**GHANA INSTITUTE OF JOURNALISM**

**(SCHOOL OF GRADUATE STUDIES AND RESEARCH)**

# PUBLIC AWARENESS ON RECYCLING OF SOLID WASTE MATERIALS: STAKEHOLDERS PERSPECTIVE IN THE GREATER ACCRA REGION

**BY**

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**OCTOBER, 2020**

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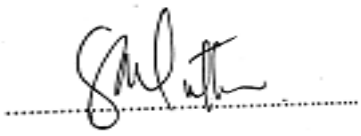

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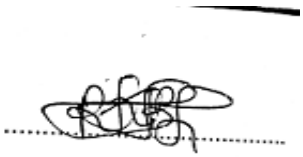

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## ACKNOWLEDGEMET AND DEDICATION

I express appreciation to my supervisor, Dr. Richard Boateng for his support in putting this dissertation together. It has been a journey and his coaching kept me through. Also, my sincere thanks go to the companies that offered me space to get information for research. Thank you for making time to share information about your companies and for the patience in gathering all the data I needed for the study. Again, thanks to everyone who contributed one way or the other to its success.

Particularly, I would also like to thank my parents who have been a great support to me all through my education journey. Many thanks for all their thoughts and prayers. Special mention and appreciation are made to all my siblings - brothers and sisters, for their immense contributions and support that saw me through this course successfully. I dedicate this dissertation to my immediate family. Last but not the least; I give God all the glory for His grace and help all through the journey.

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## ABSTRACT

Solid waste management is one issue all countries of the world grapple with. But for African countries, the problem is pronounced because of inadequate resources and technological constraints and Ghana's case is no different. Recycling has been noted to be one of the best ways in dealing with waste issues. It is considered as the most important component of a waste management system both in the developed and developing countries. Consequently, recycling is more acceptable than all other forms of waste disposal because it attracts cleaner and sorted wastes. A qualitative study was done to assess the level of public awareness on solid waste materials from the perspective of stakeholders in the Greater Accra Region. The study revealed that though public awareness was satisfactory, a lot more education and sensitization have to be done by government and stakeholders to translate knowledge into concrete attitudes and behaviours that foster participation in the form of waste separation for the sector to deliver the necessary impact on waste management drives in the country, Ghana. The sector which has great potential to create jobs and bring economic prosperity needs more financial support and also a relevant policy that encourages waste separation, to help the sector grow and become more sustainable.

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# CHAPTER ONE

## BACKGROUND TO THE STUDY

### 1.0 INTRODUCTION

Waste disposal is a major challenge that affects lots of countries in the world. Human activities have always produced waste and disposed waste in ways that invariably impact the environment. Mainly, it is the way these wastes are handled, stored, collected, and disposed of that pose risk to the environment and public health. Sadly, waste is burned in pits, dumped in random locations, or disposed of in uncontrolled dumps without any further management. As many cities have no controlled system for waste disposal. Particularly, controlled waste disposal can help improve and protect the health of local populations and preserve valuable environmental resources, such as groundwater and drinking water (The United States Environmental Protection Agency, 2002).

Hwa (2007) points out that solid-waste management is a major challenge in urban areas throughout the world. Without an effective and efficient solid-waste management program, the waste generated from various human activities, both industrial and domestic, can result in health hazards and have a negative impact on the environment. In many cities, almost more than half of the solid waste generated remains unattended (Jha, 2001). This gives rise to insanitary conditions especially in densely populated areas, which in turn may have serious health and environmental consequences.

Solid waste management refers to source separation, storage, collection, transportation, and final disposal of waste in an environmentally sustainable manner. Municipal solid wastes include

waste from the household, non-hazardous solid waste from the commercial and institutional establishment, and non-process industrial wastes (Tchobanoglous, 2009). The World Bank has reported that there will be a 70 percent increase in urban solid waste globally with a projected rise in the amount of waste, from 1.3 to 2.2 billion tonnes per year from 2012 to 2025, which will lead to a rise in the annual global costs of global waste from $205 billion to $375 billion (Kyere et al., 2019).

In developing countries, the approach to managing waste has mainly focused on the disposal of the trash, with very little or no attention paid to waste minimization or recovery efforts (Demanya, 2006). According to Lyse (2003), 9 out of every 10 African cities are facing serious waste disposal problems. Again, generating solid waste is inevitable as explained by Kyere et al. (2019). They maintain that about 40 percent of the solid waste generated in developing countries is uncollected, piles up on streets and in drains, contributing to flooding and the spread of disease. In addition, domestic and industrial effluents are often released into waterways with little or no treatment. Solid waste has been a major challenge for municipal authorities for about 6000 years now, they disclose. However, the developed countries have dealt with the problem better because of perhaps, the general attitude of its individuals to waste, and the fact that developed countries have developed specific policies to deal with each waste stream.

In Ghana, the case is no different. Waste management is a serious problem confronting the country for a long time as it is common to move around the major cities and see sights of heaped rubbish or solid-wastes not collected for days, if not for weeks. The streets are mainly littered with papers, wrappers, different colours of polythene bags as well as plastic water bottles and that of soft drinks. Rapid urbanization has fueled the problem. Aside from that, financial

constraints coupled with management gaps make collections and disposal of waste by public and private stakeholders difficult.

Again, in some parts of Ghana, refuse is generally burnt. According to Bowan et al., (2018), "Several Ghanaians consider burning as a cheap way of disposing off their solid wastes by setting the mixed wastes on fire in a little corner in their backyard or in a very open place". Even, mountains of mixed solid wastes in so-called designated places are set on fire, causing serious and dangerous environmental pollution. Most of the wastes end up in drains, streams and open places, he explains.

The Ministry of Local Government and Rural Development (MLGRD) is the institution responsible for waste management services at the national level. As policy, the primary responsibility for solid waste management rests with the Local Assemblies. However, in general, the private sector is invited to provide the actual services under contract or franchise, as appropriate (MLGRD Environment Sanitation Policy, 2009). Accra's municipal solid waste is estimated at 2200 tonnes per day with about 80% collected and disposed, according to records at the Waste Management Department (WMD) of Accra Metropolitan Assembly (AMA). This implies that about 730,000 tonnes of municipal waste is generated each year. "This leaves a deficit of 20% which undergoes various disposal methods including burying, burning and disposal in open gutters, drains and unapproved corridors", as reported by the Ghana New Agency (GNA). The waste management department of Accra revealed that Accra's solid waste, by weight, consists of 65% organics, 6% paper, 1.7% textiles, 3.5% plastics, 3% glass, 2.5% metals, 17.1 inert, and 1.2 of other materials" Although technological solutions such as sanitary landfilling, incineration, recycling, and bioreactor treatment have been executed to handle the

type and quantity of waste generated in Ghana, these efforts toward the effective management of waste have been insignificant and low (GNA).

Significantly, the call, in recent times, has been on sustainable solid waste management for both developed and developing countries. “The idea of sustainability has a quantifiable unit, which refers to three pillars of social, environmental, and economic” (Jassim, 2017). This focus on the environmental policies, which increasingly require the reduction, reuse, and recycling of waste for contributing to closing the loop of material use throughout economy by providing waste-derived materials as inputs for production (Jassim, 2017).

Typically, waste management concerns the purposeful, systematic control of the generation, storage, collection, transportation, separation, processing, recycling, recovery and disposal of waste in a sanitary, aesthetically acceptable and economical manner (Gilpin, 1996).

Waste includes both solid and liquid waste and this can be classified into five types which are commonly found in most homes. These include liquid waste, solid rubbish, organic waste, recyclable rubbish and hazardous waste (4waste Removals pty Ltd). Furthermore, waste can also be categorised into organic and inorganic. Plastics fall under the inorganic part. Quartey and others (2015) writes that “dealing with the organic part of solid waste may be very problematic - depending on the disposal option - as it is biodegradable, but the inorganic part is the challenge because of they are non-biodegradable and therefore remain for a considerable length of time causing severe environmental problems”.

Carbon dioxide - a major contributor to global warming (greenhouse effect) is released into the air and therefore the management of plastic waste through incineration is not environmentally

friendly and sustainable. Landfilling plastic waste is also not an option to take since plastic is non-degradable. Incidentally, the applications of plastic materials and their composites are still growing rapidly due to their low cost and ease of manufacture. Therefore, a high amount of waste plastic is being accumulated, which creates big challenges for their disposal (Jassim, 2017).

That is why a turn to recycling as a means of tackling sanitation and waste disposal challenges worldwide and for that matter in Ghana is a move in the right direction. Using recycling in dealing with sanitation problems brought about by solid waste can go a long way to reduce the negative impact it has on the environment. Recycling is a method of materials management in which discarded materials are separated from waste and processed to acceptable standards to re-enter the economy as usable products (Bisio & Boots, 1996). Thus, the waste materials are put to reuse through recycling, which would otherwise have gone as waste. Hence, recycling comes at the forefront of solid waste management options.

Agenda 21 is an action plan of the United Nations in promoting sustainable development. The action plan provides a general framework on how to reach sustainable management of waste and recycling is one of the proposed channels. "The major program areas concerning waste are: waste minimization; maximizing environmentally sound waste reuse and recycling and promoting environmentally sound waste disposal and treatment" (OECD, 1999).

