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WASTE-TO-ENERGY, A SOLUTION TO GHANA'S WASTE MENACE: A Market Entry for Finnish SMEs

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DEDICATION

This thesis is dedicated to the memory of the late Miss. Theresa Afua Gyasi, who before her demise was equally concerned about the state of sanitation in Ghana. Her utmost hope was to see a rapid response that will curb waste menace in Ghana.

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ABBREVIATIONS

AMA	Accra Metropolitan Assembly
CFB	Circulating Fluidized Bed
ERP	Enterprise Resource Planning
EPA	Environmental Protection Authority
EPR	Extended producer reliability
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GPS	Global Positioning System
IWM	Integrated Waste Management
MDG	Millenium Development Goal
MoSWaR	Ministry of Sanitation and Water Resources
NDAS	National Digital Addressing System
NRP	Non-Recyclable Plastics
PPP	Polluter Pay Principle
SONA	State of Nation Address
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
WASH	Water Sanitation And Hygiene
WHO	World Health Organisation
WSP	Water and Sanitation Program
WTE	Waste-to-energy

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ABSTRACT

The impact of waste on human, water bodies and the environment are as a result of human activities. Ghana over the years is faced with waste challenges and thus, the need to offer pragmatics measures on waste management systems. The purpose of the research was to first, identify the root cause of waste menace in Ghana. Secondly, the research brought to bear, all meaningful avenues for providing solutions to the alarming waste situation in the country. Waste-to-energy, a useful technology served as the main tool to curb the waste menace in Ghana.

This research employed both qualitative and quantitative analysis. The research was conducted via online platform: Google form and a face-to-face interview. The survey was conducted in three phases; The Focus group, Ministry and Agencies, and lastly, people living in Ghana. The focus group comprised of Ghanaian students studying Industrial Management at the University of Vaasa. Whereas the Ministry and agencies comprised of Ministry of Energy; Ministry of Sanitation and Water Resources and lastly, Accra Metropolitan Assembly. In all, two hundred and two (202) people responded to the questionnaire provided for people living in Ghana. The study provided unique market entry opportunities for potential Finnish waste management companies to enter the Ghanaian market. This is because of well thought through market guidelines and identification of niche in the new market: Ghana.

Finally, recommendation on innovative waste management systems was provided.

KEY WORDS: Waste-to-energy, disposal, market entry, business opportunities

1. INTRODUCTION

1.1. Background of the study

While waste is considered an inevitable part of human activities, some developing countries have over the years used innovative ways to curb what would have been a menace. On the other hand, however, some developing countries such as Ghana is faced with sanitation related problems, be it; waste generation, waste handling, dumping of waste and managing of waste. One will ask, what are the reasons for this claim? Several non-governmental bodies, researchers of environmentally related fields and news portals have all had a take on Ghana's sanitation problems.

In 2012, the Water and Sanitation Program (WSP), a unit of the World Bank conducted a research where its findings showed that Ghana loses a sum of GHC 420 million annually due to poor sanitation (Maina & Sittoni, 2012). The research further indicated that 16 million Ghanaians alone use un-sanitised or shared latrines. Again, the research pointed out that, 4,8 million Ghanaians, on the other hand, practice open defecation only because of lack of latrines. According to the report, Ghana lost US$79 million per year on open defecation only and further showed that indeed less than 1 million latrines would have eliminated the practice (Maina & Sittoni, 2012). The research revealed that the most impoverished Ghanaian is directly proportional to the dirtiest level of sanitation in his or her community. The research further explained that not only do the poorest Ghanaian associated with the dirty environment but that, they suffer all poor sanitation related issues that come with it (Maina & Sittoni, 2012).

According to news reports in 2015, Ghana was ranked the seventh (7^{th}) dirtiest country in the world (Smith-Asante, 2015). This report was jointly conducted by the World Health Organisation (WHO) and the United Nations children's fund (UNICEF). Among other things, the progress on Sanitation and Drinking Water: 2015 update and Millennium Development Goal (MDG) assessment mentioned that, in Ghana alone, due to poor sanitation, 7,500 children die annually as a result of diarrhoea, indicating that, outbreak of

cholera is on the rise because one in eight children regularly wash their hands. (WHO & UNICEF, 2015).

In a situational report on cholera in Ghana conducted by WHO, an outbreak of confirmed cholera cases recorded five hundred and ninety-one (591) with five (5) deaths between January and May in 2015 (WHO, 2015). In the report, Greater Accra Region was mentioned as the region with the highest record of cholera outbreak for both 2014 and 2015. The WHO indicated that transmission of cholera cases among people is active in Greater Accra. The organisation further cautioned that, in the area of water, sanitation and hygiene (WASH), there was the need to intensify response interventions as the raining season approached. From the report, the programme officer for WASH of the Local Government Ministry levelled the outbreak of cholera on open defecation and poor hygiene by food sellers. (Dowuona, 2015). WHO describes cholera as an acute diarrhoeal infection which is caused by bacteria called Vibrio cholera (WHO, 2018). The bacteria contaminate food and water due to poor sanitation. Cholera is known to be a global threat to life (WHO, 2018).

In 2017, the director of waste management department of Accra Metropolitan Assembly (AMA) in an interview with an Accra based radio station Easy FM, disclosed that, in terms of quantity, communities under AMA alone generates waste in excess of 3,000 tonnes per day (GhanaWeb, 2017). The director levelled the AMA's frustration on what is termed as bad a culture of littering. Below is figure 1 which shows a waste management company collecting waste littered on street of Accra.

Figure 1: Waste company collecting waste littered on the street of Accra

These are the compelling issues at hand, hence the need to ponder critically on pragmatic solutions to curb waste menace in Ghana.

1.2. Rationale of the study

After several years of observation on how waste is managed in Finland, it is worth note taking of how these best practices can be emulated elsewhere (in this case, Ghana). Finland has unique ways of handling waste generated by people living in the country. From dumping to collection and finally to the proper use of waste collected.

Meanwhile, over the years, Ghana is faced with sanitation challenges. There seems to be little or no solution to curb the waste menace in the country. Due to the above reasons

mentioned, the research is focused on finding ways of solving the waste challenges in Ghana.

The researcher, who is studying a master's program in Industrial Management at the Vaasa University, Finland, found this thesis topic interesting because the result if obtained, would go a long way to help Ghana, his home country. As the thesis topic depicts (Waste-to-energy, a solution to Ghana's waste menace; A market entry for Finnish SMEs), the researcher is of the view that, while Ghana turns to benefit enormously, Finnish companies to whom the Ghanaian market would be introduced to also benefit.

1.3. Aims and objectives of the study

The aims of the study are in two folds. First, the purpose of the study is such that, at the end of the study, the information gathered will be able to provide credible market entry opportunities for Finnish waste companies especially for those companies in the waste-into-energy technology to penetrate the Ghanaian market.

Lastly, the study aims to find suitable ways of curbing the improper ways of disposing-off waste indiscriminately in Ghana.

These study objectives are to;

- Identify what informs people's decision before dumping waste.
- Find out how much effort, the Ghana government through its responsible ministry and agencies, have been able to achieve in managing waste.
- Find out best ways of eradicating filth in Ghana rather than being a breeding ground for the spread of diseases.
- Use information derived from the data collated to serve as a suitable tool to provide recommendations for waste management companies to penetrate the Ghanaian market.

1.4. Research questions

The research study is focusing on following listed research questions to be critically investigated and finally, provide suitable findings at the end of the study. Below are research questions for the study.

- *what is the root cause of waste menace in Ghana?*

The reason behind the choice of the first research question is to avoid the reliance of blame-game-peddling. Over the years, the citizenry, after faced with the challenges of what bad waste handling bring, usually blame the authorities and waste management companies for failure to maintaining law and order by constantly failing to punish people who go contrary to regulation on waste and second, fault waste management companies for not rendering services appropriately. While the authorities, on the other hand, seek to suggest that, sanitation situation in Ghana is at a bad state because citizens fail to pay when dumping for waste and therefore will find it convenient to dump it anywhere.

To avoid these blame-game-peddling, the study seeks to find out the root cause to why citizens dump waste as described by the authorities and at the same time find out if indeed waste management companies are not enough or whether the waste management companies fail to render services.

- *Is waste-to-energy facility beneficial to Ghana?*

The researcher finds the second question as equally important as the first research question. Considering the impact of waste on the Ghanaian environment, the researcher seeks to find out if the citizens and authorities are aware of waste-to-energy technology and for that matter, how much of benefit will WTE be to Ghana.

Due to these fundamental reasons, both research questions were run through among all groups interviewed for the research. Chapter three (3) provides more detail to the groups mentioned.

1.5. Thesis structure

This thesis is divided into six but connecting chapters.

Chapter One: the beginning chapter presents an introduction to the thesis topic. The chapter is elaborated by providing a background of study, rationale of study, aims and objectives of study, and lastly, research questions and its significance.

The second is **Chapter Two**: here, the thesis presents discussions on literature which is related to the subject under study.

Chapter Three: brings to bear, how the empirical study was conducted. Issues targeted were, Research process, Research approach, Research design, Research limitations, Validity and Reliability and ethical issues.

Chapter Four: Here, results from data collated are analysed and discussions of empirical study are documented.

Chapter Five: provides justification for investment in the waste management sector. Among others, chapter five provides information on doing business in Ghana.

Chapter Six: presents recommendations and conclusion to the study. These are drawn as a result of information obtained from research findings and analysis.

2. LITERATURE REVIEW

The purpose of this chapter highlights the study by bringing to bear, the theoretical framework. This chapter contains notes on the concept of waste management, the effect of poor waste management on the environment, a comparison between waste management practises in Finland and Ghana. The chapter also introduces the concept of waste-to-energy technology and its usefulness as a whole.

2.1. Waste Management

Due to day-to-day human activities, waste is introduced into the environment. Waste on the environment if not controlled or reduced, has direct effects on human lives and the environment. The Environmental Protection Authority (EPA) of the Australian Environmental Protection Act (1993) describes waste as
"*any discarded, rejected, abandoned, unwanted or surplus matter, whether or not intended for sale or recycling, reprocessing, recover or purification by a separate operation from that which produced the matter*" (Environmental Protection Authority, 2009).

Waste management is, therefore, an activity that comprises of the collection of waste, transporting waste, recycling of waste, resource recovery and treatment of waste (Henry;Yongsheng;& Jun, 2005). The purpose of waste management is to get human health, and the environment protected, sustain development in a country and boost economic productivity as a form of job creation.

2.1.1. The Concept of waste management

Over a period, there has been varying waste management concepts. Three common concepts are, waste hierarchy, extended producer reliability and polluters pay principle (Waste Management Resources, 2009).

- Waste hierarchy

Waste hierarchy is a concept of waste management with its main priorities based on avoidance or reduction of waste thereby finding suitable ways for efficient use of resources (Environmental Protection Authority, 2017). John Gertsakis and Helen Lewis (2003), describe waste hierarchy as one of the concepts that has not been opposed. Justifying by inferring the concept as what in the human health and medicine parlance "prevention is better than cure" (Gertsakis & Lewis, 2003). Below is a diagram, Figure 2, that shows from the most preferred (above) to the least preferred (below) of the waste hierarchy.

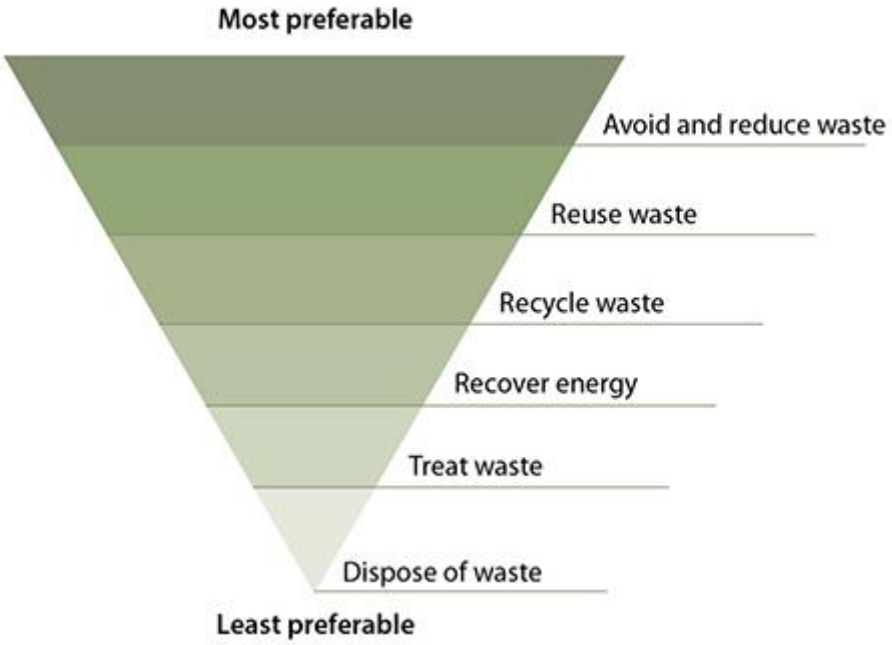

Figure 2: Waste hierarchy (Environmental Protection Authority, 2017)

Waste hierarchy considers avoidance and reduction of waste as its highest priority, followed by recovery of resources and finally, treatment and disposal. To avoid and to reduce waste means, to minimise the generation of waste and instead consider maximising materials efficiently (Environmental Protection Authority, 2017). The second most priority of waste hierarchy is the recovery of resources. Recovery of resources comprised three components, namely, re-use, recycle and recover (Gertsakis & Lewis, 2003). All three play a critical role in the recovery of resources. Where waste cannot be avoided or

reduced, re-use is the next available option. The reason being that, what would have gone through a process of energy consumption in recycling, waste can be re-used. A typical example is repairing of household chairs (Environmental Protection Authority, 2017). This means material of waste is not changed nor transformed into a different shape. On the other hand, where waste materials cannot be re-used, recycle of waste is the immediate alternative (Environmental Protection Authority, 2017). The essence of recycling waste is to decrease waste absorption thereby keeping material in its productive state and to also benefit the environment (Gertsakis & Lewis, 2003). However, in a condition where waste cannot be recycled, the next suitable condition according to the waste hierarchy is to re-cover energy. The purpose of recovery of energy is to absorb energy from waste which in turn provides a source of electricity or heat to communities (Gertsakis & Lewis, 2003). The least preferred waste hierarchy is treatment and disposal. Where further recovery resources are not feasible, materials such as hazardous waste is properly treated or dis-posed-off by triggering the appropriate disposal option (Environmental Protection Authority, 2017).

- Extended producer reliability

Another notable concept of waste management is the Extended producer reliability (EPR). This concept is designed in such a way that, the producer is made to undergo the necessary life-cycle of a product (Waste Management Resources, 2009). EPR dates back in 1990. This concept was designed in Sweden by Thomas Lindhqvist. Thomas lindhquist defined extended producer reliability as

"An environmental protection strategy to reach an environmental objective of a decreased total environmental impact of a product, by making the manufacturer of the product responsible for the entire life-cycle of the product and especially for the take-back, recycling and final disposal" (Lindhqvist, 1992).

The purpose of extended producer reliability in waste management is to ensure that, man-ufacturers incorporate a habit of producing products that can be reused and recyclable. Another significant reason is to promote innovation in the recycling industry.

- Polluter pay principle

Polluter Pay Principle (PPP) is another concept of waste management. PPP is a kind of waste management that focuses on making sure manufacturers whose by-products are harmful to the environment are made to bear the cost of managing waste. In this case, pollution of land, water and air are all underpinned to the polluter pay principle (Cordato, 2001). The benefits of PPP on the environment are; prevention and control measures on how much toxic waste is released on the environment, manufacturers bear cost of managing waste instead of the municipality, and finally, PPP provides integrated control plan for manufacturers and the country (European Commission, 2012).

2.1.2. Classification of waste

Waste is in different forms and therefore are classified in a wide range of varieties. Before waste is appropriately classified, its sources and properties must be known (Baabereyir, 2009). Below is Table. 1 and Table. 2 that show how waste is classified and risks associated and material classification of waste types respectively.

Table 1: Classification of waste (Baabereyir, 2009)

Criteria for waste classification	Examples of waste types
Sources or premises generation	Residential, commercial, industrial, municipal services, building and construction, agricultural
Physical state of waste materials	Liquid, solid, gaseous, radioactive
Material composition of waste	Organic food waste, paper and card, plastic, inert, metal, glass, textile
Level of risk	Hazardous, non-hazardous

Table 2: Material classification of waste types (Baabereyir, 2009)

Waste type	Examples
Paper	Newspapers, cardboards, office waste paper, magazine
Plastics	Bottles, expanded polystyrene, film plastic, other rigid plastics
Glass	Clear glass, green glass, amber glass, non-recyclable glass
Metals	Steel cans, aluminium cans, others ferrous, other aluminium
Organics	Wood, textiles, diapers, fines, other organics
Inorganics	Electronics, carpets, drywall, other construction and demolition, other inorganic

2.1.3. Effects of poor waste management

Even though the idea of managing waste is good, over the years, there have been challenges leading to serious effect on human lives, water bodies and the environment. All recognized waste management practices such as landfilling, incineration, composting and waste recycling have the tendency to cause harm to human lives and the environment (Giusti, 2009). Giusti in a research found out that, people upon realizing the adverse effect on human lives due to poor waste management practices, in most cases, registered displeasure of the siting of waste management facilities, notwithstanding, people acknowledged that indeed there had been technological advancement in the way waste management operates (Giusti, 2009). Giusti stressed that, as far back in history, the United Kingdom faced issues with landfill system. A report by Roshe (1996) showed that due to poor construction of landfill, surface and groundwater was contaminated (Giusti, 2009). Figure. 3 is a table adopted by Giusti (2009). In the table, all direct and indirect effect of waste management practices on human health and the environment are displayed.

Activity	Water	Air	Soil	Landscape	Climate
Landfilling	Leachate (heavy metals, synthetic organic compounds)	CO_2, CH_4, odour, noise, VOCs	Heavy metals, synthetic organic compounds	Visual effect, vermin	Worst option for greenhouse gases emission[a]
Incineration	Fall-out of atmospheric pollutants	SO_2, NO_x, N_2O, HCl, HF, CO, CO_2, dioxins, furans, PAHs, VOCs, odour, noise	Fly ash, slags	Visual effect	Greenhouse gases[a]
Composting	Leachate	CO_2, CH_4, VOCs, dust, odour, bioaerosols	Minor impact	Some visual effect	Small emissions of greenhouse gases[a]
Landspreading	Bacteria, viruses, heavy metals	Bioaerosols, dust, odour	Bacteria, viruses, heavy metals, PAHs, PCBs	Vermin, insects	Small emissions of greenhouse gases.
Recycling	Wastewater	Dust, noise	Landfilling of residues		Minor emissions
Waste transportation	Spills	CO_2, SO_2, NO_x, dust, odour, noise, spills	Spills		Significant contribution of CO_2

CO_2 = carbon dioxide; CH_4 = methane; VOCs = volatile organic compounds; SO_2 = sulphur dioxide; NO_x = nitrogen oxides; N_2O = nitrous oxide; HCl = hydrochloric acid; HF = hydrofluoric acid, CO = carbon monoxide; and PAHs = polycyclic aromatic hydrocarbons.

[a] Assuming no energy recovery.

Figure 3: Environmental impact on municipal solid waste (Giusti, 2009)

From Figure 3, it is noted that, among the listed waste management practices, landfill poses the worst threat on the ozone layer by the emission of greenhouse gases. At the same time, landfill leachate affects water bodies. A study was conducted to investigate the effect of incineration on human health. France, which has the largest size of incineration plants was used. According to reports, it was found out that, incineration plants emit high level of dioxins into the atmosphere which is known to be responsible for high risks of developing sarcoma (Giusti, 2009). Sarcoma is a cancerous disease that grows in different tissues of the body. Sarcoma comes in many different forms with each having a specific name depending on the nature of effect on the tissue (Fletcher;Unni;& Mertens, 2002).

Giusti (2009) emphasized that several studies showed that instead, workers in the compost waste management plants suffer from respiratory and dermal illnesses. Giusti referred to a report from the Environmental Protection Agency (2001) that respiratory diseases have the tendency of affecting persons working on composting facilities due to the fact that there has been an exposure to bacteria, dust and endotoxins (Giusti, 2009).

Land spreading on the other hand, if poorly managed tends to cause harmful diseases to workers. Land spreading is associated with infectious diseases such as respiratory illnesses and gastrointestinal symptoms which are usually contracted from bathing water and pathogens from sewage plants (Giusti, 2009).

2.2. Waste-to-energy Technology

Waste-to-energy is a systematic process whereby energy is recovered from waste which serves as heat or electricity for consumption. Some forms of waste include municipal waste, agricultural waste and some industrial waste (Ofori, 2016). Studies have shown that energy recovered from waste is derived through several means. These means of energy conversions are from processes such as anaerobic digestion, incineration, gasification, pyrolysis and landfill gas recovery (United States Environmental Protection Agency, 2014). All distinct technologies for waste-to-energy are based on one or more factors.

Anaerobic digestion

Anaerobic digestion is a process where microorganisms break down biodegradable waste as biogas (United States Environmental Protection Agency, 2017). This process takes places in the absence of oxygen. When biogas is produced, methane and non-methane components are formed. Only methane components are used as energy source (United States Environmental Protection Agency, 2017). According to Ofori (2016), methane production takes place within 3-5 weeks, and further indicates that methane production in anaerobic digestion is as 2-5 times more than what is recovered from landfill.

Incineration

Incineration is an energy recovery technology whereby its waste treatment process involves the burning or combustion of waste to generate energy under high temperature (Ofori, 2016). Countries such as Sweden and Denmark have for more than a century been leading countries in the use of incineration to recover energy from waste for local district supporting schemes (Heron Kleis;Vølund;& Søren Dalager, 2007).

Gasification

"Gasification can be broadly defined as the thermochemical conversion of a solid or liquid carbon/based material (feedstock) into a combustible gaseous product (combustible gas) by the supply of a gasification agent (another gaseous compound)" (Belgiorno;Feo;& Napoli, 2002).

According to Belgiomo et al (2002), gasification takes place when under high temperature, waste or biomass is converted into gas with the help of gaseous compounds. A typical example of a gasification plant in Finland which operates using a Circulating Fluidized Bed (CFB) combusts waste or biomass under high temperature with controlled amount of air (Valmet, 2018).

Pyrolysis

Pyrolysis is a process of thermal decomposition of waste or biomass under high temperature without the presence of oxygen (Kothari;Tyagi;& Pathak, 2010). According to Themelis et al (2011), the thermal treating technique known as pyrolysis can be used to covert Non-Recyclable Plastics (NRP) into crude oil or other fuel oil. The researchers added that an estimated one ton of non-recyclable plastic can be converted into three barrels of oil. Adding that, a hypothetical phenomenon of twenty-nine (29) million tons of NRP from municipal waste landfilled can be converted through the pyrolysis into eighty-seven (87) million barrels of oil (Themelis;Castaldi;Bhatti;& Arsova, 2011).

Landfill gas recovery

Landfill gas is recovery for electricity when waste is decomposed on a landfill in the absence of oxygen. Landfill gas is estimated to contain approximately 40-60% of methane and the remaining, carbon dioxide (Ehrig;Schneider;& Gossow, 2011). In the United States of America, about one hundred and ten (110) landfills sourced to landfill gas-to-energy facilities are capable of offsetting energy production of two million tons of coal

per year to power over four hundred thousand households and at the same time reducing, gradually emission of greenhouse into the atmosphere (Waste Management, 2017).

The figure (Figure 4) below adopted from Ofori (2016) shows a typical framework of waste-to-energy which explains the idea of waste recovery that goes a long way to benefit the society and the environment.

