

UNIVERSITY OF EDUCATION, WINNEBA

**SOLID WASTE MANAGEMENT; KNOWLEDGE, ATTITUDES AND
BEHAVIOUR OF RESIDENTS OF TECHIMANTIA, AHAFO REGION,
GHANA**



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UNIVERSITY OF EDUCATION, WINNEBA

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**A thesis in the Department of Geography Education,
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of the requirements for the award of the degree of
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in the University of Education, Winneba**

JANUARY, 2023

DECLARATION

Student's Declaration

I, MOSES BANGFUNUORTERU TUU, 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.....

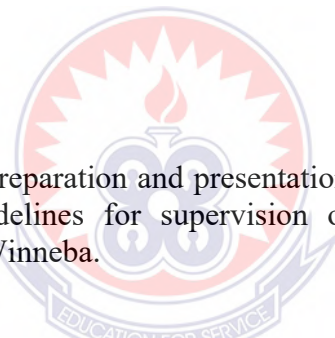
Supervisor's Declaration

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

Name: DR. KOJO OPPONG YEBOAH GYABAAH

Signature.....

Date.....



DEDICATION

This thesis is dedicated to my family, my primary one madam and all my cherished friends who have supported me in diverse ways towards the completion of this work.



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I wish to express my heartfelt gratitude to my supervisor, Dr. Kojo Oppong Yeboah Gyabaah, for his patience, understanding, reminders and insightful suggestions that enabled me to do the work with due diligence. Dr you treated me as if you knew of my weaknesses before. I also express my gratitude to Dr Victor Owusu, Department of Geography Education, UEW for his invaluable recommendations. I am equally grateful to the leadership of Samuel Otu Presbyterian Senior High School and my colleague Geography teachers for their understanding and support throughout the duration I embarked on the programme.

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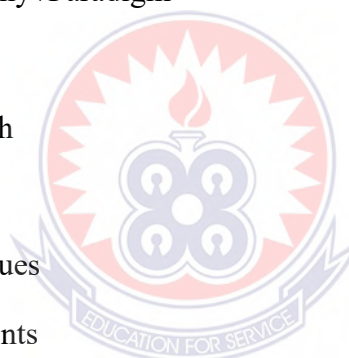
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All my family members and friends who supported me in diverse ways, I am most grateful to you all. You have always been with me. God bless you all.

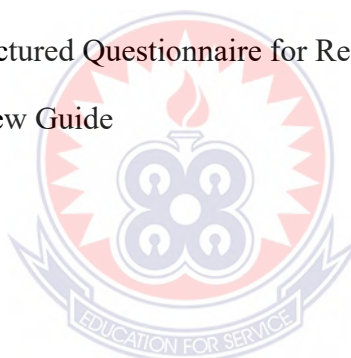
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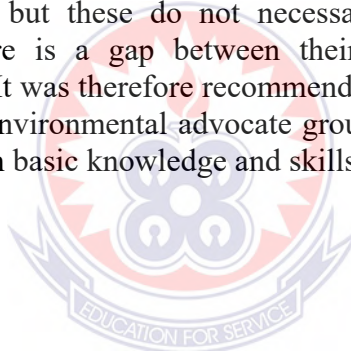
LIST OF ACRONYMS

CBOs:	Community Based Organizations
GHS:	Ghana Health Service
GSS:	Ghana Statistical Service
KAB:	Knowledge, Attitudes, and Behaviour
OECD:	Organization for Economic Co-operation and Development
MMDAs:	Metropolitan, Municipal, and District Assemblies
SSWM:	Sustainable Solid Waste Management
SWM:	Solid Waste Management
TPB:	Theory of Planned Behaviour
TSMA:	Tano South Municipal Assembly
UNEP:	United Nations Environment Programme
UNITAR:	United Nations Institute for Training and Research
WHO:	World Health Organization



ABSTRACT

The study examined the knowledge, attitudes and behaviour of residents of Techimantia toward solid waste management. It specifically sought to; determine residents' knowledge on solid waste management; examine the values held by residents towards solid waste management; assess solid waste disposal habits of residents; and investigate the impacts of waste collection infrastructure on waste management behaviour. The Theory of Planned Behaviour was applied to establish the relationship between knowledge, attitudes and behaviour toward waste management. Based on the pragmatic philosophy, the study adopted the mixed methods research design and the concurrent convergent mixed methods approach. A systematic sampling technique was used to select 384 respondents with a minimum of secondary education or its equivalent. Another 10 participants were purposefully chosen for in depth interview. Both quantitative and qualitative data were collected at the same time using interview schedule and interview guide respectively. The study established that, residents have adequate knowledge on the state of their environment – solid waste is a major environmental problem, they understand the implications of indiscriminate waste disposal, have adequate knowledge on waste reduction strategy – shopping with a durable bag and buying less packaged goods reduces waste production and have high values for environmental cleanliness (I feel bad when I dump waste anywhere) but these do not necessarily translate into proper waste disposal practices. There is a gap between their knowledge, values and waste management behaviour. It was therefore recommended that the Tano South Municipal Assembly should form environmental advocate groups among residents and educate, train and equip them with basic knowledge and skills on waste management.



CHAPTER ONE

INTRODUCTION

1.0 Introduction

Deficiencies in solid waste management (SWM) are visible in many cities and towns of developing countries, with many areas receiving little or no attention. Sound SWM, too, depends on strong commitment of people. The chapter thus gives an overview of SWM; reflecting on knowledge, attitudes and behaviour of residents of Techimantia. The chapter looks at the background, problem statement, purpose, objectives and questions, delimitation or propositions, significance, scope and organization of the study.

1.1 Background of the Study

Worldwide, environmental quality is threatened due to increasing solid waste problems adding to global warming, water pollution, loss of resources and biodiversity. Human values and behaviour are seen as contributing to these problems and their solutions as well. According to Stern (2000), man's desire for personal comfort, enjoyment, security, etc. and the machines used to meet these desires have dire impacts on the environment. As such, it is argued that changes in values and behaviour is key to tackling the waste problem (Milea, 2009). Hence, the application of the Theory of Planned Behaviour (TPB) in this study to explore the extent to which knowledge, attitudes, and behaviour affect solid waste management (SWM) in the Ghanaian context. The nature of the waste problem; magnitude and priority, is not the same between and within countries.

The developed countries seem to have addressed the problem to some extent and their focus now is on reducing environmental pollution and increasing resource recovery but the developing nations are still struggling to provide basic collection, treatment and disposal services to the rising population. This, to Lenkiewicz and Webster (2017), has resulted in open dumping and burning of waste in poor countries raising public health concerns, local air pollution, choking drainage systems, worsening floods and spreading infectious diseases. Soils, freshwater and marine ecosystems pollution, together with the harm to livestock that ingest waste unwittingly causes further problems in the future (Lenkiewicz & Webster, 2017). Residents, especially women and children across the globe, have suffered or witnessed one disaster or the other caused by poorly disposed waste. In 2018, 16 people (12 were women) died in a rubbish landslide at Maputo in Mozambique (Eco Watch, 2018:2) while Accra (Ghana) suffers regular floods due to waste-choked drains (Acquah & Safo, 2019) among other factors.

Likewise, when Rwanda's Kigali is cited as the cleanest city in Africa (Kisambe, 2016) and Sunyani the cleanest city in Ghana (Akwatia, Asuah, & Sam-Awortwi, 2016); how does the public recognition affect our attitudes and behaviour in keeping our environment clean? This is because Gusti (2016) posits that human actions are guided by their values, and behaviour based on values is better. So, knowledge on the impacts of waste on the environment and public health should positively influence attitudes and behaviour on how waste is handled which in turn affects the cleanliness of communities. If societies suffer regular floods or cholera due to poor waste disposal that should change their attitudes and behaviour toward littering and illogical dumping of waste into drains and waterways. Even sensing waste risks, Carpenter, Halage, Mukama, Musoke, Musinguzi, Ndejjo and Ssempebwa (2016), can influence

individuals or communities to tackle waste challenges. High risk perception can positively influence intentions to take actions while low risk perception can impede efforts to address the challenges (Jerie, 2016). It is argued that people are well aware of the adverse impacts of solid waste on the environment but their deficient environmental knowledge and negative attitudes often leads to undesirable behaviours in keeping a clean environment (Anies, Josphina, Licy, Saritha & Vivek, 2013). Similarly, awareness of the depleting nature of resources should influence the attitudes and behaviour of people to reusing waste (UNEP, 2015).

However, it is contended that knowledge alone is not enough to activate attitudinal and behavioural change in relation to SWM. As McAllister (2015) explains, where waste management facilities are not readily available, pro-environmental behaviours can be impeded. In that stance, people have no option but to dump or burn their waste near their homes. These practices are harmful to life and the environment (Lenkiewicz & Webster, 2017). Low public participation, poor education on or awareness of SWM skills, social norms, convenience, and values also affect the knowledge, attitudes and behaviour of people regarding SWM (Milea, 2009; O'Connell, 2011). Other factors are absence of social pressure, and realistic penalties (Al-Khatib, Arafat, Daoud & Shwahneh, 2009).

Keeping clean surroundings, for example, requires everyone's efforts but any aberrant behaviour will lead to strewing of public places (Milea, 2009). Due to poor knowledge, attitudes and behaviour of people toward cleanliness, it is more convenient for them to dump their waste anywhere as it is produced than taking it to collection points. At times out of habits and customs, Scott and Yousif (2007), people throw their waste in streets and other wrong places. Orhin (2018:3-7, Reporter) holds

that ineffective rules accounts for poor sanitation and environmental quality in Ghana. Comparing Singapore with Ghana, he explains that spitting in public is a crime in Singapore that attracts on-the-spot fine but in Ghana people can openly defecate and go unpunished.

It is proposed that plans be adopted to address the situation; tackling poor knowledge, attitudes and behaviour toward environmental protection, reducing waste production and ensuring source reduction will reduce the amount of trash to be disposed (Appiah, Shen, Samwine, Wu, Xu, & Yaoqi, 2017). Societies can play a key role; they can sort, reuse and recycle waste to reduce the quantity for proper disposal (Lenkiewicz & Webster, 2017). The advanced nations are ahead in this regard; in Sweden, families sort waste for collection, producers manage end-of-life products and municipalities collect and recycle or dispose of solid waste (Avfall Sverige, 2018). But developing countries face major setbacks in providing access to waste collection services to end open dumping and burning and ensure sound management of all waste (UNEP, 2015) with Africa facing dire environmental and health risks (Agyapong, Dauda, & Mariwah, 2015).

To ensure community support, habits and behaviour change; awareness campaigns, media advertisements, posters, community meetings, inclusion of environmental topics in formal education and law enforcement are often used to deepen people's conception on sanitation issues. Without community involvement in SWM, local authorities cannot do much. For example, a wide-spread littering behaviour and open defecation in parts of Ghana, per media reports, derails local authorities' efforts to keep communities clean. Monney (2014) states that it is usual to see passengers or other people tossing waste at lorry stations, into streets or other public places often

saying there are no bins to dump their waste yet in the presence of bins, they still dump waste anywhere and tend round to complain of the filth in the environment. Some even argue that littering the environment gives waste workers job. This supports, Milea (2009), assertion that the waste problem is behavioural and the solution lies in behaviour change.

1.2 Statement of the Problem

The Tano South Municipal Assembly (TSMA) has taken number of initiatives to manage waste effectively in the municipality and Techimantia in particular. These include; the evacuation and levelling of open dumps to clear the community off waste (TSMA, 2014–2017), creation of an office of the Environmental and Sanitation Unit at Techimantia with 15 staff (TSMA, 2019) and the recruitment of 30 labourers to be cleaning the market, lorry station and some major streets (TSMA, 2021). From observation, residents also do organize clean-up exercise to help keep the community clean. These activities make public places appear neat in a short while but have not actually stopped littering and dumping of waste in unapproved places.

It is reported that only 337 households in the municipality have access to waste collection and disposal services but the municipality generates 64,346.1 tonnes of waste daily with only 2,376 tonnes collected and disposed of monthly (Peprah, 2021; Sevmevoh, 2021). Waste production and collection rates are not known but annual reports on environmental health and sanitation affirm that waste collection in Techimantia is very limited and the community depends largely on crude dumping to dispose of waste (TSMA, 2021). This has resulted in huge heaps of refuse and the subsequence burning of such heaps in the midst of houses (TSMA, 2021). Crude burning of waste too emits methane; a harmful gas to the ozone, contributing to global

warming, climate change and is unsafe to public health (Bhada-Tata, 2012). The situation has made some residents resort to dumping waste into surface drains and other waterways creating unsanitary conditions (Peprah, 2021; Semevoh, 2021) which can lead to diseases outbreak. Reports from Ghana Health Service (GHS) show that malaria; a leading health condition, including typhoid, cholera, diarrhoea, and intestinal worms, is reported to the Techimantia Government Hospital with pregnant women, women and children being most vulnerable (GHS, 2017 – 2021).

One aim of the assembly is to keep Techimantia clean and tidy. So, the assembly engages on public education at schools, hospital, and the community at large via the community information centres to drum home the awareness of residents on the negative impacts of littering and the arbitrary dumping of waste at the wrong places (TSMA, 2021). But this has not yielded the needed results as a behavioural pattern Milea (2009) and O’Connell (2011) describe as an attitude – behaviour gap exists. Within this attitude – behaviour gap is a disconnection between values and actions; the discrepancy between people’s overtly professed care about the environmental harm posed by solid waste and the inertia by the very people to exhibit proper waste disposal habits.

In Techimantia, residents decry the indecent dumping of refuse and open defecation yet some people fail to dump waste at any of the six designated dumpsites. There are 11 public toilets but some people defecate in the open (TSMA, 2021). This gives ground to explore the knowledge, attitudes and behaviour of residents towards SWM. However, research on waste behaviours has concentrated on recycling behaviour (O’Connell, 2011) in many countries but little seems to have been done on knowledge, attitudes and behaviour toward SWM in Ghana. For instance, Daud and

Jekria (2016) determine householders' recycling behaviour in Selangor (Malaysia); Johansson (2016) does document analysis on waste recycling behaviour; and Strydom (2018) examine recycling behaviour in South Africa. In Ghana, though, Agyapong *et al.* (2015) examine residents' perceptions and attitudes towards SWM in Berekum Municipality, perceptions and attitudes are both values of people but knowledge (learned values) and behaviour (display of actual habits) regarding SWM are missing in their study creating a gap in the Ghanaian context. Again, this study focused on residents with a minimum of secondary education or above. Waste management and environmental cleanliness is part of formal education in Ghana from the basic to the pre-tertiary level where students are directly involved (behaviour is planned toward waste management). So, it is expected that the longer one schools, the more they acquire desirable knowledge, attitudes and behaviour on environmental issues and can therefore contribute greatly to the study. Targeting this group is also a follow up to explore how school experiences on waste management mirror real life outside school.

1.3 Purpose of the Study

The purpose of this study is to explore residents' knowledge, attitudes and behaviour toward SWM to see how planned behaviour plays out in order to identify the missing variables in Ghana's situation for creating the desired change to ensuring proper SWM.

1.4 Research Objectives

The researcher proposed to achieve the following objectives, to;

1. determine residents' knowledge on SWM.
2. examine the values held by residents towards SWM.
3. assess the solid waste disposal habits of residents.

4. investigate the impacts of SWM infrastructure on waste management behaviour.

1.5 Research Questions

The following questions will guide the researcher to achieve the research objectives.

1. What is the knowledge of residents on SWM?
2. What are the values held by residents towards SWM?
3. How do residents dispose of their solid waste?
4. In which ways do SWM infrastructure affect waste management behaviour?

1.6 Delimitation/Assumptions/Hypothesis/Propositions of the Study

The study centred on SWM: knowledge, attitude and behaviour of residents of Techimantia in the Ahafo Region. The study targeted a population of 11,661 and a sample of 394 was selected. Few independent variables were delved into: level of knowledge on SWM, values towards SWM, solid waste disposal habits and impact of infrastructure on waste behaviour.

The study therefore should be looked at with reference to the above-mentioned variables. It was assumed that respondents and participants would cooperate and give accurate data and answer research questions correctly to provide relevant information the study sought to obtain. No respondents' errors were expected so as to give good response rate and less data collection biasness. It was also expected that respondents would spare their time to participate in the study, and had adequate knowledge on the subject to give relevant responses to the study without prejudice. It was presumed that the sample for the study was chosen appropriately according to the required size, target population, sampling methods and data collection instruments used in the study.

1.7 Scope/Limitations of the Study

The study was conducted in Techimantia Township focusing on residents who had attained secondary education or its equivalent and higher. The mixed methods research design and concurrent triangulation mixed methods approach were used in the study. So, the researcher had to understand what the study intended to achieve, failure of which the results would not converge to strengthen the study which would have undermined the purpose of mixed methods research.

1.8 Significance of the Study

This study will provide information for decision making on SWM such as the fusion of waste management programmes and environmental education in the school curriculum by the Ministry of Education and Ghana Education Service.

It can help Metropolitan, Municipal and District Assemblies (MMDAs) to educate the public via the National Commission for Civic Education, town hall meetings and the media to raise people's awareness to change their attitude on arbitrary waste disposal.

The findings of this study can provide information to policy makers – the Ministry of Environment, Science and Technology; MMDAs and private sector waste management companies like Zoom Lion Ghana Ltd to adopt pragmatic approaches in SWM. Again, the study will serve as a reference for academics, researchers and students into SWM.

1.9 Organization of the Study

The thesis is organized into five chapters. Chapter one, introduction, consists of the study background, problem statement, purpose and objectives, research questions, significance of the study and layout of the report. Chapter two reviews related

literature on the topic. Chapter three describes the methodological approach used for the study and provides profile of the study area. It also describes the target population, and explains the sample size determination, sampling procedures, data collection instruments, data sources and data analysis techniques. It also describes the limitations associated with the research instruments used to gather data on the field. Chapter four presents the results/findings and discussion of the results while chapter five provides a summary of major findings, conclusions, and recommendations.



CHAPTER TWO

LITERATURE REVIEW AND THEORITICAL FRAMEWORK

2.0 Introduction

This chapter reviews literature on the concept of waste, trends in solid waste management (SWM), citizens' engagement in, and impacts of SWM. Knowledge, attitude, and behaviour toward SWM, impacts of waste management infrastructure on waste management behaviour, and the Theory of Planned Behaviour (TPB) used in the study.

