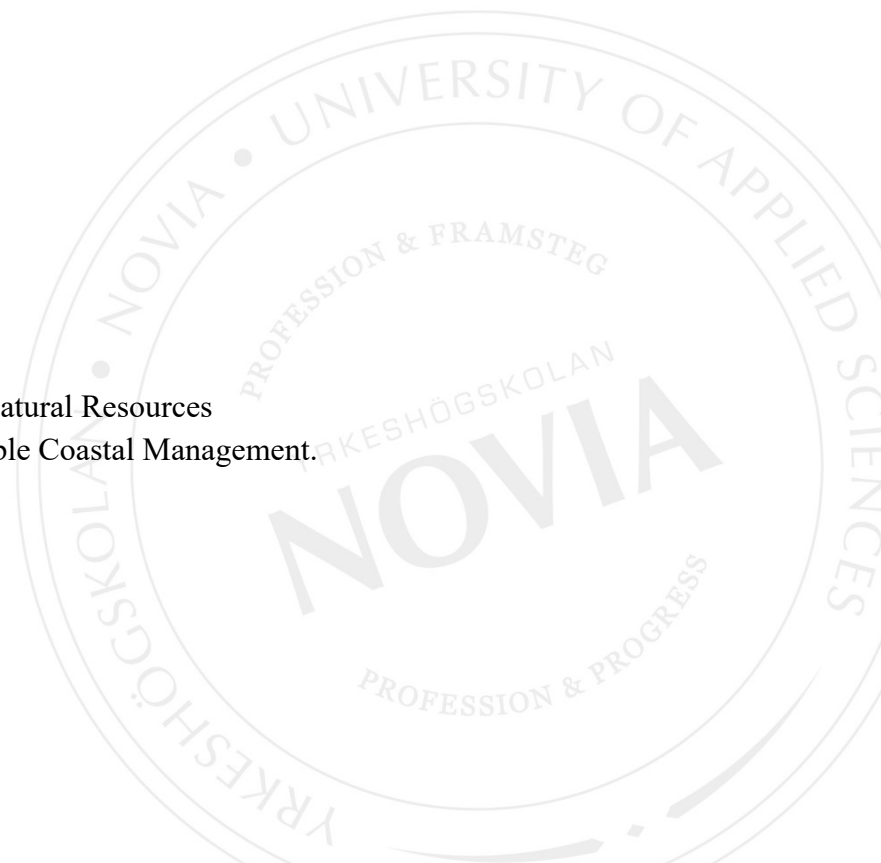


Environmental Problems of Sachet Water Consumption in Saki town, Oyo State, Nigeria

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Degree thesis for Bachelor of Natural Resources
Degree Programme in Sustainable Coastal Management.
Raseborg, 2019



BACHELOR'S THESIS

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Degree Programme: Natural Resources and Environment

Specialization: Sustainable Coastal Management

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Title: Environmental Problems of Sachet Water Consumption in Saki Town, Oyo State, Nigeria.

Date: 12/11/2019

Number of pages: 33

Appendices: 2

Abstract

Sachet water is a 500milliliter bag of water which is cost effective and considered a safe source of drinking water in developing countries. It is packed with non-biodegradable plastics (polyethylene) material. The major concern about this is environmental pollution which arises from indiscriminate dumping of the empty bags. Sachet water can be mostly found in many developing countries, and the problem has remained the same, just like in Saki town, Nigeria where this study was carried out. Generally, the aim of my thesis was to analyze the environmental problems caused by the empty sachet water bags in Saki town. The other objectives set out were; to determine the source of drinking water in Saki town, to know the rate of sachet water consumption, and lastly to assess the disposal method of the empty sachet bags. According to my survey, it was discovered that the main source of drinking water in Saki town is sachet water. More than half of the respondents consume sachet water with an average of 1 – 4 bags per day. Lastly, the disposal methods were found to be through waste bin and littering on ground. All these are among major causes of environmental problems in Saki town. To stop these problems, government should make provision for safe drinking water and that NAFDAC (*National Agency for Food and Drug Administration and Control*) should take control of unnecessary production by making strict rules and requirements for licensing the sachet water producers.

Language: English **Keywords:** *Sachet water bag, Single-use plastics, environmental problem, Pollution, Biodegradable, Waste, Reduce, Reuse, Recycling*

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1. Introduction

Water is one of the most important resources for the further existence of every living thing, including human, thus sufficient supply of fresh and clean drinking water is an essential requirement for every individual. Water is characterized as a fluid substance that is colorless, odorless, clear and very fit to exist in liquid, solid or vaporous stage. According to United Nation Sustainable Development Goals under clean water and sanitation, it says “Water shortage, poor water quality and lacking sanitation adversely affect food security, living condition and education benefits for poor families over the world. At the same time, the excess of 2 billion individuals are living with the danger of diminished access to freshwater availability and by 2050, anyway, the minimum of one out of four individuals is probably going to live in a nation influenced by incessant or repeating deficiencies of freshwater” (UN SDG). The stringent prerequisites of safe drinking water add to its shortage and demonstrate that much of the time the issue isn’t the accessibility of water, but the incapability to get good quality water. Safe drinking water is water that has been cleaned and checked for possibly unsafe substances, and has met or surpassed drinking water quality gauges that meet World Health Organization (WHO) rules or national measures on drinking water quality (Miner et al., nd).

Sachet (*Single-use of any material*) water is a water package, 500 milliliters in size made of a non-biodegradable plastic material called polyethene which is the most common used type of plastic. Starting in 2017, more than 100 million tons of polyethene resins are generated yearly, representing 34% of the whole global plastic market (Roland et al.,2017). Sachet water is not uncommon in low-income countries, majorly in Africa and Asia because the production doesn’t need a large investment. Even so, consumption is increasing because many people find it affordable and easily accessed to purchase. In West Africa, especially the anglophone part, sachet water is locally known as “pure water” by everyone. In Saki town of Oyo State, Nigeria, there are more than 50 different sachet water companies with a different label, and apart from individual consumption, it is often the source of water in the ceremonial party – (funeral, birthday, or marriage celebration). It is sold in various places in local shops, hawking on streets, and mostly delivered by the producing company to homes on a demand.

However, the improper management of the empty sachet bag has been an environmental threat to human health and aquatic life because it’s a plastic manufactured from non-biodegradable

polythene which hardly decay and remain in the soil for more than hundred years. When they are burned, they produce oxides of carbon, nitrogen and sulfur which are harmful to human wellbeing and the soil. A research study by the European Union discovered that plastic waste adds to the killings of around one million seabirds and 100,000 marine mammals (EU In-depth report, 2011). Obviously, plastics are the current object for conveying goods and products easily, but yet they are the cause of environmental pollution and farmland degradation. Plastic aggregation in the soil causes issues, for example, blocking water entry into the soil, pollution of groundwater, and poor soil air circulation (Nyarko and Adu, 2016).