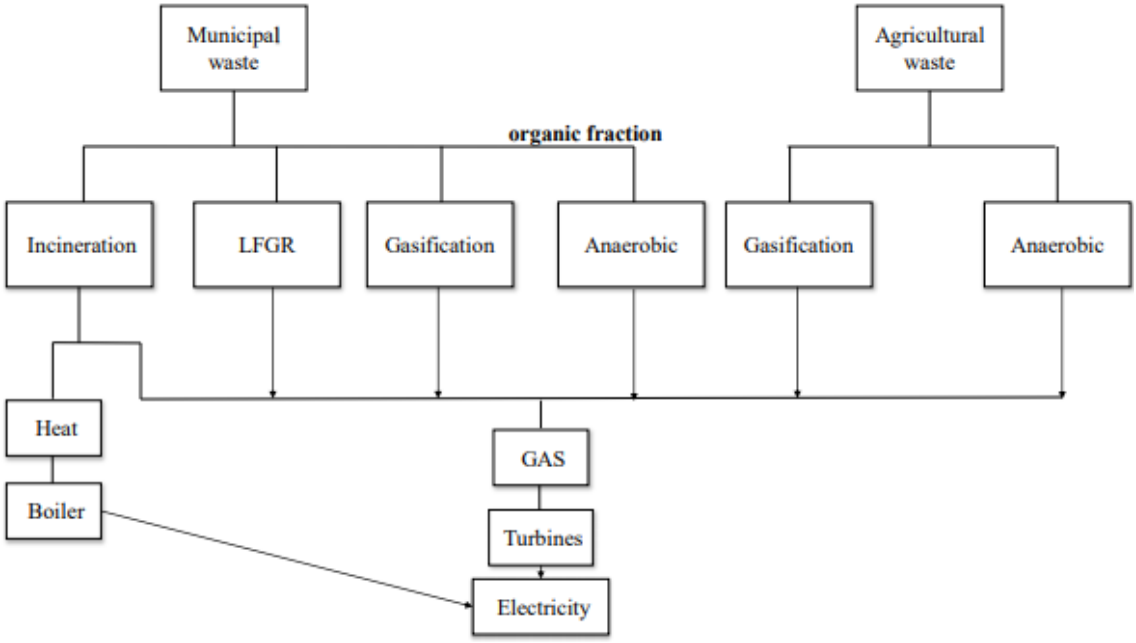

Figure 4: Waste to energy framework [adopted from (Ofori, 2016)]

2.3 Comparison of waste management in Ghana and Finland

"Developed countries exhibit a high degree of sound environmental considerations in their waste management utilizing sanitary landfills, waste treatment and processing, energy and material recovery options whereas waste disposal is uncontrolled and waste treatment, processing, energy and material recovery are rare in developing countries." (Asase;Yanful;Mensah;Stanford;& Amponsah, 2009).

Asase et al (2009), in a research to find the differences in handling waste among two different countries noted that waste management in developed countries are far advanced in technology and have consistently improved in reducing, reusing and to recovering

energy from waste whilst developing countries are far behind in technology and as a result, waste disposal in developing countries is poorly controlled.

The researcher seeks to compare waste management in Ghana, a developing country and Finland, a developed country. Today, an Integrated Waste Management (IWM) approach is widely used as a tool to compare developing and developing countries on waste management issues because it has proven to be sustainable for waste management systems (Asase;Yanful;Mensah;Stanford;& Amponsah, 2009). The integrated waste management (IWM) approach seeks to manage waste in a practical, less expensive in a wholly acceptable way (McDougall;White;& Mindle, 2001). Key features and system drivers of IWM is used to compare waste management in Ghana and Finland. These key features are; good system management, control and handling of all waste generated, consideration of critical mass for system design, socially accepted strategies, enactment and enforcement of legislation (Asase;Yanful;Mensah;Stanford;& Amponsah, 2009).

2.3.1 Good system management

The Finland system is focused on dealing with waste generated. Due to this, the Finnish waste management has adopted an approach of which its principles are based on continuous improvement strategy. A basic framework that is targeted at improving how waste is handled starting from segregation to transporting to disposing of and finally recovering of energy and or waste material at landfills. Figure 5 below is a chart that shows how the Finnish waste management has improved by reducing landfill waste into energy and material recovery. Due to good system management adopted by Finnish waste management, as at 2016, only 3% of waste was disposed at landfill sites. This is proof of continuous improvement strategy to minimise and utilise waste (Satistics Finland, 2018). An initiative that is targeted at making good use of waste dumped at landfills.

On the contrary, the waste management system in Ghana is not clearly defined. There are proven incidents where gathering data on waste management remained futile. It was found out that waste management strategies differ among city authorities in the various regions. According to Asase et al (2009), political interference in waste management

office holders has over the years delayed project timelines and sometimes, what would rather seem as a good initiative may not be implemented.

The comparison of waste management between the two countries based on good system management justifies a research conducted by United Nations Environment Programme (UNEP). In the report, it was asserted that, between developing and developed countries, one of the major differences in waste management which makes developed countries above developing countries is based on setbacks in implementing strategies to curb the waste menace. The report stated that these setbacks are based on poor managerial framework rather than technical (UNEP, 2005). Therefore, planning a good system management on waste handling in Ghana may go a long way to solve waste-related issues.

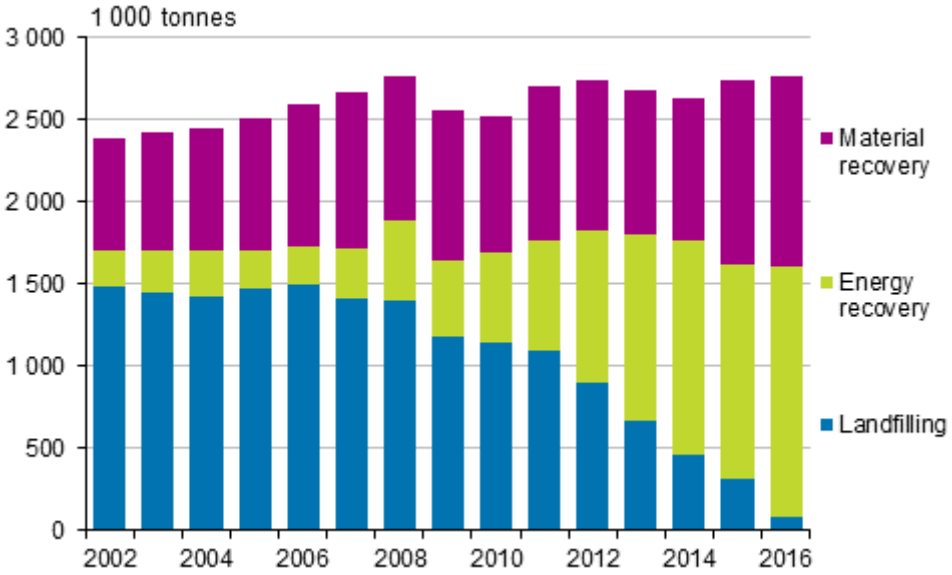

Figure 5: Amount of municipal waste by treatment method in 2002-2016 (Satistics Finland, 2018)

2.3.2 Control and handling of all waste generated

Waste statistics of the Statistics Finland in 2015 reported that the quantity of municipal waste amounted to 2.4 to 2.8 million annually and indicated that there has not been a wide difference over the years. This is to mean, waste generation in Finland has remained constant over the years. The report disclosed that about 90% of waste was recovered for

energy in 2014. Below is figure 6 that shows how waste is handled and controlled in Tampere, Finland.

Meanwhile, Ghana produces 1.7 million plastics annually. This assertion was made by a representative of the UN's developing and programme research team (Ghana Web, 2017). The research indicated that less than 2% of waste was recycled.

This comparison shows that, while Ghana produces more waste, less is recycled or recovered into energy. Finland on the other hand, utilises waste generated into proper use. Therefore, there is the need for urgent waste collection and treatment approaches in order to control waste generated in Ghana.

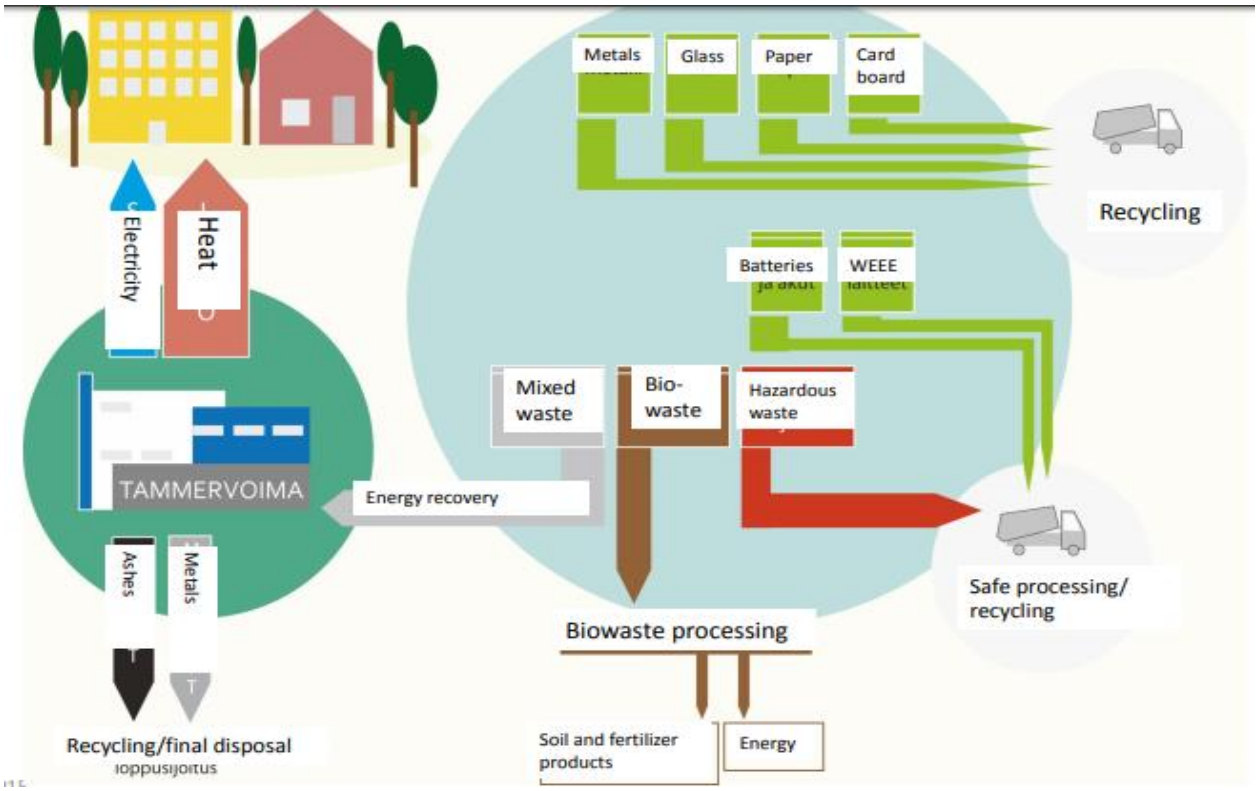

Figure 6: Municipal waste management process in Tampere, Finland (Isoaho, 2015)

2.3.3 Consideration of critical mass for system design

Finland considered reducing waste generated by her people. Figure 5 above shows how the country is keen on reducing waste and recovering energy from landfills. McDougall

et el (2001) explained that most of the developed countries critically considered land space and hence took practical measures to utilise waste dumped at landfill sites. In all these, all waste streams are involved in making sure the appropriate infrastructure is put in place to realise these dreams.

According to Asase et al (2009), Kumasi, the second largest city in Ghana is known to have an engineered landfill but indicated that there have been challenges since the population of people living in the city keep increasing and hence waste generated can often not be accounted for. That of Accra is different. In 2013, Landfill sites in Accra were closed. A landfill which was designed to accommodate 700 tons per day now received twice the amount of waste (UNEP, 2013).

2.3.4 Socially accepted strategies

Residents well appreciate waste management systems in Finland. Over the years, Finland has been keen on keeping the environment clean. All measures required to mitigate waste related issues is hugely accepted. The proof of acceptance of Finnish waste management systems is the full acceptance of waste segregation at the workplace and households. The Finnish country has adopted innovate ways of recycling waste.

In Ghana, there is no real accepted way for keeping and dumping waste. Example, some people choose to burn waste while others employ services of waste management companies to collect waste. It means, there is no uniformly proposed ways to handle and dump waste.

Socially accepted strategies under IWM seeks to find common grounds between the state and her people. Therefore, Ghana must have a well-defined waste management strategy and communicated adequately so that people in Ghana can comply.

2.3.5 Enactment and enforcement of legislation

A more flexible but concise law enacted in Finland helped to keep the environment clean. Enforcement of law that is more targeted at protecting the environment and to optimise waste generation into energy recovery (Laaksonen;Salmenperä;Stén;Dahlbo;& Merilehto, 2018).

According to Asase et al (2009), there are less or no clear defined laws for the management of waste. The researchers asserted that, city's by-laws and penalties need to be reviewed. Meanwhile in 2011, Ghana's cabinet approved the Polluter Pay Principle, an initiative targeted at protecting the environment and at the same time, an environment management revenue generation (GBN, 2011).

3. METHODOLOGY

In this chapter, the researcher defines in detail the approach used in conducting the research, the style incorporated, the processes the research was involved, the critical issues on ethics and risks, the limitation encountered and test for validity and reliability of the research approach. The study examines research methodologies to establish a well thought out and meaningful conclusion.

3.1. Research approach and data collection

The research adopted a hybrid approach for the study. A hybrid research approach is a combination of qualitative and quantitative analysis (Burns & Bush, 2000). The choice of approaches is to help critically evaluate the findings (Oyeyiola, 2015). Fischler refers to research as a process whereby study is launched into for collection and analysis of information to increase understanding of the problem (Fischler, 2014). Oyeyiola explains that qualitative and quantitative research differ in procedure than in "quality", differentiating that qualitative however can be quantified (Oyeyiola, 2015).

The purpose of selecting hybrid approach for the research is to be able to gather in-dept information to the research questions. Several researchers have varying definition of qualitative research but they all mean the same in terms of what the purpose of approach selected is intended to achieve. Qualitative research is multi-discipline of collecting a non-numeric data (Cassell;Buehring;Symon;& Johnson, 2006). Fisher (2005), describes qualitative research as effect approach to understand experiences from subject's perspective adopting to tools such as, the descriptive approach, interpretive approach and reflective approach. This way, a research can be conducted by investigating the "why" and "how" for reasoning behind decisions made while finding out the "when", "which" and "where" to produce a meaningful outcome (Oyeyiola, 2015). Effective qualitative analysis can be conducted by employing the use of focus groups, interviews, observation and substantial theories (Carson;Glmore;& Gronhaug, 2006).

Meanwhile a process by which a phenomenon is measured according scale or frequency by collecting a numerical data is referred to as quantitative analysis (Neville, 2007). Also, quantitative analysis is used to make claims and explain scenarios and phenomenon by the manipulating with numbers (Colby, 2010). According to Colby (2010), quantitative approach employed to systemically collect and interpret data while remaining consistent. Oyeyiola (2015) emphasises that a hybrid approach seeks to effective analysis a research problem or phenomenon.

Three different questionnaires were designed and designated for three different groups. Each for it significance and relevance for the research. They were, the Focus group, Citizens living in Ghana and Ministries and agencies.

Focus group

The focus group comprised of six (6) Ghanaian students studying Industrial management at the University of Vaasa. The purpose of the focus group for this research was to provide the study with a fair idea from these Ghanaians who have been away from their country, Ghana for studies in Finland and have had knowledge of the current sanitation challenges their country face.While taking into consideration that, the focus group is most likely to have observed and recognised the difference between Ghana and Finland with the way both countries manage waste. With the researcher as moderator, all six students were interviewed through an open discussion via Skype. The researcher used a questionnaire designed for The focus group to moderate the discussion.

People living in Ghana

A questionnaire was designed and targeted at people living in Ghana. It captured people from different walks of life; students, workers, pensioners etc. the purpose for designing this questionnaire to the said target group was to find out how much of concern they have regarding Ghana's sanitation. Also, the questionnaire sought to find out where they dump waste and the impact it has on the environment. Finally, the questionnaire sought to find

out how much they appreciated waste-to-energy and the benefits thereof. In all, a total of two hundred and two (202) persons were interviewed.

Ministries and agencies

A three set of questionnaires were designed for this group. They are; Ministry of Energy, Ministry of Sanitation and Water Resources and Accra Metropolitan Assembly. Each of the ministries and agencies was served with a questionnaire. It was prudent to design questionnaires for the above-mentioned ministries and agency in Ghana. The reason was because, first, Ministry of Sanitation and Water Resources is as its name suggests oversees all sanitation and water related issues hence, the study was targeted to get information from the perspective of the ministry while taking into account all data collated from the various groups.

Second is the ministry of energy. An interview was conducted between the researcher and the renewable department of the ministry of energy. This ministry was selected as part of the groups to be interviewed. The reasons were that, since the study bothered on energy related issues, it was meaningful to have a fair idea on what the plan and programs the Ghana government has with respect to waste-to-energy through the ministry of energy and if indeed there has been significant progress in its implementations. The interview with the ministry of energy sought to find out how concerned it has been towards waste menace and if indeed the ministry has plans and programs to support the ministry of sanitation and water resources in solving the problem by adopting waste-to-energy technology.

Lastly, a questionnaire was designed to be answered by the Accra Metropolitan Assembly. An interview was conducted between the researcher and the Accra Metropolitan Assembly. Among other functions of the assembly is the managing and controlling of waste in the capital city of Ghana. Therefore, the interview sought to find out from the perspective of the assembly, how it has been able to manage the impact of waste in the city and to bring to bear, what the assembly has identified as major and minor challenges it faces.

In all, three (3) persons were interviewed. Each from their respective ministries and agency.

3.2. Research process

The research process for the study started by analysing relevant literature. After that, a questionnaire was designed using a google form. In total the questionnaires designed were five (5). These questionnaires were sent via WhatsApp, Facebook, Skype, and emails to a focus group, citizens living in Ghana, two ministries and a Ghana government agency, namely; Ministry of Energy, and Ministry of Sanitation and Water Resources, lastly, the Accra Metropolitan Assembly. A face-to-face interview was also incorporated where needed. In conclusion, all data were analysed and documented.

3.3. Research limitations

In the cause of the research, a few short-comings were identified, the researcher managed to mitigate the short-comings under to meet the requirements for the research. The researcher after encountering the following limitations agree to a principle of qualitative analysis propounded by Cassell et al. (2006). The principle indicates that, while qualitative analysis is a useful tool for asking relevant questions, there are short-comings (Cassell;Buehring;Symon;& Johnson, 2006).

- The researcher's ideologies and skills could have the tendency of affecting the outcome. As the thesis topic depicts, the researcher seeks to find a suitable market for Finnish waste management companies to penetrate the market, in so doing, the researcher is likely to provide information that only seeks to attract rather than providing full disclosure of the "real state" of the Ghanaian market. To mitigate this, the potential risks of doing business in Ghana was highlighted as "Challenges" in Chapter Five.
- The research involved a significant amount of data. Analysing all five different questionnaires were time-consuming. Analysing the data was confusing and subjective. To mitigate this, the researcher combined text, figures and tables in

Chapter Four so that the data analysis and findings of the research will be clear to read and understand.

- Confidentiality clause was strictly followed during the data collection. To enforce this, no request was made to have full information of respondents. Especially for the focus group where the researcher was the moderator, no attempt was made to attach comments made by members against their names. In so doing, all members were represented with alphabets. Officers at various ministries and agency who were interviewed had their offices adopted instead of their names.

3.4. Validity and reliability

Validity and reliability testing is an integral part of the research. The purpose is to show transparency in methods or designs employed for research (Mautin, 2014). To obtain an accurate empirical data, research validity and reliability testing help to avoid errors and biases in research (Ndzibah, 2012). Establishing validity and reliability is the first step in research after a topic is chosen (Bassett & Ftzhugh, 2008). Mautin (2014), explains that, after an accurate search has been conducted into a chosen research topic is performed, the study can hence proceed if relevant instruments chosen are capable of delivering results. While validity means, minimising errors in data gathering to establishing meaningful results, reliability, on the other hand, seeks to authenticate research results if there is a possibility of obtaining same or similar results when research is reconducted (Mautin, 2014).

For this research, all relevant sources were used. As much as possible, the research avoided sources which lacked credibility. Therefore, this study can be repeated while maintaining the accuracy of results. For the sake of accuracy and precision, the researcher avoided repetition of errors in the gathering of data. The researcher also documented only relevant information while making sure the objective of the study is achieved. For reliable results, the study employed wide ranges of literature and surveys in order to arrive at a conclusion which is generally true if research is repeated.

3.5. Risks and ethical issues

The guidelines and ethical issues of the University of Vaasa was strictly followed. All issues were treated seriously. To the best of the researcher's knowledge, there was little or no obvious risks associated to the study.

To begin with, all confidential matters were kept out of this report in order to keep to confidentially clause adopted for the study. Names of contact persons, personal information of interviewees and representatives at ministries and agencies were all kept out of this report.

"Except otherwise stated and agreed, Confidential information is defined in this agreement as business information, product/service configuration, operations, financials, plans and other data proprietary to a party disclosed to other party in writing or orally provided it is indicated as "CONFIDENTIAL"." (Mautin, 2014)

Secondly, the study treated all responses as anonymous answers, this way, all written comments were written in quotes, however, no respondent was linked to them. The research focused more on the outcome of the study and response rather than an individual respondent.

Lastly, while conducting the face-to-face interview, interviewees were granted the opportunity to decide to opt out even after completion. This action was carried out because, some respondents simply wanted to opt out after the interview for reasons best known to them. All such matters were handled upon the demand of the respondents. For this reason, all who opted out after the interview was carried were excluded in the final report of the survey.

4. DATA ANALYSIS AND FINDINGS

In this chapter, all results collated from interview among the three segmented groups are all analysed in detail. Below are data collection comprised of; The Focused Group; Citizen of Ghana; Ministries and Agencies. The researcher found all questions asked significant, hence the need to analyse them appropriately. For better clarity, all data analysed are correspondent to their respective groups. Comparison of all three segmented respondents is made to find similarities and differences and thus to conclude the research conducted by incorporating the research questions.

4.1. The Focus group

The researcher as the moderator and the six (6) other students of the University of Vaasa who study a master's program in Industrial Management belonged to the focus group. After a brief brainstorming session, every member answered the questionnaire. Each member's response was considered reliable, and thus documented as follows.

How will you rate Finnish waste handling system?

A question was posed to the group members to indicate accordingly, how well waste in Finland is handled. Among the six respondents, three rated waste handling in Finland as excellent representing 50% while the remaining three also, representing 50% rated waste handling in Finland as good. Results obtained means, all group members appreciate waste handling procedures from both the citizenry and waste management companies. Below is Figure 7 that shows how the focus group members responded to how well Finnish waste

is handled.

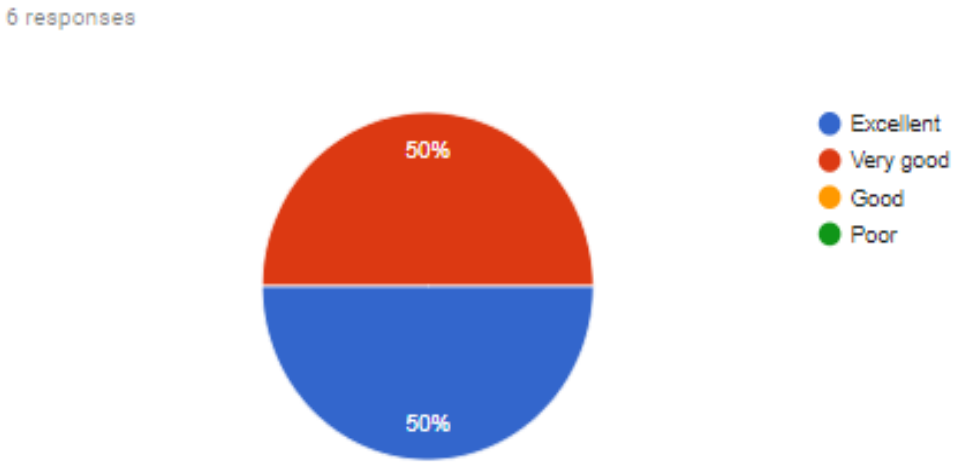

Figure 7: Rate of handling waste in Finland

Is the Finnish waste handling the best way?

The second question posed to the group was to find out of if indeed the Finnish system of handling waste is the best way, taking into account, the method of keeping waste at households, shops, canteens, workplaces, schools. The results showed that a popular majority of the group members said “Yes”. A total of 5 respondents representing 83,3% while one respondent representing 16,7% indicated “MAYBE”. Figure 8 is a chart showing how members of the group responded to the question “Is the Finnish waste handling the best way?”.

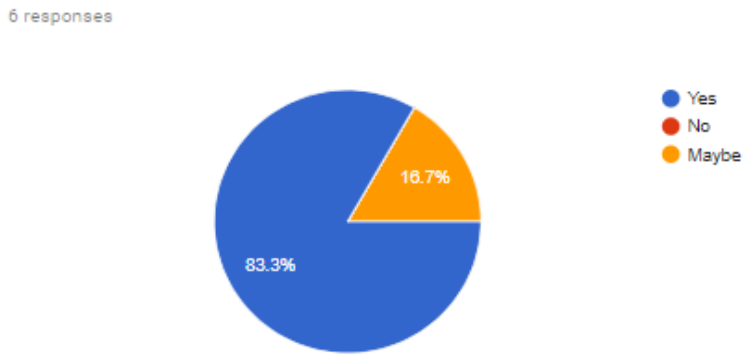

Figure 8: Response to the best way of handling waste in Finland

How will you rate Ghana's waste handling system?

Members were asked to rate waste handling in Ghana. From the results, all members indicated that the rate of waste handling in Ghana is poor. Therefore, this represents a total of 100% affirmation as to how the focus group considers waste handling system in Ghana. A chart below (Figure 9) shows how members of the focus group answered the question, "How will you rate waste handling system in Ghana?".

