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The Impact and Development of handling PET bottles waste: Case Kasapreko Ltd in Ghana

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Parker stated in 2018; plastic is the most used material around the globe. Because of its light weight, affordability and duration, which can be used and moulded into different types of products. The production and usage of plastic has increased since its inception and frequent disposal in the landfill, it has generated a huge environmental problem. Because of the persistence nature of the polymers, a significant quantity of abandoned plastics is accumulated into trash in the landfills, oceans and in natural habitats worldwide. To reduce the amount of plastic ending up in the landfill and into the ocean and to reduce the social and environmental impact of plastic, recycling must be practised.

Kasapreko is an indigenous alcoholic beverage company in Ghana. They started manufacturing drinking water and soft drinks in PET bottles in 2015. The company produces 1,440,000 PET bottles in a day which most of them end up in the landfill and causes environmental problem to the Ghanaian community. As part of the company´s plan is to improve its goodwill in the future, it aims to minimize its negative impact as a result of its operations on the environment by adopting a strategy to recycle its PET bottles.

This thesis presents a concise background of the history of plastic, plastic issues on the environment, plastic recycling process, and PET plastic recycling. It further provides a general overview of the main case study which is “the impact and development of handling PET bottles waste: a case of Kasapreko Ltd in Ghana”. The study dealt with the environmental impact of the company´s PET production the consumers view about the use of PET bottles for their products and recycling approach they can adopt for the PET bottles. The factual data was collected through an online questionnaire and virtual interview with the company´s commercial director. Transcript of the interview is presented. Descriptive analysis was used to analyse the data. As a benchmark, the Finnish recycling system, where consumers return the plastic bottles, tins and glass bottles to a designated point for recycling, was used to provide development suggestions to Kasapreko Ltd.

The results of the research indicate that, Kasapreko can be successful in its recycling approach if they partner with third party company who will be collecting empty PET bottles from consumers on their behalf. They can also replicate their already existing glass recycling system where distributors and wholesalers can also collect empty PET bottles from restaurants, pubs, bars and other hospitality facilities whenever they supply new drinks.

Keywords	PET bottles, recycling, environmental impact, plastic

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List of Abbreviations

PET: Polyethylene terephthalate
PBT: Polybutylene terephthalate
PP: Polypropylene
PVC: Polyvinyl chloride
PTFE/Teflon: Polytetrafluoroethylene
LDPE: Low Density Polyethylene
LLDPE: Linear Low-Density Polyethylene
HDPE: High Density Polyethylene
NGO: Non-governmental Organization
BBC: British Broadcasting Corporation
LED: Light Emitting Diode
IUCN: International Union for Conservation of Nature
OECD: Organisation for Economic Co-operation and Development

1 Introduction

Plastic is one of the world's most-used materials today because of its lightweight and affordability. Since its origin in 1950, almost half of all plastic has ended up in the landfill or in the ocean and only 9% of used plastic has been adequately recycled. (Jambeck & Guyer 2015: 11). The problem with plastic is not in how it is used, which is generally harmless, but rather lies in its end-of-life management of products made from it. Plastic recycling has become the most common issue in today's world which everyone talks more about it but do less about it. This is because recycling of plastic is not easy and cost effective. Plastic recycling is the process whereby plastic waste are recovered from landfill, oceans and rivers to convert them into diverse products different from their original form. (OECD 2018).

Since plastic was first developed, about 8.3 billion metric tons of plastic have been manufactured which is enough to cover all the surface of the country Ghana. (Asiedu et al. 2018). Out of the plastic produced, 6.3 billion tons end up as waste. Only 9% of the wasted plastic has been recycled, 12% has been incinerated and 79% end up in the landfills but most of these plastics can be recycled. (Jambeck & Guyer 2015: 13). According to global statistics as stated by the Impact Hub in 2019, 50% of single-use plastics are produced annually, 26% by volume is packaging. Ecoecho (2018) explained that to produce a 1-littre plastic bottle, it cost about 1 euro per kilogram of virgin plastic which is about 2-3 litters. About 99% of plastics are made from chemicals such as oil, natural gas and coal which are non-renewable resources. (Ecoecho 2018). Among the plastic produced, the PET plastic bottles are one of the most common type of plastic waste. If the current production of plastic and waste management continues, it is estimated that about 12bn tonnes of plastic waste will end up in the natural environment and landfills by 2050. (BBC News 2017).

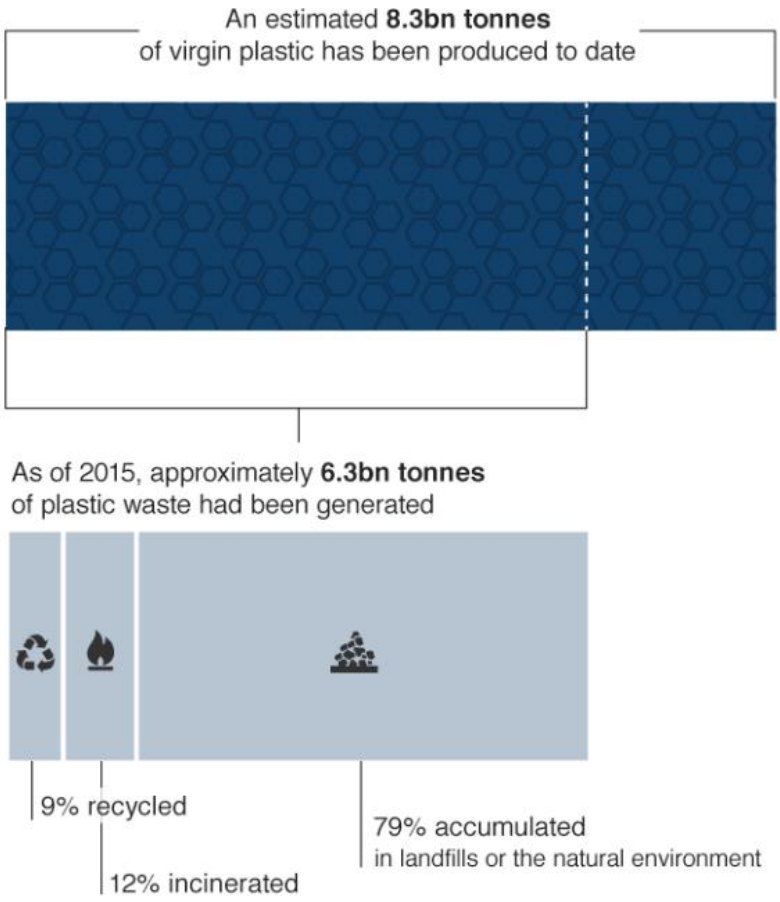


Figure 1: Plastic production (BBCnewsdotcom 2017)

Boucher (as cited in Eunomia 2011) state that, plastic is not only polluting our landfills but also our oceans. Every year, about 8 million tons of plastic end up in our oceans. Plastic trash floating on the surface of the water is currently the most abundant items of ocean waste. Plastic waste makes up 80% of all marine trash from the surface of the water to deep-sea sediments. (Boucher & Friot 2017: 16). In most densely populated areas and tourist destinations in all continents, plastic has been exposed on shorelines. This serious impact of plastic in our waters suffocate and entangle hundreds of ocean species. Ocean wildlife such as whales, fishes, turtles and seabirds eat these plastics and end up dying. This wildlife also suffers from infections, lacerations, injuries from the plastic entanglement and reduce their abilities to swim. Floating ocean plastics also contribute to the spread of bacteria and invasive marine organisms and, which turn to disrupt ecosystems. (IUCN 2018). In as much as these plastics disrupt our ecosystems, they impact our climate change and end up in our food impacting our health. Plastic,

which is produced by petroleum contributes to global warming. Incinerated plastic waste releases carbon dioxide into the atmosphere which increases the carbon emissions. (IUCN 2018). The amount of waste produced by human has incredibly increased as the world population continue to grow. Every household requires easily disposable products which most of them are made from plastic, but the rapid growth of these products has increased the quantity of plastic pollution worldwide. Due to the major toxic pollutants of many plastics, these has caused significant danger to the environment in the form of water, land and air pollution. (Tait 2018). That is why recycling of plastic is very important and must be taken very seriously. These plastics takes ages to break down and mostly plastics such as Styrofoam, trash bags, cereal box plastic, plastic wrappers, crisp bags, groceries bags, candy wrappers cannot be recycled. However, plastics that can be recycled can also be put to a good use such as creating news items like shampoo bottles, funnels, tiles and traffic cones etc. Plastics that are recycled is predicted that 7 yards of landfill area is preserved. (Parker 2018) This is important, especially since we do not have enough landfill space.

Despite the significant value of plastic recycling, most plastic products are incinerated. We can recycle more plastic if we understand the particles of plastic types and generate a circular economy for this useful resource. Many kinds of plastic are normally mixed together in production processes due to lack of knowledge, which makes them more difficult to recycle. This problem has led to plastic being incinerated which is a useful waste resource. Plastics ended up in landfills is the least choice for waste management option. The accumulated waste piled up in the landfills discharges toxins and gases that pollute the land and waterways. But it is sad that most countries still depend on this same waste disposal method without being creative in turning the waste into a useful resource. Waste taken out from landfill are useful and can be recycled and reproduced into a different products to be reintroduced back into the markets, but if the purpose of recycling is met and the environment being protected in a sustainable manner then our leaders should collectively work towards banning plastic on landfills completely. (Plasticrecycle 2018). Moreover, the unique properties of plastic that affect its colour, shape, structure and melting point has a complex material. It is difficult for recycling companies and organizations to separate and sort various types of plastic due to the product design. For example, some types of plastic are combined together with other materials such screws, glue and are fixed to the plastic. (Parker 2018). It is therefore essential to sort plastic into their various categories in order to keep them in their original state. Negative state and health issues which are linked with the way recyclates are used are also a problem of

recycling (Plasticrecycle 2018). The inferior quality of plastic recycling is derived right from the virgin material. However, several polymers can be recycled many times before it loses its original properties, and new technology for collecting, sorting and recycling these plastics have raised the quality of plastics recyclates. (Plasticrecycle 2018). The use of plastic has drastically increased in Ghana and every year, about 2.58 million metric tonnes of raw plastics are imported. According to Ghana´s Environmental Protection Agency, 73% adequately ends up as waste, while only 19% is re-used. (Oppong-Ansah 2018). Companies in the food and beverage sector uses plastic more than any other in Ghanaian community but fails to recycle their plastic waste because the government has no policies in place to force them recycled. That is why only 0.1% of plastic waste is recycled, which means that, all the produced plastic ends up in the environment causing serious health conditions. (Peprah, Amoah & Achana et al. 2015)

The use of plastic and our reckless way of not having recycling policies in place is causing environmental issues which is affecting human beings. Kasapreko Ltd is an indigenous alcoholic beverage company in Ghana which was founded in 1989 by Dr Kwabena Adjei. The company´s vision was to respond to the growing demand of quality alcoholic beverages in Ghana and in 2015, Kasapreko Ltd started manufacturing drinking water and soft drinks in PET bottles. At the beginning of its production, they were importing the PET bottles and as the demand got higher, they started producing some of the PET bottles inhouse to complement the one´s they were importing. Kasapreko has a recycling system in place for its glass bottles but not with the plastic bottles. The company wants to know the impact of their activities in Ghanaian communities if they recycle their plastic bottles.

1.1 Research aim and goal

As part of Kasapreko company Limited’s plan to improve it good will and reputation in the future, the company aims to minimize its negative impact as a result of its operations on the environment hence adopting a strategy to recycle its glass bottle. The strategy has been successful for the company over the years. This study however aims to investigate the impact and development of handling PET bottles waste, a case of Kasapreko Ltd in Ghana. It will further examine the consumer and their workers viewpoint about the company using PET bottles and finally the effect of what their PET bottles has on the environmental.

