PRESBYTERIAN UNIVERSITY COLLEGE, GHANA

FACULTY OF DEVELOPMENT STUDIES

MANAGEMENT OF PLASTIC WASTE IN THE NSAWAM ADOAGYIRI MUNICIPALITY, GHANA

BY

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Dissertation submitted to the Departement of Environmental And Natural Resources Management, Presbyterian University College, Ghana, in partial fulfillment of the requirements for the award of Master of Science in Environment Health and Sanitation.

SEPTEMBER, 2020

DECLARATION

Candidate's Declaration

I hereby declare that this dissertation is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Signature: …… Date: ……..……..

Candidate's Name: ……..……..

Supervisor's Declaration

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with guidelines on supervision of dissertation laid down by the Presbyterian University College, Ghana.

Signature: …….. Date: ……...

Supervisor's Name: ……...……

ABSTRACT

The main objective of the study was to examine the management of Plastic Waste in the Nsawam Adoagyiri Municipality. The study was limited to the Nsawam Central Market. Data was collected from both primary and secondary sources. This was done by administering questionnaires to members of the public, environmental officers and staff of the Nsawam Municipal Assembly. The municipal assembly was selected because they are in charge of waste management in the municipality. The study indicated that organic waste forms the 75% of the total waste generated in the municipality, organic waste was followed by plastic waste. Plastic waste alone accounted for about 22% of the total waste generation in the Nsawam Adoagyiri Municipality, thereby making plastic waste management an important aspect of the Municipal Assembly. By way of recommendation, it is very prudent that right from the national level, a more pragmatic policy direction be established to let everyone be aware of the direction the country is going so far as plastic waste management is concerned. This should be such that the information would be made privy to everyone within the country which will also be followed by several adverts and media coverage and announcements.

ACKNOWLEDGEMENTS

I give Glory to God for the great things He has done. I wish to thank some wonderful people who have helped me in one way or the other to make this work a success. First of all, I will want to say a big thank you to the all-knowing God who through his unending protection and provision gave me life, strength and wisdom to carry on with this course. I thank My Supervisor, Dr. Mary Adu-Kumi for her guidance throughout the research work.

DEDICATION

I dedicate this thesis to my entire family, especially to my wife, Linda Okyere, whose prayers, encouragement and support has brought me to a successful completion of my second degree.

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CHAPTER ONE

1.0 INTRODUCTION

This chapter outlines the background of the study, statement of the problem, objectives of the study, research questions, significance of the study, scope of the study, limitation of the study and organization of the study.

1.1 Background to the Study

Organizational researchers have maintained that waste management continues to gain attention in the world of research due to the relevance it has in today's world of economic management (Moore, 2016; Nice, 2018). In times past, managing waste was not a difficult task to handle due to the fact that people were not as many as it is now as well as the fact that land was very much everywhere (Bellam, 2013). Coupled with this, there was as vast land as there was all the time and hence all these helped to manage waste more appropriately. However, this cannot be said to be so in recent times (Moore, 2010).

Mensah (2010) asserted that there has been a more than 47.89% increase in waste related issues in Ghana over the past three years. There are many agencies at the national level involved in some form of Plastic waste management. The indications heighten on the clear roles and identifications of the various functions at the national level intended on defining the role of Plastic management and also singularly designing a coordinated form of the projected activities. Legislation, this in relation is concerned with Plastic management in developing countries.

The people in the remaining part of the collection services are low income earners living in the urban areas (Boon, 2013). More often than not, there are fees charged and the state of insufficiency from the central municipal budget and the fact that it cannot

adequately cater for the intended purposes. Zurbrugg (2017) underscores the key challenges of waste management, which includes financial and institutional inhibitions and shortcomings. Plastic disposal in Ghana has tendered on a cankering challenge in our world today to MMDAs. This is due to the scope that people resort to indiscrimination, dumping becoming the only source of domestic result as well as littering and continual of heaping Plastic waste (Boakye, 2012).

1.2 Statement of the Problem

According to an empirical study by Mensah (2018), Nsawam generates close to 978 tons of waste weekly, out of these, only 393 is successfully processed leaving more than half left untended to.

Some researchers opine that there are higher occurrences of human resources at both the local and national level in developing countries where the level of technicalities are unnecessary for Plastic waste management planning and its operations (Nonso, 2014; Northouse, 2011). Many of the officers responsible for the Plastic waste management at the local level have little or no technical background in engineering or management processes at all (Yen, 2017).

Ogawa (2017) noted that Plastic waste management is given a low concern especially in developing countries except for those perhaps in the capital and large cities. The consequences place some limitations on funds to managing Plastic waste's sector by the governments and the locals. The problem created here is a bit of acute nature where taxations are placed on developed countries. Hence the cause of financial basis for public services including Plastic waste management. The weak nature of the local government can be supplemented by the collection of users' services charges. This however, surmounts on the services packaged poorly in developing countries and their

unwillingness nature to pay for their services covering the ineffective and irregularities.

1.3 Research Questions

The study seeks to answer the following questions:

a. What are the types and components of plastic waste generated in the Nsawam Municipality?
b. What are means of waste disposal in Nsawam Adoagyiri municipalty?
c. What is the frequency of waste collection?
d. How is waste collected finally disposed of?

1.4 Research Objectives

The overall aim of the study is to examine the Plastic waste is manage in the Nsawam Adoagyiri Municipality. The specific objectives were to:

a. To assess the types and components of plastic waste generated in the Nsawam Municipality.
b. To examine means of waste disposal in Nsawam Adoagyiri Municipality.
c. To analyze the mode and frequency of waste collection.
d. To analyze how the waste collected is finally disposed of.

1.5 Scope of Study

The study was limited to the Nsawam central market. Furthermore, the scope of the study was limited to the quantitative research methodology. Again, the study was limited to primary source of data.

1.6 Significance of Study

The study provides some key significance that is worth mentioning. Furthermore, the study will also provide the Nsawam Municipal assembly with ideas as well as key steps they can take to improve upon the waste management situation within Nsawam since it is at a bad state.

1.7 Organization of the Chapters

The entire study was divided into five main parts based on the thesis guidelines provided by the University. Chapter One dealt with the introduction of the study, research problem, research objectives with the corresponding questions, and scope of the study, significance as well as the thesis layout. Chapter Two discussed the theories thus theoretical and empirical literature of the study. Chapter Three deals with the research methodology where the design as well as the study approach was described. The chapter Four deals with the analysis of data that was collected from the field. Chapter Five deals with the summary, conclusion and recommendation of the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

The chapter gives a review of literature related to waste management practices. This further goes on to outline the various theories that are in relation to waste management practices as well as the empirical review. The chapter concludes with a conceptual framework outlining the relationship between the variables of the study.

2.2 The Concept of Waste

Waste is defined as something, which has no face value to the owner or the object is used and further not relevant for any relevant keeping and purpose (Freduah, 2016). Waste management is one of the greatest challenges facing humanity in modern times. In spite of the numerous efforts by various governments all over the world to arrest it, technology has not been able to effectively control waste generated in communities worldwide. According to Lyse, 9 out of every 10 African cities are facing serious waste disposal problems (Lyse, 2018). Indeed, a visit to some cities and towns in Ghana revealed aspects of the waste management problem such as heaps of uncontrolled rubbish, polythene bags scattered everywhere and disposal sites overflowing with filth which comes with its associated health hazards such as cholera, malaria and typhoid to residents who live near the dumping sites. This situation is not so different in many other countries south of the Sahara. In South Africa, Zambia and Zimbabwe rubbish bags are a major eyesore (Chazan, 2017, Wetherell, 2018). In South African black polythene bags are often referred to as the "national flower" because it blights landscapes and can be seen hanging on fences, in gutters and blocking drains (Chazan, 2015). It is not out of place if stakeholders

ensure that the rural settings are also given equal attention when it comes to waste management, the reason being that the repercussions associated with improper waste management do not know boundaries and sickness know neither the rich nor the poor. Every task, from preparing a meal to manufacturing of a car, is accompanied with some production of waste material which implies that the problem is as daunting so it is a concern that ought not to be placed at the doorstep of only the governments and the waste management operators to handle but every stakeholder must do his or her best to ensure that our surroundings are kept free from filth by adopting positive attitude towards waste management.

2.2.1 The Concept of Plastic Waste

Many authors have come up with a definition of Plastic waste (Bellam, 2018; Nokturn, 2017). Definition surrounding it entails a form of debris or human activities which are not accepted or purported unwanted (Tchobanoglous, 2015).

In classification, Tchobanoglous (2015) expatiated Plastic types in relations to the generated sources and the facilitations of the activities associated their locations in each specs. There are further clarifications made by Tchobanoglous *et al* (2016), which highlights on the types of Plastic food waste, ashes, rubbishes and residues left in waste.

2.2.2 Plastic Waste Management Practices

The factor of the Plastic waste management has been captured differently by authors. A typical one is Kumah (2017), defines this waste as management contained in “the administration of activities that provide for obtaining the sources and storing, transportation in the course of processing the treatment and how they dispose waste. Nonetheless, Tchobanoglous et al (2016) gave out deep comprehensive definition of

plastic waste management. Per his input on Plastic management, it is "that discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of Plastic 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".

22.3 Plastic Waste Management Processes

When waste products are collected, there is a transfer of collection of equipment like the tricycle to an extended form of a truck for disposing off rubbish.

The generalization of this activity in the entailing concepts of the materials identified has no face value and are thrown away or gathered geared disposal (Momoh and Oladebeye, 2016). In 2017, plastic products generation was 35.4 million tons, or 13.2 percent of generation. This was an increase of four million tons from 2010 to 2017, and it came from durable goods and the containers and packaging categories. Plastics generation has grown from 8.2 percent of generation in 1990 to 13.2 percent in 2017. Plastics generation as a percent of total generation has grown slightly over the past five years (Ballam, 2017). The program incites on an estimation where World Health Organization (2018) estimates on the total health-care waste per person per year in most low income countries, is anywhere from 0.5 kg to 3 kg. Again, the causes of these changes are however, expatiated by the firm and further exhausting the issues on discussion.

The concepts engage on Plastic waste generated in increasing at a rather faster rate globally indicated by UNEP and further confirmed by Mensah and Larbi (2016), regarding the generation of Plastic waste management in Ghana.

Early Practices of Plastic Waste Management

Tchobanoglous *et al* (2016), in his quest recognized the methods for final disposal of Plastics in folds which are; Dumping on land, canyons and mining pits, ploughing into the soil, dumping in water, feeding to hogs, Reduction and incineration.

There are some folds of unwholesome practices and demeanors of Plastic waste checked in the course of early disposal practices of skills in the cities, towns and even villages. The extension relies on the core of how indiscriminate dumping are still done especially in the areas of towns and cities where the residents are situated.

