

UNIVERSITY OF EDUCATION, WINNEBA

**ASSESSING THE SOLID WASTE MANAGEMENT PRACTICES IN SOME
SELECTED SENIOR HIGH SCHOOLS IN THE ADANSI NORTH DISTRICT
OF GHANA**



2022

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**A dissertation in the Department of Social Science Education,
Faculty of Social Science Education, submitted to the School of
Graduate Studies in partial fulfillment
of the requirements for the award of the degree of
Master of Education
(Social Studies)
in the University of Education, Winneba**

DECEMBER, 2022

DECLARATION

Student's Declaration

I, George Mensah, declare that this thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

Signature:

Date:



Supervisor's Declaration

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of dissertation as laid down by the University of Education, Winneba.

Dr. Anthony Bordorh (Supervisor)

Signature:

Date:

DEDICATION

I dedicate this work to my family



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I want to use this opportunity to thank the following people for their immense support throughout my period of studies.

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May the Good Lord replenish all your losses on me and bless you abundantly.

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ABSTRACT

This study examines the level of awareness of solid waste storage and collection methods, the understanding of environmental and health impacts resulting from improper solid waste management practices, and the sources of information on solid waste management among students in selected senior high schools in the Adansi North District of Ghana. A descriptive quantitative research design was employed, targeting 900 students from three senior high schools. The sample size consisted of 277 students selected through stratified, convenience, and simple random sampling techniques. Data was collected using a structured questionnaire, achieving a response rate of 96.8%. The findings reveal that most students (40.3%) reported that their school primarily utilizes landfilling for solid waste management, followed by incineration (26.9%) and composting (8.6%). Although 76.5% of students reported the presence of designated areas for solid waste storage on their school's campus, only 10.1% reported regular waste collection services, and a mere 6.0% reported any school-wide campaigns or initiatives promoting sustainable waste management practices. Additionally, 65.3% of students were uncertain about the school's level of involvement in waste management, and 78.0% were unsure about the overall effectiveness of their school's waste management practices. Regarding awareness of environmental and health effects resulting from improper waste management practices, students displayed a moderate level of awareness. They recognized that improper waste management leads to environmental pollution (mean = 4.36) and health problems for local communities (mean = 3.51), but displayed relatively low agreement on the impact on wildlife and their habitats (mean = 2.69). Students exhibited a moderate level of awareness that recycling and composting can mitigate negative impacts (mean = 3.08), while perceiving improper waste management as a global issue requiring international cooperation received the lowest level of agreement (mean = 2.13). The study also found that the majority of students (65.3%) were not involved in waste management practices, and only 6.0% were aware of any school-wide campaigns or initiatives promoting sustainable waste management. These findings emphasize the need for increased student engagement and awareness in waste management practices within the school community. The study recommends that policymakers, educators, and local authorities in the Adansi North District take necessary steps to improve waste management practices in schools and raise environmental awareness among students. While the study provides valuable insights, it has several limitations.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Waste management has been one of most discussed topics at major international and local conferences, on radio and television, and even on both print and media (Nizar, Munir & Munawar, 2018; Nattie, 2021; Piquero & Asuncion-Astronomo, 2021). This is because poor waste management poses a threat to public health and the environment (OECD, 2013). Improper waste management endangers the lives of both people and all living things within the society. Poor waste management is a public health issues, and has the over decades, been a critical concern for many health, sanitation and environmental management activists (Loosveld, 2018; Lestari & Trihadiningrum, 2019; Odonkor, Frimpong & Kurantin, 2020). Maintaining and sustaining good community sanitation has become a fundamental human right which forms part of basic human needs. This basic human right involves ensuring adequate sanitation, solid waste management, potable water supply, housing, food, electricity, transportation, and communications, all of which are beneficial to society and the entire economy (Herring, 2021; Loen, & Gloppen, 2021; Gift, Raimi, Owobi, Oluwakemi, Anu & Funmilayo, 2020).

Worldwide, millions of people lack access to reliable basic waste management and sanitation facilities (World Health Organization, 2020; Drangert, Tonderski & McConville, 2018; Dilekli & Cazcarro, 2019). Many urban areas in sub-Saharan Africa are faced with life threatening environments and public health issues due to the lack of basic sanitation infrastructure (Orhororo & Oghoghorie, 2019; Serge Kubanza, 2021; Kubanza & Simatele, 2018; Muheirwe, Kombe & Kihila, 2022), has

noted that about 3.6 billion people worldwide do not have access to improved sanitation facilities. Barely more than one third of the population uses adequate sanitation facilities in West and Central Africa (36%), South Asia (37%) and Eastern and Southern Africa (38 percent) UNICEF (2019) noted. Indeed, poor waste management, lack of safe water and sanitation facilities is the world's single largest cause of illness. The toll on children is especially high as about 4,500 children die each day from poor waste management, unsafe water and lack of basic sanitation facilities while countless others suffer from poor health, diminished productivity, and missed opportunities for education (UNICEF, 2018).

In the view of Mireku-Gyimah, Apanga and Awoonor-Williams (2018), Ghana was in 2015 named the seventh filthiest country in the world, according to a report by WHO/UNICEF. Based on the UNICEF rating, Ghana's predicament as "sanitation insanity," requiring the collaborative efforts of all citizens to address. In the same vein, the Pan American Health Organization (2013) positioned that addressing the challenges of sanitation requires ensuring adequate sanitation measures, solid waste management, potable water supply, housing, food, electricity, transportation, and communications, all of which are beneficial to society and the entire economy.

Often, the major causes of indecorous solid waste dumping are due to lack of good and enough infrastructures, non-implementation of existing environmental sanitation laws, irregular and unplanned dumping of solid wastes, population and urban growth due to rural-urban migration, insufficient capital to run solid waste management process and lack of new technology in waste disposing (Gebrehiwot, Geberemariyam, Gebretsadik & Gebresilassie, 2020; Ohwo & Agusomu, 2018). The insufficient coverage of the collection system and methods, lack of institutional

arrangement and information resources, inflexible work schedule, and insufficient information on quantity and composition of waste have been reported as the major problems facing the solid wastes management systems in many parts of Africa and Ghana at large (Sulemana, Donkor & Oduro-Kwarteng, 2020; Lissah, Ayanore, Krugu, Aberese-Ako, & Ruiter, 2021). Moreover, lack of awareness and active involvement of the households as the key stakeholders in service provision, delay of households to pay collection fees to the organizations concern with collection of wastes and bad relationship between the households and the collectors of solid wastes are other factors hindering the process of proper solid wastes management (Kanhai, Agyei-Mensah & Mudu, 2021; Agbefe, Lawson & Yirenya-Tawiah, 2019; Owusu-Ansah et al., 2022).

To a significant extent, children spend most of their time in schools (Andrew et al., 2020). Schools partly determine children's health and well-being by providing a healthy or unhealthy environment (Littlecott, Moore & Murphy, 2018; Powell, 2019). Although water and sanitation facilities in schools are increasingly recognized as fundamental for promoting good hygiene behaviour and the well-being of the children (UNICEF, 2018), many schools in sub-Saharan Africa have very poor sanitation facilities. For some, the conditions vary from inappropriate and inadequate sanitary facilities to the outright lack of latrines and safe water for drinking and hygiene (UNICEF, 2018; Cronk, Guo, Fleming & Bartram, 2021; Ngwenya, Thakadu, Phaladze & Bolaane, 2018). Poor waste management and sanitation means that students would have direct contact with environmental contaminants, which may result in sanitation related diseases. The challenge of inadequate sanitation facilities has burdened humanity for centuries (Ampofo, 2020; Shrestha, Manandhar & Joshi,

2018), senior high school in the Adansi North District of Ghana is no exception.

1.2 Statement of the Problem

The problem of poor environmental sanitation is become an issue for many developing countries including Ghana (Khalil et al.,2022; Owusu-Ansah et al., 2022). A number of recent studies have shown poor sanitation and waste management attitudes and practices among Ghanaians (e.g Alhassan, Kwakwa & Owusu-Sekyere, 2020; Owusu-Ansah et al., 2022; Mensah, Oteng, Kuug & Osei, 2018; Asibey, Amponsah & Yeboah, 2019; Odonkor & Sallar, 2021). Many cities and towns in Ghana are experiencing worsening solid waste situation, due to human activities that produces large volumes of solid waste with associated challenges of its disposal. For example, cities like Accra, Kumasi, Takoradi and Tema have grappled with solid waste problems over the years. It is estimated that Accra, the capital city, and Kumasi the second largest city, generate over 3,000 tonnes of solid waste daily, yet, only about 10 percent of the solid waste generated is collected (Mensah & Larbi, 2005; Accra Metropolitan Assembly, 2009).

In a similar vein, attitudes and perceptions of many Ghanaians towards waste management is said to also compound the waste management problem, with schools and students inclusive. The state of poor environmental sanitation on many Ghanaian campuses ranges from choked gutters, weedy and littered environment to inadequate sanitation facilities (Legon Shelter, 2006), overflowing refuse containers and uncontrolled sale of food in insanitary markets. Though the effect of inadequate water, poor sanitation and unhygienic practices among Ghanaian students had not been explored and documented in detail, however, a number of studies have shown that show that proper education and good socio-cultural practice are imperative to

ensuring proper waste disposal and good environmental hygiene (eg Abanyie, Amuah, Douti, Owusu, Amadu & Alhassan, 2021; Anyarayer, Alhassan & Amadu, 2019; Okyere & Pangaribowo, (2018).

In Ghana, the improper handling and disposal of solid waste have led to a multitude of challenges, including environmental pollution, health hazards, and the degradation of ecosystems. Among the various contributors to solid waste generation, educational institutions, including Senior High Schools (SHS), play a significant role. The Adansi North District of Ghana is no exception, facing its fair share of solid waste management challenges.

The Adansi North District is characterized by a mix of rural and semi-urban areas, and it hosts several educational institutions, including three Senior High Schools (SHS). These schools play a vital role in nurturing young minds and preparing future leaders. However, the proper management of solid waste within these institutions has been an ongoing concern. The three selected Senior High Schools in the district, namely Fomena T.I Ahmadiya Senior High School, Dompouse Senior High School, and Asare Bediako Senior High School, have a combined student population that generates a significant amount of waste daily. The waste generated mainly consists of paper, plastics, food leftovers, and other non-biodegradable materials. Inadequate waste management practices within these schools have led to littering, indiscriminate disposal, and inefficient waste collection systems.

As the population of students and staff increases, so does the amount of waste generated daily. Rapid urbanization, lifestyle changes, and increased consumption patterns contribute to this problem (Dhokhikah et al., 2017). However, the existing

waste management infrastructure are not equipped to handle this surge in waste generation efficiently. Consequently, this leads to improper waste disposal, such as open dumping and littering, exacerbating environmental pollution.

Moreover, an integral aspect of effective waste management is raising awareness among students about proper waste storage, segregation, and collection methods. Unfortunately, an anecdotal observation suggests there is the lack of knowledge and understanding among students regarding the significance of proper waste management practices. Studies have shown that inadequate knowledge about waste disposal methods leads to the inappropriate handling of waste (Adedapo & Mauton, 2019). The consequences of such ignorance can have far-reaching effects on the environment, as well as the health of students and the surrounding community.

Furthermore, the improper management of solid waste within the school premises can have detrimental effects on the school environment and the well-being of the surrounding communities. Accumulation of waste attracts pests and vectors, creating unhygienic conditions that could lead to the spread of diseases (Arko-Mensah et al., 2018). Additionally, the unsightly appearance of littered surroundings negatively affects the aesthetics of the schools and the overall learning environment. Besides, if waste is not properly managed, it might find its way into nearby water bodies, further exacerbating water pollution.

However, literature on solid waste management practices among students is limited to tertiary students, and basic school students, with scanty information regards to solid waste management practices among senior high school students in Ghana. Also, the rising waste generation, lack of awareness and understanding of proper solid waste

management practices, limited access to relevant information, and the impact of improper waste management practices on the school environment and surrounding communities are the primary concerns regarding solid waste management in the selected Senior High Schools in the Adansi North District of Ghana. Addressing these issues through a comprehensive assessment and targeted interventions can pave the way for a more sustainable and effective waste management system within these educational institutions.

Therefore, there is a pressing need to assess the current solid waste management practices within the selected Senior High Schools in the Adansi North District. Understanding the level of awareness among students regarding waste management, their understanding of the environmental and health impacts of improper waste disposal, and the sources of information they rely on can provide valuable insights for designing effective waste management interventions. It is against the backdrop that this study assesses the solid waste management practices in some selected senior high school in the Adansi North District of Ghana.

1.3 Purpose of the Study

The overall purpose of this study is to assess the solid waste management practices in some selected Senior High Schools in the Adansi North District of Ghana.

1.5 Research Objectives

The specific objectives include to:

- 1 Assess the level of awareness on solid waste storage and collection methods among the students of the selected senior high school in the Adansi North District of Ghana.

- 2 Examine the awareness of students on the environmental and health effects of improper solid waste management practices.
- 3 Assess the sources of information on solid waste management among the students of the selected senior high school in the Adansi North District of Ghana school.

1.6 Research Questions

The study intended to answer the following questions;

- 1 What is the level of awareness on solid waste storage and collection methods among the students of the selected senior high school in the Adansi North District of Ghana?
- 2 What is the level of students' awareness on the environmental and health effects of improper solid waste management practices?
- 3 What are the sources of information on solid waste management among the students of the selected senior high school in the Adansi North District of Ghana school?

1.7 Significance of Study

This study sought to assess the solid waste management practices in some selected senior high school in the Adansi North District of Ghana. The information from this study will be beneficial to policy makers, educators and educational activists, teachers, and student. Primarily, the information from this study would add to academia and bridge the identified research gap.

1.8 Scope of Study

This study assesses the solid waste management practices in some selected senior

high school in the Adansi North District of Ghana, during the school year 2021- 2022. This study targets all Secondary Schools Student (from form 1 to form 3), who are studying in any Senior High School program (courses/subjects) at in the Adansi North District of Ghana. Principally, the study area covered Fomena T.I Ahmadiya Senior High School, Dompase Senior High School, and Asare Bediako Senior High School. That notwithstanding, this research was strictly limited to the objectives of the study. The attainment of the study objectives was dependent on the answers provided by the respondents. Hence, some set of questionnaire was given to the respondents.

1.9 Organization of Study

The study is in five chapters. Chapter one which is the introduction of study, focused on the background to the study, statement of the problem, related research questions, and objectives of the study, the significance of the study, the scope of the study and organization of the study. Chapter two comprised the literature related to the study. Chapter three discussed the methodology on how the study was carried out which comprised of the techniques used, how the data was collected and analyzed (the sample size, the research design, the sampling procedures, the data collection instruments, pilot study and methods of data analysis). Chapter four revealed the findings and analysis of results from data collected from the field and makes presentations with the aid of tables of the analysis. Chapter five discussed the summary, conclusion and relevant recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Introduction

Waste, has become a concern for all countries around the world due to its effect on health, the climate and the economy. The aim of this chapter was to review literature by looking at waste concepts and other relevant issues and theories on the topic.

2.1 Theoretical Framework

This study is underpinned by three theories, namely; the Trans-theoretical model of change (TTM), the Extended Parallel Process Model (EPPM), and the Theory of Planned Behaviour (TPB)

2.1.1 Trans-Theoretical Model of Change (TTM)

The TTM is a behaviour change model which is extensively studied (Prochaska & DiClemente, 1986). According to the TTM, behavioural change is considered to be a progression through a succession of six phases, namely: (i) precontemplation, (ii) contemplation, (iii) preparation, (iv) action, (v) maintenance, and (vi) termination (Rostami, Fallahi, Pashaei & Roshani, 2017). The TTM acknowledges that individuals have particular informational demands at all stages of behavioural change and it is capable of providing the intervention strategies which are most effective at all of the stages (Vahedian, Alinia, Attarzadeh & Esmaceli, 2013). Thus, the model proposes that individuals must obtain teaching interventions that are suitable for the stage in which they find themselves in the process of behavioural change (Brewer & Rimer, 2008). Balanced decision-making as well as self-efficacy is a central part of the theory (Brewer & Rimer, 2008). The TTM assumes that the behaviour of an individual does not change decisively and rapidly. Rather, behavioural change, most

specifically, habitual behaviour takes place via a cyclic process as stipulated below;

Stage 1- Pre-contemplation Phase

At the precontemplation phase, individuals are not even seriously thinking about changing and they have no interest in any sort of help. Individuals in this phase are inclined to defend their existing bad habit(s) and they do not deem it a problem. The individuals might be defensive notwithstanding the efforts made by other people to put pressure on them to quit. The individuals do not concentrate their attention on stopping and are inclined not to talk with others about this bad habit. Pre-contemplators are usually categorized as unmotivated or resistant and have a tendency to avoid discussion, information, or thought pertaining to the targeted behaviour (Rostami, Fallahi, Pashaei & Roshani, 2017).