2.1 Solid Waste as a Value Concept

Waste is like a resource; one's waste can be another person's treasure. Oteng-Ababio (2014) opines that waste is viewed by people differently, often seen as a needless material posing environmental and public health threat if mismanaged but can create jobs if well treated. Used electronics in the developed world are regarded as wastes but when moved to developing countries create jobs via resource recovery (Grant, 2016). Well managed waste leads to resource recovery, environmental, and financial gains (UNEP & United Nations Institute for Training and Research (UNITAR), 2013). Sweden, for example, generates electricity from waste, Singapore has made an island of waste attracting tourists but Ghanaian streets are often littered with this same resource (Monney, 2014).

According to Lenkiewicz and Webster (2017), waste is anything that loses its first value and is discarded. Organization for Economic Co-operation and Development (OECD) also defines wastes as: substances that are disposed of, intended to be disposed of or required to be disposed of by national regulations. The substances are subject to disposal activities that may or may not lead to resource recovery, recycling,

or direct reuse (OECD, 2009). This study focuses on solid waste which Miller (2001) sees as a waste that is not fluid-borne in free flow in an air or liquid stream. They are non-liquid wastes; organic and inorganic (packaging materials, clothing, kitchen refuse, etc.) produced at a time that has no value to the first user (Dania, Ramachandra, & Shwetmala, 2014). From these views, solid waste is any solid material the owner no longer wants.

2.2 Trends in Solid Waste Management

Worldwide, solid waste management (SWM) is a serious challenge to local assemblies. Failure to properly manage waste devalues land and helps spread infectious diseases. Modern consumption generates complex wastes that have to be managed. According to Leblanc (2018), SWM involves the control of waste generation, storage, collection, transport, processing and disposal of waste in environmentally sound way. It ensures that waste is treated differently according to its quality by adopting sustainable SWM options.

2.2.1 Solid waste generation and composition

Waste generation comprises all activities that identify materials that are not usable and are collected for disposal or thrown away (Leblanc, 2018) but waste composition is often expressed as the ratio of waste that is organic, paper, plastic, glass, metal, and others. The quantity and composition of waste has implications on its collection and disposal (Bhada-Tata & Hoornweg, 2012). Globally, waste volumes are rising and the composition gives management challenges to local authorities (Tchobanoglous & Vergara, 2012). With 2.01 billion tonnes of waste generated in 2016, global waste is expected to rise to 3.40 billion tonnes by 2050 (Bhada-Tata *et al.*, 2018) a time total waste in Africa will triple such that a decrease in global waste production in any

region will be overshadowed by Africa (Godfrey, 2018). The continent in 2016, produced 174 million tonnes of waste with a projection of 516 million tonnes by 2050 (Bhada-Tata *et al.* 2018) but provision of SWM infrastructure in most cities does not match with population growth leading to low collection rate and open dumping (UNEP, 2015). Often, the wastes are thrown into waterways raising health concerns (UNEP, 2018). Heaps of waste are visible in most settlements across Ghana near markets, and roads (Monney, 2014). Yearly, Ghana produces 1.7 billion tonnes of waste (Troutman, 2017). Most wastes (55-80%) are from homes (Agyepong, 2018).

Rich countries produce more non degradable waste. Food and green waste form 44% of global waste with dry recyclables: plastic, paper, cardboard, metal and glass adding to 38% but plastic, metal, and glass amount to 24% of the waste of rich nations and 9.4% of lower-income countries (Bhada-Tata, Kaza, Van Woerden & Yao, 2018). Africa's waste is 57% organic (Godfrey, 2018) and 13% plastic (Bhada-Tata & Hoornweg, 2012) while Ghana's waste is 61% organic and 20% plastics, metal and glass (Fei-Baffoe, Kadar, Mensah & Obiri-Danso, 2015). Waste composition varies among cities due to public attitude, income, and culture (UNEP, 2018). When people recognize the harm of their behaviours on the environment, they may reduce consumption to minimize waste (O'Connell, 2011) cites, but if they are unaware of the ecological impacts of wastes arising from the goods they make or buy, they are less motivated to alter their waste habits but tend to take decisions that promotes waste generation (Clapp, 2002).

Also, buying items made from recycled materials, recycling, and avoiding packaging to reduce waste creates social confusion (Milea, 2009) since consumption serves many values; it is a way of showing identity, social status, lifestyles, and servicing

relationships (UNEP, 2015). In India, for instance, packaging and plastic bags seem to be luxury, a sign of prosperity, comfort and modernity; so, for people to reduce patronage in such products will mean loss of comfort and recognition (Milea, 2009) but continuous consumption of such items leads to increase in the associated waste. Also, people just ignore the waste they discard and what they buy than consider such decisions based on waste (Peattic, 2010). One's purchasing habits are linked with their environmental attitudes; having a strong environmental value is tied in readiness to pay more for green products, participate in waste reduction and reuse (Tchobanoglous & Vergara, 2012). The bad state of waste in Ghana is ascribed to poor knowledge of waste impacts on health, ill attitude toward waste, and non-control of SWM (Monney, 2014).

2.2.2 Solid waste collection system

Solid waste collection is a significant aspect of SWM as unsatisfactory dumping of waste has caused severe pollution with great impact on life. Solid waste collection includes waste storage at the source of generation, sweeping of streets and public places, cleaning of open drains, transfer, and transporting the waste to a treatment plant or final disposal site (Coffey & Coad, 2010). When waste is generated, it should be stored in a protected way to avoid scattering (Leblanc, 2018). Containers often used are plastic bins, bags, oil drums, and disposable paper (Chaudhary, Gupta & Singh, 2014). In Ghana, 80.6% and 28.3% of urban and rural settlements singly store waste in closed containers. Urban areas use communal container collection system whereas open dumping (78.3%) is prevalent in rural areas (UNEP, 2018). Providing reliable collection service to all citizens to end open dumping and burning is the right step to ensuring sound SWM (UNEP, 2015). Local assemblies use diverse collection methods, frequencies and coverage subject to the waste volume, available funds and

vehicles. Also, waste collectors visit houses to collect waste for a fee or the trash are left outside for planned pick-up (Bhada-Tata & Hoornweg, 2012).

Globally, 2 billion people do not have access to waste collection service (UNEP, 2015). High-income states provide almost universal waste collection while low-income nations collect 48 % of waste in cities and 26% in rural areas. Across regions, Europe, Central Asia and North America collect 90 % of their waste but Africa collects 44% (World Bank, 2021) and collection is more extensive in urban than in rural areas (Bhada-Tata *et al*, 2018). Collection coverage ranges from 25–70 % (UNEP 2015) and varies between and within countries. In Ghana, for example, Wa has 28% collection coverage far below Accra with 80% coverage (UNEP, 2018). In Africa, many vicinities have common areas to dump their waste but littering is still a serious issue; waste is dumped willy-nilly in the presence of bins (Bhada-Tata *et al*, 2018).

2.2.3 Solid waste disposal system

Once materials are considered waste by households, it is disposed from the households. In developing countries, households dispose of waste as mixed waste (Bhada-Tata & Hoornweg, 2012). Various ways are employed in disposing the waste; burning, burying, throwing into drains or nearby bushes, feeding animals, composting, or recycling (UNEP, 2015). Local authorities equally adopt open dumping and burning to dispose waste. These methods involve waste being dumped and or burnt at a designated site without any environmental control measures put in place. Methane emission is a major ecological problem linked with these methods (Bhada-Tata & Hoornweg, 2012). Annual reports on environmental health and

sanitation show that open dumping and burning are the means of waste disposal in Techimantia (TSMA, 2017 – 2021).

2.2.4 Sustainable solid waste management

Waste is inevitable in our daily activities. So, it imposes a duty on us to adopt appropriate collection, treatment, recycling and disposal methods to keep clean environment, hence, the idea of Sustainable Solid Waste Management (SSWM). Gören (2015) said that, SSWM involves systematic selection of waste management options to produce a system that reduces the overall environmental impacts of waste management. The system should be less costly and acceptable by owners and beneficiaries. SSWM can be achieved via waste hierarchy that ranks SWM options based on best practices (Leblanc, 2018). The options are; reduce, reuse, recycle, recover and disposal (Bhada-Tata & Hoornweg, 2012). Understanding the waste hierarchy helps to achieve SSWM and resource utilization but SSWM practices are rare in developing countries due to unawareness, poor facilities, incentives and enforcement (Gören, 2015). The “4Rs” are discussed in the next sections.

2.2.4.1 Reduction

Waste reduction means consuming and throwing away less (Gören, 2015). Reduction starts from industry by redesigning items and using less packaging materials to ensure that once the items become waste, materials can be sorted for recycling. Governments can intervene by introducing product charges to producers (for non-returnable packaged items) and deposit refund for buyers (for returnable packaged items) (Bhada-Tata & Hoornweg, 2012). Individually, we can reduce waste by changing our buying habits; shop with our own bags, avoid plastic bags, buy only items needed, buy reusable items and goods with little packaging (Lenkiewicz & Webster, 2017).

When a larger part of the waste is reduced, little will be landfilled and reduced SWM cost. Since a large quantity of waste in developing countries is organic, composting is useful for waste reduction but such practices at the household level are not properly established due to the financial constraints of waste management (Bhada-Tata & Hoornweg, 2012).

2.2.4.2 Reuse

Reuse involves using material again in its original or subsidiary form (Gören, 2015). Reuse items by repairing, selling or giving them to charity groups. Use a product more than once for the same or different purposes. Reuse is mostly done at household level for packaging materials like carrier bags, glass bottles, metal, textile and plastic containers, etc. When the generator of a particular waste no longer has any value for it, it ends up in a bin. But another person may value it. Waste pickers collect such materials to reuse or sell them (Bhada-Tata *et al.*, 2018). Reuse reduces waste generation and raw material consumption, saves energy, water, and reduces pollution (Samiha, 2013). In developed countries, there is an increasing trend for sorting out reusable and recyclable elements of the waste stream (Bhada-Tata & Hoornweg, 2012). As this does not involve reprocessing, it is suitable for emerging economies. Therefore, promoting environmentally friendly behaviours among households is key to reusing waste.

2.2.4.3 Recycling

Recycling is the collection, sorting and processing of materials from waste to produce useful products. Recycling turns waste materials into valuable resource. After collection, materials (e.g., glass, metal, plastics, and paper) are sorted and sent to facilities that can process them into new items or products. Sorting waste at homes is

cheaper as it reduces sorting and cleaning costs at dumpsites (Gören, 2015). Recycling depends on available technology, the quantity and quality of items and economic factors (Hoorweg & Bhada-Tata, 2012). Recycling is active in the developed nations. Sweden in 2010 recycled 49% of its waste (Milios, 2013), Singapore recycled 61 % in 2016 (Wong, 2017), the European Union targets to recycle 65% of its waste by 2035 (Avfall Sverige, 2018) but Africa recycles 4% of its waste (Godfrey, 2018) and 2% by Ghana (Troutman, 2017).

2.2.4.4 Recovery

Waste recovery is the extraction of organic waste and or energy from waste for further use. Material recovery is done by composting but incineration is used to recovery energy (Bhada-Tata & Hoorweg, 2012). Composting is a controlled biological decay of organic waste into humus that is used in farming, landscaping, etc. (Gören, 2015). It is best for handling organic waste in developing nations (Coffey & Coad, 2010). Recovering energy from waste prior to final disposal is preferable to direct land filling if pollution and costs are addressed (Bhada-Tata & Hoorweg, 2012). Energy recovery is done in a controlled burning process called combustion or incineration (Gören, 2015). Energy recovery is vibrant in the developed world but is still to take off on scale in Africa (UNEP, 2018).

Remnant waste after energy recovery can be buried in a planned and managed landfill but if a landfill is not possible; waste can be controlled, covered, and contained at a site away from homes, and rivers (Lenkiewicz & Webster, 2017). Proper land filling is not readily available in developing countries, open, uncontrolled dumping remains the main waste management approach in Africa (UNEP, 2018). The hierarchy is appropriate in Ghana to ensure efficient SWM. In this regard, education and the

knowledge of residents need to improve so they can understand basic environmental values and change their behaviour towards proper SWM to save the environment, lives, and resources.

2.3 The role of Communities in Solid Waste Management

Waste management starts with waste producers as a consumer, resident, tourist, business owner or employee (UNEP, 2015). In developing countries local government authorities provide SWM services (Al-Khatib et al., 2009). They provide the facilities for collection, transportation, treatment and disposal of wastes (McAllister, 2015). However, with rising population and changing life styles, local assemblies are struggling to sustain SWM services. Often times the systems fail to function or do not exist at all due to social, expert, and institutional constraints (Milea, 2009). Modern waste management system stresses on the roles of communities since householders are experts of their own daily practices in SWM (Tchobanoglous & Vergara, 2012).

Generally, communities are to keep households and their surroundings clean, collect and store waste in specified bins, sort waste at source and convey them to waste collectors, and compost organic waste (Abubakar, Badamasi, Galadimawa & Rigasa, 2017). To encourage residents to segregate waste at source demands a significant degree of behavioural change (UNEP, 2015); creating environmental awareness and providing clear instructions to enable people develop the right habits and behaviours in handling their waste will make them willingly reduce, separate and dispose of waste properly, pay for waste management services, and approve disposal sites (Bhada-Tata et al., 2018).

Communities are to attend meetings, select representatives and leaders for consultation in planning SWM and siting facilities to manage waste, give feedback and queries to local authorities (UNEP, 2015). The feedback allows waste management authorities to measure satisfaction and trust, understand gaps in services, and make changes that benefit the population, and the environment (Bhada-Tata et al., 2018).

However, a community managing their own waste is subject to appropriate local context, a strong and competent local leadership (Colon & Fawcett, 2006) cited in Mkumbuzi and Sinthumule (2019). Adipah and Ofotsu (2019) affirm that communities can shape the design of a SWM system; their behaviour and readiness to take part in waste management will guide policy decisions making – the institution of waste service charge, prevention, reduction, separation and recycling policies. The behaviour of community members too is contingent on their knowledge, attitudes and interest in waste management matters. A study in Xiamen city (China) finds that knowledge followed by social motivation (values) is the strongest option to improve citizens' participation in SWM (Lin, Xiao, Zhang & Zhu, 2017). Failure of communities to manage their own waste will result in dire consequences on the environment and public health both in the short and long term.

2.4 Impacts of Poor Solid Waste Management

Managing waste properly is essential for building sustainable and liveable cities. It is beneficial to the economy, environment, and humans. However, the cost of providing sound waste management services is dear and is seen as a burden by African governments with limited resources and competing needs (UNEP, 2018). Effective waste management often comprises 20% – 50% of municipal budgets (World Bank,

2022). But failing to provide sustainable waste management services has long-term impacts that come at a cost to society and to the economy (UNEP, 2018). The major impacts of inaction include environmental impacts of open dumping and burning, and public health impacts of uncontrolled waste management (UNEP 2015).

2.4.1 Environmental impacts

The basic aim of SWM is to lessen and or eliminate the adverse impacts of wastes on the environment and human health (Leblanc, 2018). Yet, it remains a challenge for many poor countries (World Bank, 2019). High income countries dump only 2% of their waste but 93% of waste is openly dumped in low-income countries (World Bank, 2021). In the absence of waste rules and their strict execution, waste may be dumped on streets, vacant lands, drains or burned to reduce the waste (UNEP, 2015). This is made worse by people with deficient knowledge on the environmental impacts of waste, negative attitude and behaviour toward sanitation and the absence of waste management facilities give people a reason to dump waste anyhow (McAlister, 2015).

Uncollected wastes clog drains or rivers causing local floods (Van Niekerk & Weghman, 2019). Accra (Ghana), for example, experiences seasonal floods partly due to blocked drains by waste. Inadequate waste collection makes people just dump wastes some of which gets washed into the drains (UNEP, 2015). Accumulated waste pollutes soil, air and water. Kennedy (2016), in his study, for example, finds high level of heavy metals in the nearby soil of a dumpsite in Nairobi (Kenya) than soil farther away. Plastic waste also litters the land and oceans raising the fear that more plastics than fish will be in the oceans by 2050 (Edmond, 2019). Open burning and decay of waste in uncontrolled dumpsites also produces air pollutants. Methane (an

ozone destructive gas) from landfills alone is 12 % of global methane emissions (Hoornweg & Bhada-Tata, 2012).

2.4.2 Public health impacts

Deficient SWM has direct health impact on residents particularly the poor who live near dumpsites (Bhada-Tata et al., 2018); they are susceptible to health hazards due to the possibility of the waste to pollute food sources, water and air (Kennedy, 2016). Proximity to dumpsites has direct connection with the rise and spread of infections (Jerie, 2016; Agyemang-Duah, Darko & Suleman, 2015). In Kenya, a study finds that children living near a dumpsite suffer from malaria, congenital abnormalities, headache, cardiovascular and skin diseases, chest and muscular pains (Kennedy, 2016). Another study in Sawaba (Kumasi) reveals that participants (67%) living closer to open dumpsite experience cholera but those living farther away suffer none (Agyemang-Duah et al., 2015). Piles of waste breed mosquitoes that spread malaria, dengue and yellow fever. Contact with waste can also cause dysentery, diarrhoea and cholera (Lenkiewicz & Webster, 2017) as experienced in Ghana in 2014 to 2015; 28,975 cases and 243 deaths were reported across the country (WHO, 2015). Poor sanitation accounted for the outbreak in Accra (Addo, Afari, Bandoh, Kenu, Noora, Nortey & Ohene-Adjei, 2017). For the same reason Tano South District, where this study area is located, also recorded some cholera cases in 2014 (Tano South District Medium Term Development Plan, 2014 – 2017). Edmond (2019) affirms that a million people die annually in poor nations due to diseases caused by mismanaged waste.

2.5 Knowledge of Solid Waste Management

Knowledge is seen as a precondition for action. As such knowledge-based campaigns are usually used in fostering certain behaviours in society (Frick, Kaiser & Wilson, 2004). Knowledge, in this study, refers to the ideas, understanding, awareness, and information study subjects have on SWM. Research shows that people's knowledge on SWM is influenced by their environmental knowledge, personal experience, family, friends, socio-demographics, and the media (Barr, 2007; Adogu, Egenti, Nkwocha, Okwuoha, & Uwakwe, 2015; Hawi, Nordos, Sisay, Tariku & Tesfaye, 2017). Environmental knowledge consists of system, action-related, and effectiveness knowledge, which work together to shape behaviour (Frick et al., 2004). System knowledge is a general understanding of the state of the environment and awareness of environmental problems like waste issues (Barr, 2007). Example is knowledge of the association between waste production and pollution.