Moreover, making a strong case for recycling of solid waste, Agarwal et al. (2004) in their research on the topic; *Municipal solid waste recycling and associated markets in Delhi, India,* points out that*:*

Recycling of municipal solid waste (MSW) is now recognized as the "most environmentally sound" strategy for dealing with MSW following only the preventive strategy of source reduction and reuse (EPA, 2004). Developed nations, like the USA, recover as much as 30% of the total waste (EPA, 2004). Substantially increasing the money available for household recycling schemes makes environmental and economic sense with 20% recycling producing an environmental benefit of around £200 a tonne (ECOTEC, 2000) that include the potential benefits from diverting millions of tons of material away from landfills and incinerators and in the process preventing greenhouse gaseous emissions and water pollution, saving huge energy, and reducing the need for new landfills and combustors. In all likelihood, recycling turns materials that would otherwise become waste into a valuable resource and generates a host of benefits at every level: environmental, financial, and social.

In fact, in Ghana, methods of recycling are being developed continuously which include physical and biological processing. One of the sanitation policies of government is harnessing the potentials of recycling of waste. Anku (2000) points out waste recycling have become a viable economic option in the country despite the considerable cost of collection. “Waste recycling technologies are being used by some few industries to circumvent the need for treatment and the discharge and disposal of large volumes of waste and to reduce demand for raw materials, energy and water. In many instances, these industries have found waste recycling as effective ways of improving the economic competition of their products” (Anku, 2000). He further states that the analysis of pilot projects shows that source waste separation could gain public participation; however what needs to be done is a continuous and well-planned work on public education and motivation for source waste separation practice.

It therefore becomes clearer from the above that the possibilities recycling presents in dealing with sanitation issues is significant, however the issue of concern is the extent to which the nation has taken advantage of it.

The Greater Accra Region is the capital city of Ghana, occupying a total land surface of 3,245 km2 (Ghana Statistical Service, 2005). According to the 2010 Population and Housing Census, the total population of the Metropolis was 1,665,086 with females constituting 51.9 percent while males formed 48.1 percent. Using the Greater Accra Population growth rate of 3.1%, the 2018 population of Accra is estimated at 2,036,889. Accra has a daily influx of more than 2million people who commute to the City for various socio-economic activities. It is therefore estimated that Accra has a daily population of about 4million comprise of both residents and visitors.

Geographically, the Accra Metropolitan Assembly covers an area of 200 km2. The Accra Metropolitan Assembly (AMA) is one of the Two Hundred and Fifty-Four (254) Metropolitan, Municipal and District Assemblies (MMDAs) in Ghana and among the Twenty-Six (26) MMDAs in the Greater Accra Region. It was established in 1898 but has gone through several changes in terms of name, size and number of Sub-Metros. When Ghana returned to constitutional rule in 1993, it derived its legal basis from Local Government Act, 1993, (Act 462) which currently has been amended as the Local Governance Act, 2016 (ACT 936), and under Legislative Instrument (L.I) 2034.

The Assembly has sixteen (16) Departments and other Units with Heads of Departments who all report directly to the Metro Coordinating Director (MCD) and ultimately to the Metro Chief

Executive (Mayor). In the performance of its functions, the Accra Metropolitan Assembly works through 14 Sub-Committees (AMA website).

## 1.1 STATEMENT OF THE PROBLEM

All over the world, managing waste, particularly solid waste is a huge challenge and its effective disposal and management are huge topics for discussion any day. Governments are saddled with the challenge of finding suitable solutions in dealing with the problem efficiently and effectively. In Africa, according to USAID (2009), thousands of tons of solid waste are generated on a daily basis. Most of it ends up in open dumps and wetlands, contaminating surface and underground water and posing major health hazards. Many cities have no controlled system for waste disposal as waste is burned in pits, dumped in random locations, or disposed of in uncontrolled dumps without any further management. All these actions negatively affect public health and the environment.

The market report on Global Waste Management, published by Key Note in 2007 stated that "…in much of Africa, waste management is in a poor state due to a lack of government policies, legislation, funding, implementation and, for the population as a whole, a lack of education regarding the importance of a proper approach to waste collection, treatment and disposal. Where legislation exists, a lack of administration may prevent its implementation" (Uganda Wildlife Society, 2010).

Typically, Ghana's case is not dissimilar. The country has a major problem in managing the wastes generated. For instance, Greater Accra does not have any engineered landfill site and it is

increasingly becoming difficult for AMA, the institution responsible for the overall collection and disposal of solid waste in the metropolis, to acquire land for this purpose. This is because many land custodians are reluctant to release land because of the social cost associated with it. "While some say by releasing such lands, their communities will be exposed to unmitigated health and environmental concerns, others cite social problems and the unpalatable stigma that would be associated with area by allowing dumping sites to be situated there", a GNA feature has reported. Again, the Accra Metropolitan Assembly spends about US$ 3.45 million each year (GH6.7 million) on collection and transport of waste for disposal and GH 550,000.00 a month to pay waste contractors and landfill maintenance. Poor sanitation resulting from indiscriminate waste disposal alone is estimated to cost the country $290 million every year. This share of money represents 1.6% of the country's Gross Domestic Product (Abalo et al., 2018). Plastics, or polyethylene, the second largest component of waste produced in Accra, or the country is disposed of primarily through dumping and landfills, although plastics do not decompose.

It is in dealing with this herculean challenge of disposal and management of solid waste that there have been calls for a lot more recycling and reuse of waste materials. Highlighting the advantages of recycling, a feature done by the GNA titled "*We can solve our waste disposal concerns, it's doable"*, noted that "Recycling and reuse are often considered as better options as opposed to landfilling or open dump sites which comes with numerous environmental, economic, health and social problems."

However, public education and the push for measures that makes private participation easier need to be intensified. "With limited space, resources and infrastructure to deal with increasing populations and waste, development organizations are calling for more education, waste

reduction, and innovative recycling programs across the continent." the GNA feature explained. Also, Harvie and Jaques (2003) investigated household attitudes towards recycling of solid waste in Malaysia. The findings indicated that participation in recycling of household waste relies on the level of awareness and understanding of recycling.

Meanwhile, as part of Ghana's sanitation policy, recycling strategies are to be harnessed. "Promote benefits of alternative uses of wastes through reduction, reuse, recycling and recovery" is one of the Information Education and Communication strategies in the Environmental Sanitation Policy (2009). Waste recycling has become a viable economic option in the country despite the considerable cost of collection. In many instances, these industries have found waste recycling as effective ways of improving the economic competition of their products (Anku, 2000). Additionally, Anku (2000) explains that "the analysis of pilot projects shows that source waste separation could gain public participation; however there is a need for continuous and well-planned work on public education and motivation for source waste separation practice".

Significantly, several studies and research works, both quantitative and qualitative, have been conducted in and outside Ghana on the benefits of using recycling as a means to tackling sanitation and waste problems. For example, a research done by Agarwal et al., (2018) found out that an informal sector comprising waste recyclists and a hierarchy of recyclable dealers plays an important role in the management of solid waste.

Similarly, drivers that influence sustainable recycling of Municipal Solid Waste in developing countries identified through research include these factors. They are government policies, government finances, waste characterization, waste collection and segregation, household education, household economies, MSWM administration, and MSWM personal education. The

others are MSWM plan, local recycled material, technological and human resources and land availability. Another study identified communication, education, awareness, income, economic incentives and age as some of the drivers or factors that influence individuals to participate in recycling. Again, demographics, awareness and economic incentives were identified as some of the drivers that influence households to participate in recycling (Mwanza, & Mbohwa, 2016).

Locally, there have also been several studies conducted on ways the country can solve or deal adequately with its sanitation problems. Fundamentally, most of the studies have dwelt on finding the causes of Ghana's sanitation problem and proffer solutions. Many had looked at public awareness and management of solid waste. Results from these research works indicated that raising public awareness about municipal solid waste is a crucial component of effective waste management. Moreover, a couple of studies have also been done on the benefits recycling have on solid waste management. The findings of one established that despite creating employment, production of household utensils, revenue generation and aesthetic environment that solid waste recycling provides, only 5 percent of the daily generated solid waste are recycled. It further revealed that the low rate of recycling was due to few enterprises involved in solid waste recycling and most households not involved in this activity (Donkoh, 2016). Some main barriers identified to the growth of the sector were the lack of knowledge about practical and operational aspect of programs, an unequal sharing of the costs and benefits of recycling, a deficient infrastructure and a shortfall of professional management (Conke, 2018).

Indeed, the above narrative shows there are bottlenecks that impede private sector participation in the recycling sector since about 5 percent of solid waste is recycled in the country? What this means is that, more and in-depth studies are needed since the country's sanitation problems still

remain. Specifically, studies from the standpoint of stakeholders in the recycling sector, so as to try and understand the various nuances that pertain in the sector. In order to raise awareness and help people and the country at large take advantage of the enormous potential recycling offers economically, socially and environmentally.

Basically, what this study seeks to do is, to assess the level of awareness the public have on the crucial role recycling plays in promoting sustainable waste management in the Greater Accra Region via the lens of stakeholders. Besides, try to tease out the challenges and various measures that can be put in place to grow the industry.

## 1.2 RESEARCH QUESTIONS

In trying to find answers, these research questions have been formulated:

1. What is the level of public awareness and knowledge on solid waste recycling as perceived by stakeholders?

2. What are the various forms of recycling channels available?

3. What are the drivers, potentials and opportunities in the recycling sector?

4. What are the obstacles and barriers in the sector?

5. What are some measures put in place to help the sector thrive and also increase public awareness of activities of the sector?