Stage 2 – Contemplation Phase

The second stage, the contemplation phase, is the stage where individuals are very much aware of the particular after-effects of their negative habits and they devote time to ponder over their problem. Even though they are capable of considering the likelihood of changing, they seem to be unsure about it. In this stage, individuals happen to be on a seesaw, evaluating the advantages and disadvantages of changing their behaviour or quitting. Although the individuals ponder over the negative sides of their bad habit as well as the positives related to stopping (or reducing), they might doubt whether the benefits accompanying quitting in the long-term will be greater than the costs in the short-term. A person, at this stage, may know the benefits of making a change, but is keenly conscious of the accompanying costs (Rostami, Fallahi, Pashaei & Roshani, 2017; Sardi et al., 2019). A person in this phase honestly declares his intention to make a transformation in coming months. However, it may

take a little as just a few weeks or even as lengthy as one's lifetime to go through the stage of contemplation (Sardi et al., 2019).

As a matter of fact, some individuals keep thinking and thinking about abandoning their negative habits and might die not once getting beyond the stage of contemplation. On the plus side, people are more open to welcoming information concerning their negative habit, and it is more likely that they will really make use of learning interventions, and then think about their thoughts and feelings concerning their negative habit. Usually, contemplators are considered to be procrastinators or ambivalent to change (Rostami, Fallahi, Pashaei & Roshani, 2017).

Stage 3 – Preparation Phase

At the third stage, known as the preparation or the determination stage, individuals are committed to change, typically in the next shorter time (Rostami, Fallahi, Pashaei & Roshani, 2017; Sardi et al., 2019). Their enthusiasm to change is shown in certain proclamations as:

“I really need to take actions on this, this is worrying. Something must change. What could I do?”

This phase is like a phase of research. Here, individuals are taking minor steps on the way to cessation. They try to collect information on what they must do in order to change that negative behaviour. Most at times, people avoid this stage, trying to go directly from contemplation to action and eventually fail for the reason that they have not done enough research or agreed to what it actually takes to make such a major change in behaviour. The preparation stage is a transition stage but not a stable phase, with individuals having the intent to make progress to the next stage (the action stage) in the next one month (Sardi et al., 2019).

Stage 4 – Action Phase

The action or willpower stage which is the fourth stage is where individuals think they possess the capability to change how they behave, and they are keenly engaged in taking action to transform their negative behaviour by the use of numerous techniques (Setyowati, 2012). This stage happens to be the shortest among all the phases. How long it takes each individual to go through this stage is not the same. It normally takes about six months, but could also be as quick as an hour (Sardi et al., 2019; Rostami, Fallahi, Pashaei & Roshani, 2017). At this stage people mostly rely on their willpower. They make overt attempts to quit the negative behaviour and they stand a great chance for setback (Velicer et al., 1996). They mentally re-evaluate their dedication to their own selves and find plans to handle both external and personal pressures that might bring about slips. They might make use of short-range incentives to maintain their enthusiasm, and assess their efforts to change their behaviour in a manner that boosts their confidence. At this stage, people also have a tendency to welcome assistance, and there is likelihood as well, that they will look for support (a very essential element) from others. If they are successful here, they move on to the fifth stage (Rostami, Fallahi, Pashaei & Roshani, 2017).

Stage 5 – Maintenance Phase

The fifth stage or the maintenance stage has to do with the ability to successfully shun all temptations to go back to the negative habit. The maintenance phase aims to sustain the new condition (Rostami, Fallahi, Pashaei & Roshani, 2017). Individuals in this phase have a tendency of reminding themselves of the progress made so far (Sardi et al., 2019; Setyowati, 2012). Although they might still have thoughts of going back to their previous negative habits, they fight the urge and remain on track. It is natural

and common that individuals going through these phases would retrogress, attaining just one stage and drawing back to a preceding stage. Such drawbacks are normal as one strives to change their behaviour. The difference between those in the maintenance stage and those in the action stage is that maintainers have the highest self-efficacy and they are seldom lured to relapse (Rostami, Fallahi, Pashaei & Roshani, 2017).

Stage 6 – Termination Phase

The sixth and the last stage is the termination stage. Here, previous negative behaviours are not recognized as desirable any longer (Rostami, Fallahi, Pashaei & Roshani, 2017) (e.g. poor waste management, poor hygiene and poor sanitation are not pleasurable anymore). Drawing from the TTM, when individuals in the contemplation and preparation stages of change are educated on the need to change as well as the benefits and the costs of changing, then they will be committed to complying with good sanitation and proper waste management regulations. This theory thus indicates that education on general tax knowledge and convenience of tax compliance has a positive influence on committed tax compliance.

2.1.2 The Theory of Planned Behaviour (TPB)

The theory was proposed by Icek Ajzen in 1985. It is a theory that links beliefs and behaviour. The TPB suggests that attaining and sustaining behavioural change needs an intention to leave behind a negative behaviour or adopt a good behaviour (Ajzen, 2005). TPB maintains that not only is intention influenced by attitude regarding the behaviour, it is also influenced by the perceived social norms (the strength of other people's opinions regarding the behaviour, and the individual's own enthusiasm to abide by such significant others) as well as the extent of the perception of behavioural

control. The theory has been tested in many fields including the health sector. The authors Godin and Kok (1996) reviewed the applications of Ajzen's TPB in the health domain and verified the theory's efficiency to predict and explain behaviours that are health-related. They came out with the findings that the theory's efficiency did quite well in explaining intention, perceived behavioural control being as important as attitude across health-related behaviour categories.

Since many significant attitudes and beliefs are changeable (Brewer & Rimer, 2008), they happen to be ultimate targets for any subsequent tax educational interventions. With this theory, sanitation education should be targeted at building proper waste management and compliance intentions. This is because the theory postulates that when positive intentions are built, and real behaviours are influenced positively.

According to the theory of planned behaviour, the information received by individuals shape their intentions and it is reflected in their actions. This implies that when people are enlightened on the benefits proper waste management through general sanitation education, it stimulates their desire to comply to proper waste management. The TPB thus indicates that general education positively impacts creative proper waste management behaviour.

2.1.3 Implication of the theories to the study

All three theories establish the importance of education on behaviour formation. Drawing from the propositions of the TTM, if the proper waste management education interventions are provided at the appropriate stage of change, then the overall proper waste management behaviour of individuals will be enhanced. Borrowing from the EPPM, fear stimulates positive actions, thus if the sanitation or

waste management education is centered on the knowledge, penalties for non-compliance and illustrations on cases of poor waste management behaviours and the consequences suffered by the people who litter around the level of compliance will be high.

2.2 Definition and Concept of Waste

Waste is any material that the owner discards or plans to discard under the EU Waste Directive (Article 1(a) of Directive 75/442 / European Economic Community). Lutui, (2001) described waste as any material that is marked as waste by national legislation or any material that is no longer usable for disposal (Lutui, 2001). Depending on the category or context it is used, waste can be defined in many forms. It can essentially be described as any material deemed useless, which means that the reason for which it is intended is no longer necessary (Lutui, 2001). Waste can be described as primary and secondary based on the role it plays. It has become waste in relation to the primary function because it cannot fulfil its actual purpose (Lutui, 2001). On the other hand, if anything is no longer useful to someone, it is useful to another person and somebody's waste is the raw material of someone making it perform a secondary function. This shows how waste does not depend on a particular definition (Lutui, 2001).

2.2.1 Solid Waste

According to Fujii et al. (2018), solid waste is made up of organic and inorganic waste materials that are generated as a result of human and animal activity and are no longer needed and have to be discarded due to its loss of value to the consumer. The inadequate treatment of solid waste causes illnesses such as cholera, diarrhea, among others. Solid waste can be divided into sources like household waste, industrial waste,

commercial waste, agricultural waste, building and demolishing waste. Waste encompasses those activities in which materials are identified as no longer being of value and are either thrown away or gathered together for disposal (Momoh & Oladebeye, 2010). According to White, et al (1999), waste comes in many different forms and may be categorized in a variety of ways, by its physical state as liquid and gaseous, by material as glass, paper, etc. The World Bank (2000) notes that there are various sources of waste such as residential, commercial, industrial, municipal services, construction and demolition, and agriculture with its source emanating depending on the sector of society. Davies (2008:5) reiterates that the source of waste depends on its location and concentration. A solid waste is any material which comes from domestic, commercial, and industrial sources arising from human activities which has no value to people who possess it and is discarded as useless (Freduah, 2004; 2007). Solid waste, according to Zerbock (2003), includes non-hazardous industrial, commercial and domestic waste and falls under the category which includes household organic trash, street sweepings, institutional garbage and construction waste. Its characteristics however, according to Cointreau (2002), vary according to season, income level, population, social behaviour, climate and industrial production, the size of markets for waste materials, the extent of urbanization and effectiveness of recycling.

2.2.2 The definition and Concepts of Sanitation

Sanitation generally refers to the provision of facilities and services for the safe disposal of waste. It also means the maintenance of hygienic conditions, through services such as garbage collection and waste paper disposal (World Health Organization (WHO), 2010). And According to the Oxford Dictionaries (2017),

sanitation refers to public health conditions arrangement for preventing human contact with the hazards of solid wastes and sewage waste-water.

2.2.3 Solid Waste Management as Concept of Sanitation

Gbekor (2003) referred to waste management as involving the collection, transportation, treatment, disposal and care for disposal sites. Solid waste management practice usually relates to materials produced by human activity, and is generally undertaken to reduce their effects on health, the environment or aesthetics. Municipal solid waste management (MSW) is however, a complex and multi-disciplinary task, involving a number of processes, and impact factors such as economic, technical, environmental and political issues (Chang & Chang, 2001; Chang & Davila, 2007). The solid waste produced varies from country to country or region to region which often means that the management system differs. Solid waste is created by several factors that include the abundance and form of natural resource available, citizens' lifestyles and living standards. Solid waste is embarrassing and difficult to discuss because policy-making and policy discussions have to deal with taboos issues in different locations that affect the process of achieving achievable objectives (Abul, 2010). Waste is mainly contaminated with night soil, irrespective of the climatic variations. Countries located in humid, tropical and semitropical areas, waste generated is characterized by a high concentration of plant litter whereas waste generated in countries with seasonal changes may contain an abundance of ash due to coal or wood used for cooking and heating, especially during winter.

EU Waste Directive (2008), describes waste management to be waste collection, transportation, recovery and disposal, including monitoring of such operations and after-care of disposal sites, including actions taken as distributors or brokers. In most

developing countries solid waste management is a concern compared with developed countries. The disparity between developing and developed countries is not just about the nature of waste, but also about the quality of the services offered for waste management. In this regard, developing countries' attention is focused on achieving proper collection, treatment and disposal, while developed countries are focused on transforming waste into capital. According to Mungure (2008), Ghana, just like any developing country, is currently challenged difficulty to effectively manage its generated solid waste, from collection, treatment to disposal as waste is not considered a resource.

2.3 Education and Awareness of effective waste management

One of the major problems in developing countries is lack of knowledge and understanding of efficient waste management activities. According to McAllister, (2015), a study in Gaborone, Botswana, found that while people were aware of recycling and other sustainable waste management strategies, this does not automatically translate into involvement in environmental-friendly practices such as recycling. When people lack interest in environmental issues, this means such people are not well informed which affects their actions and also makes them feel not included in decision-making on waste management. Regardless of a lack of knowledge and information about waste management in Ghana, individuals in various societies begin to blame the government for inadequate waste management. According to McAllister (2015), lack of interest in the environment contributes to a climate of collective non-participation in decision-making processes that reinforces lack of accountability for emissions and waste. When education or knowledge about waste is provided to people, they turn to being knowledgeable as well as know the

nature of waste management that will make them accountable.

Keeping them informed or educated means improving their waste management knowledge which will demand participation in decision-making. Participation of the community in decision-making waste management activities, structural changes among others, would strengthen their sense of belonging and ownership which can lead to change rather than blame. According to (García *et al.*, 2014), researchers have recognized that creating sustainable waste systems is important as well as promoting environmental citizenship among community members through improved public awareness and community involvement in waste management.

Research conducted in Malaysia by Aini *et al.*, (2002) inferred that, in order to address the solid waste crisis, individual awareness needs to be raised through environmental consciousness and concern, the inculcation of sustainable consumption practices and the education on waste management.

2.4 Attitude and Behaviour towards Waste Management

For most developed countries, the negative activity with solid waste management is on littering which has several causes. Such factors include lack of social pressure to discourage littering, lack of effective penalties or clear compliance, and lack of knowledge of littering's environmental consequences (Al-Khatib *et al.*, 2015). Certain factors are related to the amount of litter found in a given area and the number of bins available at a site for collection of waste (McAllister, 2015). Most communities have the unconcerned attitudes of waste management which reduce their environmental responsibility. This is because most community members are not interested in decision-making, so grow the unconcerned mindset that makes them not responsible

for waste management (McAllister, 2015). This mentality varies from one social category to another. However, people's attitude and actions can be positively affected by implementing quality waste management systems to manage the created waste properly. When basic food and shelter needs demand the resources of the Community's largest part, so other environmental standards are ignored. Which means people who are pleased with or happy with their basic needs are prone to waste management.

2.5 Proper Waste Management Practices

Practices in waste management have a significant effect on our health and the environment. A good system of solid waste is like good health, because if things are done right people will have a decent life, but on the other hand, if things go wrong, it is a major and urgent issue that makes anything else seem less important. Practicing effective waste management requires efficient use of resources, and reducing waste. Waste management differs from country to country and requires specific approaches but good practice can be improved with the aid of waste management hierarchy. Countries in Africa are forced to bring the modern waste management approach into practice. Practices of the old hierarchical structure, where priority is placed on dumpsite landfill waste, still persists and this causes significant harm to public health and the environment. This is ascribed to rate of income. According to McAllister, (2015), there is a difference in the attitude of non-concern about waste management among socio-economic groups, so wealthier socio-economic groups are more likely to make a difference in environmental concerns as they feel the need to have a greater effect in solving and fixing the problem. It is shown that, with respect to solid waste management activities, the practices typically differ among income levels.

2.6 Waste Management and Sanitary Facilities in Schools

Although the significance of sanitary facilities for schools is widely established by many scholars, authors, researchers and opinion leaders, the reality is that many schools in the developing countries have appalling sanitary conditions (Cairncross, 2003). According to Cairncross (2003), despite attempts to install latrines and toilets in schools, it is frequently discovered that these facilities are either missing or malfunction; latrines are padlocked because adults do not trust children to use them correctly; and children, particularly females, choose not to enroll in school as a result of the absence of adequate latrines. Schools can become a health danger if there are no sanitation and hygiene facilities, or if they are poorly maintained and used (Akbar 2000). Lack of or inadequate maintenance of sanitation facilities in schools contributes to the cycle of water-related diseases and has detrimental impacts on students' ability to study in school as well as attendance (Akbar, 2000). UNICEF (2000) noted differences in the distribution of sanitation facilities between houses and schools in a situation report on water and sanitation in six Sub-Saharan African nations published in Burkina Faso. The majority of the nations were found to have lesser coverage of latrines and water in schools relative to the general population, as well as lower levels of usage and upkeep. According to the same survey, just 30% and 32% of schools in Cote d'Ivoire, respectively, had water and toilets. In the same research, 62% of water closets (WCs) in Yopougon, Cote d'Ivoire did not work, despite the fact that there was about one WC or latrine for every 381 students (UNICEF, 2000). According to UNICEF (2000), approximately 2% of the 90 primary schools surveyed in the crisis-affected areas of north and west Uganda had appropriate toilet facilities.

In different research conducted in Ecuador, latrines intended for usage by 30 to 40 students were instead used by up to 180 students (WHO, 1994). Experience demonstrates unequivocally that merely providing sanitary services, whether in households or schools, will not result in their sustainability. Maintenance of the facilities is necessary, and maintenance requires that there be a recognised need and demand for water and sanitation at schools. A pilot study of 14 countries at elementary schools in some of the poorest nations in Africa revealed poor waste managements and poor facilities for sufficient for sanitation (UNICEF, 1997).

The survey report also emphasised that, on average, there are more than 50 students per washroom in urban schools, and that none of the 14 countries examined had increased the number of toilet facilities in schools by more than 8% since 1990, indicating that they are only just keeping up with the growth in student populations. In order to address the greater concerns of waste disposal, according to UNICEF, there is the need to not overlook the importance of the simple latrine, since the use of toilets and toilet facilities is a fundamental human right and a crucial method of addressing sanitation issues at their root (2001).