Another method was on burning of bushes tendering to be another clear method exchanged in the communities in Ghana and many others under developed countries. Momoh and Oladebeye (2018), in their studies, unveiled the methods of Plastic waste disposal checking waste gutters, drains, dumping at unauthorized sites and streams including raining season and burning of wastes on unapproved dumping sites also in the dry seasons. This confirms the practices of Plastic waste disposal of Plastic waste in 1950s, which still occurs in our world today not excluding the area of the study as an exemption.

However, Momoh and Oladebeye's (2018), on their assessments on Plastic waste issues in a town called Ado-Akiti in Nigeria, tender to be a twisted one, a further analysis tenders in Plastic waste for collection and further disposing in the early days.

2.2.4 Source Reduction Method of Waste Management

In the assertion of Almond (2018), reduction of waste focuses extensively on the volume of intense, or the toxicity of the waste generated from a source. This includes switching to reusable products and packages. In the most firmly being returnable

bottles. Per Erban (2016), in the city of Thimphu in Bhutan, to reduce waste problems in the future, trying to reduce waste generation would be the most important factors. Examples of possible reduction at the consumption level include reuse of containers including bags better buying habits, and cutting down on the use of disposable products and packaging. A further inclination sources in separating and restoring important methods in waste.

2.2.5 The use of Sanitary Landfill Method for Reducing Waste

Sanitary land filling includes confining the waste, checking the recovery with the soil. The concept was not only because of preventing burning of garbage and but for helping in the reclamation of the land for its intended and valuable use (Centre for Environment and Development, 2018).

The placement of the Plastic waste in landfills is the oldest and concisely causes prevalent form of ultimate wastes disposal (Zerbock, 2016). His arguments are of nothing more than an open space where sometimes controlled by dumps. A further concession circulating the relations of landfills and dumps is the extent of planning, engineering and administration concerned. The open dumps are characterized by the absence of measures, no leachate management where there is no consideration of the landfill management and few operational measures like registration of the users that is controlled of the number of "tipping fronts" (Zerbock, 2018).

Akin, there are simply some combinations of waste management mechanisms where there are no actual requirements where no combination requires landfilling to make the measures work (Kreith, 2016). The landfills are just management technique where both the necessary and sufficient in connotation. Facts have it that, some of the items are not recycled and may eventually reach a point where their intrinsic base is completely dissipated and tenders on nothing too soothing and making recycling the

products in turn of residues (Renda, 2017). Further, there is a highlight on the technological operations of the modern landfill assuring the protection of human health and the stake of the surroundings, other critical factors endeavor on the compositions, waste to energy recovery and storm water controls (Ongo, 2015). The distance to the state of the settlement and the water body were not clearly inclined in the casting of the state by the authors (Ink, 2016).

2.2.6 Recycling Method of Reducing Waste

Momoh and Oladebeye (2018), in exchange of recycle is viewed on the veritable conceptions in the extent of minimizing amounts of households Plastic waste in the trailing of the dumpsites. The arguments span the need to extract raw materials for industries. In the scope of this, it is critically evident that, being efficient and effective in the methods of the Plastic waste management has been checked. However, in the course of this is not related to cost effective mechanism in a country like Ghana. The United States Environmental Protection Agency (USEPA) (2019), recommended recovery for recycling as one of the effective waste management techniques.

Kreith (2017), included in his quest that, recycling is the most positively concerned and doable of all the waste management options. In his quest, the return of the raw materials by separating reusable products from the rest of the municipal waste management flow. The benefits of recycling are enormous and it was perceive that, the concern saves finite resources, lessens the needs for mining of materials which are untapped, further tenders on lowering the impact of environmental and processing. For this reason, the Institute of Waste Management cited by Tsiboe and Marbel (2018), UK, contends with only 11% of the households waste in Spain and Italy where it is just 3%, Netherlands 43%, Denmark 29%, and Austria 50% respectively.

Having made these reservations by many authors, it is opted as the best option for the management of Plastic waste in modern times where the cost of it has to be forgotten and especially about the component which is key in the installation of implementation of any projects on recycling project. On an external dimension, developed countries are unable to successfully do this but alternatively may be the best offer for the effectively managing Plastic waste in Ghana.

2.2.7 Composting Method of Reducing Waste

The composition of this uses microorganism in degrading the organic content of the waste management. The state of aerobic composition proceeds on higher notes and further converts the diverse organic materials in the same stable humus (Centre for Environment and Development, 2018).

UNEP (2017) defined the concept as a biological decomposition of biodegradable Plastic waste tripping under predominant aerobic conditions to a state where there is enough consent, which clears off all nuisances on handling of the storages. In the same vein, the composition opts for few exceptions where there are resources within the state of adaptability to a broader spectrum (Bellam, 2016). Zerbock (2016), gave a low- tech of approach to waste in the conversion of reducing waste in its compositions. He further explained that, in developing countries, there minimal state of the municipal waste stream over 50% organic materials in the entireties.

2.2.8 Examining the Incineration Method of Reducing Waste

The Centre for Environment and Development (2017), incineration is exposed on the processes of combustion for burning combustible waste to grass, tendering on reducing it to a residue of non-combustible ingredients. In the same way, the Centre, in the scope of the incineration, moist the Plastic to waste to vaporize and a portion

oxidized. CO2, water vapor, ash and non-combustible residue are the products of incineration. The concepts take capacity in reducing the volume of waste drastically to the highest response than any other medium (Kreith, 2016). In concession, he recovered that, the useful of the energy either in the form of steam or electricity recognizes the main constrains of incineration which are high in operations relatively to a sophisticated to operate safely and economically as well as the tendency to pollute the emissions of the carbon dioxide in the environment. Literature has a further steps revealed in here that, there are alternatives mediums in managing the Plastic waste more efficiently equally synonymous to waste reduction and the scope of recycling as incited in the earlier inputs.

2.2.9 Problems Associated with Managing Plastic Waste

Ogawa (2015) gave an unpleasant means of waste management system in especially developing country, where there is a display of problems including the collection of coverages and irregular collection of services, crude open dumping and burning without the springs of air and water pollution controls. He joined these challenges into rather technical enchantments, liaising into institutional, technical, financial and social constraints. In his further discussions, he juxtaposed these constraints to sustainability of Plastic waste management in developing countries.

2.3 Technical Constraints of Plastic Waste Management

The researcher believes that, there is higher occurrences of human resources at both the local and national level in developing countries where the level of technicalities are necessary for Plastic waste management, planning and its operations. Many of the officers responsible for the Plastic waste management at the local level have little or no technical

background in engineering or management processes at all.

2.3.1 Financial Constraints of Plastic Waste Management

Ogawa (2017) condescended on Plastic waste management in tagging it for giving a low concern especially in developing countries except for those perhaps in the capital and large cities. The consequences of this limited attention place some limitations on funds to managing Plastic waste's sector by the governments and the locals. The problem created here is a bit of acute nature where taxations are placed on developed countries. Hence the cause of financial basis for public services including Plastic waste management tendering to be weak. The weak nature of the local government can be supplemented by the collection of users' services charges. This however, surmounts on the services packaged poorly in developing countries and their unwillingness nature to pay for their services covering the ineffective and irregularities.

2.3.2 Institutional Constraints of Plastic Waste Management

There are many agencies at the national level involved in at least some forms of partiality in Plastic waste management. The indications heightens on the clear roles and identifications of the various functions of at the national level intended on defining the role of Plastic management and also singularly designing a coordinated forms of the projected activities. Legislation (Public Health Act, Local Government Act, Environmental Protection Act), this in relation is concerned with Plastic management in developing countries. Zurbrugg (2017), added in the schemes of the cities in the developing countries usually as part of the urban population.

The people in the remaining part of the collection services are of low income earners living in the urban areas. More often than not, there are fees charged and the state of insufficiency from the central municipal budget and the fact that it cannot adequately

cater for the intended purposes. Zurbrugg (2017), hence, underscores the key challenges of waste management, which includes financial and institutional inhibitions and shortcomings.

2.3.3 Plastic Waste Management in Ghana

Plastic disposal in Ghana has tendered on cankering challenges in our world today to MMDAs. The result span from the focus of coercion, increasing densities, the Metropolitan Assemblies find it critical to tackle the large quantities of the waste generated. This is due to the scope that people resort to indiscrimination, dumping becoming the only source of domestic result as well as littering and continual of heaping Plastic waste. The aspect of the review analyses Plastic waste management processes in Ghana. The result circulates around the disposal of plastic waste management in the regulation of the drawn policy in our country, Ghana.

Mensah and Larbi (2015), on the full estimation of the population of 22 million and an average daily waste generation per capita of 0.45 kg, Ghana generates annually about 3.0 million tons of Plastic waste. Boateng and Nkrumah (2016) in their quest, unveiled that, Plastic waste generated daily in Nsawam ranged from 1500-1800 tons. In the same vein, Anomanyo (2016) stated that, about 1800 tons of municipal Plastic wastes were obtained per day in Nsawam Metropolis and the average per capita per day, estimating around 0.5 tons.

In his further argument, he estimated the rate of the population of the growth in the Metropolis to be 3.5%. where waste from domestic sources including; food waste, garden waste, sweepings, ash, packaging materials, textiles and electric and electronic waste with organic waste being the major component. According to Ketibuah et al (2017), in Kumasi the bulk of household waste is found to be organic

waste, which includes food waste and putrescible waste with an average of 55 per cent. The constitution is about 65%, the high proportion of food and plant waste was because Ghana's economy largely depended on agricultural products for export and domestic consumption. However, the waste rate of AMA was about 2016 tons a day with per capita waste generation of 0.45kg (AMA, 2017). Akin, according to KMA (2017), the current domestic waste generation in Kumasi rate was approximately between 1000-1500 tonnes a day. This was based on the projected population of 1,610,867.

2.3.4 Theoretical Framework

Integrated Solid Waste Management, ISWM, is a planning framework for solid waste management (Osteen, 2017). The programme was initiated of the Urban Waste Expertise Programme (UWEP), supported by the Netherlands Ministry of Foreign Affairs, and designed and carried out by WASTE, Advisors on Urban Environment and Development in Gouda, Netherlands (Nostin, 2018). Walumbwa (2017) has focused on bottom-up, participatory processes designed to improve waste management, livelihoods and urban governance in developing countries. The programme has been developed in cooperation with partner organizations in the South. In the first six years of research, between 1995 and 2001, the solid waste management was observed by local researchers in the participating countries, and the importance of micro and small enterprises and the informal sector was noticed (Boakye, 2018).