Action-related knowledge refers to information that leads to direct or indirect action (Frick et al., 2004) such as, if I buy goods with less packaging, I reduce waste or green products are decomposable; a reason to consider when shopping. Environmental effectiveness knowledge is being aware of the gain of eco-friendly actions especially when people have a set of responsible actions to select (Frick et al., 2004). Knowledge of waste problems and relevant actions are significant mediators of whether or not attitudes predict behaviour (Garling & Fransson, 1999). To effectively change behaviour related to an issue is to understand the issue and its effects UNEP (2015). Equally, knowledge of the effects of uncollected waste, awareness of the depletion of resources, and the absorptive limits of ecosystems lays a base for any action linked to SWM (UNEP, 2015) though people become apathetic toward waste issues (Furto & Reyes, 2013). Anies *et al.* (2013) opine that people are aware of the

hurtful effects of mismanaged wastes but their deficient environmental knowledge and negative attitudes often results in poor waste disposal habits. For example, Afzal, Gillani, Hussain and Shahzadi (2018) and Abdikadir, Mahmuda and Sahada (2018) find that 83% of respondents in Lahore (Pakistan) and 84% in Karan District (Somalia) affirms that waste pollutes the environment. Knowledge for action is vital for behaving in a proper way and can impede action if levels are low. Hongtong et al. (2017) find that respondents with high level of knowledge on SWM also have good level of SWM practice. Al-Khatib et al. (2019) discovers that unawareness (93.9%), poor information (91.8%) and knowledge (73%) of waste sorting and storage justify the low recycling rate in Palestine.

Personal experience is yet a factor that influences SWM behaviour. To Albarracín, Chan, Jiang, Lohmann, and Sunderrajan (2019), direct encounter with an attitude object can be a simple way to form attitudes since it influences the likelihood of an attitude to be amply aroused and triggered when the object is faced again. Agyeman and Kollmuss (2002) affirm that direct experience has greater impact on behaviour than indirect experience which results in weaker association between attitude and behaviour. As Barr (2007) points out, personal experience of or proximity to a landfill site or an area where garbage poses health threat may provide an incentive to manage waste well. Also, experience of a waste behaviour or a related one can shape SWM behaviour; if a person has composted before will be more likely to take part in recycling waste than one who has not.

Families and colleagues have values which are revered hence form a major source of SWM knowledge. Their actions, Daud and Jekria (2016), may shape eco-friendly behaviours like recycling and surveys show that people gain knowledge on SWM and

environmental issues from families, neighbours, and the community in general (e.g., Hongtong et al., 2017; Al-Khatib et al., 2019). They also form what Strydom (2018) describes as social pressure and its deficiency can result in poor SWM habits as Strydom (2018) finds low social pressure to account for non-recycling behaviour among South Africans. This trend, to Al-Khatib et al. (2019), entails the institution of environmental values to get people involved in SWM. Other variables being argued if they have any impact on knowledge, attitude and behaviour toward SWM are socio-demographics – age, gender, marital status, education, occupation, religion, residence, and income. Study on these variables on knowledge of SWM are well known (e.g., Barloa et al., 2016; Hongtong et al., 2017; Al-Khatib et al., 2019). It is found that young adults, the educated and high-earning people tend to display adequate SWM knowledge but differences exist in some studies too. The debate on the impact of socio-demographics on SWM behaviour is that they feature spurious relationships.

Information is central to raising environmental awareness and behaviour change as proved by Lin et al. (2017). They find that trash bin logo and advertising are key factors influencing public participation in waste management as they provide information on why, where and how to recycle. Hongtong et al. (2017), also find that people who receive information on SWM have high level of waste management practice compared with those without any information. Inadequate information on waste segregation and storage is one major reason respondents (96%) in Palestine do not take part in waste recycling (Al-khatib et al., 2019). Various studies show that people gain information and knowledge on SWM from the media; 39.2% of respondents in Palestine obtain recycling knowledge from Television (TV) programmes (Al-Khatib et al., 2019), and women of Kermanshahi (Iran) get

information on waste reduction, reuse, and recycling from TV (89.31%), video training programmes and TV series (67.33%) (Almasi et al., 2018).

Research on the link between knowledge, attitude and behaviour on SWM indicates that respondents have good, satisfactory to moderate and high level of knowledge on SWM as well as positive attitude toward SWM (Barloa et al., 2016; Hawi et al., 2017; Abdikadir et al., 2018; Almasi et al., 2018;) but the positive attitude does not necessarily translate into proper SWM. Almasi et al. (2018), for instance, find significant relation between knowledge and attitude but poor waste management practice, while Ahmad *et al* (2015) find a significant but weak association between knowledge and practice. The literature review so far shows that research on the knowledge of SWM in the Ghanaian context seems to be silent creating a gap for which this study will fill.

2.6 Environmental Values and Solid Waste Management

Value–action gap is seen in most environmental matters and is one that needs decisive attention if viable SWM policies are to be instituted. Schwartz (2012) defines values as broad beliefs about what is right, good, desirable, or specifies general preferences. They are the shared ideals or standards of a culture (Frese, 2015). Values shape decisions and are shown in expression of concern about human impact on the environment (Dietz, Fitzgerald & Shwom, 2005). Hence, Barr (2007) sees environmental values as the orientations people hold toward the physical environment. Thus, values reflect our way of life, our own ability to change attitudes and behaviour; so, serve as checks for doing the right thing: example, if one values cleanliness, this is mirrored in the person’s attitude to keeping their surrounding clean. Values are learned from families, neighbours, peers, or teachers (Behera & Jena,

2017). De Groot and Steg (2012) observe that people may uphold the same values but prioritize them differently leading to varied preferences, beliefs, attitudes, norms, and choices. Those who support environmental values are more likely to buy green products than those who prioritize egoistic values.

Three value types may affect environmental behaviour – egoistic, altruistic, and biospheric value orientations (Stern, 2000; De Groot & Steg, 2008). People who endorse egoistic values focus on harnessing private interests. They consider the effects of environmental actions for themselves and act eco-friendly if the perceived gains of their actions exceed the costs. Contrary, people with altruistic values decide to behave pro-environmentally or not for perceived costs and gains for other people. They may engage in pro-environmental actions like buying green produce, when this benefits their family. Individuals who embrace biospheric values base their choices on the effects on biosphere, and act pro-environmentally when their actions are likely to reduce environmental harms. It is upheld that people with altruistic, and biospheric values are more likely to engage in eco-friendly action than those with egoistic values (De Groot & Steg, 2012).

Values affect behaviour indirectly via behaviour-specific beliefs, attitudes, and norms (De Groot & Steg, 2012). Depending on one's values, they are more or less likely to admit the impacts of their behaviour on the environment; become aware of possible effects and assign a duty to themselves and their behaviour. Subject to these beliefs about the impact of their behaviour they form a personal norm which then determines their behaviour; whether one endorses waste management regulations or engages in recycling (Prager, 2012). In SWM, the extent to which the waste problem is seen to be a threat to health can shape SWM behaviour (Barr, 2007). If perceived risk is high, it

intensifies intentions to take actions but if low, it impedes efforts to address the waste problems (Jerie, 2016). If we value sanitation, this will influence our beliefs about the penalties of littering the environment leading to self- assessment of our ability to reduce the threats posed by solid waste which in turn affects our moral obligation to take actions.

However, this is often not the case in SWM in the developing world. People in developing countries value clean environment and duly see waste as a problem but recognizing waste as a problem (Moore, 2012) does not prevent them from littering or engaging in other negative behaviours relating SWM. This attitude – behaviour gap occurs due to many reasons; low public participation in SWM, poor education and awareness of effective SWM techniques, convenience and social norms (Milea, 2009; O’Connell, 2011). Within this attitude–behaviour gap is a break between values and actions; the inconsistency between people’s verbal care about the environmental harm posed by solid waste and the inaction by the very people to reduce waste or engage in pro-environmental behaviours (O’Connell, 2011). This gap is often noticed during research in the developing world where people show concern for the dross problems in their community yet proceed to litter the streets not connecting their values with their actions (McAllister, 2015).

Studies on environmental attitudes exist in many countries (e.g., Hongtong et al., 2017; Afzal et al., 2018; Strydom, 2018), yet it seems a lot is not done on knowledge, attitude, and behaviour of Ghanaians toward SWM. One such study concentrates on perceptions and attitudes toward SWM in Berekum in the Bono Region (Agyapong et al., 2015) and shows that there is public and private morality regarding environmental sanitation with people self-reports conflicting with the reality on the ground. In

Berekum, 40.2% and 26% of the respondents identify solid waste and water pollution as the most serious environmental problems in the area. 98% of them agree that waste collection services are provided free of charge, and 69.3% indicate their readiness to pay for improved services yet 81.3% of the respondents expect the waste problem to deteriorate in the near future (Agyapong et al., 2015). This is a sign that people are not reducing waste to solve the problem.

Empirical studies into SWM reveal that people value clean environment and like to see their streets clean. The finding of Afzal et al. (2018) shows that 95% respondents in Lahore (Pakistan) feel their streets should be tidy and 84% think solid waste should be properly disposed. All respondents in South West Ethiopia equally think proper waste management have health and economic benefits but 53.6% do not agree that individuals should manage their waste, and 72.1% believe in waste recycling (Hawi et al., 2017). A study in Owerri (Nigeria) discovers that respondents (99.3%) see proper SWM promotes good health and healthy environment; 79.8% also have excellent attitude and 18.4% have good attitude toward waste management (Adugo et al., 2015).

Strydom (2018) explains that when individuals among families, friends, neighbours, and other significant people that expect or exert pressure on others to manage waste is small in a population, the moral obligation to manage waste properly is low. This has accounted for the littering behaviour in many communities in developing countries. Sometimes out of habits and customs, people throw their waste in streets and other wrong places (Scott & Yousif, 2007). Some studies indicate that people are worried about waste surrounding them and are dissatisfied with how other people manage their waste. Aniemena et al. (2015), discover that though 93.3% of respondents in

Anambra State (Nigeria) participate in sanitation programme monthly, 89.6% still worry about litter around their homes and 78.1% express dissatisfaction about how others dispose waste. Strydom (2018), equally finds that low social pressure accounts for low recycling in South Africa. A study by Carpenter et al. (2016) also shows that respondents (65.8%) in Central Uganda are concerned about the presence of garbage in their vicinity but 90.3% admit, as individuals, they play a role in SWM and are willing to separate (76.6%), and compost (54.9%) waste.

2.7 Solid Waste Management Habits

Behaviour is regarded as the overt acts of a person and is assumed to stem from attitudes (Albaracin et al., 2019). When behaviour is consistent or routinized, it predisposes itself to habituation. Repetition is a main feature of daily life (Wood & Neal, 2009). Often in the same context 45% of people's behaviour is repeated daily with little or no conscious thought (Wood, Quinn & Kashy, 2002). To Wood and Neal (2007), a habit is a learned, somehow reflex, behaviour that starts unconsciously by familiar cues in a person's context (physical setting, other preceding actions, time of day). Once a habit is formed, it may dominate conscious decision making in a relevant situation. A habit can also block conscious awareness and exploration of behavioural choices and triggers rapid relapse to an old way of acting even when a person wants and intends to do something new. Many preventable causes of deaths to Hernandez, Neal, Vujcic, and Wood (2015) can be traced to bad habits and behaviours. Within the waste sector, floods from blocked drains, cholera from dirty environments, waste slides and fires from open dumpsites can be cited.

It is argued that many environmentally significant behaviours are about personal habits or household routines which are often hardly regarded (Stern, 2000); putting waste out for collection instead of dumping or burning it in the yard or somewhere nearby involves significant level of behaviour change by individuals (Rodic & Wilson, 2017). Promoting behaviour change is difficult as it often requires breaking old habits and forming new ones (Stern, 2000). Hernandez et al. (2015) maintain that people need supportive environments and materials to initiate a new habit. In the realm of SWM, waste bins must be readily available, conveniently located to ensure easy access, and must be immediately emptied and replaced when full to initiate a non-littering behaviour among people and when this occurs repeatedly, a habit is formed. Rodic and Wilson, (2017) agreed that raising awareness and guiding people is vital to develop the right waste disposal habits.

Research in different settings has highlighted the importance of enabling environments in SWM. Using recycling as a case, in the developed world where recycling facilities are well set up and procedures followed, recycling is a vibrant method of managing waste. Singapore, as stated earlier, recycled 61% of its waste in 2016 (Wong, 2017) and the whole European Union hopes to recycle 65% of its waste by 2035 (Avfall Sverige, 2018). But Africa recycles only 4% of its waste (Godfrey, 2018) and 2% by Ghana (Troutman, 2017). Empirical studies in developing countries indicate that people adopt rudimentary methods in their day-to-day waste disposal. At the household level, containers like plastic bags, baskets, sacks, and polythene bags are used to store waste (Carpenter et al., 2016; Pecajas & Ramos, 2016; Abdikadir et al., 2018). Open burning and crude dumping are commonly used to dispose of such waste (Aniemena et al., 2015; Adogu et al., 2015; Abdikadir et al., 2018; Afzal et al., 2018).

Aniemena et al. (2015) find that majority of the respondents in Anambra State (Nigeria) burn their solid wastes (94.1%). 74.1% of the respondents openly dump their waste, 51% throw into bushes, 32.2% compost, and 5.6% throw into gullies. When these practices continue overtime, they are patterned or internalized and become very difficult to break even if the person wishes to do so. When a new behaviour is initiated, it needs sustained repetition for it to become a habit. It is often proposed that habits involve a cue, a response, and a reward implying that rewards are entirely necessary to create and maintain a habit (Hernandez et al., 2015). It costs to prevent waste and plans aimed at minimizing waste imply radical changes in behaviour and life styles (Cecere, Mancinelli & Mazzanti, 2014).

Reducing or separating waste and taking it to collection points or recycling are key elements of SWM system and they can be sustained when their performance is appropriately rewarded. According to Cecere et al. (2014), the reward can be economic incentive or social appraisal. However, it is argued that economic factors play little role in changing waste management behaviour since they are knit with social, infrastructural and psychological factors (Agyeman & Kollmuss, 2002). It is found that residents in Xiamen city (China) prefer honorary titles (60.3%) to monetary gifts (22.9%) for their eco-friendly behaviours (Lin et al., 2017). Other strategies used in SWM for behaviour change include variant of 'name and fame' campaigns, whereby best performing localities, cities, or companies are given publicity in the media, public praise, and prizes. Conversely, 'name and shame' campaigns are also used to expose poor practices (Rodic & Wilson, 2017). They maintain that municipal waste departments also need to change their behaviour and habits by ensuring collected waste is sent to disposal site so as to motivate citizens to take part in waste management.

2.8 Impact of Waste Management Infrastructure on Waste Behaviour

Waste problems, and by extension environmental problems, have been linked to human values and behaviour, and that change in behaviour is the antidote (Dunlap *et al.*, 1983; Milea, 2009). Others also see the problems to be institutional failures; weak regulations and their stringent enforcement (UNEP, 2015; Orhin, 2018, pp.3–7). Yet empirical studies point to the absence of, in some cases, or inadequacy of SWM infrastructure, long distances to access waste facilities, and poor services as the causes of poor environmental conditions (e.g., Agyapong *et al.*, 2015; Almasi *et al.*, 2018; Al-Khatib *et al.*, 2019).

It is argued that without rigorous execution of waste regulations, waste generators will resort to the cheapest ways to dispose of waste by dumping waste in the street, on vacant land, into drains, streams or other waterways or burn it to reduce the piles (UNEP, 2015). Rodic and Wilson (2017) affirm that open dumping and burning of waste are illegal in many nations but non-enforcement of regulations encourages such practices to continue in many developing countries. However, they admit that facilities to receive the waste should be available before the laws can be enforced to avoid conflict. If, for instance, the laws demand that waste generators use certain facilities like recycling facilities but they are not readily available, the rules cannot be enforced. This suggests that infrastructure is a fundamental *sine qua non* for the implementation and enforcement of waste rules.

Agyeman and Kollmuss (2002) appraise the role of infrastructure in pro-environmental behaviour. They explain that much pro-environmental behaviour can only occur when the needed infrastructure is provided; for example, recycling facilities to promote recycling. The poorer these services too are, the less likely

people will use them. A study by Al-Khatib et al. (2019) indicates that limited available facilities in the municipality or nearby (76.6%), limited capacity of existing facilities (75%), and low motivation by municipal authorities (86.1%) account for non-recycling behaviour in Palestine. It is affirmed that in areas where waste facilities are not readily available people have no option but to dump or burn their waste near where they live (McAllister (2015) and empirical studies support this. Inadequate bins (52.7%), long distances to dumpsites (44%) and absence of dumpsites (2%) are found to be the causes of solid waste problems in Berekum municipal (Agyeman et al., 2015). In providing infrastructure, certain factors also have to be considered: the design, and simplicity of the facility for easy use by the citizens. Design has to do with the appearance and makeup of the facility.

Johansson (2016), using recycling as a case, explains that the design of recycling facilities can have an impact on recycling behaviour. The physical design such as the introduction of curb side collection, sorting bins made for indoor use to lessen problems of confined recycling space aids recycling behaviour. Designs are also critical for easy access; sometimes designs prevent people with less physical mobility to use certain facilities. From personal observation, there are cases in Ghana where people have to climb shaky wooden steps to dump waste in dumpsters. Such facilities discourage the aged and disable people.

Meanwhile, simplicity has to do with how easy or difficult it is to use certain facilities or carry out some tasks like recycling which, to Johansson (2016), is also affected by factors like distance to recycling facilities, container design, time required, and knowledge about what and how to recycle. A very few people strongly oppose recycling but most are ready to make small efforts to recycle, they are willing to

spend time on recycling at home as cited by Johansson (2016). Strydom (2018) discovers that South Africans will be more willing to recycle when given 2bags to sort waste to be collected at curb side compared to multi separation of recyclables. Deficient information on waste sorting and storage (91.8%) is a reason for which 96% of respondents in Palestine are not recycling (Al-Khatib et al., 2019). A short distance to bins is obviously a matter of simplicity but long distance is discouraging. Strydom (2018), find that most respondents feel negative to take recyclables to drop-off points. The further the perceived distance to collection point, the willingness to send recyclables decreases. When facilities are provided, beneficiaries need to be trained on how to operate and maintain them to ensure ownership/longevity.