## 1.3 OBJECTIVES OF THE STUDY

The objectives of the research are the following;

1. To ascertain the level of public awareness or knowledge of solid waste recycling.
2. To examine the various forms of recycling we have in the country.
3. To ascertain the drivers and opportunities in the recycling sector.
4. To identify the obstacles and barriers in the recycling sector.
5. To examine the various measures put in place to promote the sector.

## 1.4 SIGNIFICANCE OF THE STUDY

The study will help unveil the current level of public knowledge on policies, programmes, and opportunities relating to solid waste recycling in a way to mitigate sanitation problems in the Greater Accra region and for that matter the country at large. It will also to an extent add to existing knowledge on the recycling sector and improve public knowledge on the sector.

Moreso, it will bring an understanding of the major players in the sector and highlight the opportunities available and the challenges that dog the sector. Again, findings can lead to the formulation of policies and programmes that could harness the potentials that exist in the sector and promote it.

## 1.5 DEFINITIONS OF TERMS

The following terms have been defined for the purpose of this research work.

**Solid Waste:** This refers to plastics, polyethylene, paper, and to some extent metals waste.

**Stakeholders:** Players in the solid waste industry which include government, (Ministry of LGRD), Accra Metropolitan Assembly (AMA), Environmental Protection Authority (EPA), some Private Recycling businesses such as Zoomlion Ghana and the rest as well as a few members of the public.

## 1.6 SCOPE OF THE STUDY

The study will be situated only in the Greater Accra region although there are 16 regions in Ghana and the research touch points will be with a couple of stakeholders in the recycling of solid waste sector. Industry players who recycle plastic, paper and metal wastes are those the study will focus on, even though there may be several solid wastes recycled in the Greater Accra region.

## 1.7 ORGANIZATION OF STUDY

The study is structured into five main chapters. This first chapter constitutes the research design. Chapter two (2) focuses on the literature review while Chapter three (3) dwells on the methodology used for the study. Chapter four (4) presents findings and discussions of the study and finally, Chapter five (5) deals with the conclusion and recommendations of the research.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.0 INTRODUCTION

This chapter deals with the theories and theoretical framework which underpins this study, a look at the concept of waste and solid waste as well as the review of related literature to guide the study. Literature review is an indispensable tool in research. It assists researchers greatly to obtain relevant materials in relation to the topic in order to conduct an effective research.

## 2.1 WHAT IS WASTE?

Waste is a very dynamic concept to define since it can be looked at it from different angles. In fact, waste is more easily recognised than defined. What is termed waste to one person, is a resource or beneficial to another. Hence, the term, waste has been defined differently by many authors. Generally, the word,' waste' has a negative connotation. What comes to mind is garbage, rubbish, or maybe something hazardous or toxic material (Dijkema, Reuter, & Verhoef, 2000). Mostly, something becomes waste when it loses its primary function for the user. Hence, one person's waste output is often someone else's raw material input. Again, the notion of waste is also relative to the technological state of the art and to the location of its generation (Kyere et al., 2018).

The Environment Protection Act, 1993, of the Environmental Protection Agency (EPA), define waste as any discarded, rejected, abandoned, unwanted or surplus matter whether or not intended for sale or for recycling, reprocessing, recovery or purification. The United Nations Environment

Programme (UNEP) also defined waste as any substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by national law. Donkoh (2016) in his research indicated that Withgott and Scott (2008) defined waste as any unwanted material or substance that results from a human activity or process.

Mainly, there are two types of waste, liquid and solid waste. Solid waste comprises of all unwanted or discarded materials (non-liquid and nongaseous products) arising from both human and animal activities that have insufficient liquid content to be free flowing. On the other hand, liquid waste is any form of liquid residue that is hazardous for people or the environment. According to the EPA liquid waste is defined as any waste material that passes the definition of a 'liquid'. Examples are human and animal excreta, household waste water, cooking oil, fats and grease.

Hoomweg and Laura (1999) classified solid waste into various types based on the source. That is, there are residential, industrial, commercial, municipal, institutions and agricultural solid waste. Residential solid waste is generated from single and multi-family dwellings, for example, food wastes, paper, cardboard, plastics, wood, glass, metals, and others. Industrial solid waste is generated from light and heavy manufacturing, fabrication, construction sites, power and chemical plants and others. Whilst, commercial solid waste is generated from stores, hotels, restaurants, markets, offices, buildings, for example, paper, food waste, plastics. On the other hand, institutional solid waste comes from schools, hospitals, prisons, and government centers, for example, paper, cardboard and food waste. Municipal solid waste comes from street cleaning, landscaping, parks; waste water treatment plants, for example, tree trimmings and others. Whereas, solid wastes from agriculture are generated from crops, orchards, vineyards,

feedlots, and others (Hoomweg et al., 1999). . Solid waste can also be classified into municipal, industrial, and hazardous (Withgott & Scott, 2008).

In defining solid waste, Kyere et al., (2018) explain, wastes that are solid are termed to as "refuse" or solid waste. Adding that solid waste today is increasingly defined as "natural resources out of place" or as "new materials for technologies not yet found." They observe that waste is now regarded by many governments as a useful source of income and therefore policies have been initiated by both the government and the public sector to harnessing this potential. The recycling subsector is becoming an essential industry generating revenues and jobs for a larger number of people in the world today (Kyere et al., 2018).

## 2.2 SOLID WASTE MANAGEMENT

Solid waste management (SWM) usually refers to the process of collecting and treating solid wastes. Solid waste management has become an important part of the urban environment as well as the planning of the urban infrastructure to secure a safe and healthy human environment. SWM has been viewed differently by numerous authors but basically, it involves the collection, source separation, storage, transportation, transfer, recycling, treatment and the final disposal of solid waste. Waste Watchers defined solid waste management as everything that must be done to handle all the solid waste produced in a community, including collecting, transporting, processing and disposal of waste. However, Tchobanoglous et al., (1993) definition seems all encompassing and comprehensive. They believe SWM involves a range of activities and thus described it as:

"....that discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid wastes in a manner that is in accord with the best principles of public

health, economics, engineering, conservation, aesthetics and other environmental considerations and that is also responsive to public attitudes".

Therefore in solid waste management there is no throwing 'away' or no 'away' pre se. When 'throwing away' waste, system complexities and the integrated nature of materials and pollution are quickly apparent (Hoornweg & Bhada-Tata, 2012).

In recent times, the call has been on Integrated Solid Waste Management (ISWM) system which is based on waste reduction, re-use of waste and waste recycling principles. ISWM refers to the strategic management of solid waste covering all sources and all aspects such as generations, segregation, transfer, sorting, treatment, recovery and disposal in an integrated manner with an emphasis on maximizing resource use efficiency (Memon, n.d.).

Information from the Urban Development Series Knowledge Papers sponsored by the World Bank titled *What A Waste, A Global Review of Solid Waste Management* by Daniel Hoornweg and Perinaz Bhada-Tata presents the following explanation on ISWM:

Integrated solid waste management (ISWM) reflects the need to approach solid waste in a comprehensive manner with careful selection and sustained application of appropriate technology, working conditions, and establishment of a 'social license' between the community and designated waste management authorities (most commonly local government). ISWM is based on both a high degree of professionalism on behalf of solid waste managers; and on the appreciation of the critical role that the community, employees, and local (and increasingly global) ecosystems have in effective SWM. ISWM should be driven by clear objectives and is based on the hierarchy of waste management: reduce, reuse, recycle — often adding a fourth 'R' for recovery. These waste diversion options are then followed by incineration and landfill, or other disposal options.

The programme (UNEP) suggested that if most of the waste could be diverted for material and resource recovery, then a substantial reduction in final volumes of waste could be achieved and the recovered material and resources could be utilized to generate revenue to fund waste management" (Puopiel, 2010). Efforts at ISWM in countries have shown that with appropriate segregation and recycling system significant quantity of waste can be diverted from landfills and converted into resource (UNEP, 2009). Similarly, the United States Environmental Protection Agency (1999) has said that if a state or local government wants to plan for and implement ISWM, they have to consider a hierarchy of methods which are reduce, recycle, and incinerate/landfill.

**SOLID WASTE MANAGEMENT**

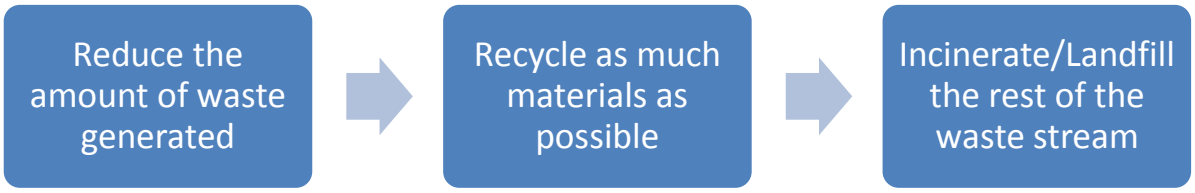


**Figure 2.1 is a model of the ISWM**

Some benefits of ISWM are cleaner and safe neighborhoods, higher resource use efficiency, resource augmentation, savings in waste management costs due to reduced levels of final waste for disposal, better business opportunities and economic growth; and local ownership and responsibilities / participation (Memon, n.d.). Therefore, Sustainable Solid Waste Management goal is to reduce the amount of natural resources consumed, confirm that any material that are taken from nature are reused as many times as possible and that the waste is kept to minimum.