2.3.5 The Integrated Solid Waste Management Framework

The ISWM insight is that problems with solid waste management often have to do with more than lack of money and equipment. It can be attitude problems among the residents, waste management staff or private enterprises, or more serious factors as

the institutional framework or social or cultural context (Lemarr, 2017). In these cases money is not the solution, but a change in social, institutional or political conditions is (Luka, 2019). It is important to remember that there is no absolute solution of solid waste management that fits to all cities and towns.

The ISWM concept takes as a point of departure four basic principles: Equity, Effectiveness, Efficiency and Sustainability. *Equity* means that all citizens are entitled to an appropriate waste management system for environmental health reasons; *Effectiveness* implies the waste management model will lead to the safe removal of all waste. *Efficiency* makes the management of waste maximizing the benefits, minimizing the costs and optimizing the use of resources and *Sustainability* refers to the fact that the waste management system should be appropriate to the local conditions and feasible from a technical, environmental, social, economic, financial, institutional and political perspective.

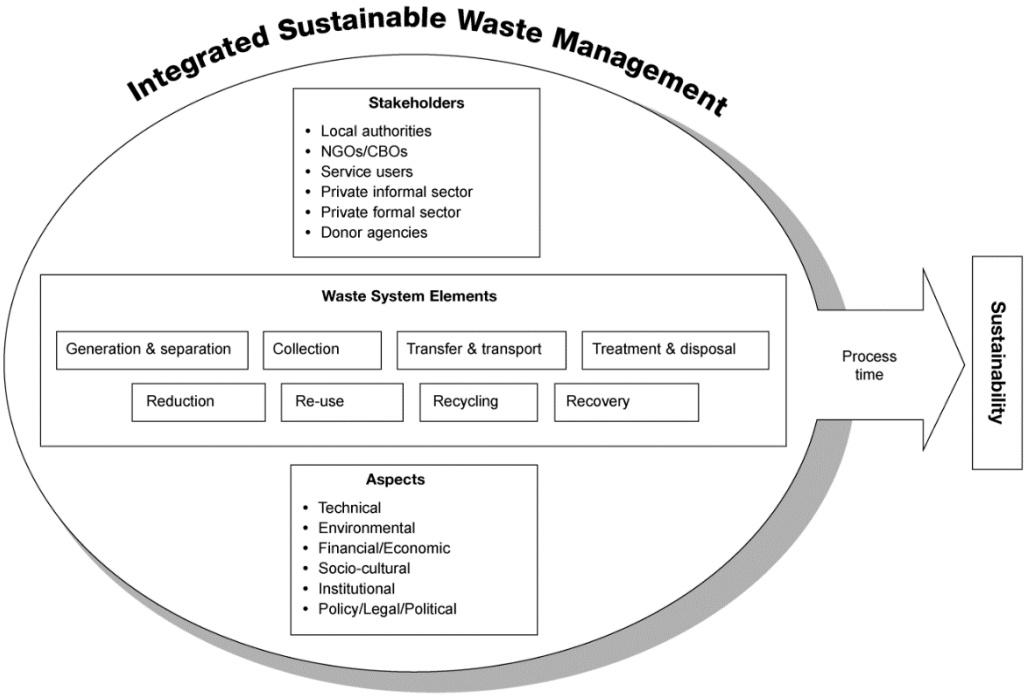


Figure 1: ISWM model (WASTE, 2010)

Integrated Solid Waste Management has also three major dimensions to focus on being, the practical and technical elements of the waste system, the aspects of the local context that should be taken into account when planning a waste management system and the stakeholders involved in the waste management (Scheinberg, Klundert, & Anschütz, 2010).

2.3.6 Waste system elements

Integrated Solid Waste Management points out that the whole life cycle for materials are important in waste management, from the mining stage via processing, production and consumption to final treatment and disposal. The high profile elements are collection, transfer and disposal or treatment, but as important are waste minimization, reuse and recycling, and composting.

2.3.7 Integrated Solid Waste Management Aspects

The Integrated Solid Waste Management concept points out different aspects, or lenses, through which the solid waste management system can be assessed, or a new system can be planned. The weight is not only put on technical and financial aspects of the system, but also environmental, social, health, legal, political, institutional and economic aspects are analyzed. This approach ensures that all the local issues affecting waste management in a specific area are taken into consideration.

Participatory approach and the involvement of stakeholders is the most important dimension in ISWM, and also the issue of most relevance for this essay (see next headline). Stakeholders are persons or organizations that have an interest in a cause, in this case waste management.

The municipalities with the general responsibility for urban cleanliness and the households using the system are always stakeholders in waste management. The local authority have several roles, they should be policymakers to legitimize and support the roles of community and micro- and small enterprises (MSE), support and participate in information campaigns, and providing reliable disposal facilities. Households can have different socio-economic and gender characteristics, but have a very important role in garbage storage and collection, recycling, re-use and disposal. They have both an individual responsibility and a collective responsibility together with the community. Beside these two groups the stakeholders can vary between towns. One primary group though, is MSEs and Community Based Organizations (CBOs). The groups can differ in characteristic which influence their waste activities. MSEs can vary in orientation towards services, production, or values, while CBOs can have variations in communication structure and legitimacy. According to the ISWM the roles of CBOs is to mobilize the households, to supervise performance by service providers and to coordinate waste management activities, including the local authority. Other stakeholders in the community may be active as waste generators or waste service users. It can also be the formal or informal sector that trade with used items or initiators of awareness raising campaigns. This is making the community very complex. They have all different interest in waste and the aim for ISWM is to make them co-operate to improve the solid waste system (Scheinberg, Muller, & Hoffman, 2017).

Local authorities used to have the only responsible for providing solid waste management. They did everything from physical infrastructure, institutional framework to everyday services. This is not always the best solution for developing countries according to Scheinberg, Muller, & Hoffman (2017), when the authorities

can only provide waste services for a smaller part of the city, while other have no service at all. Structural adjustments and fiscal discipline are imposing strict limits on governmental funds, restricting expansion. An expanding urban population demands traditional and new services, but the authorities are less and less able to provide it.

When local governments are lacking money to provide a sustainable service, well managed privatization can increase the capacity for the government to provide a reliable service to all residents. Private businesses often have the capital to make investments in equipment that the municipality lack and have also the knowledge about the neighborhood so they can provide a suitable service (Scheinberg, 2018). Integrated Solid Waste Management promotes encouragement of micro firms and to get involved in the recycling sector. This sector is important because it reduces the volume of waste and avoids the disposal cost, it can also make an income for poor people.

Micro- and small enterprises are often informal. When using MSE, ISWM promotes to give the MSE recognition and formal status. This creates a formal management and control the relationship between the government and the MSE. Another step to take is to institutionalize the MSEs and CBOs in waste management by making long term plans based on the integration of their services (Scheinberg, 2018). ISWM wants to see MSEs as building blocks in an urban privatization strategy that gives the municipality the opportunity to create a more sustainable and integrated approach. (Scheinberg, 2018).

It is understood through experience that consultation with actors concerned is likely to result in sustainable, widely supported activities. To form this kind of partnership it takes at least two parties, the authority and the community. The local authority is

important because they make the rules and frames in which the partnership can operate. The community contains of several different groups as, people, households, businesses and organizations that have different stakes. The ISWM concept means that through information and awareness-raising, organization and participation, the neighbourhood communities can play significant roles in waste management, as long as the authorities provides a supportive context. The partnership can also result in a combination of different types of waste systems that is more likely to meet the demands of the residents. It can also give jobs and income opportunities among waste collection and recycling, and the community is more likely to be positive to the system and cooperate when they are a part of it. To increase the sustainability in the waste management system it is also important to have a fair pricing on the waste services, but also to calculate the costs and investigate how much the waste generators are willing to pay. This includes both when entrepreneurs are contracted by the local government and get paid to do a service, and the collection fees (Scheinberg, Muller, & Hoffman, 2010).

Several studies have been made on solid waste management in African countries. Most of them have been carried out in big cities like Dar es Salaam and Kampala. Common for the cities is that the solid waste is a big problem and the local authorities have failed to handle the solid waste problem. Increased urbanization and a change in the composition of waste have made the situation even worse. One way to handle the problem for the authorities has been to privatize all or parts of the solid waste service. In that way it has shown in some cases that the service becomes better and others than the authorities takes the cost. Community Based Organisations have also been a very important actor carrying out services. Common for the places

studied has been a lack of cooperation between the authorities and the residents, making the arrangement unsustainable.

2.3.8 Plastic Waste Collection

Tsiboe and Marbel (2016), linked the mode of collecting Plastic waste of households in categories;

Waste Management Department (WMD) curbside taking trucks directly outside each household on a calculated base. The method was outlined on a weekly base, which comes with high-income residential areas like Roman Ridge, Airport and Cantonment, by compactor trucks.

WMD collect from communal containers where the people bring their waste. The bases of low-income earners like Nima and some surrounding community inspired this idea. Nonetheless, households which could not afford the house collection service took their Plastic waste to these communal containers and from spanning from there, WMD collected the waste and further disposed them at the landfill sites (Stephens et al 2015) cited in Tsiboe and Marbell (2016).

Door-to-door collection services designed for middle level income earners like labadi and its surroundings.

Anomanyo (2016), indicated that for the sake of efficacy and efficiency in collecting Plastic waste, the Accra Metropolitan Assembly (A.M.A) divided the city into two waste collection districts and waste management firms were introduced to do the collection. Almost fifteen waste collection firms were employed and they include; Liberty Waste Service Company, Vicma Waste Construction, Ako Waste Management Limited, Gee Waste Limited and Daben Cleansing Construction Services Limited.

The focus of the use of vehicles by A.M.A was compaction and skip trucks. These

Plastic wastes were taken directly to the disposal sites where there are no stations of transfers. The Plastic waste collected on the sites and in the cities are carried both on franchise and are on contract basis, where there is a station where these are stationed in the cities and carried on the franchise, on house to house collection done in areas of tagged with people with high income frequency. The contractors pay tips to AMA for the use of the use its dumpsite. The user fees are charges forming about 20% of the general services to the beneficiaries whose waste are conveyed. Taking grounds, on contract bases, waste contractors were paid by AMA to perform both block and communal container collection, where block collection occurred in the middle level income communities like Dansoman, Adabraka, Kaneshie and other.

Checking, about 75% of waste management generated are collected in these areas and skipped by the central residents' areas like James Town, Nima and other parts of Nsawam where houses were not well planned with poor or even no access roads (third class areas). The spaces of the markets too are covered under these arrangements. Residents deposit their waste produce in such areas and the frequency of the collection was once in a day. The waste generators waived the user fees. Regardless of the implementing strategies, there are forms of the collections in Nsawam where there is maximum of waste to be collected.