2.9 Theoretical Framework

To explain the relationship between residents' knowledge, attitude, and behaviour towards SWM, the Theory of Planned Behaviour (TPB) was used.

2.9.1 Theory of planned behaviour

The Theory of Planned Behaviour (TPB; Figure1) is often used in the study of human action (Ajzen, 2002). According to Ajzen (2012), human action is guided by three elements: 1. behavioural beliefs (beliefs about the possible outcomes of a behaviour and evaluations of the outcomes); 2. normative beliefs (beliefs about the expectations of others and motivation to comply with the expectations), and 3. control beliefs (beliefs about the presence of factors that may promote or impede the performance of a behaviour). In their right combinations, behavioural beliefs produce a favourable or unfavourable attitude toward the behaviour; normative beliefs result in perceived social pressure or subjective norm; and control beliefs give rise to perceived behavioural control, the perceived ease or difficulty to perform the behaviour.

Collectively; attitude toward the behaviour, subjective norm, and perception of behavioural control leads to the formation of a behavioural intention. Given a sufficient degree of actual control over the behaviour, people are expected to carry out their intentions. Intention is thus assumed to be the immediate antecedent of behaviour (Ajzen, 2002). Thus, the TPB considers the intention to act as a direct determinant of pro-environmental behaviour.

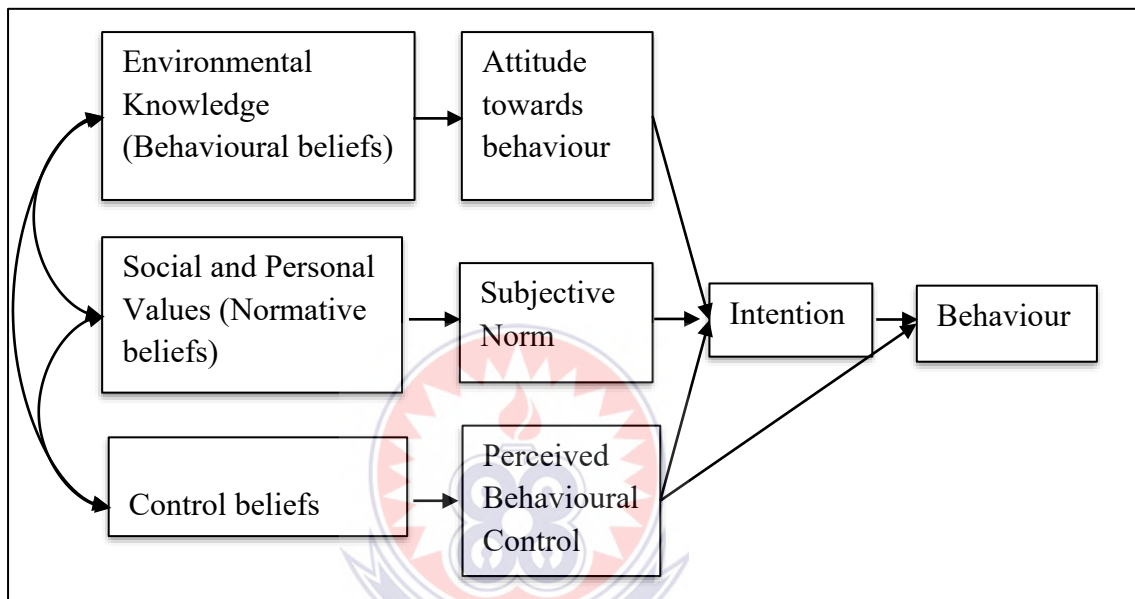


Figure 1: Theory of planned behaviour

Source: Ajzen, (2002)

The TPB (Figure 1) is relevant to this study in that one's SWM behaviour is influenced by their knowledge, beliefs, values and norms. The more knowledge one has on the environment and SWM, has favourable attitudes toward SWM, and believes they are capable of managing waste (reuse, reduce, recycle, dumping waste at designated points, etc.), the stronger should their SWM intention and vice versa.

2.2.3 Conclusion

The TPB is appropriate in this study. It helps explain the connectivity between knowledge, attitude and behaviour toward SWM. SWM behaviour in Ghana can be planned but that is highly dependent on awareness creation, provision of facilities, motivations and enforcement of regulations.



CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter provides information about the methodology and the techniques used in the study. The chapter presents the study area, the research philosophy, research design and approach, population and sample for the study. Data collection techniques, pretesting, data organization, analysis and ethical issues are also considered.

3.1 Study Area

The study was conducted in Techimantia in the Tano South Municipal. It has a total population of 16,981 comprising 8,032 (47.3%) males and 8,949 (52.7%) females occupying 4,824 houses with an average household size of three (3) (Ghana Statistical Service (GSS, 2021). 89.3% of the population are Akan, Mole-Dagbani (44.6%) and other minority ethnic groups like the Ewes, Gurma, Grusi, etc. In all, 78.2% of the people were said to be literate and most profess the Christian faith (82.2%), Islam (8.9%), traditional religion (0.2%), and those without religion (8.7%) (GSS, 2021). The community has a hospital which is well functioning in a clean and tidy environment. Because of its situation on a relatively gentle sloping land, it is well drained. Dustbins are available for people to drop their waste in for collection and proper disposal. Personal observation of the waste bins showed that they were labelled for different types of waste.

The town has a traditional council headed by a regent chief, a zonal council, six elected assembly members and unit committee members. To ensure proper SWM and sanitation in general, the TSMA had established an office of the Environmental and Sanitation Unit at the community with 15 staff. The assembly has hired 30 labourers

who sweep the lorry station, major streets and the market (TSMA, 2021). Even with this, there are times the market will not be swept until it is getting to the next market day (personal observation).

Generally, the core of the town contains old compound houses built of mud bricks. The centre is where the station, hospital, banks, market, shops, and some churches are located. Residents in this part of the town have access to 7 open dumpsites and 11 public toilets (3 water closet, 6 septic tank latrines, and 2 KIVP). Besides, there are 1200 domestic toilets yet people still defecate in the open (TSMA, 2021). The newly developing suburbs do not have access to waste dumps and public toilets, they have to manage their own waste. Due to the settlement situation on high ground, six out of the seven open dumpsites are located on relatively steep sloping lands which facilitates downslope movement of waste materials by surface run-off. The waste materials are washed into waterways like the Nsuta, Apaadu, and Kwaasu which also drain into River Moku, and River Subri; a tributary of the Tano River. Sadly, residents downstream, farmers and surrounding farming homesteads use the water in their homes and for farming. Annual reports on environmental health and sanitation by the TSMA from 2017 to 2021 captured stream water as one source of water for domestic use in Techimantia and its environs. This raise concerns due to the possibility of the water being polluted.

The soil is clayey which becomes muddy with the least rains. This makes waste materials, particularly plastic rubbers, get stuck to the soil and gutters creating unsanitary conditions. The town lies in the Semi-equatorial climatic zone which experiences double maxima rainfall, high relative humidity and temperature (GSS, 2014) providing suitable conditions for composting. However, poorly disposed waste

in a humid environment creates breeding grounds for mosquitoes and other vectors that spreads infectious diseases posing health threats to the people. Reports from the Ghana Health Service (GHS) from 2017 to 2021 indicate that malaria is the dominant health condition reported to the Techimantia Government Hospital. Other infectious diseases are typhoid fever, cholera, diarrhoea, upper respiratory tract infections, and intestinal worms. In all, women and children are more vulnerable (GHS, 2017, 2019, 2021). Women and children directly deal with waste at the households and are prone to unsanitary related infections.

The town falls within the moist semi-deciduous forest zone with part covered by the savanna grassland making animals rearing a profitable venture. Most of the people are peasant farmers engaged in crops production (Ghana Statistical Service, 2014). This has a direct impact on agricultural waste production at the community level and subsequent burning of such waste. The town is selected on the basis of its population size, and the number of open dumpsites (7) within houses which need to be removed to prevent any potential hazard. Below is the map of Tano South Municipal highlighting the study area.

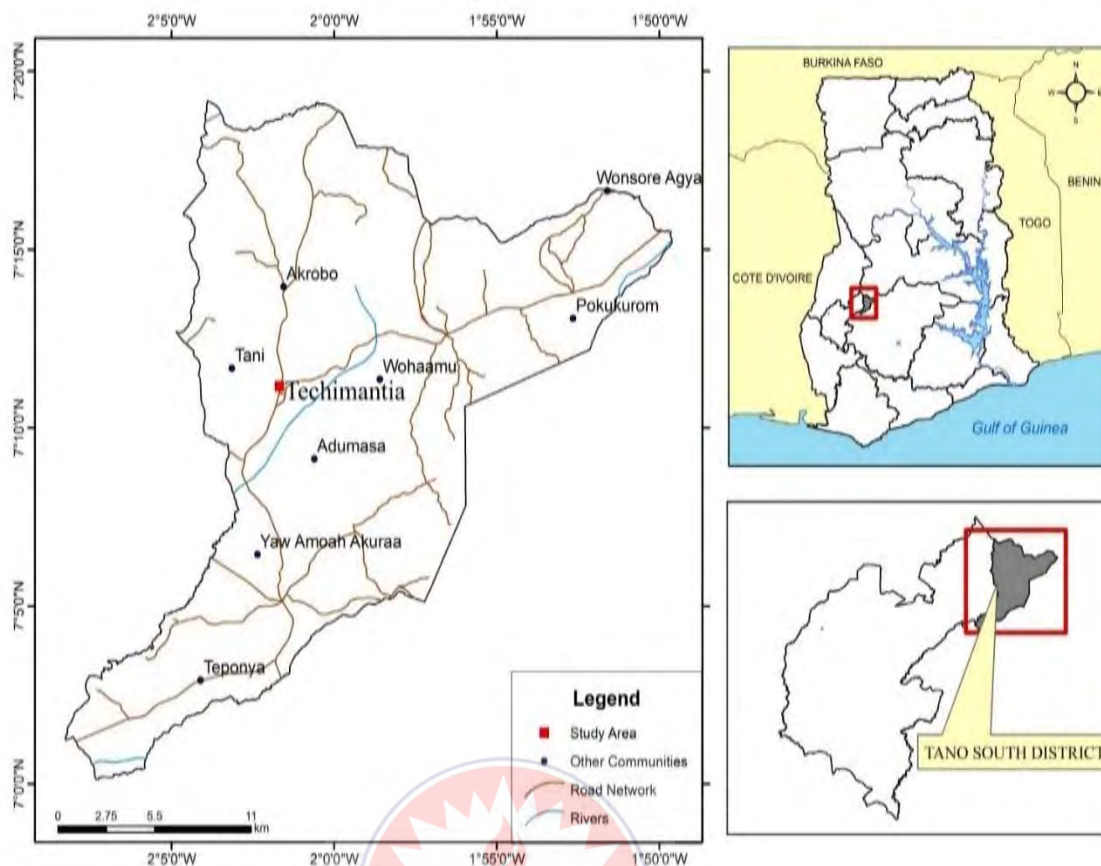


Figure 2: Map of Tano South highlighting the study area.

Map credit, Mohammed Sanda

3.2 Research Philosophy /Paradigm

Johnson and Christensen (2014) describe a research paradigm as a worldview. Creswell (2014) also describes worldview as a broad philosophical orientation about the world underpinning the type of research a researcher undertakes. This worldview; the totality of one's beliefs about reality, is the viewpoint about research held by a group of researchers that is grounded on a set of common assumptions, concepts, values, and practices (Saunders, Lewis & Thornhill, 2009; Johnson & Christensen, 2014). It is argued that since a research paradigm is the theoretical or philosophical ground for a research work; then, a paradigm is a research philosophy (Khatri, 2020). So, a research philosophy represents beliefs and assumptions about the development of knowledge or a line of thinking guiding the conduct of a research (Saunders *et al.*,

2009). Research philosophies include: positivism, realism, interpretivism and pragmatism (Saunders *et al.*, 2009).

This study is based on the pragmatism philosophy. Pragmatism is a blend of philosophies, which holds the view that it is feasible to work with diverse assumptions regarding the nature of truth (ontology) and variations in how knowledge can best be replicated (epistemology) (Saunders *et al.*, 2009). Pragmatism focuses on the research problem and then utilizing pluralistic approaches to gain knowledge about the problem (Creswell, 2014). Researchers are free to decide on the methods, techniques, and procedures of research that best meet their needs and purposes (Grover, 2015). A pragmatist researcher concentrates on the ends that they value; their research design is planned and conducted base on what best answer their research questions to produce pragmatic knowledge. The pragmatism philosophy predisposes itself to mixed methods research design (Creswell, 2014). The pragmatism philosophy is thus, guiding this study in order to fully understand the knowledge, attitudes and behaviour of residents toward SWM.

3.3 Research Design

A research design is a broad plan a researcher employs to answer their research questions (Saunders *et al.*, 2007) or a general orientation to the conduct of research (Bryman, 2012). It is the overall strategy chosen to tackle a research problem which requires joining various parts of a study in a clear and logical manner to explain the problem (Creswell, 2014; Grover, 2015). That is, a research design forms the blueprint for data collection, measurement, analysis, interpretation and reporting of conclusions. Many research designs exist but the mixed methods research design was used to conduct this study.

Mixed Methods research involves the collection of both quantitative and qualitative data in a single study; the data are collected concurrently or sequentially, are given a priority, and involve the incorporation of the data at one or more stages in the research process with the purpose of strengthening the findings (Creswell, 2009).

As stated in chapter 1, the purpose of this study is to explore the knowledge, attitudes and behaviour of residents toward SWM to understand how planned behaviour plays out in Ghana's situation. To accomplish this, both quantitative and qualitative data analysis were used to establish and justify the relationship between the variables in the study.

3.4 Research Approach

A research approach is a plan and procedure for research that covers general assumptions to specified methods. The choice of an approach is guided by philosophical assumptions; procedures of inquiry (research designs); and specific research methods of data collection, analysis, and interpretation (Creswell, 2014; Grover, 2015). Basically, the study adopted the concurrent – triangulation mixed methods approach.

Concurrent – triangulation mixed methods have been used interchangeably with convergent parallel mixed methods (Creswell, 2014; Hafsa, 2019). It involves the collection of both quantitative and qualitative data at the same time to do detailed analysis of the problem. The two datasets are analysed separately and the results compared to ascertain whether or not the findings reinforce each other. The comparison is done within a discussion by first presenting one set of findings and then the other (Creswell, 2009; 2014). A basic premise of this design is the quantitative and qualitative data give distinct types of information; quantitative scores on

instruments, and detailed qualitative views of participants but they should, together, generate the same results (Creswell, 2014).

In this study, interview schedule was used to collect quantitative data from respondents and interview guide to gather detailed information from participants. The two data sets were collected at the same time but in the analysis, the quantitative data is presented first and compared with the second presentation of qualitative data.

3.5 Population for the Study

The total population of Techimantia was 16,981: males; 8, 032(47.3%) and females; 8,949 (52.7%). 11,079 (65.2%) aged 18years or more (GSS, 2021). The target population for the study was 11,079 with secondary education or higher. Those who school for long are assumed to acquire desirable knowledge, attitude and behaviour on SWM so, would respond to questions appropriately. Residents who stayed in the community for less than a year were excluded; they may not be familiar with the waste situation; their responses may not show the reality. Techimantia was chosen due to its familiarity to the researcher.

3.6 Sample Size

The total population of Techimantia is 16,981 comprising 8, 032 (47.3%) males and 8,949 (52.7%) females. The population aged 18 years and above is 11,079 (GSS, 2021). A sample size of three hundred and eighty-four (384) was drawn from the 11,079-target population for the quantitative study using Fisher, Stoeckel and Townsend, (1991) sample size determination formula: $n = \frac{z^2 pq}{d^2}$ where;

n = the desired sample size (when population is greater than 10,000).

z = the standard of deviation, usually set at 1.96 or 2.0, which corresponds to the 95 percent confidence level.

p = proportion in the target population estimated to have a particular characteristic; it is not known here so; an estimate of 50 percent (.50) is used. $q = 1.0 - p$.

d = degree of accuracy desired, usually set at $\pm .05$.

Therefore, the sample size; $n = \frac{(1.96)^2(.50)(.50)}{(.05)^2} = \frac{3.8416(0.25)}{0.0025} = \frac{0.9604}{0.0025} = 384$

Another 10 key informants for the qualitative analysis: 3 assembly men, 2 traditional leaders, and 5 officials of the Environmental Health and Sanitation Unit of the TSMA at the community level were purposefully selected. In all a sample size of 394 was used.

3.7 Sampling Techniques

Probability sampling; systematic sampling, was used to select respondents to respond to the quantitative interview schedule. According to Cohen, Manion, and Morrison (2007), and Taherdoost (2016), systematic sampling involves picking subjects from a population list in a systematic way. The expected number of elements in a larger population is divided by the required sample size, giving a sampling interval (call it n), and the sample is obtained by listing the population elements in an arbitrary sequence and choosing every n th case, starting with a randomly selected number between one and n (Fisher *et al.*, 1991). With this study, the target population was 11,079 yielding a sample size of 384. The total number of houses in the community; 4,824 (GSS, 2021) was divided by the sample size to obtain 12 houses as the sample interval.

So, every 12th house, a respondent was identified to respond to the interview schedule. In every selected house, the mission of the researcher and the purpose of the study were explained to the house owner and in their absence any tenant present. The person helped identified those tenants who met the requirements for the researcher.

Where the identified persons were more than one, the first person was requested to participate in the study. If they declined, the second person was contacted in that order. However, if all failed to take part in the study or no one who met the requirements was found, the house was replaced till the sample was realized.

Purposeful sampling technique was used to select participants for the qualitative data collection. According to Creswell (2014) the objective of a qualitative researcher is to purposefully select participants that will best help the researcher understand the problem and the research question. Purposeful sampling was used because key informants are identifiable members in the population. Assembly members were chosen because of their mediating roles they play between residents and the municipal assembly. They can conveniently present the sanitation needs of the community to the assembly for redress, and can provide relevant information for the study. Officials from the environmental health office are in charge of waste management so, they understand the waste situation and can significantly contribute appropriate information for the study. Traditional leaders, on their part, have authority to organize their people to initiate programmes and policies, in collaboration with the municipal assembly, to manage their waste. Since they are with the people, they understand the general attitude and behaviour of residents hence, can provide valuable information for the study.