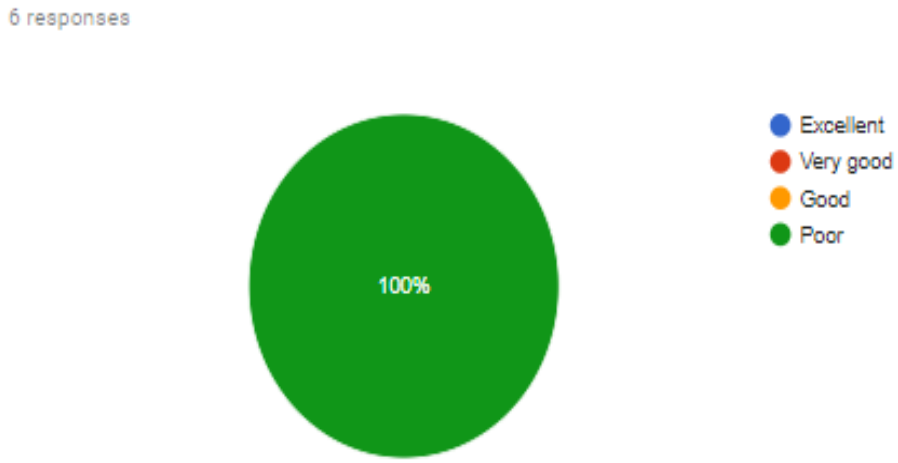

Figure 9: Rate of waste handling in Ghana

Is the waste handling system the best way in Ghana?

Again, the researcher asked from the focus group if waste handling in Ghana is the best way. All members of the group said "NO". The result represents a total of six respondents which is a 100% representation. One can conclude that, even though these group members live away from Ghana, they are aware of the challenges confronting their country concerning sanitation hence, the manner in which the group answered the question. Below is (Figure 10) a chart that shows results from response to the question, "Is waste handling in Ghana the best way?"

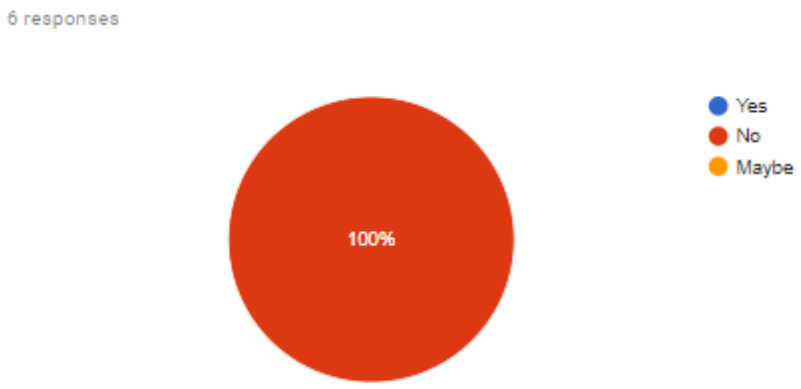

Figure 10: Response to Best way of handling waste in Ghana

What can be improved?

The researcher sought to find out if members of the group, upon providing answers to the question (Is waste handling in Ghana the best way?) posed, have confidence in the current leadership and expectation of what can be done to bring changes in the way waste is handled in Ghana. A follow-up question was asked from members to offer solutions to what can be done differently. From the results, it shows that all but one failed to respond to the question. However, the remaining five members' answers are documented as follows by representing each response with alphabets thus to avoid attaching a written response to respondents and hence revealing identities of group members. This complies

with research ethics of the research as indicated in the previous chapter. Below is a table (Table 3) which shows how each member of the focus group answered the question.

Table 3: Response on ways to improve waste handling in Ghana

Focus group member	How to improve waste handling in Ghana
Member A	"The whole chain, from dumping to the waste including human attitude."
Member B	"Reinforce the laws and regulations governing waste management institutions, this will encourage them to execute and perform rightfully according to the term of agreement."
Member C	"A lot. They should develop waste recycling systems."
Member D	"Sanitation related issues should be one of Ghana government's priorities."
Member E	"Laws on sanitation must be enforced while education into ways of handling waste, enhanced"

From the table above, member-A seeks to address the problem of sanitation to the waste management chain. From member-A's point of view, all processes in the waste management chain in Ghana should be relooked and pragmatic solutions offered to curb the sanitation-related situation in the country. Member-A further attributes sanitation problems in Ghana to attitudes of the people living in the country. Member-A seems to subject that, waste management chain infrastructure and human attitude are interconnected and hence demands closer attention.

Member-B on the hand is of the view that, lack of sanitation laws is as a result of the waste menace in Ghana. Therefore, to overcome this challenge, laws on sanitation must be enforced to the letter, giving law enforcers the necessary logistics to punish offenders.

Member-C also suggests that the Ghana government considers recycling waste generated by her people. Member-C, associates thoughts to making good use of waste generated. Here, waste generated is recycled into proper use thereby serving as a source of livelihood

for people who wish to venture into the recycling business. Member-C does not subscribe to the burning of waste practised by some Ghanaians nor dumping the of refuse at landfills sites. In member -C's view, Landfill is a waste of the land space and goes on to say that landfill produces stench which eventually makes lives of people living close to landfill sites uncomfortable. Member-C cites places such as Kwashie-Bu, a suburb of Accra, as an example of landfill sites producing unpleasant smell to people living the locality.

Member-D, while sharing ideas, recognises the enormous challenges confronting Ghana. Then goes on to suggest that, the Ghana government considers sanitation related issues as one of her priorities.

Member-E makes two suggestions as solutions to challenges on sanitation-related issues in Ghana. Member-E first opines that the country enforces laws regulating sanitation. Observation carried out from the table above shows that, Member-B and E both highlight on enforcement of sanitation laws. Both are of the view that, over a period of years, either little or no sanctions have been made by authorities in power to ensure that people complied with sanitation laws, therefore, their strong advocacy on enforcement of sanitation regulations. Secondly, member-E suggests the citizenry gets sensitised on proper ways to handle waste, either from the home, workplaces and in the streets.

What could be the reason(s) for effective waste handling practices(s) in Finland?

The researcher further asked the group what the reason for effective waste handling in Finland could likely be. Among three possible reasons selected were: educated population, awareness of waste handling diseases and lastly, cost. From the results of the research, the findings showed that members of the group indicated that Educated population and Awareness of waste handling related diseases constituted to the effective waste handling in Finland rather than cost. Five members agree that both Educated population and Awareness of waste handling related diseases is the more reason why waste handling in Finland is most effective. The respondents represented a percentage of 83,3 for both while Cost, 33,3% representing a response from two (2) group members. A graph below (Figure 11) shows how respondents answered the question asked.

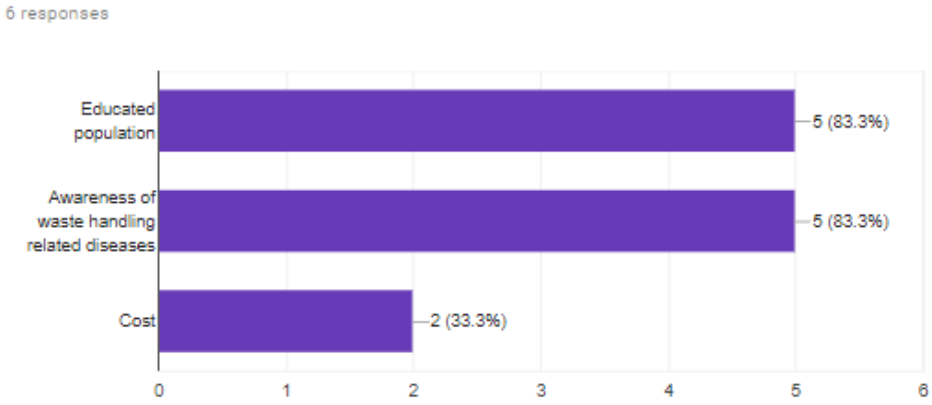

Figure 11: Response on reasons to effective waste handling in Finland

Even though the group members were unable to provide figures to illustrate points concerning the cost of waste handling in Finland, the group provided experiential evidence to the effect, that, people living in Finland are taught how to separate and finally dispose-off waste. To this effect, provision of education and training to the population on best practices of waste handling has been successful hence the outcome. Secondly, according to the group, the attitude of the citizenry towards waste handling is phenomenal. The group made it clear that the people in Finland are aware of the consequences of waste-related diseases if waste is disposed indiscriminately. The focus group sites example of people being reported to authorities for disposing-off waste improperly.

How concerned are you about environmental pollution in Ghana?

After seeking to find out what is likely to be reasons of effective waste handling in Finland, the researcher then sought to find out if the focus group is concerned about environmental pollution in Ghana. The results showed that all group members show a level of concern. From the chart below, 83,3% indicated to “very concerned” representing a total of five (5) members while 16,7% indicated to “concerned” representing one member (1). A chart below (Figure 12) shows how the question, “How concerned are you about the environmental pollution in Ghana?” was answered.

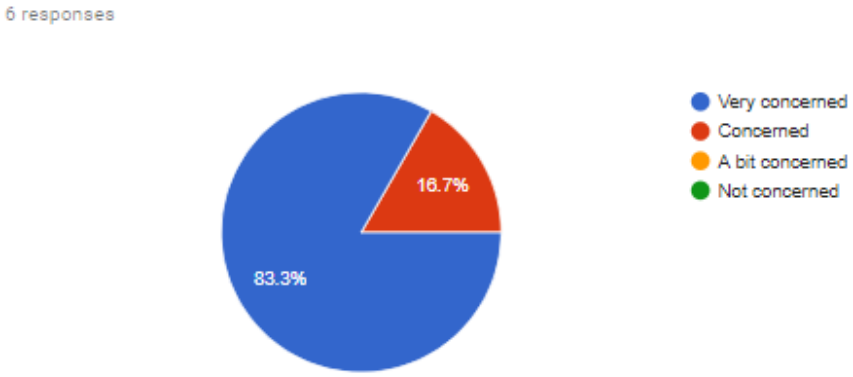

Figure 12: level of concern on environmental pollution in Ghana

How concerned are you about the waste impact on human health and water bodies?

The focused group was asked to show by indicating the level of concern or unconcern to the question "How concerned are you about the waste impact on human health and water bodies?". All members of the focus group indicated "very concerned" to the question asked. The response showed a 100% representing a total of six (6) respondents to the question asked. Figure 13 shows how concerned the focus group is towards the effect of waste impact on human health and water bodies.

Figure 13: Focus group response about waste the impact on human health and water bodies

How concerned are you about Ghana's position (seventh dirtiest country in the world) according to W.H.O?

The focus group was asked to state how concerned or not concerned of reports of W.H.O ranking Ghana as the seventh dirtiest country in the world. The results showed that all six members of the group indicated how concerned they are by indicating "very concerned and "concerned" in response to the question asked. 83,3% of the responses were for "very concerned" representing a total of five (5) whilst, 16,7% the of responses were from one (1) member who subscribed to "concerned". A chart below (Figure 14) shows how the focus responded to the question asked.

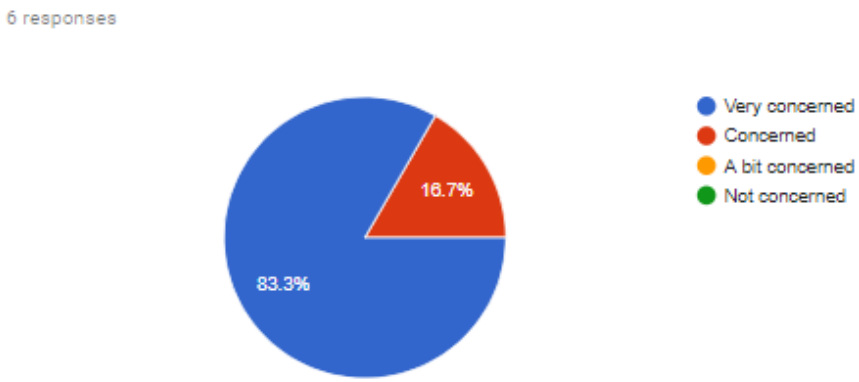

Figure 14: Focus group response to report of W.H.O ranking

Which waste-to-energy benefit is most important to Ghana now?

The researcher sought to find out from the group, what in their view is most likely to be the main reason Ghana will want to convert waste generated into energy. The limited list of reasons was for; creation of jobs, eradication of filth, provision of cheaper energy, reduction in emission of greenhouse gas and lastly, preservation of natural resources. Results from the survey showed that two of the likely reasons to why Ghana may choose to convert waste into energy are creation of jobs and eradication of filth. Both had a total of

100% in response representing a total of number of the group, six (6). Provision of cheaper energy ranked second with a total of 83,3% representing a total of five (5) members. Reduction in emission of greenhouse gas and conservation of natural resources both ranked third. Three (3) members, representing a total of 50% each. Below is a graph (Figure 15) which shows how the focus group ranked reasons to establish waste-to-energy in Ghana.

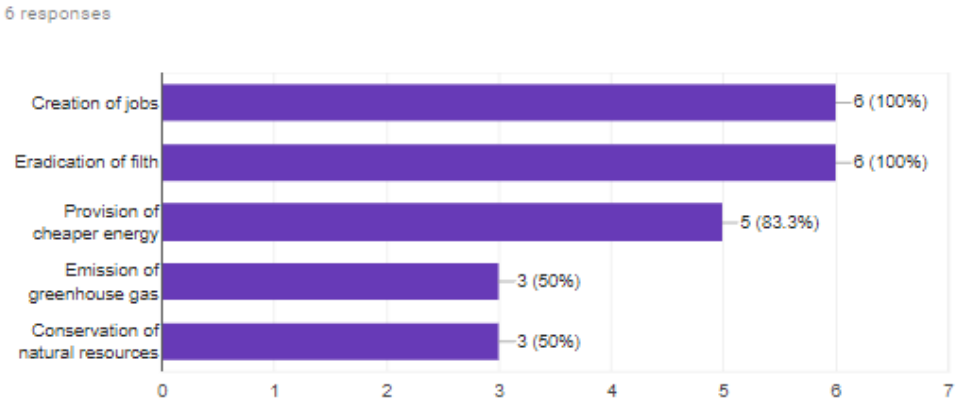

Figure 15: Most significant factor for establishing a waste-to-energy company in Ghana

From the results after the research conducted. One can notice that all factors listed for the reasoning of establishing waste-to-energy companies in Ghana are essential, however, in order of ranking, the group shows that creation of jobs and eradication of filth are the most important factors to why Ghana will appreciate a waste-to-energy company. The reason for the group's choice in selecting the first two lists (creation of jobs and eradication of filth) is undoubtedly backed by news reports on many educated but unemployed youth in the country. In 2016, the World Bank released a report on research conducted. In the report, it made mention of a significant number of 200,000 unemployed and 3 million inactive people in Ghana (Honorati & Johansson De Silva, 2016).

Secondly, the observation from the researcher who moderated the discussion for the focus group was that, the focus group though do not live in Ghana, were well informed on current sanitation issues in Ghana and therefore their decision on selecting Eradication of filth as the main reason to an establishment of waste-to-energy companies in Ghana deemed fit.

What is likely to be the reason(s) for waste menace in Ghana?

The researcher questioned the group on a list of factors provided as what in their view is the main reason for waste menace in Ghana. These factors are; insufficient waste management companies in Ghana, ineffective waste management companies in Ghana, poor human attitude towards the environment, high illiteracy rate and lastly, low or no political will. The group was asked to choose among the mentioned factors listed as the most reason for the state of sanitation situation in Ghana. Below are graphs that show the response made by the focus group as against factors leading to waste menace in Ghana. The reason to show all graphs separately is that, one can identify response made since an overview of graph could not show due to space. Secondly, separating all figures and analysing them as an individual entity provides clearer understanding. Here, the graph below (Figure 16) only shows an overview of how the focus group responded to the question asked.

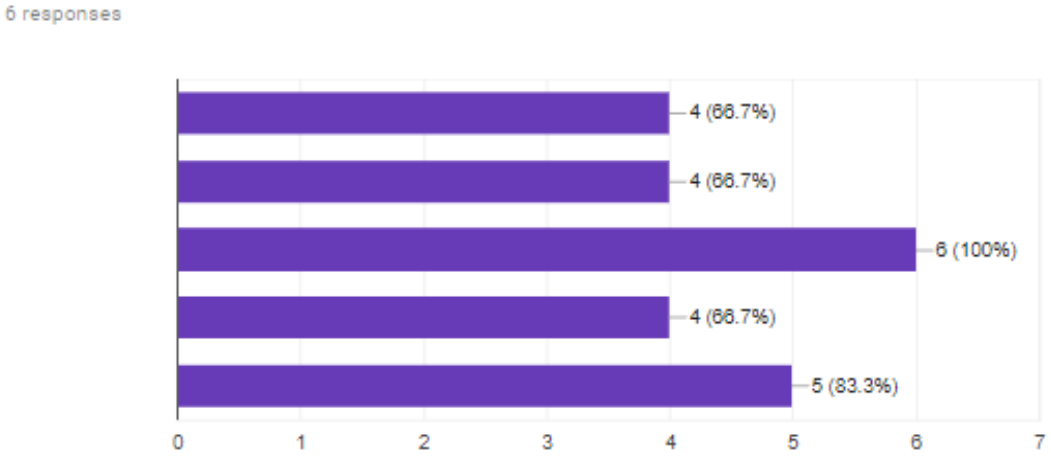

Figure 16: Overview of group response on prevalent factor on waste menace in Ghana

The collated results showed that the focus group rated poor human attitudes towards the environment as the main reason for waste menace in Ghana. The effect of rating was because all six (6) members responded, representing a total of 100%. Then, low or no political will. A total of five (5) members selected low or no political will which represents 83,3%. The rest, high illiteracy rate, inefficient waste management companies and

ineffective waste management companies secured the third position according to the focus group ranking. These three factors had four (4) respondents representing 66.7%. Figure 17 is a graph representation of the results.

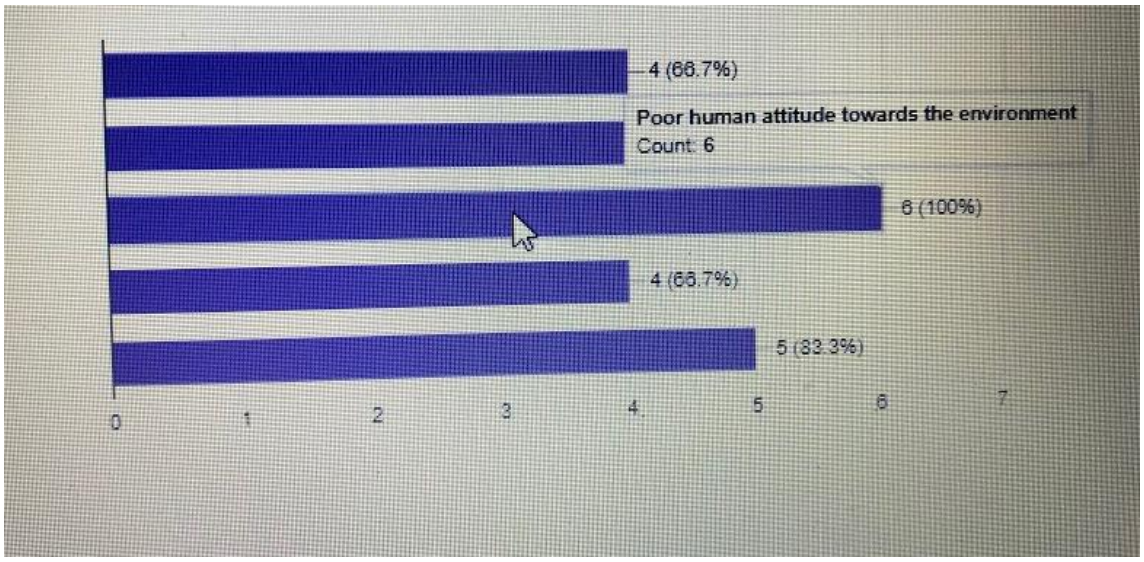

Figure 17: Poor human attitude towards the environment highest factor of waste menace in Ghana

While the focus group considers all listed factors of waste menace in Ghana worth noting, one of the factors, human attitude towards the environment recorded the highest submission. Which means, all members agree that indeed, poor human attitude is the main reason why sanitation related issues have risen to a peak where the people of Ghana acknowledge as menace. From improper dumping of waste through to open defecation to careless attitudes of poor lifestyle of people living in Ghana to inferior approach by law enforcement agencies, have led to waste menace Ghana. All these are what Ghana is confronted with thus the country has been left to fight the waste menace caused by its citizens.

Indeed, when the group was asked to provide by explaining why they claim waste handling is not the best way, more than half of the group members associated their response to poor human activities. More than half of the group sought to provide solutions by stating that, laws on waste management must be enforced and at the same time, sanctioned must be imposed on those who go contrary to what the regulations provide. This is a

reflection of what the focus group provided in writing in response to one of the questions asked above (What can be improved?).

The graph, Figure 18 shows that low or no political will secured second in ranking. According to the focus group, another higher reason why the state of Ghana's sanitation situation is a menace is as a result of low or no political will. The group seeks to suggest that, the government, if not, has powers to control and demand from her people, proper ways of handling waste. The previous governments over the years instituted monthly road-side sweeping and drenching. These exercises in the initial stages saw high patronage from the citizenry, but later, the patronage for the exercise drained out. There is a clear indication that, whilst these exercises exist, less has been done to eradicate filth. Therefore, the group is convinced the approach in tackling waste menace is either managed poorly or there is no political will at all.

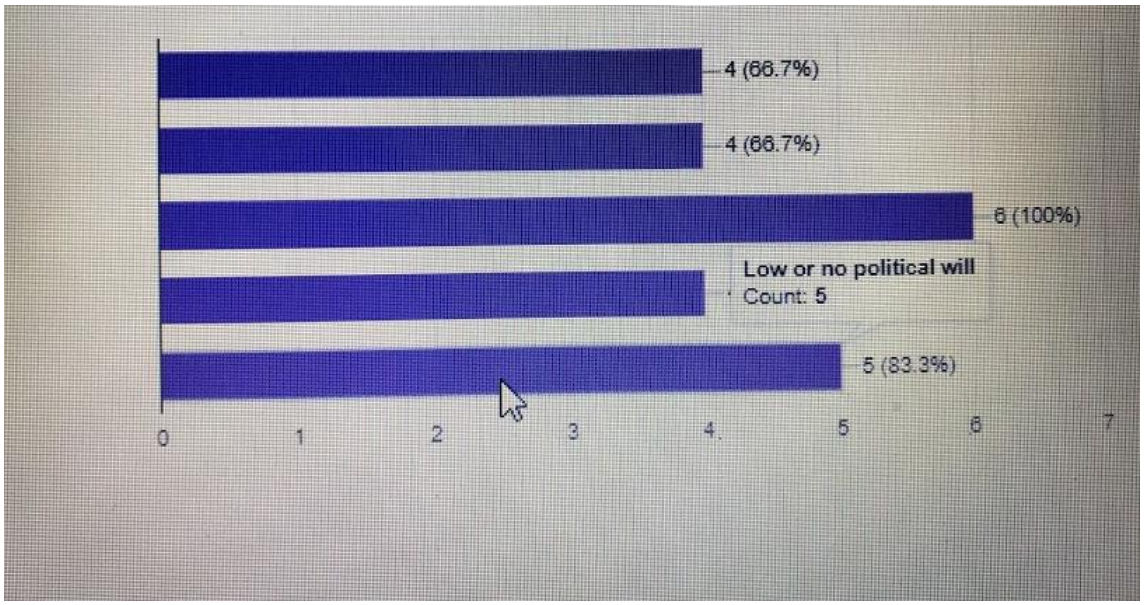

Figure 18: Low or no political will ranked second highest factor of waste menace in Ghana

Likewise, the result recorded for low or no political will, the focus group, in response to the question asked, also rated insufficient waste management companies as third highest of factors leading to waste menace in Ghana. In all, four (4) members selected insufficient waste management companies as one the factors of waste menace in Ghana which

represents 66,7% in respondents. The group is of the firm view that even though waste management companies are not into waste-to-energy, the number does not affect the sanitation situation Ghana faces. Meaning, the groups seek to suggest that, there are more waste management companies in Ghana and for that matter, there is no insufficiency regarding numbers as far as waste management is concerned. After the researcher asked the group to name some public waste management companies, the group mentioned four names. Figure 19 is a graph that shows how the focus group answered the question (What is likely to be the reason(s) for waste menace in Ghana?).

Figure19: Insufficient waste management companies third highest factor of waste menace in Ghana

Again, the focus group rated ineffective waste companies third highest factor of waste menace in Ghana. The group's reasoning was no different from what is attributed to insufficient waste management companies. Indeed, the group made it volubly clear that, despite the low application of technology in these waste companies in Ghana, their response to waste collection and many other related job responsibilities are encouraging. Figure 20 is a graph that shows four group members select from a list provided as one of the factors of waste menace in Ghana. The response, therefore, represented a total of 66.7% making it the third highest factor that constitutes waste menace in Ghana.

