mainly the conversion of specific types of waste into a valuable fuel or energy sources, thereby reducing the burden on landfills and minimizing environmental impacts (Malav et. al., 2020). This fuel

source could be utilized for purposes such as heating, cooking, and generating power through turbines (Morseletto, 2020). For instance, technologies like waste-to-energy plants convert municipal solid waste into electricity or heat, offering an environmentally friendly alternative to traditional waste disposal methods (Nsalasatta, 2022).

The final stage, treatment and disposal, is the least preferred choice in the waste management hierarchy (Ali et al., 2021). Such waste is disposed of at open dump sites or sanitary landfill sites and this open waste dumping pollutes the ecosystem (air, land pollution). Waste management experts therefore recommend such waste is disposed of in landfills especially those that have well-kept in such a way that appropriate water and gas quality standards for environmental pollution are maintained (Ahmad et al., 2019; Siddiqua et al., 2022).

2.2. Sustainable Waste Management

Sustainable waste management, represents a holistic approach in evaluating and refining waste management systems (Nunoo, 2019). It is an approach that integrates feedback loops to protect the environment and carefully considers the allocation of resources and energy consumption, all within the framework of the waste hierarchy. Sustainable waste management is driven by overarching objective to prolong the utilization of materials for as long as possible. This is the basis of the conscious effort being done to maximize the efficient use of resources and minimize the generation of waste (Nunoo, 2019). It also seeks to: create a circular system in which materials continually circulate within the economy, avoiding premature disposal and waste; and minimize the reliance on landfills and incineration as waste disposal methods (Varjani et. al., 2022). These conventional practices come with their financial, social and environmental consequences. That is why

sustainable waste management advocates for alternative waste management strategies to reduce the volume of solid waste when using these disposal methods.

In this current economic structure, waste generation commences even before products are manufactured (Kerdlap et al., 2019). Simply put, it encompasses the entire life cycle of a product (Iqbal et al., 2020). It encompasses a deliberate and meticulous approach to waste management that transcends traditional practices. Sustainable waste management constitutes a pivotal element of responsible environmental guardianship, embodying a multifaceted commitment to enhancing economic, social, and environmental sustainability (Bratayasa, 2023; Chilakamarry et al., 2023). It emphasizes the minimization of waste, conservation of resources, and reduction of the overall ecological footprint of contemporary consumption practices as well as meticulously planning and optimizing material consumption (Chilakamarry et. al., 2023; Cobo et al., 2018; Das et al., 2019; Romano et. al., 2019). By doing so, it does not only promote environmental protection but also fosters a more sustainable and responsible approach to resource utilization for the well-being of our planet and future generations. A fundamental pillar of sustainable waste management is the efficient use of materials, particularly in sectors like construction and other resource-intensive industries (Sharma et al., 2022). So waste is reduced while advancing economic, social, and environmental sustainability objectives (Fatimah et al., 2020).

2.2.1 How to Ensure Proper Solid Waste Disposal

Whether the waste you generate is hazardous or non-hazardous proper solid waste disposal is crucial for several reasons, including: environmental protection; public health and safety; resource conservation; regulatory compliance and sustainability (DeVroom, 2023). Implementing effective waste management strategies begins with partnering with a disposal company well-versed in

handling various types of solid waste. According to DeVroom (2023), partnership is important because it results in:

1. ***Acquisition of expertise in different waste types***. For instance, a disposal company experienced in managing diverse waste streams understands the complexities of different waste categories, including hazardous, industrial, municipal and specialized areas like medical or electronic waste disposal. Their expertise allows for proper identification, handling, treatment and disposal of specific waste types according to regulatory standards.
2. ***Compliance with Regulations.*** Waste disposal companies knowledgeable in waste management regulations ensure that disposal methods adhere to local, state and federal laws. They possess the necessary permits, licenses and expertise to handle and transport different types of waste in compliance with environmental regulations, reducing the risk of legal issues or penalties for improper disposal practices.
3. ***Safe Handling and Transport.*** Proper handling and transportation of solid waste are critical to prevent environmental contamination and ensure public safety. A reputable disposal company employs trained personnel, utilizes appropriate equipment and follows established protocols for safe handling, packaging, labeling and transportation of different waste materials.
4. ***Environmentally-Responsible Disposal Methods***. Partnering with a disposal company that prioritizes environmentally-responsible disposal methods is crucial. They may offer various disposal options, including recycling, composting, incineration or landfilling, and strive to minimize environmental impact while maximizing resource recovery through sustainable practices.

5. ***Customized Waste Management Solutions.*** A proficient waste disposal company can tailor waste management solutions to meet specific needs. They can provide guidance on waste reduction strategies, recycling programs, waste audits and comprehensive waste management plans designed to optimize efficiency while minimizing costs and environmental impact.
6. ***Continuous Support and Consultation*****:** Establishing a partnership with a knowledgeable waste disposal company ensures ongoing support and consultation. They can offer guidance on waste segregation, regulatory changes, best practices and innovative technologies for waste management, fostering a long-term commitment to sustainable waste disposal practices.

The right partner or collaborations facilitates the safe, efficient and environmentally-conscious handling and disposal of solid waste, contributing to a cleaner and healthier environment for all.

2.2.2. Educational Awareness about Sustainable Waste Management

Educational awareness has been identified as one of the strategies to ensure sustainable waste management. The public needs to be educated about the sustainable management practices including: recycling and reuse practices, which can significantly enhance waste handling. Through environmental education, individuals and organizations could cultivate a positive shift in their attitudes toward waste management (Abd'Razack et al., 2017; Debrah et al., 2021; Ferronato et al., 2019; Kibler et al., 2018; Li, 2018; Liao & Li, 2019; Nduneseokwu et al., 2017). By inference, the absence of such education could result in wasted time and resources in effective waste management efforts. Essentially, waste management solutions ought to meet three criteria: they

should be environmentally sustainable, cost-effective, and socially acceptable (Malinauskaite et al., 2017). Public education could help to effectively meet these three criteria.

For the long-term sustainability of solid waste management and to address environmental challenges in developing nations, it is imperative to provide formal or informal education in solid waste management aimed at achieving sustainable development across all segments of society (Debrah et al., 2021). Such educational efforts possess the potential to initiate significant societal transformations. To effectively manage solid waste and promote environmental sustainability, it is essential to have authorities equipped with the appropriate knowledge, attitudes, skills, and innovative strategies (Bui et al., 2020; Fernando, 2019; Owojori et al., 2022). These individuals play a pivotal role in educating society and disseminating information on solid waste management and environmental conservation. Ultimately, this approach contributes to a more effective and sustainable means of handling solid waste management issues (Owojori et al., 2022).

In Ghana, numerous capacity-building programs, seminars, and workshops have been arranged and continue to take place. For instance, in March 2004, the Ghana Institute of Engineers organized lectures during its 35th Annual General Meeting, focusing on "Sanitation and Waste Management in Ghana: A Path Forward." Similarly, on November 14, 2005, the Inter-Faith Waste Management Initiative conducted workshops. While these events have yielded practical solutions to address waste management challenges, it is evident that there remains much work to be done. In recent years, various initiatives have been launched to enhance sustainable waste management practices. The Recycle Up! Nationwide Waste Education Campaign (NWEC) was launched in 2019 by Recycle up Ghana to extend environmental education in schools across Ghana. This initiative aims to professionalize and intensify environmental education concepts and broaden outreach to more

schools. Voltic (GH), a subsidiary of Coca-Cola Beverages Africa (CCBA), has also pioneered several recycling projects and sustainability initiatives. These include community clean-up exercises, partnerships with local NGOs, and educational campaigns to raise awareness about proper waste management. Most recently, Voltic employees led a beach cleanup at Laboma Beach, collecting over 20 bags of post-consumer waste. Furthermore, they have held plastic bottle buy-back events and distributed recycling bags to promote sustainable practices (VolticGhana, 2023).

The establishment of National Environmental Sanitation Day, observed annually, aims to raise public awareness and encourage responsible environmental stewardship. This initiative emphasizes the importance of maintaining cleanliness and hygiene in the surroundings (Government of Ghana, 2010). These current activities reflect ongoing efforts in Ghana to address waste management challenges and promote sustainable practices within communities.

Studies in Malaysia confirmed high level of knowledge and awareness regarding solid waste management practices (Barudin et al. ,2021; Zulkipi et. al., 2022), but then the extent of practice of these sustainable waste management practices was moderate, thus underscoring the importance of implementing comprehensive waste management educational programmes. Another study by Ng et al. (2021), found that nearly half of the survey respondents expressed a lack of knowledge when it came to waste sorting. Another study by Afroz et. al., (2011), which suggested that individuals who possessed greater knowledge and conviction about waste management were more inclined to engage in environmentally sustainable waste management practices including recycling.

Respondents' knowledge, practices, attitudes, perceptions and overall awareness exhibited their disposition towards solid waste management (Zulkipli et. al., 2022). Another study by Desa et. al.,

(2011) realized some regions within the country exhibited moderate scores in terms of their waste management practices, attitudes, and perceptions as well as students possessed moderate level of understanding, attitude, awareness, and behaviour related to solid waste management (SWM). Pan et. al., (2018), also corroborated the fact that factors such as knowledge, attitude, personal responsibility, beliefs, social influences, information resources, and environmental management facilities, collectively accounted for a very high impact on environmental care behaviour. Social influences and beliefs had the most substantial influence on environmental behaviour, followed by environmental management facilities, attitude, and personal responsibility. Intriguingly, while environmental knowledge did not directly shape behaviour, it did have an impact on attitude, which in turn played a role in influencing behaviour (Pan et al., 2018).

The relationship between certain demographic characteristics, awareness and use of sustainable waste management practices was also identified. For instance, a positive association between age and education level with engagement in reuse and recycling activities was also identified. Research by Zulkipli et al. (2022) also revealed that factors such as gender, knowledge, perceptions, and attitudes significantly influenced the level of environmental awareness among undergraduates. In terms of demographic characteristics, it was also observed that females displayed a higher level of awareness compared to males. Furthermore, individuals aged over 30 years demonstrated a relatively moderate level of awareness.

Environmental education could be used to bridge the gap between awareness, knowledge and the practice of sustainable waste management (Debrah et. al., 2021). This environmental education could be added to the curriculum in basic, secondary and tertiary schools in addition to public education (Debrah et al., 2021; Liao & Li, 2019). Various categories of waste have distinct

environmental consequences when not disposed of correctly (Deus et al., 2020; Pujara et al., 2019). For instance, improper disposal of medical waste can result in water pollution, while food waste may attract flies and rodents (Ayilara et al., 2020; Ozoh et al., 2021). Sustainable waste management education therefore equips individuals with knowledge needed to comprehend the characteristics of different waste types and the most effective ways to manage them (Fadhullah et al., 2022). Medical waste, for instance, can be directed back to its origin for appropriate disposal methods like incineration (Chisholm et al., 2021; Padmanabhan & Barik, 2019; Woolridge & Hoboy, 2019) and food waste can be processed through composting and recycling. These actions play a pivotal role in pollution control, averting water contamination, curbing rodent infestations, and mitigating the pollution of our oceans (Ozoh et al., 2021).

All these emphasise the need for education to create awareness and transform attitudes and ultimately encourage the practice of sustainable waste management.

2.2.3. Statistics about Waste generation and management

According to a report from the World Bank, waste generation has been on the rise, as global cities collectively produced 2.01 billion tons of solid waste in the year 2016 (World Bank, 2016). It is projected that this number will surge to 3.40 billion tons annually, representing a growth of 70% by the year 2050, primarily driven by the escalating rate of urbanization (Kaza & Yao, 2018). In the United States, a developed nation, the rate of municipal waste generation increased from 217.3 million tons per day in 1995 to 254.1 million tons per day in 2013 (EPA, 2015). In contrast, developing nations in sub-Saharan Africa produce an annual total of 62 million tons of solid waste. This observation supports the notion that there is a positive correlation between a country's level of affluence and the amount of waste it generates (Mupara, 2018). In 2018, the annual rate of waste

generation stood at 22.5 million tons, equivalent to 150 kilograms per capita annually (Saqib, 2018). An association was identified between income levels, the pace of urbanization and the volume of solid waste generated (Yukalang et. al., 2018).

In terms of sustainable waste practices, in 2014, a report from the US Environmental Protection Agency (EPA) indicated that approximately 66.4 million tons of Municipal Solid Waste (MSW) underwent recycling, while 23 million tons were subjected to composting. Additionally, 33.1 million tons were incinerated with energy recovery processes, and a substantial 136 million tons were disposed of in landfills (EPA, 2016; Powell, et. al., 2016). In terms of specific sustainable waste management practices, it was also noted that in 2014, the recycling rate for lead-acid batteries reached an impressive 99%, equating to 2.81 million tons recycled. Similarly, corrugated box recycling achieved a rate exceeding 89%, totalling 27.3 million tons, while yard trimmings composting surpassed 61%, with 21.1 million tons composted. Nevertheless, a significant portion of Municipal Solid Waste (MSW), amounting to 135.9 million tons or 52.6%, was still directed to landfills in 2014 (Powell et al., 2016). Notably, three materials experienced an increase in composting or recycling rates from 2013 to 2014. Yard trimmings composting, for instance, rose from 60.2% (20.6 million tons) to 61.1% (21.1 million tons) in 2014, compared to a 51.7% rate in 2000. Selected consumer electronics recycling also exhibited growth, with a rate of 41.7% (1.4 million tons) in 2014, up from 37.8% in 2013 (1.3 million tons), and a substantial improvement from the 10.0% rate observed in 2000. Similarly, food composting increased slightly to 5.1% (1.94 million tons) in 2014, from 5.0% in 2013 (1.84 million tons), marking progress from the 2.2% rate recorded in 2000 (Powell et al., 2016). In Ghana's case, the daily waste generation stood at approximately 12,710 tons, with the city of Accra alone contributing around 3,000 metric tons of

waste each day (Digadam, 2020). Alarmingly, more than 90% of the waste generated in low-income countries is either openly burned or deposited in unregulated landfills (World Bank, 2016).

2.2.4. Benefits of Sustainable Waste Management

Sustainable waste management (SWM) provides a variety of important advantages that play a pivotal role in safeguarding our environment and securing a more promising future for generations to follow (Sodiq et al., 2022). A few of these benefits are presented in this section.

Sustainable waste management emerges as a critical strategy to address not only the overarching challenges posed by a linear consumption-oriented society but also as a direct remedy for the manifold issues that waste generates (Redlingshöfer, 2022). Sustainable waste management is also critical in addressing environmental concerns associated with municipal solid waste (Das et al., 2019); and mitigating the ecological toll of paper waste and promotes a more environmentally responsible approach to waste disposal (EPA, 2018).

Sustainable waste management also helps avert negative consequences including: recurrent floods, partly attributed to plastic waste blockages, which have resulted in devastating cholera outbreaks and a host of public health-related challenges in urban centers (Nunoo, 2019). In essence, sustainable waste management is of paramount importance because it provides a vital solution to the immediate and far-reaching problems caused by inefficient waste handling including: improper disposal of potentially reusable materials, environmental degradation, public health crisis, and the overall quality of life especially in urban areas (Nunoo, 2019). Sustainable waste management therefore becomes an imperative focus for policymakers and communities alike (Nunoo, 2019). Sustainable waste management is an approach that is increasingly important in response to shifting societal trends and consumption patterns (Romero-Hernández & Romero, 2018).

A benefit of SWM could be derived from this objective that states sustainable waste management reduces the depletion of natural resources, maximize the reuse of materials obtained from the environment, and minimize the generation of waste (Pujara et al., 2019; Wan et al., 2019). It also prevents waste from accumulating in landfills or being haphazardly scattered in the environment (Abubakar et al., 2022; Mandevere & Jerie, 2018; Urme et al., 2021), and ensures land usage is optimized. Sustainable waste management strategies, such as recycling and reuse, reduce the need for purchasing new materials or products (Kabirifar et al., 2020; Sharma & Jain, 2020), which in turn results in cost savings for individuals and businesses. SWM also lessen the burden on waste management agencies by reducing the costs associated with waste disposal (Sharma & Jain, 2020). By recycling and reusing materials, it also lowers disposal expenses, ultimately saving money (Shevchenko et al., 2019).

Sustainable waste management generates revenue for various organizations (Romero-Hernández & Romero, 2018). For instance, municipal councils charge fees for waste collection and recycling services thus, creating a potential source of income (Alzamora & Barros, 2020). This not only helps offset the costs of waste management but also encourages businesses and individuals to adopt more sustainable practices, making them environmentally responsible and contributing to the overall well-being of the planet (Charles, 2021; Valenzuela-Levi et al., 2021).

Humans generate waste at an alarming rate, and outdated waste management methods are a significant contributor to environmental degradation (Zhang et al., 2022). Sustainable waste management takes center stage in environmental conservation efforts (Zorpas, 2020). By preserving and improving the environment, it benefits not only humans but also other species and future generations (Zhang et al., 2022). It helps achieve resource conservation, including the

protection of trees, metals, and water, while simultaneously reducing greenhouse gas emissions responsible for global warming (Ahluwalia & Patel, 2018).

Sustainable waste management encourages the development of innovative waste management techniques, the adoption of new technologies for waste treatment, and the identification of optimal solutions for various types of waste (Das et al., 2018). For example, composting food scraps, recycling plastics, and incinerating paper instead of sending them to landfills are responsible waste management practices that reduce the environmental footprint (Ahluwalia & Patel, 2018).

2.2.5. Challenges with Sustainable Waste Management.

The cost associated with handling waste is directly linked to the quantity of waste produced so waste management imposes a significant financial strain on the global economy. Other common issues include limited coverage and inconsistent collection services, along with practices like open dumping and open burning (Saqib, 2018). A door-to-door collection system implemented by non-governmental organizations (NGOs) and community-based organizations manages to collect only a small fraction, approximately 8-12%, of the total waste generated (Saqib, 2018). The municipal authority, too, utilizes a door-to-door collection system but only to a partial extent. A study by Billah (2007) found that the primary factors contributing to this situation include a lack of motivation, awareness, commitment, expertise, and financial resources.

Other studies also identified that effective solid waste management emerged as a significant hurdle for many developing nations in recent times (Narayanamoorthy et al., 2022; Sarfo-Mensah et al., 2019; Srivastava et al., 2020). The issue of proper waste management in urban areas of these countries is closely linked to factors such as urbanization, population growth, and increasing affluence (Yukalang et al., 2018). This connection arises from the fact that higher income levels

and the pace of urbanization are directly proportional to the volume of solid waste generated (Yukalang et al., 2018). Regrettably, in some sub-Saharan African nations like Ghana, the focus has primarily been on waste collection rather than comprehensive waste management.

Landfills, which are often vast and occupy extensive areas, could deplete valuable land resources (Urme et al., 2021). For instance, it was realized in densely populated regions like Singapore, where land is already limited, that it was imperative to manage waste sustainably to optimize land usage (Arfanuzzaman, & Dahiya, 2019). In developing nations, particularly within impoverished urban communities, residents experience significantly more adverse effects due to inadequate waste management (Ferronato & Torretta, 2019; Lissah et al., 2021; Serge Kubanza & Simatele, 2020).

Another challenge was that most households used dustbins in waste collection, nonetheless, limited access to the dustbins was observed as one of the major challenges of these communities (Richard et al., 2021). Households also experienced irregular collection of the wastes, lack of dumping sites, and inadequate information on source segregation in the handling of generated wastes. Alarmingly, more than 90% of the waste generated in low-income countries was either openly burned or deposited in unregulated landfills (World Bank, 2016). This behaviour resulted in environmental repercussions and posed grave concern for health and safety, including injuries, chronic illnesses, infections among others. Ineffectively managed waste acts as a fertile environment for disease carriers and also contributes to the global climate crisis by generating methane (Ashokkumar et al., 2022).