1.1 Problem statement

The sachet water entered Nigerian market in around 1990s and started getting lot of recognition when *NAFDAC (National Agency for Food and Drugs Administration and Control)* a federal agency responsible for controlling manufacture, importation, exportation and the use of food and cosmetics got 134 different sachet water package companies registered. Hence, this has brought lot of private companies into operation since government public water corporations could not provide sufficient potable water to the masses. Today, we have millions of different sachet water label operating across the country. It was estimated that over 70% of Nigerian adults consume at least one sachet water per day due to their believe that the sachet water is hygienic, but however, the quality of water still cannot be guaranteed because of too many different labels in the market (Babatunde and Biala, 2010). So, this is a nationwide problem, and the Saki town which is our case study here is not an exception.

1.2 Research questions

- What are the main environmental challenges from the consumption of sachet water in Saki town?
- What is the major source of drinking water for residents of Saki town?
- What is the final destination of empty sachet bags after use? (Disposal method)
- What mitigation measures could be implemented to stop the environmental problem of empty sachet bag?

1.3 Saki town briefly

Saki town (coordinates 8°40'N and 3°24'E) in Oyo state western Nigeria lies close to the wellspring of the Ofiki River (the central tributary of the Ogun River), around 40 miles (60 km) from the Benin Republic fringe (fig. 1). Initially part of the Oyo domain, Saki turned into a Yoruba displaced person settlement after the demolition in 1835 of Old Oyo (Katunga), 70 miles (113 km) east-upper east, by Fulani champions. By the mid-1860s, the Yoruba Mission had built up an Anglican church in the town (Kolajo, 2007). In Saki, the wet season is harsh and cloudy, the dry season is sticky and mostly damp, and it is hot all year round. Throughout the year, the temperature normally varies from 20°C to 35°C and is barely underneath 18°C or above 37°C (Retrieved from *Weather Spark data 01.07.19*).

Saki town is the head capital of Saki-West Local Government Area; it has a land mass of 2,014 square kilometers and a population of 278,002 according to 2006 national count. Culturally, the occupation of the Saki people in ancient times was the ironsmith, goldsmith, cultivating, hunting, and clay pot designing. Currently, most of the population are small farmers cultivating yam, cassava, corn, maize, sorghum, beans, okra, shea nut and different vegetables. Additionally, Saki town is very good in the production of aluminum pot utilized for domestic and business cooking (Gbade, 2016).

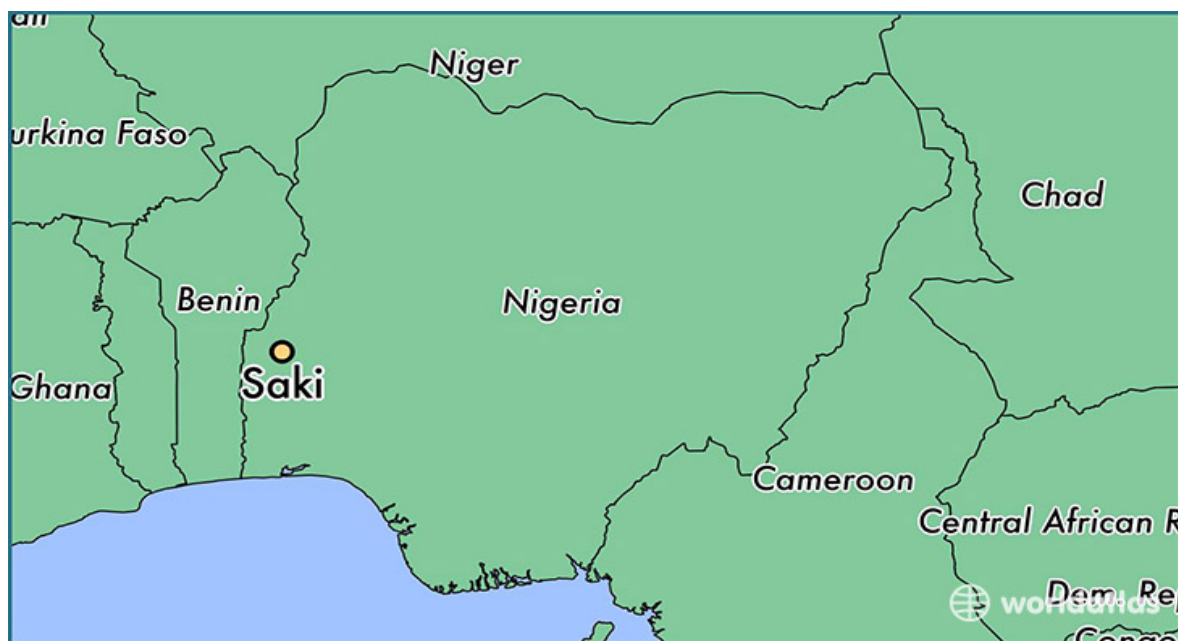


Figure 1: The map of Nigeria showing the geographical location of Saki town

Source: *World Atlas, 2015*

1.3.1 Environmental sanitation

Environmental sanitation can be defined as activities designed to make the natural environment clean and to decrease the measure of illness on humans. With this, the expectation is that living conditions will improve and medical issues will diminish. The littering of the surroundings with empty sachet bag could hinder the success of environmental sanitation (Ibrahim, 2016). In Saki, there is usually general environmental sanitation on every last Saturday of the month. Everyone is obliged to participate to clean up their premises in the morning. On that day, you are not permitted to move around until after 10:00am as there are civil defense security everywhere in the city to restrict people's movement. If you are caught, then you are probably going to be given a compulsory cleaning work to do on the spot. The monthly sanitation is in Nigeria environmental law, but each *Local Government Area* is responsible to coordinate the activity, so Saki West Local Government is responsible for this activity in Saki town.

2. Material and Method

Quantitative research method was adopted in this thesis in order to get as accurate data as possible. This chapter explains the research procedures that were used to collect and analyze the data. It includes the questionnaire design, the study area, and data collection.

2.1 Questionnaire design

The questionnaire was designed on a Google form and it contained 3 sections with the total of 13 questions.

Section I. Background information (*Question 1 - 6*)

Section II. Information on drinking water (*Question 7 - 10*)

Section III. Disposal information (*Question 11 - 13*)

All questions were marked as compulsory and the purpose of conducting the survey was stated. The questionnaire was totally anonymous because I could sense that people are usually afraid to fill their details online, so it was made confidential in order to retain the respondent interest. Again, each question was made easy and short for easy understanding.

2.2 Locations – study areas

Saki town is one of the towns in Oke-Ogun area of Oyo State, Nigeria. It is located in the northern part of Oyo State in western Nigeria (Figure 1). Saki is a big town with many communities. However, 4 communities (*Sango, Apinnite, Ajegunle, and Ogidigbo*) were accessed. Out of 250 questionnaires that were sent out, 122 responses were received which was equivalent to 48.8% of the total number sent out. The questionnaires were sent out to people of different age groups, different backgrounds, and different educational level.