All the above interventions on solid waste management seems to show that waste needs to be recycled or reused in other to preserve resources and the environment.

## 2.3 THEORIES ON WASTE

The Theory of Waste Management is a unified body of knowledge about waste and waste management, and it is founded on the expectation that waste management is to prevent waste from causing harm to human health and the environment and promote resource use optimization (Pongrácz et al., 2014).

There have been several theories propounded in an attempt to explain the recycling behaviour. They include the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), and Theory of Normative Conduct. However, the TPB seem to be one of the most widely-used and most-supported theories to explain recycling behavior. This is because there is a wealth of empirical data that supports it and has thus made TPB popular (Theoretical Framework of Solid Waste Management).

### 2.3.1 THEORY OF PLANNED BEHAVIOUR

The TPB which started as a theory of Reasoned Action in 1080 was meant to predict an individual's intention to engage in a certain type of behaviour at a specific time and place. The main intention was to explain all behaviours over which people have the ability to exert self-control. The basic assumption underlying the theory is that people tend to behave rationally and to systematically make use of information that is available to them when deciding to act or not to act. That is, people's actions are guided by conscious motives and not by unconscious motives. People consider the implications of their actions before they decide to act or not to act (Strydom, 2018).

What is of note is that the theory states that attitudes, subject norms, and perceived behavioural control, together shape an individual's behaviour intentions and behavious. Thus the key components of the TPB, are Attitude, Subjective Norms, Perceived Behavioural Control, and Intention.

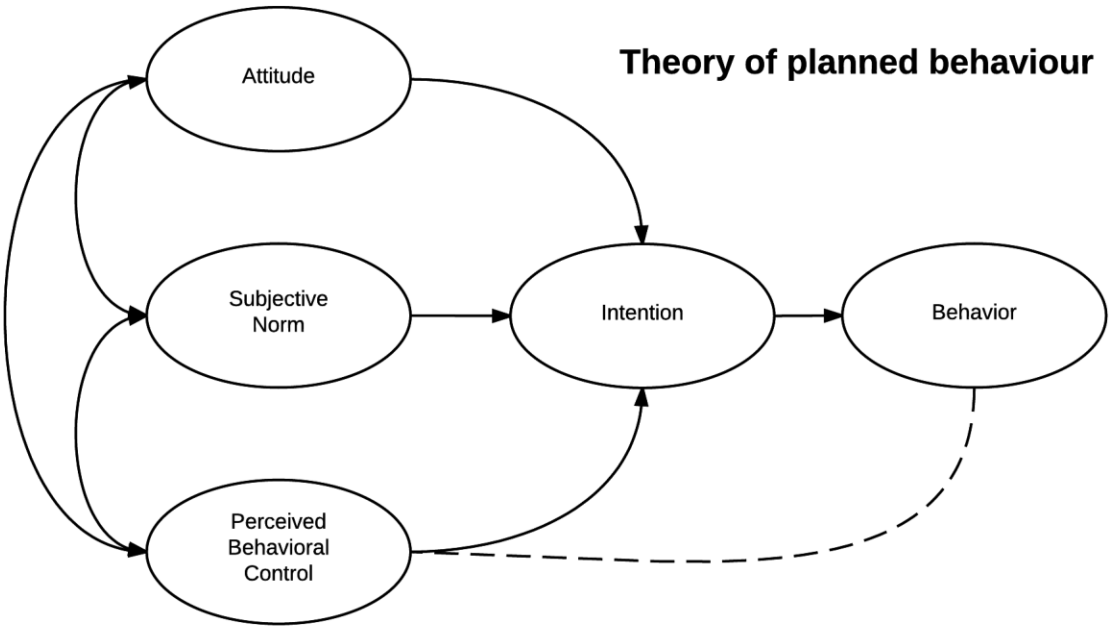


**Figure 2.2: A Diagram of the Theory of Planned Behaviour**

Attitude refers to a person's favourable or unfavorable appraisal of a certain behaviour. Attitudes toward a specific behavior are a function of the person's beliefs about the consequences of such behavior. Subjective Norms refers to the perceived social pressure from other individuals to perform or not perform the behaviour. In other words, subjective norms are the positive or negative opinion or judgement that friends family, colleagues, professional organizations or other key influential may have about a particular or potential behaviour. Subjective norms are influenced by normative beliefs, which refer to whether a person may think significantly others will approve or disapprove of his/her behaviour. Perceived Behavioural Control, the other key component of TPB explains that a behavioral intention can be expressed as a behavior only if that behavior is under the perceived control of the individual, meaning that the person perceives himself as having complete control over deciding to perform that behavior or not. For instance, a

person may wish to perform a behavior, but may not have the necessary opportunities or resources such as, knowledge, skills, abilities, information, time, money, equipment, and cooperation of others to actually perform it (Schiavo, R. 2007, Wikipedia).

The final component is intention. This refers to the motivational factors that influence a person's behavior. Intentions show how willing a person is likely to attempt a behavior, and how much effort the person is likely to exert toward that behavior. Scholars believe that in general, the stronger the intention to perform a behavior, the more likely a person is to perform that behavior. (Schiavo, R. 2007, Wikipedia).

Having said the above, there has to be some caution in concluding that the intention of adopting a certain behaviour always translates in actual behavioral performance. What is of essence is communication. Communication could play an important role in supporting behavioral intentions and increasing the likelihood that they would become actual behaviors. This requires the development of adequate tools that would facilitate and make it easy for people to try, adopt, and integrate new health behaviors in their lifestyle (Schiavo, R. 2007, Wikipedia).

### 2.3.2 NORM ACTIVATION THEORY

Another theory of relevance to the recycling is the Norm Activation Theory propounded by Shahlom Schwartz in 1977. It is a model that explains altruistic and environmentally friendly behaviour. The theory is about exploration of the functions of anticipated pride and guilt in pro-environmental behaviour. The Norm Activation Model (NAM) poses three types of antecedents to predict pro-social behavior. They are awareness of consequences, an ascription of responsibility, and personal norm. In this theory, norm activation begins with an individual's

awareness of conceivably detrimental consequences and his or her acknowledgement of responsibility for not acting pro-environmentally. The anticipated pride and guilt cause individuals to behave in a manner that is in line with personal norms.

Although research states that anticipated pride and guilt are associated with NAM, these associations are not fully understood. Anticipated pride and guilt cause individuals to behave in a manner that is in line with personal norms (Sciencedirect.com).

## 2.4 THE CONCEPT OF RECYCLING

It is believed man has always attempted to recycle usable materials from waste in several ways and as such recycling is not a new idea. Recycling is considered as the most important component of a waste management system both in the developed and developing countries. Consequently, recycling is more acceptable than all other forms of waste disposal because it attracts cleaner, sorted wastes and none of the putrescible wastes that attract vermin (Bower, 1976). The inclination or drive for recycling stems from incidence of higher disposal costs, and the increasing scarcity of virgin materials and its associated market pressures.

The United States Environmental Protection Agency [USEPA] (1999) recommended recovery from recycling as one of the most effective waste management techniques. According to USEPA, recycling turns materials that would otherwise become waste into valuable resources and, it yields environmental, financial, and social returns in natural resource conservation, energy conservation, pollution prevention, and economic expansion and competitiveness. More importantly, a sizeable portion of what is thrown away contains valuable resources—metals, glass, paper, wood, and plastic—that can be reprocessed and used again as raw materials (USEPA, 1999).

Recycling is a method of materials management in which discarded materials are separated from waste and processed to acceptable standards to re-enter the economy as usable products (Bisio and Boots, 1996). That is, waste materials are put to reuse through recycling, which would otherwise have been thrown away. There is conversion of waste into value added products and ultimately reduces the threat those wastes will have posed to the environment (Economic of Recycling: A Theoretical Framework).

There have been several definitions of the termed recycling. Global Environment Centre Foundation (2006) define recycling as the act of using all or a part of a used product as a raw material in the same or other products. Also, Eblen and Eblen (1994) define the concept as a complex chain of activities in which waste has to be collected and processed and used for making new products. Treating things that have already been used so that they can be used again is what Hornby (2006) describe recycling to be. According to Withgott and Scott (2008), recycling involves sending used goods to facilities that extract and reprocess raw materials from the used goods to manufacture new goods. Examples of such used goods are newspapers, white papers, glass, metals cans, and plastic containers (Donkoh, 2016).

Generally, the belief and idea advanced is that the application of recycling prior to discharging could convert a major portion of waste into usable raw materials for further production process and also reduce the volume of final disposal to nature. In *"Economics of Recycling: A theoretical Framework"*, a document shared by Kristine Versoza Rivera on the internet, it state that "… a nation which is unable to recycle used materials will not be able to sustain itself. Besides, it is clear that single use of some of the important materials like metals, glass and paper would lead to

scarcity of such materials as their stocks would get exhausted within a short span. In this context the urgency of recycling is mooted and waste is no longer considered as waste but a resource".

### 2.4.1 BENEFITS OF RECYCLING

There are many benefits of recycling. *Economics of Recycling: A theoretical framework* outlines a few, but summed them into three major categories, environmental, economic and social benefits.