Information gathered from a preliminary interview with the company´s commercial director (Mr. Gerald Awuah) on the 11th of October 2018 did suggest that, the company has since made a cost-savings in the last one year of about 1.5million USD after they started manufacturing the PET bottles for their soft drink inhouse. This is because the production of these PET bottles was initially outsourced and according to Mr. Awuah, the inhouse production of these PET bottles has been a positive thing for the company. He further suggested that, the company will be much interested to know the safest way of recycling the plastic bottles without causing harm to the environment and if they could even go a step further to undertake inhouse recycling through a mechanical reprocessing.

1.2 Research Question and sub-questions

The research question for this study is “What are the impacts of Kasapreko´s activities on Ghanaian communities, the case of its PET bottles?” and in order to be able to answer this question, the following sub-questions would play significant role in this research:

- What are the effects of the production of their PET bottles production on the environment?

- a) What are the consumers view about the use of PET bottles for Kasapreko soft drinks and bottled water?
  b) What are Kasapreko´s workers view about producing PET bottles inhouse?

- What recycling approach should Kasapreko adopt for their PET bottle?

1.3 Research approach

Both quantitative and qualitative research method was used in this study to collect and analyse data. Quantitative research method is grounded in numerical data and statistic relationship between variables was established. (Cohen, Manion & Morrison 2017). A qualitative research method target is to attain data through open-ended questions and conversational communication (Guest, Namey & Mitchell 2013). The information needed for this research was collected through probing question during the interviews with the

management of the company. Primary data was acquired through the interviews with the company´s management and through an online survey made of structured and semi-structured questions which were sent out to the general public. Secondary data however was collected from the Kasapreko's website and other related internet sources. Articles and journals were also used for this research work.

1.4 Limitation of the Study

There were a couple of limitation during the research. Lack of proper communication between the writer and the company and non-availability of fund for the writer to visit the company in Ghana. However, the writer was dedicated and was able to research and gather information for the thesis. Despite of communicating with some managers of the company earlier, the Commercial Director Mr Awuah later gave the writer a different perspective and direction on what the company want for their PET plastic recycling process.

Moreover, the Ghanaian community in which the company operate has little knowledge about plastic recycling and the impact of the company activities on them. Therefore the information obtained from them could not be compared to any historical ideas and the writer was compelled to use European standard to measure the social and environmental impact in the community.

In addition, Plastic recycling is an issue in today´s world and there are ample of information that will make one deviate from its original scope and aim. (oceanworkdotcodotuk). However, the writer managed with the literature on plastic recycling and socail/environmental impact at disposal. Books and academic journals on plastic in general were also used.

Considering the nature of this study, the writer needed more number of resource persons from the company for the interviews in order to have a fair representation of the company's views. This was hindered because Kasapreko was having a new company open in the second capital city of Ghana (Kumasi) and due to that, the specific people needed for the interview were always not available.

2 Literature review (theory)

This chapter present various theories and concept in order to create a suitable framework for the study. Some existing plastic waste management strategies in the world are compared and reviewed thereby concentrating on the most relevant one for Kasapreko´s plastic waste management program.

2.1 History of Plastic

From historical point of view, the development of plastic has been observed as one of the most essential technical achievements in the 20thcentury. Since its existence, it has virtually permeated our daily life, making new inventions possible and substituting materials in products which already exist. These materials been successfully based on their properties of flexibility, very stiff and can support moisture, chemical and biodegradation, their stability, and the simple way to remould them into any form. (Ampofo et al. 2015).

The 1st plastic produced was based on natural raw materials mainly. Just in 1930 that thermoplastics were produced from the essential material like styrene, ethylene and vinyl chlorine and were suggested back into the market. (plasticsamericanchemistrydotcom). But the main growth of industry dominated in the 1960s, arriving at the peak in 1973 when manufacturing increased to 40million tonnes per year. (Ampofo et al. 2015).

According to ScienceMag.org article published on December 2017 that sought to explain the plastic pollution problem in the world, 8.3bn tonnes of pure plastic is estimated to been produced to date. It further went to say that since 2015, almost 6.3bn tonnes of plastic waste has been generated. Out of this figure, 9% had been recycled, 12% incinerated and a whopping 79% piled up in landfills or the natural environment. If recent production and management of waste trend continue, approximately 12bn tonnes of plastic waste will end up on environment by 2050. (Sciencemagazine 2017). In figure 7 below provides current trend of plastic bottle production in the world, out of which less than 50% plastic collected for recycling.

Figure 2: Rising tide of plastics bottles (Euromonitor International 2018)

2.1.1 What is Plastic

Anne Marie Helmenstine, 2018 defined plastics as any synthetic or semi-synthetic materials which are made from the used of crude oil and natural gas as the raw material. These raw materials contain polymer molecules that are divided into simple individual chemical constituents of a polymer.

A polymer consists of molecular structure which are built up mainly from many similar units bonded together. Polymeric materials are huge molecules that are made by combining thousands of tiny molecules unite which is also known as monomers (Schönmayr et al. 2017). Polymerization is the process of producing plastic that is by joining one or more monomers such as styrene vinyl chloride and ethylene together and the molecules is also refer to as the degree of polymerization. (Schönmayr et al. 2017)

Plastic consist of several monomers that are linked together in a chain-like form. They can also be taken from petroleum, generally in the form of the excerpt of light or from natural gas which are in a methane form or from agricultural material such as

wood/cotton, cellulosed/soya bean by-products. (Helmenstine 2018). Just in the 19th century that the development of synthetic polymeric materials was made, and the first breakthrough was established on a cellulose. This material is known as Parkesine.

Since the development of plastic, it is now everywhere. From our daily life, household materials, kids playing tools, cars, hospitals equipment's, food containers, industrial areas etc. These several of plastic has their own characteristics and specific uses.

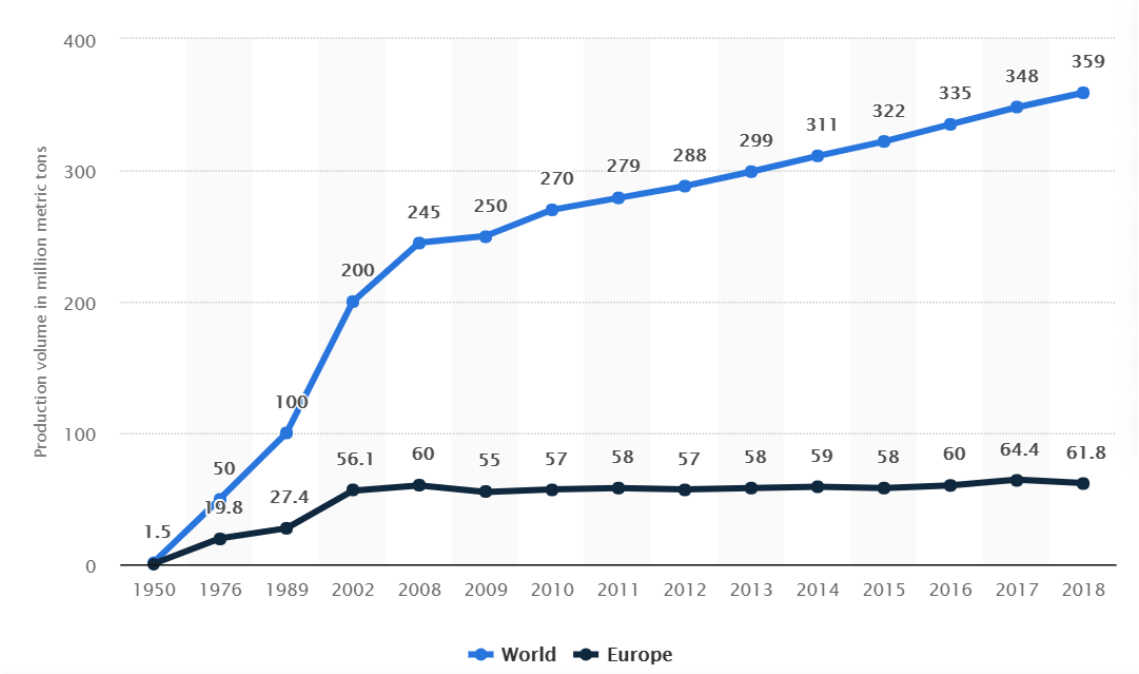


Figure 3: World Plastic Production 1950 – 2018 in million metric tons (Statista, 2019)

Plastic production in primary forms with about 1,356,000 employed persons and about 56000 companies producing plastics products with 12,900,000 employed people. (Eurostat 2015). Figure 3 shows the world and Europe plastic production from 1950 to 2018. Statista (as cited in PlasticsEurope 2019: 6) stated that in 1950, plastic production worldwide accounted for 1.5 Mt and since then, the compound annual growth rate has caused a rise in production to 359Mt in 2018. It has been predicted that, the global production of plastic is likely to increase to approximately 380Mt based on a polynomial trend calculation.

2.1.2 Classes of Plastics

Thermoset plastic

Thermoset also known as thermosetting plastics are synthetic materials that harden upon heating but are not able to remould or reheated after their initial heat-forming. (Net 2014). Thermoset is essentially opposite to thermoplastic. Thermoset plastic is normally capable to function at a higher temperature, which in effect provide some part of the plastic with a unique material for chemical and electrical support. (Net 2014)

Thermoset plastic has two stages of chemical reaction,

a) the first stage usually ends in the information of long chain-like molecules which is like the one present in the thermoplastic but can still be able to react.

b) the reaction of the second stage usually occur during the moulding process which happen under pressure and heat.

In this case if surplus heat is utilised to the materials, they will singe and impair. Because the cross-linking of the molecules is by chemical bonds which are robust, the characteristics of thermosetting materials reject adamant material which prevent their mechanical properties not to be heated delicately

Thermoplastic material

Thermoplastic materials are plastics polymers that soften upon been heated, allowing for moulding and harden upon been cooled up. (Stack Plastic 2018). Due to its unique chemical property's thermoplastic have, the materials can easily be remoulded and recycled without affecting the material physical properties negatively. This makes thermoplastics a perfect material for injection moulding because they have a high chain-like molecules which are join together by comparatively fragile Van der Waals forces. (Stack Plastic 2018).

These kinds of plastic materials are used for an extensive length of consumer goods to medical equipment, depending on the material type. There are also thermoplastics which are easier to process, e.g. is the Commodity thermoplastic which are normally used to manufacture products in a large quantity. These materials are used for packaging,

clothing, food, and beverages. Examples of thermoplastics are nylon, cellulose, polycarbonate, polyethylene, polystyrene, polyvinyl chloride, and polypropylene. According to RecycledPlastic.com, the primary benefits of Thermoplastics Materials are as follows;

2.1.3 The Primary Benefits of Thermoplastics Materials.

- They can be remolded and recycled without any damage
- Thermoplastic materials can be used to replace metal
- It has relatively low processing cost
- They can maintain high precision
- They impact resistant and chemically retardant
- Reduces waste and are more environmentally friendly
- Thermoplastic offer high strength and lightweight.