Figure 20: Ineffective waste management third highest factor of waste menace in Ghana

The focus group rated high illiteracy rate third highest factor of waste menace in Ghana. The group was of the view that, illiteracy rate has little or no impact on the state of sanitation in Ghana as compared to others. The group instead sought to suggest that, indeed, one can be highly educated and yet will be adamant on sanitation laws and regulations which can result in poor practices like, dumping waste indiscriminately, showing little or no concern while seeing others go contrary to waste laws without resorting to the right authorities. Below is the graph in Figure 21 that shows four (4) members of the focus group selecting high illiteracy rate as a factor of waste menace in Ghana with a representation of 66,7 in percentage.

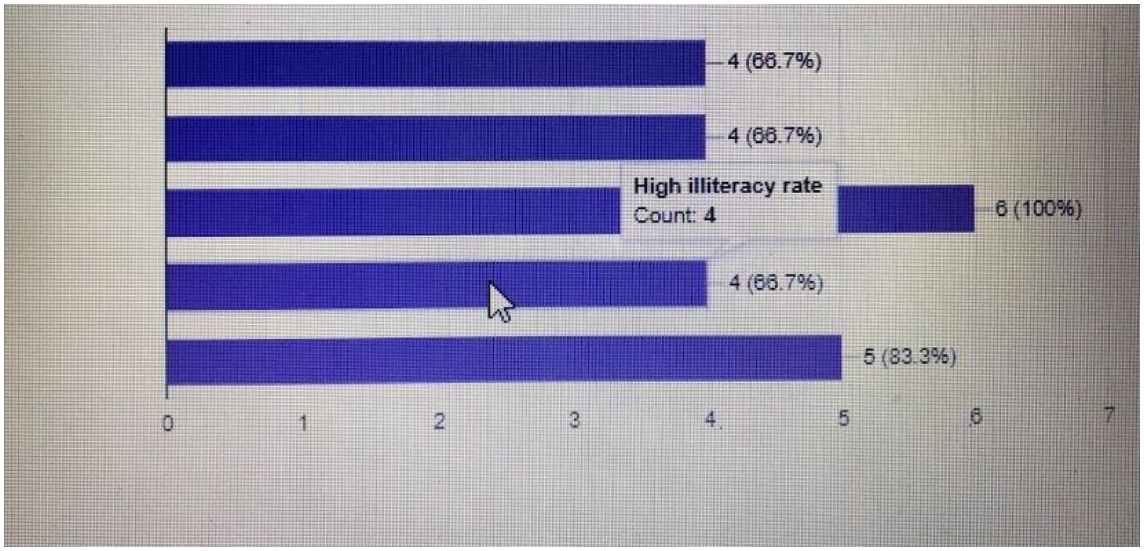

Figure 21: High illiteracy rated third highest factor of waste menace in Ghana

4.2. Ministry and agency

The researcher designed questionnaires for two bodies in Ghana, namely, Accra Metropolitan Assembly and Ministries. The ministries comprised of Ministry of Energy and second, Ministry of Sanitation and Water Resources. The researcher visited the above-mentioned ministries and agency in person to conduct the research. The researcher interviewed one person each from the two ministries and agency; AMA. Below are responses made by these respective bodies. For useful reading and flow of reading of the report, the response of Accra Metropolitan Assembly is first treated, then followed by the Ministry of Energy and finally, Ministry of Sanitation and Water Resources.

4.2.1 Accra Metropolitan Assembly (AMA)

Can Accra become the cleanest city in Africa as wished by Ghana's current president?

In 2017, The current president of the Republic of Ghana, in his speech in Accra, promised that Accra, Ghana's city capital would be the cleanest city in Africa by the end of 2020. The president's promise came while he was delivering his speech in one of the government's regional tour flagship programs in the Greater Accra Region (Nyavor, 2017). Many people, upon receiving the news had many doubts about whether this rather bold

initiative of the president is attainable. Some on the other hand, believed but were concerned about the timelines and for that matter, all attention was directed to the Accra Metropolitan Assembly and to the Ministry of Sanitation and Water Resources to inquire if indeed these two bodies have what it takes to make this vision of the president achievable. Upon the above reasoning, the researcher in the quest to find out answers from the AMA on waste related issues sought to ask the agency if indeed the vision of the president to make Accra the cleanest city in Africa achievable.

The result of the survey showed that the AMA was 100% optimistic that the vision of making Accra the cleanest city in Accra is attainable and sustainable. Figure 22 is a chat the shows how AMA responded to the question asked.

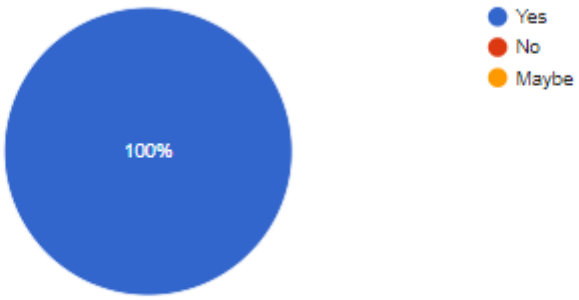

Figure 22: AMA response to Accra as cleanest city in Africa

From the figure above, the AMA was of the firm view that Accra could be the cleanest city in Africa as the president so wished. AMA responded to the question asked with a response to a total of 100% in favour of the vision being a reality.

If yes, how can this vision be achieved?

Again, the researcher asked a follow-up question. “If yes, how can this vision be achieved?”. The response in writing provided by the waste management department of AMA was “Education, enforcement of the law and the provision of logistics and infrastructure”. The AMA admits that though the challenges are many and fearsome, given the right support and logistics, the vision is indeed attainable. It also indicated that all

these cannot not be achieved if the education on waste handling and the enforcement of laws are in isolation.

What among waste handling process is/ are the reason(s) for the waste menace Ghana faces?

The researcher sought to find out from AMA what it finds as real-life challenges in dealing with waste handling processes in Ghana. The purpose of the question for further research is to know what the challenges AMA and perhaps waste management companies are facing in Ghana. Some waste handling processes listed were, waste generation, waste segregation, waste dumping and lastly, waste collection. The result of the survey shows that all except waste segregation has no effect on waste handling in Ghana and therefore does not contribute to the poor sanitation situation in Ghana. With a record of 100% in response to the effect that waste generation, waste dumping and waste collection are waste handling processes that lead to waste menace in Ghana. Only waste segregation recorded a 0 %. The graph, Figure 23 shows how the waste management department of AMA responded to the interview.

Figure 23: Waste segregation not a factor of waste menace in Ghana

From the results, it was found out that, waste generation, waste dumping and waste collection play a major role in affecting the sanitation in Ghana. AMA indicated that waste generation from different sources is a significant factor to waste menace in Ghana. The agency went on further to explain that, waste generated from households is different from

that of offices and schools. Indicating that, because there is no general layout as to how waste can be kept, that is, generating and keeping in unified agreed containers, people turn to generate and keep their waste in any available containers. For that matter, waste generated is monitored poorly.

Secondly, the AMA made mention that, waste generation is directly linked to waste dumping. Citing an example by saying that, one has no choice than to burn waste if they (citizens) have no waste containers. Again, gave another example, citing the fact that, people who turn to dump waste indiscriminately are those who have no waste containers. AMA further explained that these persons at the same time refuse to provide one for themselves or even if they do, keep waste in containers and later dump water into bodies when it rains in an expectation that, waste generated be washed away.

The third reason the AMA thinks is a contributory factor of waste menace in Ghana is the waste collection. AMA, by selecting waste collection as one of the challenges or factors to waste menace meant that waste management companies who are contracted to collect waste dumped at vantage points in the Accra metropolis fail to meet demand. Stating that,

- The waste management companies sometimes cannot transport waste collected to the landfill sites on time due to heavy traffic.
- The number of waste collecting containers are insufficient. Waste generated at marketplaces fill up waste containers which eventually leads to overflow. Due to this effect, market people are compelled to dump waste indiscriminately.
- AMA has difficulty in tracking people who do not subscribe to waste management companies. The reason is that non-subscribers constitute the number of people who are likely to dump waste indiscriminately.

On the contrary, AMA indicates that waste segregation has no effect and therefore is not a factor to waste menace in Ghana. The reason is that waste segregation is not practised in Ghana. The department emphasized that a small percentage is likely to practise waste segregation indicating that there is a possibility for people outside Accra to practise waste segregation.

How will A.M.A evaluate the state of waste collection in Accra?

The researcher sought to find out how the AMA evaluates the state of waste collection in Accra. The purpose of this question is due to the extent of challenges the AMA face in dealing with waste collection and the connection it has with waste management companies under contract. The result showed that AMA did not indicate by stating "GOOD" or "BAD" or "FAIR", it said that "there is room for improvement". A chart, Figure 24, shows the response provided for the question asked.

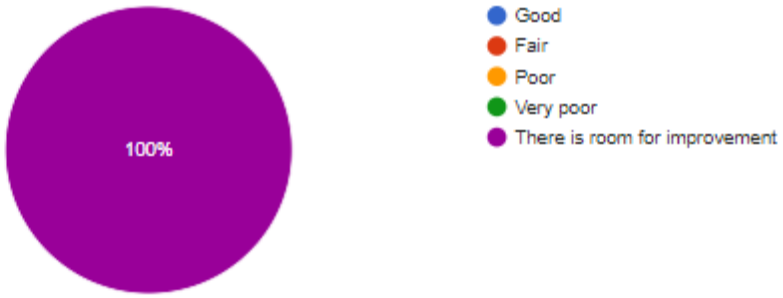

Figure 24: Waste collection evaluation by Accra Metropolitan Assembly

The answer provided by AMA seeks to suggest that, the agency is aware of the challenges it is confronted. However, all possible solution is being activated to compact the challenges in waste collection but also declares that indeed, there is more room for improvement.

Which among these, according to A.M.A poses more threat to the environment?

The researcher, this time, asked AMA to indicate which among a list of generation of waste provided poses more threat to the environment. The purpose of the question is to find out which among waste generation group is difficult for AMA to provide immediate solutions. Secondly, that, which among the list, if less attention is given, is likely to pose

a threat to the environment. The list provided are; residential waste, industrial waste, waste from hospitals, waste from market centres and waste from public places. From the results, AMA indicated that industrial waste and hospital waste pose no threat to the environment as far as Ghana is concerned. Both industrial waste and waste from hospitals recorded 0% while, residential waste, waste from marketplaces and waste from public places all recorded 100% which represents AMA's position to a fact that, residential waste, waste from marketplaces and waste from public places pose a threat to the environment. Figure 25 is a graph that shows waste generated in Ghana and their correspondent response in percentage in relation to whether the list provided poses a threat to the environment

Figure 25: level of threat waste generation to environment

AMA's justification to why it recorded residential waste as 100% threat on the environment is because, the agency, having to deal with waste generated by people in households, has noticed how much challenging it is for people living in residence to comply with regulations on waste dumping. The waste department of AMA indicated that people generate waste, keep them in right containers but refuse to pay for waste generated thereby making it difficult for waste management companies to provide the needed services since all avenue to retrieve money owed them (service providers) remain futile. In some instances, residential waste is dumped on shoulders of road and walkways. These actions become difficult for the agency or waste management companies to identify offenders. The agency will have no other option than to make sure the waste improperly disposed-off is cleared.

The department of waste management at AMA explained that waste from marketplaces and waste from public places have same number of challenges. The department mentioned some of the challenges the agency is confronted with. They are as follows;

- Late response by waste management companies on collection of waste.
- People at market and public places fail to comply with laws on waste or are ignorant of dangers waste poses on human lives.
- There is no routine sweeping and clearing of refuse at the marketplace as well as public places.

What are the challenges the assembly faces regarding waste handling?

The researcher asked AMA to answer a question by indicating which among a list provided are challenges the assembly faces regarding waste handling. The list provided are; citizenry indiscipline, lack of efficient waste management companies and lastly, lack of waste bins and containers at vantage points in Accra. AMA's response indicated that lack of efficient waste management companies is not one of the challenges it faces. It recorded 0%. Meanwhile, citizenry indiscipline and lack of waste bins and or containers at vantage points in Accra both recorded 100%. An indication that, AMA continues to have challenges dealing with the above-mentioned waste handling factors. Figure 26 is chart that shows the challenges the AMA faces regarding waste handling.

Figure 26: Waste handling challenges AMA faces

According to the waste management department of AMA, even though the agency has challenges with the way and manner waste is handled, especially in the collection of waste by waste management companies, the gravity of the outcome is not as compelling as compared to citizenry indiscipline and the lack of waste bins at vantage points in Accra. It is for this reason the waste management department of AMA, after carefully looking through the list provided as challenges of waste handling, eventually selected Lack of efficient waste management companies as the least challenges it faces.

Citizenry indiscipline recorded 100% as AMA's challenge of waste handling. The waste management department of AMA describes how Accra, the capital city, with all its beauty and tourist sites is also the busiest city in Ghana. Due to this, people living far and near, come to Accra to trade, explore its beaches and visit other tourist sites. According to AMA, activities such as these mean that people will generate waste. When waste is generated, most often, the people are less likely to keep and dump waste at preferred places. The AMA revealed that indeed, the agency is partly to blame because there are fewer waste bins at vantages points in the city of Accra and hence people who generate waste are compelled to dump it anywhere without repercussions.

4.2.2 Ministry of Energy

On the 26th day of February 2018, the researcher received a message from the Ministry of Energy to present questionnaire and letter titled, “REQUEST LETTER FOR ACEDEMIC RESEARCH WITH MINISTRY OF ENERGY” to the Communications Unit of the ministry. This development was after the researcher had sent email to the ministry of energy. The researcher was then re-directed to the Renewable energy Department of the ministry to conduct interview. Below are responses gathered after the interview was completed.

What are the plans and programs of the ministry on energy mix for energy supply in the country?

The researcher sought to find out from the ministry if there are plans of incorporating energy mix to demand. The response from the ministry was “We have plans of focusing on how to generate energy from waste”. From the response given, it is noticed that the ministry indeed is finding ways to adopt energy sources from waste to meet demand.

Will the ministry support or not support, waste-to-energy projects in Ghana?

The researcher after being provided with an answer to the first question on whether the ministry has plans on energy mix, a follow up question was posed. While the researcher is aware waste and water related issues are in the purview of the ministry of sanitation water and resources, questions needed to be asked from the ministry of energy so far as the relevance of the question borders on supply of energy for the country. The response to the question asked was “We will support waste-to-energy project because that is an area of focus for us”. The response from the ministry indicates that the ministry is ready to support either public or private sector driven initiative on waste-to-energy projects.

What is the supply and demand margin on energy?

Here the researcher sought to find out if the supply of energy meets demand as the population keeps increasing. The reason for asking this is question is find out what will trigger the ministry to want to consider energy mix or more forms of energy generation to meet demand. Secondly, the question was posed to the interviewee based on energy crisis the country faced in 2015. Reports indicate that for over a period of three years Ghana was faced with power crisis. The country received rotational power supply (load shedding) and for which a carved name "Dumsor" was adopted to mean power on and power off (Graphic Online, 2015). The response provided for the question was "The demand for energy is more than supply". The interviewee indicated that the circumstances demand urgent steps to mitigate another power crisis while making sure people who a found to have improper connected electricity in their homes or work places are dealt with under the law.

How significant will the technology of waste-to-energy meet demand if any?

The researcher asked to what significance will waste-to-energy be if added to energy mix in order to meet demand. The interviewee responded by saying "It is very important as we are looking to incorporate technology in our processes to save time, energy and bring a lot of conveniences". The interviewee stressed that, rather than have heap of waste at landfills, if waste is converted into energy will bring more convenience to people who have endured the stench and diseases because they lived close to landfill sites.

What is likely to be the reason(s) for waste menace in Ghana?

In the last question posed to interviewee, the researcher sought to find out what in the view of the ministry of energy is or are the reason(s) for waste menace in Ghana. Figure 27 is a graph that show how the interviewee responded to the question asked.

Figure 27: Cause of waste menace in Ghana according to Ministry of Energy

From the graph shown above, the Ministry of Energy is of the view that Poor human attitude towards the environment is the cause of waste menace in Ghana. From the graph, it is shown that, among Poor human attitude towards the environment are; Insufficient waste management companies, Ineffective waste management companies, High illiteracy rate and lastly, Low or no political will. Only Poor human attitude towards the environment recorded a 100%, the rest of the causes of waste menace in Ghana recorded 0%. This means, the ministry only finds Human attitude towards the environment to be the only main cause to waste menace in the country.

4.2.3 Ministry of Sanitation and Water Resources

The researcher visited the Waste Department of the Ministry of Sanitation and Water Resources in Accra. There, the researcher, just as was done at the Ministry of Energy presented hard copy of letter seeking to conduct interview for an academic research. In all, the researcher asked nine (9) questions. Below are questions and responses gattered after the interview.

What are the plans and programs the ministry has in place to curb waste menace in Ghana?

The researcher sought to find out what the plan and programs of the sanitation ministry are concerning the rate of waste and waste related issues in Ghana. The researcher seeks to find out if the ministry has outlined measure to curb waste menace in Ghana. The response from the interviewee was "The ministry is partnering with private companies to ensure waste segregation and waste recycling".

From the response, it is shown that the ministry has put in measures to collaborate with the private sector to adopt waste segregation and recycling. The researcher finds this initiative encouraging. It will be recalled that, the Accra Metropolitan Assembly (AMA) upon answering to a question posed on whether it considers waste segregation as a cause to waste menace in Ghana, the AMA indicated therefore cannot be a reason for waste menace in Ghana. The AMA explained that, indeed waste segregation in not practised in Ghana, stressing however that, there are a handful of people who practise for reason of separating food waste for the purpose of feeding livestock in their homes.

What are the challenges the ministry faces as far as managing waste is concern?

Second, the researcher asked the interviewee to indicate the challenges the ministry faces as far as managing waste is concern. The response to the question asked was that "Our waste landfills are getting full and that is the fear factor of what we will be doing with the waste generated. This is because as our pollution keeps increasing and so it means there will be an increase in waste generated".

From the response, it is noted that among many other factors, the ministry finds the over flow of landfill sites as its challenges indicating how threating it looks considering the fact that the Ghanaian keeps increasing.

What are the roles of stakeholders for the sanitation and water ministry?

After the researcher sought to find the immediate challenges confronting the ministry, another question was asked. This time, to find out the roles stakeholders of the ministry are to play. In response to the question, the interviewee said, “They are expected to play a part in educating and encouraging the segregation and recycling of waste”.

The answer from the interview shows that, the stakeholders of the ministry have a primary duty to play in insuring a clean environment. The interviewee attributed that way forward therefore is to provide education on ways to handle waste and to encourage a practice of segregation of waste and if possible, consider waste recovery resources; reduce, reuse and recycle.

What contributions have the ministry’s stakeholders done so far on waste management?

“There have been private partnerships established with private waste management and recycling companies to curb the improper circulation of waste in the country”. This was the response to the question on the kind of contributions the stakeholders of the ministry have done is in making sure the environment is clean.
The researcher finds the contributions from the stakeholders as a laudable idea and therefore must be encouraged to do even more.

Which among these, according to the ministry poses more threat to the environment?

The researcher outlined waste types generated from different places such the industry, home, hospital and at market places. The researcher then asked the interviewee to indicate the ministry’s point of view on which among the outlined listed names pose more threat to the environment. Figure 28 is a graph that shows how the question was answered.

Figure 28: Type of waste posing a threat to the environment

From the graph shown above, Household waste, Industrial waste and Commercial/public service waste recorded a 100% while hospital waste recorded a 0%. This means, the sanitation ministry finds all three different kinds of waste as a threat to the environment. The ministry however, indicates that hospital waste in its view is not a threat to the Ghanaian environment.

Which of types of waste-to-energy technologies does the ministry prefer and why?

The researcher outlined waste-to-energy technology types. These are, Anaerobic digestion, Incineration, Landfill gas recovery, Mechanical biological treatment, Gasification (presence of oxygen) and Pyrolysis. The researcher proceeded to ask the ministry what among the listed names is most preferred waste-to-energy technology type. Figure 29 is a graph that shows what among the WTE technology type is most preferred by the ministry.

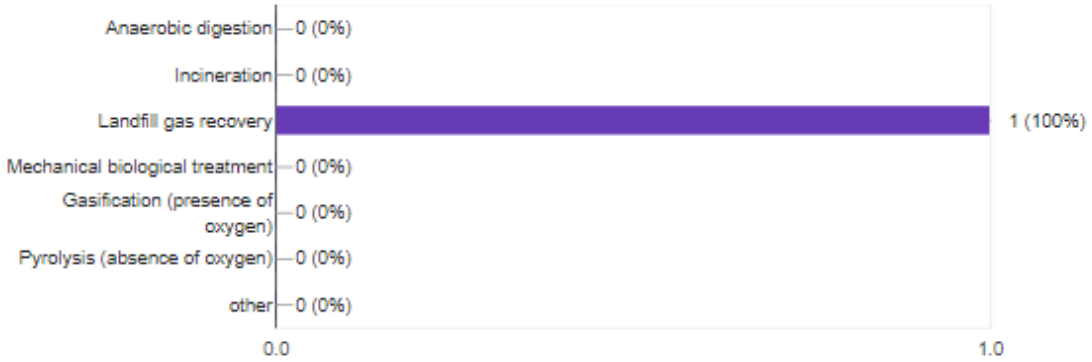

Figure 29: Preferred waste-to-energy type according to the sanitation ministry

According to the interviewee, all WTE technology type are good however indicates landfill gas recovery is the ministry's choice. Therefore, Landfill gas recovery recorded 100% while Anaerobic digestion, Incineration, Mechanical biological treatment, Gasification (presence of oxygen) and Pyrolysis recorded a 0%.

Explain your choice in question 6?

To be able to understand the reason for the choice made on WTE technology type, the researcher asked the interviewee to explain why Landfill gas recovery is the most preferred choice of the sanitation ministry. The interviewee said that, "Our landfills are getting full and incapacitated. We project this to be a serious hazard to the environment, considering the fact that the population keeps increasing and therefore waste generation will equally increase". The interviewee is of the view that, rather than have many landfills full in the country, the best option is to consider a landfill gas recovery system where was accumulated and landfill sites be put to good use.

What is likely to be the reason(s) for waste menace in Ghana?

Finding the likely reasons for waste menace in Ghana runs through all groups. The purpose is to make the researcher meets the objective of avoiding the blame-game peddling spoken about in Chapter 1. The researcher outlined a number of factors of waste menace.

They are; insufficient waste management companies, ineffective waste management companies, poor human attitude towards the environment, high illiteracy rate and lastly, low or no political will. Upon this, the researcher sought to find out from the ministry to identify and select the most likely reason for waste menace in Ghana. Figure 30 is a graph that shows how the sanitation ministry answered the question.

Figure 30: Poor human attitude towards the environment a reason for waste menace in Ghana

From the graph above, the interviewee chooses poor human attitude towards the environment as the main reason for waste menace in Ghana. Poor human attitude as shown in the graph above obtained 100% while the rest of the outlined factors obtained 0%. This is to mean, the sanitation ministry is of the view that, of the outlined factors likely to cause waste menace in Ghana, all but poor human attitude towards the environment is the main reason for waste menace in Ghana.

Which waste-to-energy benefit is most important to Ghana at the moment?

lastly, the researcher sought to find out from the sanitation ministry the most important benefit waste-to-energy technology will be for Ghana. Among the listed important benefits of waste-to-energy technology are; creation of jobs, eradication of filth, provision of cheaper energy, emission of greenhouse gas and lastly, conservation of natural resources. Again, the researcher asked this question to all groups. The reason is able to collect all views from all respondents in order to draw a conclusive analysis. Figure 31 is a graph

that shows how the question “Which waste-to-energy benefit is most important to Ghana at the moment?” was answered.

Figure 31: Most important WTE technology to Ghana according to the sanitation ministry

From the graph shown above, eradication of filth, provision of cheaper energy and emission of greenhouse gas all obtained 100%. The sanitation ministry seeks to suggest that all three listed above are equally most important WTE technology Ghana can benefit should a WTE facility be established in Ghana. The rest, creation of jobs and conservation of natural resources both obtained 0%. From the interviewee’s point of view, though creation of jobs and conservation of natural resources are important reasons for why one will consider a WTE facility, however, these important factors of WTE arise as secondary benefit. The sanitation ministry is of the view that, when filth is eradicated by converting landfill to gas, cost of energy will be cheaper, eventually greenhouse gas which would have gradually depleted the ozone layer is reduced.