1. The recycling of waste save valuable resources and postpone the consumption of virgin goods. Moreover recycling avoids the environmental damage associated with the extraction and processing of primary resources.
2. Recycling reduces the amount of waste that requires disposal. The new understanding of the impacts of landfills and incineration on ground water and air media also created social pressure for increased regulation on waste disposal. Fewer disposals mean fewer disposal sites and where they already exist their useful life can be prolonged.
3. The recycling of waste materials can generate significant energy saving compared with the production of the equivalent volume of virgin materials.
4. Recycling is also presented as a strategy for economic development by way of creating more jobs and industries in the urban areas where waste materials are more prevalent. It is a labour intensive activity involving sorting and processing of waste materials, thereby money spent on recycling leads to more employment than the same amount spent on garbage disposal.
5. It provides a domestic source of materials. Thereby, recycling conserve exhaustible resources, this reduces the dependency on import of mineral and other resources from abroad.

6. Sixth, the community based recycling and waste reduction is also considered as a means to attain regional development for developing countries through self-sufficient sustainable local communities.

The list of benefits could be more but those presented above give a perfect picture. What is more, recycling is known to save energy since research shows that from the point of view of the climate, it is almost invariably better in comparison to incineration. This was indicated in the Chapter Two of *A Study on the Effectiveness of Solid Waste Management in Municipalities of Kerala,* (India), with the title; *Theoretical Framework of Solid Waste Management.* In the sourced document from the internet, it also stated that a study conducted which assessed the relative greenhouse gas savings associated with UK levels of recycling for paper/cardboard, glass, plastics, aluminum and steel, submitted the following:

"The UK's current recycling of those materials saves between 10-15 million tonnes of CO2 equivalents per year compared to applying the current mix of landfill and incineration with energy recovery to the same materials. This is equivalent to about 10 per cent of the annual CO2 emissions from the transport sector, and equates to taking 3.5 million cars off UK roads."

Numerous other studies have shown that recycling saves far more energy than is captured by burning the materials (Theoretical Framework of Solid Waste Management). This seems to suggest the immense potential recycling has for any country that gives it a priority.

Nonetheless, highlighting what others have also said on the subject of recycling will further emphasize the crucial place the concept has for society's good. According to Puopiel, 2010 as cited by Momoh and Oladebeye (2010) recycling has been viewed as a veritable tool in minimizing the amount of household solid wastes that enter the dump sites. It also provides the needed raw materials for industries. According to them, it has been established that, it is the best, efficient and effective method of solid waste management system.

Kreith (1994) giving his views on recycling pointed out that, recycling is the most positively perceived and doable of all the waste management options. According to him recycling will return raw materials to market by separating reusable products from the rest of the municipal waste stream. “The benefits of recycling are many. It saves precious finite resources, lessens the need for mining of virgin materials which lowers the environmental impact for mining and processing”.

## 2.5 STAKEHOLDERS IN RECYCLING OF SOLID WASTE

Stakeholders as defined by Grimble and Wellard, (1997) are ‘any group of people, organized or unorganized, who share a common interest or stake in a particular issue or system. Better still, any group or individual who can affect or is affected by the achievement of an organization’s objectives (Freeman, 1984). Municipal Solid Waste Management (MSWM) is a complex task, requiring suitable organizational capacity and cooperation between several actors in both the public and private sectors (Boamah, 2010). Therefore stakeholders are the parties who are affected by or involved directly or indirectly in the MSWM (Municipal Solid Waste Management) system.

## 2.6 EMPIRICAL REVIEW

Literature and empirical studies abound on the subject of solid waste management as well as the importance of using recycling channels to address waste problems in the countries of the world.

Significantly, Hoornweg and Bhada-Tata (2012) in Urban Development Series Knowledge Papers sponsored by the World Bank presented an overview of what pertains in countries vis-a-vis income levels and recycling. They observe that in lower income countries although most recycling is through the informal sector and waste picking, recycling rates tend to be high both for local markets and for international markets and imports of materials for recycling, including hazardous goods such as e-waste and ship-breaking. Recycling markets are unregulated and include a number of 'middlemen for these countries'. Most at times there are large price fluctuations.

For the middle income counties although the informal sector still plays a part; there are some high technology sorting and processing facilities. Recycling rates are still relatively high and materials are often imported for recycling. In middle income countries, recycling markets are somewhat more regulated and material prices fluctuate considerably. For higher income level countries, recyclable material collection services and high technology sorting and processing facilities are common and regulated. Characteristics of these countries is that there are increasing focus on long-term markets, overall recycling rates higher than low and middle income and extended product responsibility common. Even though some form of informal recycling still exists for example in aluminum can collection (Hoornweg & Bhada-Tata, 2012).

This observation may account for the low levels of recycling we have in the country Ghana now, though the sector seem a little more vibrant as a lot of the youths are into sorting and picking of solid waste materials for trading at the few recycling outlets in the country.

### 2.6.1 PUBLIC AWARENESS AND RECYCLING

For recycling of solid waste to be successful, one important factor is public awareness and participation. Attitudes and behaviour of individuals in recycling programmes play a significant role in determining whether a recycling programme will be successful or not. Scholars and experts in the field hold the view that community participation is the key to the success of an Integrated Solid Waste Management System. For many of the studies done under SWM, public awareness and participation seem to be the down side or lacking part of the recycling equation, since massive participation by the public will bring a major boost to the sector.

Quartey et al., (2017) affirm the above position and clarifies that solid waste management is basically a welfare and development matter and it is commonly accepted that public participation is essential for its success. They explain that stakeholder participation entails the involvement of all groups of people in the identification of their felt needs, mobilization of resources, and deciding on the direction and execution of programs and projects. In principle, participation should take place at all levels of planning and management, including training, problem identification, implementation, monitoring and evaluation. Adding "awareness is the process of awakening and raising people's sensitivity to concerns, in this case the plastic waste management problem in Ghana."

Awareness is essential for all stakeholders to know what their stake is in tackling waste problems and help develop the recycling industry to ultimately mitigate solid waste impact on the environment. Quartey et al., show what participation entails:

Awareness should be created through formal and non-formal education with the assistance of both the print and electronic media. Environmental education with respect to plastic waste

management, formal and non-formal, is vital to changing people's attitudes to appreciating a clean and safe environment, and leads to their empowerment in enabling them to manage their wastes sustainably. It also creates responsibility among the different communities, increases environmental accountability and governance and encourages the rational use of environmental resources. There is need to create a mechanism for stakeholder participation and dialogue so as to empower and enable the public to participate in sound environmental practice.

Likewise, Abalo et al. (2018), also believes absence of public awareness on waste recycling is one of the challenges for growth of the sector. The observation was that management of plastic waste which has resulted in a number of types of small-scale plastic waste recycling business is still in an infant stage. They contend that some technologies which have been developed to assist recycling of waste have not worked according to plan because of an array of factors including inadequate government financial support on recycling, lack of public awareness on the need to recycle waste, the indifference of the public towards good waste management practices such as recycling, inter-institutional cooperation and collaboration, and low technical capacity. Investigation of household attitudes towards recycling solid waste in Malaysia by Harvie and Jaques (2003) showed that participation in recycling of household waste relies on the level of awareness and understanding of recycling. Similarly, it has also been pointed out that behaviour and attitudes of individuals in recycling programmes have a significant influence on determining whether a recycling programme will be successful or not (Mwanza, & Mbohwa, 2016).

Touching on the relevance of recycling, Stavchuk (2016) in her research work done to explore various communication tools to help overcome specific barriers to public participation in waste separation in Ukraine, noted that because landfills and incinerators have negative connotation

offering recycling as an acceptable alternative has been found to be a successful marketing and advertising practice. Adding that it is because of this, the concept that "waste is a resource" is considered as the first step in changing paradigm about waste in people's mindset. She however pointed out as indicated by Read (1999) that some local authorities do not adequately promote and advertise waste minimization and recycling or do it in an inefficient manner. Although public information and promotion is considered to be fundamental to the success of source waste separation programmes, it is often a last minute consideration by municipal decision-makers. Moreover, "EPA collection of waste minimisation practices in Europe and OECD publication on environmental communication conclude that in order to accomplish higher participation in waste management programs there is a need for intensive communication campaigns" (Stavchuk, 2016).

Her research work which mostly used the qualitative method of research found that although the analysis of pilot projects showed that source waste separation could gain public participation; however there was a need for continuous and well-planned work on public education and motivation for source waste separation practice. Stavchuk (2016) further observed that recycling is seen as an activity "to sell" with the same approaches as promotion of any other product, and so messages should be developed for different audiences within society. Messages should mainly focusing on personal motivator factors and eliminating any perceived barriers. Factors that are important are message design, its structure and content, source of information and how often it has to be repeated.

Sharma (1995) research work done over two decades ago seems to hold true for these current times. In her work she pointed out that the New South Wales (NSW) Government conducted a

survey in Sydney which revealed there was a close relation between residents' awareness of what can be recycled and actual recycling rates. What this implies is that, public education could be an effective means of increasing participation rates and yields. Besides, society as a whole will have to change its buying habits, separate its household wastes and generally become more aware of the overall environmental impact of its lifestyle for recycling programs to be successful. Since "the issue is not just one of encouraging people to have a pro-recycling attitude, but to motivate them to initiate and more importantly maintain recycling behaviour." (Sharma, 1995)

What's more, Anku (2000) writing on the state of affairs on waste management in Ghana states that the analysis of pilot projects shows that source waste separation could gain public participation; however what needs to be done is a continuous and well-planned work on public education and motivation for source waste separation practice.