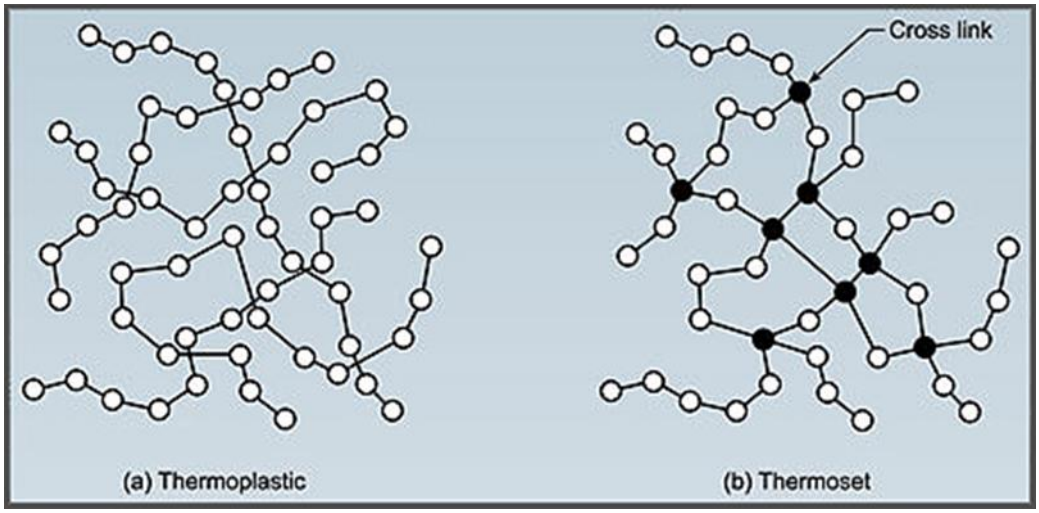


Figure 4: Structure of; (a) thermoplastic and (b) thermoset (RecycledPlasticdotcom, 2014)

2.1.4 Processing Methods

There are different kinds of processing methods used in producing plastics. Below are the two main methods in plastic processing which forms the products that consumers use in everyday life.

Extrusion

In the extrusion process, the plastic materials are loaded into a hopper and the extruder is later placed in a long-heated cubicle to produce the required cross-section. (Osswald, Bauer & Roudolph 2019). During this process, “the plastic is melted in some heat generated from the mechanical work which has been done by a hot sidewall metal”. (Plasticdotamercanchemistry). When the extruder ends, the molten plastic goes through a dye which help in the modelling the finished product. The level of the finished product comes out good and high items can be manufactured using this method. (Osswald, Bauer & Roudolph 2019)

Injection moulding

Injection moulding is a form of plastic processing whereby material of the plastics is sustained from a hopper into a heating area. (Osswald, Bauer & Roudolph, 2019)

Types of Plastics

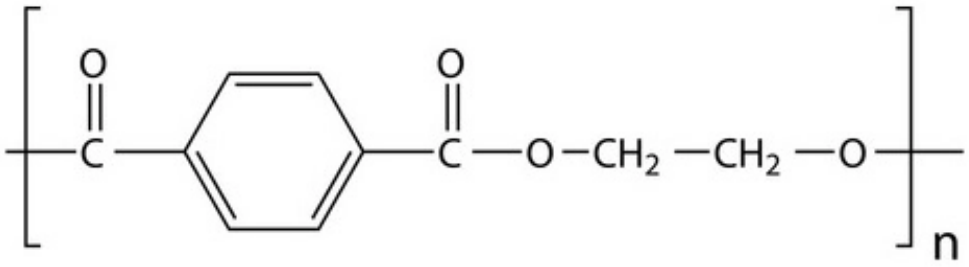
There are several types of plastics which are been produced by plastic manufactural around the globe including the traditional plastics and modified plastics. (A.C. Plastics 2018). These types of plastics are Polyethylene (PET), Polystyrene (Styrofoam), Polyvinyl Chloride (PVC), Polytetrafluoroethylene (Teflon), Polypropylene (PP). (A.C. Plastics, 2018). In most of the developing countries however, the traditional plastics are manufactured for use. There are different kinds of plastics which look the same, or there could be a particular type of plastic with many chemical and physical characteristics due to the type of additive been used. Below is the briefly description of the type of plastic which matters to this case study.

Polyethylene (PET)

The study will focus on this type of plastic. This type of plastic was invented by John Rex Whinfield in the 1941. (A.C. Plastics 2018). The invention was done by condensing ethylene glycol with terephthalic acid. Polyethylene has a density range of 917-965kg/m3 depending on the type. Its materials are soft, transparent, flexible and sometimes tough.

There are three types of polyethylene plastic, low density polyethylene (LDPE), linear low-density polyethylene (LLDPE) and high-density polyethylene (HDPE). LDPE is used in the application of making bottles, bowls, plastic buckets and bags, pipes, electrical insulators etc. however on the part of HDPE, it is lightly tougher and stiffer than LDPE. (A.C. Plastics 2018). This high-density polyethylene is used in the manufacturing of dustbins, tubes and fluid containers as well as bottle crates. (David Schön Mayr, et al. 2017). The physical property of PET plastics has several benefits and one of its important characteristics is its intrinsic viscosity which absorb water from its surroundings and makes it hydroscopic as well. Its chemical properties have excellent resistance to alcohol, oils, greases, diluted acids and aliphatic hydrocarbons. It has moderate resistance to dilute alkalis, aromatic and halogenated hydrocarbons.

PET plastics is one of the most recycled thermoplastics, its recycling symbol is number "1" usually at the bottom of the bottle.



Molecular Structure of Polyethylene Terephthalate
PET Chemical Formula: $(C_{10}H_8O_4)_n$

Figure 5: Molecular Structure of Polyethylene Terephthalate (Schönmayr et al. 2017)

2.2 Recycling of Plastic

The process of recycling plastic refers the recovery of scrape plastic and converting the materials into functional and useful products. (OECD 2018). Every day, an enormous number of plastic products are used throughout the world. Since plastic are not bio-degradable, it occupies a vast amount of space in the landfills as well as the ocean. Therefore, to reduce plastic waste from the landfill and the ocean which are causing pollution to the environment, plastic recycling is an essential action. The approach of recycling plastic will help to conserve energy and divert plastics from landfills and oceans.

The terminology for plastic recycling is sometimes complication and perplexing. This is due to the wider length of recycling and recovery exercises. These terminologies include four categories;

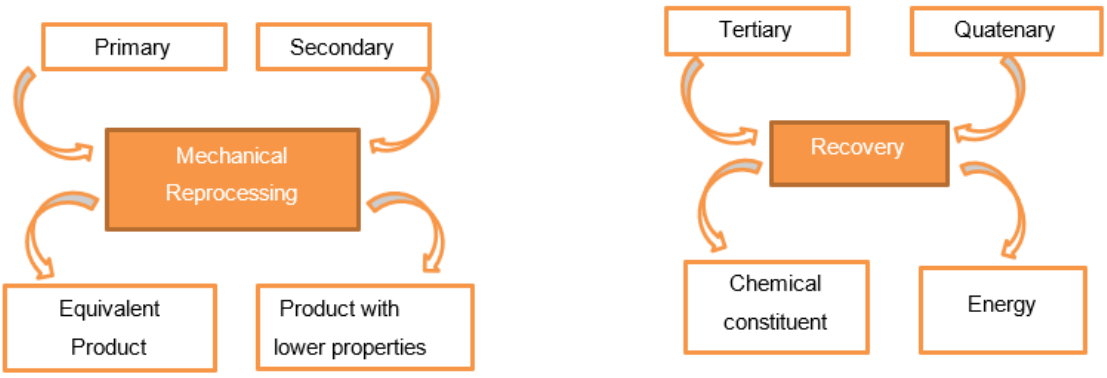


Figure 6: Plastic Recycling Terminologies (Hopewell et al. 2017)

- Primary – mechanical reprocessing into a product with comparable properties. The primary way of plastic recycling is normally known to as closed-loop recycling, that is when a post-consumer of a product waste is been collected, recycled and used to make a new product. (Hopewell et al. 2017). Example of this process is converting plastic bottle into polyester for clothing and other products.

- Secondary – mechanical reprocessing into products demanding reduction of properties. (Hopewell et al. 2017). The second way of this process is that, the plastics are reused in some other way without reprocessing. Example is cutting the plastic bottle into two to use as plant pot or reshaping it to make arts and crafts works.

- Tertiary – recovering of chemical constituents. This recycling process is either described as feedstock recycling or chemical. This means that, it has been reprocessed either by chemical process or by heat. (Hopewell et al. 2017). Example of tertiary recycling include breaking down the plastic bottles into smaller pieces to produce a new product.

- Quaternary – recovering of energy. This process is also known as biological recycling and is used very often these days. The process uses the energy from the high heat content of the burning plastic. With this process, incinerator can reach a temperature of about 900-1000 degrees Celsius.
  (Hopewell et al. 2017).

2.2.1 Stages in Plastic Recycling

The simple way to plastic recycling process is collecting, sorting, shredding, washing, resizing, identification and separation of plastic, melting and pelletizing. The recycling process vary based on the plastic type. There are two main steps to plastic recycling process.

- Step – one: Sort the plastic to make sure every pollutant is removed from the plastic waste stream.

- Step – two: Shred the plastic into flakes then melt them down before being finally processed into granulates or into a new shape. (Leblanc 2019)

2.2.2 Plastic Recycling Processes

The most familiar processes of recycling plastic waste in the industry is Heat compression and Monomer.

- Heat compression: This plastic recycling processing type is most popular in the developed countries such the Japan, Australia and the United State. Companies choose this type of plastic recycling process because it can recycle all the plastic types at once. The process uses both clean and unsorted plastic waste and mixes it in a big tumbler that boil the whole mixture. (Lunghi 2017). The main benefit of this process does not need the same forms of plastic to be recycled together.

- Monomer: With this type of recycling process, difficulties in plastic recycling can be resolved through the elaborate and accurate monomer. The process turns the polymerization reaction and use the same polymer for recycling. (Lunghi 2017). This method makes the plastic waste clean to generate a new polymer.

2.2.3 PET Plastic Recycling

Most companies are now recognizing the need to recycle their PET plastics into quality food products like new drink containers. While the establishment of quality food products are been processing, measures are put in place to improve the ability of processing technologies. (Leblanc 2019).

Polyethylene terephthalate (PET) is the common recycled plastic in the world. (APC Packagingdotcom). It is labelled with #1 code at the bottom of bottles and containers. Its recycling process is by collecting-sorting-melting/shredding.

Figure 5: Polyethylene terephthalate code (all-recyclinf-factsdotcom)

After the collecting and sorting process, the PET plastic material is shred into pieces. The pureness of the shred pieces is the central to preserve the amount of the converted plastic. There are separation techniques which involve washing of the converted plastic and air classification. This process helps the material to float or sink on a surface. “PET can also turn into polybutylene terephthalate (PBT) resin, which can be an essential material for blow-moulding and injection”. (Nwachukwu, Chima & Ikenna et al. 2013) The PET plastic could also be formed for re-use by aiding the breakup of the bottle and substituting the parts. The manufacturers can use standardising parts like, LED lamp designs. (Nwachukwu, Chima & Ikenna et al. 2013)

2.3 Social and Environmental impact of PET Plastic waste

As Shiue et al. (2015) stated that human in our everyday life get exposed to numerous environmental chemicals. Most of these chemicals are toxics and are cause by plastic waste. Since plastic takes many years to break down, so is the environmental damage also long lasting. Human bodies are absorbed by these chemicals used in producing plastics. (Knoblauch 2011). These toxics have potential human health effect and causes harm to the environment.

2.3.1 The effect on Human/Social Impact

The main social impacts are certain to be in relation with health, and most particularly, the epidemiological impacts "(these include causes of disease and its transmission, outbreak investigation, environmental epidemiology, argumentative and occupational epidemiology, disease surveillance, disease screening, biomonitoring, and comparisons of treatment effects such as in clinical trials)" (Braun 2016) which are normally associated with the waste treatment in mostly developing countries. Research indicates that the plastic impact on human health has focused on specific moments in the plastic lifecycle. (Vethaak & Lesile 2016). These are normally on a single product, its processes or risk pathways. This approach has failed to realise that important and complex way which human health impacts occurs at every step of the plastic lifecycle, that is from the manufacturing to refinery, from stores to consumers and from waste management to the growing impacts of microplastics on the environment. (Vethaak & Lesile 2016).