4.3 People living in Ghana

Between 25th of February 2018 through to 10th of March 2018, the researcher went to households to interview some Ghanaians. The reason is that the questionnaire was designed solely for people living in Ghana. All face-to-face interviews with citizens was conducted in Greater Accra, mostly in the capital city of Ghana, Accra. Some towns in the Greater Accra were selected. They are; James Town, Madina, Kaneshie market,

Agbogbloshie lorry station. These towns in the Greater Accra Region were selected because, apart from James town which is at the heart of the capital city, has people who live close to the sea. James town and its environs have been reported to be one of the dirtiest beaches in Ghana. The rest are marketplaces with people from all walks of life. These are places with lorry parks for ease of transportation for people who live far and beyond.

Another approach to collecting data was the distribution of questionnaire via online platforms. Copies of the questionnaire were sent via Facebook and WhatsApp platforms for people to answer. In all, A total of two hundred and two (202) responded to the questionnaire. Among the seventeen (17) questions posed bothered on; regional location of respondents, age factor bracket of respondents, type of waste generated, willingness of people living in Ghana to pay for dumping of waste, separation of waste, respondent's fair knowledge on the importance of waste-to-energy technology in Ghana and finally, to find out what in their view were reasons for waste menace in the country. Below are questions answered by the citizens living in Ghana and then followed by analysis based on the responses to the questions asked.

What is your gender?

Out of the two hundred and two (202) respondents, one hundred and forty-three (143) were males, representing a percentage of 70.8 and females, fifty-nine (59), representing 29,2%. The results from the question asked shows that more males responded to the questionnaire as compared to females. While others have a perception that females generate waste more than males, others on the other hand also suggest females have less concern over sanitation related cases. From the figure 32 below, the percentage margin between male respondent and female respondent is wide.

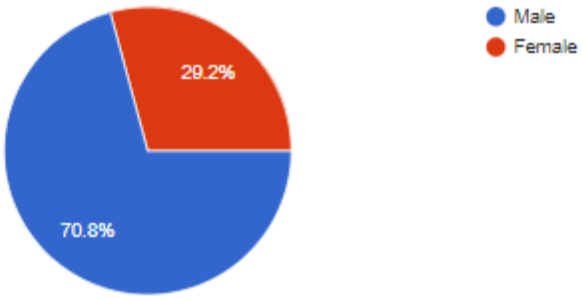

Figure 32: Percentage of male and female response to interview

In other to clear doubts of perception on who among the gender bracket is responsible for the poor handling of waste, the researcher chose two different places busy places in Accra, Kaneshie and Agbogloshie. These two places have a market and a lorry station. While females dominate the market to sell food items, the males, on the other hand, dominate the lorry station, where potential travellers come in to board vehicles to their respective destinations.

The observation gathered was that, at the market centres, indiscriminate waste handling was prevalent. Even though the market had one waste container, it was full. Rubbish was all scattered all over. Some groups of market women were seen trading near waste containers. Another observation was that this waste generated at the marketplaces comprised of plastic bags, papers and the most, organic waste.
At the lorry stations of both the Kaneshie and Agbogbloshie with male domination, however, it was observed that there were no waste containers. A heap of rubbish was found at the lorry stations with some scattered all over the place. The type of waste was mostly plastics.

To an investor, this observation will mean an opportunity instead of a challenge. While others may see indiscriminate waste, the investor, on the other hand, identifies opportunity and finds appropriate means to proffer solutions. While waste generated at the marketplaces will best suit waste management companies, who are solely converting organic waste into compost and for other purposes. Waste generated at lorry stations will best suit

waste management companies, who are into the recycling of plastics. Figure 33 below is a picture that shows heap of refuse at the Kaneshie Market in Accra.

Figure 33: Heap of refuse at Kaneshie Market in Accra

What is your age group?

The researcher sought to find out the age group of the respondents. These age group were; 17 and below, 18-29, 30-39, 49-49, 50-59, 60-69, 70 and above. Among the age groups, 18-29 and 30-39 recorded the highest response at a rate of 96.1% representing one hundred and ninety-four (194) respondents while the remaining age groups all-together, had eight (8) respondents representing only 3,9%. 18-29 age group alone recorded 72,3% while 30-39 age group, 23,8%. Figure 34 is the chart that shows a graphical representation of how the citizenry responded to question 2 of the questionnaire.

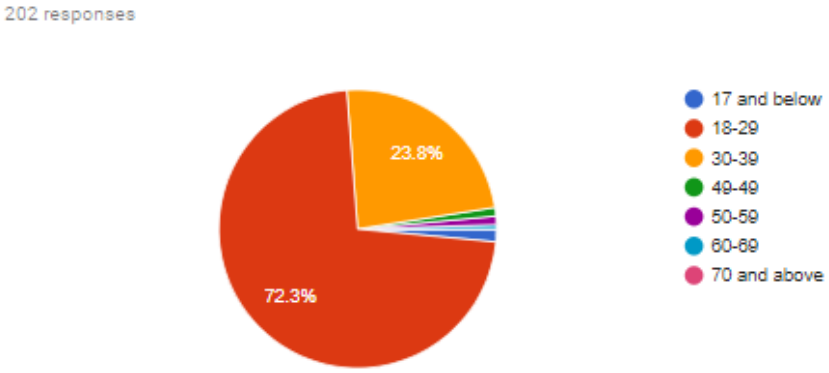

Figure 34: Respondents versus age brackets

The highest respondents, as shown in the figure above constitutes the broader population in the country. They are the young and energetic group of people living in Ghana. It is indeed not surprising therefore if indiscriminate dumping of waste is attributed to them. Why is it so? While it is obvious to recognise the fact that, the teaming youth constituting the larger population showed concern in questions posed, there is also no doubt that, the same youth have the tendency of causing filth in the country. The reason is, the youth among many, make the highest movement from one end to the other more than any other age group. Therefore, the tendency to buy food and water in polythene and finally dumped them anywhere is high.

It can equally be said however that, the investor, upon having a look at the figures on the chart can identify opportunities. Such an ideal opportunity is an identification of a more significant number of concerned youth on matters of sanitation issues. While one can say the youth is likely to cause filth in the country, the youth is as well likely to constitute the working force for a potential waste management companies.

Where do you live?

Recognizing that Ghana has ten (10) regions, every respondent indicated from where in a region they live. This was conducted to know a true reflection of sanitation related issues in the regions of the country. From the figure below, Greater Accra Region recorded the highest response at a rate of 69,8% representing a total of one hundred and forty-one (141)

respondents. The second highest, Ashanti Region, with a response at rate of 11,9% representing a total of Twenty-four (24) respondents. The remaining eight (8) regions in total, had a rate of 18,3% representing thirty-seven (37) respondents. Figure 35 below shows a graphical representation of how the citizenry responded to the questionnaire, seeking to find out where they lived.

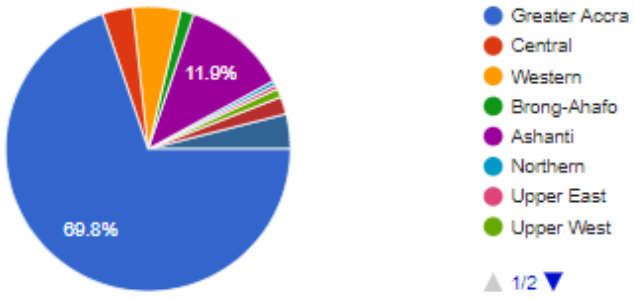

Figure 35: Regional location indication by respondents

From the chart above, respondents from Greater Accra were the highest with more than half of the total respondents in terms of percentage. It is necessary to note that Accra, the capital city of Ghana is the populous city in Ghana with averagely over 2 million inhabitants (United Nations, 2017). Accra is followed by Kumasi, before the rest of the listed regions. Therefore, results shown is a reflection of the population fragments of Ghana.

To the investor, the highest response from the respondents mean worth taking. The respondents upon answering where they live show a chronology of what they are confronted with in terms of waste situation in their city. Why is it so? If indeed these respondents who have indicated where they live, then it means the respondents are bringing to bare the real situation in their environment and therefore there must be a critical look at observations made.

In this case it will not be farfetched to say that Accra, being the most populous city in Ghana, is of the cities for siting a waste-to-energy plant. The reason being that, the city has vibrant youth hence, generation of different types of waste is on the rise. Issues of waste is mostly attributed to Accra.

Second is Kumasi, which it is located in the Ashanti Region of Ghana. From the data gathered, Ashanti Region secured the second highest of response with twenty-four (24) respondents representing 11,9%. Kumasi is the second most populous city in Ghana. The city, among many other things is as busy as Accra, with people moving from one place to another, transacting business in exchange of goods and services. Kumasi alone is recorded to have a population of about 1,5 million inhabitants (United Nations, 2017).

The other regions though had low responses, equally share in the same sanitation situation be-devilling the country. It is prudent to say the level of severity is in these populous cities of Ghana are in Accra and Kumasi.

What type of waste do you generate at home?

Next, the researcher sought to find out from the citizenry, the type of waste they generate. In all, two hundred and two (202) responses were recorded. Plastic alone recorded a total of one hundred and seventy-five (175) responses representing a total 86,6%. Organic waste, according to the results gathered, recorded a total of one hundred and thirty (130) responses representing a percentage of 64,4. Tin or Can, a third highest in response, recorded a total of one hundred and seventeen (117) responses representing a total of 57,9%. Paper on the other hand, recorded a total of one hundred and six (106) responses at a rate of 52,5% while Carton recorded thirty (30) responses with a percentage of 14,9% and Glass, thirty (30) responses at a rate of 17,8%. Figure 36 is a the graph that shows the types of waste generated by people living in Ghana.

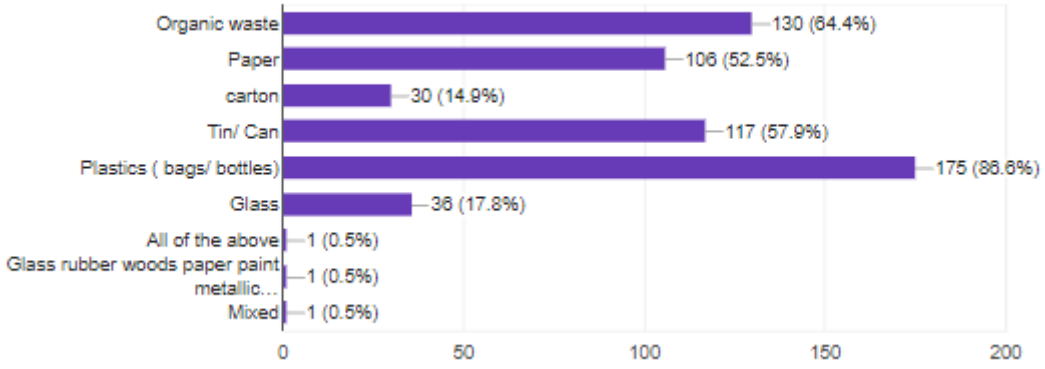

Figure 36: Types of waste generated at home

From the graph above, it is shown that while all types of waste are generated in Ghana, plastic waste was the highest waste generated, then followed by organic waste. Tin or Can as observed from the graph, was the third most generated waste in Ghana. Then Tin/Can was subsequently followed by paper waste, then after, carton and glass as the least waste generated by the people of Ghana. The purpose of asking the citizenry the type of waste they generate is to make sure all types of waste generated is known. Secondly, to aid in finding suitable connection with waste generated to how beneficial it is to waste management companies seeking to explore new markets.

To an investor, this is the greatest opportunity to tap. The graph shows the types of waste generated by the people of Ghana, providing which among them recorded the most and less waste generated. Such discovery therefore, creates an avenue for investors and in this case, waste management companies to enter suitable markets. The purposes for which the graph shows a clear representation of what type of waste generated by the people of Ghana, if ventured into, will be more profitable or less to a potential waste management company seeking to enter Ghana to establish its business and eventually dominate the market.

From the graph, it can be concluded that, until daily activities of the citizenry change or government policies change, the type of waste generated by Ghanaians is likely to remain the same. One typical example is plastics. In some parts of Africa, there is a governmental policy on ban of plastics. Ghana is different. Even though, over the past years, there has been agitation from pressure groups asking the Ghana government to ban plastics. These pressures have remained futile. One can also not say if there are plans so far by the current government to ban plastics.

In what kind of container do you keep or collect your waste?

Here the researcher sought to find out in what kind of containers waste is kept. This question was prudent because, it helps to know whether waste generated is traceable, for example, waste generated is kept in waste containers waiting to be emptied by waste

companies. If not, then there is a quest to investigate if waste being generated are burnt or dumped indiscriminately. Another relevant point for finding the type of waste containers used is for an effective analysis of waste collection methods by waste management companies in the country.

In Ghana, the commonly used containers for waste handling are; waste bins, waste cartons, plastic bags and sacks. Others who do not use any of the above listed waste containers dig pits and periodically burn their rubbish. The graph below, Figure 37, shows a pictorial view of how the citizenry answered the question on the type of waste containers they use.

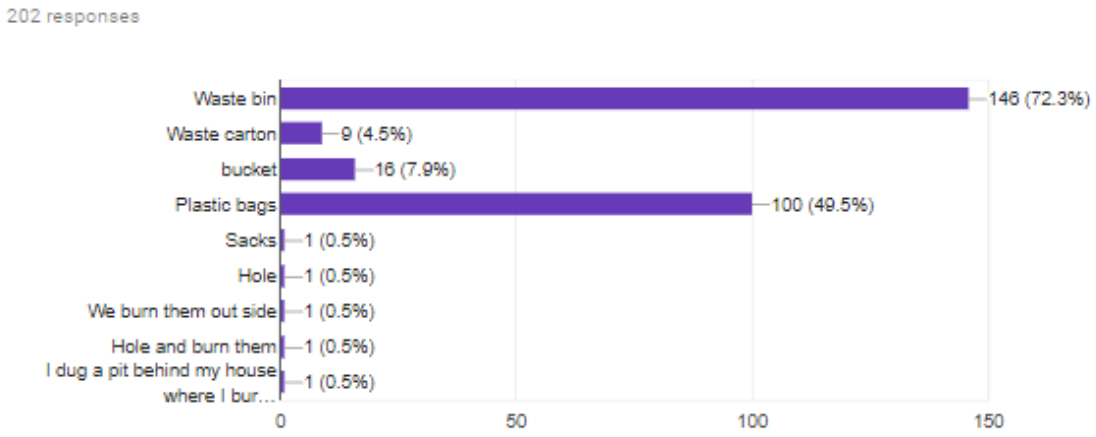

Figure 37: Types of waste containers used by Ghanaians

From the graph, Waste Bins had the highest record at a percentage of 72,3 representing one hundred and forty-six (146) respondents. The rate of percentage of waste bins only implies that, while others have other means of keeping waste, waste bins is the most patronized among the waste containers. Second highest, Plastic bags, records at a percentage of 49,5 representing one hundred (100) respondents. Bucket, a third highest according to the graph recorded a percentage of 7,9 representing sixteen (16) respondents. According to the graph, Waste Carton recorded 4,5% representing nine (9) respondents. both sacks and waste kept in Pit-to-burn recorded a 0,5%, representing one (1) respondent each.

Clearly potential waste management companies can develop concrete strategies for waste collection due to the result obtained in this research. The graph above shows that despite

the poor sanitation situation in the country, majority of the citizens and in this case, using the respondents as a reference point, prefer waste bins to any kind of waste containers. In their view, waste bins, have portable seal, bigger in size that is capable of keeping large amount of waste generated. All the rest of the waste containers mentioned cannot be compared to waste bins on its features.

Through constant public education on ways citizens need to keep waste, keep the environment tidy as well as the need to prevent waste-related diseases and to reduce the number of people who use other waste containers apart from waste bin containers will gradually tend to influence citizens to start using waste bins as containers. What this means is that waste collection companies will have had an increase in customer-base. The reason is that waste bin container users are subscribers of waste collection companies. Potential waste companies will have the competitive advantage over competitors because of pragmatic waste collecting strategies acquired.

Do you separate waste generated at home?

To understand how waste is handled, the researcher sought to find out from the Ghanaian citizenry if indeed waste generated is separated. From the results, it was found out that majority of the respondents said “NO” while a few said “Yes”. One hundred and seventy-two (172) respondents indicated that they do not separate waste, representing a rate of 85,1% while only thirty (30) of the respondents indicated otherwise, representing 14,9%. The figure below, Figure 38, shows a graph that represents of how the question was answered.

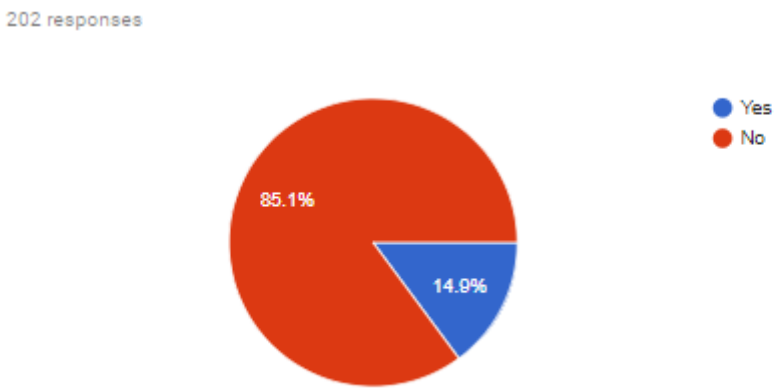

Figure 38: A graph of waste separators and non-waste-separators in Ghana

From the results of the question asked, it was found out that, a percentage of Ghanaians separate waste. Some on the other hand do not separate waste. While majority of respondents said" NO" to mean they do not separate waste, thirty (30) out of the two-hundred and two (202) said they separate waste.

It will be recalled that the waste management department of Accra Metropolitan Assembly indicated that waste segregation is not one of the factors that contributes to waste menace in Ghana. The department went on further to explain that waste segregation is not practised in Accra as far as the agency is concerned. The results shown from the graph above makes what the department of waste management of AMA said clearer. The department after explaining "waste segregation is not practised in Accra", revealed that the possibility of people to practise waste segregation is low. Hence, that position of the waste management department of AMA is a reflection of what is seen in the graph above.

Some of the inhabitants in Accra who were interviewed by the researcher revealed that, before migrating to Greater Accra Region, the practise of waste segregation was not uncommon. The reason was that, most households reared farm animals in small quantities since it was usually home based. The usual practises were that, anytime these animal breeders generate waste, food waste is separated and later used to feed the farm animals. Example of these animals are pigs.
To an investor, the results from the graph shows how people living in Ghana generate waste. The majority do not subscribe to waste segregation. Therefore, business opportunity is more to the advantage of waste management companies who are not into waste segregation.

How often does your waste container get emptied?

The researcher again asked from the citizens how long it takes for waste generated at home disposed-off. The researcher provided time bounds, they were; Daily, Weekly and Monthly. Even though these three (3) time intervals were provided, the researcher

provided an option to interviewees whose answer(s) may differ from what has been provided. In all, two hundred and two (202) people in Ghana responded to the question asked. One hundred and two (102) respondents dump waste once a week representing 50,5%. Fifty-five (55) respondents dump waste once in everyday, representing a total of 27,2%. Twenty-nine (29) respondents dump waste twice a week representing 14,4%. Other, which comprises of monthly, three times in a week and not regular, had eight (8) respondents indicating total representation of 7,9%. Figure 39 is a chart that shows how the citizens responded to the question asked.

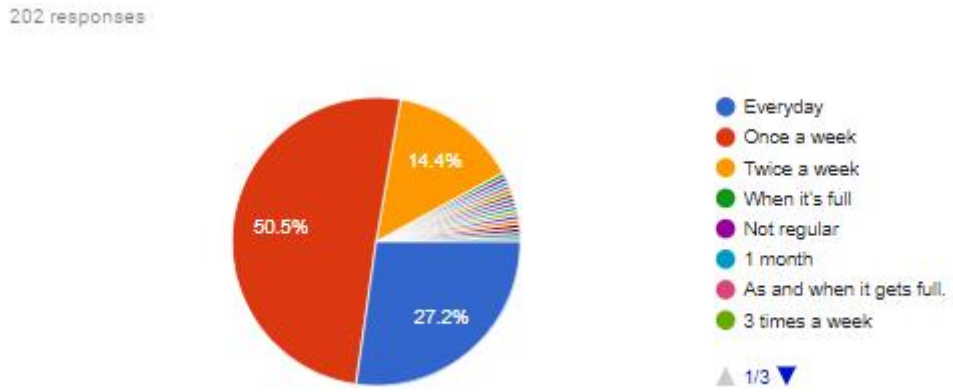

Figure 39: Response of how often citizens dump waste

From the response, everyday, once a week and twice a week turned out to be the most occurring period for the respondents to dispose-off waste. Monthly, three times a week and not regular were least in percentage terms. Meaning people who dispose-off waste within such periods are in the minority.

From the figure above, it is observed that more than half of the total respondents indicated that, waste is kept and dumped after a week. Whilst it is noticeable from the chart that waste is dumped after a week or more, there is yet an interesting twist, that is, the health concerns of the people in Ghana. The researcher is of the view that, people who keep waste for a long period before dumping have the tendency of showing less concern to the health and environmental related issues in their communities.

Where do you dump your waste?

The researcher sought to find out from the citizens to indicate where they dump their waste. The purpose of the question asked is to find out where the citizens finally dispose-off waste. The reason is backed by news reports on indiscriminate dumping of waste. Therefore, the research was designed so that, first, one can know why citizens dump waste at where they deem appropriate and secondly, to identify business opportunities for investors.

From the results, it was shown that, citizens who dump waste into waste collecting vans is the majority, followed by people who dump waste in Public bins. Others however, burn waste. Some respondents indicated that waste is dumped by the road side. One hundred and ninety (190) respondents dump waste in waste collecting vans which represents 63,9% of responses. Forty-three (43) respondents burn waste in pits representing 21,3% of response. For some, waste is dumped in public bins. These respondents are a total of forty (40) people representing 19,8% of response. Five (5) respondents dump waste by the roadside representing 2,5 percent. Two (2) respondents indicated waste is dumped in a refuse dump and the other indicated that, waste is dumped in a bin at home. Both had a percentage of 0,5 %. Figure 40 is a graph that shows where citizens of Ghana dispose-off waste.

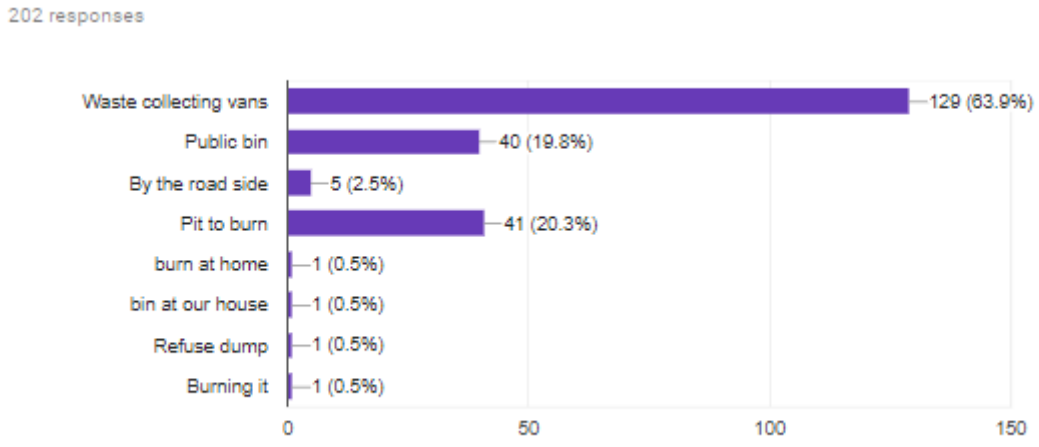

Figure 40: Response on where Ghanaians dump waste finally

Majority of citizens indicating that waste is dumped in waste collecting vans is positive. Positive in the sense that, there is a growing market in the waste collecting sector. Therefore, potential waste management companies with pragmatic strategies are likely to have a large market share among its competitors. Another critical point is that, waste generated by citizens who prefer dumping waste in collecting vans are traceable. Meaning, they have a contract with waste collecting companies. Therefore, if a customer is unsatisfied with services rendered by waste collecting companies, they will seek for another company's services. In this case, potential waste companies with good customer service wins.

Second highest among the list provided is Pit-to-burn. Originally, the 41 responses imply that pit-to-burn is what the respondents practise. Meanwhile other respondents who indicated in writing also explained how waste is dumped. They were two, from the explanation provided, the two (2) respondents also practise pit-to-burn. It is for the reason that, though the graph above shows forty-one (41) responses for pit-to-burn, the researcher included the responses of the other two persons who also practise pit-to-burn. Pit-to-burn is a practise whereby waste is gathered in a pit dug close to houses. The waste generated is periodically burned. This differs from other people who are in the same practise. An observation carried out showed that, places where there were less or no public waste collection bins, people practiced Pit-to-burn. Example of such places in Accra are; Awoshie, Agape, Ablekuma, Kwashieman and Sowutuom.

According to the respondents, Public bins placed third highest as final dumping sites. Public bins are provided by the state. Not all communities are privileged to be provided with public waste bins. Just as stated in the paragraph above, whenever a community is deprived of public waste bins, people living in the community are left with options of either dumping waste indiscriminately, burning waste in pits or contract waste collecting companies to collect waste and dump properly.