A report from the United Nations Environmental Programme (UNEP) highlighted a concerning trend (UNEP, 2019b). The world's increasing population, urbanization, and economic growth led

to a substantial rise in waste production. This surge in waste generation placed immense strain on existing waste management systems. The report further indicated that there did not seem to be any respite from this pattern (UNEP, 2019b). By the year 2030, the global middle-class population is expected to grow from 2 billion to 4.9 billion individuals, all of whom will desire larger quantities of more sophisticated and resource-intensive goods (UNEP, 2020). This is likely to place significant pressure on public waste systems in urban areas, which are already struggling to keep up with expanding cities. To compound the issue, swift industrialization is taking place in nations that have yet to establish robust systems for managing hazardous and specialized wastes (Sharma et al., 2021). The burgeoning international trade in waste materials is further posing significant difficulties (Wang et al., 2022).

In terms of cost, a concern in the realm of waste management is the escalating expenses associated with it. According to a report presented at the Biennial Conference of the Global Partnership on Waste Management (GPWM), hosted by the United Nations Environmental Programme (UNEP) on March 6, 2015, waste management stands out as one of the most intricate and financially demanding public services. Even when it is effectively organized and executed, waste management consumes substantial portions of municipal budgets (UNEP, 2015).

Several factors, including urbanization, limited financial resources, and economic downturns experienced during the 1970s and 1980s, have been proposed as potential explanations for the inadequate sanitation conditions prevalent in many towns and cities in Ghana (Asare et al., 2023; Bowan, 2023; Mudu et al., 2021). Ferronato and Torretta (2019) emphasised the detrimental environmental and health impacts of poor waste management in Nigerian cities. The inadequacy of waste infrastructure and prevalence of open dumping have contributed to these issues. In Ghana,

solid waste management in Ghana encounters numerous obstacles, including the following: a negative attitude of the general population regarding waste disposal and sanitation, haphazard urban development, inadequate planning of waste management initiatives, limited or absent public awareness campaigns on proper sanitation practices, insufficient waste infrastructure, a lack of political determination to enforce sanitation regulations, inadequate financial resources and equipment to facilitate waste management operations, and several other challenges (Basiru et al., 2019; Gyasi, 2018; Lissah et al., 2021; Sulemana et al., 2018).

Ghana also lacks dependable national data concerning waste generation and its composition, which is essential for informed and effective waste management planning (Oduro-Appiah & Afful, 2020). Developing nations like Ghana must prioritize the implementation of sustainable, cost-effective, and environmentally friendly measures for effective waste management (Deku, 2020). Adopting effective waste management practices in Ghana plays a pivotal role in promoting the achievement of Sustainable Development Goals (SDGs) such as SDG 3, which seeks to ensure the well-being and health of all; SDG 6, which emphasizes access to clean water and sustainable sanitation; and SDG 11, which aims to establish inclusive, secure, resilient, and sustainable urban areas and human settlements.

2.3. Waste Literacy

Literacy (a human resource) is generally defined by OECD, (2010) as cited in Siswantini et. al., (2022) as the capacity of human brings to apply their knowledge and skills on specific issues, conduct analysis and communicate effectively views, solutions proposed and interpretations of problems in various situations. It is used in various contexts thus in the context of solid waste

management, waste literacy refers to the knowledge, attitudes, and behaviours that individuals possess regarding waste generation, separation, disposal, and recycling. The activities of literacy, communication and interpretation of the environment are interrelated activities (Siswantini et al., 2022). Practice of literacy is reflected in activities within the home or in the public sphere or in the community (Siswantini et al., 2022). This presupposes practice of waste literacy would be reflected in activities within the home in relation to waste management.

Waste literacy comprises extensive understanding of waste, spanning various categories (e.g. organic, recyclable, and hazardous), origins (household, industrial, and agricultural), and appropriate management practices. It also includes awareness of the consequences of improper waste disposal such as environmental pollution, public health risks, and resource depletion (Debrah et al., 2021). Waste literacy is vital because it empowers individuals and communities to make informed decisions on waste management. It fosters a sense of environmental responsibility, encourages the adoption of sustainable practices, and promotes the principles of the circular economy, where waste is viewed as a resource (Bert et al., 2023).

Waste literacy education strategies vary worldwide, reflecting the differences in educational systems, resources, and cultural norms. In developed countries, waste literacy often begins with formal educational systems. For instance, school curricula may include lessons on waste reduction, recycling, and environmental sustainability, instilling basic waste literacy at a young age (Rada et al., 2016). In the United States for instance, waste literacy has witnessed a gradual increase in prominence, owing, in part, to the growing awareness of environmental concerns. A study by Thukral et al., (2023) also revealed that environmental education programs have been successful in raising waste literacy among American citizens. The U.S. Environmental Protection Agency

(EPA) played a crucial role in achieving this by implementing initiatives like the "Recycle Right" campaign, which aims to educate citizens about proper recycling practices (Debrecht, 2021).

Despite these efforts, challenges remain, with issues such as contamination in recycling streams persisting owing to inadequate waste literacy (Andeobu et al., 2021). In Europe for instance, waste literacy is often higher than in many other parts of the world, primarily due to the robust waste management infrastructure and comprehensive educational programs. A study by Masotti et al., (2023) conducted in several European countries also highlighted the positive impact of education on waste literacy, with countries such as Italy and the Netherlands demonstrating high levels of waste awareness and responsible behaviour. The European Union's Circular Economy Action Plan has also influenced waste literacy positively by emphasizing recycling and sustainable waste practices (Aceleanu et al., 2019)

In contrast, many regions in sub-Saharan Africa face challenges in integrating waste literacy into formal education because of limited resources and competing educational priorities (Serge Kubanza et al., 2022). Sub-Saharan Africa, as a region, experiences a range of waste literacy levels that are largely influenced by economic and educational disparities. Some countries have made strides in waste management education, while others have lagged behind. A study by Sarpong et al., (2020) found that waste literacy in sub-Saharan Africa varied widely but generally remained low, with significant room for improvement. It is essential to acknowledge that waste literacy in this region is closely tied to economic development, governance and access to education.

In Kenya, waste literacy has emerged as a significant concern because of rapid urbanisation and population growth. Several organisations, such as the Dajopen Waste Management (DWM) group in Kenya, initiated waste education programs to raise awareness of proper waste disposal and

recycling practices. Despite these efforts, waste literacy in Kenya remains an area that needs further attention, with informal waste pickers often playing a significant role in waste collection (Barford & Ahmad, 2021). Okot-Okumu and Nyenje (2012) however highlighted the challenges of waste management in Nairobi, Kenya's capital and emphasised the need for improved waste literacy among citizens.

Waste literacy in South Africa was realized to be influenced by the country's diverse socioeconomic landscape. While pockets of high waste literacy were identified particularly in urban areas, disparities existed. The South African government implemented waste management policies and regulations, such as the National Environmental Management; Waste Act, to improve waste literacy and promote responsible waste practices (Department of Environment, Forestry and Fisheries, 2021). However, challenges persist, including illegal dumping and a lack of awareness in some communities (Nyika et al., 2020).

In Ghana, waste literacy presents a unique set of challenges and opportunities. A few of these policies and programs in relation to waste literacy have been presented in this section. The UNDP Waste Recovery Platform and Ghana National Plastic Action Partnership highlighted Ghana's efforts in waste management, including the National Sanitation Day initiative. This waste literacy rate in Ghana remains suboptimal, with informal waste pickers often playing a crucial role in waste collection (UNDP, 2022), thus necessitating an increase in waste literacy in the country. For instance, Debrah et al., (2021) emphasised the need for targeted waste education programmes in Ghana, suggesting that increased waste literacy could lead to more sustainable waste management practices. In Ghana, waste literacy education primarily relies on non-governmental organisations (NGOs) and community-based initiatives. These organisations conduct awareness campaigns,

workshops, and training programs to disseminate waste-related knowledge to communities. However, there is a need for greater coordination between government and non-government efforts to ensure a more comprehensive approach to waste literacy education in Ghana.

2.3.1 Statistics on Waste Literacy Levels

Waste literacy in the USA and Europe generally reflects higher levels of awareness and education regarding waste management compared to developing nations. A study by Read (1999) found that in the USA, 75% of the population was aware of recycling programs and actively participated. Similarly, in Europe, Ylä-Mella et al., (2015) found that 82% of respondents claimed to separate their waste for recycling. These statistics indicate a relatively high level of waste literacy in these regions, driven by well-established recycling infrastructure and public awareness campaigns.

In contrast, Kenya and South Africa exhibited varying degrees of waste literacy. A study by Ozoike-Dennis et. al., (2019) reported that waste literacy in Kenya was relatively low, with only 40% of respondents demonstrating knowledge of proper waste disposal methods. In South Africa, the situation is somewhat better, with a study by Ayeleru et. al., (2020) revealing that 60% of urban residents were familiar with recycling practices. However, both countries faced challenges related to inadequate waste collection services in rural areas, hindering efforts to improve waste literacy across the board.

Ghana, like many other African countries, faces significant waste literacy challenges. A study by Almasi et al. (2019) showed that only 32% of Ghanaians were aware of recycling practices, with even lower levels of waste separation knowledge. The low waste literacy levels can be attributed to limited access to waste management information and infrastructure in rural areas. Additionally, cultural practices and beliefs in some regions of Ghana may hinder waste management efforts.

2.3.2 Benefits of Waste Literacy

Waste literacy programs in the USA have shown significant benefits in terms of waste reduction and recycling rates. For instance, Barker et al. (2021) found that communities with robust waste literacy initiatives had recycling rates 20% higher than those without such programs. Higher recycling rates were also directly linked to increased knowledge of which materials were recyclable and how to properly sort and prepare recyclables for collection. Furthermore, waste literacy contributed to the reduction of landfill waste. Ahmed et al., (2018) also noted a 15% decrease in the amount of waste sent to landfills in areas where waste literacy education was actively promoted. This decrease translated into reduced landfill costs for municipalities and also extended the lifespan of landfills, mitigating the need for costly expansion or the opening of new landfill sites.

In addition to environmental benefits, waste literacy programs have economic advantages. In Europe, the benefits of waste literacy extend to the creation of a more circular economy. Gupt and Sahay (2015) also realized waste literacy as a driving force behind the success of Extended Producer Responsibility (EPR) programs in many European countries. EPR initiatives shift responsibility for waste management and recycling from consumers to producers, encouraging them to design products with easier recycling in mind. This has led to less waste generation and more efficient resource utilisation. Waste literacy has also had a positive impact on reducing illegal dumping in Europe. Comprehensive waste education programs have raised public awareness of the environmental and legal consequences of illegal dumping, resulting in decreased instances of this harmful practice (Mmereki et al., 2016). In turn, this preserves natural landscapes and reduces the cost of cleaning illegal dumpsites. Moreover, European experience emphasises the societal benefits of waste literacy, such as increased participation in community recycling initiatives and

improved public health. These aspects contribute to higher overall quality of life (Knickmeye, 2020).

In sub-Saharan Africa, Kenya faced unique waste management challenges owing to its rapid urbanisation and limited resources and waste literacy played a crucial role in mitigating such challenges. Haregu et al., (2017) noted however that waste literacy programs have resulted in safer disposal practices such as reducing the prevalence of open burning and promoting waste separation at the source. Waste literacy stimulates job creation, particularly in the informal waste sector. For instance, in Kenya, where the formal waste management infrastructure is often inadequate, waste pickers and recyclers form an essential part of the waste management ecosystem. By increasing their knowledge of waste sorting and recycling, waste literacy empowers individuals to earn a livelihood while contributing to environmental protection (Haregu et al., 2017)).

Additionally, improved waste literacy enhances resilience to waste-related health hazards. Residents who are more knowledgeable about proper waste disposal and hygiene practices are better equipped to protect themselves and their communities from diseases associated with poor waste management (Amugsi et al. 2016). It also leads to community empowerment and poverty alleviation. For instance, waste literacy initiatives in South Africa have led to community empowerment and poverty alleviation. Serge Kubanza (2021) observed that communities with higher levels of waste literacy have been successful in establishing community-based recycling programs. These initiatives not only reduce the volume of waste sent to landfills, but also generate income for participating communities through the sale of recyclable materials. In South Africa, waste literacy has also been instrumental in reducing littering. Public education campaigns, combined with stricter enforcement of littering laws, have led to cleaner public spaces and

improved public hygiene (Mathe, 2014). This fosters a sense of pride and well-being among the residents.

In Ghana, waste literacy has addressed pressing environmental issues such as the open burning of waste. Kanhai et al., (2021) found that communities with higher waste literacy levels were less likely to engage in open burning practices. This resulted in decreased air pollution and improved respiratory health of residents, particularly in urban areas where open burning was prevalent. Waste literacy has also promoted eco-entrepreneurship in Ghana. As more individuals gained knowledge about recycling and waste management, they became better equipped to start and sustain recycling businesses. These ventures not only contributed to local economies but also reduced the amount of waste that ended up in landfills or open dumpsites (Bening, 2022). Moreover, waste literacy aligned with Ghana's broader sustainability agenda. Reducing waste-related environmental hazards and fostering economic opportunities therefore contributed to the country's efforts to achieve sustainable development goals (Adjei et al., 2023).

2.3.3 Challenges with Waste Literacy.

Despite its benefits waste literacy also has certain challenges. A few of them are indicated in this section. Waste literacy was marked by several challenges in the USA, primarily stemming from consumerism and a lack of awareness of the environmental impact of waste. Studies by Milovantseva & Saphores (2013); Sthiannopkao & Wong (2013) revealed that despite the presence of recycling programs, many Americans remain unaware of what is recyclable or where to properly dispose of hazardous waste. Additionally, research highlights that the lack of standardised waste education programs in schools and communities contributes to persistently low waste literacy levels (Vergara & Tchobanoglous, 2012). The proposed solutions include implementing

comprehensive waste education in schools and increasing public awareness campaigns (Moh & Abd Manaf, 2014).

European countries are generally considered leaders in sustainable waste management. However, there are disparities between nations. Wilson et al., (2012) indicate that Western European countries tend to have higher waste literacy levels than Eastern and Southern European nations. Factors contributing to challenges in waste literacy include varying waste disposal regulations across countries and a lack of standardised educational programmes (Secondi et al., 2015). Promising solutions involve harmonising waste management policies and strengthening waste education initiatives at the pan-European level (Vittuar et al., 2016).

In sub-Saharan Africa, Kenya, waste literacy faces unique challenges characterised by inadequate waste infrastructure, informal waste management systems, and limited access to formal education (Monyoncho, 2013). Research (Sibanda et al., 2017) demonstrates that many Kenyans lack basic knowledge of waste separation, recycling, and proper disposal methods. Additionally, the thriving informal waste sector complicates formal waste management efforts. Addressing these challenges requires a multipronged approach, including investment in waste infrastructure, formalisation of the informal sector, and targeted community-based waste education programs (Aparcana, 2017). South Africa faces challenges in waste literacy driven by socioeconomic disparities and insufficient waste infrastructure. Research (Verster & Bouwman, 2020) indicates that marginalised communities often lack access to waste collection services and education, leading to illegal dumping and environmental degradation. Waste literacy initiatives in South Africa should focus on equitable access to waste services, culturally sensitive education programs, and increased enforcement of waste regulations (McAllister, 2015).

In Ghana, waste literacy challenges are closely linked to rapid urbanisation and inadequate waste management infrastructure (Boateng et al., 2019). Cobbinah et al., (2017) revealed that urban areas struggle with waste literacy due to a lack of formal waste collection services and widespread open dumping. To address these issues, interventions should include expanding waste collection infrastructure, promoting community-based recycling initiatives, and implementing comprehensive waste education programs in schools (Oteng-Ababio et al., 2013).

2.4. Theoretical framework of the study

Various theories are used in the study of behaviour. This study however reviewed the Protection Motivation Theory and applied it to the study of sustainable waste management behaviour. An extensive review of literature revealed the Protection Motivation Theory (PMT), initially proposed by Rogers in 1975, offered a valuable conceptual framework to understand factors influencing individuals' decisions related to waste literacy and sustainable solid waste management. This is a psychological theoretical model that explains how people evaluate threats and decide whether or not to engage in protective behaviour or explores how motivated people are to protect themselves in various situations (Westcott, et. al., 2017).

The Protection Motivation Theory is rooted in a cost-benefit paradigm, which states that before adopting a recommended behaviour, individuals conduct a cost-benefit analysis. Their motivation to follow an adaptive behaviour is fuelled by perceived threats and individuals' appeal for avoiding the negative consequences of not engaging in the behaviour (Marikyan & Papagiannidis, 2023). The PMT explains extraneous variables such as: perceptions of threat severity, vulnerability, response cost, response efficacy and self-efficacy drive behaviour change. In addition to these, two

cognitive appraisal processes (coping appraisals and threat appraisals) also influence behaviour change (Marikyan, & Papagiannidis, 2023). It is presented diagrammatically in Figure 2.2.

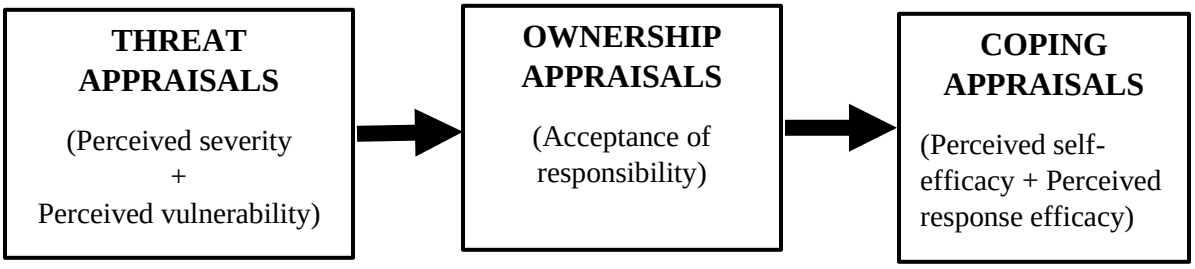


Figure 2. 2: A diagram of the Protection Motivation Theory (PMT)
Source: Protection Motivation Theory (Rogers, 1975; Rogers, 1983)

Key variables in the PMT framework are explained below. It includes definitions of threat appraisal, coping appraisal and ownership appraisal.

Threat appraisal:

Threat appraisal involves residents' cognitive processes in estimating the level of threat posed by inadequate waste management (Fadhullah et al., 2022). Individuals need to assess the threat appraisal dimension (perceive that they are vulnerable to the threat and it is severe enough). This appraisal includes evaluating the perceived severity of the waste-related problems and the perceived vulnerability of residents and the environment to the consequences of poor waste management practices (Akmal & Jamil, 2021). Perceived severity reflects the perceived seriousness of potential harm arising from improper waste disposal, while perceived vulnerability relates to residents' perceptions of their susceptibility to these harms (Hazarika, 2023).

Threat appraisal considers the perception of rewards associated with sustainable waste management behaviours. These perceptions of vulnerability, severity, and rewards are significant motivators for individuals to engage in proactive waste management actions (Tchetchik et al., 2021). Higher perceptions of severity and vulnerability tend to enhance motivation for sustainable

waste management behaviours, while greater perceptions of rewards from responsible waste disposal practices may further encourage these behaviours (Tchetchik et al., 2021).

Coping appraisal:

Individuals need to acknowledge the cost of carrying out a suggested action to comply with recommended behaviour (Marikyan, & Papagiannidis, 2023). This is referred to as coping appraisal. Coping appraisal entails assessing an individual's ability to perform these behaviors effectively, encompassing self-efficacy and response efficacy (Kim et al., 2022). Self-efficacy pertains to residents' confidence in their capability to implement proper waste management practices, while response efficacy relates to the perceived effectiveness of recommended waste management actions (Xu et al., 2018). Moreover, coping appraisal takes into account response costs, which denote the costs associated with adopting responsible waste management behaviors. High response costs, such as financial or time-related burdens, can deter residents from actively participating in these behaviors (Xu et al., 2018). Coping appraisal can be understood as the result of the appraisals of self-efficacy and response efficacy, minus the costs associated with responsible waste management practices. It is assumed that coping appraisal plays a pivotal role in determining residents' motivation to engage in sustainable waste management (Cudjoe et al., 2020).

Ownership appraisal:

This refers to how individuals accept responsibility (Marikyan & Papagiannidis, 2023). The PMT model predicts that higher response efficacy, self-efficacy, and lower response costs increase the likelihood of residents deciding to embrace sustainable waste management behaviors (Janmaimool, 2017). PMT has been widely applied to understand and encourage pro-

environmental behaviors in various contexts (Chen et al., 2020; Tian & Liu, 2022; van Valkengoed et al., 2022).