Many schools in Africa lack access to proper waste disposal and properly maintained toilets facilities (WHO, 1994). According to two recent surveys in Uganda, barely one-third of schools have sufficient sanitation facilities (WHO 2001). The findings from these studies showed that there was only one toilet for every 700 Ugandan students, compared to one for every 328 in 1995 (WHO 2001). Improved sanitation and hygiene practices, including correct facility usage and maintenance as well as excellent personal and household hygiene, are an essential health intervention that can result in the full realization of health benefits (Carr and Strauss, 2001). Graczyk et al.

(2003) conducted a survey in the southern province of Zambia and found significant incidence of Endolimax and Blastocystis hominis, both of which are linked to diarrhea. They attributed this to poor sanitation as lack of proper hygiene standards.

2.7 Factors Contributing to Improper Waste Disposal

According to Anaman and Nyadzi (2015), their analysis of improper waste disposal found a number of reasons why people engage in haphazard disposal of waste. They said one of the reasons why people engage in the practice was because of outright carelessness. Households that engage in the practice do not seem to appreciate what danger it poses for the survival of everybody and the environment. It does not cross their minds that the indiscriminate disposal of waste would result in various problems that will affect the environment and the very survival of all that inhabit it. This position was arrived at after a survey was conducted to get to know why there is indiscriminate disposal of waste. The research was conducted in Gbawe, an area in the capital city of Ghana where it is reported that there is a lot waste disposal issues, which has resulted in flooding (Anaman & Nyadzi, 2015). Majority of those interviewed agreed that waste disposal is a problem in the area and then offered reasons why the practice goes on. It has also been suggested that the practice is due to poverty among the people. According to the findings, waste collection in the area is a service that has to be paid for. Containers that are left at the premises of people by waste collectors attract a fee which has to be paid for by those patronizing such services. However, since most of the people in the area are poor, they find it difficult to pay for such services. The only option left to them is to indiscriminately dispose waste that they generate in the wake of their economic activities (Anaman & Nyadzi, 2015).

The third reason that the practice can be attributed to is the lack of compliance with the laws governing waste disposal. The non-compliance is brought about by the failure of the District Assembly to ensure that laws governing waste disposal are adhered to by households. The Assembly only comes up with laws to regulate the sector but they hardly enforce such laws leading to people flouting them. The absence of enough infrastructure was also found to be one of the reasons. The research indicates that people or households do not simply have what it takes to collect the waste by way of facilities such as bins, incinerators and proximity to the points where waste should be collected as well as the lack of knowledge about the fact that the practice results in the various sicknesses and ailments that they suffer from. To that end, they suggested measures such as people adopting the attitude of proper disposal of waste which was the position of 35% of the respondents, while others suggested a strict adherence to legislations on waste disposal among others.

In an article written by Acquaye (2013) on the cause and the results of poor waste disposal, he brought in focus the issue of paying for waste disposal services as has been raised by other writers referred to in this work. It has been reported that at the point of disposal herein referred to as dumpsite, there are self-appointed men who purport to be taking care of the site and who ask people who come to dump waste collected by them to pay monies before they are permitted to discard it. Whereas in other areas people will be compensated for bringing waste for proper disposal, same cannot be said about what is happening in Ghana. The writer attributes the situation to the fact that there are defects in the governance system in Ghana. Those who find it difficult to raise the amount required for them to dump their refuse resort to inappropriate ways of discarding such waste. Some of them send their waste to

unapproved places like river banks, gutters, etc. for disposal, while others make do with their back yards or the back of other buildings where such waste is dumped.

The situation has been extensively researched in to and discussed about by Obiora (2014) in his article entitled “Factors Responsible for Indiscriminate Disposal of Sachet Water Wastes in Anambra State, Nigeria”. The focus of his research was to find out why waste from sachet water is not being disposed properly. His analysis revealed that Most of the respondents interviewed were of the opinion that people engage in the act of indiscriminate disposal of waste from sachet water because of behavioral and attitudinal difficulties. People seem to have poor attitude towards the proper disposal of waste. This corroborates the first reason offered by Anaman and Nyadzi (2015) as accounting for improper waste disposal.

Another issue that received the highest mean score for being a reason for indiscriminate disposal of sachet water waste is the price of sachet water which is deemed to be less expensive. Its price makes it accessible to everyone and therefore an increased production of waste from it. It has also been found that laws on the disposal of such waste although having been enacted, are not being made to work as people flout them without any form of punishment to deter others from engaging in the act. This received a mean score of 4.2 which is far in excess of the average score of 3.0 indicating that the respondents strongly agreed with the point. The other problem he attributes the phenomenon to is the absence of plants to recycle the waste that is generated by the activities of people. This also received a mean score of 3.9 signifying a general acceptance of it as a reason.

Another issue that gained currency in the responses of the people is the non-availability of rubbish bins placed at vantage points for people to easily dispose waste that they generate. With a 4.5 mean score, respondents agreed that it is a reason for indiscriminate disposal of waste. The lack of knowledge of the dangers that are posed to the environment and the health of people through the indiscriminate disposal of waste is also seen as a reason why people indulge in indiscriminate disposal of waste from sachet water. People are ignorant of the need to properly handle waste by way of disposal and as a result go about leaving waste at inappropriate places. The lack of reward for people who engage in the proper disposal of waste is also seen as a discouraging factor in the drive to ensure that people are responsible in handling waste.

Writing on the reasons for people not carrying out a proper separation of dangerous waste at Nemazee Hospital in Iran, Oroei, Momeni, Palenik, Danaei and Askarian (2014) indicate that one of the reasons is the fact that the workers have not received training on the benefits of doing so. Some of the respondents said that segregating waste was not necessary because they will finally get mixed up. Although they knew the relevance of doing so, they hardly engaged in the practice of separating such dangerous waste for the purpose of disposal. The study found that people were simply not conscious about the separation of waste. Due to this state of things, they become careless in the line of duty and end up mixing them. People who are admitted to the hospital for treatment as well as other visitors could not tell the difference between the bins due to lack of knowledge of the meaning of the labels. They also attributed the problem to the failure of management to assert their authority to ensure that people under their control receive the necessary information regarding how to dispose waste

of that nature. The poor exercise of oversight responsibility by management in terms of supervising the work of subordinates is also blamed for the poor culture of separating hospital waste. The collectors of the waste argue that their numbers are not enough for them to effectively discharge the waste according to the desired separation procedure. The lack of supervision manifests itself mostly during the night shift when there are no supervising officers to ensure that people do the right things. The need for training institutions to incorporate in their curriculum training on the separation of hospital waste has been highlighted as an important step to take to minimize the effect of the knowledge gap.

The broadening of sanitation services to reach majority of the people has been identified as one of the ways of dealing with the indiscriminate disposal of waste. It was suggested that where these services are limited, those who do not get to be served are left with no option than to haphazardly get rid of the wastes. That aside, the location of the area is also seen as a potential reason why the practice could be prevalent. For instance, it was found that areas in the mountainous regions in Romania that witness haphazard waste disposal are common places frequented by tourists (Mihai, 2012).

2.8 Waste Disposal Strategies

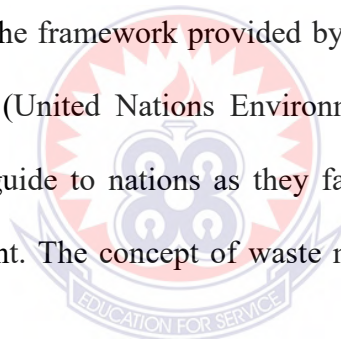
Guidelines have been provided by the United Nations Environment Programme as to how waste produced by nations can be managed. They developed what they call “waste management hierarchy”. This is part of several policies that are available for adoption for the purpose of managing waste. The United Nations Environment Programme defines it as “an order of preference for action to reduce and manage waste” At the top of the hierarchy is the prevention of waste: The source prevention

of waste calls for steps to be taken to improve upon the quality of the products such that not much material will be required in producing them. Manufacturing such products should be devoid of the use of materials or substances that are dangerous to both humans and the environment (United Nations Environment Programme, 2013). This is considered as the best way to initiate measures to deal with waste generation and for this to work there is the need to awaken the consciousness of people to waste prevention. This approach will make it possible for all hands to be on deck to deal with the menace of waste production. Buyers of products are expected to reject those items that have the potential to generate waste; the second is the reduction of the generation of waste, recycling, the fourth is to seek to recover materials and finally disposal (United Nations Environment Programme, 2013).

The reduction of the generation of waste involves the reusing of items rather than presenting them for final disposal. Recycling entails turning the waste into compost, while recovery covers an attempt to get back minerals present in the waste and using the waste as a source of energy. For these to be effective, there is the need for source separation which has the advantage of making it possible for the worth of items that can be reused or recycled to stand out (United Nations Environment Programme, 2013). Disposal on the other hand involves sending the waste to landfill sites for burial and the incineration of such waste for which there is not the possibility of getting energy out of the actions. The last step is only adopted when all efforts directed at prevention, reduction, recycling and recovery do not succeed. While the policy aims at minimizing the generation of waste in the system, it is expected that this approach will result in the reduction of waste in the system as it calls for efficiency in the utilization of the limited resources. It calls for targeted policy

initiatives that are directed at the point that the product is being thought through, that is the designing of the product so that its production does not result in waste generation. This policy approach must apply to the life cycle of any item that is going to be produced (United Nations Environment Programme, 2013).

The other tangential action paths are services in the area of waste collection arising out of the quest to promote public health, proper disposal of waste with the environment being the prime focus and then the 3Rs of reduce, reuse and recycle, which is aimed at highlighting the value inherent in resources and the need to conserve them for posterity. It calls for the involvement of all those who matter, roping in users of items and the providers of such items into the responsibility mix, among others as part of the framework provided by the UN-Habitat to be part of the three governance issues (United Nations Environment Programme, 2013). This is supposed to serve as a guide to nations as they fashion and implement policies to govern waste management. The concept of waste management is represented in the diagram below;



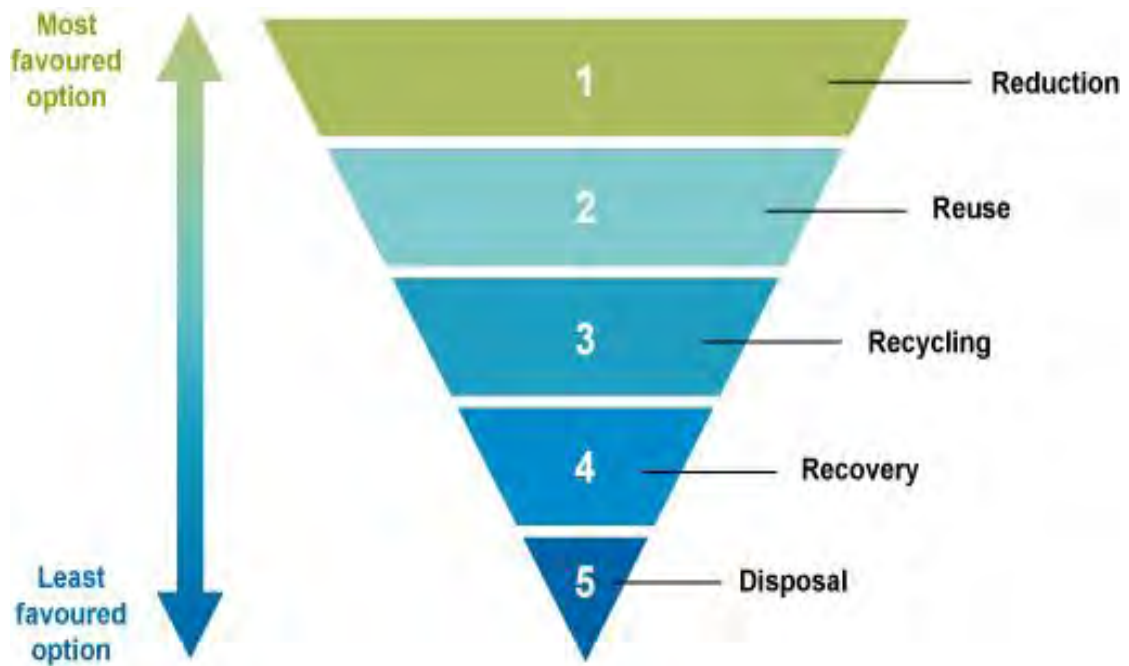


Figure 1: Source: (United Nations Environment Programme, 2013)

A number of the waste disposal strategies were discussed during the eleventh waste management and landfill conference in Cagliari, Italy, which was hosted in 2007. Assertions were advanced in favour of ways by which producers of items will be minded to make things that have the capacity to be used again after the first use especially if those items are made such that they do not contain dangerous substances and can easily be fished out from a collection of wastes and given a face lift for reuse. The volume of e-waste in the system is thought to be most safely reduced through recovery. Consequently, a case has been made for creating a framework to control the industry by focusing on trash creation, marketing, and disposal (Kurian, 2007).

As a way of making recycling a possibility, the transfer of knowledge as a key requirement to enable the countries of final users of items to recycle them to reduce waste has been advocated for. It demands for strengthening the system to stop the widespread practice of treating e-waste the same way as other municipal wastes,

which are typically deposited in landfills. It is necessary to hold those who create things ultimately accountable for what unfolds subsequently (Kurian, 2007). This is regarded as a broadening of the producer's obligation since it forces manufacturers to be accountable for how waste from their products is handled while making sure that all other persons who have interacted with the item along the way are not left out. The mentality of humans is one area that has been recognized as needing improvement. Efforts to control e-waste will be ineffective if people's minds are not changed to make them aware enough to participate in whatever strategies are available. The ideal method to reach a product's final consumers is to educate them about how those products affect the environment and, eventually, human existence, and persuade them to pay money for recycling (Kurian, 2007).

According to Zotos, et al. (2009), the quantities of waste produced in Greece has pushed the government to search for measures to ensure that there is a form of development that meets the demands of both the present generation and of future generations. One of the techniques relies on the polluter pays principle, such that those who produce waste pay a fair amount of money to the local government to effectively manage the waste. It is anticipated that this strategy would reduce the quantity of waste that individuals and businesses produce since they are aware that they will have to pay proportionately for the waste they produce in order for it to be managed effectively (Zotos, et al. 2009). Ten management systems that guarantee the essential infrastructure is given, as well as the information connected to how they are run and where the necessary financial resources are provided for new and additional measures, have been developed as a result of this strategy. What this involves is that the responsibility for realising targets set for recycling is moved to the door steps of

the producers and the middle men in the chain of goods distribution (Zotos, et al. 2009).

Zotos, et al., (2009) also look at bringing and integrating environmental concerns into the procedures involved in procuring goods for the public sector. It demands that actions be done to support ecologically friendly technology and to disapprove of results that might have a harmful influence on the environment. Flagging local governments based on environmental concerns is also recognized as one of the finest techniques for encouraging healthy competition among local governments in terms of environmental behaviour. It is envisaged that the local governments would compete for the ideal town or city. The best practices of the well performing communities are supposed to be replicated by other communities that are not doing well environmentally (Zotos, et al., 2009).

Another technique developed concerned the handling of hazardous chemicals. Local Authorities are expected to go into arrangement that make it possible for the public sector and the private sector to engage in a partnership to deal with such waste as canisters, chemical substances, paint, etc. so that the general public will not feel endangered in any way by the way they are being handled (Zotos, et al. 2009). They are anticipated to act as a venue for the airing of complaints. In other words, a group should be established with the job of answering questions from the general public on the issue. As part of the strategy, they are expected to produce measures that will culminate in the business establishments in their localities getting involved in the management of such waste in the system. One other strategy has to do with encouraging Local Authorities to adopt the principles set out by Eco-Management and Audit Scheme (EMAS) and the International Standards Organization (ISO)

(Zotos, et al. 2009). It is reported that a lot of the Local Authorities are said to be registering and receiving endorsement from these organizations to certify their activities although doing so is voluntary. Any Local Authority that subscribes itself to the dictates of the organizations are giving an indication that they are prepared to adopt measures that protect the environment thereby influencing how they are viewed locally and internationally (Zotos, et al., 2009).

The last approach focuses on the tools and campaign strategies that are pushed by various communities. Volunteers are expected to receive training as part of the strategy in areas like composting, reuse events, assisting with activities that aim to educate the public on environmental practices, supporting individuals as they establish demonstration gardens, developing proper recycling strategies, and supporting their friends and family as they start waste-diversion initiatives; the adoption of measures that result in the minimization of waste (Zotos, et al. 2009). It is deemed that an analysis of the strengths, weaknesses, opportunities and threats is necessary before these measures can be adopted so that a local authority does not plunge itself into problems simply by looking at the measure that is rewarding (Zotos, et al., 2009).