2.3 Data Collection

This thesis made use of both primary and secondary data. Primary data was collected from people of Saki through the use of an online questionnaire survey which was opened for a month (*between June 24th – July 26th, 2019*). Secondary data was accessed from the internet using scientific articles, journals, books, environmental news, online newspaper articles, governmental website, company website, and scholarly pieces of literature. The key words searched on the internet were: *plastics, sachet water, plastic bags, biodegradable materials, environmental problems of sachet bag, Saki town, single-use plastics*. etc. All these were extensively searched on google and Google scholar search engine.

3. Results - Literature review

3.1 Plastics

Plastics are manufactured (human-made) materials, produced using polymers, which are long particles worked around chains of carbon molecules, commonly with hydrogen, oxygen, sulfur, and nitrogen filling in the spaces. Plastics are soft and flexible (fig. 2), then can be turned around during manufacturing to form any shape (Woodford, 2019). Plastics make up about 90% of marine litter and it is assessed that there are somewhere in the range of 15 and 51 trillion plastic particles appearing on the surface of the seas. A world without plastics, or manufactured natural polymers, appears to be unbelievable today, yet their huge scale production and use just started in 1950. Plastics biggest market is the packaging of goods and commodities, an application whose development was quickened by a worldwide move from reusable to single-use holders. Thus, the portion of plastics in the city solid waste (by mass)

expanded from under 1% in 1960 to over 10% by 2005 in the middle class-developed nations (Geyer et al., 2017).



Figure 2: Raw plastic pellets (Akash, 2019).

3.1.1 Single-Use Plastics

Single-use plastics frequently referred to as disposable plastics, are regularly used for plastic packaging that are planned to be utilized just once before they are discarded or reused. The examples are basic food item sacks, sachet water bags, bottles, straws, compartments, cups and cutlery (fig. 3). Plastics can be categorized into two: it can be either *thermoplastics* or *thermosets*. Thermoplastics are plastics that can be softened and melted when heated and get very hard when cool, while thermosets are plastics that cannot be heated or melted twice once it is heated to form a particular shape, it can't be reformed again (UN environment, 2018).

One of the main uses for single-use plastic is in the creation of PET (polyethene terephthalate) drinking bottles utilized for water and soft drinks packaging. About 500 billion units are presently created every year; an expansion from ~300 billion units in 2004. Another common use for single-use plastics is for grocery and retail packs with an estimated 500 billion to 1 trillion of such packs expended every year (Citi GPS report, 2018). According to the scientists, packaging, (*where sachet bag belongs*) is one of the most environmentally harmful kinds of plastic waste as it is regularly intended for single use, and very hard to reuse. A steady increment in the utilization of flexible and multilayered packaging plastics has been adding difficulties to accumulation, separation, and recycling. Globally, 40% of plastic packaging waste is discarded at clean landfills, 14% ends up in incinerator and 14% is gathered for

3.1.2 Sachet plastic bag (*Pure water bag*)

Sachet plastic bag is made from polyethene plastic material which is non-biodegradable, it belongs to single-use plastic (Roland et al., 2017). Sachet bags can be recycled by crafting it to another thing, but unfortunately it mostly ends up on landfills or littering the ground after use. In Nigeria, the name of the producing company and the NAFDAC registration number will be printed on the bag. This number is what people (*consumers*) always look out for before buying the water as they have strong belief that such company has passed all the NAFDAC specification. Any company with sachet plastic bag that has no NAFDAC number can be reported and get charged to court.

However, the creation and commercialization of sachet plastic bags which are very little controlled causes too many false businesses. Some are filled up with tap water, untreated or from illicit drilling. In addition, serious hygiene issues happen because of the storage of the bag (unsanitary premises). Other noticeable problem is that, they are often left littering the ground (*fig.4*) blocking the waterway which can lead to flooding (Grellier, 2017).



Figure 4: *Littered sachet plastic bag (Pure water bag)*

Source: (Grellier, 2017) *Makery.info*

3.2 Sachet water production in Saki

The production of packaged sachet water in Saki town is no different from the rest of the country as almost all packaged sachet water factories in Nigeria use *distillation system* or *Ultra violet filtration* for the water purification, but the advantage in Saki town is the low cost of production due to amount of salary to pay workers in the factory. Another system is *Reverse osmosis* which is very expensive. The most widely used system by small to medium scale factories in Saki town and Nigeria at large is *Ultra Violet Filtration* which is very cheap, effective, and eco-friendly (Amaeshi, 2016). Below (fig. 5) are the steps involved in using ultra violet filtration for the sachet water purification in the factory.

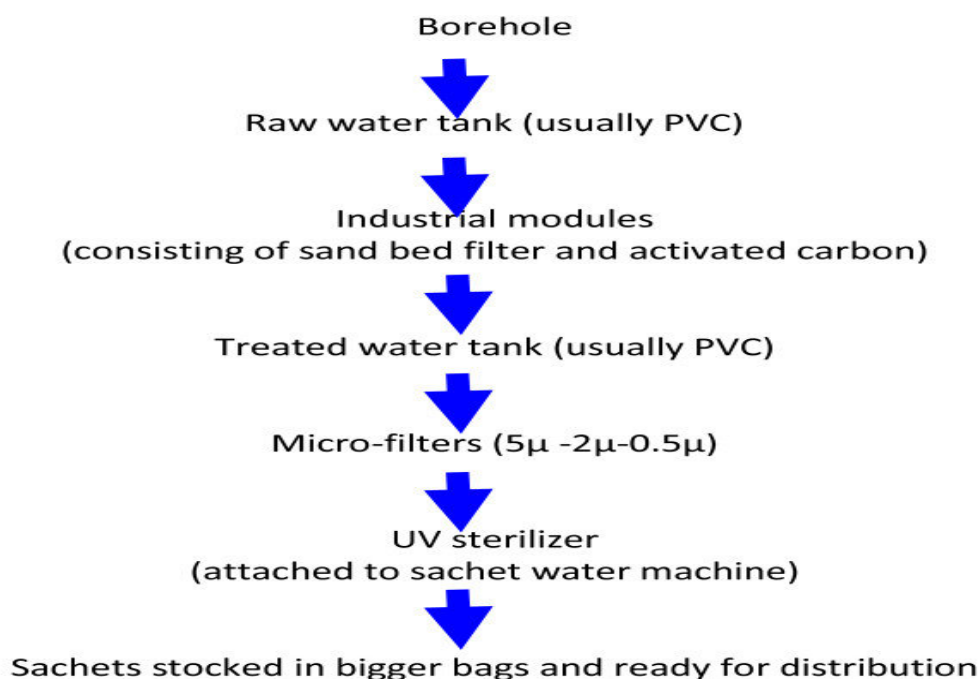


Figure 5: Water treatment process in sachet package water factory.