### 2.6.2 OPPORTUNITIES AND DRIVERS

For any economic or social venture to develop and thrive there must be positive drivers and opportunities that motivate people to participate. The recycling sector must therefore come with opportunities to promote public cooperation and participation. Looking at the business and economic side of recycling of waste and what great potentials it offers for African economics who battle with the problem of adequate finances and resources, and getting jobs for its teeming youthful populations. Abalo et al. (2018) points to a possible solution. In presenting a conceptual framework on the uses and benefits of solid waste, Abalo et al. (2018) indicated that waste generation is an invitation to income generation when considered from the "periscope of waste management economics". Explaining that income from waste may be generated from the employment it creates and the cost it saves from waste collection and management. Furthermore,

"while other developed economies such as Australia, Singapore, and Sweden are profiting financially from the generation of solid waste, developing economies such as Ghana continue to regard all forms of solid waste to be fated for the landfill sites and see it as a burden as well as a problem to be addressed". Likewise, with the current pace of natural resource exploitation in the country for production, recycling of recyclable waste as raw materials for production will serve a purpose of protecting the environment, conserving resource, and promoting the socioeconomic sustainable development of the country. Agarwul et al. (2004) have also advanced that in all likelihood, recycling turns materials that would otherwise become waste into valuable resource and generates a host of benefits at every level: environmental, financial, and social.

As well, Jassim (2017) writing on Sustainable Solid Waste Recycling observes that in recent years, waste management has become a significant business issue for small businesses since all goods and products contain raw materials and energy. "Therefore we are effectively throwing away valuable natural resources, if these goods and products are discarded". Touching on recycling of polyethylene waste, Jassim (2017) disclosed that today, sustainability has obtained top priority in the construction industry. This is because in recent times, plastics are used to prepare coarse aggregates, thereby providing a sustainable option to deal with the plastic waste. Adding that recycling of plastic waste in concrete has advantages since it is widely used and has a long service life, which means that the waste is being removed from the waste stream for a long period (Jassim A, 2017). Going further, Oteng-Ababio (2014) revealing the results of a study show that a greater part of the 'waste' is recyclable or potentially recyclable and that a well-coordinated recycling programme will not only ensure a huge reduction of waste volume, but can equally lengthen the life of existing dumpsites and possibly, create wealth and reduce poverty. Pointing out that it is evident that many companies in some countries such as India are

making good use of waste to manufacture products such as cement, wall panels, and tiles. "Hazardous waste from metallurgical residues, galvanizing waste, and tannery waste can be converted into products including cement, bricks, tiles, ceramics, and boards".

Mwanza and Mbohwa (2016) have also postulated that there is ample opportunities for the reduction of oil usage, carbon dioxide emissions and quantities of waste requiring disposal through sustainable recycling of post-consumer packaging plastic solid waste. "As a result recycling of plastic waste is considered sustainable in manufacturing as new products are manufactured without utilizing new materials hence contributing to sustainable development", they explained (Mwanza & Mbohwa, 2016).

The above assertions therefore affirm that recycling channels indeed can help address the herculean problem of waste that bedevils developing countries and for that matter Ghana. Again the prospects are high for persons who will want to go into the recycling business since there is much untapped potentials in the sector. Practical moves and steps to enhance the sector through all means possible, is a move in the right direction as population grows and the economy expands due to globalization.

### 2.6.3 OBSTACLES AND BARRIERS

Though it is evident what great potentials and opportunities recycling of solid waste portend to countries' development, little is still done in the sector with regards to developing countries. Currently for Ghana, according to existing data only a little over 5 percent of solid waste generated is recycled. Surely, there must be some obstacles and barriers accounting for this. Jassim, (2017) highlighting some challenges of the recycling sector stated, "The difficulties

encountered in recycling are labor costs, lack of government awareness and support toward recycling, and limited real-life applications of recycled materials to allow for evaluation for their performance".

Similarly, Quartey et al., (2017), lament that in contrast, the recycling of waste has not gained strong root in Ghana. The country to a larger extent conceives waste management as discarding of waste with the aim of protecting the environment. Little attention is given to the reuse character inherent in waste generated in the country. Thus, these wastes, although are raw materials, continue to exist as neutral stuffs which pollute the environment.

A potential barrier to recycling is a sense of lack of personal salience, according to Sharma, (1995). She explained this to mean the belief held by people that out of the billions of people, they alone cannot really make a difference. In other words, their individual actions do not matter. Such people will not recycle, though they hold positive environmental attitudes. Another barrier to recycling, she offers, is people's belief in technology. "People believe that society will never reach a stage of desperation because scientists will certainly come up with a solution before it is too late. This attitude of "technical optimists", as Pausacker (1975) defines the western society, who believes technology will solve all the problems, tends to inhibit participation" (Sharma, 1995).

Abalo et al., (2018) also observed that even though other countries are making huge gains from the generation of MSW by means of income generation, Ghana continues to spend on waste management than generating income from waste, despite the economic viabilities of waste generated in the country. However, the inability to effectively tap the dividends from waste generation and management significantly by the country may stem from the low investment due

to the negative mindset towards waste management, low infrastructure, and poor research implementation.

Donkoh (2016) has also disclosed that only 5 percent of the daily generated solid waste was recycled and the low rate of recycling was due to few enterprises involved in solid waste recycling and most households not involved in this activity (Donkoh, 2016).

In a research on the wealth of plastic recycling, Addei (2016) concluded that the plastic recycling industry in Accra is largely unstructured. The technology available to plastic recycling companies accounts for the major difference between the output of the companies in Accra and the companies in advanced economies. Therefore government of Ghana should support the sector by partnering with companies into recycling in order to equip them with advanced technology (Addei, 2016).

What the literature seems to suggest is that obstacles and challenges of the sector is quite enormous but what may account for this and what practical solutions can be established to help the industry grow and help the sanitation problems of the nation.

### 2.6.4 PROMOTING RECYCLING

Suggesting ways to promote the sector, Abdel-Shafy & Mansour (2018) citing Scheinberg et al., (2010), reported that where there are tipping fees at the site of disposal, there are indications of high rates of recovery for recycling. High disposal pricing has the positive effect on recovering the generated solid waste. They also note that Minghua et al., (2009) has said that in order to increase the recycling rates, the local government must encourage the markets for the recycled materials and should increase the professionals in the recycling companies. Other notable

measures could be financial support for different recycling projects and offering support to the infrastructure of the recycling companies and establishing drop-off and buy back centers amongst others (Abdel-Shafy & Mansour, 2018).

In fact, in Ghana, methods of recycling are being developed continuously which include physical and biological processing. One of the sanitation policies of government is harnessing the potentials of recycling of waste. As such, "waste recycling has become a viable economic option in the country (Ghana) despite the considerable cost of collection" (Anku, 2000). Waste recycling technologies are being used by some few industries to circumvent the need for treatment and the discharge and disposal of considerable volumes of waste and to reduce demand for raw materials, energy and water. In many instances, these industries have found waste recycling as effective ways of improving the economic competition of their products (Anku, 2000).

To expand capacity of the recycling of solid waste for that matter plastics recycling in Ghana, Quartey et al. (2017), contend that, government should assist by removing obstacles to the entrepreneurial activities of both informal sector operators and organisations, which is an important factor in sustainable waste management". Alternatively, they advanced government should promote research and development (R&D) focusing on present recycling technologies (i.e., pre-treatment stage), new forms of recycling technologies such as chemical recycling, and the recyclability of end-products. Political will as well as attitude change, they further pointed out is important in expanding the national recycling capacity. "It is a matter of formulating national policies, respective laws and regulations for better collection and sorting of specific waste streams, limiting or banning landfilling of waste streams like plastic".

# CHAPTER THREE

# METHODOLOGY

## 3.0 INTRODUCTION

This chapter discusses the methodology used in the study. It presents details on the research design, method of data collection, and the instruments used. Primarily, the study used the qualitative method of research and this section discusses sources of data and data collection approaches of the study.

## 3.1 AREA OF STUDY

The study focus area was mainly in the Greater Accra Region of Ghana. Hence stakeholders in the region were persons identified for the in-depth interviews conducted in line with the chosen method of research.

The Greater Accra Region is the capital city of Ghana, occupying a total land surface of 3,245 km2 (Ghana Statistical Service, 2005). According to the 2010 Population and Housing Census, the total population of the Metropolis was 1,665,086 with females constituting 51.9 percent while males formed 48.1 percent. Using the Greater Accra Population growth rate of 3.1%, the 2018 population of Accra is estimated at 2,036,889. Accra has a daily influx of more than two (2) million people who commute to the City for various socio-economic activities. It is therefore estimated that Accra has a daily population of about four (4) million comprise of both residents and visitors.

Geographically, the Accra Metropolitan Assembly, tasked with the mandate of Waste Management Services, covers an area of 200 km2. The Accra Metropolitan Assembly (AMA) is one of the Two Hundred and Fifty-Four (254) Metropolitan, Municipal and District Assemblies (MMDAs) in Ghana and among the Twenty-Six (26) MMDAs in the Greater Accra Region. It was established in 1898 but has gone through several changes in terms of name, size, and number of Sub-Metros. When Ghana returned to constitutional rule in 1993, it derived its legal basis from the Local Government Act, 1993, (Act 462) which currently has been amended as the Local Governance Act, 2016 (ACT 936), and under Legislative Instrument (L.I8) 2034.