The study of Bovea, Ibáñez-Forés, Gallardo, and Colomer-Mendoza (2010) aimed to compare the many approaches that might be used in a Spanish town to manage the garbage produced there. The study initially identified a few waste management techniques, such as landfills without any attempt to collect energy from the garbage and landfills with such an effort. It was discovered that the greatest alternative for the environment is a strategy that assures that bio gasification as well as landfill paired with attempts at extracting energy (Bovea, Ibáñez-Forés, Gallardo & Colomer-

Mendoza, 2010). The approach is claimed to have potential benefits because it not only produces energy but also reduces the quantity of garbage going to landfills. The reason is that items like organic material, compost, paper/cardboard and textiles are fished for in order to extract the energy that they possess. This implies that the final disposal site would no longer receive certain types of waste for the purpose of land filling (Bovea, Ibáez-Forés, Gallardo & Colomer-Mendoza, 2010).

Similarly, Cherubini, Bargigli, and Ulgiati (2009), in assessing the life cycle of the management of waste, identified some of the strategies in the disposal of waste to include land filling. This activity is said to set in motion an action that results in the production of CH₄, CO₂, H₂S, HCl, HF, etc. These chemical compositions are then trapped for the production of electricity. Another approach is the sorting of the waste that is generated and collected (Bargigli & Ulgiati, 2009). The act involves separating the waste into groups such as organic and inorganic waste for which the former is subjected to a process that leads to the production of biogas, while the inorganic part is made to undergo controlled burning or incineration which brings about the production of electricity. This action sets in motion the third approach to disposing waste (Bargigli & Ulgiati, 2009).

According to Eaton and Gascoigne (2013), the Australian government has a hierarchy of waste disposal strategies, which include efforts at helping the people to avoid the activities that lead to the production of waste. This is the most preferred of all the activities. It is expected that the citizenry will stop going into acts that result in the creation of waste when in fact they can avoid them. Another strategy is reducing the amount of waste that is generated. This approach occupies the second slot considered to be the second most important and preferred approach (Eaton & Gascoigne, 2013).

This calls for cutting back on the amount of the waste generating stuff that is acquired by households and individuals. These items may be things that the households cannot avoid in their daily life activities but the usage of such items can be reduced to proportions deemed as highly unavoidable. The third slot is occupied by reuse, which involves subjecting used items to a second time use. It may not be using it for the purpose for which it was originally meant to be used for but subjecting it to another use in a different form. Another approach considered less desirable compared to the above-mentioned approaches is recycling. This approach occupies the fourth slot counting from the top. It calls for the recycling of the waste categories that are recyclable in order to avoid disposing such waste to the environment. The fifth approach is to recover the items that have been thrown away as waste (Eaton & Gascoigne, 2013).

Treatment is the second but last strategy where waste that is meant for disposal is subjected to various treatments to make them less dangerous to the environment when disposed. The least preferred is the disposal of waste. As much as possible, the Australian government thinks that this approach must be avoided due to the consequences it possesses for the environment. They effectively carry out their activities by providing information on these strategies to the general public since it is widely acknowledged that knowledge is power.

Writing on municipal waste management in Turkey, it was revealed that there are two systems of waste collection in Turkey. The first approach for waste collection which focuses on the cities involves the waste truck moving from house to house to collect the waste that has been collected over the period in their bins. The collected waste is then sent for onward processing. The second approach is directed at the villages or

areas around the cities where a bigger bin is placed at a particular point to receive waste from households and homes, businesses, etc (Turan, Çoruh, Akdemir, & Ergun, 2009). The waste generated is sent to the community and emptied into it for the final conveyance to be done. One of the strategies adopted in Turkey is open disposal or the use of dumps that are not closed. Waste collected is sent to these dump sites and disposed although they are aware of the dangers that the practice presents to the environment. Composting is another strategy adopted in the country. It involves the transformation of waste into manure for the purpose of fertilizing the soil for it to better support plant life. Incineration is yet another strategy adopted by the country. It involves the construction of special facilities that ensure a protected burning of the waste that is collected (Turan, Çoruh, Akdemir, & Ergun, 2009).

Although in recent times the amount of electricity produced from the incineration of waste is low, there is still the practice of tapping electricity from it to support the national grid. There are also people who visit dumpsites and look out for things recoverable from the collected waste (Turan, Çoruh, Akdemir, & Ergun, 2009). They are then sold to companies for the production of other items. Land filling is also practiced but it represents just a fraction of the disposal methods. However, sanitary land filling is the second most adopted practice in the country and not the other form of land filling that does not ensure that the waste is treated before it is buried. Some amount of the waste generated in the country is discharged into water bodies. Of all the methods talked about, open dumping is the major method of waste disposal in the country (Turan, Çoruh, Akdemir, & Ergun, 2009).

Another article written by Finnveden, Björklund, Reich, Eriksson and Sörbom (2007) on flexible and robust strategies for waste management in Sweden indicates that

incineration is widely practiced in Sweden. One of the reasons why it is the most adopted method of waste disposal is the fact that it is considered less expensive to carry out because it does not attract the kinds of taxes that other similar sectors are confronted with in the form of carbon tax. Other methods are sorting, recycling, land filling, and composting. Waste such as food scraps and organic matter are normally subjected to incineration and composting because of the inherent benefits. Incineration is best carried out with items like waste from wood, waste from gardens and food waste. Waste that is not sorted is best dealt with by the use of incineration as well as remains from materials that have undergone recycling. Land filling is also carried out on materials that are very difficult to burn and cannot be recycled either.

Reference has also been made to the waste disposal hierarchy which has been widely adopted by the EU and Japan as well as other developed nations (Dijkgraaf & Vollebergh, 2003). The hierarchy recognizes the principle that works at ensuring that the production of waste is avoided as the prime focus to be adopted as the first option in waste disposal. It is only when this is not possible that the other methods of waste disposal are thought of. The next method is recovery, while safely disposing waste is the last option which should never at any instance be considered as the first option. Safe waste disposal could come in the form of land filling. This method is said not offer benefits in the form of utilizing waste in the system because land filling presupposes that the waste cannot be used for anything again apart from having to dispose it.

The US government also focuses on the reduction of waste coming from various sources, which occupies the number one position on the ladder. The second method for them is recycling, which embodies composting of the waste generated and finally

the two forms of disposal which include incineration and land filling. For the US, neither of the forms of disposal is placed higher than the other in the ranking of the methods. But what is sure is that they are both at the bottom. Although source prevention occupies the top spot, in the event that this is not possible, it is expected that materials can be recovered and reused. The most dominant method being applied in the EU zone is incineration which is deemed to offer the benefit of energy production. Some countries have also adopted incineration not because of the benefit of producing energy but because such countries are running out of space to accommodate the other forms of waste disposal (Dijkgraaf & Vollebergh, 2003).

In her unpublished thesis, Post (2007) identified some of the methods of waste management provided by the Jamaican laws to include the collection of waste, providing storage for waste collected, waste reduction, the management of such waste, recycling of the waste, waste reuse and the proper disposal of waste. Although these things have been outlined by the law, they do not get to be implemented. Recycling which is central to waste management in Jamaica is not being done the way it should have been. The difficulty with carrying out recycling is blamed on budgetary constraints. Due to these challenges, there is a drift towards the point where people who create pollution pay for the management of the waste so generated. There is also the practice where waste management companies engage in moving to the homes of the people who live within their areas of operation to pick up waste collected by households for final disposal. The final disposal is in the form of dropping the waste at the dumpsite. Household waste is collected in inappropriate containers like rubber bags. Reuse of waste in Jamaica involves mainly food scraps. The scraps are used to make feed for animals. The study also found that one of the

strategies of waste disposal is setting fire on collected waste to burn it up without the use of incinerators. There is also a conscious effort at creating awareness among the people about the need to get involved in the management of waste especially recycling.

A policy document was issued by the Department for Environment, Food and Rural Affairs in London, which is expected to guide the management of dangerous waste (Department for Environment, Food and Rural Affairs, 2010). The document draws inspiration from the United Nations Environment Programme guidelines to nations which identify the prime approaches to waste management as prevention, preparing for re-use, recycling, recovery and disposal which have been spelt out in the inverted pyramid. The document indicates that it used to be and even still is the case that dangerous substances would be buried. Some of such substances include acids and sludges, soil that has been mixed up with dangerous substances, etc.

The reason why the strategy has been designed is to make possible the bringing to being the facilities needed for the proper management of waste considered to be dangerous. The strategy does not make room for the management of waste considered to be radioactive since it is being taken care of by a different dispensation. The strategy demands that where there is the need to apply land filling in the disposal of dangerous waste, the companies or the individuals responsible will have to pay for such act. This is expected to discourage people from falling for landfill as the first option in disposing such waste. In fact, landfill is deemed acceptable only after the other measures have been taken or considered and they prove to be ineffective in managing the situation. The strategy frowns upon the situation where such dangerous wastes will be brought together by way of mixture unless it has been permitted by the

powers that be (Department for Environment, Food and Rural Affairs, 2013).

Another document that provides impetus for how waste is managed especially radioactive waste is by International Atomic Energy Agency (2009). The document provides a policy direction for the management of radioactive waste. The policies and strategies are to among others guide nations when they are fashioning laws to deal with the sector and for the document to serve as a reference point in the management of radioactive waste. The strategy places the responsibility of managing radioactive waste squarely on the one who has generated such waste. Owners are responsible for the provision of the needed resources to manage or contain such waste. The prime objective of the policy document is that countries will work at protecting all that matter from the negative repercussions of radioactive waste at present and in the future. At the top of the management strategies for radioactive waste is the minimization of the production of such waste, which must be provided for by the policy directive of any nation. For what is regarded as spent fuel, the management strategy calls for it to be seen as a resource which must be harnessed. It should be properly labeled as such and directly disposed.

The last guideline is that where the resource is not used, then it must be given back to the one that supplied it. Radioactive material which is disused is expected to be sent back to the authority supplying it. The strategy also makes the case for information sharing with the general public on matters of radioactive waste so that their inputs are factored into issues around the subject matter. The most widely accepted mode of radioactive waste management is to ensure that the waste is not scattered so that the dangerous constituents can be brought under control for onward disposal in specially designed infrastructure that have the capacity to protect the environment.

The procedure calls for waste to be collected, profiled and separated to facilitate higher level processing; the treatment of the waste meant to shrink the amount of it while removing other components of it; the conditioning of the waste would make easy for carting, which is done by way of solidarization and other approaches; storage which describes the act of keeping waste to the point that it will no longer be seen as a threat to the environment and the occupants of it and the last and final step being the disposal of the waste so that it does not present a danger to anybody (International Atomic Energy Agency, 2009).

Writing on the strategies for managing urban solid waste in Nigeria, Uwadiogwu and Chukwu, (2013) identified the involvement of the citizenry as one of the effective measures to be adopted. They call for the education of the people to awaken their consciousness in the subject matter to ensure that they make an effective contribution in the drive towards effective waste management. The lack of involvement of the people and the private sector will not make it possible for the desired results to be achieved because the people will not develop the right type of attitude that will make them responsible for their neighborhoods and work towards making them clean. There is also the need to increase the staff strength of government institutions that are responsible for waste management while ensuring that the necessary tools and structures are provided them to enhance their capacities to efficiently carry out their mandate. However, due to funding difficulties, there is the need to institute the policy where polluters are made to pay for the clearing of the mess that they create. Poverty which is said to be a catalyst for improper waste disposal practices should be comprehensively dealt with to lift the people out of the miasma of deprivation that they find themselves, if the battle against the canker of improper waste disposal is to be won.

Governments should have competent advisors who will advise them on waste management issues and then measures like prosecution should be taken seriously so that people who violate laws on waste disposal can be punished appropriately after the necessary laws have been put in place. The laws should prohibit children from being involved in waste disposal so that only adults will be responsible for emptying bins of waste in order to put a stop to the haphazard disposal of waste. The current method operational in most developing countries must give way to a more technologically oriented approach. This approach will ensure that waste is viewed in a positive light since it will be seen as resources for the production of other things. Women can also be constituted into a group within neighborhoods that will be responsible for ensuring that people do the right things when it comes to waste disposal. Women are the focus here because of the fact that they are always at home and are more concerned about keeping their environment clean than their male counterparts (Uwadiogwu & Chukwu, 2013).

A document published by the South African government entitled “National Waste Management Strategy” also makes reference to the waste management hierarchy while adding other ingredients to arrive at their National Waste Management Strategy (NWMS). The strategy is based on the following eight goals. The first goal seeks to promote activities like the minimization of waste, the reuse of waste, waste recycling and waste recovery. The second goal is aimed at the delivery services involved in waste management to ensure that there is effective service delivery. This is done by incorporating the hierarchy for waste management into waste management activities, which also ensures that the separation of waste at where it is originating is made possible. The next goal calls for an integration of measures that promote green

economy into waste management. The involvement of the citizenry in efforts to ensure the proper management of waste is the next goal. An all involving waste management system that ropes in all outfits in the country is another goal. The rest are making financial resources available while ensuring that such resources are properly managed for the purpose of waste management; to reclaim land that has been contaminated and then the last goal being ways of instituting measures that compel people to abide by laws on proper waste management (Environmental Affairs Department, 2011).

Some of the waste management measures that have been adopted by the Swedish government to properly manage their waste include the collection of waste – This particular activity is mostly carried out by nongovernment contractors who collect household waste including those that are hazardous for further actions to be taken in the waste management chain. Another strategy is the recovery of materials that are essential from the waste – This strategy involves recycling where materials such as metals, paper and plastics can be recovered for the purpose of making new things out of them. Biological treatment is yet another strategy – it covers activities such as making manure out of waste through composting and the making of biogas. Incineration also features prominently as one of the strategies for managing waste in Sweden. In 2002, the country incinerated 10 million tons of waste making it possible for energy to be retrieved from the activity. 29 waste incineration plants were very active in 2004, which helped in accelerating incineration activities in the country that year. Landfill which can be described as a point where waste is sent for safe keeping is also being employed in the management of waste in Sweden. For instance, in 2002 about 1.8 million tons of waste emanating from manufacturing activities was

subjected to land filling which was carried out in the 140 landfill points in the country (Swedish Environmental Protection Agency, 2005).

According to Nuclear Decommissioning Authority (2010), important concepts like the waste hierarchy, harnessing the available resources for Low Level Waste management and new pathways for waste management are the guiding principles for the waste management strategy in the UK. At the top of the waste management strategy is an outline of measures for waste management to guide the operations of all waste producers. This is described as the vision aimed at safe guarding people and the environment among others. The second level strategy focuses on planning with the prevention of waste, minimization of waste, reuse of items, recycling, reduction in the volumes of waste and waste disposal being the major areas of consideration. The third and final level covers collaboration, reward for good behavior, research and development, etc. These are described as enablers without which the smooth operation of the strategy will be impossible.

In Sri Lanka, a study found that waste that is highly infectious is the most generated in hospitals. This situation has led to measures being adopted to properly manage such waste. The strategies so adopted include the establishment of incinerators that are fired by fossil fuel to burn the waste that is generated or where these things are not available, other companies are given the contract to carry out the incineration activity. The strategy for managing waste considered too sharp is not different from those applied for the dangerous ones. However, waste from medicines is managed by private entities which receive such waste and send it to different land points for disposal. Some of the hospitals were also found to engage in the practice of giving medicines that are near expiring back to the companies that supplied them for fresh

drugs to be received. Others also send pharmaceuticals that are not needed by their hospitals to other areas where they are most needed in order not to allow it to go waste. This is seen as a measure to prevent the creation of waste (Karunasena, Jayathilaka, & Rathnayake, 2015).

According to Adedapo (2014), waste management involves the collection, transport, processing, recycling or disposal of products described as waste with the ultimate aim being to promote good human and environmental health as well as maintaining the beauty of the environment. To that end, he identified landfill as one of the methods of waste disposal. He describes this method as an activity that results in the burial of collected waste in order to get rid of it. Landfill sites according to the article are located in areas that have been neglected after they have been used as places for sand winning, mining, quarrying etc. which has resulted in pits developing in such areas as the case is in some countries. However, modern ones are specially designed to take care of problems that could arise relative to waste.