In this research, where effective waste management was of paramount importance, applying PMT to this study was especially relevant. Understanding how threat, coping and ownership appraisals interact with residents' decisions regarding waste management could inform the development of tailored strategies to enhance waste literacy and promote responsible waste management practices within the Accra Metropolis.

2.4.1. Limitations of the theory

While Protection Motivation Theory (PMT) offers a valuable framework for understanding pro-environmental behaviors, it has notable limitations. The theory assumes rational decision-making, which may not fully capture the context-specific factors that shape such behaviors. Although PMT is designed to explain individuals' intentions to adopt adaptive behaviors, it does not encompass all environmental influences, cognitive processes, or moderators that might affect motivation (Marikyan & Papagiannidis, 2023).

Some critiques of PMT remain unresolved. A key issue from a decision-making perspective is PMT's reliance on a cost-benefit approach, assuming rational behavior (Wu, 2020). The theory's predictive power holds when, faced with imminent threats, individuals can assess both the threats and their coping mechanisms rationally (Sturges & Rogers, 1996). However, people do not always act rationally; they may not align threat and coping appraisals when deciding whether to follow protective behavior recommendations (Floyd et al., 2000). This rational-choice assumption limits the theory's applicability to certain situations and demographics, such as children, who may lack the ability to conduct a detailed cost-benefit analysis (Sturges & Rogers, 1996).

PMT also assumes uniform cognitive processes across individuals with differing personality traits. For instance, perceived threat vulnerability is subjective, as individuals may interpret threats based on their own sensitivity (Floyd, Prentice-Dunn & Rogers, 2000). Dispositional factors like anxiety and defensive tendencies can impact fear appraisal, yet these elements are not included in the model (Rogers, 1975). Research confirms that individual socio-demographic traits, such as gender and age, moderate motivation; for example, threat appraisals tend to have stronger effects for women and older adults, while coping factors are more influential for men and younger people (Norman et al., 2015). Despite efforts to extend PMT with individual factors (Norman et al., 2015), the roles of personality and psychological characteristics remain underexplored.

Another critique concerns the concept and operationalization of the response cost variable. In the context of health-protective behaviors and PMT specifically, it is unclear whether the response cost of adaptive behavior should be distinct from the expected loss of intrinsic and extrinsic rewards (Weinstein, 1993). This debate stems from ambiguity over whether response cost refers to the losses involved in changing behaviors or the potential costs (e.g., financial investment, mental effort) of adopting the recommended behavior.

Additionally, PMT sometimes struggles to explain why individuals may choose to follow or ignore specific recommended behaviors. Some scholars suggest that the theory should incorporate context-specific factors (Ifinedo, 2012; Thompson, McGill & Wang, 2017; Verkijika, 2018). In fact, findings suggest that adding multiple factors can enhance PMT's explanatory power up to 70% (Verkijika, 2018). In response, researchers have modified the model; for example, a "moral obligation" construct was added to examine pro-environmental behaviors, broadening PMT's

application beyond health (Chen, 2020). To investigate behavioral inhibitors, Pechmann et al. (2003) examined social disapproval risks and confirmed their role in predicting motivation.

The limitations of PMT were partly addressed in a 1983 revision, which introduced cognitive and individual variables—namely, response cost and self-efficacy (Cacioppo, Petty, & Morris, 1983). These additions significantly expanded the theory's explanatory power, leading to its broad application across diverse fields (Boss et al., 2015; Verkijika, 2018). PMT was later modified further by including anticipated regret as a predictor, which accounts for psychological predispositions that influence individuals' responses to adaptive behavior (Verkijika, 2018).

Despite these limitations, PMT remains relevant to this study. Applying PMT to this context may yield valuable insights that can inform strategies to enhance waste literacy and promote sustainable solid waste management in Accra. Therefore, PMT was adapted to fit this study.

2.5. Conceptual framework

Based on the empirical and theoretical review of literature, certain variables were identified as being of importance in understanding waste literacy and sustainable waste management practices among residents in the Ablekuma south sub – Metropolis. These include: extraneous variables, waste literacy, threat appraisal, coping appraisal and ownership appraisal. The interrelationships between these four key variables have been presented in the conceptual framework in Figure 2.3. It showed that extraneous variables (e.g. demographic characteristics and culture) indirectly influenced respondents waste literacy, coping appraisal, threat appraisal and ownership appraisal that ultimately influenced these respondents sustainable waste management behaviour.

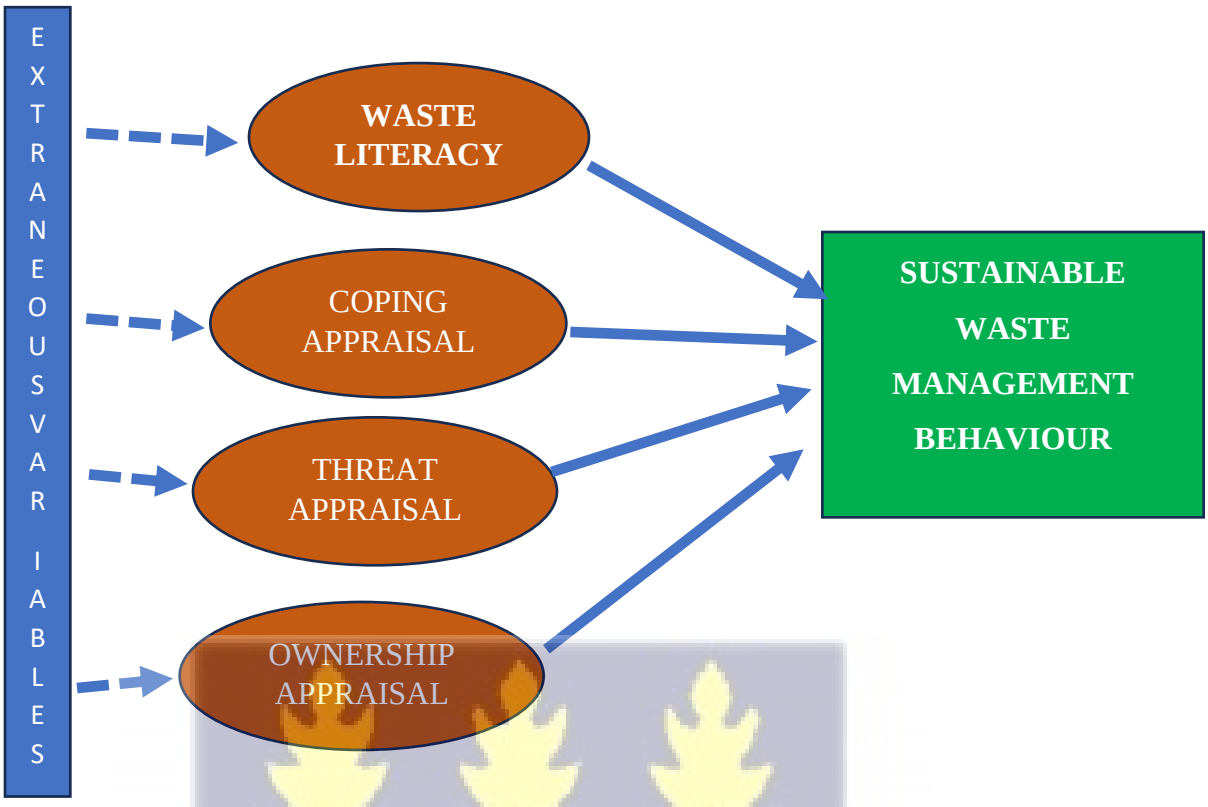


Figure 2. 3: A conceptual framework of the study adapted from the PMT model (Source: Authors Construct, 2024)

2.5. Hypotheses of the study

Based on the review of literature and the conceptual framework, The study developed four (4) null hypotheses:

2.5.1. Hypothesis One:

Research in Kenya by Okot-Okumu and Nyenje (2012) also highlighted the need for improved waste literacy among citizens to address the challenges of waste management in urban areas. Their findings suggested that enhancing waste literacy could lead to better waste management practices, such as safer disposal methods and reduced open burning. Haregu et. al., (2017) also noted that

waste literacy programs in Kenya resulted in positive outcomes, including decreased instances of open burning and increased waste separation at the source.

In Ghana, Debrah et al., (2021) emphasized the importance of targeted waste education programs in Ghana, suggesting that increased waste literacy could lead to more sustainable waste management practices. Almasi et al., (2019) also found that low waste literacy levels in Ghana were associated with limited awareness of recycling practices, indicating a potential link between waste literacy and sustainable waste management behaviour. Kanhai et al., (2021) also observed that communities with higher waste literacy levels were less likely to engage in open burning practices. This suggests that waste literacy could influence residents' decisions regarding waste management methods. Additionally, Sarpong et al. (2020) found that waste literacy levels in sub-Saharan Africa, including Ghana, varied widely but generally remained low.

These studies underscored the importance of waste literacy in promoting sustainable waste management behaviour. Therefore, it was hypothesized that (Ho1) "Waste literacy levels positively influence engagement in sustainable waste management practices."

2.5.2. Hypothesis Two

Fadhullah et al., (2022) found a relationship between residents' perceptions of severity and vulnerability associated with inadequate waste management practices. Additionally, Akmal & Jamil (2021) emphasized the significance of threat appraisal in estimating the level of threat posed by inadequate waste management, highlighting its role in motivating proactive waste management actions. It seems that the more people appraised poor waste disposal and inadequate management practices on the environment and the individual as threatening, the more proactive they became in finding sustainable solutions in managing waste. For these reasons the researcher hypothesized

that (Ho2) “Residents' threat appraisal positively influences their sustainable waste management practices”.

2.5.3. Hypothesis Three

Cudjoe et al., (2020) suggested that coping appraisal plays a pivotal role in determining residents' motivation to engage in sustainable waste management. This includes factors such as self-efficacy, response efficacy, and response costs. Similarly, Xu et al., (2018) found that residents who perceived themselves as capable of implementing proper waste management actions (self-efficacy) and believed in the effectiveness of these actions (response efficacy) were more likely to adopt such behaviours. Additionally, Marikyan & Papagiannidis (2023) highlighted a significant relationship between coping appraisal and residents' motivation to participate in sustainable waste management, emphasizing its importance in influencing behaviour change. The study therefore hypothesized that (Ho3) “Residents’ coping appraisal positively influence their motivation to practice sustainable waste management.”

2.5.4. Hypothesis Four

The role of community ownership in effective waste management is also well-documented. Ownership appraisal typically examines how individuals' sense of ownership and responsibility towards waste management practices affects their willingness to engage in sustainable behaviours. This may include aspects such as personal responsibility, perceived control over waste outcomes, and the psychological ownership of community waste management issues. Research by Dawkins et al. (2017) delved into the concept of psychological ownership, revealing that individuals who felt a sense of ownership over their environment were more inclined to engage in behaviours that protected and enhanced it. This can be extended to the domain of waste management, where

residents who perceived ownership over their community's cleanliness and waste management practices were likely to be motivated to adopt sustainable waste management behaviours. Bolaane et al., (2021) examined community participation in solid waste management in Botswana and concluded that programs with higher community ownership and participation achieved better outcomes in waste reduction and recycling rates. Further evidence was shown in studies linking ownership feelings to pro-environmental behaviour. Van Dyne and Pierce (2004) for instance studied the connection between ownership feelings and organizational citizenship behaviours, noting that a sense of ownership motivated individuals to exceed their basic responsibilities. Applied to waste management, this implied that residents with a strong sense of ownership over their community's waste practices were likely to be more proactive and diligent in managing waste sustainably. These findings underscore the importance of community ownership in adoption of sustainable waste management practices. Therefore, it was hypothesized that (Ho4) "Residents' ownership appraisal positively influences their engagement in sustainable waste management."

2.6. Conclusion

This chapter presented a review of literature on waste literacy and sustainable waste management. Based on the review, it was identified that, the rising global population, coupled with urbanization and economic growth, amplified the urgency for effective waste management. This study adapted the Protection Motivation Theory (PMT) as a conceptual framework to investigate waste literacy and sustainable solid waste management practices among residents in the Accra Metropolis in Ghana. A key notification based on the review of empirical and theoretical literature also showed a significant gap in literature in relation to waste literacy and sustainable waste management in a Ghanaian setting.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter outlines the methodology of the study used to collect data to understand waste literacy levels and sustainable solid waste management practices among residents in the Accra Metropolis. The methodology is structured under the following subheadings: study design, study location, target population, sample size and sampling procedure, data collection tools and procedures, pre-test, and data analysis procedures.

3.1 Study Design

The study used an explanatory sequential design, which is a type of mixed-method research that combines both quantitative and qualitative approaches. In an explanatory sequential design, data is first collected and analyzed through a quantitative phase, followed by a qualitative phase to help explain or elaborate on the quantitative results (Creswell, 2018). This approach was used because the study aimed to first assess waste literacy levels and sustainable waste management (SWM) practices using a quantitative method (e.g., survey), which could provide broad patterns and insights.

The quantitative phase allowed for the identification of general trends and relationships, such as the level of awareness and practice of SWM methods among residents. Following this, the qualitative phase was implemented to further explore and explain these trends by conducting in-depth interviews with key stakeholders. The qualitative data provided richer, contextual details that helped explain the patterns observed in the quantitative data. For example, it allowed the study to investigate why there was a gap between awareness and the actual practice of SWM, and to

explore barriers to sustainable waste management in greater detail. Refer to Figure 3.1. for a diagrammatical presentation of the study design.

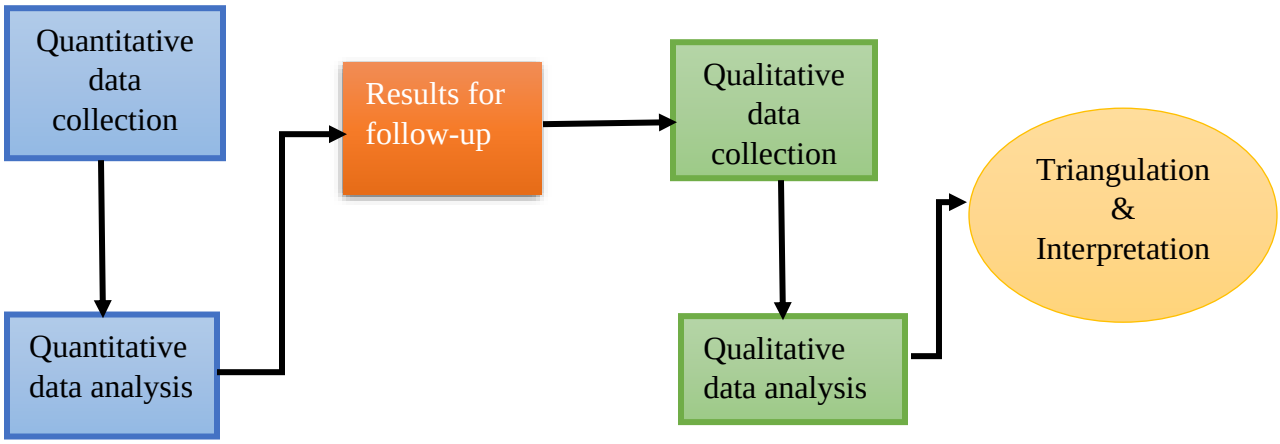
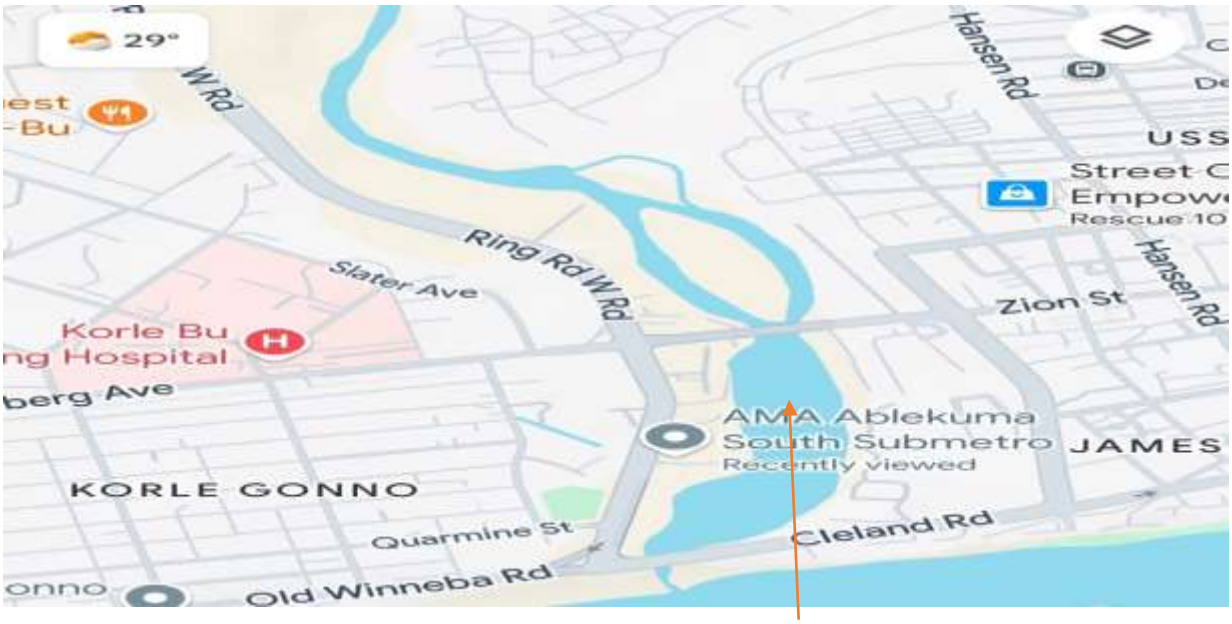


Figure 3. 1: Explanatory Sequential Design (Creswell & Creswell, 2018).

3.2 Study Location

The study was conducted within the Accra Metropolitan Assembly (AMA). AMA was chosen for the study because it houses the largest Metropolitan area in Ghana, where a wide array of waste collection and recycling activities could be observed. Since AMA was too large, the Ablekuma South Sub Metro was selected as the study location using the purposive sampling technique. This is shown in Figure 3.2.



Study area

Figure 3. 2: A Google map showing the study area- Ablekuma South Sub Metro.
(Source: www.googlemaps.com, 2024)

The Ablekuma South Sub Metro, a crucial part of the Accra Metropolitan Assembly (AMA) in Ghana, was selected purposively because of its economic significance (driven by dominant fishing and fish-mongering activities along the coastline), that has been resulting in waste management challenges. Diverse people within communities in this district were also likely to offer various perspective on waste literacy and sustainable solid waste management practices. The study location also has major markets (such as the Tuesday Market at Korle Gonno and Dansoman markets), with traders who generate and dispose of solid waste. There is also a land-fill site in this Metropolis which is shown in Figure 3.3. Thus, individuals in this study are likely to provide valuable information in relation to waste literacy and solid waste management behaviour.

Figure 3. 3: A Landfill site at Ablekuma South Sub Metro managed by IRECoP.

3.3 Target Population

The target population for this research comprised of:

i. All households in Ablekuma South Sub Metro. Households were targeted because day-to-day activities in these households resulted in waste generation that needed to be managed sustainably.

ii. All Officials from Public/Government Waste Management Department of Ablekuma South Sub Metro

iii. All Officials from Private Waste Management Agencies in the Ablekuma South Sub Metro.

3.4. Sample size and Sampling technique

The sample size and sampling technique for Household Heads, Public waste management officials and private waste management officials are presented in this section.

3.4.1. Households:

In determining the appropriate sample size for this study conducted in the Ablekuma South Sub-Metro, Accra, the Cochran's (2007) formula was utilized. This formula was chosen because it is a scientifically robust method capable of determining a sample size that is both precise and reliable, especially for large and known population sizes. The total accessible population (N) in this context refers to the total number of individuals in the study area from which the sample is drawn, in this case, 110,158. This figure represents the population size for the Ablekuma South Sub-Metro (based on the GSS – 2021 Population and Housing Census). The accessible population included individuals residing in 106,766 households.