2.3.1.1.1 Health effect:

Human health is always at risk when it comes to plastic pollution. The stem from Bisphenol A like polycarbonate plastic which are used in containers that store beverage and food have some additives. These additives have a negative impact on both the health and environment. During the manufacturing process and using the plastic packages, people are exposed to these chemicals, and this is because some of the chemicals migrate to the food from the plastic packaging. Acetaldehyde from PET is one of the plastics contaminating food. (Vethaak & Lesile 2016).

2.3.2 Environmental Impact

The biggest environmental issue everyone is concerned about is Plastic pollution. It may seem like the amounts of plastic waste in the landfill and ocean are unavoidable, but everyone can help in the small way with the plastic pollution issue by being aware of its dangers and making effort to reduce it. Polyethylene terephthalate (PET) plastics are made completely recyclable but they do not biodegrade, they photodegrade, meaning that with time, they break down into particles. Those particles absorb toxins that pollute the environment. (Forbes 2018)

- **The Process for producing the Plastic Bottles:** 17 million drums of oil is needed every year to produce a plastic water bottle. This amount of oil can maintain up to one million cars fuelled for an entire year. (The production process utilises the petroleum product polyethylene terephthalate which also requires a large amount of fossil fuel for both manufacturing and transporting. A large amount of water is needed in the manufacturing process which then become wasted due to that fact its expose to chemicals during the production. The energy needed in manufacturing these plastic bottles can power up to 190,000 homes. (Laville & Taylor 2017).

- **Where Do Plastic Water Bottles End Up?** Norm Schriever (2017) point out that the most plastic bottles end up in the landfills, oceans and rivers. Every year, about 38 billion PET bottles end up on the landfill and only 23% are recycled. When these bottles end up in the landfills, not only do they cause land pollution but also develop bio-aerosols, and visual disturbance that releases hazardous chemicals through the emerge of leachate from landfill. When these chemicals permeate the land, they spoil the quality if the water. It is approximated that 46,000 pieces of plastic trash are floating on the ocean per square mile. (Gourmelon 2015). Animals are dying, our ecosystems are being disrupted and chemicals are being leaked into the air. A bottle can take up to one thousand years to decompose, discharging dangerous and harmful chemicals during the process. (GoGreen 2017).

2.4 Benchmarking countries with good plastic recycling system against Ghana.

Plastic use has increases over the years, and it has become a larger part of Ghana´s municipal solid waste. Recycling plastic has not been easier but the need to recycle our plastic keeps them from the landfills, it reduces the amount of the energy and resources such as natural gas, water, petroleum and coal needed to create plastic. This part of the paper aims to compare countries with good plastic recycling system against Ghana. Countries like Finland and United Kingdom are used in this comprising. In order to understand how good plastic recycling system is performed, a set of indicators is developed for the selected benchmark countries. These indicators measures; Separate waste collection, recycling habit, Recycling circular system and Human resources. The performance in this benchmark will help proffer solution to how Kasapreko can feasibly recycle its plastic bottles

2.4.1 Plastic waste situation in Ghana

Ghana has about 140 plastic companies and most of these companies are located in Greater Accra region which is the capital city of Ghana. Among the 140 plastic companies in the country, 20 companies collect the by-product and re-use or recycle them. (Asiedu 2018). The rest of the companies are not concern where these plastic wastes may end up, leaving them in landfill thinking that its tedious and expensive to reuse the plastic. These manufacturing companies import about 230,000 tons of raw materials every year and 210,000 tons of the raw materials are used to produce plastic products. Out of these 210,000 tons of plastic that are been used to manufacture plastic products, only 40,000 are recycled and the remaining 170,000 tons goes to waste. (Asiedu 2018)

The solid waste management in Accra Ghana, is very appalling. About 2000 metric tonnes are generated per day and about 1700 metric tonnes are collected per day, therefore 500 metric tonnes per day of waste are left uncollected. This huge backlog of waste left uncollected in a day is due to several reasons that includes; lack of policy from government, people’s bad attitude toward waste management which includes indiscriminate littering of waste without putting them in provided collection bins. Their lack of knowledge to separate waste i.e. bio-degradable waste and plastic waste. Many residents also refuse to pay for waste management service to collect their waste and

instead they resort to dumping them in the street. Inadequate waste collection bins in the metropolis and this is because there is only one company in the country who take care of the recycling and this company operates on a small scale. This is due to improper waste management by city authorities. (Zoomlion 2018).

2.4.2 Plastic waste situation in UK

Plastic waste recycling is a huge problem for the UK. Over the years, they have struggled to recycle its plastic waste and in fact in 2014 alone, they produced 4.9 million tons of plastic waste but thanks to government policies put in place, things will change years to come. (Marshall 2019). Dr Adam Read, Suez Recycling & Recovery UK director stated in 2019 that, two-third of the waste were packaging and only 1.2 million tons were recycled, however, things will get better in the next few years since government policy and plan are in place. An article published by Sönnichsen in sattista.com, the source of plastic waste in the UK from 2018 to 2013 is from the plastic packaging which account for majority of the plastic waste stream in the UK. This waste sums up to 67% and it's the highest share of waste sources. In 2019, the waste management in the UK collected about 371,000 tons of plastic bottles from household and this was the highest in UK history and in fact between 2015 and 2019, plastic recycling rate has increased in the UK.

2.4.3 Plastic waste situation in Finland

Finland has good waste management policies which encourage residents to stop throwing plastic out with mixed household waste. Every house has a container for different waste collection and the waste are sorted according to its material that is biowaste, paper, carton, glass, plastic and metal. Waste such as hazardous waste, batteries and electrical equipment are sent directly to recycling points. (Infofinlanddotfi). They have recently decided to export its plastic waste due to the fact that it lacks the capacity to process all of the plastic waste sorted by household. (yledotfi). In 2019, the amount of plastic waste was more than previous years and the Finnish Plastic Recycling Ltd is able to process only 20,000 tons of plastic waste. its plastic bottles.

Table 1: Benchmarking countries with good plastic recycling system against Ghana

	Ghana	**UK**	**Finland**
Separate waste collection	Ghana does not practice separate waste collection. (Zoomliondotcom) Lack of awareness Lack of policy from government	Around 45.5% of household waste in England are recycled compared with 43.5% in Scotland, 46.3% in Northern Ireland and 57.6% in Wales. (UK statistic on waste, 2019) The biodegradable municipal waste to landfill in the UK has reduced from 7.8m tonnes in 2016 to 7.4m tonnes in 2017	Every house or block has containers for different waste collection. Waste are sorted according to its material and it's a national policy for every household to sort their waste before taking it out to the waste bins. Monetary benefits when waste products like plastic bottles, tins and glass bottles.
Recycling habit	Glass bottles for soft drinks are usually recycled. This is because old bottles are	Only 70% of all plastic is recovered in the UK. 59% of all plastic bottles	Plastic bottles, tins and glass bottles can be

	returned when buying new ones. (Zoomliondotcom) Plastic bottles are however not recycled Some NGO´s e.g. Recycle Ghana have started educating and training local people on how to use plastic waste in creating beads and building houses in villages. (RecyclingUpGhanadotcom)	are collected and only 31% of all plastic is recycled. (UK Gov. Statistical Service, 2020) They export some of their waste especially plastic for recycling because they do not have the capacity to recycle all the plastic it produces. (UK Gov. Statistical Service, 2020)	resold for recycling. Undamaged goods can also be sold at the flea market or on the internet for reuse. (Imfopankkidotfi) Recycling awareness is nationwide.
Recycling circular system	In urban cities like Accra, most people have waste cans in household to collect waste. (mswrdotgovdotgh) Companies like Zoomlion collect waste from homes but all end up in landfills. (Zoomliondotcom) Majority of people in rural Ghana does not have any proper circular system.	In the UK, they have several companies that have made waste management simple. These companies such as Bristol Waste Disposal, Cheaper Waste etc provide regular bin collections,	Several designated collection point in Finland Suomen Palautuspakkaus Oy (Palpa) is an NGO that over sees the deposit base recycling system of plastic bottles, tins and glass bottles.

		confidential shredding and more for both household and businesses.	(Suomen Uusimuovi Oy, 2016).
Human resources	Some NGO has started creating awareness of recycling, but they are not funded by the government but rather from foreign agencies. (RecyclingUpGhanadotcom)	The UK employs a lot of human capital to recycle their waste. (UK Gov. Statistical Service, 2020)	Recycling is a big industry that employs a lot of people.

2.5 Explanation of the Benchmarking

Below is an explanation to the set of indicators which was developed for the selected benchmark countries.

2.5.1 Separate Waste Collection

When using Finland´s and UK´s waste management system to benchmark that of Ghana it was revealed that in Finland there are separate waste containers for waste collection thereby making it easy for recycling companies. It was also revealed that waste is sorted according to its material in Finland and it's a national policy for every household to sort their waste before taking them out to the waste bins. In Finland, there is monetary benefit when plastic bottles, glass bottles and tins are returned to designated point. This system motivates people to be more responsible any time they use these products. (Popova, et al. 2018).

Recycle management in UK on the other hand is not as efficient as that of Finland. The UK recycling rate for waste on households are 45.5% in England, 43.5% in Scotland, 46.3% in Northern Ireland and 57.6% in Wales which is not up to the 50% of the EU

target. UK is also making strides in recycling of their waste. This is because according to the UK statistic on waste, the biodegradable municipal waste to landfill in the UK has reduced from 7.8m tonnes in 2016 to 7.4m tonnes in 2017 (UK statistic 2019).

Based on the aforementioned facts about Finland and UK waste management, it is obvious that Ghana needs to do a lot more as far as waste management is concerned. Ghana does not practise separate waste collection, and this is due to lack of awareness on separating waste and lack of policy backing from higher authorities.

2.5.2 Recycling Habits

Finland´s recycling awareness is very high. People are very conscious of creating a sustainable environment. In Finland it is very common for people to take their used and unwanted items such as cloth, bags electrical appliances etc to the flea market or sell them online. (Infofinland 2019).

In the UK, 70% of all plastic are recovered, 59% of all plastic bottles are collected from household, companies and landfill. Only 31% of all the plastic recovered and collected are being recycled. UK export some of their waste especially the plastic to some Asian countries for recycling. This is because they do not have the capacity to recycle all the plastic they produce. (Bayley 2019)

In Ghana, companies like coca cola, Kasapreko have a system in place that allows users to return their old glass bottles when purchasing new products. They do not however incentivise customers when they return the old bottles. Plastic bottles however are not recycled. Some NGO´s in Ghana such as Recycle Ghana have started educating and training local people on how to use plastic waste in creating beads and building houses in villages. (Recycleupghana 2017)

2.5.3 Recycling Circular System

There are several designated collection points for plastic bottles, tin and glass bottles scattered across Finland. Suomen Palautuspakkaus Oy (Palpa) is an NGO which is put together by retailers and breweries example Alko, Kesko, Hartwell, Olvi etc which manages the administration of plastic and glass bottles returns in Finland. (Palpa 2019). Other beverage package return system also exists in Finland but Palpa is the largest.