Another method is incineration which entails the burning of materials that are considered to be waste. The ultimate residue of waste that is made to go through thermal treatment or incineration is ash. This method is said to generate a lot of controversy because of the possible problems that could arise such as pollution in the form of gas. The method is the commonest approach for countries that are running out of land space like Japan since it does not eat up much space like the other methods. Recycling is the next approach said to have different methods. The approach which is described as recovering valuable items from waste for reuse can take the form of physical reprocessing where items are scouted for within waste such as aluminum cans, steel cans, bottles, etc. which are processed into new products. Another form is

biological reprocessing where materials like food particles, products from paper and the like are collected and transformed into compost to be used for crops and plants. Energy recovery is another form of waste recycling. This method makes it possible for fuel and electricity to be generated from waste products (Adedapo, 2014).

2.9 The Health Effects of Improper Waste Disposal

According to Burmamu, Law, Aliyu and Ibrahim (2014), there are lots of materials that get thrown out as waste in the everyday activities of human beings. Some of these materials include papers, polythene bags, metals, bottles, etc. The effect of the disposal of these items is that they get to litter the physical space and take away the beauty that it naturally possesses. Some of these items like polythene do not easily get decomposed when they get into contact with the land and they get blown to all corners of the environment by wind. The polythene products get to block the pores in the soil thus making aeration and water leakage impossible, which can lead to flooding.

Water that drips from dumpsites into river bodies and down to ground water, results in pollution of the water thereby rendering it unsafe for human consumption. A study of the level of pollution in liquid from dumpsites found that the PH, calcium and nitrate levels were far more than the limits set by the World Health Organisation in almost all the areas that the exercise was carried out. The levels are deemed to be dangerous to the environment and also to human life (Burmamu, Law, Aliyu, & Ibrahim, 2014).

Writing on the impact of poor management of waste being research conducted in Juba in South Sudan, Karija, Shihua and Lukaw (2013) found some of the waste management practices in the area to include, haphazard disposal by households, which is the dominating approach; management of the waste by the district level authorities and independent companies also engaging in waste management, which is the least used option. The households send their waste to the riverbed where the water has dried leaving it bare for disposal. The result is that the waste is carried to the river Nile when it begins to rain. Many of the people in Juba depend on River Nile for drinking water and also use the water for other domestic purposes such as bathing. The polluted water is said to cause the persistent water pollution related problems that are witnessed every year in the area. Some of these problems are typhoid, dysentery, diarrhea, hepatitis A and cholera. Tests conducted on the water from the river bodies showed abnormal levels of dangerous substances and a very high PH level being an indication that there is a high concentration of acid in the water. Tests also conducted on ground water in the area showed that some of the points where the tests were carried out, high levels of fecal matter concentration were recorded thus making it unsafe for human consumption but which is still being consumed.

Rabl, Spadaro and Zoughaib (2008), also sought to juxtapose the effects of landfill activities and incineration using various models that arrive at the same results. They found that pollution from these activities can result in the formation of certain chemicals which are dangerous to human life. These chemicals compounds include nitrates, sulfate products like ozone, Carbon Monoxide (CO), Sulphur Dioxide (SO₂), Nitrogen Oxides (NOX), benzene, benzo(a)pyrene, formaldehyde, dioxins, As, Cd, Cr, Hg, Ni and Pb, etc. The pollution from some of these compounds is picked up by

human beings through the air that they breathe in or through the intake of food that may be contaminated.

Their analysis shows that pollution of the air contributes to mortality rate especially death among children brought about by breathing and cardiovascular problems. These problems come mainly from compounds such as PM10 or PM25, but also from ozone, which is also deemed to make some contribution. Some of the impacts on children could be due to acute mortality and chronic bronchitis while SO₂ is also found to have adverse effects on the lives of people. The following metals are also considered to be dangerous to human health – arsenic (As), cadmium (Cd), chrome (Cr, in oxidation state VI) and nickel (Ni). He, is also another metal that is said to cause damage to the human system leading to people developing low IQ. The metal is deemed to have the capacity to stay very long in the atmosphere and it can be changed by living things in water to methyl-mercury and if such living things are caught and made into food, an intake of such food will lead to fatal consequences. The metal comes from fluorescent light bulbs, thermometers and batteries. Dioxins is one other pollutant that comes from the burning of solid waste from municipalities which could result in asthma attacks.

Inhalation, the intake of water, eating food which has bacteria and viruses when waste is used as manure and food contamination brought about by organic chemicals when burning of waste takes place are seen as the main mode of getting exposed to the problems of waste disposal especially land filling and incineration (Giusti, 2009). He also came up with some of impacts to include the production of CO₂ = carbon dioxide; CH₄ = methane; VOCs = volatile organic compounds; SO₂ = Sulphur dioxide; NO_x = nitrogen oxides; N₂O = nitrous oxide; HCl = hydrochloric acid; HF =

hydrofluoric acid, CO= carbon monoxide; and PAHs = polycyclic aromatic hydrocarbons. Some of these chemicals are responsible for increasing temperature levels. The situation can lead to adverse problems for people who are suffering from heart related diseases like asthmas and older people who have cardiovascular cases. There could be increasing cases of malaria due to the warm weather which is a factor for the survival of mosquitoes, the spreading agent of malaria. Acute cases of deeply troubling accidents can emerge relative to people who have had a reduced period exposure to heavy amounts of dangerous substances, dusts, bio aerosols, etc. and chronic situations due to expanded period exposure to substances which have low levels of dangerous agents could also be a problem.

The work indicates that incineration leads to the production of polychlorinated dibenzo-p-dioxins (PCDDs) commonly called dioxins as referred to in the article reviewed above. The substance is considered to be a toxin such that its presence in eggs, dairy products, fish, and fat from animals can be dangerous when eaten. It is even suggested that emissions from the incineration of solid waste could lead to cancer in humans. It has also been realized that washing down with water that is contaminated can result in gastrointestinal problems as well as ear and eye diseases.

A study conducted in Kaya in Burkina Faso found that there is haphazard disposal of waste in the area. Solid waste is disposed at landfill sites that are not regulated neither are they state of the art structures that are meant for that purpose. Containers meant for the collection of waste are not being used properly since people avoid them by placing waste on the ground near the containers despite the fact that they are not full. As a result of these practices, there is bound to be negative externalities on the lives of the people. It is suggested by the research that diseases like malaria, acute

respiratory infections and diarrhea which are very common in the area are as a result of the poor management of waste. The use of items like barrels that have been cut in half only help provide the necessary condition for mosquitoes and flies to triumph. These insects are known to be the carriers of the vectors of malaria and diarrhea respectively (Kafando, Segda, Nzihou, & Koulidiati, 2013).

Open dumps which are the order of the day in the area as well as improper sewage system are also fertile grounds for these insects to multiply and wreak havoc on the health of people. Hydrochloric acid which can be traced to some waste products is known to cause skin problems, eyes and respiratory tract problems, cardiovascular diseases and cancer (Kafando, Segda, Nzihou, & Koulidiati, 2013).

Writing on the health-related problems that can arise as a result of the improper disposal of medical waste, Manyele (2004) identified nosocomial infections as a health problem acquired from bacteria from the waste produced at hospitals, which can stay hours in the air in the hospital. This situation exposes both people who are admitted or attend hospital for treatment and the staff as well to the risk of acquiring infections. Hospital waste which has not been treated to neutralize the potential danger that they carry when disposed in the open can lead to the release of pathogens in the air which can land in water sources, foodstuffs and in the soil while some stay in the air. This situation presents grave danger to all those who come into contact with them.

Burning which is a common practice in dealing with hospital waste in the developing countries facilitates the release of dangerous gases including oxides of Sulphur, oxides of nitrogen, carbon dioxide and the like. These are known to cause respiratory

problems when taken in. The dangerous gases do not get confined to only the hospitals but can be blown by wind to the surrounding areas leading mass infections (Manyele, 2004).

Lekwot, Nunyi, Ifeanyi, Okafor and Adamu (2012), writing about the negative effects of the improper disposal of waste from hospitals, arrived at the point that coming into contact with such waste could result in infections. One of the ways suggested to be a possible cause of health problems is when the waste gets in contact with the sources from which communities get their drinking water. They also assert that these wastes carry certain bacteria that can be distributed across an area by the act of wind such that animals that get to feed on grasses contaminated could pick up the bacteria and pass it on to humans when products of such animals are eaten. They are also found to provide an enabling environment by way of providing food for flies and other living organisms when the waste begins to produce pungent scent through fermentation.

Decaying hospital waste is also a source of harmful gasses like methane (CH₄), nitrogen (N₂) and hydrogen sulfide (H₂S). When such waste is subjected to combustion activities, it could give off carbon di-oxide (CO₂), CH₄ and CO₂ and also dioxins, furans and mercury. Metals, salts, and chlorinated hydrocarbons get to remain in the soil upon which the waste in question has been placed over time. The resultant effect could be irritation of the eyes and the respiratory system when one gets in contact with it.

Nisar, Ejaz, Naushad and Ali (2008) in their study titled “Impacts of solid waste management in Pakistan: a case study of Rawalpindi city” came out with results that are not different from the findings of many of the articles reviewed so far under this subject matter.

Their research found that open dumping is one of the waste disposal practices in the area under study. The practice is said to result in the throwing of dust and rubbish all over the place, the spread of bad odor, breeding place for bacteria and viruses, release of dangerous gases, contamination of water bodies, etc. The result of the prevalence of this situation is the spread of diseases and illnesses.

Another practice in the area is open burning said to produce ash that stays on the ground and one that flies about in the air, which are dangerous for human life due to the resultant pollution. The practice also results in the reduction of visibility brought about by the smoke, which can lead to accidents involving vehicles that may be fatal. Other health related problems identified by the research are the breeding of mosquitoes and flies which spread diseases like malaria and dengue on one hand known to be caused by mosquitoes and diarrhea and other related diseases also known to be caused by flies. The open burning practiced in the area in a bit to reduce the volumes of waste is also fingered for the production of dioxins. Children and other persons who go to these waste dumping sites stand the risk of being hurt since they can be cut by some objects that may be sharp and found among the waste. There is also the risk of some of the waste which may be large in size falling over and hurting people who go close to them (Nisar, Ejaz, Naushad, & Ali, 2008).

It has also been reported by Forastiere, et al. (2011) that a prolonged exposure to the effects of incineration could bring about chronic problems such as cancer, which is deadly due to the inhalation and ingestion of substances like PM10 and NO₂. The same is reported for landfill activities, which lead to children being born having low weight that may make it difficult for them to survive. This situation is the result of many years of taking in the biogas that is produced as the waste materials decay. The

case has been made that cancer cases that were reported in Italy from 2001 with an estimated yearly figure of 90 were attributable to the fact that those people had been exposed to incineration activities prior to the reporting period. They are therefore contending that the new measures that are being adopted for the purpose of ensuring proper waste management will do little to avert the consequences or the cancer cases that will occur due to the effect arising out of the poor management of waste since the effect has already been done.

Alam and Ahmade (2013) were also clear in their position that there are health related problems associated with the haphazard disposal of solid waste. They argue that the problems affect those whose job it is to take care of the waste produced. On the issue of hospital waste, they claim that the impact is far reaching as it affects all the people who are exposed to the vagaries of the result of such waste which are flies and rats known to carry diseases. They have also alluded to the possibility of car crashes occurring as a result of waste in the form of toxin spilling on roads. There is also the possibility of concentrated metals from dumpsites making their way into water bodies and posing danger to those who use such water. There other related problems like people getting poisoning because they have breathed in harmful chemicals thought to come from waste; children born could possess light weight, which is not good for the survival of such children; cancer can occur; the development of brain related diseases; people could have nausea feeling or throw out; health complications resulting from the intake of aquatic products which have various levels of mercury in them; etc.

Abul (2010), decided to adopt a different approach to establish the link between improper waste disposal and health related problems. He did this by comparing the health history of the people who stay near a dumpsite with those who stay far from

the dumpsite. Reporting on the outcome of his research, (59%) of the interviewees was emphatic that such places facilitate the multiplication of insects that carry diseases and spreading same. Therefore, 82% of those who reside in places that are near the dumpsite were of the view that they were getting certain sicknesses and ailments because they were near such places, implying that if they were not found in such areas, the situation would have been different.

In studying the records relating to malaria cases in the area, the writer found that a greater number of the people who were residing close to the dumpsites contracted malaria than those whose places were far from the dumpsites, that is 36% as against 13% respectively. In the case of diarrhea, it was discovered that 16% of the people near the dumpsite suffered the disease compared to just 5% of those far away from the dumpsite. While 18% of those in close proximity to the dumpsite got cholera and 16% of those staying afar got the disease. In general terms, more people (that is 71.8%) from the areas around the dumpsite reported to the hospital for being sick compared to just 59% of those far from the dumpsites.

In a publication by Health Protection Scotland and Scottish Environmental Protection Agency (2009), they sought to highlight the facts around incineration and health related problems, which evidence is based on literature that have been published already. The report asserts that some of the literature reviewed indicated that there was no any known fact that incineration could result in the contraction of diseases. Other reports reviewed also found no link between the incineration of waste materials and cancer. It has also been indicated in some of the reports that they could not arrive at the conclusion that the incineration of waste leads to certain sicknesses or not because of the uncertainties resulting from such reports.

Other reports were however of the review that incineration was very much linked to lung cancer, deaths or mortality issues resulting from laryngeal cancer. Some of them also came to the conclusion that the imbalances in the number of males and female were thought to be the result of incineration activities. What is significant is that people who were in the business of manning incineration activities showed significant problems that could be linked to the job that they do.

Modebe, Onyeonoro, Ezeama, Ogbuagu and Agam (2009) have also corroborated the findings of some of the articles and reports reviewed by suggesting that there is a relationship between improper waste disposal and the growth in the number of house flies, mosquitoes, rats and the rest. These are known to carry diseases that are highly contagious such that when they come into contact with people, they could transmit such diseases to them.

Domingo and Nadal (2009), identified three ways by which compost can present danger to human health – the taking in of soil that has been interlaced with compost especially children, eating food prepared from foodstuffs grown out of soil that has been interlaced with the substance taken over a longer period of time and inhaling air that has the dust of compost in it. Some of the chemicals that are dangerous and which are present in compost are metal components like arsenic, cadmium, chromium, lead, mercury and nickel; pesticides; organochlorinated compounds (PCDD/Fs and PCBs); PAHs and halogenated hydrocarbons. They are produced during the process of chemical reaction to break down the solid waste. Once produced, they can travel to any part of the world. In other words, they are not confined to the atmosphere around the compost area. benzene and 1,3-butadiene present in the atmosphere could fast track the development of leukemia and formaldehyde, while PAHs could lead to cancer developing in people.

The pungent smell from compost is also suspected to be an indirect cause of nausea and vomits, hypersensitivity and changes to the respiratory system. According to them, benzene has the potential to induce aplastic anemia and polycythemia. Other chemicals like carboxyhemoglobin, dichloromethane, toluene, styrene, trichloroethylene and tetrachloroethylene which are brought about by dichloromethane known to be present in compost can result in introducing toxin to the neurons. Others are naphthalene and styrene, which can cause the mucosal membranes to develop irritations.

A study conducted in Port Harcourt in Nigeria to ascertain the impact of various practices relating to waste disposal on the health of people found that improper waste disposal leads to the development of health problems (Wokekoro & Inyang, 2014). Haphazardly disposed rubbish was found to be the reason why people pick up diseases from the bad smell of decaying waste and also the promotion of the multiplication of rodents like rats and disease or parasite carrying vectors such as insects like flies and mosquitoes. For instance, it has been suggested that empty tins, bottles, tire plastic containers and drums collect water when it rains thereby promoting the breeding of mosquitoes (Wokekoro & Inyang, 2014).

Flies are known to spread diseases that emanate from fecal matter. Culex mosquitoes are instrumental in the spread of microfilaria and aedes mosquitoes are notorious for passing on dengue and yellow fever to their victims. Rats can also spread diseases such as plague, salmonella and leptospirosis. Another aspect of rodents is that they serve as food for snakes, which make their way to places where waste has been left to look for prey. This can result in humans picking up snake bites which can be deadly. The pollution caused to the air has the potential of spreading diseases like

tuberculosis and infection of the respiratory system. Water pollution is also considered as one of the effects of waste disposal due to leachate from dumpsites. The result is that people will develop typhoid, cholera and dysentery (Wokekoro & Inyang, 2014).

A study conducted by Addo, Adei, and Acheampong (2015) in Kumasi arrived at the conclusion that waste management could result in health problems for the people. For instance, they contend that there are health problems for people who stay close to dumpsites due to the presence of mosquitoes, flies and rats. It was gathered that the population of insects at these sites increase exponentially during the rainy season due to the presence of water. The residents of areas around dumpsites attribute their sicknesses to mosquito bites since most often than not they are diagnosed of the disease when they fall sick and report to the hospital. Others were also of the view that the flies were the sources of their health problems. The burning of the waste results in the generation of smoke and other particles which sit in the air and when inhaled, could result in health problems. The respondents of the research made this point clear when they alluded to it as the cause of some of the ailments that they suffer from.