The Assembly has sixteen (16) Departments and other Units with Heads of Departments who all report directly to the Metro Coordinating Director (MCD) and ultimately to the Metro Chief Executive (Mayor). In the performance of its functions, the Accra Metropolitan Assembly works through 14 Sub-Committees (AMA website).

### 3.2 DATA GATHERING METHODS

As said earlier, the study used the qualitative method of research for data collection, analysis, and reporting. Qualitative research, according to Strauss and Corbin (1990), is a kind of research that generates non-statistical findings or non-quantifiable results. It involves any information that can be captured that is not numerical in nature (Miles & Huberman, 1994). This research method uses in-depth studies of small groups of people and it is considered more flexible and allows greater spontaneity between the researcher and the study participants. Again, it is concerned with obtaining an in-depth look at a particular individual, situation, or set of materials. Research studies that investigate the quality of relationships, activities, situations, or materials are frequently referred to as qualitative research.

The qualitative research method was employed for this study in view of the nature of the research problem which tried to gain an understanding on public awareness of recycling of solid waste from the perspective of major stakeholders. In accordance, primary and secondary sources of data collection were used. Bryman (2008) defines data collection as the technique for gathering or collecting information or data for a study. Data collection allows persons identified to answer relevant questions, evaluate outcomes and make predictions about future probabilities.

Primary sources included face-to-face interviews, telephone interviews, Zoom interview and sending interview guide questions to stakeholders identified in the recycling sector. According to Wimmer and Dominick (2010), an interview is an extensive one-on-one personal interaction which can produce much information. In-depth interview will allow for follow up questions and also enables the researcher to get detailed data. For Berger (2000), interview is an effective way of information gathering where detailed information is required and most appropriate where a small sample of informants is involved which is usually obtained by means of purposive sampling.

Structured or semi-structured interviews were used where necessary. At most, two persons were interviewed from each stakeholder group identified for the sector. However, in the case of the public (households) – three (3) households' persons were purposively sampled for interview. Herein, the interviews were scheduled by first contacting the prospective stakeholders. A few observation sessions were also conducted where possible to gather firsthand information on the sector. For secondary sources of data collection, articles, journals, newspaper reports, the internet and relevant books on the subject were used.

## 3.3 PROCEDURES

To successfully collect the needed information, an initial scouting was done to identify some of the major recycling companies in Accra. It was a bit challenging getting information on companies into solid waste recycling in Accra on the internet as most of the information were inaccurate. Thus using the snowball approach, contacts were made with a few solid waste recycling companies where the procedures for getting the needed information were formalized. Dates and times were set for the interviews. Most of the interviews were done through the telephone or phone calls and Zoom. Hand written notes were taken during the interviews; parts of the interviews were recorded and later transcribed. The companies that agreed to be interviewed were Integrated Recycling and Compost Plant Limited (IRECOP) and Jekora Ventures. Subsequently, a few personal observations were done to gain firsthand experience with recycling in general.

## 3.4 DATA ANALYSIS

The qualitative data collected were analyzed primarily in a narrative and descriptive manner. From then on, the data was analyzed using a combination of thematic analysis and summative content analysis. This was used to ensure that all the relevant data that was collected was properly used and that the desired results were achieved at the end of the study (Sarantakos, 2005).

Based on this understanding the data was analyzed not only based on the themes that were established at the beginning of the research but also based on others that were identified in the process of analyzing the data

# CHAPTER FOUR

# FINDINGS AND DISCUSSIONS

## 4.0 INTRODUCTION

This chapter presents information and data gathered either through primary (interview) and secondary data (books and internet) channels. It will be presented based on the objectives of the research looking at it from the perspective of the recycling businesses, the authorities, and members of the public.

## 4.1 RECYCLING BUSINESSES

### 4.1.1 LEVEL OF AWARENESS

The recycling sector is gradually picking up steam and it can boast of several companies both formal/commercial and informal who are into the recycling trade. It seems to be an untapped area that government must pay more attention.

Speaking to two of such private companies to ascertain the level of public awareness or knowledge on solid waste recycling, they rated public awareness in the Greater Accra Region to be about 45 percent (an average was taken of 60 percent and 30 percent answers given by the two companies), but added that although there seem to be some general awareness, practice or participation was significantly low. Jekora Ventures, represented by Administration Manager, Felix Laryea and Segregation Officer, Emmanuel Chainortey indicated that in the Company's

operation areas such as Korle Klottey Municipal, parts of the Adentan Municipal Assembly and parts of Weija-Gbawe Municipal Assembly, awareness was widespread in the communities due to sensitization works and engagements they do. IRECOP also known as the Accra Waste Recovery Park, represented by the Operations Manager, Malik Korbla Ganyo, noted that his outfit does sensitization in public schools around its catchment area such as Korle-Bu and its surrounding places and thus awareness is generally high in the area resulting in increased participation in its operations.

### 4.1.2 FORMS OF RECYCLING

The various forms of recycling identified from the study are food waste into compost (organic fertilizers), recycling of plastics and polyethylene into pellets, and paper and metal recycling. Some of the recycling companies, in the value chain, for instance Jekora just compress the used plastics materials and sell to 'off-takers' who then sell to manufacturing companies to recycle them into finished products like plastic chairs, tables, cups, plates, toilets rolls, etc. IRECOP one of the leading recycling plants in the Greater Accra region, has a total capacity of 800 metric tons of solid waste per day but runs half of its capacity, doing 400 metric tons per day. Jekora does about 6.6 cubic metres of food waste, 1.6 cubic metres of plastics and 24 cubic metres per day. Yearly outputs are 2,500 cubic metres for food waste, 600 cubic metres for plastics and for paper 8,600 cubic metres.

Information from the Accra Plastic Waste Management Program shows that 120 metric tons of waste is recycled on a daily basis in Ghana, with empty plastic water sachets accounting for about 40% of this figure. The Accra Compost and Recycling Plant (ACARP) at Adjen Kotoku in

Accra, one of the major recycling plants in Ghana is an integrated waste processing and recycling company that collects, sorts, processes, and recycles solid and liquid waste to produce organic compost for use in Ghana. It also produces pellets that are sold to plastic manufacturing companies who recycle the pellets into plastic products such as plastic chairs, tables and bowls (Addei, 2017). However, most of the recycling companies in Accra and the country at large operate on a small scale and this sometimes makes it difficult to get information about them.

### 4.1.3 OPPORTUNITIES AND DRIVERS

On the above, interviewed stakeholders believe opportunities abound in the sector because raw materials (solid waste materials) are readily available as well as the technology for recycling easily accessible. Much more, with proper education on the benefits of recycling and the offering of greater incentives for public participation, the recycling business is a promising venture to take advantage of.

According to the interviewees, the benefits recycling offer the country are creating jobs opportunities (IRECOP provides 75 direct jobs and 1,500 indirectly, while Jekora, provides about 240 jobs directly), safeguard the environment since the adverse effects of gas emission from the use of landfill sites for waste management are minimized, it is good for tourism, as the beaches are cleared of the plastic waste that pollutes them, and the over-dependence on virgin raw materials is managed effectively, which becomes a plus for the environment. All these translate into both economic and social benefits for the country as a whole.

### 4.1.4 OBSTACLES AND BARRIERS

Obstacles or barriers mentioned by the business stakeholders interviewed were financial and lack of adequate policy for the sector. Much capital is involved due to the equipment and technology

used in the sector and this makes cost of investment to be very high as well as the constant changes in foreign exchange rates the country experiences. As such, the venture is not so profitably all over the world and governments have had to always provide the needed support. Additionally, the lack of concrete policy in regards to, waste separation also adds to the cost of operation. Since raw materials picked up have to undergo many processes before it passes the quality mark for use.

### 4.1.5 MEASURES TO PROMOTE SECTOR

To promote the sector, respondents opined that more support and funding have to be given by the government to industry players. They contend that the fact that the government has given space to private companies to operate in the sector, though was welcoming, more could be done in terms of the policy, sensitization for increase public participation, and incentives to expand operations in the industry. The companies lamented that there was no direct form of assistance or support from the government; it is only when grants from international partners come up that they are called upon to put in a proposal to sources such funds. Significant engagements, they contend have to be done to make the sector more vibrant since only 2 to 5 percent of the total waste generated in the country is recycled.

### 4.1.6 ENVIRONMENTAL IMPACT

Recycling of solid waste contributes to improvement in environmental quality. For the respondents, recycling solid waste to an extent prevents people from burying and burning their waste which would have negatively impacted the environment and so environmental pollution is minimized. Moreover, the adverse effects of gas emissions from landfill sites that will have been generated if the wastes are dumped there are minimized through recycling, the beaches are

cleared of plastic waste which pollutes them, and the over-dependence on virgin raw materials for manufacturing is managed effectively, which is a plus for the environment.

### 4.1.7 KEY ACTORS

For the recycling sector, the key actors identified by respondents are the following.

- The Generator: Persons or households and business entities that generate the waste.
- Waste Service Providers or Collectors: Here, the collector can be two-fold. Some collectors collect the waste and send it to the recycling plants. Others after collecting, process it by cleaning them up and compressing them.
- Off-takers: Persons or entities that pick up the cleaned and compressed waste or pellets and sell to companies that are into recycled finished products.
- Recycling Plant or Company: The companies that recycle solid waste into compost or pellets and the ones that manufacture finished products from recycled materials such as pellets or compressed plastics.