In the UK, they have several companies that have made waste management simple. These companies such as Bristol Waste Disposal, Cheaper Waste etc provide regular bin collections, confidential shredding and more for both household and businesses. The UK could have done much better if they could have adopted the Finnish recycling circular system because people consume a lot of bottle water in Europe. (Statista 2019)

Ghana´s recycling circular system is very poor. The country lack proper structures and planning compare to what currently exist in Finland and in UK. Even though some people in the urban cities have a system where waste collection companies like Zoomlion come to their residence to collect their waste, these wastes end up in the landfills with just a fraction of them incinerated. Majority of these waste in the rural areas that end up in the landfills cause serious health problems to the locals especially when they are burn in the open causing poisonous gasses and other health related diseases like cholera. Plastic waste and other non-biodegradable waste which also find itself in the landfills also cause serious health problems.

2.5.4 Human Resources

Since environmental sustainability awareness is a big thing in most European nations, Finland and UK are no exception, however, the industry employs a lot of professionals in that sector. They also invest a lot of money in the area of research and planning.

In Ghana, the ministry of science and environment also has a policy that creates awareness about sustainability, but they lack the political will to back it with legislations. Notwithstanding, some NGO´s have taken it upon themselves to educate, train and create the awareness about recycling. These organizations are mostly funded by foreign funding agencies and would have been better off if they have some government funding's. (Recycleupghana 2017)

3 Kasapreko Ltd (history and what they do)

Kasapreko Company was founded in 1989 by Dr Kwabena Adjei. The company´s vision was to respond to the growing demand of quality alcoholic beverage in Ghana. A country located in the western part of Africa and bordered along the Gulf of Guinea and Atlantic Ocean. The company started from its founder´s garage and has since grown as one of the leading indigenous successful alcoholic and non-alcoholic beverages producing company in Ghana. Kasapreko currently employs over 500 multinationals and hundreds of contracted staffs to see to the seamless achievement of its vision. The company has currently installed state of the art production facility which is in Spintex Accra and Kumasi in the Ashanti region. This facility is equipped with world class machinery that contribute to the production of their various brands in different packaging. Their customize high speed production line can produce 60,000 alcoholic bottles per hour in both glass and PET bottles and produces about 120,000 plastic sachets per shift. All these products produced in bottles and sachet when consumed end up as solid waste thereby adding up to the burden of waste management in Ghana. The company now is trying some recycling method whereby they collect used bottles from consumers (usually retailers like restaurants, pubs etc.) to reuse in production. This method even though good is not adequate to collect all bottles back to the company. They do not have any recycling program in place for product in sachet and PET bottles at all which is not good for the largest indigenous alcoholic and non-alcoholic beverage company in Ghana. (kasaprekodotcom)

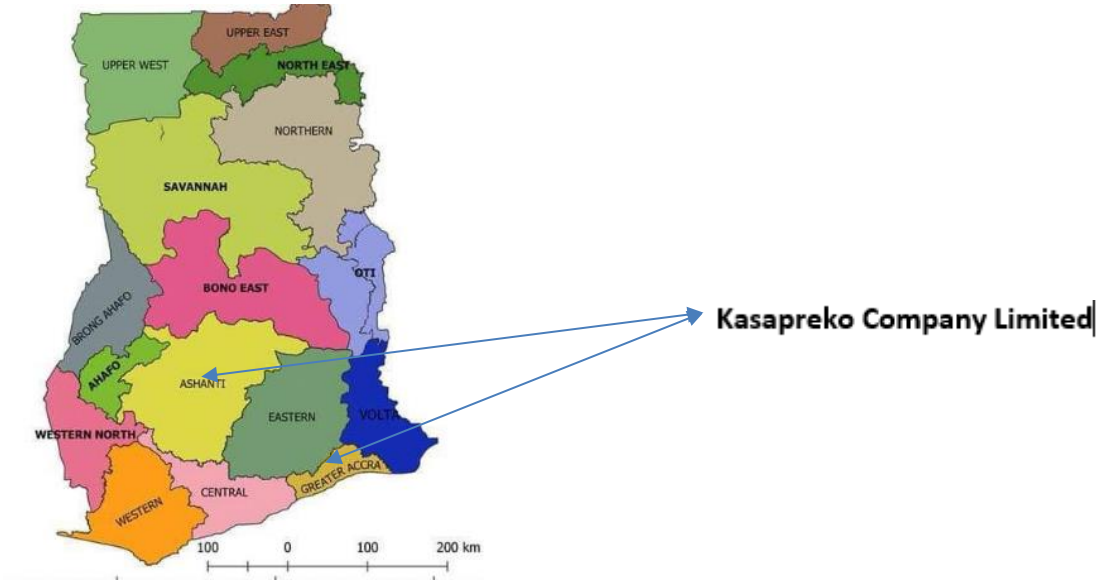


Figure 6: Map of Ghana (googledotcom)

Some products of Kasapreko

Figure 7: Kasapreko´s products in glass bottle (kasaprekodotcom)

Figure 10: Kasapreko´s products in glass bottle (kasaprekodotcom)

4 Methodology

This part of the study outlines the research methodology used to answer the research question and sub-questions, the research approach, a description of data collection process for the conducted interviews and data analysis. The description of the process in more detail is significant to enable the reader understands and to give it credibility. The aim, however, is to make the study transparent in such a way that it can be repeated in the future when needed. In addition, the section explains how the research was conducted and the research approach used. This section will finally end with discussing the data analysis.

4.1 Research Design

In this study, both quantitative and qualitative research method was used. The main tool used in collecting data was done by both interview and semi-structured questionnaire. The interviews were conducted via telephone with Kasapreko´s commercial director Mr Gerald Awuah and other representatives of the company and it was recorded and later transcribed for analysis. Open ended questions were used in the interview to find out about how the company perceives the idea of its activities in the Ghanaian communities. A semi structured questionnaire was however sent out to respondents in Ghana. A quantitative research approach collects data using structural instruments such as questionnaire where the results of the analysis is based on the sample which is the representative from population. (Cohen, Manion & Morrison 2017:317). This type of research approach is usually based on a positivist research paradigm which places the researcher in an objective and neutral position. This allows the researcher to be factual in the process. A qualitative research method concentrates on accessing data through open-ended and conversational communication (Guest, Namey & Mitchell 2013). With this approach, the researcher was able to obtain and analyse the research sub-question.

4.2 Sample/ Data Collection

The respondents used in this study were gathered by what is known as the non-probability sampling. “Non-probability sampling is a sampling method where the researcher selects samples which are based on subjective judgment rather than random

selection". (Cohen, Manion & Morrison 2017:113). Quantitative research typically uses this type of method where the researcher uses a target group from a wider population because they share some characteristics in which the researcher is interested in. In this case study, they share characteristic people in the Ghanaian community whose

lives have been impacted both positively and negatively by the activities of Kasapreko and the effect of their PET bottles on the environment. This study later adopted convenient sampling because all the respondents were gathered virtually. Convenience sampling derives from non-probability sampling method where the data collection from population members depends on who are conveniently available to participate in study. (Lohr 2019: 225). The overall respondents the study gathered via the online questionnaire were 55. The questionnaire was sent to the respondents both by email and on social media (Facebook). The company´s representative Mr. Gerald Awuah provided the researcher with 50 emails of the worker of Kasapreko. A link to the questionnaire was sent to these 50 emails of which 34 (62%) responded. A link of the questionnaire was also shared on Kasapreko´s official Facebook page which has over 22,000 subscribers and the researcher received 21 (38%) responses from consumers or fans of Kasapreko´s products. The questions were structured and semi-structured questions. This method was used because it was easy and straight forward for the respondents to answer. The data recorded were anonymously collected, even though it required personal information like gender, age, area where they live, educational background and knowledge about PET bottle recycling and the impact on the environment. The questions have YES and NO answers and Agree/Disagree answers. The questionnaire used is attached as appendix 2 and the interview questions used is attached as appendix 1.

55 responses were received, and the data were analysed to answer the research question. William & Zikmund et al. (2013: 483) explained that in a descriptive analysis, a raw data is transformed into a different form that make it easy for the researcher to understand and interpret the data to generate descriptive information. In this study, the data was analysed and presented in pie chart. The pie chart was used to show the percentage or proportional data. The data were however validated by comparing the results with what has already been discussed in literature in order to have a meaningful conclusion.

5 Survey Results

This part of the study presents the factual result of the survey. The analysed data in this section is in relation to the research questions as stated in this study.

5.1 Survey Responses

There were 55 respondents in total to respond to the questionnaire. These people are university graduates, vocational school graduate, senior/junior high school graduates and even nonstudent who patronize Kasapreko´s products. The analysis herein is intended to respond to all the three research questions as stated below.

- What are the effects on the environment in the production of their PET bottles?
- What are the consumers/workers view about the use of PET bottles for their products?
- What recycling approach should Kasapreko adopt for their PET bottle?

5.1.1 Background of the Respondents

This part of the study presents the background of the respondents. The questions they responded were about their gender, age, area where they live, educational background, environmental issues and knowledge about plastic recycling. The information provided gave enough grounds for understanding the sample composition, the effect of socio-demographics and shaping of attitude towards plastic recycling.

Respondents by Gender

From the 55 respondents, 60% were male while 40% were female as shown in figure 11 below.

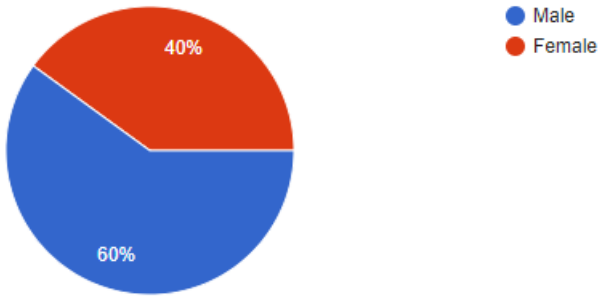


Figure 8: Respondents by Gender

The age of the respondents was asked to determine their knowledge and experience with the questionnaire topic. The figure below shows the age category of the respondents in the questionnaire. The overall respondent was 55 and out of that, 27 respondents with percentage of 49.1% were between age 26–35. 22 respondents with 40% were between the age of 36-45 and 3 respondents with a percentage of 5.5% were below the age of 25, 1 person with a percentage of 1.8% in the age bracket of 46-55 and 2 people with 3.6% are above the age of 56.

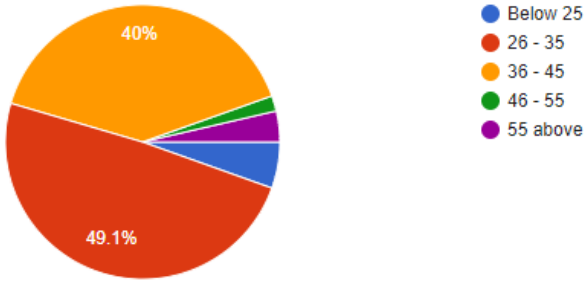


Figure 9: Respondent by Age

The results from the questionnaire shows the respondents resided in the urban area and the rural area in Ghana. A significant number of respondents resides in the urban area with a percentage of 89.1% and 10.9% respondents resides in the rural area. The results in figure 13 indicate that, Kasapreko´s royal soft drinks and awake purify water can be find in both urban areas and rural areas. The company however can implement some of these findings and recommendations from the results.

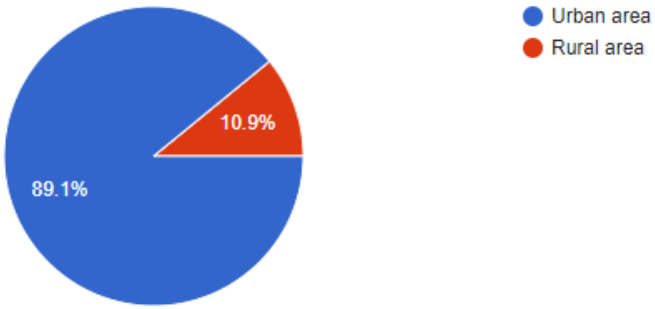


Figure 10: Area of Residence

Majority of the respondents are university graduates. The results in *figure 14* indicate that 47 people with a percentage of 85.5% of the overall respondents have attended or still in university. Whereas 5 respondents with 9.1% are vocational students,2 respondents with 3.6% are senior high school graduates and only 1 respondent with 1.8% have not graduated from any institution.