2.10 Literature Gap

While research on solid waste management in Ghana exists, there is a noticeable gap concerning the specific context of solid waste management practices in Senior High Schools (SHS) within the Adansi North District. The available literature tends to focus on waste management in urban areas or at the national level, often overlooking the waste generation and management challenges within educational institutions, especially SHS.

- Limited Studies on Solid Waste Management in SHS

Most existing studies in Ghana tend to concentrate on municipal solid waste management, waste generation in urban centers, and waste disposal at landfill sites. There is limited research that delves into the solid waste management practices within educational institutions, including SHS. As a result, there is a lack of comprehensive data on waste generation patterns, disposal practices, and students' awareness and behaviors regarding waste management in SHS.

- Neglect of Environmental and Health Impacts in SHS

While some studies highlight the environmental and health impacts of improper waste management practices in urban areas, these studies rarely extend their focus to educational institutions. SHS, with their significant student population and daily waste generation, are potential contributors to environmental pollution and health risks if proper waste management practices are not in place. The literature gap lies in the absence of research specifically examining the environmental and health consequences of waste mismanagement in SHS.

- Lack of Attention to Awareness and Education in SHS

Research has consistently emphasized the importance of awareness and education in influencing waste management behaviors. However, few studies have investigated the level of awareness among students in SHS regarding solid waste management. Understanding students' awareness of waste management practices, their perception of the environmental and health impacts, and the sources of information they rely on are crucial for designing targeted interventions. This gap in the literature hinders the development of effective educational strategies to promote responsible waste management practices among students in SHS.

- Absence of Solutions Tailored to SHS:

Existing literature offers insights into waste management challenges in Ghana and other contexts, but the applicability of these findings to SHS may not be straightforward. The school environment has unique characteristics, and waste management solutions that work well in urban centers may not be directly transferable to educational institutions. Therefore, the literature gap lies in the lack of research focusing specifically on waste management solutions tailored to SHS in the Adansi North District.

2.10.1 Closing the Literature Gap

Addressing the aforementioned literature gap is essential for developing effective and context-specific waste management interventions in Senior High Schools within the Adansi North District of Ghana. This study is focused on understanding waste generation patterns, disposal practices, and students' awareness and behaviors regarding solid waste management within the selected SHS. Additionally, investigations into the environmental and health impacts of improper waste management in educational institutions are necessary to raise awareness and inform policymakers of the urgency of addressing this issue. Moreover, the study explores the effectiveness of educational strategies and interventions aimed at promoting responsible waste management behaviors among students in SHS are essential. Closing these literature gaps, aids policymakers, school authorities, and waste management practitioners to develop targeted and sustainable waste management practices that not only benefit the school environment but also contribute to broader environmental sustainability in the Adansi North District and beyond.

2.11 Conclusion

This chapter analyzed the state of consciousness of waste disposal, factors contributing to improper waste disposal, waste disposal strategies and health effects of improper waste disposal.



CHAPTER THREE

METHODOLOGY

3.0 Introduction

The chapter discusses research design, study population, source of data, research instrument, sample size, sample procedure, location and description of study area as well as data analysis procedure. In addition, the section further presents the profile of the study area, the characteristics of the beneficiaries as well as the data analysis and presentation processes.

3.1 Research Approach

The research approach refers to the overall strategy and plan adopted by researchers to conduct their study. It guides the methods and procedures used to collect, analyze, and interpret data in order to address the research questions or objectives effectively. There are two primary types of research approaches: quantitative and qualitative. Quantitative research involves the collection and analysis of numerical data, typically using structured instruments such as questionnaires or surveys. On the other hand, qualitative research focuses on understanding the experiences, perceptions, and meanings of participants through in-depth interviews, focus groups, or observations (Creswell, 2014).

In this study, the research approach will be quantitative, as it aims to assess the solid waste management practices in selected Senior High Schools in the Adansi North District of Ghana using numerical data and statistical analysis.

Quantitative research is a systematic and empirical approach to study phenomena by collecting and analyzing numerical data. It seeks to quantify relationships, patterns, and trends, enabling researchers to draw objective conclusions and make

generalizations about a larger population (Babbie, 2016).

The decision to employ quantitative research in this study is supported by several reasons. Firstly, the objective nature of quantitative research ensures a systematic and unbiased examination of the solid waste management practices in the selected Senior High Schools. The use of numerical data provides a clear and precise representation of the students' awareness and understanding levels. Secondly, the potential for generalizability is a key advantage of quantitative research. By using a quantitative approach, the findings can be generalized to a larger population of students in the Adanso North District, enhancing the study's external validity and increasing the potential impact of its results. Thirdly, the comparability enabled by quantitative research allows for comprehensive analysis of variations in waste management practices between different schools, grade levels, or demographic groups within the sample. Lastly, the efficient data analysis offered by statistical methods in quantitative research allows researchers to process and interpret large volumes of data effectively, leading to more precise conclusions.

3.2 Research Design

A descriptive quantitative research design was used for this study. According to Agyedu, Donkor and Obeng (2011), a descriptive study seeks to gather information so that a description of what is going on can be made. It may be designed to discover whether there is any relationship between two variables (but not causal relationship). Descriptive research was identified by AL-Hussami (2008) as a way of presenting data in a manageable form, using quantitative methods to describe single variables but also describe the associations that connect one variable to another. Beehr (2012) stated that descriptive statistics are used in a study when a researcher was to

understand the opinions of a group of people towards a particular issue at a particular time.

Quantitative methods involve the use of statistical tools, or numerical analysis of data collected through questionnaires, polls and surveys, or by manipulating secondary or already-existing statistical data (Obeng, 2011). Quantitative research primarily focuses on assembling or gathering numerical data and generalizing to explain a particular phenomenon. The goal for carrying out quantitative research study is to establish, determine or examine the relationship between one thing [an independent variable] and another [a dependent or outcome variable] within a population. In this design, the collected data was analysed quantitatively to help explain, or elaborate on, the results obtained through administering of structured questionnaire. This design is found application in both social and behavioural sciences research (Klassen & Burnaby, 1993). The rationale for this approach is that the quantitative data and their subsequent analysis provided a general understanding of the research problem (Creswell, 2003).

3.3 Research Settings

The research was conducted in the Adansi North District, situated in the southern part of the Ashanti Region, Ghana. The district is boasted of a diverse landscape, featuring forests, hills, plains, and rivers. It is a mix of urban and rural areas, each presenting unique waste management challenges and practices. This diversity made it an ideal setting to assess solid waste management practices in Senior High Schools.

Within the Adansi North District, three Senior High Schools, three Senior High Schools namely; Fomena T.I Ahmadiya Senior High School, Dompase Senior High School, and Asare Bediako Senior High School, were selected as the focal points of

the study. These schools served as representative samples, allowing researchers to gain insights into the waste management practices within educational institutions. The schools varied in their waste management awareness, implementation of measures, and access to waste disposal facilities. The socioeconomic factors of the district were also taken into consideration. Variables such as income levels and educational attainment could influence waste management behaviors and practices among the population. Additionally, local culture and traditions may have played a role in shaping attitudes towards environmental conservation and sustainability.

3.4 Population

The population for this study included the students from three Senior High Schools in the Adansi North District of Ghana, namely; Fomena T.I Ahmadiya Senior High School, Dompoase Senior High School, and Asare Bediako Senior High School. That is, 300 participants each from the selected Senior High Schools

3.5 Sampling Design

According to Strydom et al., (2005) sampling means taking any portion of a population as characteristic of that population. If population is comparatively small, the model should comprise a reasonably larger percentage of the population. Large samples enable the investigator to draw more accurate assumptions and more precise predictions than in smaller samples (ibid).

The researcher employed a statistical model by Yamani (1964) to settle on the sample size at a 95% confidence level with 5% margin of error. $n = \frac{N}{1+N(\partial^2)}$ Where n= the sample size, N= the sample frame, 1= a constant, and $\partial = 0.05$

However, the population for the study constituted 900 Senior High School students

from three Senior High Schools in the Adansi North District of Ghana, Therefore,

$$n = \frac{900}{1+900(0.05^2)} = 277$$

Consequently, the researcher used three methods of data collection in getting respondents for the study. These are, convenience sampling, test administration, and simple random sampling.

Firstly, convenience sampling method was used to select the three Senior High Schools in the Adansi North District of Ghana. This was based on proximity, the conveniences in gathering data, and time; taking into consideration that this is an academic project that must be conducted within the specified academic year.

Secondly, the researcher applied test administration in selecting the 277 respondents equally from various selected senior high schools. By this technique, the researcher made sure that each school was allotted 93 participants. This sampling technique ensured that each school was adequately represented within the whole sample population. According to Creswell (2013), this is an effective sampling technique for studying how a trend or issue might differ across subgroups. By means of test administration as a method of collecting data, the researcher achieved greater precision. Administratively, this method guarantees better coverage of the population, giving the researcher an advantage control over the subgroups that are included in the sample, guaranteeing that any one type of person was included in the final sample.

Finally, the researcher applied simple random sampling technique to select 93 participants each from the three selected Senior High Schools. According to Meng (2013), this method of sampling is one of the basic and common type of sampling method used in quantitative social science research and in scientific research. The

main benefit of simple random sampling is that each member of the population has an equal chance of being chosen for the study. This guarantees that the sample chosen is representative of the population, in an unbiased way. In turn, the statistical conclusions drawn from the analysis of the sample will be valid (Frerichs, 2008). Simple random sampling method is used primarily when there are unlimited numbers of people who have expertise in the area being study (Palys, 2008; Etikan, 2016).

3.6 Research Instruments and the Method of Data Collection

Formal approvals from the heads of the schools were obtained before the starting of data collection. Selected respondents were asked to fill questionnaires. These questionnaires were given and collected during school hours. The data collection tools included four sections; Section (A) consists of demographic information; Section (B) collected data on the level of awareness on solid waste storage and collection methods among the students of the selected senior high school in the Adansi North District of Ghana pupils; Section (C) collected data on the students level awareness of the environmental and health effects of improper solid waste management practices; and Finally section (D) collected data on the sources of information on solid waste management among the students of the selected senior high school in the Adansi North District of Ghana school.

3.7 Access

Before data collection, the researcher visited the respondents to schedule meetings with them. During the visit, the plan for data collection was discussed, and the sent on the scheduled date and administered to the participants personally by the researcher.

3.6 Ensuring the Validity and Reliability of the Research Instruments

Validity

The term “validity” in research basically denotes the level, degree, scope or extent to which research instruments measures what they intend to measure, or aid to attain the intended research objectives (Cohen, Manion and Morrison, 2017). To ensure that the validity of the study instruments, the designed questionnaire was submitted to the project supervisor for vetting, correction and approval before distributing it to the respondents.

Reliability

Reliability refers to the extent to which the research instrument produces consistent results if repeated measures are taken. It can be achieved when keeping results at a consistent level despite changing of time and place (Kimberlin & Winterstein, 2008). Internal consistency is determined by employing Cronbach's alpha test, which determines the extent to which personal items are intercorrelated with overall scale findings (Shrotryia & Dhanda, 2019). To ensure reliability of the research instruments, a pre-test was conducted 20 students at Fomena T.I Ahmadiya Senior High School. The pre-test was intended to examine the correctness and completeness of the questionnaire. It was also intended to have an overview of how the participants would react to the questions during the various items of the questionnaire. Through the pre-test, the questions were improved and corrections made.

Accordingly, the Cronbach's alpha test was employed to assess the internal consistency of the research instrument used in this study. The test was conducted on the responses obtained from the pre-test, which involved 20 students at Fomena T.I Ahmadiya Senior High School.

The Cronbach's alpha value obtained from the test was 0.85. This indicates a high level of internal consistency among the items in the questionnaire. A Cronbach's alpha

value of 0.85 suggests that the items in the questionnaire are strongly intercorrelated, indicating that the research instrument is reliable in measuring the intended constructs (Shrotryia & Dhanda, 2019). Having a Cronbach's alpha value above 0.7 is generally considered acceptable for most research purposes, and a value of 0.85 indicates a high degree of reliability in this case. This means that if the same questionnaire is administered to a similar group of participants under comparable conditions, it is likely to produce consistent and reliable results. The high Cronbach's alpha value strengthens the confidence in the reliability of the research instrument and the validity of the findings derived from it (Shrotryia & Dhanda, 2019).

3.7 Data Analysis

The data from this study was analyzed quantitatively. The quantitative analysis included descriptive analysis, frequency, quantification of mean and standard deviation. The data for this study was processed using Microsoft Excel 2016.

3.8 Ethical Issue

This study is solely for academic purposes; therefore, all respondents were to be identified by their names but rather, they were identified with codes during dissemination of results. The confidentiality and privacy of the respondents was assured, hence, all information or data provided by the respondents were kept confidential. The respondents' involvement and participation in the study was on voluntary term and they were not be exposed to any form risks, coerce or induced with any form of monetary or kind of reward. Likewise, the researcher gave full affirmations to all the reference materials utilized as a part of the study.

3.12 Summary

This chapter outlined the research design, study area, population and sample

characteristics, Sampling procedure and technique, data collection instrument, data collection procedure and data Analysis.



CHAPTER FOUR

PRESENTATION OF DATA, RESULTS AND ANALYSIS

4.0 Introduction

This chapter presents the findings of the analysis conducted for this study. It covers the response rate, demographics of the respondents and the analysis of the findings with regard to the objective of the research.

4.1 Response Rate

Response rate in research refers to the percentage of participants who respond to a survey or questionnaire. It is a measure of the success of a study's recruitment efforts and the willingness of participants to participate in the study. A high response rate is generally considered desirable, as it increases the representativeness and generalizability of the study's findings. A low response rate, on the other hand, can introduce bias and limit the conclusions that can be drawn from the study (Deutkens, De Ruyter, Wetzels & Oosterveld, 2004). Table 4.1 below illustrate the response rate for this study.

Table: 4. 1. Response Rate

Response Rate	Frequency	Percent.
Questionnaires completed and returned	268	96.8
Questionnaires returned incomplete	7	2.5
Questionnaires never returned	2	0.7
Total	277	100

Source: Field work, 2022

From table 4.1 above, the researcher dispatched 277 questionnaires for this study; however, only 268 questionnaires were returned complete, yielding a satisfactory response rate of 96.8%, 7 of questionnaires representing 2.5%, returned incomplete, whereas 2 (0.7%) questionnaires never returned. Therefore, the researcher proceeded

to analyse the data collected from the 268 respondents. According to Krosnik and Presser (2010), a 60% responds rate would be marginal, 70% is reasonable, 80% would be good, 90% would be excellent and 100% perfect. Therefore, in this study, a 96.8% response rate is an excellent representation of the targeted study sample.

4.2 Demographic Characteristics of Respondents

This section presents at the background of the respondents. The respondents to this study included senior high students from in the Adansi North District of Ghana, namely; Fomena T.I Ahmadiya Senior High School, Dompase Senior High School, and Asare Bediako Senior High School. Table 4.2 below presents the demography of the respondents. These included their gender, age and programme or subject.

Table: 4. 2. Demographic Characteristics of the Respondents

Demographic Characteristics	Freq.	%
Gender		
Male	115	42.9
Female	153	57.1
Total	268	100
Age		
Less than 15 years	21	7.8
15 – 18 years	59	22.0
19 - 20 years	161	60.1
21 – 25 years	27	10.1
Total	268	100
Subject/Program of study		
Home Economics	58	21.6
Business	67	25.0
General Art	99	37.0
Visual Art	44	16.4
Total	268	100
Class/Form		
Form 1	85	31.7
Form 2	87	32.5
Form 3	96	35.8
Total	268	100

Source: Field Survey, 2022

Table 4.2 showed that a total of 268 respondents were surveyed of this study. A majority of 57.1% of the respondent were females and 42.9% were males. This data shows that there were considerably more female participants than male in this survey. The above result also depicts the population Senior High School Students in the Adansi North District of Ghana are largely dominated by females.

The age distribution of the respondents revealed that, 7.8% of the respondents were less than 15 years of age, 22.0% fall between the ages of 15 to 17 years, 60.1% fall between 18 to 20 years, 10.1% fall between 21 to 25 years. The above result indicates that majority of the respondents were between the age bracket of 15 to 25 years.