The initial sample size calculation is as follows:

Sample size $n = \frac{z^2 \times p \times (1-p)}{e^2}$

Where:

Z = the Z-score corresponding to the desired level of confidence.

P = the estimated proportion of the population with the desired characteristic.

e = is the desired margin of error.

Therefore, the sample size was as follows:

Sample size (n) = $\frac{1.96^2 \times 0.5 \times (1-0.5)}{0.05^2}$

= 384.16

Thus, the initial sample size calculated was approximately 384.

Adjustment for Finite Population:

Since the total population (N = 110,158) is finite, the sample size was adjusted using Cochran's finite population correction formula

$$n_{adjusted} = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Where:

- N: 110,158 (Total accessible population)
- n_0= 384.16 (the initial sample size)

$$n_{adjusted} = \frac{384.16}{1 + \frac{384.16 - 1}{110{,}158}}$$

382.82

This adjustment resulted in a final sample size of approximately 383. To ensure comprehensive coverage and account for any potential non-responses or errors, the sample size was rounded up to 395 households for the purposes of this study.

In total, the study involved 395 households, 1 public waste management official, and 5 private waste management Officials. This ensured a comprehensive understanding of waste literacy and sustainable waste management practices in the Ablekuma South Sub – Metro was derived.

3.4.1.1 Sampling technique (Households)

The multi-stage sampling technique was employed to select Household Heads in the study area. The process involved several steps to ensure a representative sample of households in the Ablekuma South Sub-Metro was selected. There are six (6) Sub – metropolitan areas in the Accra Metropolitan area. The Ablekuma South Sub – Metro was selected using the purposive sampling technique, due to its relevance to the study and proximity to the researcher. There are five electoral areas in the Ablekuma Sub – Metro namely: Korle Gonno, Korle -Bu, Chorkor, Mamprobi and New Mamprobi. Out of these five electoral areas, three of them (i.e. Korle Gonno, Korle – Bu and Chorkor), were selected using the simple random sampling technique, to ensure each electoral area

had an equal chance of being included in the study. Specific areas in these three selected areas were selected using convenience sampling and these were:

i. **Korle Gonno:** - Old Nurses Quarters, Student Hostel, Police Barracks.

ii. **Korle-Bu**: - Kiss Meals, Sempe Road, Lighthouse.

iii. **Chorkor**: - Tea Gardens, Lantey Maami, Chemuenaa.

Finally, household heads were selected using the convenience sampling technique. To qualify as a study sample: individuals in household must have resided in the Ablekuma South Sub Metro for at least a period of one year. Such individuals who met the criteria were informed about the purpose of the study and those who volunteered to be part of the study, became the study sample. The sampling procedure for Household heads has been presented diagrammatically in Figure 3.4.

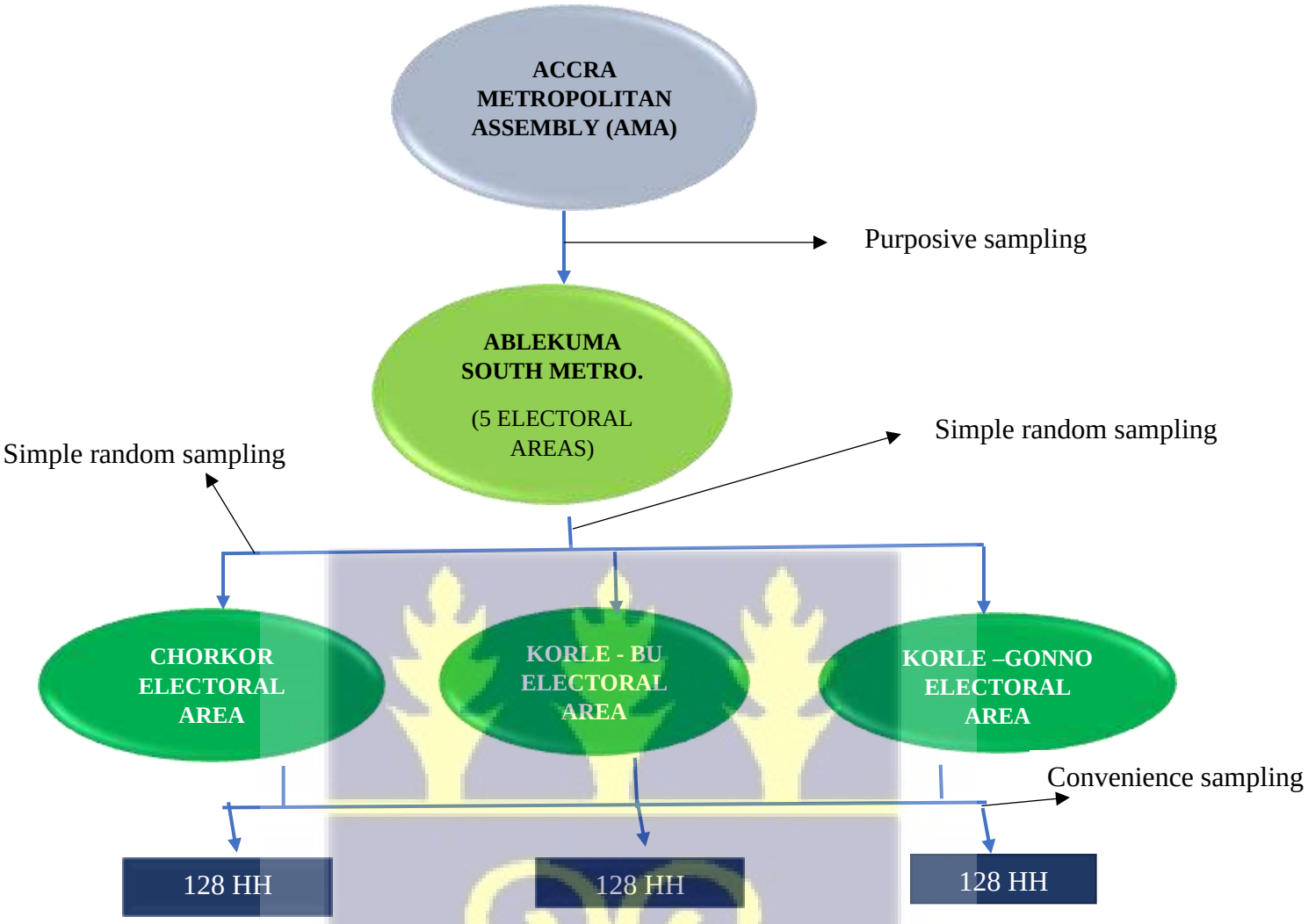


Figure 3. 4: The sampling procedure for Household Heads

3.4.2. Stakeholders from Public/Government Waste Management Department of Ablekuma South Sub Metro

The purposive sampling technique was used in selecting only one (1) Officials from Public or Government Waste Management Departments in the Ablekuma South Sub – Metro. The criteria used in selection of the study sample was that, the Official from the Waste Management Company or Institution must have worked for at least a period of one year in that company or institution; and

must volunteer and give consent to be part of the study. The first Official who volunteered to be part of the study was the study sample.

3.4.3. Stakeholders (Officials from Private Waste Management Agencies in the Ablekuma South Sub Metro.

With the private waste management agencies however, two of these in the Ablekuma South Sub Metro were selected using purposive sampling. There were:

i. Officials from Integrated Recycling and Compost Plant Limited (IRECoP).
ii. Officials from ZoomLion Ghana Ltd.

The purposive sampling technique was again used in selecting three (3) Officials from IRECoP and two (2) Officials from ZoomLion Ltd. The criteria used in selecting of the study sample was that the Official from the private Waste Management Company or Institution must have worked for at least a period of one year in that company or institution; and must volunteer and give consent to be part of the study. The first three (30 and two (2) officials respectively that volunteered from the two selected private waste management companies or institutions became the study sample.

3.6. Data Collection Tools

The data collection tools used in collecting both quantitative and qualitative data are presented in this section. This research used two (2) different data collection tools. These were a: Researcher administered questionnaire (for household heads) and Face-to- Face Interviews (for Officials of the sub metro and private waste management companies).

3.6.1. Researcher administered questionnaire

This data collection tool was used in collecting quantitative data. A researcher-administered questionnaire is a data collection tool in which the researcher or trained assistants directly ask respondents questions and record their answers. This approach ensured respondents understood the questions and answered them accurately. It is particularly useful in cases where participants may have varying literacy levels or when detailed explanations of questions were needed. This tool was chosen for the following reasons:

i. **Clarity and Accuracy**: By administering the questionnaire in person, the researcher was able to clarify any misunderstandings or ambiguities in the questions, ensuring that participants fully comprehended the content. This minimized the risk of misinterpretation that arose from self-administered questionnaires.

ii. **Higher Response Rate**: Researcher-administered questionnaires typically yield higher response rates compared to self-administered ones because respondents were more likely to complete the survey when guided by the researcher. The presence of the researcher encouraged engagement and ensured completion.

iii. **Suitability for Diverse Literacy Levels**: Given that some respondents may not have high literacy levels, having a researcher administer the questionnaire allowed for effective communication, ensuring that everyone, regardless of their reading ability, Participated in the study.

The questionnaire included a set of both open-ended and close-ended items and consist of five (5) sections which were linked directly to the research objectives of the study. Refer to Appendix 1 for a sample of the questionnaire. The subsections were:

i. Section A: General information about solid waste management
ii. Section B: Awareness and understanding of sustainable waste management and practices.
iii. Section C: Assessment of waste literacy levels
iv. Section D: Waste Management Problems.
v. Section E: Demographic characteristics

3.6.2. Face -to – face Interview

This Face-to – face interview data collecting tool was used in the collection of qualitative data. Face-to-face interviews are a qualitative data collection method in which the researcher directly engages with participants to ask questions and gather information. This approach allowed for in-depth discussions and enabled the researcher The issue under study more thoroughly, capturing nuanced perspectives that may not emerge through surveys alone. This data collection tool was chosen for several reasons:

i. **In-Depth Insights**: The face-to-face interviews facilitated a deeper understanding of participants' views, experiences, and challenges regarding waste management. They allowed respondents to elaborate on their answers, providing richer qualitative data that revealed underlying issues and themes.
ii. **Building Rapport**: Conducting interviews in person helped build trust and rapport between the researcher and participants. This led to more open and honest responses, enhancing the quality of the data collected.

iii. **Flexibility:** The face-to-face format allowed researchers to adapt their questioning based on the flow of conversation, encouraging participants to share additional thoughts or insights that may not have been anticipated in original questions.

The face-to-face interviews were used to collect data from the institutions and key stakeholders in Ablekuma South Sub Metro. It was used to gather institutional insights and practical perspectives on the challenges encountered in waste disposal and management. Additionally, this interview guide helped gather information to validate and evaluate the opinions shared by respondents. Refer to Appendix II for a sample of the Interview Guide. The sub-sections of the Interview guide were:

i. Section A: Challenges in Waste Management
ii. Section B: Waste Generation and Collection
iii. Section C: Sustainable Waste Management Practices
iv. Section D: Waste Literacy
v. Section E: Overall Improvement and Recommendations

3.7. Procedure for Data Collection

The procedures followed in collection of data from both household heads and from stakeholders in public and private waste management companies or institutions are presented in this section.

3.7.1. Procedure for Data Collection in Household Heads

Ethical clearance was sought from the Ethics Committee of the College of Basic and Applied Sciences (CBAS), and approval was granted on April 22, 2024, for conducting the study (see Appendix for a sample of the ethical clearance letter, ECBAS 045/23-24). Following this approval, an introductory letter was obtained from the Department of Family and Consumer Sciences, which

was presented to the Accra Metropolitan Assembly (AMA) to seek permission for conducting the study. Once permission was granted, the researcher and her three enumerators visited the three selected areas in the Ablekuma South Sub-Metro: Chorkor, Korle-Bu, and Korle-Gonno. The data collection procedure involved the following steps:

- **Starting Point:** The team began at the taxi rank in Korle-Bu, a busy area with high foot traffic, to identify potential respondents.
- **Systematic Approach**: From the taxi rank, the team moved to the nearest households on the right side of the street. Enumerators approached households sequentially, seeking out those who had been living in the area for at least one year, as per the study's criteria.
- **Informed Consent**: Upon reaching each household, enumerators introduced themselves, explained the purpose of the study, and provided information about the data collection process. They ensured that participants understood that their involvement was voluntary and that their responses would remain confidential.
- **Selection of Participants:** If multiple heads were present in a household, the enumerators randomly selected one individual to participate in the study. This method ensured that each household had an equal chance of being represented.
- **Data Collection:** After obtaining informed consent, enumerators administered the questionnaire. They recorded responses on the spot to minimize any biases or inaccuracies that could arise from memory recall.
- **Completion of Sample Size**: The process continued until the targeted sample size of 395 households was achieved, ensuring a diverse representation of respondents from the selected areas.

The procedure for data collection is presented diagrammatically in Figure 3.5.

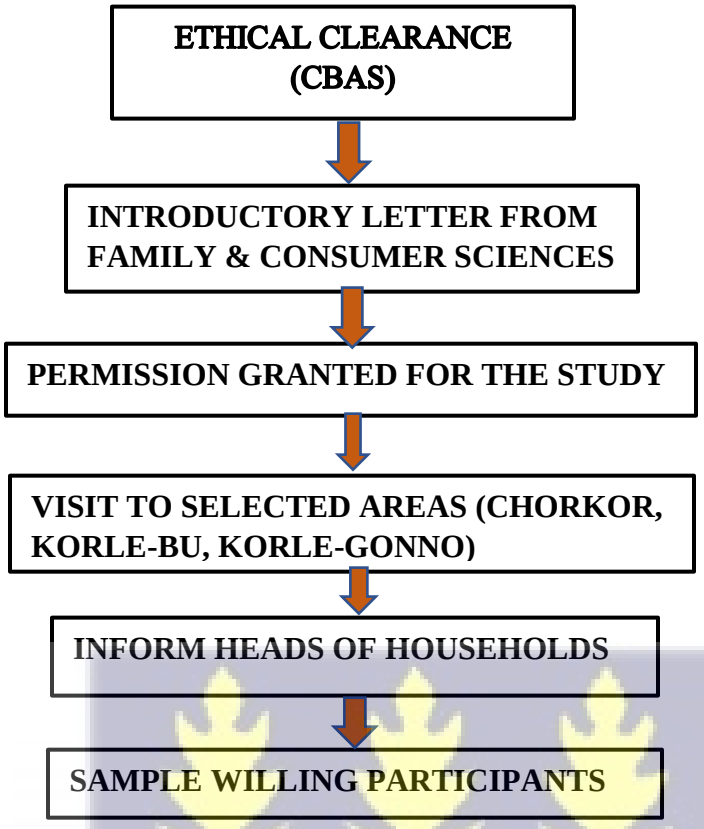


Figure 3. 5: Procedure for data collection

3.7.2. Procedure for Data Collection from public/private officials in waste management Companies/ Institutions

Ethical clearance was sought from the Ethics Committee of the College of Basic and Applied Sciences (CBAS), and approval was granted on April 22, 2024, for conducting the study (Refer to Appendix A for a sample of the ethical clearance letter, ECBAS 045/23-24). Following this approval, an introductory letter was obtained from the Department of Family and Consumer Sciences, and presented to the Accra Metropolitan Assembly (AMA) to seek permission for conducting the study. Once permission was granted, the researcher and her three enumerators followed these steps to collect data from officials in public and private waste management institutions in the Ablekuma South Sub-Metro:

i. **Identification of Institutions**: The team identified two selected private waste management companies (Integrated Recycling and Compost Plant Limited (IRECoP) and ZoomLion Ghana Ltd) and one public waste management institution to approach for the study using the purposive sampling.

ii. **Initial Contact**: Upon arrival at each institution, the team first approached the Public Relations Officer (PRO) or the designated representative. They presented the introductory letter and explained the purpose of the study, emphasizing the relevance of gathering insights from waste management professionals.

iii. **Scheduling Interviews:** After informing the PRO about the study, the team arranged a suitable time to conduct interviews with officials from the respective institutions. This scheduling was done to ensure that officials were available and could participate without interruptions.

iv. **Informed Consent:** Before commencing interviews, informed consent was sought from the selected officials. The researchers ensured that participants understood the study's purpose, their rights to confidentiality, and their ability to withdraw from the study at any time without consequences.

v. **Conducting Interviews:** The interviews were conducted using the face-to-face interview guide. The enumerators asked questions from the guide, allowing for follow-up questions based on responses to gain deeper insights into the challenges faced in waste management and the institutional practices observed.

vi. **Documentation of Responses:** Responses were recorded using audio recorders (with permission) and notes to ensure accurate capturing of information. This allowed for thorough analysis and validation of data collected.

vii. **Completion of Sample Size**: Data collection continued until the team gathered responses from 5 officials from the private sector and 1 official from the public sector. This ensured a comprehensive understanding of the perspectives and experiences in waste management practices.

3.7.3. Other Data Collection Procedures

Apart from the data collection procedures indicated in Sections 3.7.1. and 3.7.2., other procedures followed to ensure confidentiality included: informed consent procedures; confidentiality measures; potential risks to participants; motivation; procedure for withdrawal from the study.

3.7.3.1. Informed Consent Procedures

Participants were fully informed about the purpose, procedures, and potential impacts of the study. Each participant was given an informed consent form that explained the study in detail, including their rights and any potential risks. They were assured that their participation was voluntary, and they could withdraw at any time without any consequences. Their informed consent was obtained before data collection.

3.7.3.2. Confidentiality Measures

Participants were assured that their identity and privacy would be protected throughout the study. Pseudonyms (unique identification numbers) were used instead of actual names to ensure confidentiality. All information provided by participants was securely stored under lock and key, accessible only to the researcher.

3.7.3.3. Potential Risks to Participants

While there was no physical harm associated with this study, some questions may cause discomfort. Participants were informed that if they felt uncomfortable at any time during the interview, they would be allowed time to compose themselves. The research team was trained to handle such situations with sensitivity.

3.7.3.4. Motivation

To acknowledge the time and effort participants spent in conducting this study, each participant received GH₵ 5.00 worth of airtime as a token of gratitude following the interview. This small compensation aimed to show appreciation without creating undue influence on their willingness to participate.

3.7.3.5. Withdrawal from Study

Participation in the study was entirely voluntary. Participants were informed that they could withdraw from the study without any negative consequences. They were also assured that if they decided to withdraw from the study at any point, they could do so freely, and any data collected from them up to that point would be excluded from the final analysis.

3.8. Research Assistants

Three (3) Research Assistants assisted the Researcher with data collection. These were National Service Personnel with the necessary research experience. The Research Assistants were selected based on specific criteria, including possessing a first degree, research experience, proficiency in local languages, and interpersonal communication skills. The training provided to the Research Assistants by the Researcher was comprehensive and aimed at ensuring data quality and

consistency. It covered various topics to equip the Research Assistants with the necessary skills to effectively collect data and maintain consistency throughout the study. The topics included:

i. **Specific Objectives of the Study**: Research assistants were briefed on the overall goals and objectives of the research to ensure alignment in data collection efforts.

ii. **Contacting Respondents and Introducing the Study:** Guidelines on how to approach and engage with respondents were provided to ensure a standardized approach in data collection.

iii. **Questioning Techniques:** Training on how to ask questions in a consistent manner to ensure all relevant information is gathered uniformly.

iv. **Protocols for Addressing Insufficient Responses**: Procedures to handle situations where respondents provide incomplete or unclear responses were outlined to maintain data accuracy.

To ensure data quality and consistency, the following were employed:

i. **Supervision:** Research assistants were trained to collect data with minimum or no supervision, but the researcher intermittently performed random spot checks to verify adherence to questionnaire administration protocols and accurate recording of responses.

ii. **Language Proficiency:** Research assistants were required to have a high level of proficiency in local languages (Ga & Adangbe, Akan and Ewe) spoken in the Ablekuma South Sub Metro to ensure accurate communication with participants.

iii. **Confidentiality and Sensitivity:** Training sessions emphasized the importance of maintaining confidentiality in accurate data collection, and sensitivity to ensure participants felt comfortable and willing to provide information.

iv. **Cultural Sensitivity:** Research assistants were trained to be culturally sensitive in their interactions with participants to ensure data collection was conducted respectfully and effectively and in a way that suited cultural sensitivity of respondents.