Per KMA (2015), there are defined modules of the collecting waste in the Kumasi Metropolis. These are house-to-house and communal collection. In concession of the Assembly, Aryetey Brother Company Limited (ABC), Waste Group Ghana Limited (WGG), Sak-M Company Limited (SAK-Mo Meskworld Limited (ML) and Kumasi Waste Management Limited (KWML), were made aware to check on the collection of waste. In the course of this, about 33% of the population enjoys the service declining payment for the services in its irregularly form and composure.

Additionally, the communal collection was awarded to Kumasi Waste Management Limited (KWML), Waste Group Ghana Limited (WGG), Meskword (ML) and Aryetey Brother Company Limited (ABC). The total quantities collected were weighed at the disposal site and payment was staged on a rate of GH¢ 9 per ton. Qualifying, the assessment is spanned on two focus housed on AMA and KMA. These are door-to-door or house-to-house collection and communal collection, which are carried out, in the high class and low class residential areas respectively. These nonetheless, the door-to-door collection tenders on not favoring the poor or low-income earners since it costive in its way. Akin, collecting waste materials in these areas tender to be less. The tendency is leveled on residents to dump the Plastic waste indiscriminately and at places which are unauthorized of the poor collection and how costly it takes in its entirety.

However, to use this as a means of checking the residents in the cities like Nsawam, it could be typically misleading; this is due to the fact that, the living standards of the people slaps their very existence as cited by Stephen et al (2015) and accentuated by Tsiboe and Marbell (2016). Here, Tsiboe and Marbell (2016) critically dug the extension and the exceptions of this before finally giving in the will power and ability to pay for the collection of services should there be a consideration exchanged.

2.3.9 Waste Management Regulation and Policy

The Ministry of Local Government and Rural Development (MLGRD) (2016), general waste management in Ghana is the responsibility of the MLGRD, with the proportions of checking on the decentralized Metropolitan, Municipal and District Assemblies (MMDAs). Nonetheless, the ministry indicates that, the regulation authority is given some form of power in the Environmental Protection Agency

(EPA) joined squarely around the auspices of the Ministry of Environment and Science. The Metropolitan, Municipal and District Assemblies given the mandate and power for the collection of Plastic waste via the means of Waste Management Departments (WMDs) and their Environmental Health and Sanitation Departments (EHSD).

The developed policy manual guiding the management of critical Plastic and radioactive waste includes the Local Government Act (2015), Act 462, the Environmental Protection Agency Act (2015), Act 490, the Pesticides Control and Management Act (2016). Act 528, the Environmental Assessment Regulations 2019, (LI 1652), the Environmental Sanitation Policy of Ghana (2019), the Guidelines for the Development and Management of Landfills in Ghana, and the Guidelines for Bio-medical Waste (2016).

Timing, all these Acts and regulations were 'coughed' from the folds of the National Environmental Action Plan (MLGRD, 2016). The Ministry has published the National Environmental Sanitation Policy (NESP) since May 2019. The scope of the policy looks at the basic principles of the environmental sanitation constraints and the role assigned to communities, ministries, departments and agencies and the private sector, spans on the management of the environment and the protection thereof. The legislature and the law enforcement, their scope of criterion for the specifying of the intended services, programs, funding, equipment and supplies. Extending from the diverse, the National Sanitation Policy, the MLGRD, turned out to be the logical and developed technic in checks of the document titled; 'The Expanded Sanitary Inspection and Compliance Enforcement (ESICOME) Program guidelines. MDDA implements the program guidelines ritually followed at quadrupled checks, which are effective environmental health inspections, dissemination of sanitary information,

and pests/vector control and law enforcement. The intended inputs of MMDAs were to develop the plans of the waste management and environmental health to tender on solving the numerous sanitation problems. More often than not, , the National Environmental Sanitation Policy Co-ordination Council (NESPoCC), is concerned with checking the policies for effective management of the communication and cooperation between the diverse installed agencies in the environment geared towards their respective districts (MLGRD**,** 2016).

The indications pined by the ministry of health indicates efforts chalked to address problems emanating from waste management where the government in her attempts, has place some sort of national policies and regularities in place for the institutions to be working effectively. Because of this, the Environmental Sanitation Policy (ESP) was formulated in 2019. The policy is linked to the current amended strategic plan manned for the implementation of the scoping, where various concerned legislations of the controls installed to enact the purpose of intense, hence, management of Plastic waste.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The current chapter is centered on the research methodology. Thus, the research design, approach, population of the study, sample size as well as the sampling technique have all been discussed in this chapter. Again, the instrument used for data collection has also been described as well as the analytical tools which will be used to analyze the data collected from the field.

3.2 Study Area

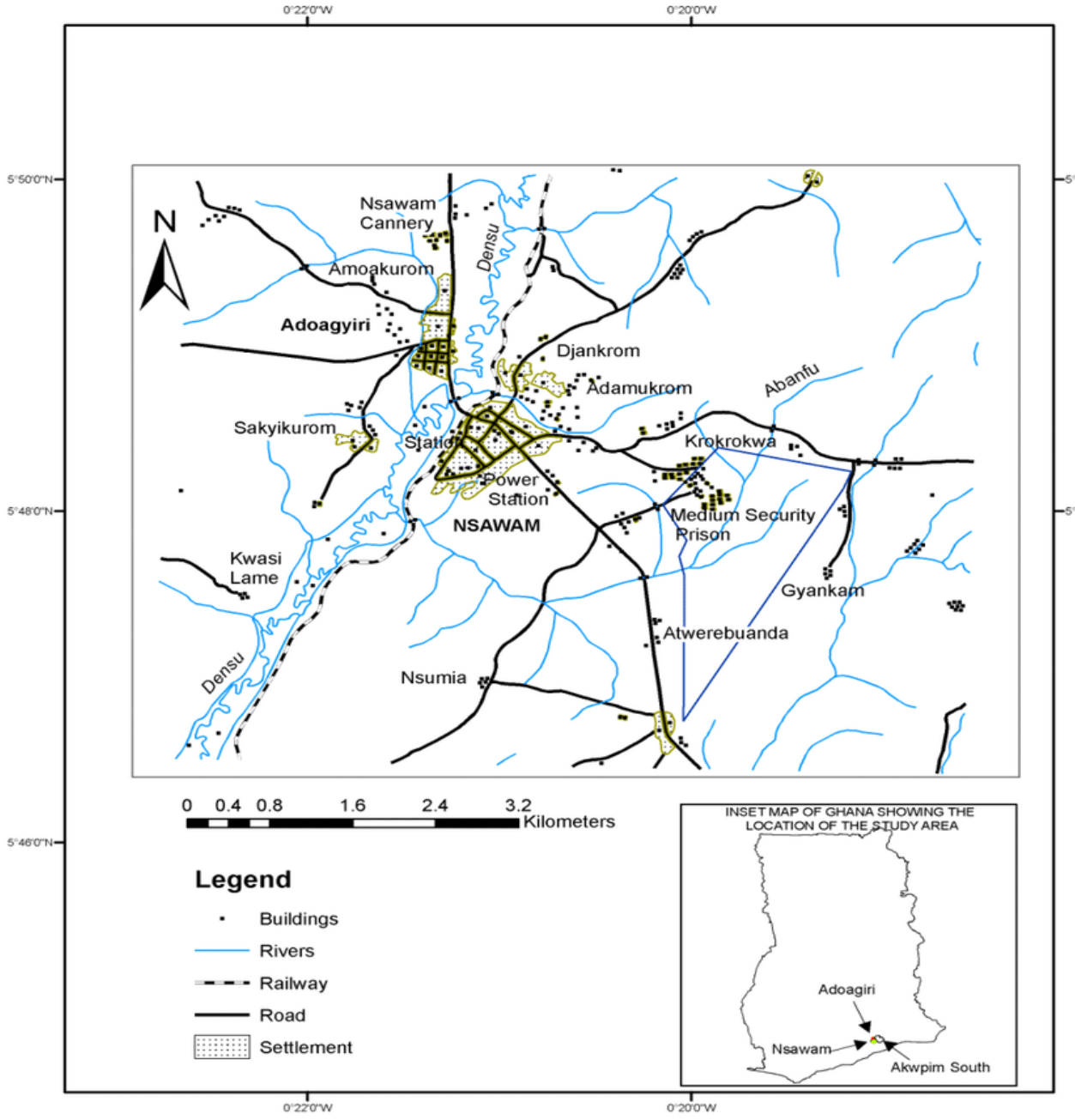
Nsawam Adoagyiri Municipality is located approximately 23km from Accra, the national capital. It is situated in the South Eastern part of the Eastern Region between latitude 5.45'N and 5.58'N and longitude 0.07'W and 0.27'W and covers a land area of about 175 square kilometre. In terms of spatial interaction, it is boarded to the

North by Suhum Municipal Assembly, to the south by Ga West Municipal Assembly, to the west by West Akim District, and to the East by Akuapem South District

The proximity of the Municipality to Accra and Tema is a potential for development. For instance, the Accra–Tema conurbation provides the single largest market in the country and provides ready market for farm produce and industrial products from the Municipality. Thus, the Municipality, for instance, can focus on market gardening in agricultural development. The Municipal capital, Nsawam is a gap town along the main highway linking the coastal lands to the Northern part of the country that is the Accra–Kumasi Road.

The population composition by age and sex influences fertility, mortality, migration and other demographic processes that underline population growth and ultimately socio-economic development. This section discusses the population in the Municipality by age, sex and locality. Nsawam Adoagyiri Municipality has a population of 86,000, comprising 42,733 (49.7%) males and 43,267 (50.3%) females. Urban population constitutes 50,864 (59.1%) whilst rural is 35,136 (40.9%). The Municipality is densely populated with a density of 465 persons per square kilometres.

Figure 2.0 Map of the Study Area



Source: Ghana Statistics Authority, 2020

3.3 Method

3.4 Research Design

Creswell (2017) opined that the choice of a research design should be done considering the various objectives that have been stated for the study. In view of that, considering a study that seeks to determine the effect of one variable on the other, the

quantitative approach has been employed. This was chosen based on the grounds that quantitative research enabled the researcher to quantify the various variables used in the study and more particularly because the study is quantity bias. This will also make it easier to draw conclusions and make recommendations that will be practical for the study.

A research design can be defined as the blueprint based on which a study is developed. The research design acts as the directional map for the study. The study employed the use of the descriptive design since the researcher intended to describe the views of the respondents pertaining to the variables of the study. Furthermore, the descriptive design allows the researcher to give better meanings to the variables instead of relying solely on numbers without any explanations. Besides, the survey design was also employed. This is prudent based on the ground that the study is quantitative, hence pieces of questionnaires were designed as the main instrument for data collection.

3.4.1 Population of Study

The population of the study comprises all residents of Nsawam Market area as well as the staff of Nsawam Municipal Assembly, in all, there were 621 resident members. The Nsawam Adoagyiri Municipal Assembly was selected based on the fact that they are responsible for the management of waste. On the other hand, the firm was opened to the research which also informed the decision to use them for the study.