Source: (Ayokunle, 2011) [researchgate.net](https://www.researchgate.net)

Ultraviolet filtration system has long been known far to be used for water treatment and lately, the interest for using UV for water reuse applications has expanded as well. It has the accompanying points of interest over all other purification techniques: no chemical compound utilisation, no transportation, low accident risks, decreased small space requirement, no unsafe side-effects are formed, and low energy consumption. The water is channelled through the ultra violet filtration system (fig. 6) where it will be exposed to the light from the UV lamp, that

destroys the microorganism DNA, which makes them unable to reproduce or replicate again. This system is eco-friendly due to absence of chemicals, however, the filter that protects the lamp needs frequent replacement because it only functions when the water is clear (Oparaku et al., 2011).

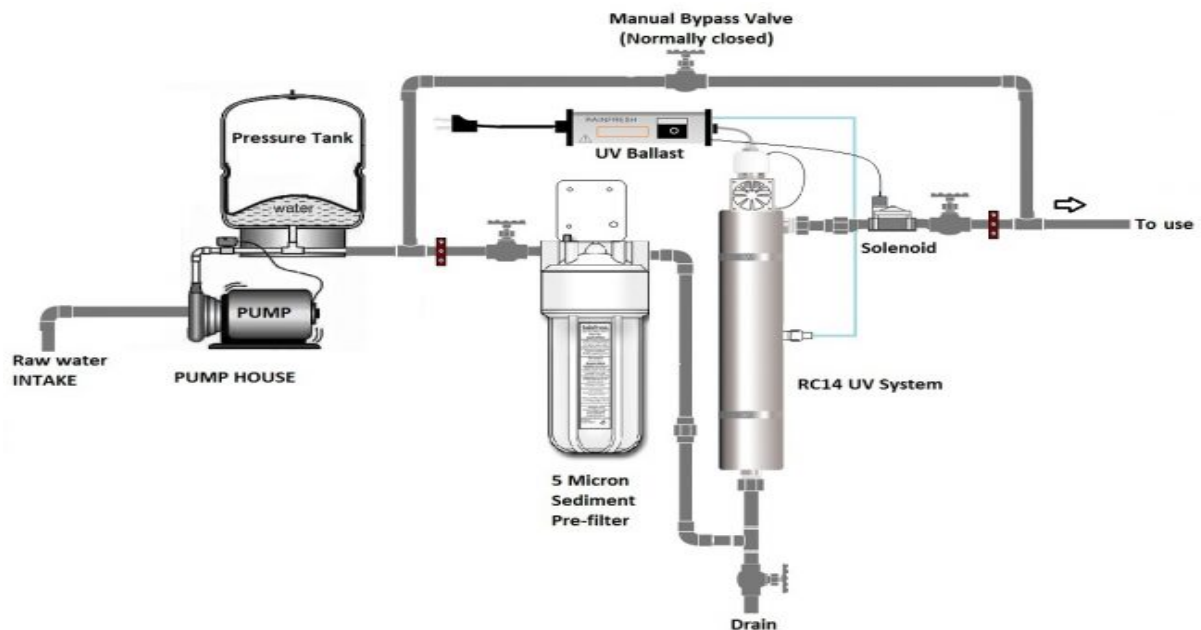


Figure 6: Diagram of ultra violet filtration for small scale sachet water production

Source: Gratisco.in

After the purification, the sealing machine (fig. 7) is needed to complete the filling of water into the sachet bag, sealing of the bag, cutting and counting. This is being controlled by microprocessor and automatic photocell (Oyetunji, 2016).

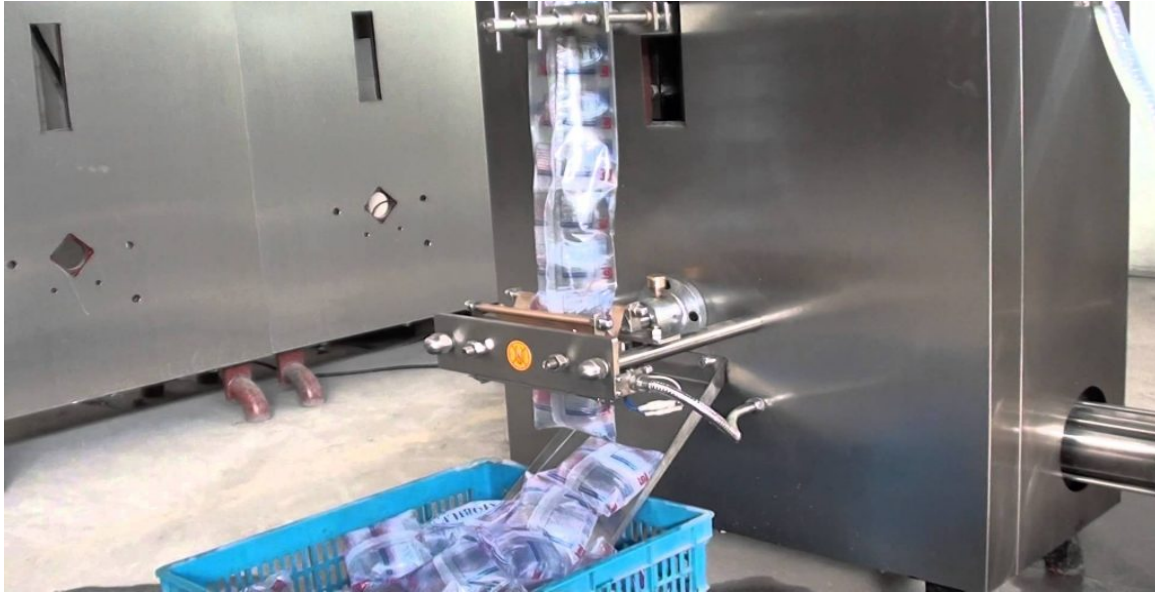


Figure 7: Sealing Machine at sachet water factory

Source: *smedigest.com.ng*

3.2.1 Social perception of Saki people on sachet water

The incapability of the Nigerian government to supply good quality drinking water to an individual home has made the public believe in sachet water safety (*figure 8*). The main social behavior of people is that they rely on sachet water during any ceremonial event. This is actually the main source of drinking water during any festivities, and this contributes further to environmental littering (*fig. 4*) as there is no proper monitoring to cleaning ground after such event. This is not limited only to people of Saki town, but to the whole country and some other West-Africa neighboring countries.

Reasonably, sachet water production by small-scale companies have been improved due to treatment of raw water by aeration, ultra violet filtration using membrane filters and disinfection. Even though there are as yet innate quality and regulatory difficulties related with this type of drinking water, the significance of this type of drinking water is all recognized by common social orders and country legislatures of the developing nations (Ayokunle, 2011).