3.8 Research Instruments

Both quantitative and qualitative research instruments were used in the study; interview schedule and interview guide. An interview schedule or protocol, according to Johnson and Christensen (2014), is a quantitative interview instrument which is designed by the researcher and read by the interviewer to the participants.

Participants' responses are then recorded by a recorder on the script. In this case, respondents have the opportunity to ask for clarification if they do not understand any question. The interview schedule (quantitative interview instrument) had five sections: section A contained information on demographic characteristics of respondents, section B addressed the first objective; knowledge of residents on SWM, section C tackled objective 2; values on SWM, while sections D and E provided information on waste disposal habits (objective 3) and impact of SWM infrastructure on waste management behaviour (objective 4) respectively. Interview guide was also used to solicit ideas from participants on the topic. This enabled the researcher to obtain detailed information on participants' thoughts, knowledge, beliefs and feelings about the topic (Johnson and Christensen, 2014). Interview guide was used to explore specific topics and ask specific open-ended questions. It contained seven leading questions covering the research objectives. The interview guide helped to obtain clarity on responses and information (Creswell, 2014). Also, it was used to verify the reliability of responses from the interview schedule and the face-to-face interview.

3.9 Methods of Data Collection

Before the fieldwork, I recruited two research assistants and trained them. Copies of an introductory letter from Department of Geography Education, University of Education, Winneba was presented to the office of the environmental health and sanitation unit (TSMA), and the traditional authority to seek permission to conduct the study. Prior to data collection an announcement was made on the community information centre about the team's visit to various homes to interact with them. Primary data was obtained from the preliminary field investigations. These data were gathered through the use of both quantitative and qualitative methods. In the quantitative inquiry, a detailed structured questionnaire with open ended and close-

ended questions were administered through an interview to the respondents and their responses were hand recorded on the questionnaire. The questionnaire gathered information on respondents' demographic features and the research objectives.

In-depth interview was conducted to gather more information on the subject matter and sought clarification on emerging issues using interview guide. This instrument was considered appropriate to elicit detailed responses from participants which could have otherwise not been captured by the questionnaire. The interview guide contained seven leading questions on the research objectives. Face-to-face interviews were conducted with the three assembly members, five officials from the office of the environmental and sanitation unit of the TSMA at the community level as well as two traditional leaders. The interviews were audio-recorded though the researcher also took hand written notes.

3.10 Reliability and Validity of the Research Instrument

Research instruments were pre-tested before the actual data collection to determine respondents' understanding of the questions and to verify whether the questions elicited the appropriate responses associated with the research questions. The pre-test helped uncover ambiguities, and poorly phrased questions. In addition, this helped the researcher to understand the sequence of the questions; time to complete, difficulties and the nature of the responses and therefore determined the reliability of the instruments. The validity of the instruments was also ensured by using multiple data collection tools – interview guide and interview schedule thereby, ensuring truth in the data collection tools. In addition, the questions were simplified for easy understanding. The interview schedule was fully examined, and reorganized by colleagues (MPhil level) and my supervisor.

3.11 Data Analysis

Quantitative data was analysed using the Statistical Package for Social Sciences (SPSS volume 25). Items on the questionnaire were pre-coded in statistical format. Responses to open-ended questions were appropriately coded in statistical format and analysed quantitatively using SPSS. Frequencies, cross tabulations and correlation were the techniques used to analyse the data and the results displayed in charts and tables. Responses from the in-depth interview were manually coded and categorized into themes according to the research questions and analysed. The quantitative data were presented first and then the qualitative data to address the appropriate research question.

3.12 Ethical Consideration

An introductory letter from the Department of Geography Education, University of Education, Winneba was obtained and sent to the office of the environmental health and sanitation unit (TSMU), and the traditional authority to seek permission to conduct the study. On the field, informed consent of respondents and participants was sought. They were briefed on the purpose of the study and how the information obtained would be utilized and were briefed on their rights to withdraw from the study at any time. They were assured anonymity and confidentiality. Pseudonyms were used in place of real names. People with diminished returns were also excluded from the study.

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.0 Introduction

This chapter presents the findings and discussion of the study on knowledge, attitude and behaviour of residents of Techimantia towards solid waste management (SWM) in the Ahafo Region of Ghana. The presentation begins with the demographic characteristics of respondents, and is followed by the findings; quantitative and qualitative based on the research objectives.

4.1 Demographic Characteristics of Respondents

The background variables of respondents considered in this study include gender, age, educational level, ethnicity, and religious affiliation. Females represent 51.0% (196) of the study sample out of which 144 (73.5%) are in the age cohorts 18 – 30. The selection of more females in this study is influenced by the common knowledge that, in a traditional Ghanaian setting, females are mostly in charge of waste management at the household level. The highest education attained by most of the respondents (211) is Senior High/Secondary School (SHS). Out of this, 110 are males representing 58.5% of the male respondents (188) while 101 are females also representing 51.5% of the female respondents (196). The dominant ethnic group is Asante (128) or 33.3% of the total sample (384). Finally, 237 of the respondents profess the Christian faith of which 128 are females and 114 males. Detailed information on the demographic characteristics of respondents is shown in Table 1.

Table 1: Background information of respondents

Variable	Sex		Total N (%)
	Female N (%)	Male N (%)	
Age			
Below 30 (18 – 30)	144 (73.5)	119 (63.3)	263 (68.5)
Above 30 (31 – 60)	52 (26.5)	69 (36.7)	121 (31.5)
Total	196 (51.0)	188 (49.0)	384 (100.0)
Education			
SHS/Its equivalent	101 (51.5)	110 (58.5)	211 (55.0)
Tertiary	95 (48.5)	78 (41.5)	173 (45.0)
Total	196 (51.0)	188 (49.0)	384 (100.0)
Tribes			
Asante	39 (19.9)	89 (47.3)	128 (33.3)
Ahafo	66 (33.7)	19 (10.1)	85 (22.1)
Bono	15 (7.7)	35 (18.6)	50 (13.0)
Mole-Dagbani	65 (33.1)	26 (13.8)	91 (23.7)
Other tribes	11 (5.6)	19 (10.1)	30 (7.8)
Total	196 (51.0)	188 (49.0)	384 (100)
Religion			
Christianity	123 (62.8)	114 (60.6)	237 (61.7)
Islam	59 (30.1)	37 (19.7)	96 (25.0)
African Traditionalist	8 (4.1)	27 (14.4)	35 (9.1)
Others	6 (3.0)	10 (5.3)	16 (4.2)
Total	196 (51.0)	188 (49.0)	384 (100)

Source: Field Work; 2022

4.2 Knowledge about Solid Waste Management

The study sought to determine residents' knowledge on SWM. The issues considered are residents' understanding of the state of their environment, sources of education or information on SWM, and the relationship between background variables and knowledge of waste separation.

4.2.1 Residents' knowledge of solid waste management

Knowledge of a given issue is recognized as a major factor that shapes the attitude, and behaviour of people. As such, residents' knowledge on the state of the environment, impact of poor waste disposal, waste reduction strategies, and disposal options were examined and the results are shown in Table 2.

Table 2: Knowledge of residents on solid waste management

Knowledge Items	Responses N (%)				
	SD	D	N	SA	A
Solid waste is a major problem in this town.	—	19 (4.9)	49 (12.8)	69 (18.0)	247 (64.3)
Wastes are dumped into gutters, bushes, and open land	—	83 (21.6)	3 (0.8)	115 (29.9)	183 (47.7)
Poorly disposed wastes clog drain, cause floods, disease and pollute environment.	—	14 (3.6)	48 (12.5)	86 (22.4)	236 (61.5)
Shopping with a durable bag and buying less packaged items reduces waste.	—	22 (5.7)	11 (2.9)	123 (32.0)	228 (59.4)
I do not consider the waste I produce when shopping.	4 (1.0)	82 (21.3)	79 (20.6)	39 (10.2)	180 (46.9)
Waste must be separated before disposing it.	97 (25.3)	82 (21.3)	10 (2.6)	51 (13.3)	144 (37.5)
Dumping waste into drains is better than burning.	148 (38.5)	111 (28.9)	36 (9.4)	11 (2.9)	78 (20.3)
Reduce, reuse, and recycle are the best in managing waste.	33 (8.6)	112 (29.2)	82 (21.3)	27 (7.0)	130 (33.9)

Source: Field Work; 2022. Note: **SD:** Strongly Disagree, **D:** Disagree, **N:** Neutral, **A:** Agree, and **SA:** Strongly Agree.

With reference to the TPB (figure 1), residents' environmental knowledge (behavioural beliefs) – knowledge of the state of the environment and an awareness of environmental problem like waste, knowledge of action strategies, and skills should lead to positive or negative attitude toward behaviour. From Table 2, most respondents 82.3% (18.0% + 64.3%) considered solid waste as a major problem in

their town compared to 40.2% in Berekum Municipal, Ghana (Agyapong et al., 2015) and 88% in Karan District; Somalia (Abdikadir et al., 2018); 77.6% (29.9%+47.7%) lamented the dumping of waste into gutters, bushes, and open land (Figure 3). Such practices, according to 83.9% (22.4%+ 61.5%) of the respondents, pollute the environment, clog drains, cause floods and spread diseases similar to the findings of Afzal et al. (2018) that 72% of the people in Lahore (Pakistan) were aware that disposing more waste pollutes the environment and 83% said mismanaged waste impact human health negatively.



Figure 3: Waste dumped into a gutter and bush

Source: Field Work; 2022

From Table 2, 91.4% (32.0% + 59.4%) of the respondents said shopping with a durable bag and buying less packaged items can reduce the amount of waste to be disposed (knowledge of action strategies) but in practice, more than half (10.2% + 46.9% = 57.1%) of the respondents disregard the waste they produce while shopping (negative attitude toward behaviour (Table 2). This implies that the knowledge of respondents on the state of the environment, the negative impacts of waste on both the environment and human health and waste reduction strategy they verbally expressed

does not necessarily translate into practice. This supports the finding of Barloa et al. (2016) that though undergraduate students of Philippine State University had satisfactory knowledge (73.4%) on SWM, that did not necessarily lead to exemplary practice. In response to the waste problem a key informant wondered whether the indiscriminate dumping of waste is caused by laziness, carelessness or distance to dumpsites. This was what he said;

Look, there are people I do not know whether it is laziness or they just do not care or walking to the dumping site is their problem. They will hide and throw rubbish into the gutters and bushes nearby and go away. Those living close to some of the big gutters excuse me, I do not mean all of them, but some they do not even go out they will be in their yard and throw the waste over the wall into the gutter and that is all. They do not care what happens next. You go to 'Amalga' (a drinking spot) and see (**Assemblyman, 06/08/2022**).

Speaking on the issue of indiscriminate dumping of waste, a traditional leader attributed it to uncooperativeness on the part of some residents and a time factor. People have no time for waste matters in the morning either than to hurry to their farms. He stated that;

Some people are just not trying to co-operate. They consider going to the dumpsites as time wasting. So, they gather their waste and keep it when they are going to farm, they carry it along and, on the way, they hide and dump the rubbish at places that they are not supposed to throw rubbish (**A traditional leader, 04/08/2023**).

Knowledge about sorting out waste is very critical in waste management because it is the first point for waste reduction after production in the environment. Separating materials from the waste stream at the point of generation helps to identify usable and recyclable items to be recovered. The findings of this study show that while 46.6% (25.3% + 21.3%) disagreed, 50.8% (13.3% + 37.5%) agreed that waste ought to be sorted before disposing it (Table 2). The different stand points on waste sorting could be linked to the fact that most of the respondents; 217 or 56.5% (Figure 4) never had

any form of education on SWM contrary to the finding of Pecajas and Ramos (2016) that most respondents in

Secondary Schools of Leyte Division agreed on the sorting of waste before disposal. To further examine residents' knowledge, they were asked to explain their understanding of SWM. Majority of them explained SWM as dumping waste at the right places (41.4%), burning waste in a pit (22.4%), keeping the environment clean (11.5%), keeping waste away from drains and waterbodies (7.8%), properly storing waste in a dust bin (7.3%), dumping waste away from our surroundings (4.9%), and reducing waste at home (4.7%).

The qualitative data had, somehow, detailed explanation of SWM. In the first place, it involves not producing more waste; by using what we throw away for something else and what cannot be reused should be separated and given to waste pickers. Second, SWM is a process starting from waste generation point to the final disposal site. At generation point, waste should be stored in a covered dust bin and when full waste service providers should empty and cart it away but where that is not feasible, the producer of the waste should convey it to a dumping site. These explanations given by some officials from the Environmental Health and Sanitation Unit of the TSMA are stated below.

When we talk of solid waste management the first thing is not to produce more waste. We can do this by using some of the things we throw away again for something else. Look there are people in this town who buy the old things we throw away. Why can we select the things they buy and give to them so that we will throw away less at the dumpsite? If we are doing this waste will not be a big problem **(Officer 1 of Environmental Health and Sanitation Unit, 02/08/2023)**

When we talk of solid waste management it is a process all the way to final disposal site but because we don't have final disposal site let's leave that one out. As I was saying solid waste management starts from where the waste is produced it should be put in a proper dust bin with cover so that when it is full the zoom lion car will come for it or you send it to the dumping site because here, we don't have transfer station. So, because we don't have transfer station, the people will throw the rubbish at the dumpsites and it will scatter again and dirty the environment (**Officer 2 of the Environmental Health and Sanitation Unit, 02/08/2023**)

Solid waste management, I think the first thing to do is to sort the wastes once they are produced and store them separately. Then use the ones that you can use again for something else and those you cannot use again, dump them separately. When we do this, degradable waste can decompose easily and we will not have the heaps of waste we are seeing in our community. (**Officer 3 of the Environmental Health and Sanitation Unit, 02/08/2022**).

4.2.2 Sources of solid waste management education/information

To verify respondents' knowledge on SWM, they were asked to indicate whether or not they have had any form of education or information on SWM and if so, indicate the source of the education or information. Their responses are shown on figure 4

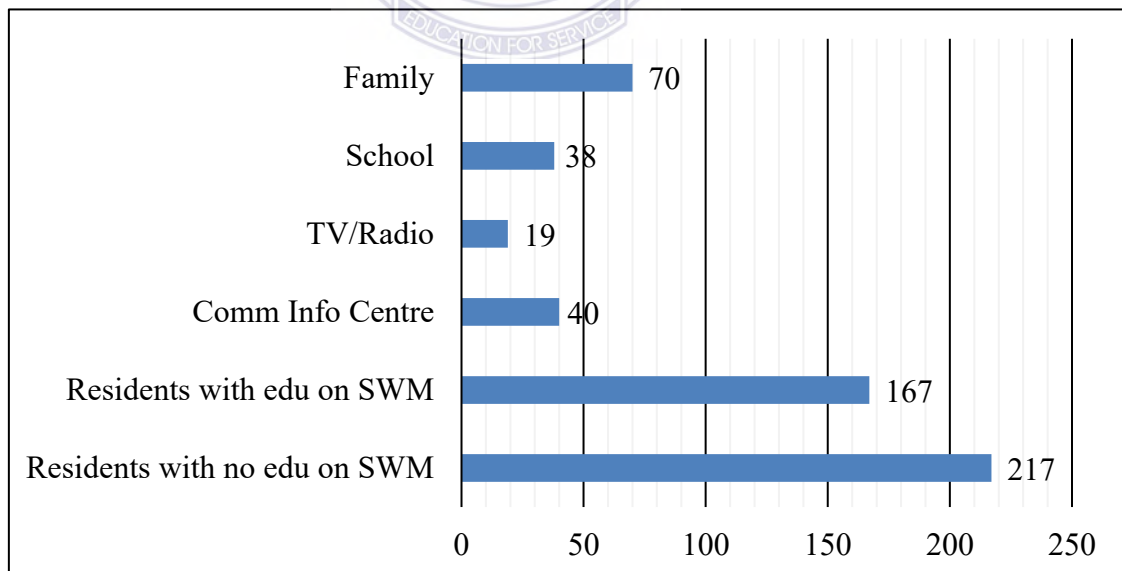


Figure 4: SWM education and sources

Source: Field Work; 2022

Public education on SWM at the community level is low, only 167(43.5%) of the respondents received some form of education on SWM but the majority, 217 representing 56.5%, never had any form of education or information on the matter (Figure 5). But Environmental Health Officer stressed that public education on SWM in the community has been going on. He stated this;

If you look at the reports you are holding, (referring to the researcher) you see we have been educating people in the schools, hospital, information centre, etc. So now like Presby (referring to the premises of the Presbyterian basic schools), formally they were dumping waste anywhere there but now through education we enforce the law and things have changed (**Officer 1 of the Environmental Health and Sanitation Unit, 02/08/2023**).

The incongruence in the two findings could mean two things; inconsistency in the education programme, and inability of residents to devote time for the programme. This situation makes residents passive actors in SWM as they have limited information and become unaware of SWM processes which affirmed the findings of Al-Khatib et al. (2019) that scanty information (91.8%) and poor awareness (93.9 %) on the process of waste separation and storage accounted for residents' non-participation in local waste recycling in Ramallah and Al-Bireh District (Palestine).

The few respondents who had education on SWM; family (70/41.9%), community information centre (40/24%), school (38/27.8%), and TV/Radio (19/6.3%) were their sources of the education or information somehow related to the finding of Adogu et al., (2015) and Aniemena et al., (2015). The results highlight the role of families in nurturing environmentally responsible citizens. This presupposes that if families are well educated and equipped with the necessary knowledge and skills, they will be an effective means of training the younger generation on SWM thereby changing their behaviour positively toward waste management. Hongtong et al. (2017) in their study found brochures (14.4%), community radio (19.8%), community media online

(11.3%), local newspaper (2.4), and community leader (42.6) as the sources of knowledge for respondents also in line with the results of Almasi et al., (2018) and Al-Khatib et al. (2019).

4.2.3 Background variables and knowledge of waste management

Cross-tabulation and Pearson Chi-square tests were used to establish whether or not there is correlation between residents' background information and their level of knowledge on SWM (waste separation). From Table 3, all background variables considered in this study tend to associate with knowledge of waste management. For gender, 184 (47.9%) out of 384 respondents who agreed waste had to be sorted before it is dumped, 106 (57.6%) are females. There was a significant association between gender and waste separation $\chi^2(4) = 31.50$, p-value $< .001 < .05$. This correlation was also observed between age and waste separation; $\chi^2(4) = 39.3$, p-value $< .001 < .05$. Also, most respondents (78.3%) above 30 years (31 – 60) affirmed the sorting of waste (Table 3).