Do you pay for dumping your waste?

The researcher sought to find out whether indeed people pay when dumping of waste. Out of two hundred and two (202) respondents, one hundred and forty-eight (148) said "YES" in affirmation to paying some amount of money when dumping waste. The "YES"

was the highest with 73,3% while fifty-four (54) persons said “NO” to mean that they do not pay for dumping of waste. The 54 persons who said “NO” represented 26,7 percent. Below is Figure 41 that shows the rate at which citizens responded to the question on payment of dumping of waste.

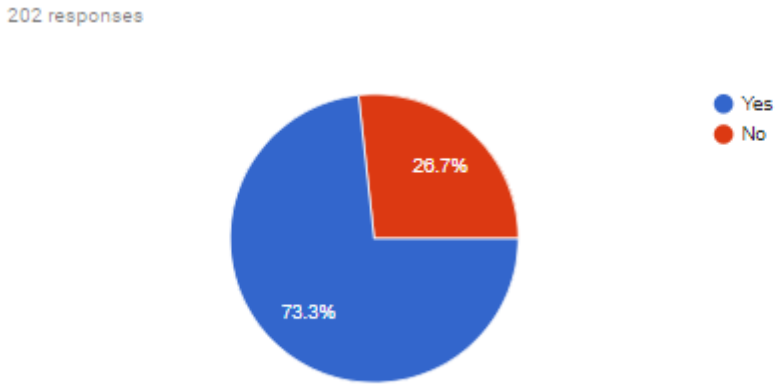

Figure 41: Responses from Ghanaian citizens on payment of dumping of waste

From the chart above, more than half of the respondents pay anytime waste is disposed. While 26,7% do not pay when disposing of waste. From the results obtained, it can be concluded that a resounding majority of citizens place value on the environment. One of the main reason is that, these respondents who pay for waste are well aware of the effects of waste-related diseases and hence will prefer to dispose-off waste appropriately by making sure waste generated is payed-for when dumping. From observation, it can be concluded that, respondents who do not pay for waste represents the number of people who either dispose waste indiscriminately or burn waste in a pit.

To investors, the results from the research shows that, the Ghanaian market for waste management is sustainable. This is because, there are people who show willingness to pay for waste generated. Therefore, there is a high chance for patronage of potential waste company’s services.

How often do you dump waste?

Another critical question was posed to citizens living in Ghana. This time, on how often people dump waste. The question was asked for significant reasons. First, for academic

purposes and research. The researcher found it is prudent to know whether the people of Ghana are particular about the impact of waste on the health of people and the environment. To do so, there was the need to know how long it takes for waste generated to be finally dumped. Taking into consideration the health concerns of the Ghanaian people. Second, to identify business opportunities as a result of the interview conducted. The researcher asked if waste was dumped daily, weekly or monthly. Out of two hundred and two (202) respondents, a total of one hundred and sixteen (116) respondents dump waste weekly. The response represented significantly more than half of the total respondents for the question asked. This represents a total of 57,4%. Seventy-one (71) respondents however dump waste daily, representing 35,1%. Twenty (20) responses indicated for dumping waste monthly representing 9,9% of respondents. Figure 42 is a graph that shows how the respondents answered the question asked.

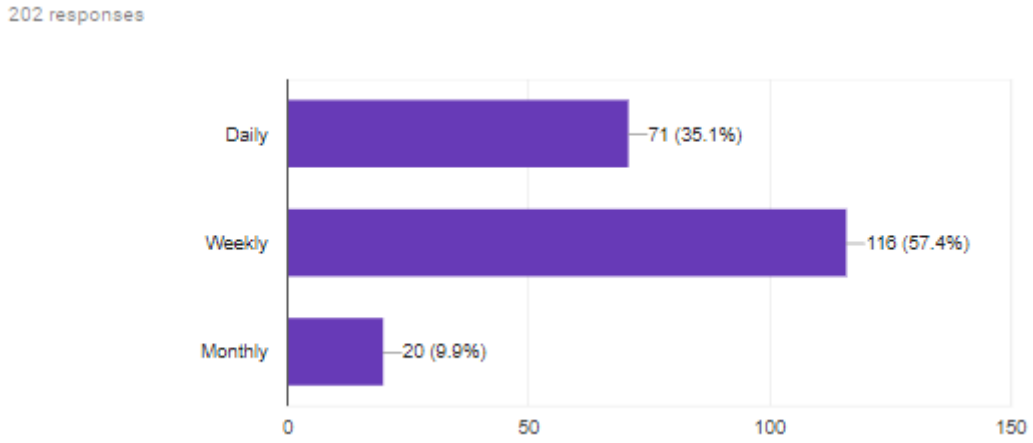

Figure 42: Responses on when waste is dumped

From the graph above, according to the responses generated, waste dumped on weekly basis was the highest among the three-time frames. Waste dumped weekly placed first, daily as second and finally, monthly. From the results obtained, majority of Ghanaian prefer to dump waste weekly as compared to daily or monthly. If majority of the people dumping waste are in the daily and weekly brackets, then one can conclude that, people living in Ghana will under favourable conditions prefer to get rid of waste generated than to rather accumulate for a long time (a month or more). This kind of practise is to the advantage of waste collecting companies. Therefore, the question posed by the researcher is to identify an avenue for potential waste management companies to derive strategies for collecting waste efficiently based on the results obtained from the survey.

The researcher then sought to find out how much people pay for dumping waste. This question was asked in all three cases, daily, weekly and monthly. For the purpose of reading and understanding, all three cases are tackled separately.

If daily, how much do you pay for dumping waste?

It will be recalled that, payment for dumping of waste daily placed second as against weekly and monthly. A price range was provided to guide the respondents in making meaningful choices when answering. Price range selection was first made after consulting with the focus group to find out how much people will pay for waste if waste must be collected and dumped. These price ranges were between; 0.00GH₵ - 0.99 GH₵, 1.00GH₵ - 2.99GH₵, 3.00GH₵ - 4.99GH₵ and other. The results show that, Other, was the highest among the price range. Meaning people who subscribe to dumping waste daily pay more than 4.99GH₵. Thirty-five (35) people said for dumping waste daily, the amount paid is more than the price range provided. This represented 41,2% of the respondents. Twenty- three (23) people who constitute 27,1% of respondents pay between 1.00GH₵ - 2.99GH₵ for dumping waste. Eighteen (18) people however, pay between 0.00GH₵ - 0.99 GH₵ when dumping waste. These responses constituted 21,2% representing number of respondents. A total 15,3% representing thirteen (13) respondents pay between 3.00GH₵ - 4.99GH₵. Figure 43 is a graph that shows how people pay for dumping of waste daily.

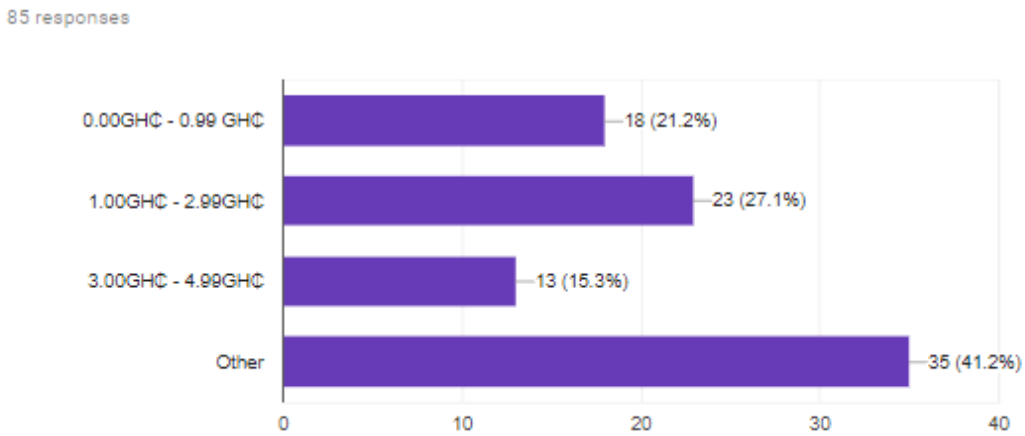

Figure 43: Price range for dumping waste daily

If weekly, how much do you pay for dumping waste?

For dumping waste weekly, the price range was different from waste dumped daily. These price ranges were between; 5.00GH₵ - 6.99 GH₵, 7.00GH₵ - 8.99GH₵, 9.00GH₵- 10.00GH₵ and other. The results showed that, Other, was the highest among the price range provided. It therefore Means that people who subscribe to dumping waste weekly pay more than 10,00GH₵. According to the results from the survey, forty-eight (48) people said for dumping waste weekly, the amount paid is more than the price range provided. The response constituted 37,2% of the respondents. Forty-six (46) people pay between 5.00GH₵ - 6.99 GH₵, representing 37,5% of respondents. Twenty-two (22) people however, pay between 9.00GH₵- 10.00GH₵ when dumping waste. These responses constituted 17,1% representing a total of 22 respondents. A total 14% representing eighteen (18) respondents pay between 7.00GH₵ - 8.99GH₵. Figure 44 is a graph that shows how people pay for dumping of waste weekly.

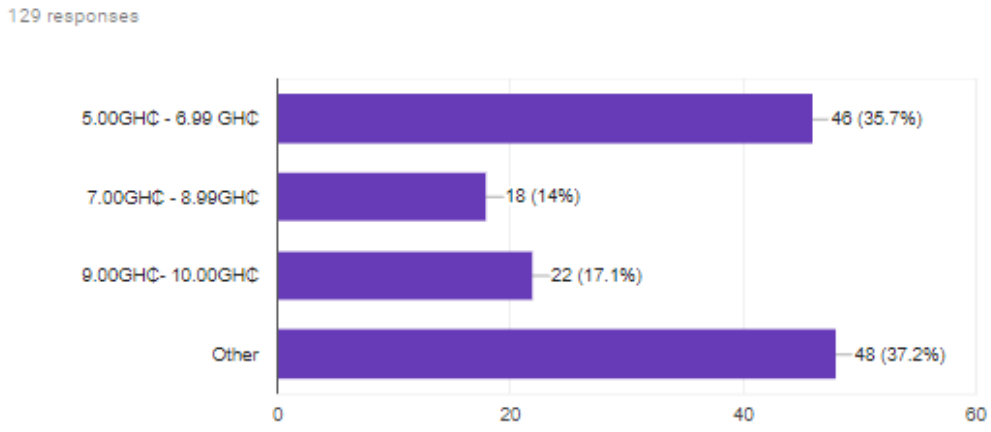

Figure 44: Price range for dumping waste weekly

If monthly, how much do you pay for dumping waste?

For dumping waste monthly, the price range was different from waste dumped for both daily and weekly. These price ranges were between; 5.00GH₵ - 10.00GH₵, 11.00GH₵ - 20.00GH₵, 21.00GH₵ - 30.00GH₵ and other. From the responses obtained, the results show that, Other, was the highest among the price range provided. It therefore Means that

people who subscribe to dumping waste monthly pay more than 30,00GH₵. According to the results obtained, thirty-three (33) people said, for dumping waste monthly, the amount paid is more than the price range provided. It will be observed that, this scenario has taken among all three time-periods of payments. The response constituted 34,7% of the respondents. A total of twenty-seven (27) people pay between 21.00GH₵ - 30.00GH₵ representing 28,4% of respondents. Eighteen (18) people however, pay between 5.00GH₵ - 10.00GH₵ for dumping waste. These responses constituted 18,9% representing a total of 18 respondents. A total 17,9% representing seventeen (17) respondents pay between 11.00GH₵ - 20.00GH₵. Figure 45 is a graph that shows how people pay for dumping of waste monthly.

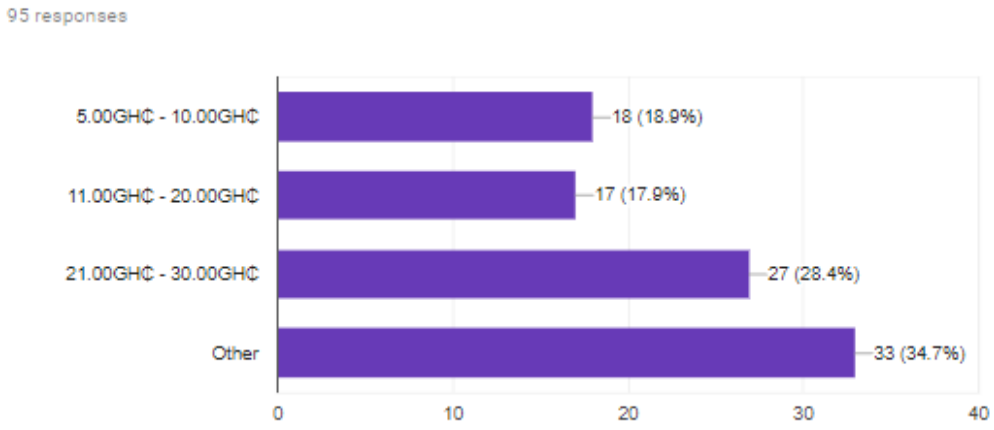

Figure 45: Price range for dumping waste monthly

After observing all three graphs, the conclusion made over the cost of paying for dumping waste in Ghana are as follows:

- Cost of dumping waste is dependent on the volume of waste generated.
- Cost of dumping waste is dependent on location of residence.
- Cost of dumping of waste is dependent on contract agreement between service providers and customers.

Overall, how do you rate the level of waste impact on the environment as compared to five (5) years ago?

The researcher sought to find out from the people living in Ghana to rate the level of waste impact on the environment, taking into account, what is happening in regard to sanitation related issues dating five years ago. The purpose for this question is to;

- Find out if the people living in Ghana are comfortable with the sanitation conditions in the country
- Find out if the people are aware of governmental interventions over the years in eradicating filth if there be.

In all, the responses obtained as the level of waste impact on the environment was; better, good, the same, and worse. Figure 46 is a chart that shows how the question was answered.

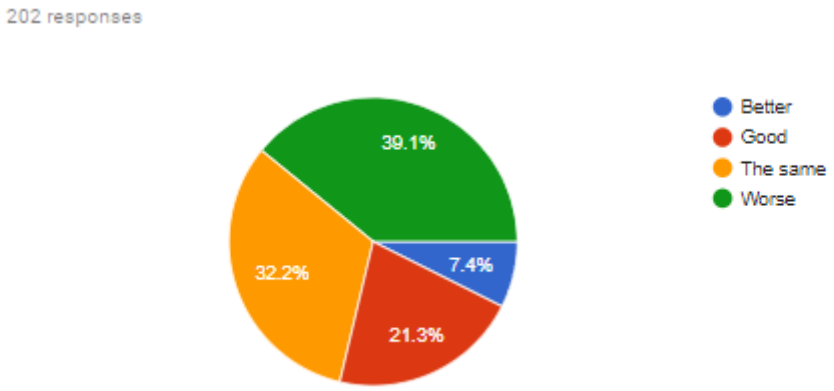

Figure 46: level of waste impact on environment in Ghana

From the figure above, the results obtained show that, 39,1%, representing a total of seventy-nine (79) respondents were of the view that, the level of waste impact in Ghana has worsened and therefore there has been little or no progress. 32,2%, representing sixty-five (65) respondents indicated that there has been no positive radical change as to how the environment has been, taking into account, waste related diseases. Meanwhile, 21,3% representing forty-three (43) respondents say the level of waste impact over the period is good. 7,4% representing fifteen (15) respondents indicated that impact of waste on the environment was better.

Respondents for both, “same” and “worse” recorded the highest responses. Both constituted 71,3% representing a total hundred and forty-four (144) respondents out of the total number of respondents. In conclusion, majority of Ghanaians are of the view that, indeed the sanitation situation in Ghana is not encouraging. Adding that, there has not been any significant change.

However, an investor sees these challenges as opportunities. In a situation where the results from the survey shows how the respondents answered to the question asked, provides an avenue for waste management companies to enter the Ghanaian market.

Do you agree that everyone is responsible for keeping his or her surroundings clean?

The researcher sought to find out from the people living in Ghana to indicate, strongly agree, agree, disagree, strongly disagree or neutral to whether citizens are responsible for keeping the surrounding clean. In all, two hundred and two (202) responded to the question asked. From the results obtained, a percentage of 68,3 responded to the question by indicated “strongly agree” that citizens are responsible for keeping the surroundings clean. This 68,3% represented a response made by one hundred and thirty-eight (138) respondents. Forty (40) people ticked “agree” to mean that, citizens are responsible for keeping the surroundings clean. These forty (40) people represented a 19,3% of respondents to the question asked. Nineteen (19) people however, strongly disagree that keeping the surrounding clean is the responsibility of citizens. These 19 respondents represent 9,4%. three (3) people each, representing 1,5% of response ticked “neural” and “disagree” on the reason of making keeping the surroundings clean, the responsibility of citizens. Figure 47 is a graph that shows, respondents in percentages on whether keeping the surroundings clean is a responsibility of the citizen.

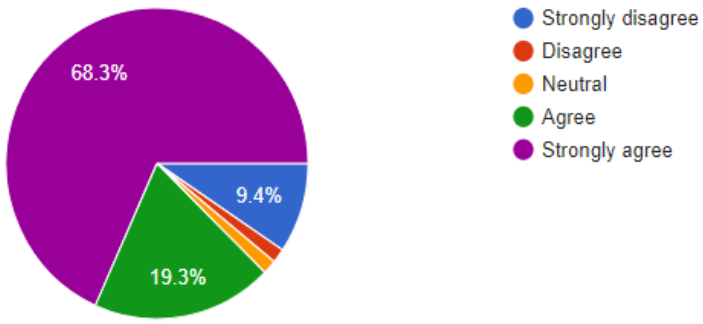

Figure 47: Keeping surroundings clean an individual responsibility

From the chart shown above, “strongly agree” covered more than half of the responses while “agree” 19,3% being second highest to the question asked. In total, “strongly agree” and “agree” constitutes 86,7% representing one hundred and seventy-eight (178) respondents who seek to suggest that, cleaning of the surroundings is the responsibility of citizens. In conclusion, the overwhelming response by the 178 respondents who suggest that cleaning of the surroundings is a citizen’s responsibility are the people who are likely to dispose-off in a proper way. This is an advantage to investors. Reason is that, those who agree to keeping the surroundings cleaning are mindful of waste related diseases and the effect on the environment thus, are therefore willing to make sure waste generated are properly disposed-off by seeking the services of waste management providers. In so doing, potential waste management companies seeking to enter the Ghanaian market may have a number of customers to do business with.

Meanwhile, a total of 12,4% representing twenty-four (24) of respondents, “strongly disagree”, “disagree” and “neutral” to the notion that keeping the surroundings clean is the responsibility of every citizen. According to the results obtained, it can be concluded that the respondents who do not agree to the notion which suggests that, cleaning of surroundings is the responsibility to of citizens, are likely to be in the category of people who have little or no recourse on activities that are causes of waste menace in Ghana.

Which waste-to-energy benefit(s) is or are most important to Ghana at the moment?

The researcher, after finding out whether people living in Ghana agree to keeping the surroundings a responsibility of citizens, another follow-up question was posed, this time, to find out if the people of Ghana have an idea of what the benefits of waste-to-energy technology is to a country. Some the benefits associated with waste-to-energy technology include; creation of jobs, eradication of filth, provision of cheaper energy, reduction in emission of greenhouse gas and conservation of natural resources. Figure 48 is a graph that shows in hierarchy, the most important waste-to-energy technology to Ghana.

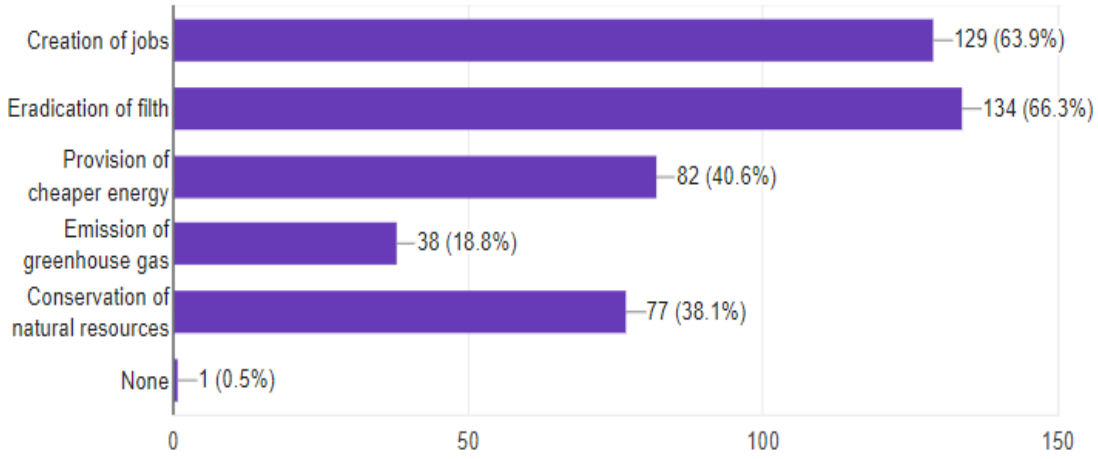

Figure 48: Benefits of waste-to-energy to Ghana

The results obtained show that, one hundred and thirty-four (134) people representing 66,3% of respondents claim, eradication of filth is the most important benefit of waste-to-energy in Ghana. 63,9%, representing one hundred and twenty-nine (129) respondents claim, creation of jobs is the most important benefit of waste-to-energy technology for Ghana. On the other hand, eighty-two (82) people representing 40,6% of response to the question asked suggests that, provision of cheaper energy is the most important benefit Ghana will derive from the technology of waste-to-energy. To others, conservation of natural resources is the most important benefit of waste-to-energy technology to Ghana. The number of people who selected conservation of natural resources as the main important benefit Ghana will derive from a waste-to-energy technology are seventy-seven

(77). This number represents 38,1% of response. Lastly, reduction in emission of greenhouse gas was found to be the least most important benefit of waste-to-energy to Ghana. In all, 18,8 percent of responses were recorded presenting thirty-eight (38) of respondents.

According to the graph shown above, eradication of filth scored highest with 66,9% of response representing 134 respondents. This is to mean, majority of people in Ghana are of the view that, in hierarchical order, eradication of filth is the top most priority Ghana considers if waste-to-energy technology is going to be the driving force for waste management companies. These respondents, as shown in the graph, consider the sanitation situation in Ghana as improper and for that matter, has the tendency of painting a bad picture of Ghana to tourists.

Second is creation of jobs. According to the graph, 63,9% which constitutes 129 respondents to the question asked suggests, creation of job be the basis of establishing waste management companies which will rely heavily on waste-to-energy technology. Last year, the president of the republic of Ghana, in his State of Nation Address (SONA) in parliament reiterated his utmost concern of youth unemployment in the country but however expressed confidence indicating a rapid change in the economy which is targeted at the youth. In his speech, the president explained that, the rate of unemployment increased to 5,77% in 2016 from 5,54% in 2015 (GhanaWeb, 2018).

Eighty-two (82) respondents to the question asked indicated that, provision of energy is the most important benefit waste-to-energy technology to Ghana. From the graph, provision of energy placed third. The people of Ghana having been in power crisis over the last three years, noted that, even though the supply of power to homes and workplaces has improved, it still considered provision of power as third highest to the most important reasons waste management companies who rely on waste-to-energy technology be most significant to Ghana.

Last but not the least is conservation of natural resources. Seventy-seven (77) people who represent 38,1% of responses chose conservation of natural resources as the most important benefit of waste-to-energy to Ghana. From the graph shown above, conservation of natural resources placed forth. Meaning, the people of Ghana as per the graph dictates

consider the effective ways of conserving natural resources forth in respect to hierarchy. The interviewees recognised the negative effect of improper dumping of waste in water bodies, stating how aquatic lives are being destroyed as a result of poor human attitudes. Some narrated how people living close to the Volta Lake in the Eastern Region of Ghana, dump household waste, wash cloths and often fetch the water for irrigation purposes. These activities have led to decline in what rather used to be the hub for fishing. Another instance is Ghana's forest reserves. Indiscriminate felling of trees for charcoal production and for mining of minerals has gradually depleted Ghana's forest areas. Accra and other city capitals have landfill sites where waste is finally dumped. These landfill sites are mostly choked. With no sustainable ways to regenerate waste at landfill sites into proper use, people living near landfill sites suffer from the stench it brings and waste related diseases such as cholera and diarrhoea. Upon these effects on natural resources, the people of Ghana are in support of an alternative that seeks to reduce waste and reserve the country's natural resources. Therefore, waste management companies have huge business opportunities in Ghana.