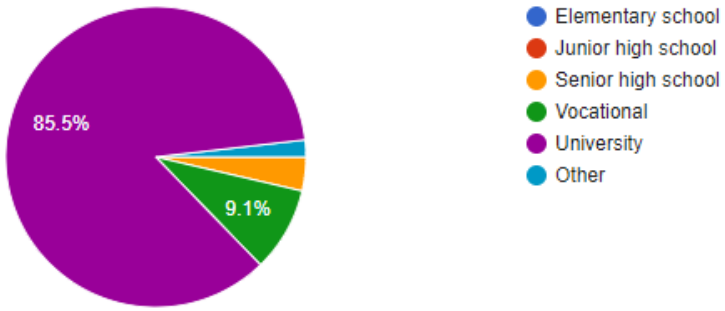


Figure 11: Respondents by education

5.1.2 Knowledge about Plastic Recycling and Environmental issues.

This part of the questionnaire sought to measure the respondent's knowledge about the environmental issues cause by plastic waste. The questions in this section were designed to obtain information about plastic waste recycling, its process, how they can help the environment.

Respondents who are conscious of preserving the environment

Plastic pollution is one of today´s biggest environmental concerns. It occurs that, the amount of plastic waste in the world we live in today are inevitable, but we can together with the issue of plastic pollution by being aware of its dangers and taking steps to reduce waste. This question sought to measure the respondent's knowledge on how conscious they are about plastic pollution on the environment. The results presented in *figure 15* indicate that all the respondents (100%) are conscious of preserving the environment for the next generation.

Respondents who understands what recycling is.

To have a positive impact on the environment, one needs to recycle their plastic waste because recycling is both importance to human and the natural environment. 52 respondents responded YES to knowing what recycling is and 3 respondents had no idea what recycling is. This represent 94.5% and 5.5% respectively as shown in figure 15.

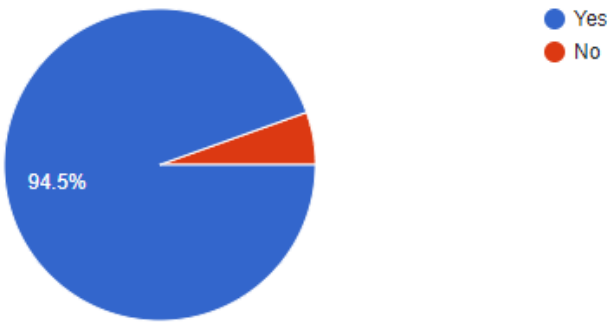


Figure 15: Do you know what recycling is

Respondents who are willing to return the Plastic bottle and make extra money

when the respondents were asked their willingness to return the plastic bottle to a designated collection point and make extra money, the results in figure 16 shown their responses. 87% of the respondents were willing to return the plastic bottle to any designated point just to make extra money. 11.7% respondents don't know or are not sure if they will return the bottles to those designated collection points and 1.3% responded NO to the question.

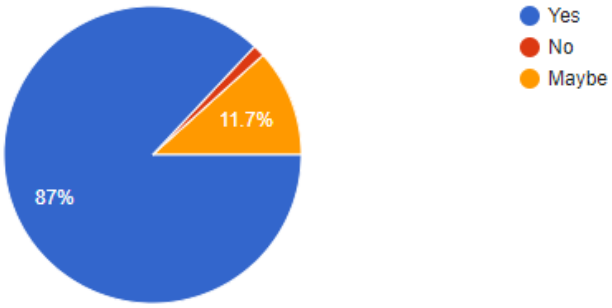


Figure 16: Willingness to return the Plastic Bottle to a collection point

Respondents who are concern about the environment with plastic issues.

It is just natural for human to be concern about the environment with the numerous plastic waste deluging slowly into degradable materials which enters the environment and our food chain. The results indicate that, majority of the people who answered the survey are extremely concern about the environment on plastic issues. The result indicated in *figure 18* shown how 72.7% of the respondents are concern about how plastic waste is harming the environment. Furthermore, 18.2% are somewhat concern with the environment on plastic waste, 5.5% was neither concern nor unconcern about plastic issue on the environment. 1.8% of the respondents was somewhat unconcern and 1.8% was extremely unconcern about the environment on plastic waste.

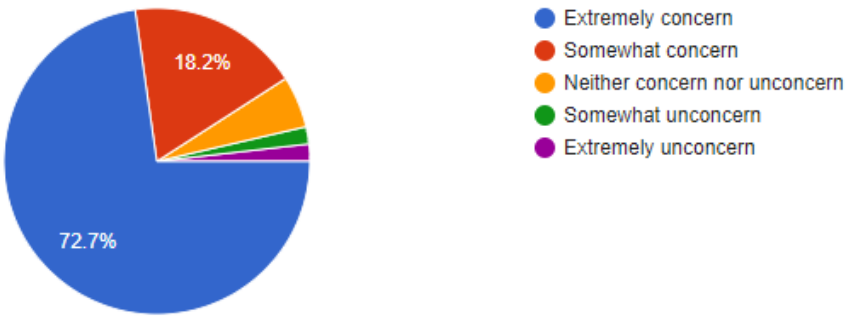


Figure 17: Concern/unconcern about the environment

Respondents who think the most effective way to reduce plastic bottles ending up in the landfill is to collect and recycle.

The most common approach to reduce plastic waste ending up in landfills are to reduce, reuse and recycle. While human probably believe that recycling and reduce is an effective, reusing the plastic bottles for other things like construction will prevent them ending up in landfills. Among the respondents who think the most effective way to reduce plastic bottles ending up in the landfill is to collect and recycle, a significant number of respondents 72.7% strongly agree with the question, whereas 20% somewhat agree to the question 5.5% don't know if collecting and recycling is the most effective way to reduce plastic bottles in landfills. On the other hand, 1.8% of the respondents strongly disagree with the question.

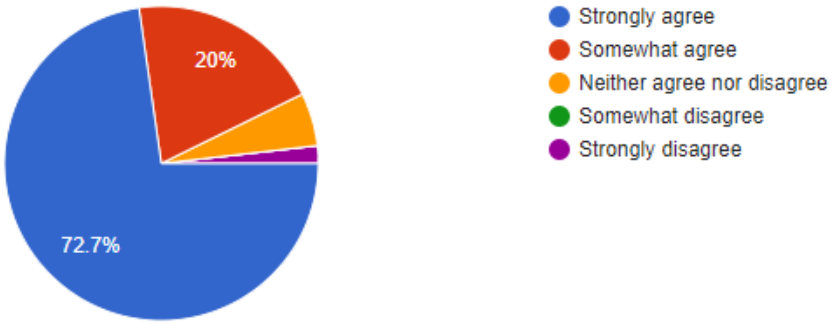


Figure 18: Effective way to reduce plastic bottles

Respondents who think single use plastic bottle can harm the environment

As the name suggest, single-use plastic is disposable plastic that is designed to be used once then tossed or recycled. When respondents were directly asked if they think single use plastic bottle can harm the environment, majority of the respondents 79.6% answered YES to single-use plastic bottle harming the environment while 20.4% thinks that single-use plastic bottle can never harm the environment. (*See figure 19 for details*)

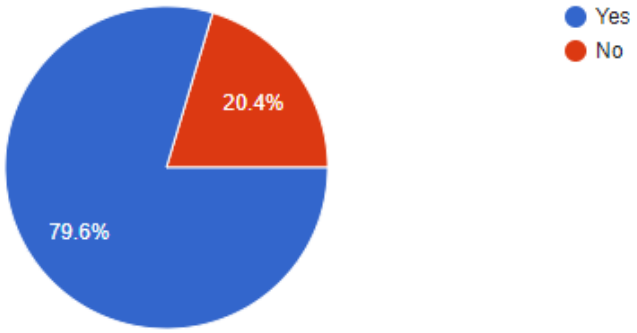


Figure 19: Single use plastic bottles

Respondents who think Kasapreko is the first local manufacturer to establish a modern quality control and product development laboratory to ensure safety in its production.

Ensuring workers safety must be the priority of every employer. When there are proper working conditions in place, the employees will not be stressed, due to that productivity will increase. The respondents were asked if they agree or disagree with the fact that Kasapreko is the first among all the manufacturing company to establish a modern quality control and product development laboratory to ensure safety and *Figure 20* shows the respondent's results. 27.3.% of the respondents strongly agree that Kasapreko ensures safety for its workers. 23.6% somewhat agree to the question, 41.8% of the respondents being the majority neither agree nor disagree to this question. This is because the information about the company is not public. However, 7.3% somewhat disagree to the question.

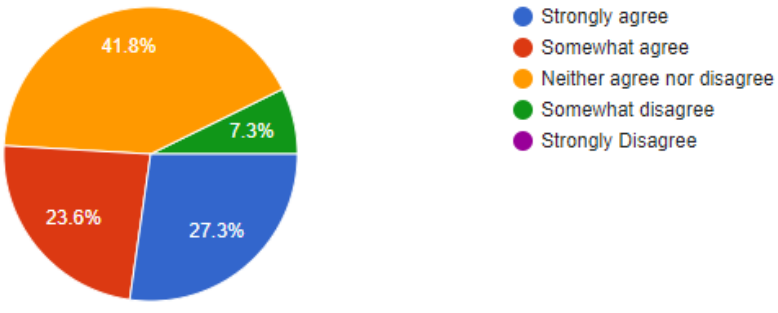


Figure 20: Workers Safety

5.1.3 Consumer´s viewpoint on Kasapreko using PET bottles

The questions in this section (questions 12, 13. See appendix 2) were designed to obtain information about how Kasapreko´s plastic waste will affect the Ghanaian community.

Respondents who thinks Kasapreko make a lot of noise during PET manufacturing process

Bottling manufacturing companies are usually characterized with high levels of noise, and this is usually due to repeated collisions between the bottles and the capacity of the bottling plant. The higher the capacity of the plant, the higher the level of noise it producess. Kasapreko recently installed ultramodern bottling machines in their newly built facility in the Ashanti region. These machines have the capacity to produce 60,000 bottles per hour. The respondents were asked if they agree or disagree to the reason why Kasapreko make a lot of noise production and *figure 21* shows what the respondents think. Majority of the respondents 61.8% strongly agree that Kasapreko big machinery use in manufacturing the PET bottles make a lot of noise. 25.5% of the respondents somewhat agree and 12.7% neither agree nor disagree.

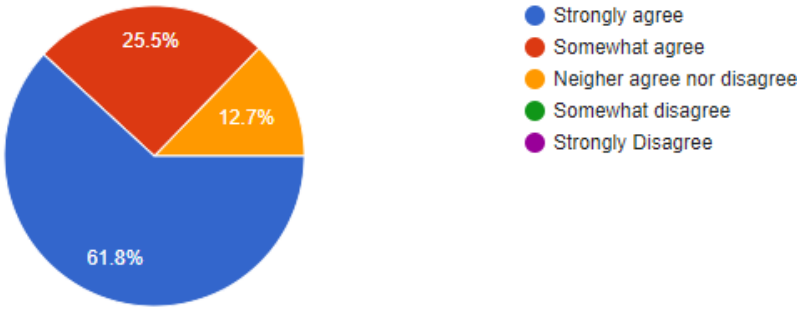


Figure 21: Kasapreko make a lot of noise

Respondents who will buy the same drinks if offered in a different package.