More so, results from table 4.2 showed that 37% of the respondents read General Arts, 25.0% reads Business, 21.6% reads Home Economics and 16.4% reads Visual Art. Finally, about 31.7% of the students were in form Form 1 (SHS 1), 32.5% of them were in form 2 (SHS 2) and the remaining 35.8% of them were in form 3 (SHS 3).

4.3 The level of awareness on solid waste storage and collection methods among the students of the selected senior high school in the Adansi North District of Ghana.

This section of the study sought to find out the level of awareness on solid waste storage and collection methods among the students of the selected senior high school in the Adansi North District of Ghana. The survey asked students about how their school currently manages its solid waste, if there are specific procedures in place for the disposal of different types of solid waste, if there are designated areas for the storage of solid waste on campus, if there are regular solid waste collection services provided, and if there are any school-wide campaigns or initiatives in place to

promote sustainable solid waste management practices.

The survey also asked students to rate the overall effectiveness of their school's current solid waste management practices. The views of the students were analyzed and presented in the table 4.3 below

Table: 4.3: Students level of awareness on solid waste storage and collection

methods

	Freq.	%
How does your school currently manage its solid waste?		
Incineration	72	26.9
Landfilling	108	40.3
Recycling	14	5.2
Composting	23	8.6
I have no idea	51	19.0
Total	268	100
Are there specific procedures in place for the disposal of different types of solid waste (e.g. paper, plastic, food waste)??		
Yes	79	29.5
No	137	51.1
Not sure	52	19.4
Total	268	100
Are there designated areas for the storage of solid waste on your school's campus?		
Yes	205	76.5
No	41	15.3
Not sure	22	8.2
Total	268	100
Are there regular solid waste collection services provided for your school?		
Yes	27	10.1
No	194	72.4
Not sure	47	17.5
Total	268	100
Are there any school-wide campaigns or initiatives in place to promote sustainable solid waste management practices?		
Yes	16	6.0

No	244	91.0
Not sure	8	3.0
Total	268	100
To what extent does your school involve students in solid waste management?		
Very involved	13	4.9
Somewhat involved	28	10.4
Not involved	52	19.4
Not sure	175	65.3
Total	268	100
Are there any facilities in your school for the recycling of paper, plastics, or other materials?		
Yes	8	3.0
No	243	90.7
Not sure	17	6.3
Total	268	100
How do you rate the overall effectiveness of your school's current solid waste management practices?		
Highly effective	7	2.6
Somewhat effective	49	18.3
Not effective	3	1.1
Not sure	209	78.0
Total	268	100

Source: Field Survey, 2022

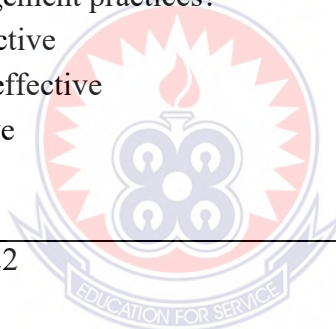


Table 4.3 shows the results of a survey on the level of awareness on solid waste storage and collection methods among senior high school students in the Adansi North District of Ghana. The results of the survey indicate that the majority of students (40.3%) report that their school currently manages its solid waste through landfilling, while a substantial number of students (26.9%) report that their school uses incineration. A percentage of students (8.6%) report that their school uses composting, and 5.2% of them reported that their school recycles its solid waste. A number of students (19%) are unsure of how their school manages its solid waste.

The survey also found out that a majority of students (51.1%) report that their school does not have specific procedures in place for the disposal of different types of solid

waste, while a percentage (29.5%) report that their school does have such procedures in place. A number of students (19.4%) are unsure.

The survey further found that a majority of students (76.5%) reported that there were designated areas for the storage of solid waste on their school's campus, while a 15.3% reported that there are no designated areas. A number of students (8.2%) are unsure.

The survey also found that a majority of students (72.4%) report that their school does not have regular solid waste collection services provided, while a percentage (10.1%) report that their school does have such services. A number of students (17.5%) are unsure.

The survey found that a majority of students (91%) report that their school does not have any school-wide campaigns or initiatives in place to promote sustainable solid waste management practices, while 6% reported that their school does have such campaigns or initiatives. A percentage of three (3) are unsure about the situation.

The survey also found that a majority of students (65.3%) are unsure to what extent their school involves students in solid waste management, while a percentage (19.4%) report that their school is not involved, and a percentage (10.4%) report that their school is somewhat involved. 4.9% of them reported that their school is very involved.

The survey also found that a majority of students (90.7%) report that there are no facilities in their school for the recycling of paper, plastics, or other materials, while 3% reported that their school does have such facilities, and 6.3% of them were unsure.

Finally, the survey found that a majority of students (78%) are unsure of how to rate the overall effectiveness of their school's current solid waste management practices, while 18.3% report that their school's practices are somewhat effective. A relatively lower percentage (2.6%) report that their school's practices are highly effective, and an even smaller percentage (1.1%) report that their school's practices are not effective.

Overall, the data suggests that the level of awareness and participation in solid waste management practices among senior high school students in the Adansi North District of Ghana is low. These results suggest that there is a need for increased education and awareness about solid waste management among students in the Adansi North District of Ghana, as well as the implementation of more effective and sustainable solid waste management practices in schools

That notwithstanding, the data in Table 4.2 aligns with theories Trans-theoretical model of change (TTM), The Extended Parallel Process Model (EPPM), and The Theory of Planned Behaviour (TPB) that underpinned this study.

The Trans-theoretical Model of Change (TTM) posits that individuals go through several stages in order to change their behavior. The TTM suggests that individuals first need to become aware of the problem and then progress through stages of contemplation, preparation, action, and maintenance before they are able to sustain a new behavior. The results in Table 4.3 suggest that many of the students surveyed are in the early stages of this process, with a number (19%) them reporting that they have no idea how their school manages solid waste, and a similar number (19.4%) being unsure if there are specific procedures in place for the disposal of different types of waste. This suggests that these students may not yet have reached the contemplation stage of the TTM, and more education and awareness is needed before they can take action to change their behavior.

More so, this results also align with the Extended Parallel Process Model (EPPM), which posits that communication campaigns can be more effective when they match the level of perceived threat of a problem with the level of efficacy (or perceived ability to cope with the problem). The results of the survey suggest that the level of perceived threat of solid waste management among the students surveyed is relatively low, as a majority of students (78%) were unsure of the overall effectiveness of their school's current solid waste management practices. This suggests that a communication campaign that focuses on increasing the students' perceived efficacy, such as providing information about effective solid waste management practices or involving students in solid waste management initiatives, would be more effective in promoting sustainable solid waste management practices.

Lastly, this results further aligns with the Theory of Planned Behaviour (TPB) which posits that individuals' behavior is determined by their attitudes, subjective norms and perceived behavioral control. The results of the survey suggest that students' attitudes towards solid waste management are relatively neutral, with a majority of students (78%) unsure of the overall effectiveness of their school's current solid waste management practices. This suggests that interventions that focus on changing students' attitudes towards solid waste management, such as providing information about the environmental and health benefits of sustainable solid waste management practices, would be more effective in promoting sustainable solid waste management practices. Additionally, the results suggest that students' subjective norms and perceived behavioral control towards solid waste management is relatively low, as many students (19%) reported having no idea how their school manages solid waste, and a similar number (19.4%) were unsure if there were specific procedures in place for the disposal of different types of waste. This suggests that interventions that focus

on involving students in solid waste management initiatives and providing information about effective solid waste management practices, would be more effective in promoting sustainable solid waste management practices.

That notwithstanding, the results of this study corroborate with other research findings on solid waste management in Ghana. For example, a study conducted by Otoo and Appiah (2017) found that solid waste management in Ghana is characterized by poor waste collection, inadequate disposal facilities, and a lack of awareness and education about solid waste management among the general population. This is consistent with the findings of this study, in which a number of students (19%) reported having no idea how their school manages solid waste, and a majority (72.4%) reported that their school does not have regular solid waste collection services.

This study's results also concur with research on solid waste management in other sub-Saharan African countries. For example, a study by Abubakar et al. (2018) on solid waste management in Nigeria found that a lack of proper infrastructure and inadequate funding for waste management were major challenges facing the country. Similarly, a study by Kansime et al. (2020) on solid waste management in Uganda found that the majority of waste was not properly managed and that there was a lack of awareness and education about solid waste management among the general population.

On the other hand, this study's results contrast with findings on solid waste management in developed countries. For example, a study by the European Environmental Agency (2019) found that the majority of solid waste in European Union countries is properly managed through a combination of recycling, composting, and energy recovery. This highlights the need for increased efforts in Ghana, and

other developing countries, to improve solid waste management infrastructure and education in order to bring it up to the standard of developed countries.

Overall, this study's findings on the awareness and understanding of solid waste management among senior high school students in the Adansi North District of Ghana aligns with the Trans-theoretical model of change (TTM), The Extended Parallel Process Model (EPPM), and The Theory of Planned Behaviour (TPB), as well as concurs with other research on solid waste management in Ghana and other sub-Saharan African countries, and contrast with findings on solid waste management in developed countries.

4.4 The level of students' awareness on the environmental and health effects of improper solid waste management practices

As parts of the objectives of this study, it was imperative to examine students' level of awareness on the environmental and health effects of improper solid waste management practice. This section consisted of 10 statements, and students were asked to rate their level of agreement on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree. The results show that on average, the students had a moderate level of awareness on the environmental and health effects of improper solid waste management practices. Table 4.4 below presents the results.

Table: 4.4: The level of students' awareness on the environmental and health effects of improper solid waste management practices

	N	Mean	S.D
1. Improper solid waste management can lead to			
a. Environmental pollution.	268	4.36	0.593
b. Health problems for local communities.	268	3.51	0.546
c. The spread of disease.	268	3.44	0.539
d. Groundwater contamination.	268	3.19	0.511
e. Air pollution.	268	3.31	0.561
f. Soil contamination.	268	3.41	0.793
2. Improper solid waste management can negatively impact wildlife and their habitats.	268	2.69	0.768
3. Recycling and composting can effectively reduce the negative impacts of improper solid waste management.	268	3.08	0.762
4. Improper solid waste management can have negative economic impacts.	268	3.72	0.663
5. Improper solid waste management is a global issue that requires international cooperation to address.	268	2.13	0.704
6. Landfills are an effective and safe method of solid waste management.	268	4.82	0.643
7. Incineration is a safe and effective method of solid waste management.	268	2.87	0.641
8. The use of biodegradable and compostable materials can help reduce the negative impacts of solid waste management.	268	2.94	0.626
9. Properly managing hazardous waste is essential to minimizing negative environmental and health impacts.	268	3.01	0.554
10. The use of renewable energy sources in solid waste management can help reduce negative environmental impacts.	268	2.44	0.548

Source: Field Survey, 2022

Table 4.4 presents the results of a survey conducted on senior high school students in the Adansi North District of Ghana to test their level of awareness on the

environmental and health effects of improper solid waste management practices.

From the table, the first item, “improper solid waste management can lead to environmental pollution,” had a mean of 4.36, indicating that students generally agreed that improper solid waste management can lead to environmental pollution. Similarly, students also agreed that improper solid waste management can lead to health problems for local communities (mean of 3.51) and the spread of disease (mean of 3.44). However, students had a lower level of awareness on the potential impacts of improper solid waste management on groundwater contamination (mean of 3.19) and air pollution (mean of 3.31).

The second item, “improper solid waste management can negatively impact wildlife and their habitats,” had a mean of 2.69, indicating that students generally disagreed that improper solid waste management can negatively impact wildlife and their habitats. This could suggest a lack of understanding of the potential impacts of improper solid waste management on wildlife and their habitats.

The third item, “Recycling and composting can effectively reduce the negative impacts of improper solid waste management,” had a mean of 3.08, indicating that students generally agreed that recycling and composting can effectively reduce the negative impacts of improper solid waste management. This suggests that students understand the potential benefits of these waste management practices.

The fourth item, “Improper solid waste management can have negative economic impacts,” had a mean of 3.72, indicating that students generally agreed that improper solid waste management can have negative economic impacts. However, students had a lower level of awareness on the potential impacts of improper solid waste

management on global issues (mean of 2.13) and the use of renewable energy sources in solid waste management (mean of 2.44).

The fifth item, “Landfills are an effective and safe method of solid waste management,” had a mean of 4.82, indicating that students generally agreed that landfills are an effective and safe method of solid waste management. This suggests that students have a positive perception of landfills as a waste management option.

The sixth item, “Incineration is a safe and effective method of solid waste management,” had a mean of 2.87, indicating that students generally disagreed that incineration is a safe and effective method of solid waste management. This could suggest a lack of understanding of the potential benefits and drawbacks of incineration as a waste management option.

The seventh item, “The use of biodegradable and compostable materials can help reduce the negative impacts of solid waste management,” had a mean of 2.94, indicating that students generally agreed that the use of biodegradable and compostable materials can help reduce the negative impacts of solid waste management. This suggests that students understand the potential benefits of using these materials in solid waste management.

The eighth item, “Properly managing hazardous waste is essential to minimizing negative environmental and health impacts,” had a mean of 3.01, indicating that students generally agreed that properly managing hazardous waste is essential to minimizing negative environmental and health impacts. This suggests that students understand the importance of proper management of hazardous waste.

The ninth item, “The use of renewable energy sources in solid waste management can help reduce negative environmental impacts,” had a mean of 2.44, indicating that students generally disagreed that the use of renewable energy sources in solid waste management can help reduce negative environmental impacts. This could suggest a lack of understanding of the potential benefits of using renewable energy sources in solid waste management, such as reducing greenhouse gas emissions and dependence on fossil fuels.

The tenth item, “The use of renewable energy sources in solid waste management can help reduce negative environmental impacts,” had a mean of 2.44, indicating that students generally disagreed that the use of renewable energy sources in solid waste management can help reduce negative environmental impacts. This could suggest a lack of understanding of the potential benefits of using renewable energy sources in solid waste management. It could also imply that students may not be aware of the environmental impacts of traditional energy sources and the importance of transitioning to cleaner, renewable energy sources in order to reduce the negative impacts of solid waste management.

Overall, the results of this section of the study suggest that while senior high school students in the Adansi North District of Ghana have a moderate level of awareness on the environmental and health effects of improper solid waste management practices, there are areas where students lack understanding, such as the potential impacts of improper solid waste management on wildlife and their habitats, the use of renewable energy sources in solid waste management and the safe and effective method of solid waste management. The implications of this result suggest that there is a need for more education and awareness-raising activities on these topics to increase students' understanding and engagement in solid waste management practices.

This results, generally, concur with findings from other studies that have investigated students' awareness and understanding of solid waste management practices. A study conducted in Nigeria (Akinnifesi, et al. 2017) found that high school students had a moderate level of awareness about the negative impacts of improper solid waste management on the environment and human health. Similarly, a study conducted in India (Shaik and Ramaiah, 2018) found that college students had a moderate level of awareness about the environmental and health impacts of improper solid waste management.

The results also align with the findings of a study conducted in Turkey (Eren and Selvi, 2019), which found that high school students had a moderate level of understanding about the benefits of recycling and composting as a way to reduce the negative impacts of improper solid waste management. The study also found that students had a low level of understanding about the potential impacts of improper solid waste management on wildlife and their habitats. This aligns with the results of our study, which found that students had a low level of understanding about the potential impacts of improper solid waste management on wildlife and their habitats.

Additionally, this finding sync with other findings in the literature on students' awareness of the environmental and health effects of improper solid waste management. For example, a study by Huang et al. (2019) found that students in Taiwan had low levels of knowledge and awareness about the impacts of improper solid waste management on the environment and human health. Similarly, a study by Adomako et al. (2019) found that students in Ghana had limited awareness of the impacts of improper solid waste management on the environment and human health. These findings suggest that there is a need for more education and awareness

campaigns to increase students' understanding of the impacts of improper solid waste management on the environment and human health. Additionally, the result in table 4.3 contrasts with other studies that have found higher levels of awareness among students about the impacts of improper solid waste management. For example, a study by Kim et al. (2018) found that students in South Korea had high levels of awareness about the environmental and health effects of improper solid waste management. This suggests that there may be cultural and geographic differences in students' awareness about the impacts of improper solid waste management. However, the results contrast with the findings of a study conducted in China (Li, et al. 2016), which found that university students had a high level of awareness about the negative impacts of improper solid waste management on the environment and human health. This suggests that there may be cultural or regional differences in students' level of awareness and understanding of solid waste management practices.

Generally, the results in table 4.4 highlight the importance of increasing education and awareness about the impacts of improper solid waste management on the environment and human health, particularly among senior high school students in the Adansi North District of Ghana.

4.5 The sources of information on solid waste management among the students of the selected senior high school in the Adansi North District of Ghana school.