3.4.2 Sampling procedure

In a research study, it is almost impossible to select the whole constituents in an organization. In view of that, it has become expedient to select a sample out of the

population, out of which the results from the sample selected will be used to represent the entire population. Three (3) respective offices of Nsawam Municipal Assembly were selected. In all, 40 respondents were targeted. This was done using the convenient sampling technique. Thus, inhabitants who were willing to participate in the study were selected.

3.4.3 Data Collection Tool

Based on the fact that the study was approached quantitatively, questionnaires were used as the main data collection tools. These questionnaires were developed based on the objectives that have been set for the research. Besides, the researcher also sourced questionnaires from other researches to develop this new questionnaire used in this study. Considering the objectives of the study, questionnaire was grouped into three main parts. The first part was concentrated on the demographic variables of the respondents; this was followed by items relating to the waste management practices of the organization. The final part of the questionnaire was skewed to the enquiring about the challenges facing waste management. The questionnaires were close ended as they allowed the respondents to choose from a list of options given to them. Again, the researcher ensured that the questionnaire was not that voluminous in order not to frustrate the respondents and also not to take too much time in responding to the questions.

3.4.4 Data Collection Procedure

One of the most difficult aspects of a thesis research has got to do with the data collection. The researcher thus faced some key challenges in collecting the data. First of all letters were sent to the various branches that were sample for the study to

ensure that they understood the purpose of the research and also to ensure that they are willing to participate in the study. This was also very necessary based on the fact that a place such as AMA is a very busy area and that it was very prudent that permission will be sought from the organization since we will be contacting their staff as well as their customers on site.

In view of that, letters were sent to the organization. As soon as the firm showed consent that they were willing to participate in the study, the research prepared the survey questions to send. The questionnaire was then distributed to the respondents with the help of three other customers who helped with the data collection. In all, twenty respondents were targeted. The entire data collection process lasted for two months thus the month of March 2020. The respondents were given aid as to laces where they faced some issues with some of the words used in the questionnaire. After this, some of the staff officials were also sampled as stated earlier and questionnaire pertaining to their social media practices as an organization.

3.4.5 Data Analysis

The Statistical Package for Service Solutions (SPSS) 20th version as well as Microsoft excel was used for data analysis. All the variables item measures were first totaled and then averaged for individual participants. The gender of the participants was entered as dichotomous variables (a variable that places responses into only two groups) such as Female = 1, Male=2), and participants' age, number of years they have transacted business with the firm. Descriptive statistics was used to analyze the data collected from the field, thus bar graph and histogram were employed to describe the data received.

3.5 Ethical Consideration

The study thought it necessary to apply some ethical principles in the data collecting process. The APA (American Psychological Association) enshrined some ethical standards in order to serve as a guide for most of the situations psychologists face in conducting research. As indicated in the ethical code, researchers are supposed to make known to participants the purpose of the research, how long it is going to take as well as their freedom to either participate or decline from the study. In other words, no form of cohesion should be employed by psychologists in getting their participants to partake in the study. In accordance to the guideline stipulated above, the current study applied methods to ensure that these were duly followed. That is, participants concern was sought and the overall purpose of the research explained to them to help them make informed decisions about their participation. They were also made aware that their participation was voluntary and that any information provided by them is held confidential and would not be shown to any third party. In conclusion, the phone number of the researcher was made available to participants to call should they have any enquiries to make about the study or concern for privacy of information.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results of the study. Furthermore, the chapter also shows the discussion of the results based on literature. Firstly, the demographic respondents of the targeted sample are presented; this was done for the officials of the Nsawam Adoagyiri Municipal Assembly's Health and Environmental Unit as well.

4.2 Demographic Data of Respondents

The socio-economic characteristics of respondents considered in the study included their gender, age, level of education, household size, occupation and their average monthly income. Banda (2011) reported that the income, education and the age of households influenced their willingness to pay for improved solid waste collection.

4.3 Age of Respondents

The study findings show that 4 respondents, representing 10% were from the age group between 20 and 30 years. 22 respondents also representing 55% were from the age group 31 and 40 years. 12.5% being 5 of the respondents were from the age group between 41 and 50 and 9 (22.5%) were from the age group between 51 and 60 years. A large number of the officers were from the age group between 31 to 40 years. Table 4.1 illustrates.

Table 4.1 Respondents' age (N=40)

Age of the Respondents	Frequency	Percentage (%)

20 to 30 years	4	10.0
31 -40 years	22	55.0
41-50 years	5	12.5
51-60 years	9	22.5
Total	**40**	**100.0**

Source: Field data, 2020

4.4 Gender of Respondents

The study involved a sample of 40 (100%) respondents who filled the questionnaires. 21 (52.5 %) of total respondents were male and 19 (47.5 %) were female. The results in the table below reveal that there was a slight difference between male and female respondents.

Table 4.2: Respondents' Gender

Sex of the Respondents	Frequency	Percentage (%)
Male	21	52.5
Female	19	47.5
Total	**40**	**100.0**

Source: Field data, 2020

4.4.1 Marital Status of Respondents

Marital status was considered as an important element to consider during this study. The findings revealed that 6 (15%) of total respondents were single whiles 34 (85%) were married. No respondents were from the group of divorced and widows. In Table

4.3 the figures revealed that there was huge difference between married and single respondents during this study.

Table 4.3 Marital status of the respondents

Marital Status	Frequency	Percentage (%)
Single	6	15.0
Married	34	85.0
Divorced/divorcee	0	0
Widow/ widower	0	0
Total	**40**	**100.0**

Source: Field data, 2020

4.4.2 Level of education of Respondents

The study found that 2 (5%) had a qualification of certificate. 3 (7.5%) were a diploma holder. 20 (50%) of respondents were university graduates and 13 (24%) were masters' degree holders. only 2 (5%) of the respondents were having PhD and postgraduate diploma respectively. Therefore, the statistics indicate that all categories of education were present at the selected area of study. However, many respondents were those who had bachelor and masters' degree**.** Table, 4.4 illustrates.

Table 4.4 Respondents' education level

Education Level	Frequency	Percentage (%)
Certificate in Waste Management	2	5.0
Diploma	3	7.5
University degree	20	50.0
Master degree	13	32.5
Others	2	5.0
Total	**40**	**100.0**

Source: Field data, (2020)

4.4.3 Tenure at Organization

Respondents were asked to state their work experience with their current organizations. The study statistics indicate that 18 (45%) worked with their current organizations for the period of less than four years. 11 (27.5%) worked between five and ten with their current organizations. 2(5%) worked with their employer between 11 and 14 years. 9 (22.5%) worked with their employer for more than 14 years. Therefore, the statistics shows that most of the respondents were new to their employer.

Table 4.5 Respondents work experience

Work experience	Frequency	Percentage (%)
Less than 4 years	18	45.0

Between 5 and 10 years	11	27.5
Between 11 and 14 years	2	5.0
Above 14 years	9	22.5
Total	**40**	**100.0**

Source: Field data, (2020)

Demographic Data of Junior Staff

The table reveals the demographic data of the staff;

Table 4.6 reveals the demographic data of the staff. The data above shows that a majority of the respondents were females (32, 61.54%). Furthermore, the data showed that most of the respondents had attained tertiary education (17, 34%). The data shows that a majority of the respondents were Christians (33, 63.46%) and having an average household of 5 to 7 in terms of size.

Table 4.6: Demographic Characteristics of the sample

Frequency statistics for Respondents			
Variables	**Items**	**Frequency**	**Percentage**
Gender	Male	20	38.46
	Female	32	61.54
Age	36-40 years	9	17.31
	46-50 years	15	28.85
	50-56 years	14	26.92
	Above 56 years	14	26.92
Education Status	None	4	8.00
	Basic	15	30.00
	SHS	4	8.00
	Tertiary	17	34.00
	Non-formal	10	29.00
Religion	Traditional	7	13.46
	Christian	33	63.46
	Muslim	12	23.08
Household Size	2-4	17	32.69
	5-7	21	40.38
	8-10	12	23.08
Marital Status	Married	5	10.00
	Single	11	22.00
	Divorced	21	42.00
	Widow/Widower	13	26.00

Source: Survey data, 2020

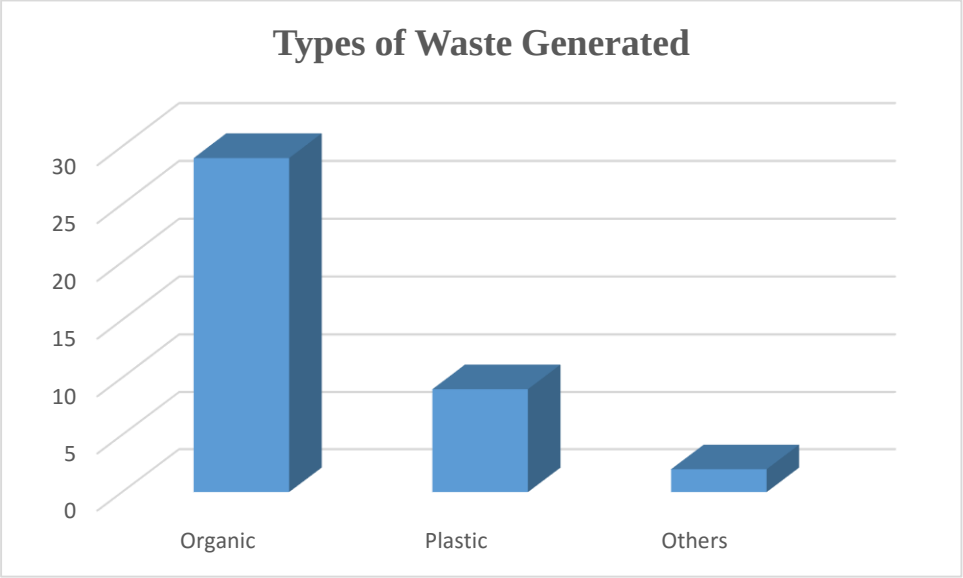
Descriptive Analysis of Results from Respondents

The approaches identified as modes of disposing solid waste usually have serious public health hazards - respiratory diseases from polluted air as reported by Owusu-Sekyere (2013). Households that adopt these modes usually complain that the sites are too far away from their houses as reported by Ballam (2018) and in some cases they do not have at all, hence they adopting these alternative modes of disposal.

Types of Waste generated

The study was interested in identifying the types of waste generated. The results of the analysis have been displayed.