112 or 50.9% out of 220 respondents who agreed that waste should be separated before disposal had tertiary education. A significant relationship between educational level and waste management knowledge (separation) was found; $\chi^2(4) = 36.02$, p-value $< .001 < .05$. Across ethnic groups, in this study, majority supported waste segregation before disposal with Asante constituting the greatest percentage (30.1%). The study found a statistically significant correlation between ethnicity and knowledge of waste management (separation) $\chi^2(16) = 172.07$, p-value $< .001 < .05$. Christians; 117, forms 65.6% of the respondents (184) who agreed that waste should be segregated before disposal. The relationship between religion and knowledge of

waste management (separation) was found to be significant $\chi^2(12) = 228.48$, p-value $< .001 < .05$ (Table 3).

Other studies equally found age, and educational level to be significantly associated with SWM (Hongtong et al., 2017). Al-Khatib et al. (2019) in their study observed that respondents aged 41 – 50 tend to be less careful about source separation of waste since their attention was not drawn to waste issues at childhood.

Table 3: Background variables of respondents and knowledge of SWM

Variable	Waste should be separated before it is disposed				Chi-square Tests
	SD/D (%)	N (%)	A/SA (%)	Total	
Sex					
Female	81 (44.3)	9(52.9)	106 (57.6)	196(51.0)	$\chi^2(4) = 31.50$, p-value =.000
Male	102 (55.7)	8(47.1)	78 (42.4)	188(49.0)	
Total	183 (47.7)	17(4.4)	184 (47.9)	384(100)	
Age					
Below 30 (18 – 30)	102 (55.7)	17(100.0)	144 (78.3)	263(68.5)	$\chi^2(4) = 39.3$, p-value =.000
Above 30 (31 – 60)	81 (44.3)	–	40 (21.7)	121(31.5)	
Total	183 (47.7)	17(4.4)	184 (47.9)	384(100.0)	
Education					
SHS/Its Equivalent	87 (59.2)	16 (94.1)	108 (49.1)	211(55.0)	$\chi^2(4) = 36.02$, p-value =.000
Tertiary	60 (40.8)	1 (5.9)	112 (50.9)	173(45.0)	
Total	147(38.3)	17 (4.4)	220 (57.3)	384(100.0)	
Ethnicity					
Asante	59 (41.8)	1 (5.9)	68 (30.1)	128(33.3)	$\chi^2(16) =$ 172.07, p-value =.000
Ahafo	22 (15.6)	–	63 (27.9)	85(22.1)	
Bono	35 (24.8)	3 (17.6)	12 (5.3)	50(13.0)	
Mole-Dagbani	20 (14.2)	9 (52.9)	62 (27.4)	91(23.7)	
Other tribes	5 (3.6)	4 (23.5)	21(9.3)	30(7.8)	
Total	141(36.7)	17 (4.4)	226 (58.9)	384(100)	
Religion					
Christianity	116 (63.3)	4 (23.5)	117 (63.6)	237(61.7)	$\chi^2(12) =$ 228.48, p-value=.000
Islam	51 (27.9)	3 (17.6)	42 (22.8)	96(25.0)	
Traditionalist	8 (4.4)	9 (52.9)	18 (9.8)	35(9.1)	
Other	8 (4.4)	1 (5.9)	7 (3.8)	16(4.2)	
Total	183 (47.7)	17 (4.4)	184 (47.9)	384(100)	

Source: Field Work; 2022

Note: **SD**: Strongly Disagree, **D**: Disagree (combined **SD/D**), **N**: Neutral, **A**: Agree, and **SA**: Strongly Agree (combined **A/SA**). Alpha (α) = .05

4.2.4 Perceived responsibility of solid waste management

To verify whether residents assign responsibility to themselves in managing waste, they were asked to indicate the one responsible for SWM at the community level.

Their responses are shown on Figure 5.

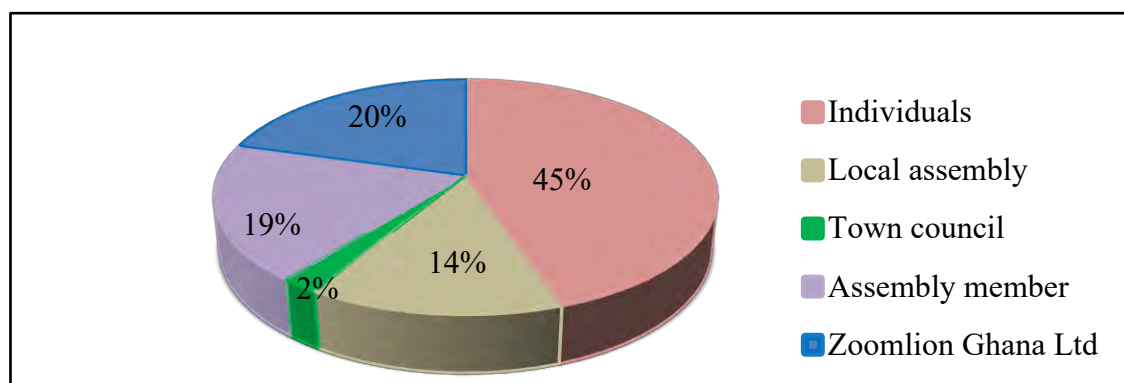


Figure 5: Perceived agent responsible for SWM.

Source: Field Work; 2022

In Ghana, it is common for citizens to point at local authorities, and Zoom lion as the actors in charge of waste management at the community level since they (the residents) pay tax to the government. But looking at figure 5, respondents have the right mind set towards waste management. Most respondents (45%) saw individual waste generators as being responsible for managing their own waste similar to the finding of Carpenter et al. (2016) that most respondents (90.3%) said they play an important role in SWM in their areas. The qualitative data, on the other hand, indicated that it is the duty of both the community and the municipal assembly to manage waste at the community level as indicated by an assembly member:

To effectively manage waste, households and the municipal assembly have roles to play. Just as the assembly cleans all public places, people also have to clean their surroundings, stop littering and dumping waste at inappropriate places, and together distil any chocked drains. As this goes on, the assembly should provide transfer points for the waste to be collected and sent to final disposal site which we do not have. I mean the community does not have any final disposal site (**An assemblyman, 06/08/2022**).

4.3 Environmental Values and Solid Waste Management

Attitudes toward SWM depend on the values held toward environmental cleanliness.

This section examines the values held by residents toward SWM.

4.3.1 Values held by residents toward solid waste management

There were eight statements covering littering, clean environment, waste as a resource, and individuals' contribution to the waste problem serving as the dependent variables. These variables were measured in relation to gender, age, education, religion, and ethnicity as the independent variables. The results are displayed on table 4.

Table 4: Values held by residents toward solid waste management

Value Statement	Responses N (%)				
	SD	D	N	SA	A
I feel the community is surrounded by filth.	5 (1.3)	59 (15.4)	2 (0.5)	97 (25.3)	221 (57.5)
I feel the streets should be clean and free of litter.	21 (5.5)	15 (3.9)	53 (13.8)	66 (17.2)	229 (59.6)
Clean environment promotes public and environmental health.	4 (1.0)	60 (15.6)	11 (2.9)	86 (22.4)	223 (58.1)
I feel bad when I dump refuse anywhere.	29 (7.5)	29 (7.6)	–	54 (14.1)	272 (70.8)
I feel bad when others throw refuse anywhere.	7 (1.8)	67 (17.4)	14 (3.7)	33 (8.6)	263 (68.5)
More waste production and disposal exhausts resources.	47 (12.2)	58 (15.1)	97 (25.3)	51 (13.3)	131 (34.1)
I deplete resources when I dispose more waste.	16 (4.2)	151 (39.3)	73 (19.0)	32 (8.3)	112 (29.2)
I contribute little to the waste problem.	41 (10.7)	126 (32.8)	89 (23.2)	23 (6.0)	105 (27.3)

Source: Field work 2022

Note: **SD**: strongly disagree, **D**: disagree, **N**: Neutral, **SA**: strongly agree, and **A**: agree. Value statements were self-constructed by researcher.

Looking at Table 4, most respondents (25.3%+57.5% = 82.8%) are concerned of their community being engulfed by filth, 76.8% (17.2%+59.6%) felt the streets should be cleared of litter. Most respondents (22.4% + 58.1% = 80.5%) believe that maintaining

clean environment promotes both public and environmental health. A participant, however, observed that the problem is not about the community being surrounded by filth but where to throw away refuse is actually the issue. They stated this:

Sometimes we go for communal labour to clean the place. People also clean their surroundings so if you come here, you will see that every place is clean but they will go and throw the refuse at the dumpsite, no car to convey it away. It keeps piling up creating trouble and the only thing we can do is to burn the dumps from time to time (**Officer 4 of the Environmental Health and Sanitation Unit, 04/08/2023**).

In the TPB (Figure 1), Ajzen (2002) explained control beliefs as beliefs about presence of factors that may promote or impede the execution of a behaviour. In the same vein, residents believe that the absence of trucks to cart waste out of the community is impeding their efforts to keep the community clean. Though they value environmental cleanliness, it is difficult for them to live by their values. In the contrary Lin et al. (2017), in their study into household waste management in Xiamen City (China), found that 15.3% of the respondents were very satisfied, 39.5% satisfied, and 34.7% generally satisfied with the waste management in the city. The satisfaction was mainly due to improved waste collection and transportation which is not the case in this study. Another study in Lahore (Pakistan) by Afzal et al. (2018) also revealed that most respondents valued proper waste disposal and felt their streets should be clean but were not playing any significant role in that regard. To address the waste challenge in this study, an environmental health officer pointed out that they introduced the use of dust bins to curb the indiscriminate dumping of waste and improve on the quality of the environment and there has been some improvement in its use. This was what they said:

For now, we are starting domestic dust bins. Last year we had almost 200 people using dust bins but currently we have about 300. The dust bin is increasing so there is improvement. Where we don't have crude dumping the people there are using dust bins. The dust bin is increasing so if they didn't agree and are throwing rubbish carelessly like Akobro road side there is water passing there and they are throwing rubbish there which is not fine. But currently we stopped that area because it is on the road side and is disgracing us **(Officer 1 of the Environmental Health and Sanitation Unit, 02/08/2023).**

It is also clear that personal norm; guilty feeling of doing what is socially unacceptable, is high ($14.1\% + 70.8\% = 84.9\%$) – I feel bad when I dump refuse anywhere, but declines to 77.1% ($8.6\% + 68.5\%$) when others throw refuse anywhere. An indication that social pressure (norm) is not as high as that of personal norm. In establishing respondents' value for waste as a resource, below half; 47.4% ($13.3\% + 34.1\%$) agreed that producing and disposing more waste exhausts resources but declines to 37.5% when considering the matter at individual level, "I deplete resources when I dispose more waste". 43.5% of the respondents did not see waste production and disposal as contributing to resource lost but 19% were not sure. The contradiction in these findings suggest that people believe the waste they produce, as individuals, is negligible to contribute to resource depletion hence, cannot see the usefulness of such waste as resource. Therefore, education is needed to create the awareness of people to realize the resource value of their waste so that they do not think of the dumpsite as the first point to send waste after production but consider alternative use for it. This is congruent with a study by Abdikadir et al. (2018) in which 77.3% of the respondents in Karan District (Somalia) said that waste cannot be a resource, and 59.3% of them said waste cannot be sorted and recycled; an indication that the respondents did not see any use for their waste. Again, 43.5% disagreed that their contribution to the waste problem is negligible.

4.3.2 Background variables and values on solid waste management

Generally, all background variables appear to correlate with values on SWM. From Table 5, females (54.9%) were more likely to feel guilty if they drop waste anywhere than males (45.1%). This is not surprising; it is a trait of a Ghanaian woman to keep her surroundings neat and clean. The study found an association between gender and values on waste management; $\chi^2(3) = 28.15$, $p\text{-value} < .001 < .05$. In terms of age, those above 30 years; 28.8% said it embarrassed them when they dump waste anyhow. In most cases these are people who attain tertiary education but quite shocking to note that majority of these respondents (71.2%) were those with secondary education. This is likely, when one considers the fact that in most secondary schools and households in Ghana, it is the young adults, particularly females, who do the cleaning and sweeping activities. So, the situation can be ascribed to difference in experience of people about waste. Correlation between age and values on SWM was observed; $\chi^2(3) = 16.66$, $p\text{-value} = .001 < .05$. Respondents below 30 years (71.2%), admitted they feel bad when they throw rubbish inappropriately. Education, which this study focuses on, was found to correlate significantly with values on waste management; $\chi^2(3) = 44.30$, $p\text{-value} < .001 < .05$. Respondents who attained secondary education, 60.7% feel bad anytime they throw away rubbish indiscriminately.

Among ethnic groups, the Mole-Dagbani (89/27.0%), and the Asante (87/26.3 %) were most likely to feel guilty for inappropriate waste disposal. The study found significant relationship between ethnicity and values on waste management; $\chi^2(12) = 102.67$, $p\text{-value} < .001 < .05$. Also, a large relationship existed between religion and values on waste management (I feel bad when I drop waste anywhere); $\chi^2(9) = 48.99$, $p\text{-value} < .001 < .05$. Across religious groups, Christians represent 205 or 62.9% of

the respondents (326) who feel heavyhearted for indecent waste disposal as portrayed by Table 5.

Table 5: Background variables of respondents and values on SWM

Variable	I feel bad when I drop waste anywhere			Chi-Square Tests
	SD/D (%)	A/SA (%)	Total (%)	
Sex				
Female	17(29.3)	179(54.9)	196(51.0)	$\chi^2 (3) = 28.15$, p-value = .000
Male	41(70.7)	147(45.1)	188(49.0)	
Total	58 (15.1)	326 (84.9)	384 (100.0)	
Age				
Below 30 (18 – 30)	31(53.4)	232(71.2)	263(68.5)	$\chi^2 (3) = 16.66$, p-value = .001
Above 30 (31 – 60)	27(46.6)	94(28.8)	121(31.5)	
Total	58(15.1)	326 (84.9)	384 (100.0)	
Education				
SHS/Its Equivalent	13(22.4)	198(60.7)	211(54.9)	$\chi^2 (3) = 44.30$, p-value = .000
Tertiary	45(77.6)	128(39.3)	173(45.1)	
Total	58(15.1)	326(84.9)	384(100.0)	
Ethnicity				
Asante	41(75.9)	87(26.3)	128(33.3)	$\chi^2 (12) = 102.67$, p-value = .000
Ahafo	2(3.7)	83(25.2)	85(22.1)	
Bono	7(13.0)	43(13.0)	50(13.0)	
Mole-Dagbani	2(3.7)	89(27.0)	91(23.7)	
Other tribes	2(3.7)	28(8.5)	30(7.8)	
Total	54(14.1)	330(85.9)	384(100.0)	
Religion				
Christianity	32(55.2)	205(62.9)	237(61.7)	$\chi^2 (9) = 48.99$, p-value = .000
Islam	14(24.1)	82(25.1)	96(25.0)	
Traditionalist	5(8.6)	30(9.2)	35(9.1)	
Other	7(12.1)	9(2.8)	16(4.2)	
Total	58(15.1)	326(84.9)	384(100.0)	

Source: Field Work; 2022

Note: Strongly disagree (SD), Disagree (D) (are added: SD/D); N: Neutral, and Agree (A), Strongly Agree (SA) (are added: A/SA). Alpha (α) = .05

4.4 Solid Waste Disposal Practices/Habits

This section sought to assess waste disposal practices by residents. Clean-up activities, waste separation, storage, disposal methods, and prevention of littering were considered.

4.4.1 Organization of communal clean-up activities by residents

Clean-up activity is one way of managing waste in a community. As such, respondents were asked to indicate the number of times clean-up activities are organized in the community within a year and their participation in them. Figure 6 displays the results.

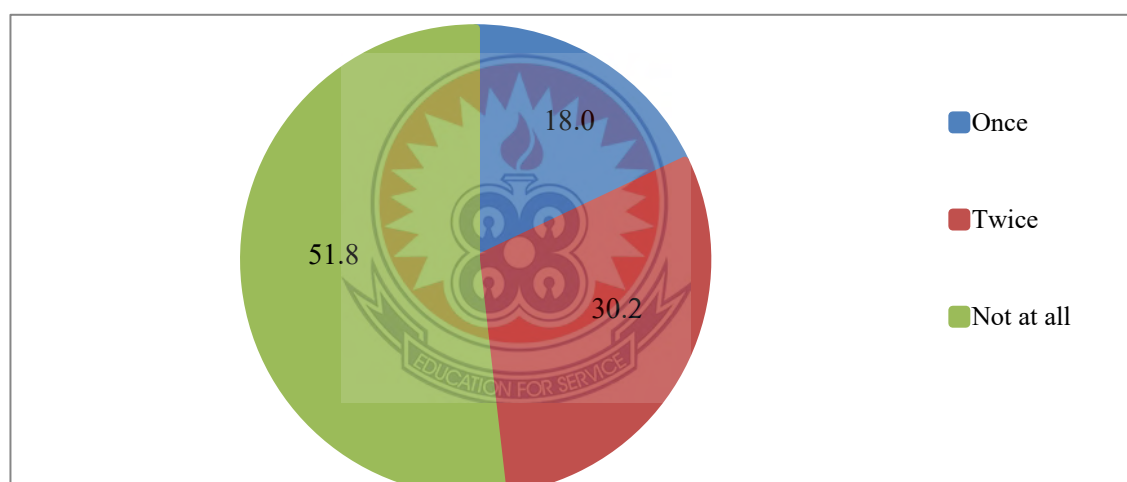


Figure 6: Frequency of communal clean-up activities

Source: Field Work; 2022

From figure 6, majority (51.8%) of the respondents indicated they do not organize clean-up activity at all but some key informants revealed that clean-up activities are organized but could not tell how often; this was what they said:

Sometimes we go for communal labour to clean the place. Individuals also clean their surroundings but they go and throw the refuse at the dumpsite. No truck to carry it away. So, because we do not have the facilities that is why waste is a problem (**Traditional leader, 04/08/2023**).