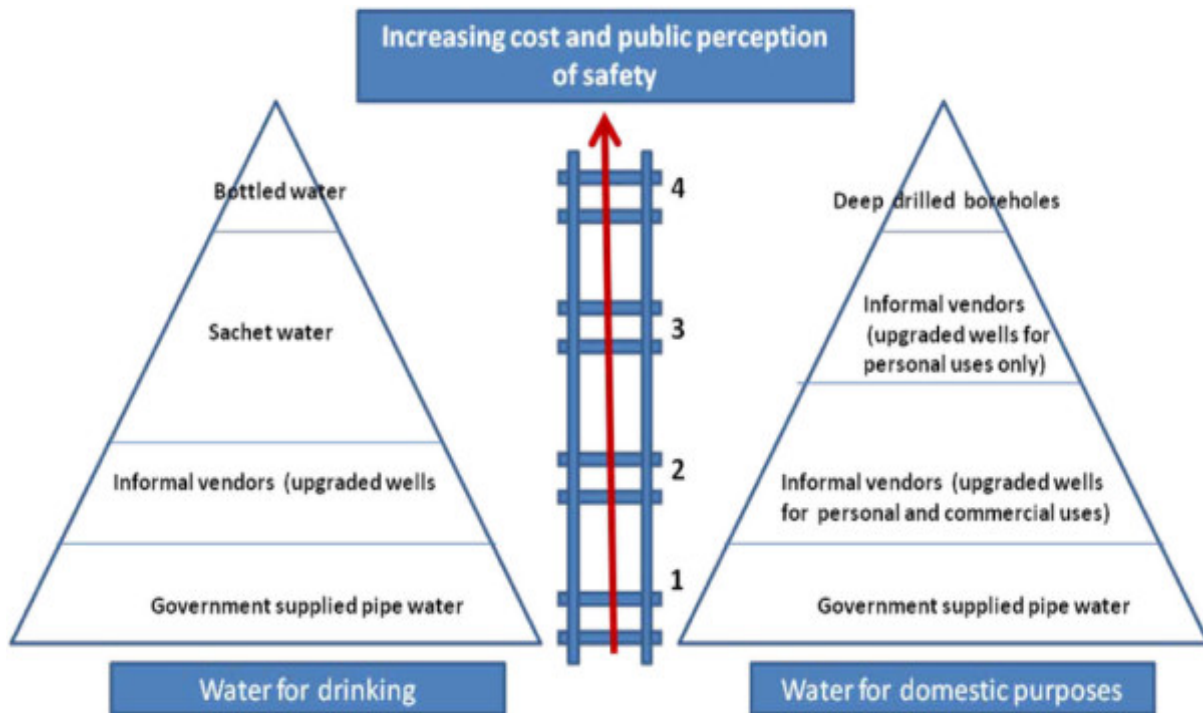


Figure 8: Public perception on safety drinking water and for domestic purpose

Source: (Ayokunle, 2011) globalizationandhealth.biomedcentral.com

3.3 Environmental effect of sachet water bag

Improper dumping of sachet water bags by the consumers after use has been one of the great environmental challenges affecting the whole country. Inadequate monitoring from the government on how people should manage their waste has left many citizens careless, and always put the blame on government. With this, empty sachet bags constitute a large percentage of the waste that can be seen in the streets. The problem associated with the empty sachet bag is highlighted below:

3.3.1 Ocean pollution

Covering 70 percent of our planet, oceans and seas are among the world's most significant common assets. They impact the climate, clean the air, help feed the world, and give a living to millions. They are additionally home to the greater part of the life on earth, from invisible (microscopic) algae to the blue whale, the biggest creature on earth. However, we're polluting them with contaminants (Denchak, 2018). Recent researches have proposed that the ocean receives an estimated 8 million metric tonnes of plastic waste every year (University of Georgia, 2015. *Sourced directly from the University web*). As plastic stays in the earth for many

years, the trillions of plastic pieces aggregating in the ocean create some portion of a worldwide pollution problem that influences every coastal nation (Jambeck et al., 2018).

The unfilled sachet bag waste dumped into ocean or water bodies can influence aquatic animals by constraining the infiltration of sunlight and diffusion of oxygen (Idiata, 2013). For example, according to *Centre for Biological Diversity*, ocean turtles can confuse floating plastic trash for food. They can stifle, develop internal injury and get killed. A huge number of seabirds ingest plastic consistently. Plastic ingestion diminishes the capacity volume of the stomach, causing starvation. It is assessed that 60% of all seabirds have eaten bits of plastic, with that number anticipated to rise to 99 percent by 2050 (Biological diversity, nd).

3.3.2 River pollution

Sachet bag is also a problem when it comes to river pollution. The human activities on land have an effect on water bodies, most especially the rivers. A river is a natural water body that is mobile and which usually originate from highland or mountain regions. The pollution of plastics into the marine environment happens through different pathways, basically river and other sources like sea shore littering and directly to the sea by means of aquaculture, shipping and fishing practices. However, due to its running nature, a river is a main source of pollution entering into the ocean. In the case of single-use sachet water bag, river easily get polluted because of indiscriminate dumping of plastic waste on waterway such as drainage path during the raining time, and this will eventually end up in the river (Lebraton et al., 2017).

3.3.3 Environmental littering

The utilization of plastic sachet bag has risen drastically and can be found wherever in the developing nations, especially in the western part of African and some Asian countries. They are light-weight. Thus, wind can take them all over the places. They are not expensive, so people feel that they do not have value for reuse or recycle. The spread of these plastic materials in the Nigerian environment can cause contamination and various forms of illness (Maher et al., 2014).

The way consumers discard the empty sachet bags block the drainage system and affect Nigerian ecosystem. Studies have demonstrated that the non-degradable nylon utilized for

sachet water bags is a significant reason for flood catastrophes happening in many parts of the country (*European Journal of Business Management, 2012. p,118*). Thus, the free flow of water during the precipitation will in general be obstructed by piles of sachet water bags, hence, blocking drainage paths and trenches. Aside from this, roads are littered and consistently look so filthy due to poor waste management (Micah et al., 2015).

3.4 How to reduce the use of sachet bag (plastics)

Plastic bags are so cheap to manufacture, durable, simple to convey and store that they have been used to carrying at least 80 percent of the basic food items in our grocery store due to comfort it gives since it was introduced 25 years ago, according to the Arlington, Virginia-based American Plastics Council. Upon the numerous advantages it renders, it will be unwise to ignore the risk it poses to our ecosystem. Thus, there is a need to look for ways to reduce the consumption rate in order to decrease its negative impact in our environment (Gogte, 2009, p, 364).