Figure 3. Types of Waste Generated



Source: Field Data, 2020

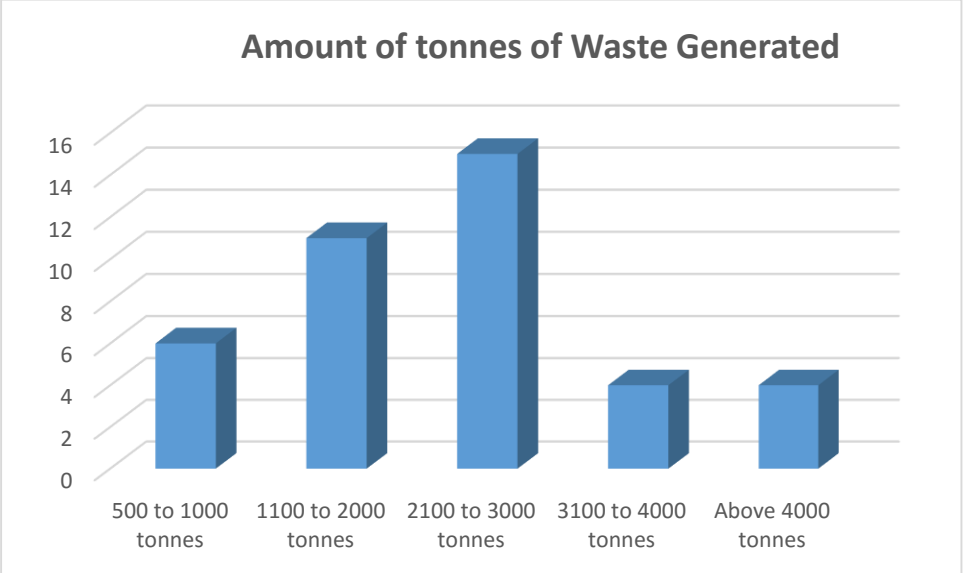
From the figure, it is very evident that the most dominant among all the types of waste generated is organic. Thus waste coming from food substances remains the most dominant of all the forms of waste generated in Nsawam. Thus as many as 29

respondents attested to this. On the other hand, 9 of the respondents noted that plastics waste was the most dominant followed by 2 respondents who also though that it was other forms of waste that dominated the study area.

Amount of Waste Generated by the People of Nsawam Adoagyriri

In order to determine the amount of waste generated in Nsawam, the respondents were given options to select from. The results of the analysis have been displayed below:

Figure 4. Amount of Waste Generated



Source: Field Data, 2020

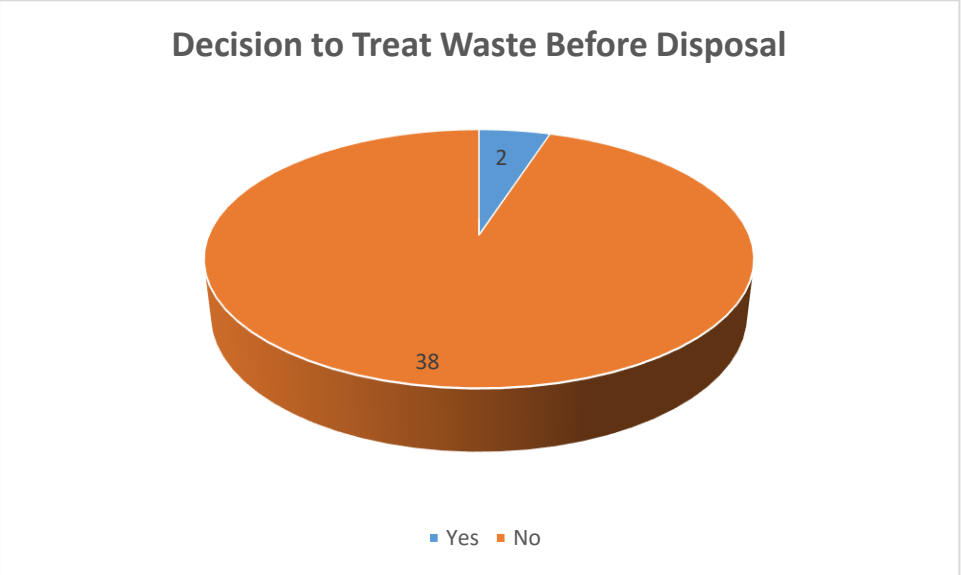
From the figure above, it is very evident that most of the respondents indicated that the total amount of waste generated in Nsawam per month is between 2100 to 3000 tons. This was attested by 15 respondents. On the other hand, 6 of the respondents mentioned that the amount of waste generated is between 500 to 100 tons per month. Again, the data shows that 4 of the respondents equally agreed that the amount of waste generated is 3100 to 4000 tons and above 400 tons as well. A majority of the

respondents were of the opinion that the amount of waste generated in Nsawam is at least above 1000 tons per month.

Treatment of Waste before Disposal

Further, the study sought to determine the percentage of respondents who treat their waste before disposal. The findings obtained have been presented in the pie chart:

Figure 5. Treatment of Waste before Disposal



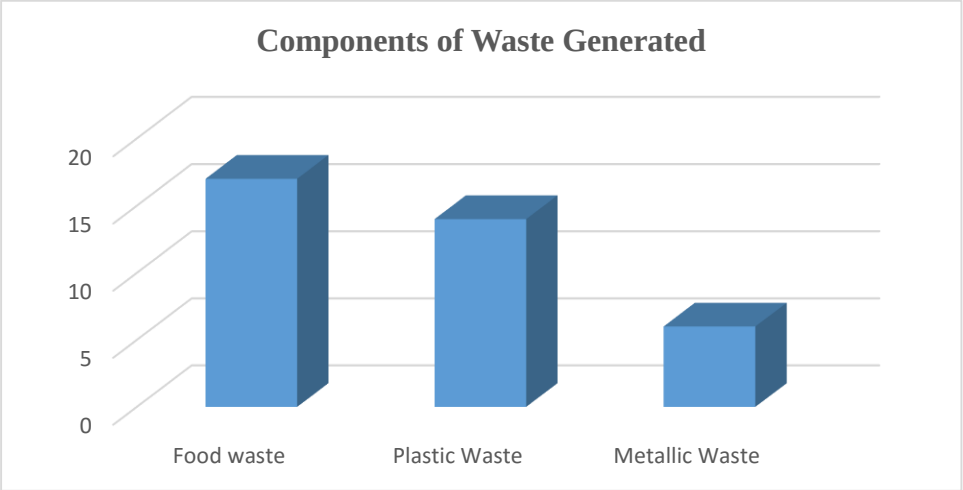
Source: Field Data, 2020

It is evident that a majority of the respondents (38) do not treat waste before they are disposed. The respondents further asserted that the reasons why they do not treat waste before disposing it is due to the fact that it takes much effort. Others also pointed out that it is because they do not have the required tools and machines to do that. Others further pointed out that it is the responsibility of the waste collection companies or units to do that.

Major Components of Waste Generated

It is evident that as many as 17 of the respondents mentioned that food waste is the most dominant of all the components of waste. This was then followed by plastic waste which 14 of the respondents mentioned. Besides, 6 of the respondents mentioned that metallic waste was also common.

Figure 6. Components of Waste Generated



Source: Field Data, 2020

Where Waste Is Disposed off

After identifying the various forms of waste generated, it was key to also determine the places where such waste is generated. The results of the analysis have been displayed below:

Figure 7. Where Plastic Waste is Disposed

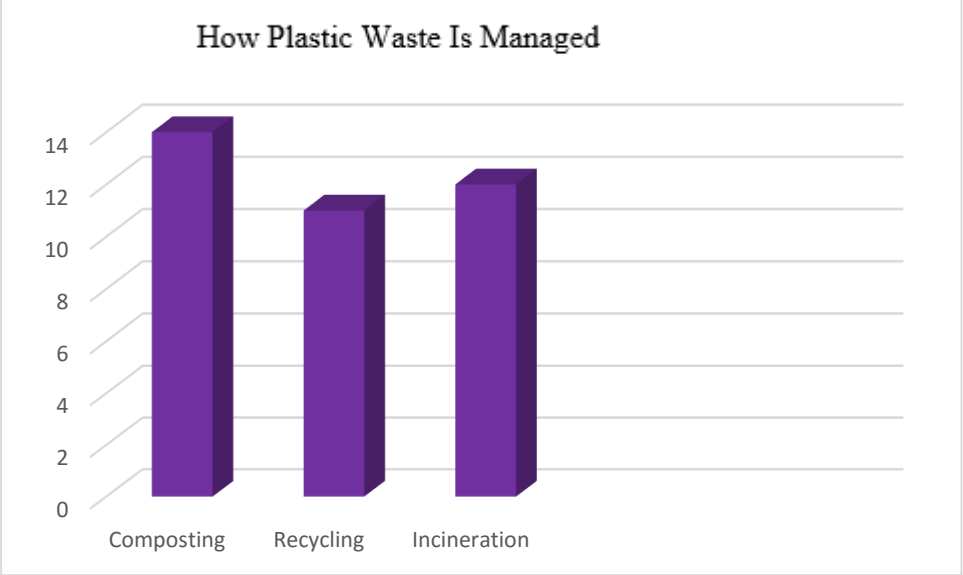
Source: Field Data, 2020

From the figure, it is evident that the common ways in which waste is disposed off is by dumping them into the communal waste containers supplied by the Nsawam Adoagyiri Municipal Assembly through Zoomlion Ghana Ltd. This was confirmed by as many as 14 respondents. This accounts for the odor mostly experienced at the sea sides. Again, the figure also shows that some of the wastes are burnt on parks (12) whiles others are dumped at deserted places (11). Finally, others are also buried underground (3).

Methods Used in Managing Plastic Waste

It was also important to determine the ways in which plastic waste are managed, the figure below shows a pictorial view of the responses:

Figure 7. How Plastic Waste is Managed.



Source: Field Data, 2020

From the figure, it is evident that composting is considered as one of the key ways in which waste is managed. On the other hand, it was also evident that incineration is the second highest mode in terms of how waste is managed. This is followed by recycling.

Problems Facing Plastic Waste Management

In order to ascertain the problems facing the management of plastic waste, the respondents were given options to choose from as well as open ended question to further explain.

Figure 8. Problems Facing Plastic Waste Management

Source: Field Data, 2020

From the figure, it is very clear that the lack of adequate personnel to manage the waste in the country remains the number one problem facing the country (14), this if followed by the fact that people have a very bad attitude towards the management of waste (12) and then the lack of plastic waste management resources (11). It is very evident that even if there are very good plastic waste management resources in the country, so far as people have a bad attitude towards plastic waste management, the problem will still persist.