We do organize clean-up activities. Sometimes too some churches will organize their members to go and clean a place they consider to be dirty. If you see most of the chocked gutters that are distilled, it is through communal labour. When we organize and you cannot take part for whatever reason, you can give some amount for us to buy water for those who are doing the work (Assemblyman, 06/08/2023).

4.4.2. Participation in communal clean-up activities by residents

Taking part in clean-up activities fosters unity and collective duty of keeping clean environs. So, respondents were asked to specify if they participate in clean-up activities when they are organized. The results show that, of the 384 respondents, 109 (28.4%) said they participate in clean-up activities but 275 (71.6%) do not. Meanwhile, a similar study conducted by Aniemena et al. (2015) in Anambra State (Nigeria) showed that 93.3% of the respondents participated in monthly clean-up programme. From the TPB, residents turning out or agreeing to partake in communal clean-up activities will depend on their belief as to how easy or difficult the execution of the activities are likely to be. If they feel the activities will be inconveniencing to them or insignificant to solve the waste problem, their turn out will be low. And that could be the case in this study area. The data was further queried to verify if any correlation exists between background variables of respondents and their involvement in clean-up exercise (see table 6).

From Table 6, more males (44.7%) than females (12.8%) participate in communal clean-up activities. A significant relationship existed between gender and clean -up activities; $\chi^2 (1) = 48.11$, $p\text{-value} < .001 < .05$. Also, more respondents (34.7%) in the middle age 31 – 60 years than the youthful age 18 – 30 (25.5%) years take part in clean-up exercise. However, there was no significant correlation between age and joint clean-up exercise, $\chi^2 (1) = 3.48$, $p\text{-value} = .062 > .05$ but there was significant

relation between education and clean-up activities, $\chi^2(1) = 35.27$, p-value $< .001 < .05$. Respondents (28.9%) with secondary education participate in clean-up activities more than those with tertiary education. The Asante (28.9%) and Bono (60.0%) are the ethnic groups who participate more in clean-up exercise. There was a meaningful relationship between ethnicity and clean-up exercise; $\chi^2(4) = 32.73$, p-value $< .001 < .05$. Based on religion, the Christians (40.5%) and Moslems (8.3%) highly participate in clean-up exercise. Religion was found to associate with clean-up activities; $\chi^2(3) = 45.70$, p-value $< .001 < .05$.

Table 6: Background variables and participation in communal clean-up exercise

Variable	Do you take part in communal clean-up activities?			Chi-Square Tests
	Yes n (%)	No n (%)	Total n (%)	
Gender				$\chi^2(1) = 48.11$, p-value = .000
Female	25 (22.9)	171(62.2)	196(51.0)	
Male	84(77.1)	104(37.8)	188(49.0)	
Total	109(28.4)	275(71.6)	384(100.0)	
Age				$\chi^2(1) = 3.48$, p-value = .062
Below 30(18 – 30)	67(61.5)	196(71.3)	263(68.5)	
Above 30(31 – 60)	42(38.5)	79(28.7)	121(31.5)	
Total	109(28.4)	275(71.6)	384(100.0)	
Education				$\chi^2(1) = 35.27$, p-value = .000
SHS/Its Equivalent	86(78.9)	125(45.5)	211(54.9)	
Tertiary	23(21.1)	150(54.5)	173(45.1)	
Total	109(28.4)	275(71.6)	384(100.0)	
Ethnicity				$\chi^2(4) = 32.73$ p-value = .000
Asante	37(33.9)	91(33.0)	128(33.3)	
Ahafo	21(19.3)	64(23.3)	85(22.1)	
Bono	30(27.5)	20(7.3)	50(13.0)	
Mole-Dagbani	17(4.4)	74(26.9)	91(23.7)	
Other tribes	4(3.7)	26(9.5)	30(7.8)	
Total	109(28.4)	275(71.6)	384(100.0)	
Religion				$\chi^2(3) = 45.70$, p-value = .000
Christianity	96(88.1)	141(51.3)	237(61.7)	
Islam	8(7.3)	88(32.0)	96(25.0)	
Traditionalist	2(1.8)	33(12.0)	35(9.1)	
Other	3(2.8)	13(4.7)	16(4.2)	
Total	109(28.4)	275(71.6)	384(100.0)	

Source: Field Work; 2022 Alpha (α) = .05

4.4.3 Solid waste separation by residents

Solid waste segregation plays an important role in the choice of waste disposal method. Pondering on future SWM improvement, waste segregation/recycling method will be more complex if citizens have to throw different waste compositions at different times, in different sites or trash bins. As people become increasingly aware of the value of the environment and want to take part in environmental protection, the perceived difficulties with sorting and recycling various materials, as explained in the TPB (Figure1), may pose a formidable barrier to participation. Take composting as a case, it is a very vibrant way of disposing degradable waste in the Ghanaian context, and the study area in particular, due to the high content of organic waste in the waste stream but owing to the mixture of the waste, the method is hardly used. So, in assessing respondents' waste separation behaviour, it was found that only 7.3% (28) of the respondents do separate but 92.7% (356) do not sort their waste before disposal. The data was further explored to establish the relationship that exists between the background variables and waste separation and the results are displayed on Table 7.

More males (82.1%) than females (17.9%) said they separate their waste before disposing it and a significant association was found between gender and waste segregation; $\chi^2 (1) = 13.31$, p-value $< .001 < .05$. A relationship between age and waste separation was also observed; $\chi^2 (1) = 8.31$, p-value = $.004 < .05$. Those who separate their waste, 92.9% are below 30 (18 – 30 years). Most respondents (57.1%) with secondary education sort their waste before disposal. However, there was no substantial relationship between education and waste separation; $\chi^2 (1) = .06$, p-value = $.808 > .05$ (Table 7).

The findings above contradict that of Carpenter et al. (2016) as they established that 54.9% of respondents in Central Uganda reported carrying out some form of waste separation at the household level and 78.0% did separate biodegradable wastes, especially food peelings which were mainly collected as animal feed. A further 76.6% and 54.9% expressed willingness to partake in solid waste separation and composting initiatives respectively and that gender, age and educational level of the respondents did not have any influence on their willingness to participate in waste separation and composting. Lin et al. (2017) also discovered that 53.5% of respondents in Xiamen City reported they always separate recyclable waste from household waste, 37.9% do so occasionally and 8.6% never separated recyclables. 83.5% of them were willing to take part in waste separation programmes proposed by the government.

Among ethnic groups in this study, the Asante (60.7%) and Mole-Dagbani (32.1%) said they sort their waste before disposing it. Ethnicity and waste separation were found to be correlated; $\chi^2 (4) = 18.34$, $p\text{-value} = .001 < .05$. Across religious denominations, majority of the waste segregators (78.6%) are Christians. On the whole, religion and waste sorting were found to be significantly related, $\chi^2 (3) = 23.54$, $p\text{-value} < .001 < .05$ (Table 7).

As stated earlier, it has been argued by a participant that education on waste management has been going on in the community but the low participation in communal clean-up exercise and waste separation as explained before, equally suggests that the education has either been inconsistent or does not necessarily equip residents with the needed knowledge and skills on SWM. So, for residents to move away from mixed waste dumping to waste separation, the message communicated to

them should be easier for them to act on it. The education should direct people on how exactly to separate waste and what to do with segregated waste.

Table 7: Background variables and waste separation

Variable	Do you sort your waste before disposing it			Chi-Square Tests
	Yes (n/%)	No (n/%)	Total (n/%)	
Sex				
Female	5(17.9)	191(53.7)	196(51.0)	$\chi^2(1) = 13.31$, p-value = .000
Male	23(82.1)	165(46.3)	188(49.0)	
Total	28(7.3)	356(92.7)	384(100.0)	
Age				
Below 30 (18 – 30)	26(92.9)	237(66.6)	263(68.5)	$\chi^2(1) = 8.31$, p-value = .004
Above 30 (31 – 60)	2(7.1)	119(33.4)	121(31.5)	
Total	28(7.3)	356(92.7)	384(100.0)	
Education				
SHS/Its Equivalent	16(57.1)	195(54.8)	211(54.9)	$\chi^2(1) = .06$, p-value = .808
Tertiary	12(42.9)	161(45.2)	173(45.1)	
Total	28(7.3)	356(92.7)	384(100.0)	
Ethnicity				
Asante	17(60.7)	111(31.2)	128(33.3)	$\chi^2(4) = 18.34$, p-value = .001
Ahafo	–	85(23.9)	85(22.1)	
Bono	–	50(14.0)	50(13.0)	
Mole-Dagbani	9(32.1)	82(23.0)	91(23.7)	
Other tribes	2(7.1)	28(7.8)	30(7.8)	
Total	28(7.3)	356(92.7)	384(100.0)	
Religion				
Christianity	22(78.6)	215(60.4)	237(61.7)	$\chi^2(3) = 23.54$, p-value = .000
Islam	–	96(27.0)	96(25.0)	
African Traditionalist	1(3.6)	34(9.6)	35(9.1)	
Other	5(17.8)	11(3.0)	16(4.2)	
Total	28(7.3)	356(92.7)	384(100.0)	

Source: Field Work; 2022

4.4.4 Solid Waste Storage Methods Used by Residents

Figure 7 below shows how waste is stored by residents before disposal.

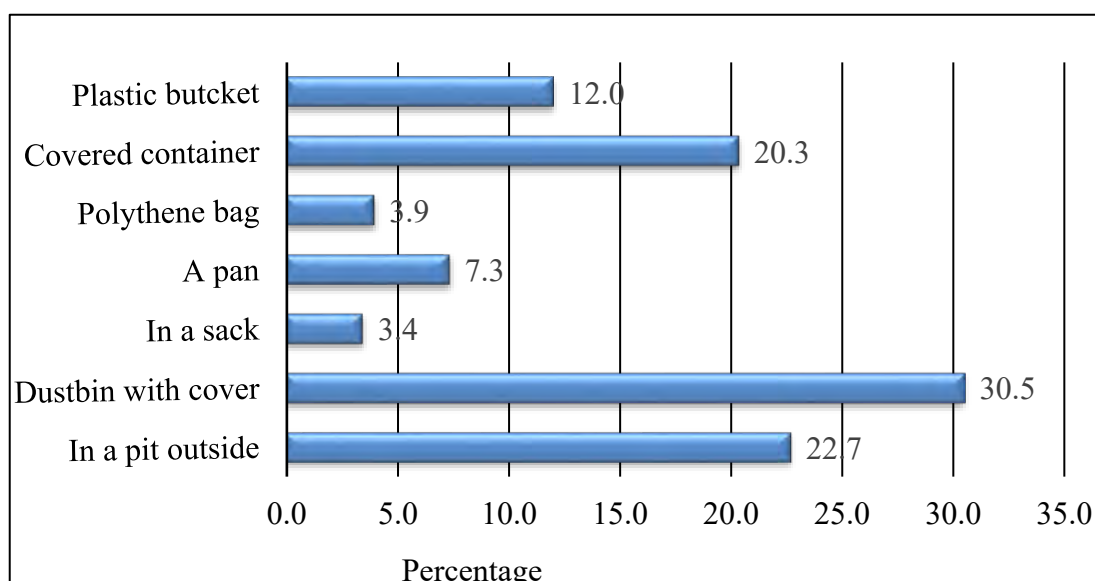


Figure 7: Waste storage options by residents

Source: Field Work; 2022

30.5% or 117 of the 384 respondents (figure 7), store their waste in dust bins with covers while 3.4% representing 13 respondents store their waste in sacks. This signifies that the use of standard waste bins in storing waste is very low and something has to be done about it. As such one environmental health officer explained that they will continue to educate and encourage residents to use standard waste bins but expressed worry about delay collection by Zoomlion Company. They had this to say:

We still encourage domestic dust bins. We are seriously educating people if everyone or every house in Techimantia gets a dust bin, when we get more than 300 or 400 this year, next year we will be talking of 1000's. Our problem is, sometimes these people (Zoomlion) delay us. Due to disappointment, they usually say their car is faulty ((**Officer 1 of the Environmental Health and Sanitation Unit, 02/08/2023**)).

Another participant speaking on the issue confirmed that about 300 households store their waste in standard dust bins but the rest use any container they deem appropriate as they said:

This whole town we have about 300 houses using standard or proper dust bins to store their waste. The rest are using either old pan, bucket, plastic container, etc. to store their waste and from there straight to the dumpsite. Others too sometime will hide and throw their rubbish at the wrong places (**Officer 5 of the Environmental Health and Sanitation Unit, 04/08/2023**).

4.4.5 Methods of waste disposal by residents

Research shows that the commonest methods of waste disposal in most developing countries include open dumping and burning (crude dumping), burying in a pit, animal feeding, throwing into bush or waterways, and in few cases composting (UNEP, 2015). Carpenter et al. (2016) in their study in Central Uganda, for example, revealed that respondents burn their plastic waste in open pits (27%), others drop it at dumping site (25.3%), some give it to private waste collectors for a fee (22%), and some are carried away by the municipal trucks (17%). Majority of the households (74.7%) reported reuse of wastes. Abdikadir et al. (2018) on their part reported that 34% of the respondents bury their garbage somewhere near the house, 31.3% burn it, 28% dump it outside their houses, and 6.7 % throw it at the community dumpsite. Afzal et al. (2018) also report of 42.0% open dumping, and 24.0% open burning as the methods of waste disposal in Lahore (Pakistan). These findings are in consonant with the findings of the current study; the waste disposal methods used by residents of Techimantia include burning (75%), dumping at the dumpsite (12%), throwing into the bush (8%), throwing into gutters (4%), and burying in a pit (1%). The qualitative data also revealed that the prevalent method of waste disposal in the community is crude dumping (see Figure 8). This method involves the dumping and burning of waste in the open without any environmental control measures put in place as

explained by an officer in the Environmental Health and Sanitation Unit of the TSMA. They outlined some of the methods used to dispose waste in the community as follows:

Those who are at the outskirts and are not close to the dumpsites, we educate them and they will dig a hole and be throwing the rubbish in so that when it dries, then they burn it. Some people where they stay is far away for the car to go there is a problem and if you ask them to bring their waste to the roadside they will not do. But we don't also allow them to throw the rubbish anywhere. They too they burn. So, the whole of Techimantia is crude dumping that we are using **(Officer 1 of the Environmental Health and Sanitation Unit, 02/08/2023)**.

Some people too will burn their waste near their houses and that one we can't do anything about it because the whole town that is what we do. The refuse dumps we burn them from time to time and fire can be there for weeks producing smoke **(Officer 1 of the Environmental Health and Sanitation Unit, 02/08/2023)**.

All these point to the fact that no proper mechanism is put in place for effective waste collection and disposal. So, the residents are left on their own fate to manage their waste. This, therefore, paves way for irresponsible residents to engage in littering.



Figure 8: Crude dumping of waste; Techimantia

Source: Field Work; 2022

4.4.6 Ways of preventing littering in Techimantia

In order to curb littering and indiscriminate dumping of waste, respondents were asked to suggest what should be done. The responses are presented on figure 9.

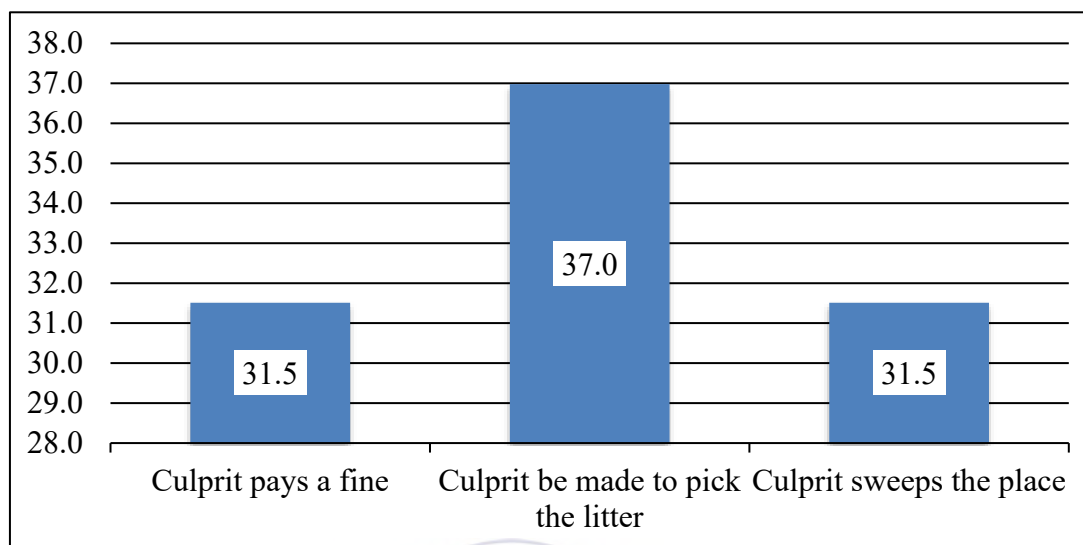


Figure 9: Ways of preventing littering

Source: Field Work; 2022

Figure 9 shows that most respondents (37.0%) specified that a person who litters or indiscriminately dumps refuse should be made to pick up the litter so as to deter others from engaging in same acts. But the bone of contention is how to fetch out the culprit and enforce the regulation as an assembly member lamented on how difficult it is to enforce the law anytime someone is caught due to family interference by the victim. This was what they said;

For some people whatever you do they will still hide and dump waste carelessly. Some even defecate in the open and when they are caught and arrested, their relatives will go with high personalities like pastors or their church elders to the police station to plead for the release of the victim. This behaviour does not discourage others from engaging themselves in the same acts but I think we will start ignoring such pleads (**Assemblyman, 06/08/2023**).

4.5 Impacts of Waste Management Infrastructure on Waste Behaviour

Ajzen (2002) explained controlled beliefs as beliefs about the presence of factors that may stimulate or hinder the performance of a behaviour. The stimulating or hindering factors will give rise to perceived ease or difficulty in taking action. Respondents' waste management behaviour was probed into in relation to the necessary facilities that were available promoting positive waste management behaviour and those that were not there hence, inhibiting pro-environmental behaviour. With regards to standard waste bins to store waste at homes, only 152 (39.6%) of the 384 respondents said they have waste bins at home but 232 (60.4%) said they do not have but a key informant asserted that some residents have the bins but for some reasons they decide not to use them particularly those who operate small eateries. This was what they stated:

Many people have taken the waste bins from Zoomlion Company but because of disappointment they decide not to use them again. Those who decide they will not use it (dust bin) again, they turn over the dust bin or lay it on the ground (Figure 11). So, if you are going round and you see a dust bin that way it means they have terminated the contract or agreement with Zoomlion. The reason why some people say they will not use it especially the food sellers, they say the whole week the bin can be full and the tract will not come for it. So, they want the collection to be every 2 or 3 days in a week and Zoom lion people are also saying it is costly. But if anybody wants, 2 or 3 bins can be given and the price will be increased small. For example, instead of the Gh¢ 30.00, it can be Gh¢ 50.00 and people do not want to accept that (**Officer 4 of the Environmental Health and Sanitation Unit, 04/08/2023**).