3.9. Pre-Test

Once a data collection instrument is designed, it must be pre-tested under practical conditions to reveal any inadequacies and verify the clarity of items in the data collection tools. The questionnaire was pre-tested on ten (10) household heads in Mamprobi, selected using the convenience sampling technique. Purposive sampling was used to select two (2) officials from waste management institutions. They were chosen because they shared similar characteristics with the final study sample. The pre-test revealed several key insights:

1. The use of a researcher-administered questionnaire was found to be more effective than a self-administered questionnaire.
2. The pre-test helped determine the optimal time of day for administering the questionnaire, which was found to be between 4 PM and 6 PM. This timing was chosen as it aligned with residents' availability after work hours, maximizing response rates and participant engagement. On average, each interview took approximately 10 to 15 minutes to complete.
3. The pre-test revealed that participants felt bored and disengaged when faced with lengthy questionnaires. To address this, the questionnaire was streamlined by:
    - **Reducing the number of questions**: Some less critical questions were eliminated to focus on the most relevant topics.
    - **Rephrasing questions for clarity**: Complex or redundant questions were simplified or combined, making them easier to understand and quicker to answer.

4. Some participants initially mistook the researcher for a town council worker, fearing potential repercussions, which made them reluctant to answer the questions. However, once the purpose of the study was explained, it alleviated their fears and built trust between the participants and the researchers or research assistants.

In addition to the above, the following adjustments were made in the data collection process:

1. The length of the questionnaire was reviewed and potentially shortened to maintain participant interest and avoid boredom. This was achieved by:
    - Identifying redundant questions that could be combined or removed without losing essential information.
    - Prioritizing questions based on their relevance to the research objectives, focusing on those that provided the most valuable insights into waste literacy and management practices.
2. Clear communication strategies were developed to reassure participants about the researcher's identity and the purpose of the study, thereby fostering trust and willingness to participate. These strategies included:
    - Providing identification to participants, including a copy of the ethical clearance letter and introductory letter from the Department of Family and Consumer Sciences.
    - Explaining the study's purpose in simple terms, emphasizing its significance for improving waste management practices in their community and how their participation would contribute to positive change.
    - Assuring confidentiality of their responses and clarifying that their participation was voluntary, further encouraging openness and honesty during interviews.

3.10. Data Analysis and Presentation.

This section describes how quantitative and qualitative data was analysed and presented.

3.10.1. Quantitative data (Researcher Administered Questionnaire)

Data obtained from the questionnaires were coded, edited, entered, and analysed using the Statistical Package for the Social Sciences (SPSS) Version 23. This statistical tool facilitated the use of both descriptive and inferential analytic techniques, such as calculating means and standard deviations. Pearson Product Moment Correlation was employed to determine the relationships between dependent and independent variables. Inferential statistics, such as multiple regression tests, were used to identify associations or relationships between waste literacy and sustainable waste management behaviours practiced by residents. The data was presented in the form of tables, charts, and graphs.

Threat appraisal score: This was derived as a composite measure that combined perceived severity and perceived vulnerability. Specifically, perceived severity was assessed through responses to items 1 to 4, and perceived vulnerability was evaluated by items 5 to 7. The composite score was then calculated by averaging or summing these items, representing the overall threat perception of the respondents.

Coping appraisal score: This was a composite measure that included response efficacy and self-efficacy. Specifically, response efficacy was evaluated by items 8 to 10, while self-efficacy was assessed through responses to items 11 to 13. The composite score was calculated by summing or averaging these items, representing the overall coping appraisal of the respondents.

Ownership appraisal score: This was derived as a composite measure that included residents' sense of responsibility and pride in managing waste. This score was calculated by summing or averaging responses to items 14 to 18, which assessed various aspects of personal responsibility, commitment, and long-term environmental considerations related to waste management.

3.10.2 Qualitative data (Interview Guide)

Qualitative data was collected using an interview guide. The proceedings of the interview were recorded using an audio recorder. After the interviews, the researcher categorized similar answers (identified themes and sub-themes) to streamline the analysis process. The grouped responses were analyzed to identify patterns, commonalities, and recurring themes (Rädiker & Kuckartz, 2020). This method enabled the researcher capture and understand diverse perspectives and experiences related to waste literacy and sustainable waste management from the perspective of waste management companies.

3.11. Chapter Summary

The methodology section of the study on waste literacy and sustainable waste management practices in the Accra Metropolitan Assembly (AMA) provided a detailed outline of the research design, data collection methods, and procedures for data analysis. The study employed a mixed method design, combining quantitative and qualitative data collection techniques to gain a comprehensive understanding of waste management practices. The research was conducted in the Ablekuma South Sub Metro, focusing on households and officials from waste management institutions. The study design involved the use of survey questionnaires and in-depth interviews to collect data. The sampling technique included multi-stage sampling to ensure a representative sample of individuals in households in the study area. Ethical considerations were addressed

through informed consent procedures, confidentiality measures, and participant compensation. Research Assistants were carefully selected and trained to facilitate effective data collection.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0. Introduction

This chapter presented and discussed the results of the study. It was divided into sections based on the research objectives as follows: socio-demographic characteristics of respondents, respondents' awareness about sustainable waste management, respondents' sustainable solid waste management practices, waste literacy levels, and barriers or challenges residents encountered in adopting sustainable waste management behaviours.

4.1. Demographic Characteristics of Study Respondents

This section presents the demographic characteristics of respondents. The factors include gender, age, ethnicity, marital status, educational levels, number of children, household population, occupation, and respondents' monthly income, as shown in Table 4.1. It can be deduced from Table 4.1 that a more significant percentage (53%) of the household respondents were females. The predominance of female respondents was primarily due to the perception that waste handling was a female-oriented household chore (Kanhai et al., 2019). This finding aligns with the studies by Kanhai et al. (2019), who noted that while any household member could dispose of waste, it was commonly seen as the responsibility of women. Additionally female respondents were better able to provide detailed information about household waste generation and management practices than males (Kanhai et al., 2019).

In terms of age distribution, the majority of respondents (50%) were in the 20-30 years age group. Research by UNEP (2019) supported this finding, highlighting that younger individual tended to be more environmentally conscious and proactive in sustainable practices, including waste

management because many younger individuals have received education on environmental issues as part of their formal schooling, which emphasizes sustainability and the importance of waste management practices.

In terms of the ethnic composition, 46% of respondents were Ga. This is mainly because the study was conducted in a Ga Community, which reflected the (GSS- 2021 Population and Housing Report, 2021). About two-thirds of respondents were single (60%). A significant portion of respondents (91%) had formal levels of education, with the main one being tertiary education (37%). Education is a substantial factor in sustainable waste management practices (Budihardj et al., 2021). Most respondents had fewer than three children (71%). Regarding occupation, less than half (44%) were self-employed in professions like business, Fishermen/farmers. Respondents' incomes ranged from less than GH₵ 300 to above GH₵ 5,000. Most respondents (85%) reported having less than GH₵ 1,000 income. This is in line with information from GSS (2021) that indicated that the monthly average cash income in Accra was nearly GH₵ 1,000.

Socio-demographic factors such as age, gender, marital status, educational level, occupation, and income were considered, as they can affect individuals' perceptions, attitudes, and vulnerability to fulfilling their responsibilities (Shih et al., 2022). These variables were, therefore, essential for understanding waste management practices.

Table 4. 1: Background Information of Respondents

Demographic characteristics	Frequency (n= 395)	Percentage (%)
Gender		
Female	211	53
Male	184	47
Age Group		
20-30	199	50
31-40	59	15
41-50	51	13
>50	47	12
< 20	39	10
Ethnicity		
Ga & Adangbe	181	46
Akan	119	30
Ewe	53	13
Others (e.g. Northerners, Krobo)	42	11
Marital Status		
Single	237	60
Married	133	34
Divorced	13	3
Widowed	12	3
Educational Level		
No formal	37	9
Basic (Primary/ JHS/JSS)	83	21
Secondary (SHS/SSS)	108	27
Vocational/Technical	21	5
Tertiary (Universities/Polytechnics)	146	37

Number of Children		
<3	279	71
3-4	78	20
5-6	22	6
>6	16	4
Household Size		
0-5	147	37
6-10	109	28
>20	61	15
11-15	44	11
16-20	34	9
Occupation		
Unemployed	147	38
Self-employed	175	44
Government Employed	73	18
Average Monthly Income (Cedis)		
<1000	332	85
1000	36	9
>1000	27	6

4.2 General Information about Solid Waste Management

Solid waste management involves collecting waste from various sources, transporting it, treating it, analysing it, and ultimately disposing it (Khan et al., 2022). This section presents respondents general information about solid waste management. It includes information about: types of waste generated; waste storage and management; solid waste collection and disposal; time spent to dispose of waste at designated collection points; frequency of waste collection.

4.2.1. Types of Waste Generated

Waste arises primarily from human activities involving the consumption and disposal of unwanted materials (Choi, 2016; Danuor, 2022). It is widely acknowledged that individuals generate and dispose of waste in various forms (Meng et al., 2019). In this study, respondents indicated various types of waste was generated in their households as shown in Table 4.2., with the most significant one being plastic/rubber waste materials (i.e., Polybags/takeaways, plastic bottles, water sachet bags, plastic bowls, food take-out packs) being the most significant waste generated in the area by 78% of respondents. This finding is contrary to the Environmental Protection Agency (2019) report, that indicated paper was the primary type of waste generated. However, in this study, the primary waste was plastic/rubber (78%).

The prevalence of plastic/rubber waste materials was as a result of the kinds of businesses (i.e., markets, shops, food joints) found in the study area. These businesses required the packaging of their goods. For instance, takeaway services have been over-reliant on plastic/rubber waste and this has contributed to the accumulation of this non-degradable waste. This assertion was corroborated by (Ahmed et al., 2018), who also realized the growing environmental concerns associated with unchecked urbanization and the accumulation of non-degradable wastes like plastics and rubber waste in urban areas.

Table 4. 2: Types of Waste Generated by Household

Types of Waste	Components	Frequency (n=395)	Percentage (%)
Plastic/rubber waste	Polythene bags, plastic bottles, water sachet bags, plastic bowls, food take-out packs	308	78
Organic waste/kitchen wastes	Food leftovers, green leaves, root and tuber peels, animal waste	266	67
Paper/cardboard waste	Paper used, toilet paper, scratch cards	206	52
Metals	Metal/aluminium cans, scrap metals, pots	177	45
Glass/bottles/ceramics	Ceramic cups, tiles, drinking bottles, louvre blades	51	13
Textiles/wardrobe waste	Cloths, bags	4	1

*Multiple responses observed
(**Source**: Field Work 2024).

The finding in Table 4.2., was also confirmed by key informants (i.e. waste management companies). They confirmed the waste they collected was what respondents in households explained they generated and that plastics were the main type of waste collected. This assertion could be deduced from these excerpts or quotes:

> *"We primarily collect food waste, plastic bags from markets and clean-up exercises, and paper and plastic bottles. These materials are the most common types of waste we encounter during our collections" (**R1, Field Data, 2024**).*
>
> *"We often deal with a large amount of plastic waste, especially water sachets and takeaway containers, which are very common in this area. Organic waste, like food scraps, is also a big part of what we collect, particularly from households and local markets" (**R2, Field Data, 2024**).*
>
> *"Besides the typical household waste, we also see a lot of cardboard and paper waste, especially from businesses and shops. These materials and plastic bottles and bags form the bulk of our collections on most days" **(R3, Field Data, 2024).***

4.2.2 Waste Storage and Management

In many areas of Ghana, challenges exist at every stage of solid waste management. That is from waste generation and storage to collection, transportation, and disposal (Yoada et al., 2014). The existing waste storage and disposal facilities are often insufficient to handle the volume and type of waste produced. Household solid waste is challenging to store due to its diverse composition (Abdel-Shafy & Mansour, 2018). Therefore, this study evaluated the methods households use to store their waste materials. It is presented in Table 4.3. It showed respondents used a variety of waste storage methods with 38% using the dustbin and 1% using wooden boxes. This assertion was also confirmed by Fagariba & Song (2016), in their study that also found dustbins as the main waste storage method in the Accra Metropolis.

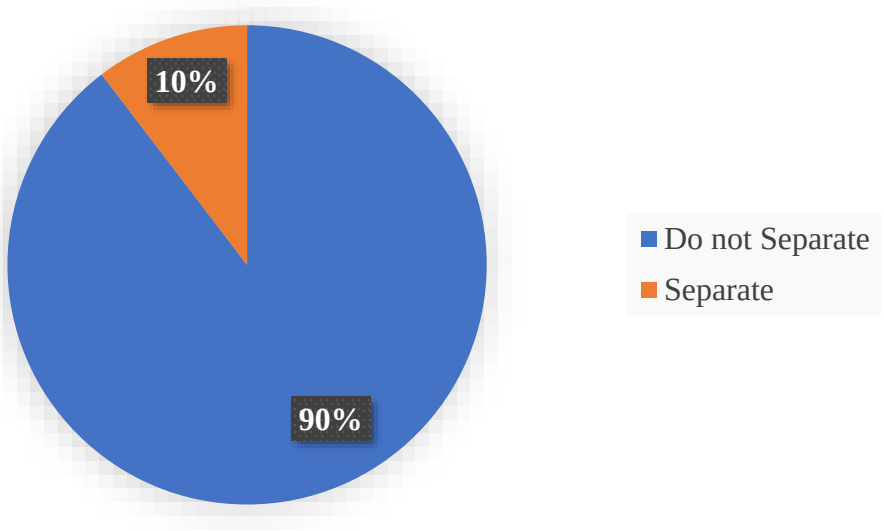
Table 4. 3: Waste storage methods used by respondent before waste disposal

Storage Facility	Frequency (n=395)	Percentage (%)
Dust bin	150	38
Bucket	100	25
Zoomlion container	48	12
Head Pan	40	10
Polythene bag	35	9
Basket	20	5
Wooden box	2	1

(**Source**: Field Work 2024)

Figure 4. 1: Household waste storage containers provided by ZoomLion Ghana Ltd.

A sustainable way of waste storage and disposal is by separating the waste (i.e. mainly degradable from non-degradable waste). Respondents were therefore asked if they did separate their waste. Their responses as presented in Figure 4.2. revealed the majority (90%) did not engage in this practice. This corroborates findings by Almasi et al. (2019), who also found out that only a few Ghanaians practiced waste separation.



(n = 395)

Figure 4. 2: Waste Separation Practice
(**Source**: Field Work 2024).

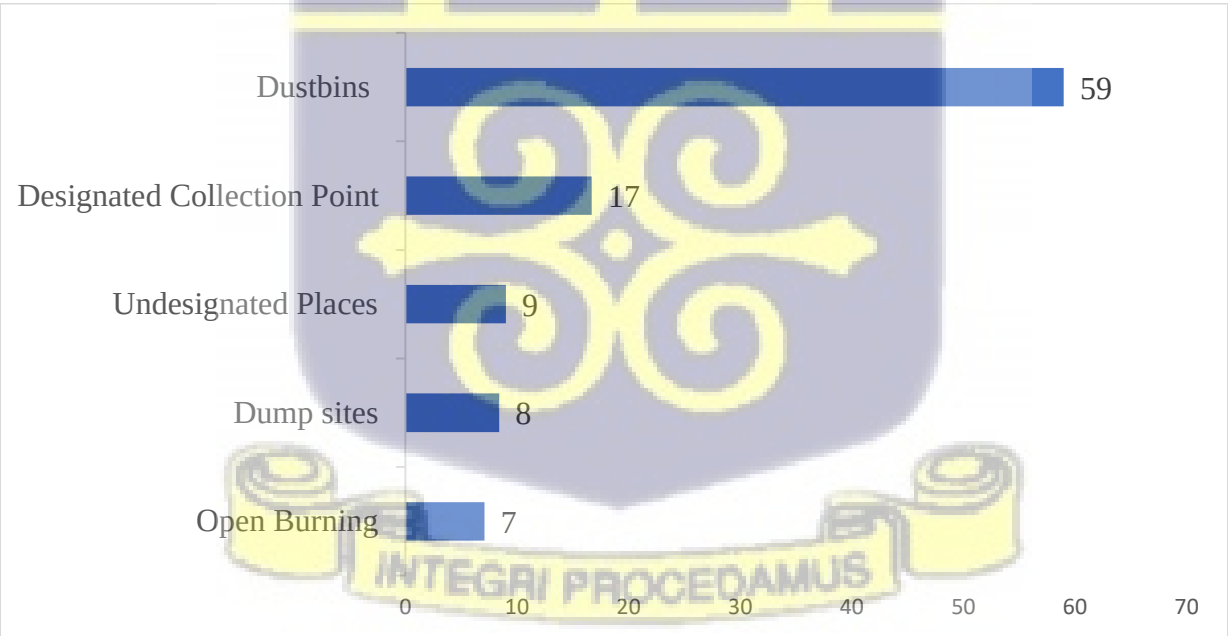
The minority (10%) that indicated they separated their waste explained this was done mainly to prevent liquid waste from contaminating the contents in the containers or bins, since this could produce an unpleasant odour. Additionally, some respondents separate plastic containers for reuse (e.g. as water containers or storing palm oil, groundnut oil, and other kitchen ingredients). Another respondent explained:

> *"I store food wastes, such as plantain and cassava peels, for domestic animals such as goats and sheep, so those are not added to the general waste bin."* ***(Household 20. Field data, 2024)***

It must be noted that the practice of waste separation not only improved the household environment but also had a positive impact on the larger ecosystem.

4.2.3 Solid Waste Collection and Disposal

The method of waste disposal is crucial for effective waste management and environmental protection (Guo et al., 2021). This study evaluated how waste was collected and disposed of in households in the survey. Their findings as presented in Fig 4.3. indicated respondents had a variety of ways to dispose of their waste with 59% of the surveyed households primarily relying on dustbins for waste disposal. Dustbins were therefore identified as an accessible infrastructure for waste disposal in the area. This is similar to findings by Richard et. al., (2021), who also realised that most households used dustbins for waste disposal, as well as designated collection points as confirmed by Anaman and Nyadzi (2015). It is worth noting that disposal of waste at undesignated places and open burning were not sustainable modes of waste disposal since they were significant contributors to air and environmental pollution. Households need to be sensitized to avoid such unsustainable practices.



(n = 395)

Figure 4. 3: Method of Waste Disposal
(**Source**: Field Work 2024).