3.4.1 Sustainable production (*Biodegradable bags*).

Sustainable production means manufacturing of products (goods and services) in such a way that is pollution free, using less energy and natural resources, economically viable, and harmless consumption of the product (University of Massachusetts Lowell, nd). Nowadays, plastic bags are petroleum based which means they are non-biodegradable and with that they can remain on ground for hundreds of years before they decompose. This is one of the major reasons why scientists are seeking for alternative ways of making plastics. Biodegradable plastics can be broken down after dumping to environment by the help of microorganisms which produces the by-products CO₂ and H₂O. Biodegradable plastic is produced using 100% sustainable resources such as corn and starch. Starch is converted by microorganisms into lactic acid by fermentation. At that point, lactic acid particles connect together in long chains called polymers. This lactic acid is generally cheap to create and can be produced in huge quantities. This production is viewed as green since it's produced using sustainable resource (Abdallah et al., 2014).

For example, a company in Indonesia called *Avani Eco* has claimed to have manufactured a plastic bag made from starch which is totally degradable (Gray, 2018).



Figure 9: Avani Eco biodegradable starch-based bag
Source: (Gray,2018) weforum.org

3.4.2 Reduce, Reuse, and Recycle

The 3 Rs, (reduce, reuse and recycle) have been considered as the regular way to deal with the large extent of plastic waste issue. The intention is to make a circular plastic economy where items are 100% recyclable, durable, and yielding limited amount of waste. Until recently, this method has not made any achievement, however with an expanding number of new initiatives, support from governments and real focus from top producers to reach targets, change is being fulfilled (Nature Communication, 2018, p, 2157). In case of a sachet water bag, it is extremely difficult to ask people to reduce the consumption rate without any provision from the government. However, the empty sachet bags could be reused or recycled as seen in Togo where empty sachet bags are crafted e.g to handbags and umbrellas. This is a good initiative as compare to indiscriminate dumping (Grellier, 2017).



Figure 10: Crafted empty sachet water bag into umbrella & handbag

Source: (Grellier, 2017) www.makery.info

3.4.3 Government regulation

Regarding quality and amount of fresh water supply (public), the lack of pipe borne water in Nigeria is very common. An option to the apparently deficient water supply is found in packaged water regularly sold in sachets. *The National Agency for Food and Drug Administration Control* (NAFDAC) is the sole controller established and enabled to make rules with the drinking water standard as directed by World Health Organisation (WHO). However, it is estimated that there are thousands of sachet water companies across the country, and many of them are not truly registered with NAFDAC and keep using bogus registration number. This simply implies that, is either they find it too cheap or easy to register (Ayokunle, 2009). The recommendation here is for NAFDAC to impose strict and tough registration procedure and close down any company that doesn't meet the standard. Thus, this could also help to reduce the high production and consumption rate.

4. Results from questionnaires

This chapter presents the results derived from the questionnaire. The 3 sections (Background information, Information on source of drinking water, and disposal information) were thoroughly analysed and discussed, and then each question is represented on either table or pie chart.

4.1 Background Information

This section evaluates the basic information of the respondents such as their community, gender, age, marital status, level of education, and occupation.

Community	Number	Percentage %
<i>Ajgunle</i>	37	30.3
<i>Igboro</i>	7	5.7
<i>Apinnite</i>	17	13.9
<i>Sango</i>	62	50.8

Table 2: Community response rate information

The *table 2* above represents the response rate from each community where the questionnaire was sent to. Sango community had the highest number with total of 62 respondents which is equivalent to 50.8% while the response rate from Ogidigbo community was the least with 7 respondents which was 5.7% percentage of the total response rate. The total number of respondents for the community part was found out to be 123 respondents against other 122 responses from other questions. It was discovered that one respondent has chosen to live in two communities.

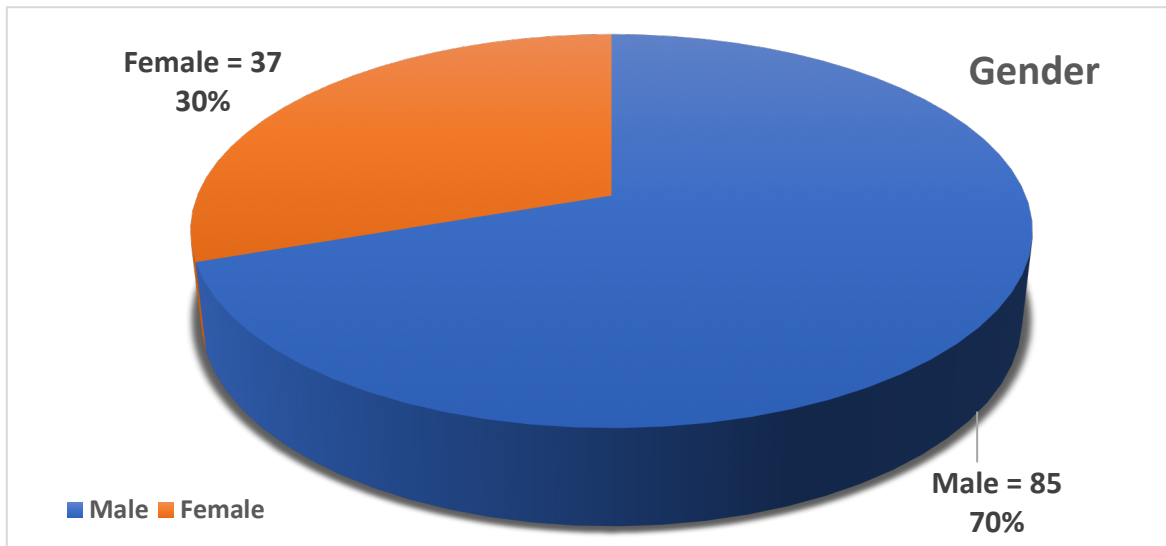


Figure 11: Gender of respondents.

Figure 11 shows the (gender) sex distribution of the respondents. 85 males responded which constitute the total of 70% while females were just 37 in number with average 30% of the total survey.

The table 3 below illustrated the age group of the respondents. The largest age groups that responded were between age 21-30, while the least respondents were people above age of 50.

Age	Number	Percentage %
<i>Less than 20</i>	4	3.3
<i>21 - 30</i>	96	78.7
<i>31 - 40</i>	17	13.9
<i>41 - 50</i>	4	3.3
<i>50 Above</i>	1	0.8

Table 3: Age distribution of respondents.