According to the results, the people of Ghana after comparing all factors, considered greenhouse gas emission reduction as the least most important benefit of waste-to-energy facilities to Ghana. From the graph shown above, thirty-eight (38) people who represent 18,8% of respondents claim the most important benefit of waste-to-energy facilities to Ghana is by reduction of emission of greenhouse gas. Greenhouse gases is referred to as group of compounds which per human activities gets trapped in the atmosphere and in turn keep the earth surface warmer due to its presence. The ripple effect is global warming and change in the climate. (Allison, 2015). Therefore, waste-to-energy technology instead of landfill will reduce greenhouse gas. This means that Ghana is ready to support WTE facilities so as to help reduce effect of greenhouse gas emissions even though the responses proved the citizens least preferred reduction of emission of greenhouse gas to other factors which are most important to Ghana currently.

From the graph, it is noted that one person whose response represents 0,5% however, suggests none of the lists provided is the most important benefit of waste-to-energy to Ghana.

What is likely to be the reason(s) for waste menace in Ghana?

The Ghanaian citizens were asked to indicate what in their view, are reasons for waste menace in Ghana. List of reasons provided were; poor human attitude towards the environment, high illiteracy rate, ineffective waste management companies, insufficient waste management companies and lastly, low or no political will. it will be recalled that the question above has been also asked from other groups. The reason is to know how each group considers what is or are the reasons leading to poor sanitation in Ghana. Secondly, it has been noticed that, often than not, people fail to tackle the real issues been confronted but rather turn to apportion blame. Here is a situation where the citizenry, the ministries and agencies responsible for waste management are asked same questions to identify if the response provided is a true reflection of the reality on ground. A graph below, Figure 49, shows an overview of the responses based on the question asked.

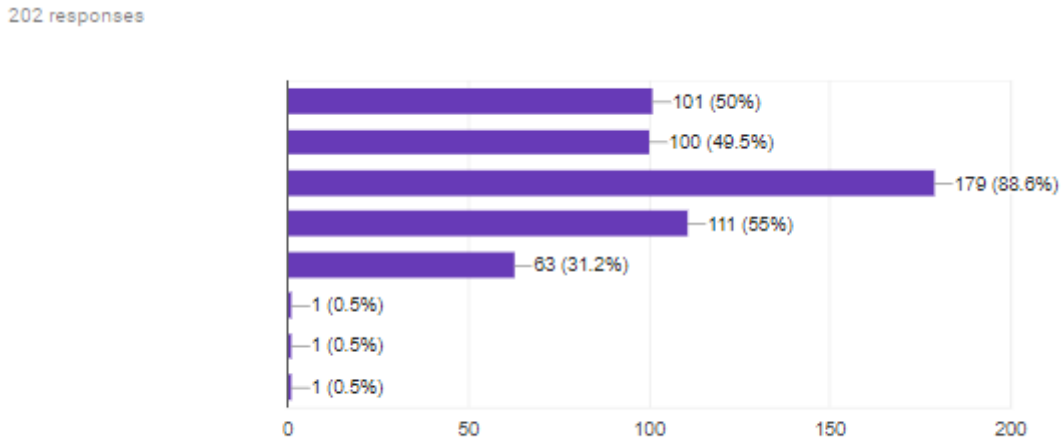

Figure 49: Overview of citizen's response on reasons for waste menace in Ghana

The graph above shows how the citizenry responded to the question asked. It will be noticed that though the number of responses and respective percentages are shown, identifying each response to the reason of waste menace in Ghana did not appear on the graph. The reason is because, the texts are too large to appear on the y-axis of the graph. For this reason, all factors leading to waste menace in Ghana and their corresponding responses are shown below.

The result from the interview shows that, the citizens selected poor human attitudes towards the environment as the top-most reason for waste menace in Ghana. One hundred and seventy-nine (179) people representing 88,6 percent of respondents said, the reason why Ghana's sanitation is what it is, is because of poor human attitude on the environment. The results from citizens this time, numbering about one hundred and eleven (111) people which represents 55 percent of respondents said another reason for waste menace in Ghana is high illiteracy rate. One hundred and one (101) people on the other hand, said the reason why sanitation challenges has escalated into a menace is due to insufficient waste management companies in Ghana. The response from one hundred and one (101) people represented 50% of respondents. One hundred (100) people who represent 49,5 percent said effective waste management is the reason for waste menace in the country. 31,2 percent, representing sixty-three (63) respondents are of the view that, the reason for waste menace in Ghana is due to little or no political will. Below are graphs that show factors of waste menace in Ghana with respective responses from the people living in Ghana.

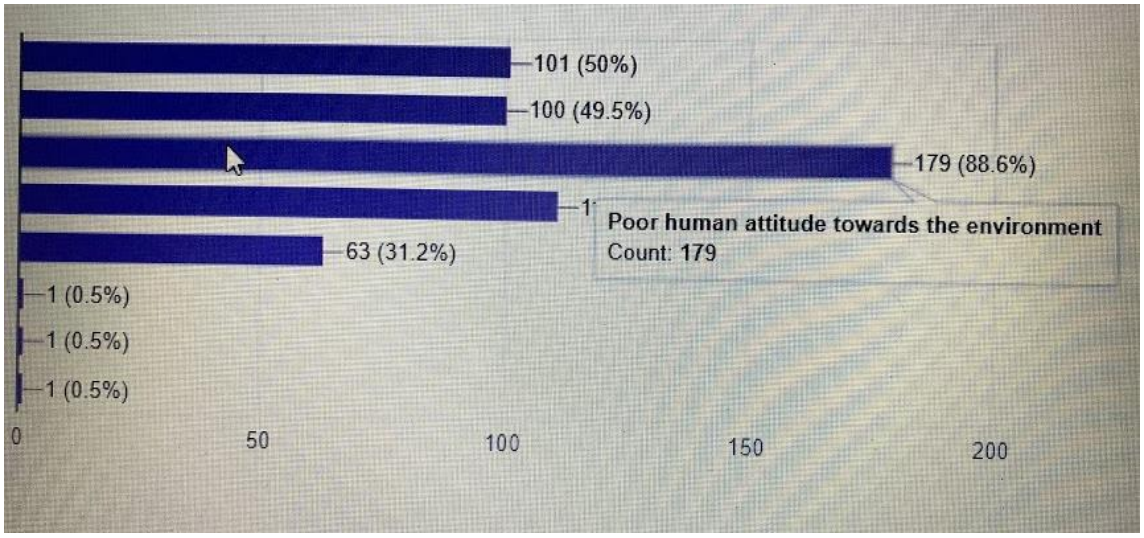

Figure 50: Poor human attitude towards environment highest reason for waste menace in Ghana

The graph above shows that, among the listed reasons likely to cause waste menace in Ghana, the respondents selected poor human attitude towards environment as the main reason to the poor sanitation problems in Ghana. One hundred and seventy-nine (179) respondents representing 88,6% are strongly of the view that, while all other factors contribute to waste menace in Ghana, poor attitude towards environment is regarded the highest. Indiscipline, if not, is the poor attitude exhibited by some Ghanaians. This can be associated to indiscriminate dumping of waste on the streets and in water bodies.

The second most occurring factor for waste menace is high illiteracy rate. The respondents are of the view that, poor attitude towards environment is directly linked to high illiteracy rate in the country. The research establishes that, indeed the level of illiteracy rate is directly proportional to sanitation challenges. Why is it so? The simple reason is that, if the citizenry is well aware of effects of indiscriminate waste handling and all other factors associated with waste handling, there will be a significant approach towards sanitation related issues. Figure 51 is a graph that shows how the citizenry answered the question.

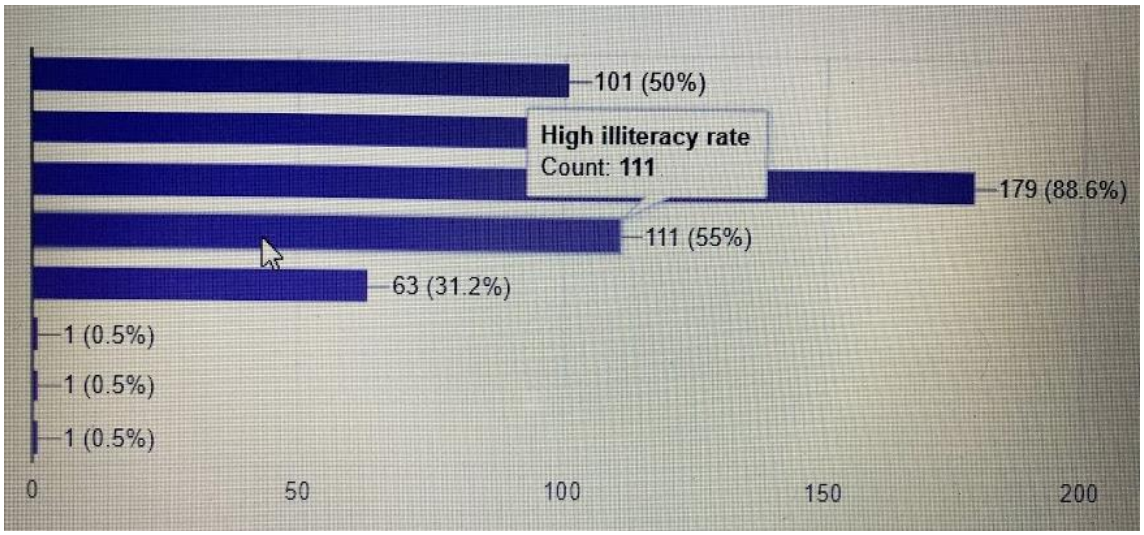

Figure 51: High illiteracy rate a second highest factor of waste menace in Ghana

One hundred and eleven (111) respondents, representing 55% selected high illiteracy rate making it the second ranking among other factors responsible for waste menace in Ghana.

Others, however, were of the view that insufficient waste management companies are the reason why Ghana's sanitation situation is what it is. In all, one hundred and one (101) people representing 50% of response selected insufficient waste management companies as the reason for waste menace in Ghana. Figure 52 is a graph that shows the results obtained from the survey.

Figure 52: Insufficient waste management companies contribute to waste menace in Ghana

The one hundred and one (101) respondents attributed the poor sanitation to insufficient waste management in the country. In their view, the more waste management companies, the less difficult waste handling will be for the country. To the respondents, more wastes management companies will help reduce the poor sanitation situation in the country.

Fourthly, 49,5% responses representing one hundred (100) respondents attributed the waste menace in Ghana to ineffective waste management companies in Ghana. Figure 53 is a graph that shows how the respondents answered the question.

Figure 53: Ineffective waste management companies contribute to poor sanitation in Ghana

From the graph, inefficient waste management companies placed fourth as the reason for waste menace in Ghana. The number of people who selected inefficient waste management as the reason for waste menace in Ghana, are of the view that, the poor response of waste management companies is as a result of the sanitation situation Ghana faces. These 100 respondents suggest that, Ghana focuses her attention on waste management companies who are more efficient and reliable.

On whether low or no political will of government and authorities is the reason to waste menace in Ghana, sixty-three (63) people representing 31,2 percent of respondents said, low or no political is the least factor that contributes to waste menace in Ghana. These respondents were of the view that, though gradual, successive governments and authorities have put in place policies to curb the sanitation situation in the country.

From the graph, it is noted that, some persons gave out reasons for waste menace in Ghana. These persons amounted to three in number. Each had 0,5 percent representing one (1) respondent. The first respondent said the other reason why waste menace is at what it is because of “wickedness” another also said, “there is no punishment for those who flout waste regulation laws”. The last respondent attributed waste menace in Ghana to indiscipline.

4.4. Solution to research questions

As stated earlier in Chapter 1, two questions were raised. These questions sought to find out what the root cause of waste menace in Ghana could be and second, to find out if waste-to-energy technology is needed in Ghana and hence a solution Ghana's waste menace. Below are results of the research conducted.

- **What is the root cause of waste menace in Ghana?**

All groups (the focus group, Ministries and People living in Ghana) were asked to indicate which among a given list, the main cause of waste menace in Ghana. Among these lists were; poor human attitude towards the environment, high illiteracy rate, ineffective waste management companies, insufficient waste management companies and lastly, low or no political will. all the respondents chose poor human attitude towards the environment over the rest. However, it must be noted that, the Accra Metropolitan Assembly was asked same question but in a different form, to which two answers stood out, citizenry indiscipline and lack of waste bins at vantage points. Below is Table 4 that shows the respondents and the respective responses.

Table 4: Root cause of waste menace in Ghana

Respondent	Response
Focus group	Poor human attitude towards the environment
Accra Metropolitan Assembly (AMA)	1. Citizenry indiscipline 2. Lack of waste bins at vantage points
Ministry of energy	Poor human attitude towards the environment
Ministry of Sanitation and Water Resources	Poor human attitude towards the environment
People living in Ghana	Poor human attitude towards the environment

From the table above, it is shown that the researcher sought the views of all groups, all in the quest to make sure views from every group is taken into account. Therefore, if all respondents selected poor human attitudes towards the environment or citizenry indiscipline then, it means the root cause of waste menace in Ghana is the poor attitude to which people living in Ghana act towards the environment.

- **Is waste-to-energy facility beneficial to Ghana?**

The second research question was to find out if waste-to-energy technology and for that matter, having a WTE facility is beneficial to Ghana. All groups except the Accra Metropolitan Assembly were asked to indicate which among a list is more benefiting should waste-to-energy facility is built in Ghana. Below is a Table 5 that shows responses from respondents on whether WTE is beneficial to Ghana.

Table 5: benefits of waste-to-energy facility in Ghana

Respondent	Response
Focus group	1. Creation of Jobs 2. Eradication of filth 3. Provision of cheaper energy
Ministry of Energy	Landfill gas recovery
Ministry of Sanitation and Water Resources	1. Eradication of filth 2. Provision of cheaper energy 3. Reduction in emission of greenhouse gas
People living in Ghana	1. Eradication of filth 2. Creation of jobs 3. Provision of cheaper energy

From the Table 5 above, it is observed that the focus group among others, selected creation of jobs, eradication of filth and provision of cheaper energy as three main benefits of WTE to Ghana.

Secondly, the Ministry of Energy, in responding to the researcher indicated that, converting landfill waste into gas recovery will be good initiative and therefore WTE technology has a high chance to benefit Ghana.

Thirdly, the Ministry of Sanitation and Water Resources also selects eradication of filth, provision of cheaper energy and reduction in emission of green house gas.

Finally, the people living in Ghana selected eradication of filth, creation of jobs and provision of cheaper energy as main benefit Ghanaians can derive when WTE is established in Ghana.

In conclusion, it is not far fetch to say that all the groups who were interviewed agreed on similar things. Therefore, creation of jobs, eradication of filth, provision of cheaper energy, reduction of emission of greenhouse gas and the recovery of gas or energy from landfill sites are the benefits Ghana would receive should waste-to-energy facilities are established in Ghana.

5. THE GHANAIAN MARKET

In this chapter, the researcher provides details of doing business in Ghana, both benefits and challenges. This chapter shows a detailed account of how waste management companies in Finland can penetrate the Ghanaian market. In the previous chapter, data collated was analysed and several business opportunities were discovered after findings made. The researcher finds it prudent to analyse Ghana's market to make meaningful conclusions for the research work.

5.1. Guidelines to enter the Ghanaian market

Guidelines for market entry is country specific. However, there are situations where countries can have similarities. Ghana, in this case, located in the western part of Africa is surrounded by countries which have similar as well as differences for market entry. Some essential components to consider when entering the Ghanaian market are; culture and language, political stability, pollution and workforce and economic performance of Ghana over the years.

5.2. Culture and language

Ghana, a country with its people from different backgrounds, ethnic groups, and diverse culture, yet one thing that symbolizes them is their hospitality, honesty, and friendliness. These three key features embody a Ghanaian, be it from the North, East, West or South. Ghanaians believe respect is reciprocal. In other words, a Ghanaian would demand respect because he or she has dully given the respect one deserves. A typical example is greetings. Before a conversation can start between two people, it is required of the one who is approaching the other to begin by greeting. If this custom is unperformed, it is likely that the needed reception from the Ghanaian will be denied. In Ghana, a greeting is usually accompanied with a handshake. These two are inseparable. To start or sign-off a deal, one is expected to give a handshake. Ghana uses English as her official language. Both the public and private sectors transact business by using the English language as the

mode of communication. Another useful culture of Ghanaians is their goal setting capabilities. Though the process may be steadily slow, reaching set goals is never compromised. (PricewaterhouseCoopers, 2014).

5.3. Political stability

Recently, Ghana celebrated her longest stable democracy, twenty-five years of uninterrupted democratic governance. Before, Ghana had suffered slavery, colonialism, imperialism and military dictatorships. Indications have shown the journey Ghana has gone through before democracy. Within the twenty-five-year period of democracy, Ghana choked for herself, six violence-free elections. In 2012, when Ghana's main opposition party disagreed with election results, they sought final interpretation and declaration of results from Ghana's supreme court instead of the streets. A clear sign of having faith in Ghana's court as the final arbiter. (JoyOnline, 2018).

5.4. Population and work force

Ghana's population from the table below shows an approximated figure of 29 million people with a total land area of 227,540 km^2. It is estimated that about 52,7 percent is urban population. (Worldometers, 2018). An indication of Ghana's population growth rate at a percentage of 2,18 shows a forecast of Ghana's population increasing to 30,7 million in 2020 and 51,2 million in 2050 (Worldometers, 2018).
The estimated forecast of increased populations brings to bear a significant point worth noting. Why so? If waste generated by a population of 29 million is poorly curbed, how best will waste related issues be dealt with, considering a population of 50 million people? It will mean that there is undoubtedly going to be much waste to manage and thus, a business opportunity for waste management companies.

Therefore, one can say that Ghana's current population plays a critical role in determining the volume of waste generated in the country, thus waste generated can be said as directly proportional to the number of people living in the country. Figure 54 shows Ghana's population from a period of 1955-2018.

Year	Population	Yearly % Change	Yearly Change	Migrants (net)	Median Age	Fertility Rate	Density (P/Km²)	Urban Pop %	Urban Population	Country's Share of World Pop	World Population	Ghana Global Rank
2018	**29,463,643**	2.18 %	630,014	-20,000	20.5	4.12	129	52.7 %	16,018,511	0.39 %	7,632,819,325	49
2017	**28,833,629**	2.22 %	626,901	-20,000	20.5	4.12	127	53.9 %	15,533,945	0.38 %	7,550,262,101	49
2016	**28,206,728**	2.26 %	623,907	-20,000	20.5	4.12	124	53.4 %	15,055,103	0.38 %	7,466,964,280	49
2015	**27,582,821**	2.39 %	614,143	-10,000	20.4	4.18	121	52.9 %	14,582,770	0.37 %	7,383,008,820	49
2010	**24,512,104**	2.62 %	594,019	37,852	19.9	4.37	108	50.2 %	12,304,401	0.35 %	6,958,169,159	48
2005	**21,542,009**	2.61 %	520,649	33,104	19.3	4.64	95	47.0 %	10,116,375	0.33 %	6,542,159,383	49
2000	**18,938,762**	2.47 %	435,659	-22,527	18.8	5.02	83	43.7 %	8,269,671	0.31 %	6,145,006,989	51
1995	**16,760,467**	2.76 %	426,441	-3,257	18.4	5.34	74	40.1 %	6,727,828	0.29 %	5,751,474,416	52
1990	**14,628,260**	2.84 %	382,406	-6,001	17.8	5.88	64	36.4 %	5,330,857	0.27 %	5,330,943,460	53
1985	**12,716,228**	3.32 %	382,840	41,200	17.4	6.35	56	32.9 %	4,183,320	0.26 %	4,873,781,796	54
1980	**10,802,028**	1.90 %	194,124	-112,800	17.0	6.69	47	31.2 %	3,366,368	0.24 %	4,458,411,534	55
1975	**9,831,407**	2.72 %	246,885	-32,800	16.9	6.90	43	30.0 %	2,954,295	0.24 %	4,079,087,198	57
1970	**8,596,983**	2.20 %	177,287	-72,400	17.3	6.95	38	29.0 %	2,489,577	0.23 %	3,700,577,650	62
1965	**7,710,549**	3.00 %	211,652	14,400	17.6	6.44	34	26.1 %	2,009,981	0.23 %	3,339,592,688	66
1960	**6,652,287**	3.21 %	194,375	28,400	17.7	6.64	29	23.3 %	1,546,844	0.22 %	3,033,212,527	66
1955	**5,680,410**	2.66 %	139,907	14,400	17.6	6.44	25	19.1 %	1,084,333	0.20 %	2,772,242,535	66

Figure 54: The population of Ghana, historical and up-to-date (Worldometers, 2018)

5.5. Economy

According to World Bank, Ghana faced difficult times in the year 2016, but the result in 2017 looked encouraging. It went on to show that Ghana's microfinance improved in the year 2017 by indicating that, the economy expanded in the September 2017 at its fifth successive quarter (The World Bank, 2018). Henry Kerali, a world bank country director for Ghana stated that *"the macroeconomic outlook was largely positive based on the 2017 performance. GDP growth for 2017 is estimated to have almost doubled from the 3,7 percent in* 2016 *and is expected to stay at that elevated level through 2018"* (Kerali, 2018). Reports from Bloomberg Markets agree more with the statement above. The report, as at 11th April 2018 indicates that, as Ghana's oil and gas production surged, it has had a significant expansion in the economy representing the fastest rate in five years. Government Statistician, Baah Wediah, disclosed to Bloomberg Market that, Ghana's GDP in 2016 was 3,7% but expanded 8,5% in last year showing a broad comparison

between 2016 and 2017 (Ekow & Andre, 2018). Figure 55 is a graph that shows Ghana's GDP growth rate from 2011 through to 2017 and a forecast for 2018.

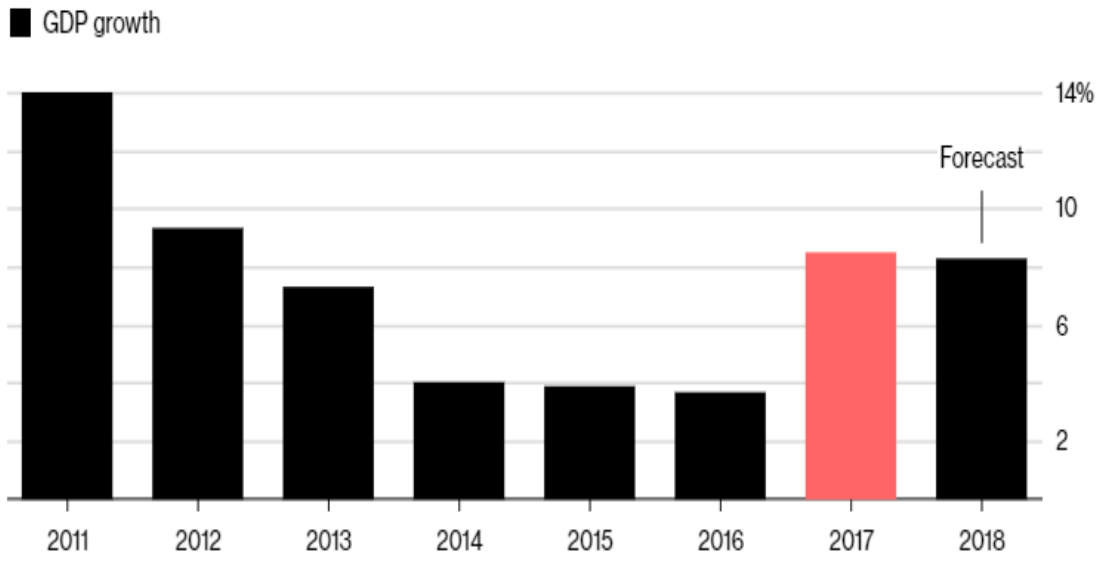

Figure 55: Ghana's GDP growth rate more than doubled in 2017 (Source: world Bank and Ghana Statistics Service)

The report further explains that oil and gas in the industrial sector alone contributed a quarter of Ghana's economy, hence the surge in growth. Indications showed that the oil and gas rose to 80,4% while, Agriculture and Service industry rose to 8,4% and 4,3% respectively.

Importance of Ghana's economy to investors

To an investor, having full knowledge of a country's GPD is critical. The reason is that it shows how the country is performing in its product and services; doing business. It is, therefore, crucial to have full grips of Ghana's economic status as far as doing business is concerned. From reports of both The World Bank and Bloomberg Markets, Ghana's economic status is encouraging. It is an evidence of hope for investors. The country's economic fortunes are festered on good governance and excellent managerial skills.

5.6. Government initiative for private sector

In the past, several governments struggled at tackling the sanitation situation head-on. Today's government has shown differently, how much sanitation related issues means to it. For the first in Ghana's history, the government created a ministry to deal with sanitation and water-related issues. In 2017, the ministry was established. Ministry of Sanitation and Water Resources (MSWR) as at today is fully resourced with personnel with the adequate technical knowledge to combat its huge tasks ahead. Some of the key initiatives today's Ghana government seeks to introduce to the benefit of the private sector and the citizens are, namely; One-district-One-Factory and the technology behind Ghana post GPS.