The purpose of this question was to gain further knowledge regarding preferences of the Ghanaian population towards plastic bottles, where respondents were given the option to answer YES or NO to the question if they will buy the same drinks offered in a different packaging. Of all the respondents, 89.1% answered YES demonstrating that, they would have preferred other options like glass, can and cardboard packaging to plastic bottles.

10.9% of the respondents preferred using the plastic bottles and won't change for any other packaging.

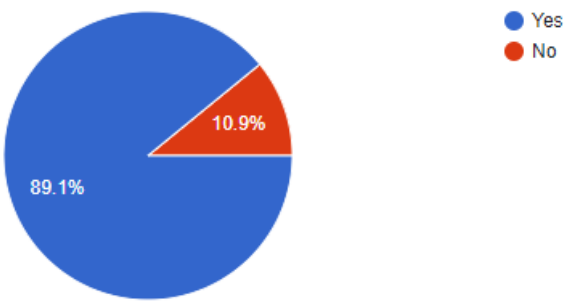


Figure 22: Same Drinks offered in a different Packaging

Respondents who thinks that aging equipment can waste energy by operating inefficiently.

Furthermore, the questions went on to probe about how energy are wasted in manufacturing companies. The information gathered will throw more light on whether aging equipment can waste energy by operating inefficiently. The results shows that, 65.5% of the respondents strongly agree with the question whereas 21.8% somewhat agree. However, 9.1% doesnt know if aging equipment´s can waste energy by operating inefficiently and 1.8% somewhat disagree and strongly disagree to the question.

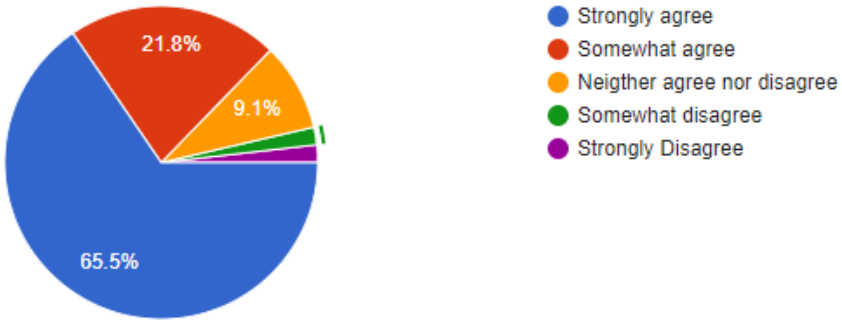


Figure 23: Aging Equipment waste Energy

Respondents who are satisfied or dissatisfied with Kasapreko´s One4Life Fund

Kasapreko instituted a One4life Fund about five years ago since the inception of the awake purify water. One Cedi of every pack of awake purify water sold is donated to the fund.

The company donates this money to Cardiothoracic center in Accra every year. The One4Life project of Kasapreko is not just raising money for the Ghana National Cardiothoracic Center at Korle Bu Teaching Hospital but also a way to promote the message and goals of the charity work they offered to do. 77.8% of the respondents being the majority were very satisfied with the One4Life Fund. This indicate that, they will be willing to purchase awake mineral water just to promote the charity work. 13% were somewhat satisfied, 5.6% of the respondents were neither satisfied nor dissatisfied and 3.7% were very dissatisfied. The respondents who were very dissatisfied however have no idea what the One4Life Fund project is or probably not benefitted from it.

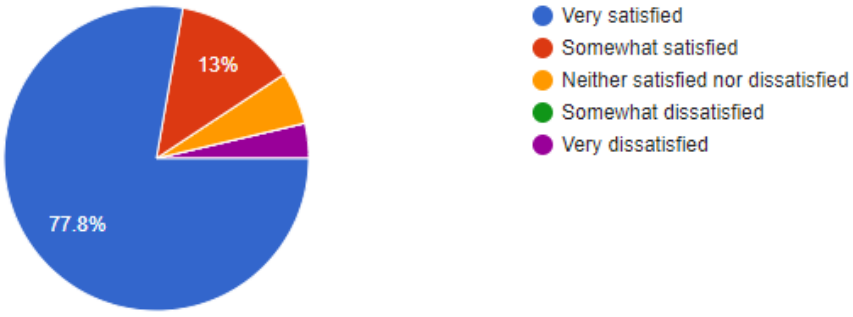


Figure 24: One4Life Fund

5.1.4 Knowledge about Recycling Approach.

The questions in this section (questions 14, 15, 16, 17. see appendix 2) were designed to obtain information about how Kasapreko can collect their plastic bottles. As a company who wants to continue its activities and adopt a plastic recycling approach that will be suitable for its PET bottle without causing any environmental problem on the community, it is important to know the opinion of the respondents.

Respondents who think educating workers to know the difference between waste and recyclable materials can help Kasapreko recycling approach.

When waste is sorted correctly, the material can be reused to make new products. It is therefore important for the company to educate its employees on how to collect and sort its plastic bottles for recycling. If the employees are not educated on this topic, the company will be affected financially because waste that could have been recycled will end up on the filled causing environmental hazard to the community.

Majority of the respondents (96.4%) responded YES to educating employees on the difference between waste and recyclable materials. They believe educating employees on such a topic will make things easy for Kasapreko to choose which kind of recycling process needed for its PET bottles. However, 3.6% of the respondents disagree on educating workers to know the difference between waste and recyclable materials.

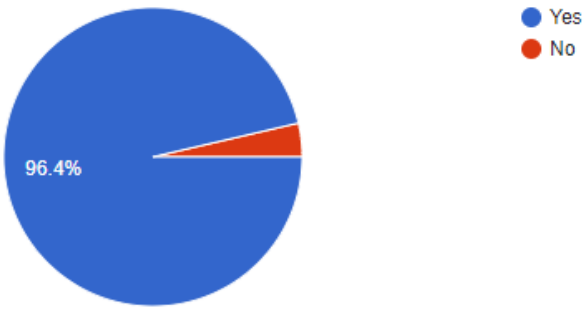


Figure 25: Educating Employees on waste and recyclable materials.

Respondents who think Kasapreko can use waste third party companies to sort post-consumer PET waste for its recycling approach.

Post-consumer waste when serve its intended purpose as a consumer item, needs to be separated from other materials which are to be disposed of. It is then better to ask third party company to collect and sort these wastes which has completed its life cycle as a consumer item and its ready to be recycled and reused. Majority of the respondents 94.5% think that, Kasapreko should get a company to help sort its post-consumer PET waste for its recycling approach. 5.5% out of the overall respondents think that it is not necessary for Kasapreko to hire third party company to collect and sort its post-consumer waste for its recycling approach.

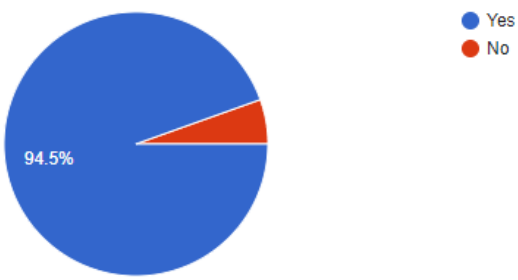


Figure 26: Kasapreko can use waste companies to collect and sort post consumer PET.

5.1.5 Interview with Kasapreko´s Commercial Director: Mr. Gerald Awuah.

Before the interview was conducted on 8.3.2020 via mobile phone call, the researcher has had the pre-interview phase (planning how the interview will be conducted, knowing the background of the company, pre-testing all the electronics device ”mobile phone & recorder” and the list of the interview questions) dealt with in advance. The researcher went through the questions again to make sure the questions will elicit the necessary response needed to answer the research question. The interview questions were open-ended and they have already been forwarded to the interviewee ahead of time in order to get ample time to reflect and think about their responses. The researcher had eleven interview questions set for the interviewee. The language used for the interview was English since it is the official language in Ghana and both the interviewer and interviewee are familiar and fluent in it.

The interviewer started the interview by introducing herself and the purpose of the interview. The approach the interviewer used during the interview was conversational, courteous, friendly and unbiased. During the interview, the interviewer made sure the interviewee talked as much as possible by probing a vague and general answers with statements like ”That´s interesting...., could you explain that a little more" or "Let's see, you said ... just how do you mean that?" and at the same time, given the interviewee feedback as appropriate (JUDD et al. 1991). The interview lasted about 45 minutes and ended with salutations. Next is presented information about the company and status of recycling based on the interview.

The company started producing soft drinks and awake bottle water in 2015 when Guinness Ghana Limited was the only beverage company producing soft drinks and bottled water. During that time, the demand was very high and Guinness Ghana could not meet the demand. So Kasapreko as a competitor, they decided to do a market analysis about the need to start producing bottle water and soft drinks. The interviewee stated that, the company first produced the bottled water (Awake purified water) in a PET bottle and when it became successful, they rolled out the production of soft drink a year after. The company uses standard size (500ml) for both bottled water and soft drink. They also have 350ml, 200ml and 100ml for the airlines companies as well as 10liters for the water dispenses. He explained that, Kasapreko is able to produce about 1,440,000 plastic bottles a day. This is because the company has recently installed new machines which can produce twice the capacity of the company´s old machine. The interviewee (Mr. Awuah) further explained that, before the company decided which

plastic to use for their products, the company have a team of technical guys who does all the background work and research about a particular product, its quality and make a recommendation for them. But what he could say about the questions was that, PET bottles are quite robust and hygienic for Kasapreko´s line of business.

When it come to logistics, Kasapreko practice reverse logistics which is only for their glass bottles. The company works with the hospitality industry such as restaurant, pub and bars. This process is designed in such a way that, their wholesalers and distributors who supply the alcoholic beverages to the restaurant, bars and pub will collect the empty bottles of the previous delivery while making the next delivery. Moreover, the company´s trucks also go around in certain areas to collect these empty bottles from their clients. There is also recycling plant at the company´s factory for the glass bottles where the glasses are been washed and sorted by color. A machine then crushes the glasses and melt them to me remolded. The interviewee explained that, the inhouse recycling has helped Kasapreko to make alot of cost saving as well as being good for the environment. The interviewee further stated that, any activity that will protect and preserve the environment as part of their corporate social responsibility should be sustain and hope they expand their recycling activities to cover all their products. For the company to be successful in expanding their recycling to all their products, Mr. Awuah stated that, they have been working closely with their partners, distributors and wholesalers across the country as far as delivery excellent is concern. This system in place allows them to collect the empty bottles from restaurants, pubs and other hospitality industry.

Furthermore, Kasapreko being the most successful indigenous company in Ghana, they always keep in mind the well-being and satisfaction of the Ghanaian people in everything they do. This has influenced the launching of the One4Life foundation at the inception of Awake purified water right from the very beginning. The company also do a lot of charitable work to support the needy in the Ghanaian society.

6 Discussion

The study recorded 55 respondents who are mainly graduates from university, senior/junior high school, vocational graduates and non-graduates and fall within the age bracket of 25 and 55 above. The data recorded present a wide range of respondents in relation to their place of domicile in Ghana, representing 89.1% and 10.9% urban area and rural area respectively. The gender ratio of the data recorded 60% and 40% of male and female respectively.

Kasapreko soft drinks and awake purified water in plastic bottles has been popular within these few years. The convenience of disposable water today means that you can find these products everywhere you go in Ghana and it's no question that; these empty plastic bottles are bad for the environment. In our quest to probe further about how our respondents are concern about the environment in relation to plastic bottles, it was revelling that quite a significant number of respondents 90.9% are very much concern about the plastic issue on the environment.

6.1 findings

Three sub-questions were formulated at the beginning to guide the study. Below are answered to the sub-questions.