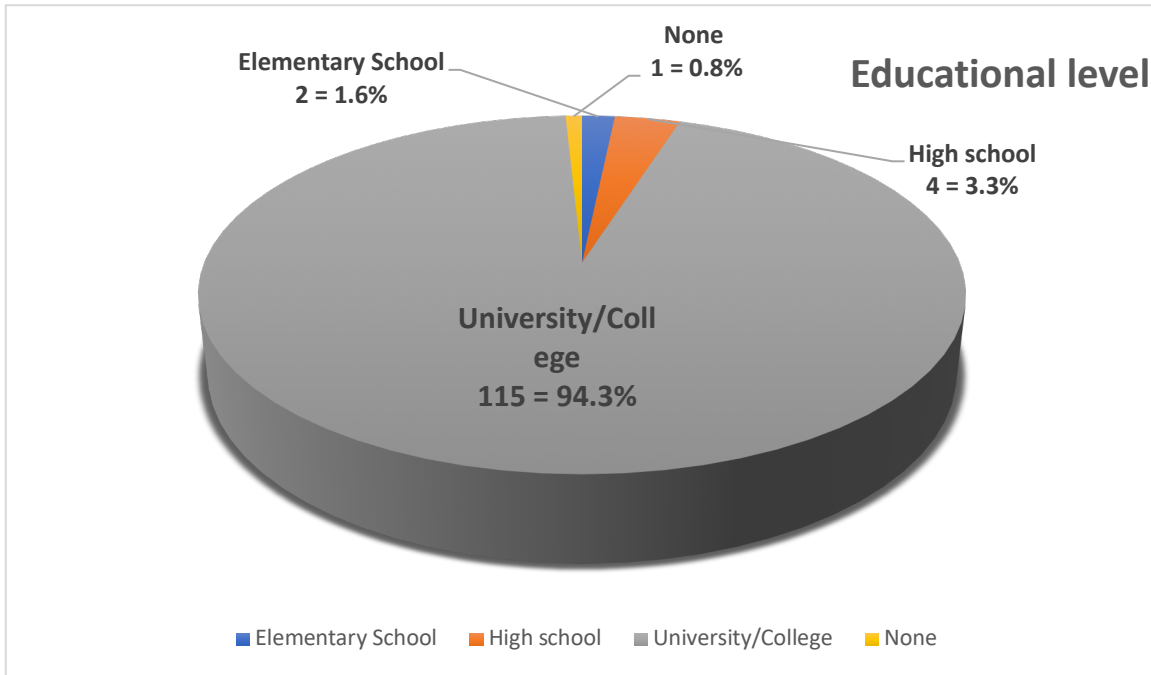


Figure 12: Educational level of respondents.

Almost all the respondents were either university graduates or current university students with a large percentage of 94.3% (115 people), followed by high school graduates which was 3.3% (fig. 12).

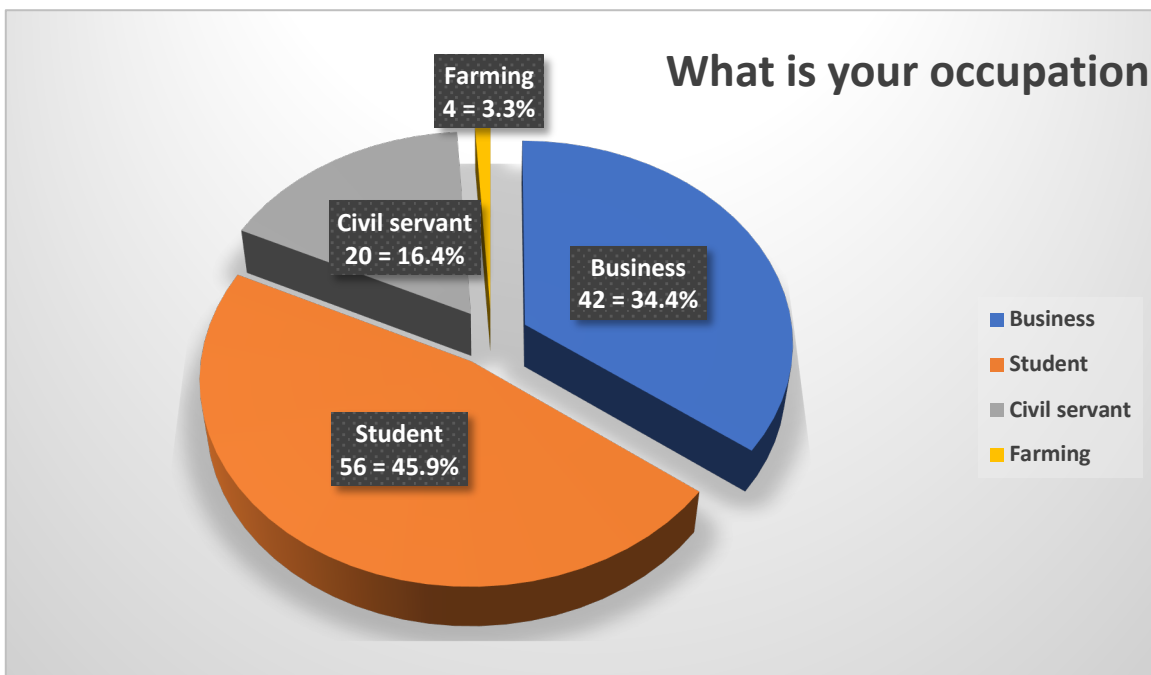


Figure 13: Occupation of respondents.

The *figure 13* above shows the occupation of the respondents. The majority of the respondents were students (ca. 45.9%), followed by the business people with ca. 34.4%.

4.2 Information on Source of Drinking water

In this section, I studied the main source of drinking water in Saki town by asking questions about the reason for sachet water consumption.

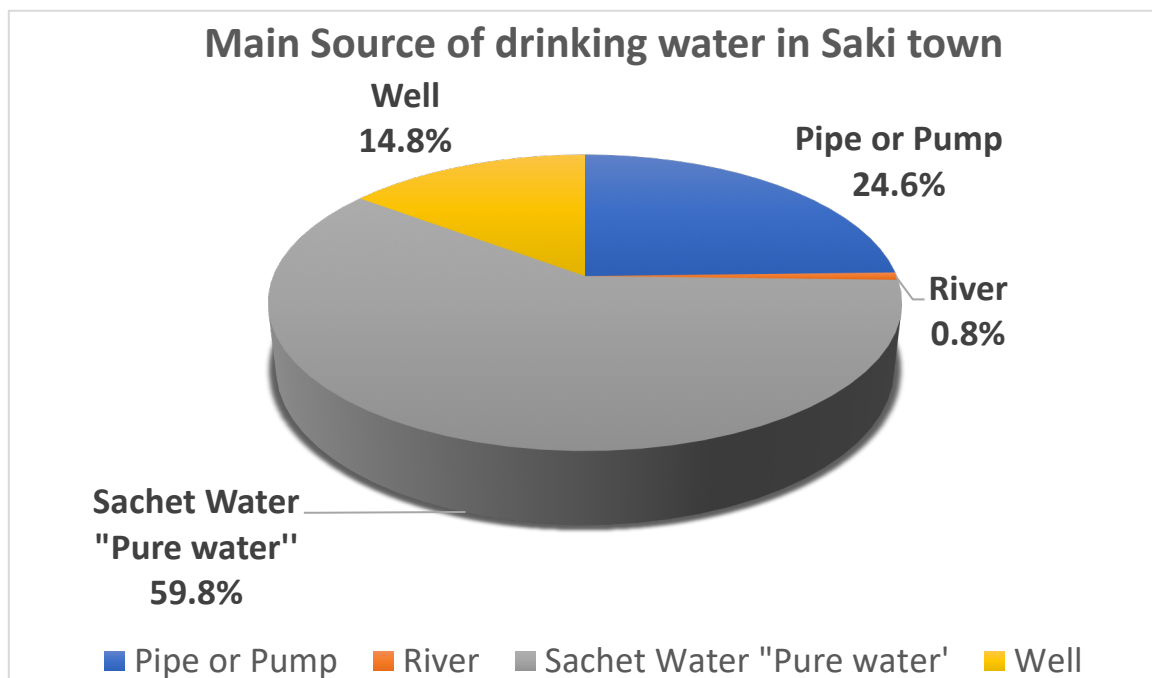


Figure 14: Main source of drinking water in Saki town.