Resolving Plastic waste management Problems

The final question on the questionnaire sought to determine the solutions to the plastic waste management problems being faced by the people of Nsawam. The results have been displayed below:

Figure 9. Resolving Plastic Waste Management Problems

Source: Field Data, 2020

From the figure, it is evident that most of the respondents (12) were of the opinion that waste can be better managed when sanctions are placed on offenders who dispose waste off unlawfully. Again, a section of the respondents (11) pointed out that the best way to handle respondents is to embark on a plastic waste management education campaign. Besides, the data also showed that the increase in personnel will help solve the issues.

Table 7: Waste Generated by the People of Nsawam Adoagyiri

Question	Response
How much revenue do you generate in a month	Average of Ghs 73,800
How much do you spend on plastic waste collection	Average of Ghs 17,821
How much do you spend on acquiring plastic waste management equipment	Average of Ghs 7,000
Amount spent on maintaining plastic waste management equipment.	Average of 2,500
How much common fund did you receive last year	Less than 300,000
How much of that is spent on plastic waste collection	93% of the fund received
How much of that is spent on acquiring plastic waste management equipment	47% of the fund received
Challenges of managing plastic waste	Revenue Generation, Technology, Skilled Staff, Mindset of Citizenry

Source: Field Data, 2020

From the table, it is evident that the institution generates an average of 73,800 cedis worth revenue in a month. Again, the firm spends an average of 17, 821 cedis on plastic collection. The data also reveals that 7,000 cedis is spent on acquiring plastic

waste management equipment whiles 1,500 cedis is spent averagely on maintaining plastic waste management equipment. It was also revealed that fund received last year was below 300, 000 cedis out of which 93% is spent on plastic waste collection and 45% spent on acquiring plastic waste equipment. The most challenges faced by the organization include technology to be used to manage the waste, skilled staff, revenue and the mindset of the citizenry.

Concerning how these challenges can be overcome, he pointed out that:

> *"For now, what we need two things to overcome these challenges, that is, the injection of capital in order for us to do what we have to do and the public education of Ghanaians pertaining to this"*

Besides, about the state of plastic waste management in the municipality. The officer mentioned that:

> *"The current state of plastic waste management is not the best at all, it has yielded several issues that it is not supposed to"*

In terms of their greatest challenged, he asserted that:

> *"From time immemorial, our greatest challenge has been the attitude of Ghanaians pertaining to waste management. You see, we do not have the funds as we ought to have them and so when the citizens also portray negative attitude towards it, it really becomes a worry"*

For the key policies that the Environmental Health Department has in place to manage plastic waste in the Nsawam Adoagyiri Municipality. The officer opined that:

"For now, we are embarking on a national education policy campaign which is geared towards addressing the information needs by speaking to the general public about the need to maintain a good waste management attitude and how that will be beneficial to all"

As a department/secretariat, what long term strategic actions have your department/secretariat put in place to manage plastic waste in Nsawam Adoagyiri Municipality?

> *"Currently, we are in talks with government to determine what will be done in the long run, but what I can say for now is the fact that we are in talks with China for an aid concerning a technology that can help to manage waste that have been collected from the field, this will help us in monitoring of the level of waste as well as explore how they can be used"*

Discussion of Results

The study revealed that the management of waste is done at several levels and in several ways at various homes within Adoagyiri. Momoh and Oladebeye (2018), in exchange of recycle is viewed on the veritable conceptions in the extent of minimizing amounts of households Plastic waste in the trailing of the dumpsites. The arguments span the need to extract raw materials for industries. In the scope of this, it is critically evident that, being efficient and effective in the methods of the Plastic waste management has been checked. However, in the course of this is not related to cost effective mechanism in a country like Ghana. The United States Environmental Protection Agency (USEPA) (2019), recommended recovery for recycling as one of the effective waste management techniques.

Kreith (2017), included in his quest that, recycling is the most positively concerned and doable of all the waste management options. In his quest, the return of the raw materials by separating reusable products from the rest of the municipal waste management flow. The benefits of recycling are enormous and it was perceive that, the concern saves finite resources, lessens the needs for mining of materials which

are untapped, further tenders on lowering the impact of environmental and processing. For this reason, the Institute of Waste Management cited by Tsiboe and Marbel (2018), UK, contends with only 11% of the households waste in Spain and Italy where it is just 3%, Netherlands 43%, Denmark 29%, and Austria 50% respectively. Having made these reservations by many authors, it is opted as the best option for the management of Plastic waste in modern times where the cost of it has to be forgotten and especially about the component which is key in the installation of implementation of any projects on recycling project. On an external dimension, developed countries are unable to successfully do this but alternatively may be the best offer for the effectively managing Plastic waste in Ghana.

The composition of this uses microorganism in degrading the organic content of the waste management. The state of aerobic composition proceeds on higher notes and further converts the diverse organic materials in the same stable humus (Centre for Environment and Development, 2018).

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter outlines the summary of the findings from the data analyzed, this is followed by the conclusions arrived at, as well as the recommendations to policy makers.

5.2 Summary

The main objective of the study was to examine the management of Plastic Waste in the Nsawam Adoagyiri Municipality. The study was limited to the Nsawam Central Market. Data was collected from both primary and secondary sources. This was done by administering questionnaires to members of the public, environmental officers and staffs of the Nsawam Municipal Assembly. It was evident that the most dominant among all the types of waste generated is organic. Thus, waste coming from food substances remains the most dominant of all the forms of waste generated in Nsawam. Thus, as many as 29 respondents attested to this. On the other hand, 9 of the respondents noted that plastics waste was the most dominant followed by 2 respondents who also though that it was other forms of waste that dominated the study area. Again, the study also revealed that most of the respondents indicated that the total amount of waste generated in Nsawam per month is between 2100 to 3000 tons. This was attested by 15 respondents. On the other hand, 6 of the respondents mentioned that the amount of waste generated is between 500 to 100 tons per month. Again, the data shows that 4 of the respondents equally agreed that the amount of waste generated is 3100 to 4000 tons and above 400 tons as well. Thus, a majority of the respondents were of the opinion that the amount of waste generated in Nsawam is

at least above 1000 tons per month. It was also very clear that the lack of adequate personnel to manage the waste in the country remains the number one problem facing the country (14), this if followed by the fact that people have a very bad attitude towards the management of waste (12) and then the lack of plastic waste management resources (11). It is very evident that even if there are very good plastic waste management resources in the country, so far as people have a bad attitude towards plastic waste management, the problem will still persist. Again, that most of the respondents were of the opinion that waste can be better managed when sanctions are placed on offenders who dispose waste off unlawfully (12). Again, a section of the respondents (11) pointed out that the best way to change bad attitudes towards plastic waste is to embark on a plastic waste management education campaign. Besides, the data also showed that the increase in personnel will help solve the problem.

5.3 Conclusions

The study revealed that the main types of wastes generated in the municipality were plastic solid waste. This contributed 70% of the total waste generated. Plastic waste management has encountered many challenges in our world today. Waste infrastructure has failed to keep up with Ghana's economic growth, leaving its cities including Nsawam drowning in plastic trash. Streets and waterways in Nsawam are regularly inundated with single-use plastics such as shopping bags, pure water plastic bags, plastic takeaway food boxes, and water/soda bottles.

The main means of waste disposal by households in Nsawam Adoagyiri Municipality was disposed using bins. Disposing waste through the use of bin is considered the commonest ways of disposing off waste. Due to dysfunctional municipal waste

management services, residents in Nsawam regularly burn plastic waste in the open, releasing highly toxic substances such as dioxins into the environment.

5.4 Recommendations

By way of recommendation, it is very prudent that right from the national level, a more pragmatic policy direction be established to let everyone be aware of the direction the country is going so far as plastic waste management is concerned. This should be such that the information would be made privy to everyone within the country which will also be followed by several adverts and media coverage and announcements. This will help to create the necessary awareness of the policy and also allow for people to adopt and make behavioral changes to attitudes that do not auger well for plastic waste management.

On the other hand, it is also very important that the agencies, more specifically the Nsawam Municipal Assembly be given the required resources including machinery that will enable them perform their core operations effectively. This means that from the national budget, there is the need to have an amount of money separated for managing waste within the country. Also, there is the need for training to be organized for the various personnel at the Assembly level so that they will be equipped with the necessary ideas in managing plastic waste. This will also prove to be very important for the organization as they will not just be doing the usual plastic waste management practices but also be proactive about what they do in line with industry best practice. Again, it is very important that technology be employed in the management of plastic waste. This will enable the Municipal Assembly to fast track not just the collection of the waste, but also the disposal thereof. Again, this will come with some form of training for the staff. When technology is made to affect the management of plastic

waste, it will end up providing some form of revenue for the third party organisations as well as the country at large. On the other hand, it is very important that individuals change their attitude towards the management of waste. The throwing of rubbish into gutter among other very bad attitudes must be stopped. This will help the government immensely as it will also reduce how much should be spent on the management of waste in the country.

By way of enforcing the By-Laws at the Assembly levels to win the war against insanitary conditions, N.A.M.A should establish a Quasi-Sanitation Police Unit within their scheme of work with the power to arrest and prosecute. This will prevent the tendencies of culprits challenging or resisting citizen arrest when they commit sanitation related offence.

To ensure sustainability of the Public Policies and Programmes, the government should resort to more fine regime rather than jail terms. For instance, if offenders litter the streets or public areas are fine by the courts but are unable to afford, they should be made to do a communal labour for one (1) week continues or more whilst serving under Police custody. This among other things will help decongest the overcrowding prisons.

This will serve as a deterrent to people who dump indiscriminately. Added to the above, monies which would have been spent to manage plastic waste would be save to address other peripheral Problems associated with plastic waste management.

REFERENCES

Amfo-Otu, R., Debrah, W.E. Adjei, K. P. Akpah-Yeboah, S. (2012) *Willingness To Pay For Solid Waste Collection In Semirural Ghana: A Logit Estimation*, International Journal of Multidisciplinary Research, Vol.2 Issue 7, July 2012, ISSN 223 1 5780.

Banga, M. Lokina, R. B. And Mkenda, A. F. (2011) *Solid Waste Collection Services in Kampala City, Uganda.* The Journal of Environment Development December 2011, Vol. 20 no. 4, pp 428-448.

Basel Convention (2011) *Control of Transboundary Movements of Hazardous Wastes and their Disposal*. Designed and Printed by the United Nations, Geneva-GE 11-00459-July 2011-1500-UNEP/SBC/2011/4.

Boadi K.O and Kuitunen, M. (2016). *Municipal Solid Waste Management in the Accra Metropolitan Area*. Environmentalist Journal, Volume 23, No.3

Benneh, G., Songsore, J., Nabila S.J. Amuzu A.T., Tutu K.A, Yaugyuorn (2015) *Environmental problem and urban household In Greater Accra Metropolitan Area(GAMA)*. M.A.C. Stockholm, Ghana.