Figure 10: Over turned waste bins

Source: Field Work; 2022

Clearly, Zoomlion Waste Management Company woefully studied the waste generation pattern in the community before engaging residents and that might have contributed to the contention between the company and residents as to the frequency of waste collection. If this situation is not aptly handled it has the tendency to discourage other residents from getting enrolled onto the programme as already observed by a key informant that the programme is like a market, while others are existing, others are also entering. This was they said;

The domestic dust bin programme is like a market, while others are joining, others are also existing. Some people want to use the dust bins but they consider the cost to be too much for them. So, they use it for few months and will not want to pay again. Others too when the bin is full and it is not collected on time and they have to go and empty it by themselves, they get disappointed and decide to opt out of the programme. So, when the bin is there for some time and they are not paying, Zoomlion Company will also come for their bin and that is all (**Officer 5 of the Environmental Health and Sanitation Unit, 04/08/2023**).

It is expected that as the TSMA has recruited people to be cleaning the streets and other public places, waste bins would have been placed at vantage points for pedestrians to drop their waste to ease the burden of the sweepers. However, the findings of this study showed that of the 384 respondents, 351 (91.6%) said there are no bins on the streets only 33 (8.6%) said there are bins. Again, 74.2% (285) of the respondents indicated that they do not have dumpsters for them to throw their waste into. But this response might be due to misunderstanding of the communal bins since there is actually not one as stated earlier. Also, most respondents; 64.1% (246) affirmed that open dumpsites (Figure 9) are available for them to dump their waste but 35.9% (138) disaffirmed. These respondents could be those staying on the outskirts of the town away from the dumpsites. Afzal et al. (2018) in their study showed that most of the respondents (58.0%) were not using bins for waste collection except 41.0% of them.

The inadequacy of or limited facilities have been found to be a major militating factor against the involvement of people in many pro-environmental behaviours such as waste reduction, recycling, sorting, and composting. Agyeman et al. (2015), for example, in their study into the attitudes and perceptions of residents toward SWM in Berekum Municipality, Ghana established that 52.7% and 44% of the respondents identified inadequate waste bins, and long distances to dumping sites as the causes of the waste problem while 2% blamed it on the absence of dumping sites similar to the finding of Sarpong-Anane (2015). Among other factors, inaccessibility to recycling station, and inadequate space were reasons for which the women of Kermanshah (Iran) were not recycling (Almasi et al., 2018). Al-Khatib et al. (2019) also identified limited available facilities in the municipality or nearby (76.6%) and limited capacity of existing facilities (75%) among other reasons accounting for the non- recycling

behaviour of the people of Palestine. It is clear that infrastructure plays a major role in promoting sound waste management behaviour.

Table 8: Facilities needed to ensure effective solid waste management

Needed Facility	No of Respondents	Percentage
Waste bins	201	52.3
Dumpsters	63	16.4
Waste collectors	43	11.2
Trucks	58	15.1
Landfill site	19	4.9
Total	384	100

Source: Field Work, 2022.

Note: Waste collectors are not facilities but are considered as needed for effective SWM.

From Table 8, most respondents (52.3%) mentioned waste bins as a major facility needed for effective waste management. This is quite surprising as people take the waste bins but are not able to pay for the collection services resulting in the bins being taken back by the service provider. The second facility that is of priority to majority of the respondents (16.4%) is dumpsters. This is in line with the demand of an assembly member as they stated:

The assembly too should give us transfer station. If they give us transfer station, the big, big containers (dumpsters) so that if they dump and is full, we take it away (**Assemblyman, 06/08/2023**).

In Techimantia we don't have transfer station and final disposal site. We almost have seven open dumping sites except the Akobro road one we don't allow people to dump there. So, if dumpsters are provided, that will help reduce the crude dumping of waste (**Assemblyman, 06/08/2023**).

It is clear that respondents consider waste collection as a key factor to effective SWM. As such, most of them identified waste collection facilities as the needed facilities for SWM. To ascertain respondents' opinion on the waste management situation in the community, they were asked to provide any further information they deemed necessary for effective waste management and their responses are shown on Table 8.

It was earlier found that 217 respondents, representing 56.5%, never had education on SWM before (Figure 5). It is not surprising then that 24.5% of the respondents suggested the local assembly should embark on sanitation programmes, and 20.8% of the respondents saw recycling as the panacea to the waste problem (Table 9).

Table 9: Respondents' suggestions on effective waste management

Suggestion	No of Respondents	Percentage
Embark on sanitation programmes	94	24.5
SWM should be taught in schools	77	20.1
Waste should be recycled	80	20.8
SWM is proper for development	36	9.4
Engage in communal clean-up activities	26	6.8
Provision of dust bins at public places	42	10.9
Employ more well-remunerated waste collectors	20	5.2
Missing value/system	9	2.3
Total	384	100

Source: Field Work, 2022.

4.6 Chapter summary

Having evaluated the results of the study, a significant majority (82.3%) of the respondents saw solid waste as a major problem in the community. 83.9% of them indicated that poorly disposed waste can pollute the environment, clog drains, cause floods and spread diseases. More than half of the respondents (56.5%) said they never had any education on SWM before which is in contrast to the qualitative data that shows that education on SWM has been going on in the community. All background variables considered in this study were found to correlate with values on SWM but 71.6% of the respondents do not take part in communal clean-up activities. Most people (60.4%) do not have standard waste bins to store waste at home, neither are there dumpsters (74.2%) in the community for them to dump their waste. So, 75% of respondents resort to burning to dispose of their waste.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMENDATIONS

5.0 Introduction

The chapter presents a summary of the study showing conclusions drawn from the study, and recommendations for policy development and further study. It highlights issues that were discovered during the study with regards to the knowledge, attitude and behaviour of residents toward solid waste management

5.1 Summary of Findings

Worldwide, environmental quality is threatened by increasing solid waste problems. According to Milea (2009) human values and behaviour contribute to the waste problems and their solutions as well. Therefore, the study sought to explore the knowledge, attitude and behaviour of residents of Techimantia regarding SWM to understand how planned behaviour plays out in order to identify the missing variables in Ghana's situation for creating the desired change to ensuring proper SWM. Specifically, the study set out to achieve the following objectives; to:

- determine residents' level of knowledge on SWM.
- examine the values held by residents towards SWM.
- assess the solid waste disposal habits of residents.
- investigate the impacts of infrastructure on SWM behaviour.

The study reviewed literature on the concept of waste, trends in solid waste management (SWM), citizens engagement in, and impacts of SWM. Knowledge, attitudes, and behaviour toward SWM, impacts of infrastructure on SWM behaviour, and the Theory of Planned Behaviour (TPB) used in the study. The study was guided by the pragmatism philosophy and mixed methods research design. Based on these,

concurrent triangulation approach was adopted. Both probability (systematic sampling) and non-probability (purposeful sampling) techniques were used to select respondents and participants. Interview schedule and semi-structured interview guide were used to collect the data which were analysed according to the research objectives. The quantitative data was analysed using descriptive statistics on SPSS while the qualitative data was manually coded into themes and trends identified to compare with the quantitative analysis.

The following were the major findings that emanated from the study.

- Respondents had adequate knowledge on the waste situation in their community (state of the environment, causes and negative effects of indiscriminate waste disposal). Respondents had adequate knowledge on waste reduction strategy but poor attitude toward waste reduction. 91.4% of them agreed that shopping with a durable bag and buying less packaged goods reduces waste production but only 29.4% of them consider the waste they produce while shopping.
- Respondents had high values for environmental cleanliness; 84.9% of them feel bad when they dump refuse anywhere.
- Communal clean-up activities were inconsistently organized; once or twice a year, and were poorly patronized (only 24.8% of the respondents said they take part). Only 30.5% of 384 respondents store their waste in dust bins with covers.
- There was no proper engagement between Zoomlion Waste Management Company and residents on the terms of waste collection services provision.
- Waste bins, dumpsters, and sanitation programmes were identified as needed to sustain proper waste management habits.

5.2 Conclusions

The problem of SWM in Techimantia is least to be desired. The knowledge, attitudes and behaviour of residents are critical issues that cannot be over looked when it comes to finding solutions to the waste problem. The study, therefore, examined the knowledge, values, and behaviour of residents in relation to solid waste management. It also assessed the impact of infrastructure on waste behaviour.

The study has established that, though, residents have adequate knowledge on the state of their environment – solid waste is a major environmental problem (82.3%), understand the implications of indiscriminate waste disposal, have adequate knowledge on waste reduction strategy – shopping with a durable bag and buying less packaged goods reduces waste production (91.4%) and have high values for environmental cleanliness (I feel bad when I dump waste anywhere (82.8%), these do not necessarily translate into proper waste disposal practices. There is a gap between their knowledge, values (attitudes) and waste management behaviour – a gap which this study has tackled.

Also, there has been inconsistent public education of the community on SWM and sanitation in general, sporadic organization of communal clean-up activities with poor patronage, and very inadequate waste bins in most homes and public places for waste collection and proper disposal. This has resulted in open dumping and burning of waste in the community.

5.3 Recommendations

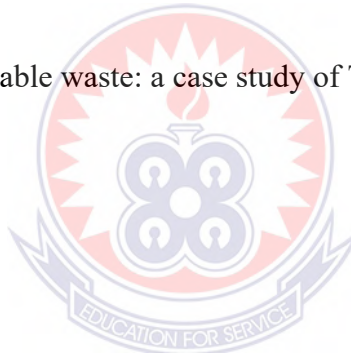
Based on the findings, it is recommended that:

- ❖ The TSMA should, through their officers at the community, identify environmental advocates among residents and educate, train and equip them with basic knowledge and skills on waste separation and composting. The advocates should be provided with waste bins, wheel barrows, shovels and protective clothes to implement what they have learned.
- ❖ The municipal assembly should form environmental monitoring team and an award scheme. The team's duty is to monitor the progress of work by the advocates – the compost they have produced, what they have used it for and the number of people they have also trained. Based on this, those deserving awards and retraining are identified and appropriately rewarded.
- ❖ The TSMA should also encourage school heads to form environmental clubs in their respective schools. The trained advocates now move round the schools to educate and train members of the clubs. The monitoring team also moves round the schools to monitor progress of work and select stelling schools for awards.
- ❖ The TSMA in collaboration with traditional leaders, as a matter of urgency, provide space in the newly developing areas for waste dumping. If this is done, the assembly should also provide dumpsters for the waste to be dropped in for collection and proper disposal.

5.4 Suggestions for Further Study

People interested in environmental and waste management related studies; the following areas can be considered for further investigation.

- ✓ The topic should be repeated but extended to cover all stake holders involved in waste management in the municipality – solid waste management: knowledge, attitudes and behaviour of stake holders in Tano South Municipal, Ahafo Region.
- ✓ Practical research; a case study can be conducted in the community but focused on two to three farmers who are willing to undertake composting – using farming to manage degradable waste: a case study of Techimantia in Ahafo Region.



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APPENDICES

APPENDIX I

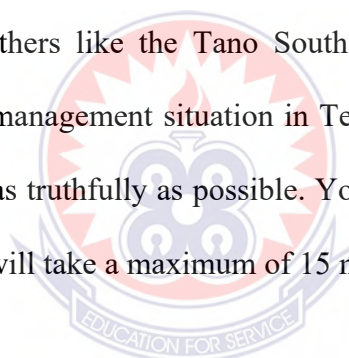
A Structured Questionnaire for Residents of Techimantia

UNIVERSITY OF EDUCATION, WINNEBA

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF GEOGRAPHY EDUCATION

This is academic research. Thank you for taking part in this important study to find out how solid waste is handled by the residents of Techimantia. The researcher will be gaining your thoughts and perspectives in order to better understand how the researcher along with others like the Tano South Municipal Assembly can better support the solid waste management situation in Techimantia. Please, be encouraged to answer the questions as truthfully as possible. Your responses will be held in strict confidence. The survey will take a maximum of 15 minutes to complete. Thank you.



Section A: Demographic data

1. Sex:

{1} Female []

{2} Male..... []

2. Age/ years:

{1} 18 – 25..... []

{2} 26 – 30..... []

{3} 31 – 40..... []

{4} 41 and above..... []

3. Educational level:

{1} SHS..... []

{2} Tertiary..... []

4. Religious denomination:

{1} Christianity..... []

{2} Islam..... []

{3} African traditional religion []

{4} Other..... []

5. Please, indicate your ethnic group.....

Section B: Knowledge of Residents on Waste Management.

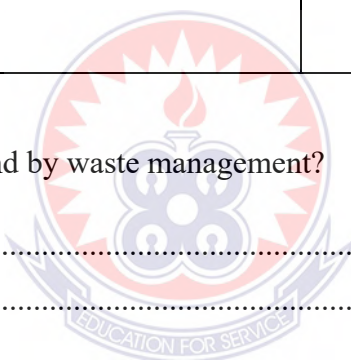
6. Please circle the number which indicates your level of agreement with each of the statements under knowledge items.

Knowledge items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Solid waste is a major problem in this town	1	2	3	4	5
Wastes are dumped into gutters, bushes, open land, etc. in this town.	1	2	3	4	5
Poorly disposed waste can pollute the environment, clog drains, cause floods, and spread diseases.	1	2	3	4	5
Indiscriminate waste disposal can clog drains, cause flood, spread diseases, etc.	1	2	3	4	5

Buying items with less packaging can reduce the amount of waste to be disposed of.	1	2	3	4	5
Shopping with a durable bag, and buying less packaged items reduces waste production.	1	2	3	4	5
I do not consider the waste I produce when shopping.	1	2	3	4	5
Waste must be separated before disposing it	1	2	3	4	5
Dumping waste into drains is better than open burning.	1	2	3	4	5
Reduce, reuse, and recycle are the best in managing waste.	1	2	3	4	5

7. What do you understand by waste management?

.....



8. Have you had any education on waste management before?

1. Yes..... []

2. No..... []

9. If yes, what are the sources of education/ information?.

.....

10. Who is responsible for managing waste at the community level?

.....

Section C: Values on Waste Management

11. Please circle the number which indicates your level of agreement with each of the value statement.

Value statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I feel the community is surrounded by filth.	1	2	3	4	5
I feel the streets should be clean and free of litter.	1	2	3	4	5
Clean environment promotes good health and healthy environment.	1	2	3	4	5
I feel bad when I dump refuse anywhere.	1	2	3	4	5
I feel bad when others throw refuse anywhere.	1	2	3	4	5
More waste production and disposal exhaust resources.	1	2	3	4	5
I jointly cause resource depletion by generating and disposing more waste.	1	2	3	4	5
I contribute little to the waste problem.	1	2	3	4	5

Section D: Residents' Waste Disposal Habits.

12. How do you store your waste at home before disposal

.....

13. How do you normally dispose of the waste you generate?

.....

14. Do you sort your waste before disposing them of?

{1} Yes..... []

{2} No..... []

15. How often do you undertake communal clean- up activities within a year?

- {1} Once..... []
- {2} Twice..... []
- {3} Thrice.....[]
- {4} Everyday..... []
- {5} Not at all..... []
- {6} Other, please specify

16. Do you take part in the clean-up activities?

- {1} Yes..... []
- {2} No..... []

17. What can be done to prevent littering and indiscriminate dumping of refuse in the community? The culprit should be made to;

- {1} Pay a fine..... []
- {2} Pick it up..... []
- {3} Sweep the place.... []

18. Do you have any information to add concerning waste management in the community.....

Section E: Impact of Infrastructure on Waste Management Behaviour

19. Do you have dust bins with covers in your house to store waste?

- 1.Yes..... []
- 2.No..... []

20. Are there dust bins with covers on the streets for people passing by to dump their waste?

- 1. Yes..... []
- 2. No..... []

21. Do you have communal bins or dumpsters for you to dump your waste for collection?

- 1. Yes..... []
- 2. No..... []

22. Open dumpsites are available for you to dump your waste.

1. Yes..... []

2. No..... []

23. What are the facilities needed to ensure efficient waste collection and disposal.....

.....

.....



APPENDIX II

Interview Guide

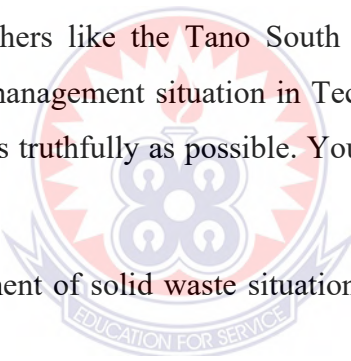
UNIVERSITY OF EDUCATION, WINNEBA

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF GEOGRAPHY EDUCATION

INTERVIEW GUIDE FOR OFFICIALS OF THE ENVIRONMENTAL PROTECTION AND SANITATION UNIT OF THE TANO SOUTH MUNICIPAL ASSEMBLY, ASSEMBLY MEMBERS, AND TRADITIONAL LEADERS.

This is academic research. Thank you for taking part in this important study to find out how solid waste is handled by the residents of Techimantia. The researcher will be gaining your thoughts and perspectives in order to better understand how the researcher along with others like the Tano South Municipal Assembly can better support the solid waste management situation in Techimantia. Please, be encouraged to answer the questions as truthfully as possible. Your responses will be held in strict confidence. Thank you.

- 
- A. What is your assessment of solid waste situation and sanitation in general in the town?
- B. Do you think the residents understand the implication of indiscriminate disposal of waste? In which ways?
- C. What do you do to create the awareness of residents about indiscriminate disposal of waste particularly the dumping of waste into drains and other watercourses?
- D. Generally, how is waste disposed of by individuals and the community as a whole?
- E. In which ways do the attitudes and behaviour of residents contribute to the waste management problems in the community?
- F. How does the municipal assembly engage residents in managing waste?
- G. What do you think can be done to ensure efficient waste management?

Thank you.