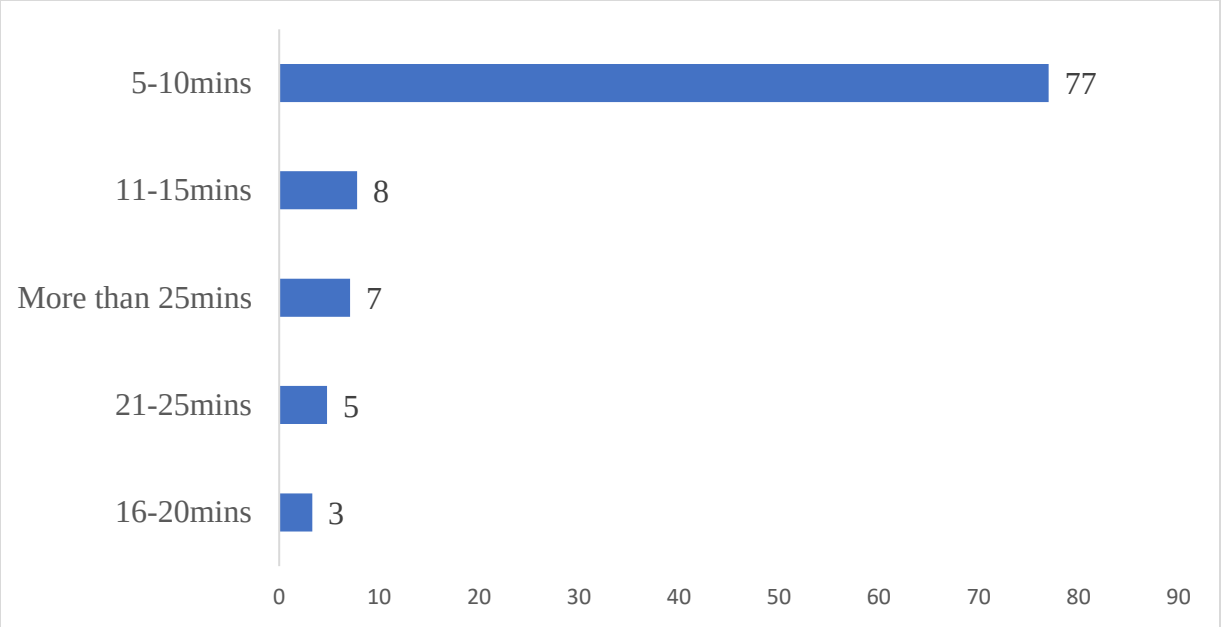
Figure 4. 4: Public solid waste dumping container at designated collection point

Figure 4. 5: Picture of Korle-Bu waste dumping site

4.2.4 Time spent in disposing of waste at designated collection points

The time spent disposing of waste is a critical factor for efficient waste management since the convenience of the waste disposal process could significantly impact people's willingness to participate in waste management. Travelling long distances to dispose of waste at dumping or container sites can be frustrating and discouraging (Adjei, 2013) thus the researcher ascertained the length of time spent in disposing of waste mainly at designated collection points. It was deduced as presented in Fig. 4.6 that a majority, representing 77%, travelled between 5 - 10 minutes to dispose of their waste at designated skip sites. These respondents further confirmed that they disposed of their waste regularly because of the proximity of their homes to these dumping sites. They indicated the close proximity of dumping sites to homes was beneficial, convenient, and time-saving, since it allowed people to dispose of their waste quickly and properly when necessary.

Those respondents who lived far from dumping sites explained disposal of waste was a challenge so they resorted to alternative methods waste disposal methods such as: paying others to transport their waste to the dumping site, digging large trenches on their property if there was available land, or open burning of their waste. To such respondents, there is a need for them to use more accessible waste disposal options.



(n = 395)

Figure 4. 6: Time spent to dispose of waste at designated skip sites
(**Source**: Field Work 2024)

4.2.5. Frequency of waste collection

Regular waste collection is a cornerstone of effective solid waste management (Azevedo et al., 2021). The survey therefore provided data on the frequency of waste collection within a week. The findings as presented in Table 4.4. showed with the exception of 18% of respondents who indicated their waste was collected throughout the week (daily), 82% had their waste collected infrequently. Those who had their waste collected throughout the week were those in residential areas like Korle – bu.

Ideally, waste is supposed to be collected daily. Waste collection for longer durations (i.e., more than a day) could be attributed to the extensive nature of the municipality and the limited resources available for daily waste collection (Denteh et al., 2017). Infrequent waste collection (especially the one with degradable waste) not only results in an unsightly environment (because the bins/skips

get so full or are heaped and overflow), but also results in foul odour and become a breeding ground for pests (e.g. rodents, flies, cockroaches). This condition also poses a health risk to individuals in households especially if these dumping sites are close to places of residence.

Table 4. 4: Frequency of waste collection

Waste Collection Frequency	Frequency (n = 395)	Percentage (%)
Once	135	34
Twice	104	26
Thrice	46	12
Four times	16	4
Five times	11	3
Throughout	69	18
Once a while	14	4

(**Source**: Field Work 2024).

From a key informants (Assembly members) perspective, in addition to they providing a designated place for waste disposal (i.e. big skip/container), the Assembly collected waste daily in the study area. He opinionated that:

> *"Waste is collected every day from the various skip (containers) at the designated areas" (R4, Field Data, 2024).*

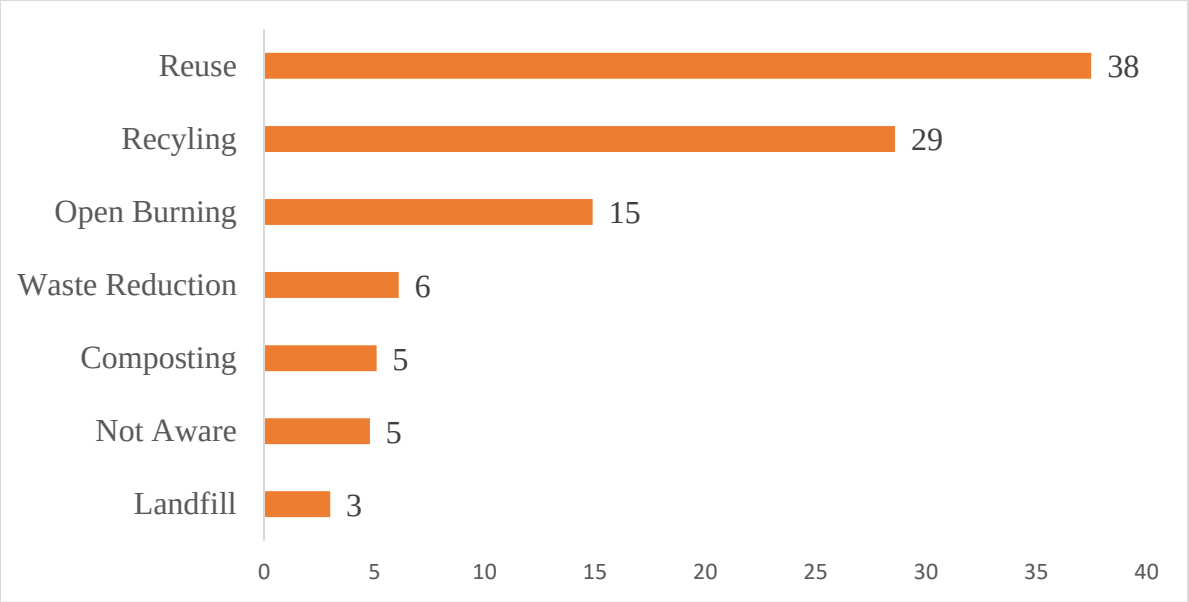
What this suggests was that individuals in households' assertions differed from that of key informants. Personal observation by the researcher corroborated what the individuals in households said about infrequent collection of waste in the study area. She further observed that households with poor road network faced more challenges with waste disposal than those who lived in areas with good road network.

4.3. Sustainable Waste Management (SWM).

According to Nunoo (2019), sustainable waste management represents a holistic approach to evaluating and refining waste management systems. Understanding sustainable waste management (SWM) is crucial for developing effective strategies to handle waste in environmentally friendly ways. It is closely linked to reducing waste (Cobo et al., 2018). The researcher therefore gathered data in relation to respondents' understanding of sustainable waste management and these are presented based on the following sub-headings: knowledge, awareness and practice of sustainable waste management; sources of information about SWM; and reasons for practicing SWM.

4.3.1. Knowledge, Awareness and Practice of Sustainable Waste Management (SWM)

Respondents were asked to indicate whether they had ever heard of sustainable waste management (SWM). A significant majority (81%) confirmed awareness of the concept, and 95% were able to identify one or more SWM practices. Figure 4.7 shows that the most commonly cited practices were reuse (38%) and recycling (29%). These findings are consistent with Agamuthu and Babel (2023) and Ali et al. (2021), who also found reuse and recycling to be the most favoured SWM strategies. Interestingly, 15% of respondents considered open burning to be a sustainable practice, which is a misconception since it contributes to air pollution. The World Bank (2016) reported that over 90% of waste in low-income countries, including Ghana, is openly burned or deposited in unregulated landfills, both of which are unsustainable.



(n=395)

Figure 4. 7: Respondents Awareness of Sustainable Waste Management Practices
(**Source:** Field Work 2024)

Key informants (waste management company officials) also demonstrated awareness of SWM and reported that they practised the 3Rs—reduce, reuse, and recycle. One official explained:

> *"Sustainable waste management means recycling, composting, reuse, and landfill, and that is what our company does."* **(R5, Field Data, 2024).**

When respondents were asked about their actual practices, however, a clear gap emerged. Table 4.5 shows that while 72% were aware of reuse, only 46% practiced it; similarly, 71% were aware of recycling, but only 29% practiced it. Open burning was reported by 31% as a current practice, despite 67% being aware of it as a method. A chi-square test revealed a statistically significant relationship between awareness and practice ($\chi^2 = 21.385$, df = 5, p = 0.000685), suggesting that awareness was associated with, but did not guarantee, practice.

Table 4. 5: SWM Method Currently Aware and Practices

SWM Method	Aware (n=395)	Practice (n = 395)
Reuse	286 (72%)	180 (46%)
Recycling	282 (71%)	114 (29%)
Open Burning	261 (67%)	123 (31%)
Composting	259 (66%)	89 (23%)
Landfills	250 (63%)	100 (25%)
Waste Reduction	233 (59%)	126 (32%)

(**Source:** Field Work 2024)

These results demonstrate an awareness–practice gap: while most respondents were aware of sustainable practices, fewer implemented them. Several factors helped explain this discrepancy. First, infrastructural limitations were widely reported. Respondents noted a lack of recycling facilities, insufficient waste bins, and infrequent collection services. Secondly, socio-cultural norms continued to normalise indiscriminate dumping, with many perceiving waste management as the responsibility of municipal authorities rather than households. Thirdly, convenience and cost played a role, as some households found it easier or cheaper to dispose of waste improperly than to separate or recycle it. These findings echoed Debrah et al. (2021), who emphasised that high awareness did not automatically translate into sustainable behaviour in Ghanaian urban contexts.

4.3.2. Sources of information about sustainable waste management

The sources through which respondents gain information about sustainable waste management are essential for assessing the reach and effectiveness of various messages communicated (Idamah, 2015). Table 4.6 presented the different sources of SWM information among respondents. It showed the mass media (TV, Radio, Posters) were the most common source of information. This

is in line with findings by Otinga (2014), which showed that the media, including TV and radio, were powerful tools for raising awareness about environmental issues, including SWM. Educational institutions play a crucial role in shaping ecological attitudes and behaviours, as highlighted by research on environmental education (Reid et al., 2021). Education was also a key source of SWM information identified in this current study. According to Oduro-Kwarteng and van Dijk (2013), community engagement through public meetings is essential for fostering collective action and local solutions to waste management problems. This was a source of SWM for a minority (25%) of respondents.

Table 4. 6: Source Information about SWM

Sources of Information	Frequency (n =312)	Percentage (%)
Tv	134	43
School	108	35
Radio	95	30
Public Meeting	78	25
Poster	23	7
Friends	12	4

(**Source**: Field Work 2024).

4.3.3 Reason for Practising Sustainable Waste Management

People have different reasons for accepting or adopting practices. The respondents were asked to indicate why they practised sustainable waste management. These specific reasons are presented in Table 4.7. The main reason, cited by 72% of respondents, was to minimise waste generation. This reason was also identified in studies by Pujara et al. (2019) and Wan et al. (2019) as the main reason for practicing sustainable waste management. Another notable reason for practicing SWM indicated by 48% of respondents was to improve environmental health by reducing pollution. This

reason aligned with Sustainable Development Goal (SDG) 3, that states we need to "ensure healthy lives and promote well-being for all ages." Through sustainable waste management practices SDG 3 could be attained to an extent since it would help reduce air, water and soil pollution (a significant factor in the prevalence of respiratory and water borne diseases, and adverse pollution related health conditions).

Table 4. 7: Reasons for Practising Sustainable Waste Management

Reason	Frequency (n=385)	Percentage (%)
Minimise waste generation	277	72
Cost effectiveness	198	51
Improve environmental health	184	48
Reduce soil pollution	124	32
Economics gains (create jobs)	121	31
Positive social impact (improved quality of life)	101	26
Reduce the need for chemical fertilisers	79	21
Managing and requiring less space for disposal	65	17
Limited infrastructure	41	11

*Multiple responses observed
(**Source:** Field Work 2024)

4.4. Waste Literacy

Waste literacy encompasses knowledge about different types of waste, their environmental impact, and strategies for reducing and recycling waste (Debrah et al., 2021). Understanding waste literacy is crucial for empowering communities to manage waste more effectively (Utami & Godjali, 2019). This section assessed waste literacy among respondents based on these sub-headings: knowledge about the definition; integration of waste management education in formal education; benefits of waste literacy.

4.4.1. Knowledge about the Definition of Waste Literacy

Respondents were asked to define waste literacy, and their responses are presented in Table 4.8. Nearly half of the sample (46%) stated that waste literacy means understanding waste management practices. This response aligned with Sam's (2023) definition that described waste literacy as a comprehensive understanding of waste and its proper management. Another 32% described it as knowledge about different types of waste, 11% as awareness of environmental impacts, and 11% as the ability to adopt waste reduction and recycling practices.

Table 4. 8: Definition of Waste Literacy

Statement	Frequency (n=395)	Percentage (%)
Understanding of waste management practices	179	46
Knowledge about different types of waste	124	32
Awareness of the environmental impact of waste	47	11
Ability to adopt waste reduction and recycling practices	45	11

(Source: Field Work 2024)

While these findings showed the various ways respondents understood the term, they do not fully capture the overall level of literacy. To quantify literacy, responses were grouped into three categories: High literacy (correct and comprehensive definitions), Medium literacy (partial definitions), and Low literacy (incorrect definitions). The findings suggested that while not all respondents provided a comprehensive definition, almost half gave correct responses that represented high literacy, about one quarter gave partial responses indicating medium literacy, and nearly one third provided incorrect responses, reflecting low literacy. These categories provided a clearer picture of waste literacy levels among respondents Table 4.9 presents these results.

Table 4. 9: Assessment of Waste Literacy Levels

Waste Literacy Level	Frequency (n=395)	Percentage (%)
High	190	48
Medium	89	23
Low	116	29

(Source: Field Work, 2024)

In relation to key informants, they seemed to understand and were able to define the term waste literacy. For instance, it could be deduced from a quote from one official from a Waste Management Company who indicated:

> *"Waste literacy means education on waste. Understanding that waste is a resource, not just a waste." (**R6, Field Data, 2024**).*

4.4.2 Integration of Waste literacy in Formal Education

Most respondents (96%) felt waste education should be inculcated in the formal education curricula so that school children would have an extent of waste literacy. This was suggested because if school children had waste education, they were likely to help with the effective management of waste in their communities. This assertion corroborates findings in studies that indicated "understanding waste literacy was crucial for empowering communities to manage waste more effectively" (Utami & Godjali, 2019), and integrating environmental education into school curricula was vital for fostering a generation of environmentally conscious individuals (Rada et. al., (2016). Learning about waste management especially early in the formal educational system resulted in higher levels of waste awareness and responsible behaviour (Thukral et. al., 2023).

4.4.3. Benefits of Waste Literacy

The benefits of waste literacy in reducing waste, pollution and conserving resources are well-documented in the literature (Ahmed et. al., 2018; Thukral et. al., 2023; Utami & Godjali, 2019). The researcher therefore found out respondents' knowledge about the benefits of waste literacy. These are presented in Table 4.9. with the main respondents indicated being reducing environmental pollution (54%) and the least being "contribution to the Sustainable Development Goals (SDGs) 3, 12 & 15, which include responsible consumption and production, climate action, and life on land.

Table 4. 10: Respondents knowledge about benefits of Waste Literacy

Benefits	Frequency (n=395)	Percentage (%)
Reduces environmental pollution	215	54
Helps with conservation of natural resources	73	19
Improves public health and sanitation	53	13
Creates jobs opportunities in waste management sectors	36	9
Contributes to the achievement of SDGs 3, 12 & 15	17	5

(**Source:** Field Work 2024)

The benefits indicated from the quantitative findings were confirmed by key informants in waste management companies. They indicated some of the benefits included: reduction of air pollution, promoting a circular economy, and fostering a cleaner and healthier environment. These are a few quotes from waste service providers (Key informants) to support these assertions:

> *" Our community has seen a noticeable decrease in air pollution since we began educating people on waste management. By teaching residents about recycling and proper disposal methods, we have reduced the amount of waste in landfills and promoted the idea of reusing materials"* ***(R3, Field Data, 2024)****.*

*"Waste literacy is not just about reducing pollution; it is about creating a cleaner, healthier environment for everyone. When people understand the impact of their waste, they are more likely to take action, whether through recycling, composting, or simply being more mindful of their consumption habits" (**R6, Field Data, 2024**).*

*"I will say the operation 'Clean Your Frontage' has led to a positive outcome. At first, when we went around collecting waste in the areas, people stood and watched, and when you told them to join, they would tell you it was your work. However, with the operation 'Clean Your Frontage,' after much education, now people clean and call you to come for the waste without your knowledge, putting more pressure on us to do more, especially in Chorkor." (**R4, Field Data, 2024**).*

4.5. Assessment of Threat Appraisal

Threat appraisal is the subjective interpretation of the likelihood, vulnerability and acuteness regarding a difficult situation (Constant et. al., 2020; Krok, 2023; Lahiri et. al., 2021; Maloney, Lapinski & Witte, 2011). Individuals modify their health convictions and practices on the basis of threat appraisal. Thus, in this instance the study sought to find out if individuals in households modified SWM behaviour based on threat appraisal. Respondents' perception of threat appraisal was evaluated based on statements that assessed perceived severity and perceived vulnerability. Refer to Appendix C for samples of the statements and Section 3. 10.1. for the description of how the threat appraisal score was determined.

The assessment of threat appraisal involved a descriptive statistical analysis of respondents' perceptions regarding the severity and vulnerability related to solid waste management (SWM). This analysis aimed to quantify how individuals interpret the risks associated with poor waste management practices and their potential effects on the environment and public health. Based on the analysis, respondents reported a relatively high perceived severity of the adverse consequences of poor solid waste management, with an average score of 4.07 and a standard deviation of 0.92.

A mean score of 4.07 suggests that respondents generally agreed that poor solid waste management led to severe environmental problems. The standard deviation of 0.92 is close to 1.0, It suggested a moderate level of consensus among respondents regarding the perceived severity of the issue.

In terms of perceived vulnerability, which reflected respondents' sense of potential harm or danger due to poor waste management practices, the average mean score was 4.08 with a standard deviation of 1.01. This high score suggests that respondents felt risk of negative outcomes due to inadequate waste management practices.

These findings indicated that respondents recognized severe environmental pollution problem caused by improper waste disposal. The high scores for perceived severity and vulnerability suggested that respondents were aware of the threats associated with poor SWM practices. This awareness motivated them to engage in more sustainable waste management behaviors. However, the relationship between threat appraisal and actual SWM behavior needs to be carefully examined. While a mean score above 3.0 indicates awareness of the issue, it does not directly imply that this awareness translated into action. Respondents recognized the threats posed by inadequate waste management but still engaged in unsustainable practices due to factors such as social and cultural norms, lack of resources, or insufficient infrastructure among others. These findings are presented in Table 4.10.

Table 4. 11: Assessment of Threat Appraisal

	Items	Mean	SD
Threat Appraisal	Perceived severity	4.07	0.92
	Perceived vulnerability	4.08	1.01

4.6 Assessment of Coping Appraisal

People may alter the way they think about a problem by altering their goals and values (Carver & Conner – Smith, 2010; Lahiri, 2021). This is described as coping appraisal. In this study, coping appraisal was determined using the mean of statements in relation to self-efficacy and response efficacy. It was used to determine if people may alter the way they think about the SWM problem by altering their goals and values. Refer to Appendix C for samples of the statements and Section 3. 10.1. for the description of how the coping appraisal score was determined.

The descriptive statistical analysis as presented in Table 4.11 revealed that respondents reported a relatively high perceived response efficacy, with an average score of 4.09 and a standard deviation of 0.87. This score suggests that respondents believed in the effectiveness of their actions to reduce solid waste as a means to prevent environmental pollution. A mean score above 4.0 Indicated strong confidence among respondents that their efforts could lead to positive outcomes in waste management.

In terms of self-efficacy, which reflects respondents' confidence in their ability to contribute to waste reduction efforts, the average score was slightly lower at 3.94, with a standard deviation of 0.84. This score indicated that while respondents felt competent in their capacity to engage in sustainable waste management practices, there was some variability in their confidence levels. A mean score above 3.0 signified that the majority of respondents possessed a reasonable belief in their ability to take effective actions.