Cointreau-Levine, S. (2017) *Private Sector Participation in Municipal Solid Waste Management in Developing Countries*, Vol. 1: The Formal Sector, Urban Management Programme Policy Paper No. 13, World Bank, Washington.

Denison, R.A. and Ruston, J. (2016) *Recycling and Incineration*. Island Press, Washington D.C.

Dryczek, L. (2016) *Environmental Health Secrets*. Hanley and Belfus, Inc. p 26.

El-Fadel, M. (2017) *Environmental Impacts of Solid Waste Landfilling*. Journal of Environmental Management, Vol 50 No.1, pp 1-25.

Freduah G. (2015) *Problems of Solid Waste Management in Nima, Accra*. University of Ghana, Legon, Undergraduate Research, Journal for the Human Sciences, High School edition, vol. 12.

Foray J. (2016) *Solid waste management in Ghana*: Time to Act. www.africanrealityarticle/solidwaste-magement-in-ghana-time-to act42625122.html, Accessed on November 9, 2012.

Ghana Statistical Service, (2016) Population and Housing Census Report, 2010.

Gladding, T. (2017) *Health Risks of Materials Recycling Facilities. Environmental and Health Impact of Solid Waste Management Activities*, Macmillan Publishers, London pp53-72.

Glenn D. I. (2016) *Determining Sample Size*, Agricultural Education and Communication Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.

Gourlay, K.A. (2017) *World of Waste* (Dilemmas of Industrial Development). Second Edition Books Ltd., 57 Caledonian Road, London, pp 21-49.

Ian A. T. (2018) *Domestic Waste Management Strategies in Accra*, Ghana and Other Urban Cities in Tropical Developing Nations.

Intergovernmental Panel on Climate Change (2015) Summary for Policymakers, Emissions Scenarios. UNEP, ISBN: 92-9169-113-5.

Kreith, F. (2014). *Handbook of Solid Waste Management*. McGraw Hill, USA.

Kumasi Metropolitan Assembly (2012) *Domestic Waste Management Strategies and Implementation* in Kumasi 2009 – 2012.

McDougall, F. White P. Franke M. and Hindle, P. (2015) *Integrated Solid Waste Management:* A Life Cycle Inventory. Blackwell Science, London.

Mensah, A. (2015) FACT SHEET: *Solid Waste Disposal* (SWD) in Ghana.

MLGRD (2018) National Report for Ghana Waste Management 2009, 18th Section of United Nations Commission on Sustainable Development. www.un.org/National Reports/ghana). Accessed on 10th October, 2012.

Nyang'echi, G.N. (2016) *Management of Solid and Liquid Wastes*. A Manual for Environmental Health Workers. African Medical and Research Foundation.

Ogawa, H. (2015) *Sustainable Solid Waste Management in Developing Countries*.(www.gdrc.org.). Accessed on 20th October, 2012.

Ogwuche, J. andYusufu, A.F. (2011) *Assessment Of The Factors Influencing The Generation And Disposal Of Urban Household Solid Waste In Africa: The Nigerian Perspective* Department of Geography, Benue State University, Makurdi. Journal of Environmental Sciences and Resource Management, Volume 3.

Onibokun, A. G. (2015) *Managing the Monsters: Urban waste and Governance in Africa*. International Development Research Centre, Ottowa.

Oteng-Ababio, M. (2010b). *Missing links in Solid Waste Management in the Greater Accra Metropolitan Area in Ghana*. Geojournal, doi:10.1007/s10708 -010-9363-9O

Post, J. Obirih-Opareh, N. (2014) Partnerships and the Public Interest: *Assessing the Performance of Public-Private Collaboration in Solid Waste Collection in Accra*. Space and Polity, Vol.7, No.1, 45-63.

Puopiel, F. (2018) *Solid Waste Management In Ghana*: The Case of Tamale Metropolitan Area. Unpublished dissertation submitted to the Department of Planning, Kwame Nkrumah University of Science and Technology, Kumasi-Ghana.

Sekyere East District Assembly (2016) Sekyere East District Assembly Annual Report.

Sekyere East District Health Directorate (2017) Annual Health Report. District Health Management Team, 2007.

Shafiul, A.A. and Mansoor, A. (2019) *Partnerships for solid waste management in developing countries*: Linking theories to realities in the Institute of Development Engineering, Water and Development Centre (WEDC). Loughborough University, U.K.

Tchobanoglous, G. Theisen, H. and Vigil, S. (2017) *Integrated Solid Waste*: Engineering principles and management issues. McGraw-Hill Publishing company, USA.

Tsiboe, A. and Marbell Q. (2015) *An Analysis of Solid Waste Management in Accra*, Ghana. Masters Thesis, Roskilde University. pp 13-14.

United Nations Conference on Environment and Development (2017) Agenda 21. Report of UN Conference on Environment and Development (UNCED), Brazil.

United Nations (2010) United Nations Sanitation Report on Ghana. The Ghanaian Journal. Html.www.theghanaianjournal.com. Accessed on July 21, 2012

United Nations (2016) United Nations Sanitation Report on Ghana. The Ghanaian Journal.htm www.theghanaianjournal.com. Accessed on July 21, 2012

United Nations Environmental Programme (UNEP) (2009) Developing Integrated Solid Waste Management Plan Training Manual, Volume 2, Assessment of Current Waste Management Systems and Gaps Therein. Osaka/Shiga, Japan.

USAID, (2009) Solid waste: generation, handling, treatment and disposal Environmental Guidelines for Small-Scale Activities in Africa (EGSSAA)

United States Environmental Protection Agency, USEPA (1999) State and Local Solutions to Solid Waste Management Problems. (http://www.epa.gov). Accessed on 20th October, 2012.

United States Environmental Protection Agency, USEPA (2015) Towards Sustainable Management of Water Resources. World Bank Publications, Washington, ISBN: 13: 978-0821334133.

USPS, (2016) *Solid Waste Management Plan for Thimphu City*, Bhutan, Draft version, April 2000 .Bhutan: Urban Sector Programme Support Secretariat.

Vivor, B. Y. (2017) *Dimensions of Child Labor Legislation In Ghana*. Prepared For West African Health Organisation (WAHO) and Tulane University 8th December, 2019.

Wikner, E. (2019) *Modeling Waste to Energy systems in Kumasi*, Ghana. Sveriges lantbruksuniversitet publishing.

World Bank, (2016) *WHAT A WASTE: A Global Review of Solid Waste Management*, Hoornweg, D. and Bhada-Tata, P 68135 no. 15

Yamane, T. (2017) *Statistics: An Introductory Analysis*. 2nd Edition, New York: Harper and Row.

Zerbock, O. (2018) Urban Solid Waste Management: *Waste Reduction in Developing Nations*. www.cee.mtu.edu. Accessed on 20th July,2012.

Zurbrugg, C. (2015) *Solid Waste Management in Developing Countries*. (www.sanicon.net). Accessed on 10th October, 2016.

APPENDIX

Dear Sir/Madam

This voluntary survey is a part of my masters degree project work. My study is geared towards determining the state and management of waste in Accra. All the information you provide here will be held strictly **confidential**. No other person will have access to the information and all information will be used for academic purposes only. Please answer the following questions completely. It will take approximately 20 minutes for you to complete this survey. If you have any questions about this survey, please do not hesitate to contact me. Thank you for your time and participation.

Sincerely.

QUESTIONNAIRE

Section A: Background of the Respondent

1. Gender: Male [ ] Female [ ]

2. Age: Less than 30 Years [ ] 31-40 Years [ ] 41-50 years [ ] More than 50 Years [ ]

3. Marital Status: Single [ ] Married [ ] Divorced [ ]

4. What level of education have you completed?

Primary Certificate [ ] Secondary Certificate [ ]

Other College Education [ ] Diploma [ ] Degree Certificate [ ] Postgraduate/PhD [ ]

SECTION B: Objective One: Waste Collection and Disposal

Please record answers in the *spaces* provided

Q1.What is the quantity of waste generated in a day in tonnes? (In figures):

.....

Q2.What is the quantity of waste generated per capita in a day in tonnes? (In figures):

.....

Q3. Do you separate the waste before disposal? (Either into plastic, wood, metals, glass, food waste among others) Yes ☐ No ☐

Q4. If yes, indicate the reasons.

a.....

b.....

c.....

d.....

Q5. What are the major components of waste generated in your area? (Indicate their percentages in the table provided below).

Major Component	**Percentage Generated**
Plastic	
Glass	
Wood	
Metals	
Food Waste	
Other:	

Q6. Where do you dispose off the waste collected from the various sections? (Final disposalsite).....

Q7.What methods do you use in managing the solid waste generated in the area? (If more than one indicate them)

Composting ☐

Recycling ☐

☐

Incinerating

Q8. In your view what are some of the problems facing the metropolis in terms of managing waste?

.....

Q9. How can the problems be solved? (State them briefly)

a. .....

b. .....

c. .....

d. .....

Interview schedule for the Office of Metropolitan Assembly

The research is mainly for academic purpose. Therefore, answers given will be treated as confidential.

Thank you.

Position of Respondent:

.....

Date of Response:

.....

SECTION D: Objective Two: Revenue and Solid Waste Management

Please record answers in the *spaces* provided

Q1.How much revenue do you generate in a month? Indicate the amount in GH¢.....

Q2. How much do you spend on waste collection? Indicate the amount in GH¢.....

Q3. How much do you spend on acquiring waste management equipment? Indicate the amount in GH¢.....

Q4.Amount spent on maintaining waste management equipment. Indicate the amount in GH¢.....

Q5.How much common fund did you receive last year? Indicate the amount in GH¢.....

Q6. How much of that is spent on waste collection? Indicate the amount in GH¢.....

Q7. How much of that is spent on acquiring waste management equipment? Indicate the amount in GH¢.....

Q8. How much is spent on maintaining waste management equipment? Indicate the amount in GH¢.....

Q9. What are some of the challenges of managing solid waste in the Metropolis? (List at most four)

a.....

b.....

c.....

d.....

Q10. How can these challenges be overcome? (State them briefly)

a.....

b.....

c.....

d.....

Q11. In your opinion what would you say is the state of beautification of Accra Metropolis Area?

……

……

Q12. What would you say are the main waste management areas within the Accra Metropolis that needs to be addressed pragmatically?

……

……

Objective Three: Challenges of Waste Management

Q13. As a waste management secretariat, what would you say is the greatest challenge you face in your quest to improve the waste management situation in Accra?

……

……

Objective Fours: Strategies for Improving Waste Management

Q14. Briefly explain the key policies that the secretariat has in place to manage waste in Accra and how well they can work.

……

……

……

……

Q15. As a department/secretariat, what long term strategic actions have your department/secretariat put in place to manage solid waste in Accra?

……

……

……

……