5.6.1. One-District-One-Factory

The government among many other things, in 2017, launched a program dubbed, One-District-One-Factory. This program, being part of the government's special reforms are aimed at rapidly improving the production and industrialization sector of the economy which in effect, received laud applauds from very meaning Ghanaians, stakeholders and think-tank groups in the country. Some were of the view that, the government has good plans in making Ghana a more industrialised and production-based country thereby reducing the rate of unemployment. Ghana has in total, 216 districts. It means if this initiative is realised, 216 industries from all sectors would have sprung up by the end of 2020. Government's focus is to transform Ghana's economy which over the years depended on the exportation of raw materials to value-added economy anchored on industrialisation with the private sector as the main driving force. (GhanaWeb, 2017).

Importance of Government special initiative to investors

The government's special initiative on One Factory One District includes a wide range of industries such as; Agro-business, Textiles, Waste management, Pharmaceutical and cosmetics, ICT, Trading and Tourism, Arts and Crafts (GhanaWeb, 2017). It, therefore,

means Waste management companies have potential in this special initiative. Therefore, Finnish waste management companies upon identification of business avenues can enter the Ghanaian market.

5.6.2. Technology and innovation

In October last year, the government of Ghana launched a somewhat aggressive approach to the increment job creation. This was the outdooring of a long-awaited digital addressing system to locate businesses, households, and persons at specified jurisdictions. The launch was to outdoor a technology-centered system called the National Digital Addressing System (NDAS) (Yeboah, 2017). The main feature of the National Digital Addressing System dabbed as GhanaPostGPS is to segment the country into grids of 5m x 5m and thus assign each with a unique digital address. This means every land and property in Ghana is uniquely identified and permanently provided with an address. (GhanaWeb, 2017). This information technology app which is a location-based system is primarily expected to provide useful means of providing an address to every location including slums and undeveloped areas in the country (GhanaWeb, 2017).

Importance of Government's special initiative to investors

In the previous chapter, it was recognised from the survey conducted that, the citizenry had different ways of keeping and dumping waste. Results from questions asked from the citizens showed that while majority kept waste in waste bins, others kept waste in plastic bags, buckets, waste cartons, sacks and burn waste in a pit. In most cases when household waste, especially, is kept in a pit-to-burn, it means that no waste management company has business with households in this kind of practice. Among the different types of waste containers, waste bins recorded the most significant number of users. From the survey conducted, waste bins alone recorded 146 users out of 202 respondents. Another factor of concern is the rate at which waste is dumped. It was noticed from the survey that, while some citizens dumped waste weekly, others, dumped theirs daily and monthly. Among the three-time frame of dumping waste, dumping waste after a week had the highest rate.

From the analysis drawn from the survey conducted, it can be said that potential Finnish waste companies have varied opportunities to enter the Ghanaian market. With the National Digital Addressing system efficiently running, waste companies can track the location of customers and for efficient waste collection as well as revenue collection. The technology if not implemented would mean that companies would have followed an old system of direction giving, where a direction is given to destination by identifying landmarks and names of shops as the cardinal point to find the destination. However, today, the GhanaPostGPS can assist one to reach the destination and in this case customers.

5.7. Challenges

Whilst the above provides details of doing business in Ghana, there are few challenges confronting the Ghanaian market and therefore the need to point out these short falls to serve as guide for companies seeking to enter the country to establish businesses. Some of these short falls are, poor attitude towards time and bureaucracy.

5.7.1. Attitude towards time

In addition to unplanned transportation system, coupled with poor road networks even in the major cities of Ghana, people living the country hardly keep to time. Unlike Finland, one is required to indicate before meeting starting time if he or she cannot attend at the proposed time. However, in Ghana, attending meetings 30 minutes late may simply not require apologies and the provide reasons for being late. Whilst this poor attitude towards time has over the years seen improvements, it is worth noting that poor attitudes towards time in Ghana causes undue delay in project progress and completion.

5.7.2. Bureaucracy

Tsikata et el (2000) conducted a research on Foreign Direct Investment (FDI). The research sought to find out challenges foreign direct investors go through in establishing businesses in Ghana. The results of the research showed that investors faced undue delays in acquiring land titles and necessary documents for the establishment of businesses and

or for construction of industrial buildings. The research pointed out the frustration investors go through in waiting for more than four weeks before business documents are approved. The research revealed that undue bureaucracy is caused by establishments who are in the position of going through documents and issuing clearance before the commencement of business initiation. According to the researchers, one other problem investors pointed out was frustration on land litigation, indicating how such process has undue delay on industrial development. The researchers revealed that bureaucracy has the potential of eroding Ghana as a suitable foreign direct investment destination. (Tsikata;Asante;& Gyasi, 2000).

6. RECOMMENDATIONS AND CONCLUSION

This chapter provides a summary for the studies and provides recommendations based on the findings obtained and finally, make suggestions for feather studies.

- **Gas recovery from landfill sites**

Based on the findings obtained, the researcher is of the view that, gas recovery from landfill sites is the best way to go. Responses from Accra Metropolitan Assembly and Ministry of Sanitation and Water Resources showed that, landfills in Accra alone are shocked and that, the authorities have difficulty in disposing of waste. A report from IMANI GHANA, a centre for policy and education, indicated that by 2025, waste generation in Accra alone is likely to hit 4,000 tons per day (IMANI GHANA, 2018). This report reveals how much of rapid response there is to recover energy or gas from landfills.

- **Strict enforcement of sanitation laws**

Another critical factor to consider is the strict enforcement of sanitation laws. The study found that Finland in particular, enforces sanitation laws to the letter and there-fore all inhabitants are compelled to obey the laws regarding sanitation. In order to improve sanitation and keep a healthier environment, the prudent way to make sure all inhabitants in Ghana follow strictly all sanitation laws beginning from generation to transporting and finally to disposal. Meanwhile, a more solution-driven tactic to poor compliance on sanitation laws is to focus on designing sanitation laws that is geared towards waste recovery to reduce waste generation and at the same time, improve on sanitation towards the environment. Lastly, laws on sanitation in Ghana needs to be reviewed. Also, persons in authority be given the needed power to enforce and apply sanctions where needed.

- **Education and training**

It will be recalled in Chapter 4 that, the root cause of waste menace in Ghana is a result of human activities towards the environment. Therefore, a gigantic leap into causing change is necessary. To ensure this, education and training campaigns is needed to first, sensitise inhabitants of the effect of improper waste handling. Such education campaign will be preferable in basic and secondary schools where the campaign is centred on nurturing a new set of youth with a transformed mind towards keeping the environment and water bodies clean and healthy. Secondly, men and women at both market and lorry stations should also be educated on sanitation laws as well as proper handling and dumping of waste. This is because the research found that both places in Ghana were identified as places with the highest record of waste disposed-off indiscriminately.

- **Continuous improvement strategy framework**

Keeping an eagle-eye on performance on sanitation in Ghana should be a priority for those in authority. The research found out that, one of the major keys for Finland to progress in sanitation-related-issues is a continuous improvement strategy. Finland makes sure waste is generated and separated appropriately, then waste is carefully transported to various fields whilst taking into consideration the principles of waste hierarchy before disposing-off waste. Finland's ultimate is to generate material and or energy from waste disposed as well as reduce landfill sites. In so doing, proper records are kept to monitor where lapses have occurred and improvements made upon successes.

The study showed however that, Ghana's management system on waste lacked clarity and its data mostly not traceable. Meanwhile, Ghana has the potential of institutionalising waste management systems that are geared towards the continuous improvement of strategies and frameworks as being practised in Finland.

Lastly, is it recommendable to adopt the use of Enterprise Resource Planning (ERP). This is whereby waste as a resource, undergoes an enterprise chain before end products are recovered. The main feature of ERP is the use of SAP systems whereby business

operations between customer relation and enterprises are managed. The reason is because, the study showed that waste management companies faced transportation challenges. Customers whose waste were not located were forced to dump waste indiscriminately. The Accra Metropolitan Assembly pointed out that, due to poor record keeping of customers and service providers, the assembly faced difficulty in metering out sanctions to both customers and service providers. Therefore, the incorporation of SAP systems into work activities by Finnish waste companies will enhance customer-to-customer relationships and at the same time reaching the country's sanitation goals.

Conclusion

The study launched into finding out what could be the reason for waste menace in Ghana. This was as a result of the numerous reportage on sanitation-related-issues in Ghana.

For unbiased analysis of the issue at hand, the researcher adopted a hybrid approach for the study. This was where qualitative and quantitative approaches were both used for the empirical research. The researcher categorised all persons interviewed. Here, six (6) University students described as the Focus group were interviewed and responses obtained, documented. Two hundred and two (202) people living in Ghana who respond-ed to the interview were also documented. Lastly, one representative each of the ministries and agency were interviewed and responses, documented. These ministries and agency are namely; Ministry of Energy, Ministry of Sanitation and Water Resources and lastly, Accra Metropolitan Assembly.

In the end, the research showed that the root cause of waste menace in Ghana was the poor human activities towards the environment. Secondly, the research found that, above all waste-to-energy technology approaches, landfill gas or energy recovery is most preferred considering that, landfill sites in Ghana are in a deplorable state and that, residents living close to landfill sites suffered from waste-related diseases and stench.

The research then proffered a market-entry opportunity for Finnish waste management companies to penetrate the Ghanaian market to seek to address sanitation-related-challenges confronting Ghana and at the same time benefit for expanding frontiers**.**

Suggestions for further studies

This research focused on providing solutions to waste menace in Ghana. The most appropriate choice after considering Ghana's possibilities and challenges was waste-to-energy. The reason was that waste-to-energy can provide solutions to Ghana's sanitation and power crisis. One of the types of waste-to-energy technology which is more applicable to Ghana as far as Ghana's landfill sites are concerned is the landfill gas and or energy recovery.

Additionally, the study proffered market entry opportunities for Finnish waste management companies to penetrate the Ghanaian market. The study found out that, Ghana today has created enabling business environments for the private sector to thrive. Some of the enabling business environments are the digitalisation in registering new companies, digital addressing systems and digitising the ports reduce time wasting at the ports. At the same time, there few suggestions made for future studies.

- **Suitable sites for establishing waste-to-energy plants**

Finding a suitable place in Ghana to site waste-to-energy plants in the researcher's view is a critical point to consider for future studies.

- **Conflict mitigation and resolution**

One of the challenges pointed out in Chapter 5 was bureaucracy. The study showed that undue delay occurs when investors are met in land migrations which in turn, leads to industrial frustration. Therefore, it will be important to consider conflict resolution strategies and reforms for penetrating companies a matter of future studies.

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APPENDIX 1. QUESTIONNAIRE

a) **FOCUS GROUP**

Information will be collected from a section of university students of Vaasa who are Ghanaians. These selected group of students are students who are reading the same program (Master's in Industrial Management) with the researcher and for that matter, have acquainted themselves with courses related to the research. This is to help find out the views on waste menace in Ghana and what their expectations may be going forward. The purpose of creating a focus group is to find how much of attention and with delight they appreciate waste management systems in Finland while comparing what they know with that of waste management systems in Ghana.

1. How will you rate Finnish waste handling system in Finland?

- excellent
- Very good
- Good
- Poor

2. Is the Finnish waste handling system the best way?

- Yes
- No
- Maybe

3. What can be improved? Ignore if you answered YES or MAYBE

…….

……..

4. How will you rate Ghana's waste handling system in Ghana?

- excellent
- Very good
- Good
- Poor

5. Is the waste handling system in Ghana the best way?

- Yes
- No
- Maybe

6. What can be improved? Ignore if you answered YES or MAYBE

…….

……..

7. What could be the reason(s) for effective waste handling practice in Finland?

- Educated population
- Awareness of waste handling related diseases
- Cost
- Other

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8. How concerned are you about environmental pollution in Ghana?

- Very concerned
- Concerned
- A bit concerned
- Not concerned

9. How concerned are you about the waste impact on human health and water bodies?

- Very concerned
- Concerned
- A bit concerned
- Not concerned

10. How concerned are you about Ghana's position (seventh [7] dirtiest country in the world) according to W.H.O?

- Very concerned
- Concerned
- A bit concerned
- Not concerned

11. Which waste-to-energy benefit is most important to Ghana at the moment?

(one or more answers is allowed)

- Creation of jobs
- Eradication of filth
- Provision of cheaper energy
- Emission of greenhouse gas
- Conservation of natural resources
- Other

  ……
  ……

8. What is likely to be the reason(s) for waste menace in Ghana? (one or more answers is allowed)

- Insufficient waste management companies
- Ineffective waste management companies
- Poor human attitude towards the environment
- High illiteracy rate
- Low or no political will
- Other

(fill the blank space if you choose OTHER……..

b) **MINISTRIES AND AGENCIES**

Ministries in Ghana such as; Ministry of Energy and Ministry of Sanitation and Water. Accra, the capital city of Ghana is one of the dirtiest cities in the world. Accra metropolitan assembly (A.M.A) plays a key role in keeping the city clean hence, it was selected for this study. Members of A.M.A are interviewed on issues related to waste collection, handling transporting and disposal as well as all other relevant matters on waste in the city.

Ministry of energy

Ministry of Energy was chosen among this category because, considering the topic of the thesis, it will serve a better purpose and broader understanding of issues regarding the ministry's plans and program on energy mix: hydro and renewable energy. This will also reveal if indeed the ministry has intentions to venture into waste-to-energy in order to reduce the rate of waste impact on the environment in the immediate term.

1. What are the plans and programs of the ministry on energy mix for energy supply in the country?

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2. Why will the ministry support or not support, waste-to-energy projects in Ghana?

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3. What is the supply and demand margin on energy?

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4. How significant will the technology on waste-to-energy meet demand if any?

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What is likely to be the reason(s) for waste menace in Ghana? (one or more answers is allowed)

- Insufficient waste management companies
- Ineffective waste management companies
- Poor human attitude towards the environment
- High illiteracy rate
- Low or no political will
- Other

(fill the blank space if you choose OTHER……..

Ministry of Sanitation and Water

As the name of the ministry suggests, it will mean that, interviewing persons in charge of research of the ministry will make provisions and be able to answer all relevant questions asked. Since the ministry is in charge of sanitation and water, it will be meaningful to find out from the ministry, what plans and programs it has on waste management as well as the challenges it faces.

1. What are the plans and programs the ministry has in place to curb waste menace in Ghana?

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2. What are the challenges the ministry faces as far as managing waste is concern?

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3. What are the roles of stakeholders for the sanitation and water ministry?

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4. What contributions have the ministry's stakeholders done so far on waste management?

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……
……
……

5. Which among these, according to the ministry poses more threat to the environment?

(one or more answers is allowed)

- Household waste
- Industrial waste
- Hospital waste
- commercial/ public service waste
- other……

6. Which of types of waste-to-energy technologies does the ministry prefer and why?

- Anaerobic digestion
- Incineration
- Landfill gas recovery
- Mechanical biological treatment
- Gasification (presence of oxygen)
- Pyrolysis (absence of oxygen)
- other

…….

7. Explain your choice in question 6?

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8. What is likely to be the reason(s) for waste menace in Ghana? (one or more answers is allowed)

- Insufficient waste management companies
- Ineffective waste management companies
- Poor human attitude towards the environment
- High illiteracy rate
- Low or no political will
- Other

(fill the blank space if you choose OTHER) …….

9. Which waste-to-energy benefit is most important to Ghana at the moment?

(one or more answers is allowed)

- Creation of jobs
- Eradication of filth
- Provision of cheaper energy
- Emission of greenhouse gas
- Conservation of natural resources
- Other

  ……
  ……

Accra metropolitan assembly

1. Can Accra become the cleanest city in Africa as wished by Ghana's current president?

- Yes
- No
- Maybe

2. If YES, how can this vision be achieved?

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……
……
……
……...

3. If NO, what are the possible setbacks which is likely to prevent this vision?

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……
……
……
……...

4. What among waste handling process is/ are the reason(s) for the waste menace Ghana faces?

- Waste generation
- Waste segregation
- Waste dumping
- Waste collection
- Other …….

5. How will A.M.A evaluate the state of waste collection in Accra?

- Good

- Fair
- Poor
- Very poor

6. Which among these, according to A.M.A poses more threat to the environment?

- Residential waste
- Industrial waste
- Waste from hospitals
- Waste from market centres
- Other …….

7. What are the challenges the assembly faces regarding waste handling?

- Citizenry indiscipline
- Lack of efficient waste management companies
- Lack of waste bins and or containers at vantage points in Accra
- Other

(please state here)

…….

8. What is likely to be the reason(s) for waste menace in Ghana? (one or more answers is allowed)

- Insufficient waste management companies
- Ineffective waste management companies
- Poor human attitude towards the environment
- High illiteracy rate
- Low or no political will
- Other

(fill the blank space if you choose OTHER) ……..

9. Which waste-to-energy benefit is most important to Ghana at the moment?

(one or more answers is allowed)

- Creation of jobs

- Eradication of filth
- Provision of cheaper energy
- Emission of greenhouse gas
- Conservation of natural resources
- Other

  ……

c) **CITIZENS LIVING IN GHANA**

Questionnaires to citizens living in the country will be done in two folds. First, an online platform and second, a face-to-face interview approach. Questionnaires will be posted via Online platforms such as; Facebook, emails and skype. Whereas the second fold, face-to-face, will be done through a house to house questioning and answering approach.

1. What is your gender?

- Male
- Female

2. What is your age group?

- 17 and below
- 18-29
- 30-39
- 49-49
- 50-59
- 60-69
- 70 and above

3. Where do you live? Please tick appropriate region.

- Greater Accra
- Central
- Western
- Brong-Ahafo

- Ashanti
- Northern
- upper East
- Upper West
- Volta
- Eastern

4. What type of waste do you generate at home? (one or more answers is allowed)

- Organic waste
- Paper
- carton/
- Tin/ Can
- Plastics (bags/ bottles)
- Glass

Other……

5. In what kind of container do you keep or collect your waste? (one or more answers is allowed)

- Waste bin
- Waste carton
- bucket
- Plastic bags

Other …….

6. Do you separate waste generated at home? (Example, separating food waste from tin)

- Yes
- No

7. How often is your waste container emptied?

- Everyday
- Once a week

- Twice a week

Other……

8. Where do you dump your waste?

- Waste collecting vans
- Public bin
- By the roadside
- Pit to burn

  Other ……

Do you pay for dumping your waste?

- Yes
- No

How often do you dump waste?

- Daily
- Weekly
- Monthly

9. If DAILY, how much do you pay for dumping waste?

- 0.00GH₵ - 0.99 GH₵
- 1.00GH₵ - 2.99GH₵
- 3.00GH₵ - 4.99GH₵
- Other ……...

If WEEKLY, how much do you pay for dumping waste?

- 5.00GH₵ - 6.99 GH₵
- 7.00GH₵ - 8.99GH₵
- 9.00GH₵- 10.00GH₵
- Other ……

If MONTHLY, how much do you pay for dumping waste?

- 5.00GH₵ - 10.00GH₵
- 11.00GH₵ - 20.00GH₵
- 21.00GH₵ - 30.00GH₵
- Other ……...

10. Overall, how would you rate the level of waste impact on the environment as compared to fives (5) years ago?

- Better
- Good
- The same
- Worse

11. Do you agree that everyone is responsible for keeping his or her surroundings clean?

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

12. Which waste-to-energy benefit(s) is or are most important to Ghana at the moment?

(one or more answers is allowed)

- Creation of jobs
- Eradication of filth
- Provision of cheaper energy
- Emission of greenhouse gas
- Conservation of natural resources

- Other
  ……
  ……

13. What is likely to be the reason(s) for waste menace in Ghana? (one or more answers is allowed)

- Insufficient waste management companies
- Ineffective waste management companies
- Poor human attitude towards the environment
- High illiteracy rate
- Low or no political will
- Other

(fill the blank space if you choose OTHER) ……..

APPENDIX 2. LETTER OF REQUEST FOR ACADEMIC RESEARCH

April 28, 2018

REQUEST LETTER FOR ACADEMIC RESEARCH INTERVIEW WITH ACCRA METROPOLITAN ASSEMBLY

Dear Sir/ Madam,

I am a final year student of in the department of production at University of Vaasa, Finland. Mandatorily, every student is required to undergo a scientific accepted methodology for his or her master's thesis. In so doing, I have carefully written down questions to be answered by your outfit to aid in my research. My thesis topic is; WASTE-TO-ENERGY, A SOLUTION TO GHANA'S WASTE MENACE: A MARKET ENTRY FOR FINNISH SMEs.

Due to this, a questionnaire is therefore compiled to assist me carry out a substantial research within the subject matter. These questions are related to waste issues in Ghana, of which have been reviewed and approved by my thesis supervisors in Finland.

I therefore will request that, I be given the opportunity to either interview your outfit in person or questionnaire be answered through attached file (link) below.

HERE, I WILL SEND LINKS TO RESPECTIVE OUTFITS

Accra Metropolitan Assembly: http://bit.ly/AMA2018

I live in Finland but will return to Ghana from 23.02.2018 through to 21.03.2018, and will therefore be ready within the period of my stay in Ghana to have a face-to-face interview with your outfit.

I am open to any form your outfit chooses: face-to-face interview or answer through link provided above.

I hope my request reaches your concern and kind consideration.

Thank you,

Enoch Afrane Gyasi
University of Vaasa,
Faculty of Production, Student

Jussi Kantola
Professor, Head
Department of production
University of Vaasa, Finland
Supervisor

Beatrice Obule-Abila
University of Vaasa,
Faculty of Production,
Supervisor (Assistant)

Vaasan yliopisto
UNIVERSITY OF VAASA

April 28, 2018

REQUEST LETTER FOR ACADEMIC RESEARCH INTERVIEW WITH MINISTRY OF ENERGY

Dear Sir/ Madam,

I am a final year student of in the department of production at University of Vaasa, Finland. Mandatorily, every student is required to undergo a scientific accepted methodology for his or her master's thesis. In so doing, I have carefully written down questions to be answered by your outfit to aid in my research. My thesis topic is; WASTE-TO-ENERGY, A SOLUTION TO GHANA'S WASTE MENACE: A MARKET ENTRY FOR FINNISH SMEs.

Due to this, a questionnaire is therefore compiled to assist me carry out a substantial research within the subject matter. These questions are related to waste issues in Ghana, of which have been reviewed and approved by my thesis supervisors in Finland.

I therefore will request that, I be given the opportunity to either interview your outfit in person or questionnaire be answered through attached file (link) below.

HERE, I WILL SEND LINKS TO RESPECTIVE OUTFITS

Ministry of Energy: http://bit.ly/MOE2018

I live in Finland but will return to Ghana from 23.02.2018 through to 21.03.2018, and will therefore be ready within the period of my stay in Ghana to have a face-to-face interview with your outfit.

I am open to any form your outfit chooses: face-to-face interview or answer through link provided above.

I hope my request reaches your concern and kind consideration.

Thank you,

Enoch Afrane Gyasi
University of Vaasa,
Faculty of Production, Student
Email: enoch.gyasi@student.uwasa.fi

Jussi Kantola
Professor, Head
Department of production
University of Vaasa, Finland
Supervisor

Beatrice Obule-Abila
University of Vaasa,
Faculty of Production,
Supervisor (Assistant)

Vaasan yliopisto
UNIVERSITY OF VAASA

April 28, 2018

REQUEST LETTER FOR ACADEMIC RESEARCH INTERVIEW WITH MINISTRY OF SANITATION AND WATER RESOURCES

Dear Sir/ Madam,

I am a final year student of in the department of production at University of Vaasa, Finland. Mandatorily, every student is required to undergo a scientific accepted methodology for his or her master's thesis. In so doing, I have carefully written down questions to be answered by your outfit to aid in my research. My thesis topic is; WASTE-TO-ENERGY, A SOLUTION TO GHANA'S WASTE MENACE: A MARKET ENTRY FOR FINNISH SMEs.

Due to this, a questionnaire is therefore compiled to assist me carry out a substantial research within the subject matter. These questions are related to waste issues in Ghana, of which have been reviewed and approved by my thesis supervisors in Finland.

I therefore will request that, I be given the opportunity to either interview your outfit in person or questionnaire be answered through attached file (link) below.

HERE, I WILL SEND LINKS TO RESPECTIVE OUTFITS

Ministry of Sanitation and Water Resources: http://bit.ly/MOSAWS2018

I live in Finland but will return to Ghana from 23.02.2018 through to 21.03.2018, and will therefore be ready within the period of my stay in Ghana to have a face-to-face interview with your outfit.

I am open to any form your outfit chooses: face-to-face interview or answer through link provided above.

I hope my request reaches your concern and kind consideration.

Thank you,

Enoch Afrane Gyasi
University of Vaasa,
Faculty of Production, Student
Email: enoch.gyasi@student.uwasa.fi

Jussi Kantola
Professor, Head
Department of production
University of Vaasa, Finland
Supervisor

Beatrice Obule-Abila
University of Vaasa,
Faculty of Production,
Supervisor (Assistant)