- **What are the effects on the environment in the production of their PET bottles?**

Environmental preservation has over the year become a topical issue and as a matter of fact, plastic waste takes centre stage in this discussion. Asiedu, 2018 reports that, in Ghana alone manufacturing companies import 230,000 tons of raw materials of plastic per annum and about 210,000 tons are used in manufacturing plastic products. Among these plastic products produced, only 40,000 are recycled and reused and the rest 170,000 tons of plastic goes to waste and end up in the landfill. When these plastic bottles are not properly disposed of, they end up blocking gutters which in effect causes Cholera outbreaks, mosquito breeding and other health related problems. And when they are also not properly recycled, some of the plastic will end up in landfill which are usually burn in open air which produces poisonous gases for human consumption. Having said

that, it was also important to know whether the respondent have any idea what recycling is all about. It was recorded that 94.5% are very much aware of what recycling is about. Perhaps this result is also tied to their level of education since the least educated respondent was junior high school. Looking at the figures presented in the literature review, as far as plastic waste is concern in Ghana, Kasapreko´s PET bottles if not properly handled will also add up to the problem we have on our hand. Respondents were also asked if they think that single used plastic bottles can harm the environment and their response were to the affirmative representing 79.6%. The PET bottles Kasapreko use for its product is also a single use and if they do not put in place a pragmatic recycling system, the bottle will end up in the landfill causing environmental problems. (Kasaprekodotcom)

- **a) What are the consumers view about the use of PET bottles for Kasapreko soft drinks and bottled water?**

Since the inception of Kasapreko´s Awake purified water and subsequently adding soft drinks, it is not out of place to say that the company has had a positive impact in the Ghanaian society by way of job creation, contributing positively to the GDP and making numerous donations through their One4Life Foundation. (Kasaprekodotcom). However, regardless of the positive impact the company has made since the production of soft drinks and bottled water, it has been presented in this paper at section (2.2.5) in the literature review that PET plastic if disposed improperly will not biodegrade which means that, they take a long time for the bottle to break down into smaller fragments. These fragments absorb toxins that contaminate the soil, pollute the waterways and make the animals sick. (Forbes 2018). Today´s throwaway culture promotes the single-use PET bottles which in effect give us all the statistics about plastic waste. (Wales 2018). Respondents were asked in the questionnaire about what they think on single-use plastic bottles harming the environment and the results as shown in figure 19 indicate that a significant number of people which is 79.6% thinks that single-use plastic bottle can harm the environment whereas 20.4% think that, it cannot. This is a confirmation that single-use PET bottles are harming the environment. Respondents were further asked if they were willing to purchase the same drinks if offered in a different package and 89.1% were to the affirmative whereas 10.9% said No. The PET bottles Kasapreko use for its bottled water and soft drinks are single-use plastic which they will end up producing more each day. Therefore, switching to a different package which is environmentally friendly will be a good alternative since they are willing to patronise the same drinks if offered in

a different package. Kasapreko can look into other alternative packaging in future. Again the respondents were asked if the company make a lot of noise during their PET manufacturing process and the data in the questionnaire recorded that, 87.3% strongly agree that, Kasapreko make a lot of noise during the PET manufacturing process which turn out to disturb the people in the vicinity. Perhaps this result from the respondent is under the impression that, most big factories with heavy machineries usually generate a lot of noise in their operations. (Worksafe.govt.nz). However, looking at the company´s location at Spintex a suburb in Accra which is also a residential area, their operations will disturb the resident but when the company is usually located in industrial area, there is no such disturbances.

- **b) What are Kasapreko´s workers view about producing PET bottles inhouse?**

PET plastic is an excellent material choice for brewery companies. According to Jambeck and Guyer (2015: 11) PET bottles are strong, it has light weight, shatterproof properties, chemical resistance and are cheaper to produce. During the manufacturing process, PET packaging uses less energy and natural resources and it create a strong link with the outside environment which doesn't permit oxygen to passthrough. (Grew 2019) PET plastic bottles are 100% recyclable and can be moulded into different shapes at a cheaper cost. However, during production ethylene glycol and terephthalic are heated together under the influence of chemical catalysts which can be hazardous to workers. (Gregersen et al. 2020). During PET production, serious accidents such as explosions, chemical spilling, fire outbreak and toxic vapor into the air occurs. These accidents can cause severe injuries, property damage and death. Respondents were asked in the questionnaire about Kasapreko Ltd being the local manufacturer to establish a modern quality control and product development laboratory to ensure safety in its production and the results as shown in figure 20 indicate that 50.9% agree, 41.8% neither agree nor disagree and 7.3% disagree. This shows that, workers safety plays a significant role in the production industry. Respondents were further asked if they think educating employees to know the difference between waste and recyclable materials can help Kasapreko recycling process and 96.4% were to the affirmative whereas 3.6% said educating employees cannot help. Educating workers to know the different between waste and recyclable materials is very important especially in the brewery companies. It makes it easy for the workers to understand the importance of recycling since not all the people working in the production unit are educated.

- **What recycling approach should Kasapreko adopt for their PET bottle?**

Kasapreko in a day manufacture about 1,440,000 PET bottles for its products. They manufacture different sizes which include standard size (500ml) for the bottle water and soft drink. They also have 750ml for bigger bottle water, 350ml, 200ml and 100ml for the airline's companies. The company have 10liters for the water dispenses they distribute to corporate institutions. If Kasapreko want to adopt a new approach to recycling its PET bottles, using a third-party company like Zoomlion will be much better in the process. Respondents were asked if Kasapreko can use third party to collect and sort empty plastic bottles for recycling and their response were to the affirmative representing 94.5%. Again, when the respondents were asked if they are willing to return the PET (plastic) bottle to a designated collection point and make extra money, 87% were willing to return the plastic bottle which is a significant number that the company can count on. As presented in section 2.3 in the literature review (see table 1), countries with good recycling system like Finland, the awareness of recycling is nationwide and there is a monetary benefit when waste like plastic bottles, tins and glass bottles are resold for recycling. (Palpa 2019). Therefore, if Kasapreko wants to adopt the Finnish recycling system, they must for example collaborate with a company in Finland like Suomen Palautuspakkaus to help them manage the administration of their plastic bottles as well as their glass bottles. Such a collaboration will make it easy to avoid unnecessary mistakes and other bottleneck.

7 Conclusion

Every household one way or the other utilized beverages that are in plastic bottles daily. These bottles are wreaking havoc on the environment. Banning the use of plastic bottles will not only help Ghana as a country but it would benefit the entire world if other countries also adopt this system and stop using plastic bottles. Plastics are the most dangerous substances in our environment that has ever been invented. (Parker 2018). The invention was not to cause havoc to the environment but rather for convenience in packaging, carrying and affordability. However, just as great inventions like biotechnology and nuclear energy has its own disadvantages, plastic is also causing severe harm like environmental problems, global warming and economic hardship. Human has got it all wrong about how to utilise plastic and getting rid of it. Many giant beverage companies have great knowledge of producing these plastic bottles and have less knowledge about how to get rid of them without harming the environment. Kasapreko is no exception but as the saying goes, “it is never late than never”, the company want to differentiate itself from other beverage companies in Ghana by recycling all its plastic bottles.

Looking at the Ghanaian context, Kasapreko can be successful in its recycling approach if he partners with third party company to execute its plan in PET bottle recycling. The company can partner with Zoomlion (a garbage collection company) in collecting these bottles from consumers household for recycling. Moreover, Kasapreko can also learn the Finnish system where consumers return the plastic bottles, tins and glass bottles to a designated point usually supermarket for recycling. Kasapreko on the other hand can have a collection point at their various distributors and wholesalers for their PET bottles. This is because they are scattered across the country. They can also replicate their already existing glass recycling system where distributors and wholesalers can also collect empty PET bottles from restaurants, pubs, bars and other hospitality facilities whenever they supply new drinks.

Since the consumers are willing to patronise the same drinks from the company if offered in a different packaging, Kasapreko can in the future investigate other alternative packaging for their products. By doing so, there will be reduction of PET bottles ending up in the landfill, waterways etc. and health related problems cause by toxic pollutant being produce by plastic bottles will diminished.

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APPENDIX 1

Questionnaires to both Kasapreko Ltd. Workers and Consumers

Demographics

1. Age
   Below 25
   26 - 35
   36 – 45
   46 – 55
   56 above

2. Gender
   Male
   Female

3. Where do you live?
   Urban area
   Rural area

4. What is your educational level?
   - Elementary school
   - Junior high school
   - Senior high school
   - University
   - Other

Environmental

5. Are you conscious of preserving the environment for the next generation?
   Yes
   No

6. Do you know what recycling is?
   Yes
   No

7. The most effective way to reduce plastic bottles ending up on the environment is to collect and recycle.
   - Strongly agree
   - Somewhat agree
   - Neither agree nor disagree
   - Somewhat disagree
   - Strongly disagree

8. Do you agree or disagree with the following statement: Kasapreko is the first local manufacturer to establish a modern quality control and product development laboratory to ensure safety in its production?
   - Strongly agree
   - Somewhat agree
   - Neither agree nor disagree
   - Somewhat disagree
   - Strongly disagree

9. Do you think single use plastic bottle can harm the environment (Ghanaian communities)?
   - YES
   - NO

10. How concern/unconcern is you about the environment on plastic issues.
    - Extremely concern
    - Somewhat concern
    - Neither concern nor unconcern
    - Somewhat unconcern
    - Extremely unconcern

Consumer viewpoint

11. Kasapreko make a lot of noise during PET manufacturing process
    - Strongly agree
    - Somewhat agree
    - Neither agree nor disagree
    - Somewhat disagree
    - Strongly disagree

12. Aging equipment can waste energy by operating inefficiently.
    - Strongly agree
    - Somewhat agree
    - Neither agree nor disagree
    - Somewhat disagree
    - Strongly disagree

13. How satisfied or dissatisfied are you with Kasapreko donating a percentage of each bottle sold towards the One4Life Fund?
    - Very satisfied
    - Somewhat satisfied
    - Neither satisfied nor dissatisfied
    - Somewhat dissatisfied

- Very dissatisfied

Recycling Approach

14. Can Kasapreko use waste companies to collect and sort post-consumer PET waste for its recycling processing?
    - YES
    - NO

15. Will you be willing to return the PET (plastic) bottle to a designated collection point and make extra money?
    - Yes
    - No

16. Would you purchase the same drinks if offered in a different package?
    YES
    NO

17. Do you think educating employees to know the difference between waste and recyclable materials can help Kasapreko recycling approach?
    - YES
    - NO

APPENDIX 2

Interview Questions to Kasapreko commercial director Mr. Awuah

My name is Paulina Bonsu, an International Business and Logistics student from Metropolia University of Applied Science. I am conducting this interview because I am making a research for Kasapreko Company Limited. This interview questions are an academic exercise in partial fulfilment of the award of bachelor's degree in business administration (B B.A.) and will not be used in any other way but solely for academic purposes. And I want to assure you that your responses will be treated confidential. You were chosen to respond to these questions because of your expertise and as one of the valuable staff of this company to provide the researcher with information to enable us to undertake a research on the topic The Impact of Kasapreko´s activities in Ghanaian Community and their plastic recycling.

1. When did Kasapreko start producing the soft drinks?
2. Does the company manufacture the PET bottles?
3. What sizes of the PET bottles do you produce?
4. How many PET bottles do you manufacture in a day?
5. How did you decide which plastic to use for your product?
6. Do you have any form of reverse logistics?
7. Do you have any form of recycling?
8. Can you explain the glass recycling process?
9. Where do you see the recycling work heading?
10. What are the most successful social impact Kasapreko has achieved over the years?
11. Are you willing to collaborate with your distributors who are all over Ghana to serve as your collection point?