It must be noted that some recycling enterprises' might be involved in more than one activity in the value chain presented.

### 4.1.8 LINES OR METHODS OF COMMUNICATION

Communication within the value chain is done mainly through sensitization and advocacy programs embarked on by the companies in the sector. For instance, Jekora indicated that they do a lot of such in the communities they operate in. For instance, they do public education of waste segregation at source in basic schools in the Osu Klottey Sub-Metro. For IRECOP, they also do sensitization in the catchment area of their plant. For the business players, communication channels are forged among themselves to

enhance business operations; these are done either through calls, internet, and scouting for potential connections.

## 4.2 THE PUBLIC

In line with the methods of data collection of the study, three household persons were to be interviewed for the study. To start, all three persons said that they were much aware of the benefits of recycling of solid waste. To them, they were sure that the public awareness of the recycling of solid waste among Ghanaians was satisfactory; however, the commitment to participate was the challenge. Some answers provided were that recycling can lead to a drastic reduction of waste on the street of Accra, and thus make the environment clean and it also serves as a boost for the economy as it provides jobs for people. Two out of the three interviewees stated that they were not into recycling or did not make any attempt to reuse or recycle any part of the solid waste materials generated at home. However, one person indicated that he was into recycling as he stockpiled used water and drink bottles, plastic water sachets, and sold them to waste pickers at a fee. He was into the scrapping of metals as well.

All three respondents were unaware of any government policy on the recycling of solid waste and so could not highlight any. One of the interviewees however indicated that he could see a few government interventions in the sector but was not sure what the policy entails. Furthermore, all the respondents said they were aware of companies and businesses that undertake recycling in the Greater Accra Region, citing Zoomlion and Accra City Compost Plant and a few small companies.

On the question of what could be done to enhance public involvement and awareness on solid waste, all the three respondents said public education engagements should be increased. That is, citizens have to be sensitized on how and why there is the need for it, and most importantly the benefits the individual, society, and the environment at large would derive from the practice.

### 4.3 PERSONAL OBSERVATION

From a few observation sessions, it was seen that there was a lot of the youth, mostly young men in the recycling trade. Most of them were collectors who scavenge for metals, papers and paper boxes, and plastic materials from the dumps, homes, and around the streets and sell to recycling companies at a fee. It was also observed mostly along the streets in some communities in Accra, piles of plastics bottles, scraps of metals and materials waiting to be transported. Similarly, the collection of water sachet plastics has become a job for many people and the majority of such people are females.

**Figure 4.1 Piles of plastic waste waiting to be transported to a recycling plant**

## 4.4 THE AUTHORITIES

For this study, attempts to get information from the authorities with regards to the recycling industry were unsuccessful, aside from the time constraints presented by COVID-19. However, other stakeholders made the point that it is incumbent on the authorities, such as the AMA, District Assemblies to provide the enabling environment for recycling stakeholders to get the necessary support to grow the industry and significantly impact solid waste management in Ghana.

This is because the Accra Metropolitan Assembly (AMA) is the body tasked with the mandate of Waste Management Services in the Greater Accra Region. According to the Government of Ghana sanitation policy, the District Assemblies are the key institutions responsible for the management of sanitation and waste at the local and community level. (Environmental Sanitation

Policy –Revised, 2009). Promoting the benefits of alternative uses of wastes through Reduction, Reuse, Recycling, and Recovery is a value the policy upholds. As well as improving the knowledge, attitudes, and behaviour of individuals, households, and communities towards environmental sanitation which is central in any effort aimed at making sustainable progress. Therefore the authorities must up to the task of fulfilling the mandates as the policy subscribe. The Sanitation policy also states that Waste management shall be carried out by Waste Management Departments, within Metropolitan and Municipal Assemblies. They are to provide the services either directly or indirectly through private contractors or franchisees.

# CHAPTER FIVE

# CONCLUSIONS AND RECOMMENDATIONS

## 5.0 INTRODUCTION

The studies sought to ascertain the level of public awareness of the recycling industry in Greater Accra, from the perspective of stakeholders in the industry, as well as looking at the drivers and opportunities and the obstacles or problems that bedevil the sector.

From the findings, although stakeholders in the recycling industry believe awareness on recycling of solid waste by the public is satisfactory; actual practice and participation are very low. Though the awareness exists, there must be increased conscious awareness where attitudes and behaviours are positively affected, like the Theory of Planned Behaviour and Normative Action Theory subscribe, to make the sector grow and be more impactful.

It was also evident from the findings of the research that the plastic recycling industry in Accra is still in an infant stage, fairly unstructured as revealed by the number of companies that operate in the formal and informal sectors of the industry. Informal operators seem more. No doubt, information on their activities was scanty as operations are done on a lower scale basis. Nonetheless, what can also be said is that the sector seems to be growing steadily, specifically on the informal front, and serves as an avenue of employment to the youth to earn a living.

Additionally, it was evident financial and lack of adequate policy were the main obstacles and barriers to the growth of the industry, though the opportunities of the trade are enormous given the abundance of raw materials (waste materials) and existing technology. The recycling industry

is a capital intensive field and so much capital and financial resources are needed for people to venture in. Moreover, the sector seems to be an area of untapped opportunities and when given the necessary push by government and relevant stakeholders by way of investments, financial support, and policy as in waste separation promotion and the likes, it will bring about economic and social gains or returns to Ghana, in terms of jobs, economic prosperity and a cleaner environment.

## 5.1 RECOMMENDATIONS

Recommendations that flow from the study are the following:

First, to help make the sector grow government should enact policies and regulations that encourage waste separation in the country. One of the problems recycling businesses are saddled with is getting high-quality raw materials. Most of the wastes they receive and use have to be first cleaned and this adds on to the cost of operations. That is the reason solid waste such as polythene bags and plastic bottles are still on the streets and gutters, although it is a raw material for their operation. Ultimately, waste separation practices will provide them with clean materials that will aid their operations and make the sector grow.

Second, there is a need for more public education and sensitization on the benefits of recycling of solid waste for Ghana's development. Though an amount of awareness exists it is not enough to foster the positive change in attitudes and behaviours that can help address the sanitation problems of the country. This duty must not be for the government alone but all stakeholders in the recycling value chain.

Third, more investments and financial support must be offered to players in the recycling industry by the government, in the form of tax holidays and import duty waivers in order to help the sector grow. The government should consciously grow the industry as the nation's economy expands. This is important because the growth of the sector directly helps tackle the environmental challenges waste disposal bring and also deals with the employment issues of the nation.

Four, the recycling industry must be coordinated and structured properly as most of its operators are in the informal sector. This will help give them the united front to voice out and address concerns that affect them and also provide relevant information that will aid research into their activities

## 5.3 LIMITATION OF THE STUDY

Due to time constrains and the ramifications of COVID-19, not all the targeted stakeholders could be contacted and interviewed. For instance, attempts to source information from the authorities, such as AMA, were unsuccessful.

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# APPENDIX

## POSSIBLE INTERVIEW GUIDE QUESTIONS

## FOR RECYCLING BUSINESSES

What in your estimation is the level of public awareness and knowledge on solid waste recycling? What informs your answer?

Do you do any information dissemination about what you do generally?

What type of recycling are you in?

Which aspect of recycling as a business are you into?

What are your sources of raw material supply?

Who are the key actors in the recycling value chain?

What are the communication methods within the recycling value chain?

What are some of the products derived from the recycling of solid waste?
Which amount of solid waste on the average do you obtain from the public on daily bases?
What amount of solid waste do you recycle within a day?
What are the prospects and opportunities for you in this business and in the industry?

What are the challenges or bottlenecks in your line of business?

Can I know some benefits of recycling from your point of view?

Do you believe the authorities are doing enough to boost public knowledge on the sector?

Does the government or authorities release funds or provide any form of assistance into your organization solely for recycling activities?

To what extents do the activities of your enterprise threatens environmental quality?

To what extent do the activities of your enterprise contribute towards the improvement of environmental quality?

## FOR THE AUTHORITIES (AMA ETC)

What is your take, views or how do you see recycling of solid waste?

What types of recycling works are done in the Greater Accra region?

How many registered companies are into recycling in the Region?

What are the current policies or guidelines regulating the recycling sector?

What measures have been put in place to help the sector grow and also deal with sanitation problems in Greater Accra?

Is there any recycling plant in Accra Metropolitan area owned fully or partly by the state?

Does the AMA own any recycling plants or business?

How does your organization collaborate with other regulatory bodies in controlling the activities of recycling enterprises?

Do you do any public education or information dissemination about the benefits about the sector?

In your estimation, what is the average amount of solid wastes generated daily in the Accra Metropolitan area?

What amount of the daily generated solid wastes goes into recycling?

To what extent do the activities of recycling enterprises contribute towards the improvement of environmental quality?

To what extents do the activities of recycling enterprises threatens environmental quality?

**FOR THE PUBLIC**

Generally do you know the benefits of recycling?

Are you into recycling of any of your solid waste?

Do you make attempts to reuse or recycle your solid waste materials? Please give a brief explanation.

Are you aware of any government policies about recycling?

If you do, can you highlight on some?

Do you know of companies or businesses that undertake recycling of solid waste in Greater Accra?

What can be done to enhance public involvement in recycling of solid waste?