The findings suggested that while respondents exhibited high confidence in the effectiveness of their actions (response efficacy), their self-assurance in executing those actions (self-efficacy) was somewhat lower. This distinction highlighted an important aspect of behaviour change.

Respondents recognized the potential impact of their actions on SWM but hesitated to engaged in those behaviors due to concerns about their capability to implement them successfully. Therefore, enhancing self-efficacy through targeted education, resource availability, and community support could be crucial for encouraging active participation in sustainable waste management practices.

Table 4. 12: Assessment of Coping Appraisal

	Items	Mean	SD
Coping Appraisal	Response efficacy	4.09	0.87
	Self-efficacy	3.94	0.84

4.7 Assessment of Ownership Appraisal

Ownership appraisal examines how individuals' sense of ownership and responsibility towards waste management practices affects their willingness to engage in sustainable behaviors. This includes personal responsibility, perceived control over waste outcomes, and psychological ownership of community waste management issues. Research has shown that individuals who feel a sense of ownership over their environment were more inclined to engage in behaviors protected and enhanced it. For example, Dawkins et al. (2017) found that a strong sense of psychological ownership motivated individuals to adopt proactive measures regarding their surroundings, including waste management practices.

In this study, respondents' sense of responsibility was assessed through various dimensions related to ownership appraisal in sustainable waste management. This assessment involved evaluating participants' feelings of ownership over their community's cleanliness and their willingness to

engage in sustainable waste management behaviors. Refer to Appendix C for samples of the statements and Section 3.10.1 for the description of how the ownership appraisal score was determined.

The descriptive statistical analysis indicated that respondents reported a high sense of ownership and personal responsibility, (with an average score of 4.04 and a standard deviation of 0.77). For proper waste management and believed their actions could significantly contribute to environmental sustainability. Such high scores reflected that respondent viewed themselves as integral to the waste management process in their community, and this enhanced their motivation to engage in sustainable practices. These results are presented in Table 4.12.

Table 4. 13: Assessment of Ownership Appraisal

	Items	Mean	SD
Ownership Appraisal	Responsibility	4.04	0.77

4.8. Barriers or challenges to adopting Sustainable Waste Management behaviours

Adopting effective waste management practices in Ghana is critical to achieving the Sustainable Development Goals (SDGs) 3, 12, and 15. The study identified three key barriers to sustainable waste management practices, based on perspectives from both households and waste management officials. These are presented in Table 4.13.

Table 4. 14: Challenges or barriers encountered with SWM

Kind of Challenge	Households		Waste Management Companies	
	Freq. (n= 249)	(%)	Freq. (n=4)	(%)
Social and Cultural Norms	130	52	1	25
Lack of Awareness and Education	72	29	1	25
Facilities and Resources	47	19	2	50

(**Source:** Field Work 2024)

From the household perspective, the main challenge was social and cultural norms (52%). Many households admitted to disposing of waste in nearby gutters or open spaces, practices that had become entrenched over generations. There was also a widespread perception that waste management was solely the responsibility of municipal authorities, leading to low personal responsibility for activities such as waste separation and recycling. Furthermore, the handling of waste was viewed socio-culturally as a low-status or demeaning task, which discouraged household members from engaging in sustainable practices. These findings resonate with Lissah et al. (2021), who reported that cultural beliefs and low community ownership continue to undermine waste management interventions in Ghana.

The second barrier was lack of awareness and education (29%). Respondents highlighted that many community members were not adequately informed about the environmental impact of poor waste management. One official explained:

> *"There is a real challenge with the lack of public education on waste management. People are simply not aware of the environmental impact of their actions, and without that awareness, change is slow."* **(R1, Field Data, 2024).**

The third barrier was inadequate facilities and resources (19% for households; 50% for officials). Waste management officials stressed that the lack of bins, poor collection services, and insufficient infrastructure often made it difficult for even willing households to dispose of waste properly. As one official noted:

> *"Our biggest issue is the insufficient infrastructure. We need more waste disposal containers and better collection services, especially in densely populated areas. Without these, even those who want to manage their waste responsibly find it difficult."* (**R6, Field Data, 2024).**

Supporting studies confirm that weak logistical support, poor enforcement of regulations, and inadequate infrastructure are persistent barriers to sustainable waste management in Ghana (Basiru et al., 2019; Lissah et al., 2021; Sulemana et al., 2018)

4.9. Test of Hypotheses

Based on extensive review of literature, four (4) alternate hypotheses were developed and tested. Results of this testing are presented in this section.

4.9.1. Hypotheses One (1)

The chi-square test of values in Table 4.14. showed there was a statistically significant relationship between respondents' waste literacy levels and their engagement in sustainable waste management ($\chi^2 = 39.956$, df = 24, p = 0.022). Hypothesis One (*Ho1: Waste literacy levels significantly influence engagement in sustainable waste)* was therefore accepted.

Table 4. 15: Relationship Between Waste Literacy and SWM Practices

Waste Literacy Assessment	Sustainable Waste Management practice					
	Reuse	Recycling	Burning	Waste Reduction	Composting	Landfill
Understanding of waste management practices	58	62	31	11	10	4
Knowledge about different types of waste	57	24	12	7	7	7
Awareness of the environmental impact of waste	13	16	11	2	0	0
Ability to adopt waste reduction and recycling practices	18	11	3	4	3	1

($\chi^2 = 39.956$, df = 24, p = 0.022)

4.9.2 Hypotheses Two (2)

A linear regression analysis was conducted to test alternate hypothesis Two. The p-values shown in Table 4.15 showed a threat appraisal score coefficient of -0.0135, indicating there was a negative relationship between threat appraisal and sustainable waste management practices. No statistically significant relationship between respondents' threat appraisal and their sustainable waste management practices (p value = 0.109) was also identified. This current finding contrasts with results of studies by Akmal & Jamil (2021) and Fadhullah et. al., (2022), who found that perceived threats motivated proactive waste management actions. Hypothesis Two (*Ho2: Residents' threat appraisal significantly influences their sustainable waste management practices)* was therefore not accepted.

Table 4. 16: Relationship Between Respondents' Threat Appraisal and Practice of Sustainable Waste Management

Variable	Coefficient (B)	P-value
Constant	0.4193	
Threat Appraisal Score	-0.0135	0.109

4.9.3. Hypotheses Three (3)

A linear regression analysis was conducted to test alternate hypothesis Three. The p-value shown in Table 4.16 showed a coping appraisal score coefficient of -0.0719, indicating there was a negative relationship between coping appraisal and motivation to practice sustainable waste management. No statistically significant relationship between respondents' coping appraisal and their motivation to practice sustainable waste management (p value = 0.230) was identified. This implies that residents' confidence in their ability to manage waste (self-efficacy) and their perception of the effectiveness of waste management actions (response efficacy) did not significantly influence their sustainable waste management behaviour. This result was different from findings by Cudjoe et al. (2020) and Xu et al. (2018), who reported that higher self-efficacy and response efficacy encouraged sustainable behaviour. Hypothesis Three (*Ho3: Residents' coping appraisal significantly influences their motivation to practice sustainable waste management)* was not accepted.

Table 4. 17: Relationship Between Respondents' Coping Appraisal and Practice of Sustainable Waste Management

Variable	Coefficient (B)	P-value
Constant	2.431	
Coping Appraisal	-0.0719	0.230

4.9.4 Hypotheses Four (4)

A linear regression analysis was conducted to test alternate hypothesis Four. The p-value shown in Table 4.17 showed an ownership appraisal score coefficient of - 0.0228, indicating a negative relationship of ownership appraisal with sustainable waste management practices; however, this relationship was not statistically significant (p = 0.251). This implies that residents' sense of responsibility and pride in waste management (ownership appraisal) did not significantly influence their engagement in sustainable waste management practices. Hypothesis Four (*Ho4: Residents' ownership appraisal significantly influences their engagement in sustainable waste management)* was not accepted.

Table 4. 18: Relationship Between Respondents' Ownership Appraisal and Practice of Sustainable Waste Management

Variable	Coefficient (B)	P-value
Constant	0.4009	
Coping Appraisal	-0.0228	0.251

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter summarises the study's key findings, draws conclusions based on those findings, and offers recommendations based on those findings.

5.1. Summary of Key Findings

The aim of the study was to assess respondents in the Ablekuma South Metropolitan areas, waste literacy and their sustainable solid waste management practices. To achieve this aim, the study was guided by the following specific objectives: Assess respondents' awareness about sustainable waste management; identify sustainable solid waste management practices (if any) that respondents adopted; determine respondents waste literacy levels; and identify any barriers or challenges (if any) that residents encounter in adopting sustainable waste management behaviours. It tested four null hypotheses.

The study used a mixed method approach (specifically the explanatory sequential design). Three hundred and ninety-five households (395) were selected as the survey sample for the quantitative study using the multi-staged sampling technique. The study sample for the qualitative study involved one (1) official from a public waste management company and five (5) officials from private waste management companies. They were selected using the purposive sampling technique. Quantitative data was collected using a researcher administered questionnaire while the qualitative data was collected using face – to – face interviews. The quantitative data was analysed using IBM SPSS, Version 23. Descriptive statistics (including: means, frequencies, and

percentages), Chi-square tests, linear and regression analysis were employed to analyse the relationships between selected study variables. Qualitative data was analysed manually, by identifying themes and sub-themes.

The study revealed that mainly respondents: were females (53%); 50% were within the 20-30 age group; were Ga's (46%); single (60%); had formal levels of education (91%); had fewer than three children (71%); self-employed (44%); 85% had monthly incomes below GH₵ 1000. Respondents generated a variety of waste with the main types being plastic/rubber waste (78%); organic waste (67%) and paper or cardboards (52%). Waste was stored and disposed of mainly in dustbins. Majority of respondents (90%) in households did not separate their waste before disposal. On average, 77% of respondents spent between 5-10 minutes in waste disposal because of the proximity of the skips to their households. A majority (82%) further confirmed their waste was collected infrequently (i.e. not collected daily).

A significant majority (81%) of respondents were aware of sustainable waste management (SWM) practices, with the main ones being reuse (38%) and recycling (29%). Their main source of SWM information was from the mass media. The key reason why 72% of respondents practiced SWM was to minimize waste generation. Forty – six percent (46%) of respondents understood the term "waste literacy." A vast majority of respondents (96%) felt waste literacy must be inculcated in the formal educational curriculum. Fifty -four percent (54%) of respondents also felt waste literacy was beneficial because it mainly helped in the reduction of environmental pollution. The study identified three key barriers to adopting sustainable waste management practices, with social and cultural norms being the most significant barrier.

The study tested four alternate hypotheses. Out of these, only the first hypothesis (that waste literacy significantly influences engagement in sustainable waste management) was accepted, while the remaining three hypotheses were not supported.

5.2. Conclusion

In conclusion, residents in the Ablekuma South Sub Metro demonstrated mixed but generally encouraging levels of waste literacy. Almost half of the respondents provided correct definitions that reflected high literacy, about one quarter gave partial definitions indicating medium literacy, and nearly one third gave incorrect definitions, representing low literacy. Awareness of sustainable waste management was also widespread, with many respondents identifying practices such as reuse and recycling.

However, this awareness did not consistently translate into practice. Although a majority knew about reuse and recycling, relatively few households reported engaging in these behaviours on a regular basis. This awareness-practice gap reflected both structural and behavioural challenges. On the structural side, households were constrained by irregular waste collection services, limited recycling infrastructure, and the inconvenience of available disposal systems. Behaviourally, entrenched socio-cultural norms, such as the belief that waste management is solely the duty of municipal authorities and the perception of waste handling as a low status activity, reduced household responsibility for sustainable waste practices.

The findings highlighted that while improving waste literacy is important, it is not sufficient to ensure sustainable behavioural change. Lasting change requires reshaping cultural norms and improving infrastructure to make sustainable practices more practical and accessible. The study also confirmed the applicability of the Protection Motivation Theory in examining household

waste literacy and sustainable waste management practices. It demonstrated that waste literacy significantly influenced behaviour, but other psychological appraisals such as coping and ownership were less influential in shaping household waste practices.

5.3. Recommendations

Based on the results and discussions, the following recommendations are proposed:

1. **Strengthen Public Education and Behavioural Campaigns**

Government agencies and non-governmental organizations should intensify community education campaigns that go beyond general awareness and provide households with practical steps for sustainable waste management. These campaigns should address socio cultural norms directly by engaging traditional leaders, opinion leaders, and community groups, and by using culturally relevant messages that promote collective responsibility.

2. **Improve Waste Management Infrastructure**

The Accra Metropolitan Assembly and private contractors should expand facilities to make sustainable practices easier and more convenient. This should include: establishing neighbourhood recycling centres; providing accessible composting facilities; and distributing colour coded separation bins especially in residential and non – residential areas (i.e. markets, factories etc). Adequate funding and regular monitoring are needed to ensure that these facilities are well maintained and used effectively. Implementation would require adequate budgetary allocation, partnerships with private waste contractors, and strict monitoring systems to prevent neglect of provided facilities.

3. **Integrate Waste Literacy into Formal Education**

The Ministry of Education should incorporate waste literacy into the school curricula at all levels (i.e. basic, secondary, tertiary levels). Early waste literacy education would foster long term sustainable behaviours and create a generation that viewed responsible waste management as a normal civic duty.

4. **Address Psychological and Behavioural Barriers**

Although waste literacy was found to influence behaviour, psychological factors such as coping and ownership appraisal were less significant. Interventions should therefore aim to build residents' confidence in their ability to manage waste and highlight the personal and community benefits of sustainable practices. Training workshops, peer examples, and recognition schemes could be used to reinforce these behaviours.

5. **Promote Community Ownership and Challenge Social Norms**

Community initiatives such as clean up campaigns, peer monitoring, and enforcement of existing sanitation by laws should be prioritized. These initiatives should involve residents in design and leadership to change perceptions that waste management is solely the responsibility of authorities. By involving communities directly, a stronger sense of ownership and accountability would be created. One challenge, however, is resistance to behavioural change. To overcome this, sensitisation campaigns and community incentives would be necessary to sustain participation.

6. Policy and Research Implications

Policymakers should link waste literacy and sustainable waste management initiatives to national goals, particularly SDG 11 on sustainable cities, SDG 12 on responsible consumption, and SDG 13 on climate action.

Future research should also explore causal relationships between waste literacy, psychological factors, and household behaviour. Longitudinal studies are especially important to assess the lasting impact of waste literacy education and community interventions.

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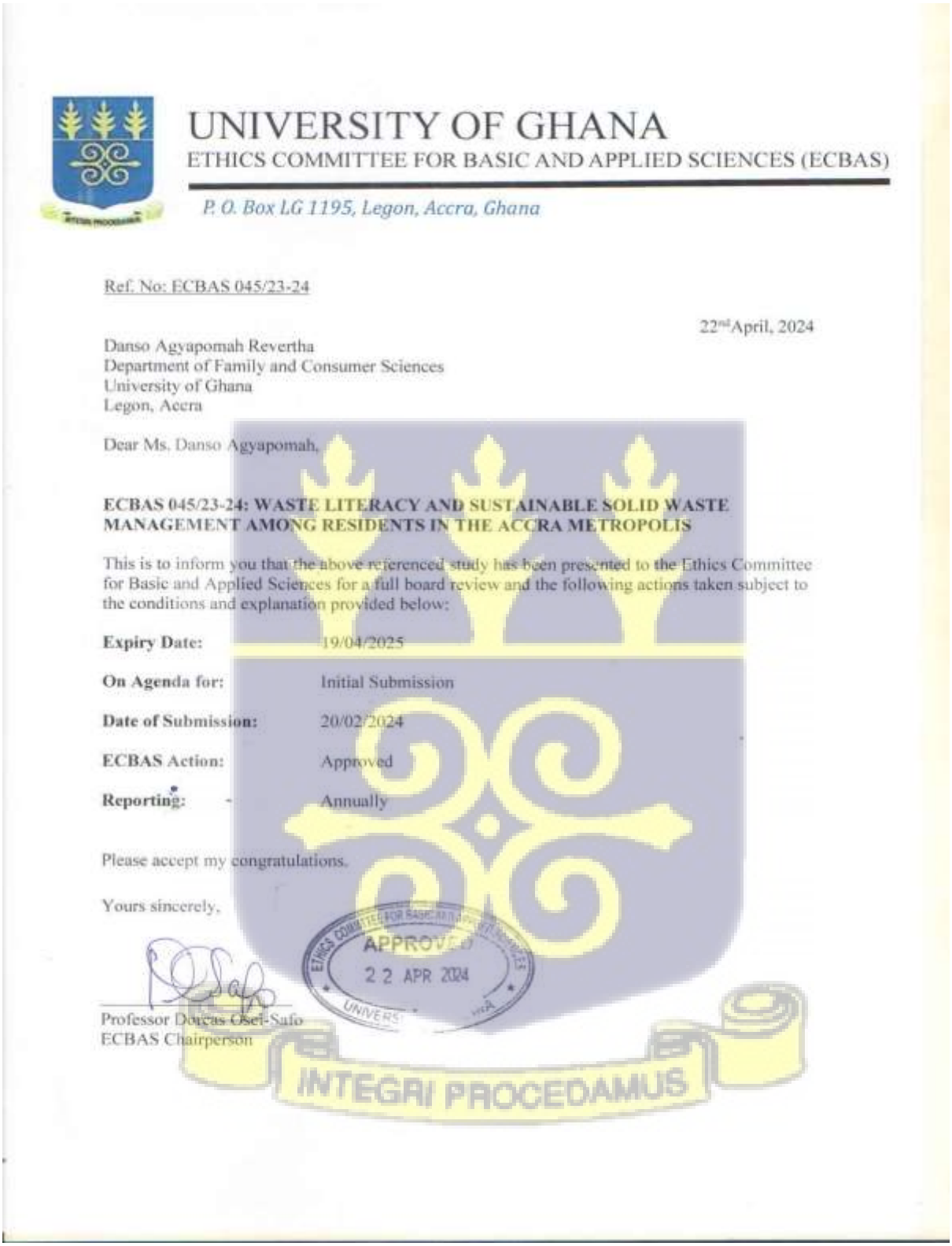
APPENDICES

Appendix A: Ethical Approval for The Study



UNIVERSITY OF GHANA
ETHICS COMMITTEE FOR BASIC AND APPLIED SCIENCES (ECBAS)
P. O. Box LG 1195, Legon, Accra, Ghana

Ref. No: ECBAS 045/23-24

22nd April, 2024

Danso Agyapomah Revertha
Department of Family and Consumer Sciences
University of Ghana
Legon, Accra

Dear Ms. Danso Agyapomah,

ECBAS 045/23-24: WASTE LITERACY AND SUSTAINABLE SOLID WASTE MANAGEMENT AMONG RESIDENTS IN THE ACCRA METROPOLIS

This is to inform you that the above referenced study has been presented to the Ethics Committee for Basic and Applied Sciences for a full board review and the following actions taken subject to the conditions and explanation provided below:

Expiry Date:	19/04/2025
On Agenda for:	Initial Submission
Date of Submission:	20/02/2024
ECBAS Action:	Approved
Reporting:	Annually

Please accept my congratulations.

Yours sincerely,

APPROVED
22 APR 2024

Professor Doreas Osei-Safo
ECBAS Chairperson

INTEGRI PROCEDAMUS

Appendix B: Protocol Consent Form for Study Participants

UNIVERSITY OF GHANA

COLLEGE OF BASIC AND APPLIED SCIENCES

Official Use only
Protocol number

Ethics Committee for Basic and Applied Sciences (ECBAS)

PROTOCOL CONSENT FORM

Section A- BACKGROUND INFORMATION

Title of Study:	WASTE LITERACY AND SUSTAINABLE SOLID WASTE MANAGEMENT AMONG RESIDENTS IN THE ACCRA METROPOLIS
Principal Investigator:	DANSO AGYAPOMAH REVERTHA
Certified Protocol Number	

Section B– CONSENT TO PARTICIPATE IN RESEARCH

Please seek the consent of the research participants by informing them (research participants) about your research using the guide below. Develop your form as would be used on the field.