Finally, the third objective of this study sought to assess the sources of information on solid waste management among the students of the selected senior high school in the Adansi North District of Ghana school. The respondents were asked to indicate (as many) their sources of sources of information on solid waste management. The collected was analyzed and presented in the table 4.5 below.

Table: 4. 5: The sources of information on solid waste management

	Multiple responds	
	Freq.	%
1. Textbooks and classroom lessons	251	93.7
2. News articles and media coverage on the topic	229	85.4
3. Field trips or site visits to waste management facilities	71	26.5
4. Online resources, such as government websites and research databases	36	13.4
5. Student clubs or organizations dedicated to environmental issues, including waste management.	28	10.4
6. Internship or hands-on experience in the waste management industry	19	7.1
7. Presentations from Guest teacher, resource persons or experts in the field	11	4.1

Source: Field Survey, 2022

The table 4.5 presents data collected from senior high school students in the Adansi North District of Ghana to assess the sources of information on solid waste management among the students. The data shows that the majority of the students (93.7%) reported that they obtained information on solid waste management from textbooks and classroom lessons. A large percentage of students (85.4%) also reported getting information from news articles and media coverage on the topic. About 26.5% of them reported obtaining information from field trips or site visits to waste management facilities. 13.4% of the students reported using online resources, such as government websites and research databases, while 10.4% reported getting information from student clubs or organizations dedicated to environmental issues, including waste management. 7.1% of the students reported having internship or

hands-on experience in the waste management industry. Lastly, 4.1% of the students reported getting information from presentations from guest teacher, resource persons or experts in the field.

From the data the majority of the students in the selected senior high school in the Adansi North District of Ghana submitted to obtain information on solid waste management from textbooks and classroom lessons. This could be the consequence of having environment studies as a subject covered in the Senior High School curriculum. Additionally, the large percentage of students who reported obtaining information from news articles and media coverage suggests that there is a level of awareness and interest in the various media outlets in Ghana.

Nevertheless, the data also implies that there may be a lack of opportunities for students to gain hands-on experience or visit waste management facilities, as only some students reported obtaining information from these sources. This could potentially limit their understanding and engagement with the topic. Furthermore, the low percentage of students who reported getting information from student clubs or organizations dedicated to environmental issues and presentations from guest teacher, resource persons or experts in the field, suggests that there may be a limited number of opportunities for students to get information outside the classroom.

This finding aligns with other findings that suggest that textbooks and classroom lessons are a primary source of information for students on solid waste management. For example, a study by (Cheng, et. al, 2018) found that in Taiwan, students primarily obtained information on environmental education topics, including solid waste management, from textbooks and classroom lessons. Similarly, a study by (Anwar & Khan, 2012) found that students in Pakistan primarily obtained information on

environmental education topics, including solid waste management, from classroom lectures and textbooks.

The findings also concur with other findings that suggest that students have limited opportunities for hands-on learning and field trips related to solid waste management. A study by (Anwar & Khan, 2012) found that students in Pakistan had limited opportunities for field trips and hands-on activities related to environmental education topics, including solid waste management. This aligns with the finding in table 4.4 that only 26.5% of the students in the selected senior high school in the Adansi North District of Ghana reported obtaining information from field trips or site visits to waste management facilities.

However, the results in table 4.4 contrast with other findings that suggest that students primarily obtain information on solid waste management from media coverage and online resources. For example, a study by (Khan, et. al, 2016) found that students in Pakistan primarily obtained information on solid waste management from television and radio programs. This contrasts with the finding in table 4.4 that only 85.4% of the students in the selected senior high school in the Adansi North District of Ghana reported obtaining information from news articles and media coverage.

Overall, the results in table 4.5 align with some findings that suggest that textbooks and classroom lessons are a primary source of information for students on solid waste management, and that students have limited opportunities for hands-on learning and field trips. However, it contrasts with other findings that suggest that students primarily obtain information on solid waste management from media coverage and online resources.

CHAPTER FIVE

SUMMARY AND RECOMMENDATIONS

5.0 Introduction

This chapter gives a summary of the study, draws conclusions from the study and also makes recommendations as to how to address the critical issues that emerged from the study.

5.1 Summary

This study aimed to assess the level of awareness on solid waste storage and collection methods, the awareness of environmental and health effects of improper solid waste management practices, and the sources of information on solid waste management among students in some selected senior high schools in the Adansi North District of Ghana. The study used a descriptive quantitative research design and targeted 900 students from three senior high schools in the Adansi North District. The sample size was 277, selected using stratified, convenience and simple random sampling techniques. The data collection was done using a structured questionnaire and the response rate was 96.8%.

5.2 Summary of the Key Findings

Awareness on Solid Waste Storage and Collection Methods

The study aimed to evaluate the level of awareness on solid waste storage and collection methods among the students of a selected senior high school in the Adansi North District of Ghana. The results showed that the majority of the students (40.3%) reported that their school currently manages solid waste through landfilling, followed by incineration (26.9%) and composting (8.6%). About 76.5% of the students reported that there were designated areas for the storage of solid waste on their

school's campus. However, only 10.1% reported regular solid waste collection services and only 6.0% reported that there were school-wide campaigns or initiatives to promote sustainable solid waste management practices in their respective schools. The majority of the students (65.3%) reported that they were not sure about the level of involvement of the school in solid waste management. The overall effectiveness of the school's solid waste management practices was rated as not sure by 78.0% of the students.

5.2.2 Awareness on Environmental and Health Effects of Improper Solid Waste Management Practices

The study also aimed to evaluate the level of awareness of the students on the environmental and health effects of improper solid waste management practices. The results showed that on average, the students had a moderate level of awareness on these effects. The students agreed that improper solid waste management can lead to environmental pollution (mean = 4.36) and health problems for local communities (mean = 3.51). However, their agreement on the impact on wildlife and their habitats (mean = 2.69) was relatively low. The students reported a moderate level of awareness that recycling and composting can reduce the negative impacts of improper solid waste management (mean = 3.08). The students had the least agreement that improper solid waste management is a global issue that requires international cooperation to address (mean = 2.13). The level of students' participation in solid waste management practices and their attitudes towards the same.

5.2.3 The sources of information on solid waste management among the students of the selected senior high school in the Adansi North District of Ghana school

The third objective of this study was to determine the level of students' participation in solid waste management practices and their attitudes towards the same. The results showed that the majority of students were not involved in solid waste management practices, with 65.3% of students indicating that they were "not sure" about their involvement. The study also found that only 6.0% of students were aware of any school-wide campaigns or initiatives promoting sustainable solid waste management practices. The results of the survey indicated that there was a need to promote student engagement and awareness in solid waste management practices within the school community.

5.3 Conclusion

The findings of this study highlight the need for improvement in the solid waste management practices in the selected senior high schools in the Adansi North District of Ghana. There is a need to increase the awareness of students on solid waste storage, collection methods, the environmental and health effects of improper solid waste management practices, and the sources of information on solid waste management. The results also indicate a low level of student involvement in solid waste management and the need for schools to implement initiatives and campaigns to promote sustainable solid waste management practices and involve students in the process. The study provides useful insights and recommendations for policymakers, educators, and the local authorities in the Adansi North District to improve solid waste management practices in schools and raise environmental awareness among students. Overall, this research sheds light on the current status of solid waste

management practices in the selected senior high schools of the Adansi North District. The study emphasizes the importance of increasing waste management awareness, promoting sustainable practices, and fostering active involvement of students in waste management efforts. Implementing targeted interventions based on these findings can lead to improved waste management practices, contributing to a cleaner and healthier environment for the school community and beyond.

5.4 Recommendation

Based on the findings of this study, the following recommendations are proposed:

To the Government of Ghana through the Ministry of education:

1. The government should provide funding to the schools in the Adansi North District of Ghana to enable them to put in place effective solid waste management systems.
2. The government should provide training and educational resources to schools on solid waste management to help raise awareness and understanding of the importance of proper solid waste management practices.
3. Government through the ministry of education and Ghana education service should Integrate waste management topics into the school curriculum. This will help mainstream environmental education in our pre-tertiary schools.

Recommendations to Teachers and Schools:

1. Enhance Waste Management Education: Schools should prioritize waste management education and awareness-raising campaigns among students. This can be achieved through workshops, seminars, and interactive sessions that emphasize the importance of proper waste disposal, recycling, and composting. Increasing students' knowledge of the environmental and health

implications of improper waste management will foster a sense of responsibility and encourage them to adopt sustainable practices.

2. **Implement Comprehensive Waste Management Plans:** Senior High Schools should develop and implement comprehensive waste management plans tailored to their specific needs and resources. These plans should encompass waste segregation, efficient collection methods, recycling initiatives, and waste reduction strategies. The involvement of students, teachers, and school management in the planning process will increase ownership and commitment to the implementation of these strategies.
3. **Promote Student Engagement:** Schools should actively involve students in waste management activities. Creating waste management clubs or eco-teams will provide students with opportunities to participate in practical waste management projects. Organizing regular cleanup campaigns and waste sorting exercises within the school premises will help instill a culture of cleanliness and environmental responsibility.
4. **Collaborate with Local Authorities and NGOs:** Schools should collaborate with local waste management authorities and non-governmental organizations (NGOs) specializing in environmental conservation. These partnerships can offer valuable support, resources, and expertise in developing and implementing effective waste management strategies.
5. **Regular Monitoring and Evaluation:** Schools should establish a monitoring and evaluation system to assess the effectiveness of their waste management initiatives. Regular assessments will help identify areas that require improvement and allow for adjustments to be made to the waste management plan as needed.

Recommendations to Students:

1. Students should take an active role in their schools' solid waste management efforts and participate in initiatives aimed at promoting sustainable solid waste management practices.
2. Students should educate themselves on the environmental and health effects of improper solid waste management practices.
3. Students should encourage their classmates, teachers and schools to adopt best practices in solid waste management.

5.5 Limitation of the Study

The study has number of limitations that should be considered when interpreting the results. Firstly, the study was conducted in only three selected senior high schools in the Adansi North District of Ghana, which may not be representative of all senior high schools in the district or in the country, and therefore, the findings may not be generalizable to other populations. Additionally, the study relied on self-reported data from the students, which may be subject to bias or misinterpretation. The study relied on a sample of students from the selected schools, which may not reflect the views or experiences of the entire student population. The sample size for the study may not be large enough to generalize the findings to the entire population. Furthermore, the study relied on self-reported data (questionnaire), which may have been subject to social desirability bias. Lastly, the study focused only on solid waste management practices in senior high schools, and did not consider other types of waste or other types of institutions.

5.6 Suggestions for Further Studies

Based on the findings of this study, the following recommendations are made for future studies on solid waste management practices in senior high schools in the Adansi North District of Ghana and other areas:

1. In-depth studies on the impact of solid waste management practices on the environment and health. Future studies should focus on the environmental and health impact of solid waste disposal methods, such as incineration, landfilling, and recycling.
2. Expansion of the study area to include other areas in Ghana and other countries. This will provide a better understanding of the solid waste management practices in other regions and enable comparison and analysis of the results.
3. Assessment of the impact of solid waste management practices on the economy. Future studies should focus on the economic impact of solid waste management practices, such as the cost of waste management services, and the potential benefits of waste reduction and recycling.
4. Examination of the role of the government in solid waste management. Future studies should focus on the role of the government in solid waste management, including the policies and regulations put in place to manage solid waste, and the level of government involvement in waste management.
5. Study of the attitude of other stakeholders towards solid waste management. Future studies should focus on the attitude of other stakeholders, such as the general public, local authorities, and waste management companies, towards solid waste management practices.
6. Assessment of the effectiveness of solid waste management education. Future

studies should focus on the effectiveness of solid waste management education in schools, including the level of student engagement, and the impact of education on solid waste management practices.



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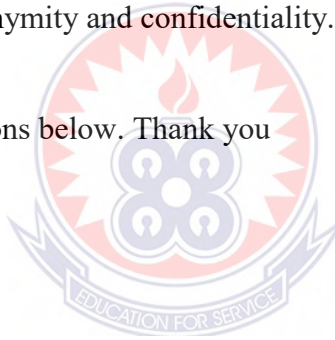
APPENDICES
QUESTIONNAIRE

**TOPIC: ASSESSING THE SOLID WASTE MANAGEMENT PRACTICES IN
SOME SELECTED SENIOR HIGH SCHOOLS IN THE ADANSO NORTH
DISTRICT OF GHANA**

Dear Student,

This questionnaire is drafted purposely to assess the solid waste management practices in some selected Senior High Schools in the Adanso North District of Ghana. This study is purely academic, therefore the information you provide will be treated with absolute anonymity and confidentiality.

Kindly answer the questions below. Thank you



SECTION A

BACKGROUND INFORMATION

Please tick [] where appropriate and provide response and comments where applicable

1. What is your sex?

a. Male []

b. Female []

2. How old are you?

3. What programme or subject do you read at school ?

a. Home Economics []

b. Business []

c. General Art []

d. Visual Art []

e. Other

specify).....



(please

What is your Class/Form?

a. Form (SHS) 1 []

b. Form (SHS) 2 []

c. Form (SHS) 3 []

SECTION B**STUDENTS LEVEL OF AWARENESS ON SOLID WASTE STORAGE AND
COLLECTION METHODS**

Kindly tick [✓] the answers that best describe your opinion

Statements	Tick [✓]
How does your school currently manage its solid waste?	
Incineration	
Landfilling	
Recycling	
Composting	
I have no idea	
Are there specific procedures in place for the disposal of different types of solid waste (e.g. paper, plastic, food waste)??	
Yes	
No	
Not sure	
Are there designated areas for the storage of solid waste on your school's campus?	
Yes	
No	
Not sure	
Are there regular solid waste collection services provided for your school?	
Yes	
No	
Not sure	
Are there any school-wide campaigns or initiatives in place to promote sustainable solid waste management practices?	
Yes	

	No	
	Not sure	
To what extent does your school involve students in solid waste management?		
	Very involved	
	Somewhat involved	
	Not involved	
	Not sure	
Are there any facilities in your school for the recycling of paper, plastics, or other materials?		
	Yes	
	No	
	Not sure	
How do you rate the overall effectiveness of your school's current solid waste management practices?		
	Highly effective	
	Somewhat effective	
	Not effective	
	Not sure	

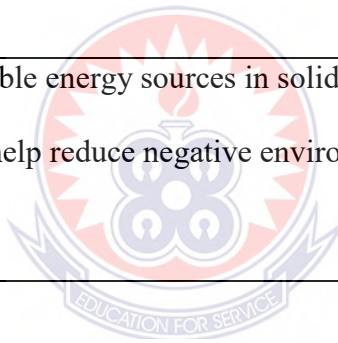
SECTION C**AWARENESS OF THE ENVIRONMENTAL AND HEALTH EFFECTS OF
IMPROPER SOLID WASTE MANAGEMENT PRACTICES**

Kindly indicate the extent to which the following statements best describe the environmental and health effects of improper solid waste management practices in your school.

Please tick (✓) appropriately. Strongly Disagree =1, Disagree=2, Neutral=3, Agree= 4 and Strongly Agree=5

Statements	1	2	3	4	5
1. Improper solid waste management can lead to					
a. Environmental pollution.					
b. Health problems for local communities.					
c. The spread of disease.					
d. Groundwater contamination.					
e. Air pollution.					
f. Soil contamination.					
2. Improper solid waste management can negatively impact wildlife and their habitats.					
3. Recycling and composting can effectively reduce the negative impacts of improper solid waste management.					
4. Improper solid waste management can have negative economic impacts.					
5. Improper solid waste management is a global issue					

that requires international cooperation to address.					
6. Landfills are an effective and safe method of solid waste management.					
7. Incineration is a safe and effective method of solid waste management.					
8. The use of biodegradable and compostable materials can help reduce the negative impacts of solid waste management.					
9. Properly managing hazardous waste is essential to minimizing negative environmental and health impacts.					
10. The use of renewable energy sources in solid waste management can help reduce negative environmental impacts.					



SECTION D**THE SOURCES OF INFORMATION ON SOLID WASTE MANAGEMENT
AMONG THE STUDENTS**

Please indicate the extent to which you agree or disagree with the following statements on how to improve your attitude towards Social Studies. You are required tick (✓) appropriately.

Statements	Tick [✓]
1. Textbooks and classroom lessons	
2. News articles and media coverage on the topic	
3. Field trips or site visits to waste management facilities	
4. Online resources, such as government websites and research databases	
5. Student clubs or organizations dedicated to environmental issues, including waste management.	
6. Internship or hands-on experience in the waste management industry	
7. Presentations from Guest teacher, resource persons or experts in the field	