General Information about Research

My name is Danso Agyapomah Revertha, I am an M.Phil. student of the department of family and consumer sciences, university of Ghana. I am conducting a study on waste literacy and sustainable solid waste management among residents in the Accra metropolis.

The study aims to investigate waste literacy and sustainable solid waste management among residents in the Accra Metropolis. I want to find out if there's a connection between what people know about waste and how they manage it at home. By learning more about this, I hope to find better ways to help people make positive changes in how they handle their waste, which can benefit the environment and their communities.

Participation in this study will take approximately 30 to 45 minutes for household heads who will complete the questionnaire. For officials and management personnel involved in interviews, the duration will be about 60 minutes.

Participants will be asked to fill out a questionnaire if they are household heads, which will include questions about their awareness of waste management practices, how they dispose of their waste, and any challenges they face. The questionnaire will be administered by the researcher or trained assistant for officials and management personnel, a semi-structured interview will be conducted to gather insights into government strategies, policies, and programs related to waste education and management. The interviews will involve open-ended questions to allow participants to share their experiences and perspectives.

Participants will be asked to provide honest and accurate responses to the questions. Their anonymity and confidentiality will be maintained throughout the study, and they will have the option to withdraw from participation at any time without consequences. The data collected will be used for research purposes only and will be kept confidential.

Benefits of the study

In our daily lives, we generate waste from various activities like cooking, cleaning, and packaging. But how we manage this waste matters for our environment, health, and community well-being. This study aims to understand how people in our neighborhood manage their waste and how it affects us all.

Waste management can improve our physical environment. When we dispose of waste properly, it keeps our surroundings clean and reduces pollution. For example, throwing trash in bins instead of on the streets can prevent clogged drains and reduce the risk of flooding during heavy rains. Plus, it helps keep our air and water clean, which is good for everyone's health.

Secondly, good waste management practices can strengthen our sense of community and make us feel more connected to our neighbors. When we work together to keep our neighborhoods clean, it creates a sense of pride and belonging. By participating in waste management activities, like community clean-up days, we can build stronger relationships with those around us and make our neighborhood a nicer place to live.

When we take responsibility for managing our waste properly, it gives us a sense of control and empowerment. Knowing that our actions can make a positive difference in our environment and community can boost our confidence and self-esteem. It can also reduce stress and anxiety, knowing that we are contributing to a cleaner and healthier environment for ourselves and future generations.

Risk of the study

In participating in this study, some questions are likely to elicit some discomfort. If you feel uncomfortable at any time during the interview, you would be allowed some time to put yourself together. There is however, no physical harm associated with this study.

Confidentiality

Be assured that your identity and privacy will be protected. Your name will not be asked or written in any of the information taken from you instead, a number will be used to identify you. Any information you provide will be kept under lock which only the researcher and the supervisor will have access to.

Compensation

Your participation in this study is very important and I do appreciate the time you made available.

Withdrawal from Study

Your participation in this study is fully voluntary and you are free to decide not to participate. There is nothing to lose for not taking part. If you participate and, in the process, you want to stop, you will be allowed to do so.

Contact for Additional Information

If you have any questions or concerns about the survey, please feel free to contact any of the following persons:

Miss. Danso Agyapomah Revertha (Student Investigator)

Department of Family and Consumer Sciences
P. O. Box LG 91, Legon, Accra
Phone number: 0551539611
Email address: radanso007@gmail.com

Dr. Cynthia Gadegbeku (Main Supervisor)
Department of Family and Consumer Sciences
P. O. Box LG 91, Legon, Accra
Phone number: 0276333220
Email address: cgadegbeku@ug.edu.gh

Dr. Fortune Abla Djirakor (Co-Supervisor)
Department of Family and Consumer Sciences
P. O. Box LG 91, Legon, Accra
Phone number: 0243319449
Email address: fadjirakor@ug.edu.gh

If you have any issues on your rights as a participant you can contact the address below:

Administrator, Ethics Committee for Basic and Applied Sciences College of Basic and Applied Sciences
University of Ghana
P. O. Box LG 68
Legon – Accra IP No.: 3014
Email: ethicscbas@ug.edu.gh

Appendix C: Questionnaire

Dear Participant,

I am a Postgraduate student of the Department of Family and Consumer Science, University of Ghana, Legon, conducting a study on **"Waste literacy and Sustainable Solid Waste Management among Residents in the Accra Metropolis."** Kindly answer the following questions to enable us obtain more information about the issue being studied. Be assured that all information provided would be used solely for academic purposes and treated with confidentiality. Thank you.

You have been selected to be part of this study. Kindly respond to the following questions to enable us gain information about the issue being studied. Please understand your participation is voluntary. You can withdraw from participation at any stage of the research and can refuse to answer certain questions if you do not want to do so. I will however really appreciate it if you shared your thoughts on this topic under study with me. Be as honest and open as possible in answering the questions.

Be assured that all information given would be used solely for academic purposes and treated with confidentiality. Your anonymity is assured since no personal information provided would be traced back to you or presented in the research findings. I would also appreciate it if you give consent in writing to participate in this study.

Thank you.

CONSENT FORM:

I have read and had explained to me the accompanying information sheet relating to the research on **"Waste literacy and Sustainable Solid Waste Management among Residents in the Accra Metropolis."** I understand what is expected of my participation. Any questions I had, have been answered to my satisfaction. I agree to the information in the information sheet concerning my participation. I also know that my participation is voluntary and I have the right to withdraw from the study at any time and that this decision will not affect me negatively. I understand the research is being used purely for academic purposes. I understand the answers I give will remain confidential and my name would not be linked to any information I give.

I have fully read and understood all the information on the consent form.

( ) I am 18 years or older and I agree to participate in this research study.

( ) I do not agree to participate in this research study.

…….

Signature of Participant

INTERVIEW GUIDE ON WASTE LITERACY AND SUSTAINABLE SOLID WASTE MANAGEMENT AMONG RESIDENTS IN THE ACCRA METROPOLIS.

(Waste Collector)

SECTION A (SOCIO - DEMOGRAPHIC CHARACTERISTICS)

a. Waste Management Company/Institution: ……
b. Position/ Work status of respondent: .....
c. Work experience (Years): ……
d. Date of Interview..... Interview Number ……

SECTION B: GENERAL INFORMATION ABOUT SOLID WASTE MANAGEMENT

1. Type of waste do you collect from the area
2. Frequency of waste collection
3. Mode of management of Solid waste in the area
4. Place of waste disposal (final disposal site)
5. Distance to final waste disposal site (in minutes/kilometres)
6. Indicate any issues with distance/ why distance was chosen?

SECTION C: AWARENESS AND UNDERSTANDING OF SUSTAINABLE WASTE MANAGEMENT AND PRACTICES

1. Can you describe what sustainable waste management means to you?
2. Sustainable Solid Waste Management practices of the company
3. How do you stay updated on new developments or best practices in sustainable waste management?
4. What do you perceive as the benefits of implementing sustainable waste management practices?
5. Understanding or practice of 3Rs by the company
6. What sustainable waste management practices does your company currently implement?
7. Can you provide examples of successful initiatives or projects related to sustainable waste management that your company has undertaken to help the community?
8. Are there any plans or initiatives your company is considering to further improve sustainable waste management practices?
9. What opportunities do you see for innovation or improvement in sustainable waste management within your company?
10. How do you envision the future of sustainable waste management in the waste management industry?

SECTION D: ASSESSMENT OF WASTE LITERACY LEVELS

1. What is your understanding of the concept of waste literacy?
2. How would you define waste literacy within the context of waste management?
3. In what ways does waste literacy manifest in the operations and initiatives of your organization?
4. Company's or institution's activities promoting waste literacy.
5. How does waste literacy contribute to improved waste management practices?
6. Can you provide examples or instances where increased waste literacy has led to positive outcomes or impacts in your organization or within the community you serve?
7. What are the main challenges or barriers encountered in promoting waste literacy?
    a. Socio-cultural
    b. Economic
    c. Institutional
    d. Others specify ……..
8. What strategies or approaches has your organization adopted to address waste literacy?
9. How do you engage with stakeholders, including government agencies, communities, and educational institutions, to promote waste literacy?
10. In your opinion, what are the most effective methods or tools for enhancing waste literacy among diverse audiences?
11. Looking ahead, what opportunities do you foresee for advancing waste literacy and sustainable waste management practices in Ghana?
12. Based on your experiences, what recommendations would you offer to policymakers, educators, and other stakeholders to improve waste literacy initiatives?
13. How can collaboration between waste management companies/organizations and other sectors contribute to enhancing waste literacy and achieving sustainable waste management goals?

SECTION E: WASTE MANAGEMENT PROBLEMS

1. Are there any current problems experienced with controlling solid waste in the Accra Metropolis?
2. How do these challenges affect efforts towards sustainable waste management?
3. Any suggestion to address challenges with sustainable solid waste management?

(Household Questionnaire)

Name of Electoral Area.....

Location of House: .....

House Number (if available): .....

Date.....Questionnaire Number: .....

SECTION A: GENERAL INFORMATION ABOUT SOLID WASTE MANAGEMENT

1. Which of the following types of waste do you generate in your home? (You can tick more than one answer).
    a. Paper [ ]
    b. Tin [ ]
    c. Glass [ ]
    d. Food waste [ ]
    e. Rubber [ ]
    f. Metal [ ]
    g. Plastic [ ]
    h. Other (specify)……
2. Do you separate the waste before disposal? (Either into plastic, wood, metals, glass, food waste among others) a. Yes [ ] b. No [ ]

If yes, how is it separated?

……
……
……

3. Where do you dump your waste?

a. Roadside [ ] b. Nearby gutter [ ] c. Skip (container) [ ]

d. Backyard [ ] e. Dump sites [ ] f. Open spaces [ ]

g. Burn [ ] h. Dustbins [ ]

i. Others (specify) ……

4. If waste is dumped in skip (container), do you pay as you throw?

a. Yes [ ] b. No [ ]

If yes, on average how much are you charged a day?.....

5. Are you position to pay?
   a. Yes [ ] b. No [ ]

If no, why?

   a. I am not working [ ] c. I don't see the need [ ]
   a. My income is very small [ ] d. Other reason (Specify): .....

6. Have you ever dumped your refuse at unapproved sites (anywhere else) because you did not have money to pay?

a. Yes [ ] b. No [ ]

7. If waste is dumped in skip (container), approximately, how many minutes does it take you to get to the site?

a. 5-10mins [ ] b. 11-15mins [ ] c. 16-20mins [ ] d. 21-25mins [ ] e. More than 25mins [ ]

8. Does it cause you inconvenience if you have to leave the house for more than 10 minutes to dispose of waste?

a. Yes [ ] b. No [ ]

If yes, what do you do with the waste? I/ dump them in

Nearest available space [ ] b. Nearest gutter [ ]

Burn them [ ] d. Bury them [ ]

Other, specify.....

9. Which waste management institution collects waste in your area for disposal?
   a. Waste Management department (Metro. Assembly) [ ]
   b. Integrated Recycling and Compost Plant Limited (IRECoP) [ ]
   c. Zoomlion Ghana Limited [ ]
   d. None [ ]
   e. Other, specify: .....

10. What is the mode of collection of waste in your area?
   a. Compaction Truck [ ]
   b. Tricycle [ ]
   c. Other, (specify): .....

11. If any of the modes, how many times a week?
   a. Not at all [ ] e. Four times [ ]
   b. Once [ ] f. Five times [ ]
   c. Twice [ ] g. Throughout [ ]
   d. Thrice [ ]

SECTION B: AWARENESS AND UNDERSTANDING OF SUSTAINABLE WASTE MANAGEMENT AND PRACTICES

12. Have you heard about Sustainable Waste Management?

a. Yes [ ] b. No [ ]

If yes, what was your source(s) of information? (one or more answer)

a. Over radio [ ]
b. Over Tv [ ]
c. In public meeting [ ]
d. In school [ ]
e. On poster [ ]
f. Other Specify……

13. Are you aware of any Sustainable Waste Management practices?

Yes [ ] b. No [ ]

If yes, (please specify)

……

……

……

14. In your opinion is Sustainable Solid Waste Management important? If yes, why is it important?……
……
……

15. Does managing solid waste help achieve sustainable development?

a. Yes [ ] b. No [ ]

16. Do you agree that solid waste management should be developed in your community for sustainable development?

a. Yes [ ] b. No [ ]

17. Please indicate which of the following Sustainable Solid Waste Management practices you are aware of or currently practice. (You can tick (√) multiple options).

SUSTAINABLE SOLID WASTE MANAGEMENT	AWARE	PRACTICE
Composting		
Turning food scraps/leftover food and yard waste into nutrient-rich soil		

Reuse		
Re-using bags, plastic, or bottles instead of throwing them away		
Using old bags for marketing/purchase instead of collecting new ones each time you market		
Recycling		
Sorting out waste (paper, glass, plastic, and metal) to be used in making new things instead of throwing them away		
Sorting out waste (paper, glass, plastic, and metal) in separate bins to be recycled instead of thrown away		
Waste reduction		
Using paper bags instead of polythene bags		
Using reusable bags instead of poly bags		
Donate or Sell Items - Instead of throwing away unwanted clothing, furniture, electronics, and other household items, consider donating them to charity organizations		
Landfills		
Bury garbage in the ground		
Disposing of garbage in designated disposal areas		
Incineration/burning		
Burn waste to reduce its quantity/volume		
Dispose of solid waste by burning to reduce its quantity/volume		

18. Why do you practice sustainable solid waste management? (You can tick (√) multiple options).
    a. Minimize waste generation [ ]
    b. Cost saving/save money [ ]
    c. Improve environmental health (reducing environmental pollution) [ ]
    d. Economics gains (create job) [ ]
    e. Positive social impact (improved quality of life) [ ]
    f. Reduce soil pollution [ ]
    g. Reduce the need for chemical fertilizers [ ]
    h. Limited infrastructure [ ]
    i. Managing and requiring less space for disposal [ ]

j. Others (please specify) ……

SECTION C: ASSESSMENT OF WASTE LITERACY LEVELS

Please read each question carefully and provide your honest opinions and experiences.

19. What is waste literacy?
    a. Understanding of waste management practices [ ]
    b. Knowledge about different types of waste [ ]
    c. Awareness of the environmental impact of waste [ ]
    d. Ability to adopt waste reduction and recycling practices [ ]
    e. Other (please specify): …….
20. What are the benefits of waste literacy?
    a. Reduced environmental pollution [ ]
    b. Conservation of natural resources [ ]
    c. Creation of job opportunities in waste management sectors [ ]
    d. Improved public health and sanitation [ ]
    e. Contribution to sustainable development goals [ ]
    f. Other (please specify): …….
21. Have you personally taken any steps to improve waste literacy in your community?
    a. Yes [ ]
    b. No [ ]

If yes please briefly describe your efforts

……
……
……
……

22. How do you think waste literacy can contribute to the overall development of your community?

……
……
……
……

23. Do you think waste literacy education should be integrated into formal education systems in Ghana?
    a. Yes [ ]
    b. No [ ]

24. Please rank (by ticking in the space) the following statement using the scale 1 (Strongly disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), and 5 (Strongly agree) to indicate your perception about sustainable solid waste management.

Statement	**1**	**2**	**3**	**4**	**5**
Severity					
1. Environmental pollution problem caused by solid waste disposal is serious					
2. Various harmful substances are generated when disposing of solid waste.					
3. Ghana is suffering from environmental pollution due to poor solid waste disposal					
4. Our surroundings are becoming increasingly polluted by poor solid waste disposal					
Vulnerability					
5. Poor solid waste management will eventually have a harmful effect on people					
6. When solid waste is disposed of improperly, various environmental hazards, harmful to health are generated					
7. Poor solid waste management eventually threatens our lives					
Response Efficacy					
8. Efforts to reduce solid waste will help prevent environmental pollution					
9. Reducing solid waste is an effective solution for preventing environmental pollution					
10. Reducing solid waste helps minimize environmental pollution					
Self-Efficacy					
11. I can do enough to reduce solid waste					
12. I am confident that I will join in reducing solid waste					
13. I will try to reduce solid waste					
Responsibility					
14. I feel a personal responsibility for the proper disposal of waste					

15. I believe that individual actions, like mine, can significantly contribute to improving waste management					
16. I am committed to adopting sustainable waste management behaviors in my daily life					
17. I consider the long-term impact of my waste management practices on the environment					
18. I take pride in contributing to a cleaner and healthier environment through responsible waste management					

SECTION D: WASTE MANAGEMENT PROBLEMS

25. Do you believe that waste management is a significant issue in your community?
    a. Yes [ ]
    b. No [ ]
26. Have you personally witnessed or experienced challenges relating to solid waste management in your community?
    a. Yes [ ]
    b. No [ ]
27. If yes, please specify the kind of challenge you encountered

……
……

28. Are you satisfied with the current waste collection services provided by local authorities in your community?
    a. Yes [ ]
    b. No [ ]
    c. Not Sure [ ]
29. Do you think there is adequate infrastructure for waste collection and disposal in your area?
    a. Yes [ ]
    b. No [ ]
    c. Not Sure [ ]
30. How frequently do you observe littering or illegal dumping of waste in public spaces in your area?
    a. Daily [ ]
    b. Weekly [ ]
    c. Monthly [ ]
    d. Rarely [ ]
    e. Never [ ]

31. Have you noticed any specific types of waste that are more prevalent in your area than others?
    a. Yes [ ]
    b. No [ ]

32. If yes, which specific type of waste?
    a. Plastic waste [ ]
    b. Organic waste [ ]
    c. Electronic waste (e-waste) [ ]
    d. Hazardous waste [ ]
    e. Other (please specify): …….
33. Do you think there is enough awareness among the general public in your community about the environmental impact of improper waste disposal?
    a. Yes [ ]
    b. No [ ]
    c. Not Sure [ ]
34. Are you aware of any health risks associated with improper waste management practices in Ghana?
    a. Yes [ ]
    b. No [ ]
    c. Not sure [ ]
35. In your opinion, do you suffer from any of the following diseases?

    a. Malaria [ ] b. Diarrhoea [ ]

    c. Worm infection [ ] d. Other (please specify) …….

36. Do you believe these diseases are related to improper waste disposal/management?

    a. Yes [ ] b. No [ ]

    c. Not sure [ ]

37. Do you believe that waste management problems in your area contribute to environmental pollution?
    a. Yes [ ]
    b. No [ ]
    c. Not sure [ ]
38. Have you observed any efforts by waste management companies or organizations to address waste management issues in your area?
    a. Yes [ ]
    b. No [ ]

If yes, please specify the kind of effort(s)

……
……
……

39. Do you think there is effective enforcement of waste management regulations in your area?
    a. Yes [ ]
    b. No [ ]
    c. Not Sure [ ]
40. Do you think there is a need for stricter penalties for those who engage in illegal dumping of waste in your area?
    a. Yes [ ]
    b. No [ ]
41. In your opinion, what are the top three priorities for improving waste management in your area? (tick the three most applicable)
    a. Enhancing waste collection and disposal infrastructure [ ]
    b. Increasing public awareness and education about waste management [ ]
    c. Strengthening enforcement of waste management regulations [ ]
    d. Promoting recycling and waste reduction initiatives [ ]
    e. Investing in sustainable waste management technologies [ ]
    f. Other (please specify): …….

SECTION E: DEMOGRAPHIC CHARACTERISTICS

(Please tick as appropriate)

42. Age ……..
43. Gender: a. Male [ ] b. Female [ ]
44. Ethnicity
    a. Ga [ ]
    b. Adangbe [ ]
    c. Akan [ ]
    d. Ewe [ ]
    e. Others (specify) ……..

45. What is your marital status? a. Single [ ] c. Divorced [ ]
    b. Married [ ] d. Widowed [ ]
46. What is your educational level?
    a. No formal [ ]
    b. Basic (Primary/ JHS/JSS) [ ]

c. Secondary (SHS/SSS) [ ]
d. Vocational/Technical [ ]
e. Tertiary (Universities/Polytechnics) [ ]
f. Others (please specify) ……..

47. Number of Children ……..
48. Number of people in your household.....
49. What is your occupation? …….....
50. What is your monthly income? (Cedis)…….