Based on this study, sachet water, popularly known as ‘*pure water*’, is the main source of drinking water in the town as seen from the chart above with 59.8% of the response (fig.14). The other major sources of drinking water are pipe born water and wells with 24.6% and 14.8% respectively. River with 0.8% is a mostly outdated source of drinking water, and was only found in the suburb village of the town.

As seen from *figure 15*, only 2 respondents answered not consuming sachet water, while 98.4% (ca.120 people) of the respondents consumed sachet water.

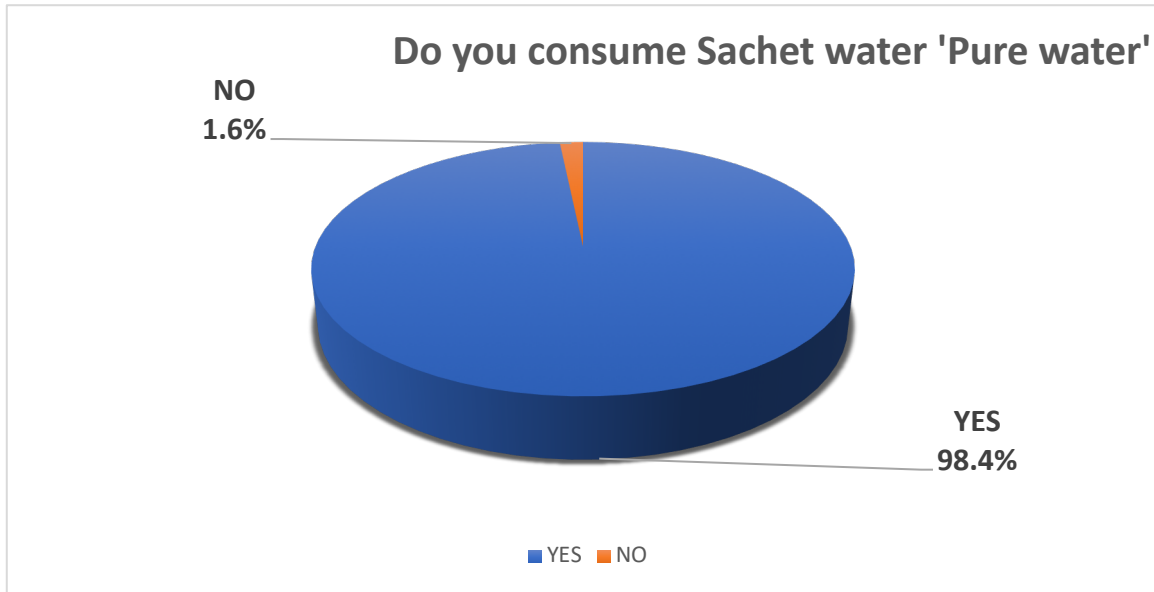


Figure 15: Consumption of sachet water.

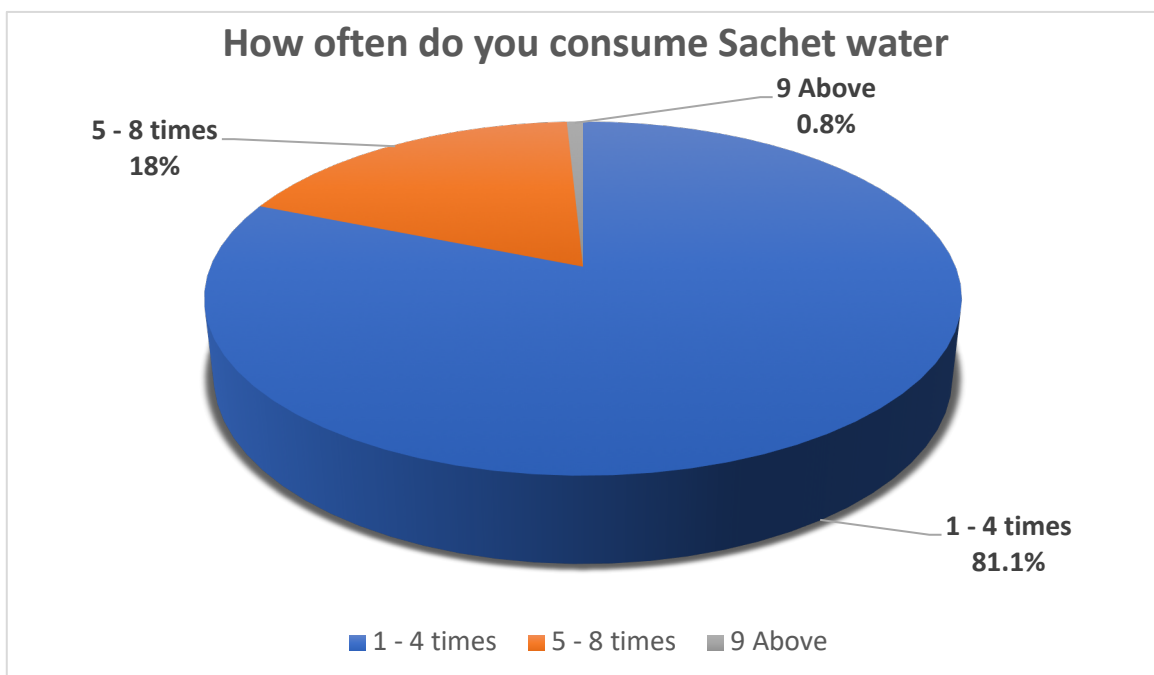


Figure 16: How frequently is the sachet water is consumed.

On average, the highest consumption rate is between 1 to 4 sachets of water per individual (81.1%) followed by 5 to 8 sachets water (18%), while only one person answered taking 9 and above sachets of water. Considering the number of consumers and the amount of sachet water

being consumed, there is a large probability of empty sachet bags littering the environment due to the lack of proper waste management.

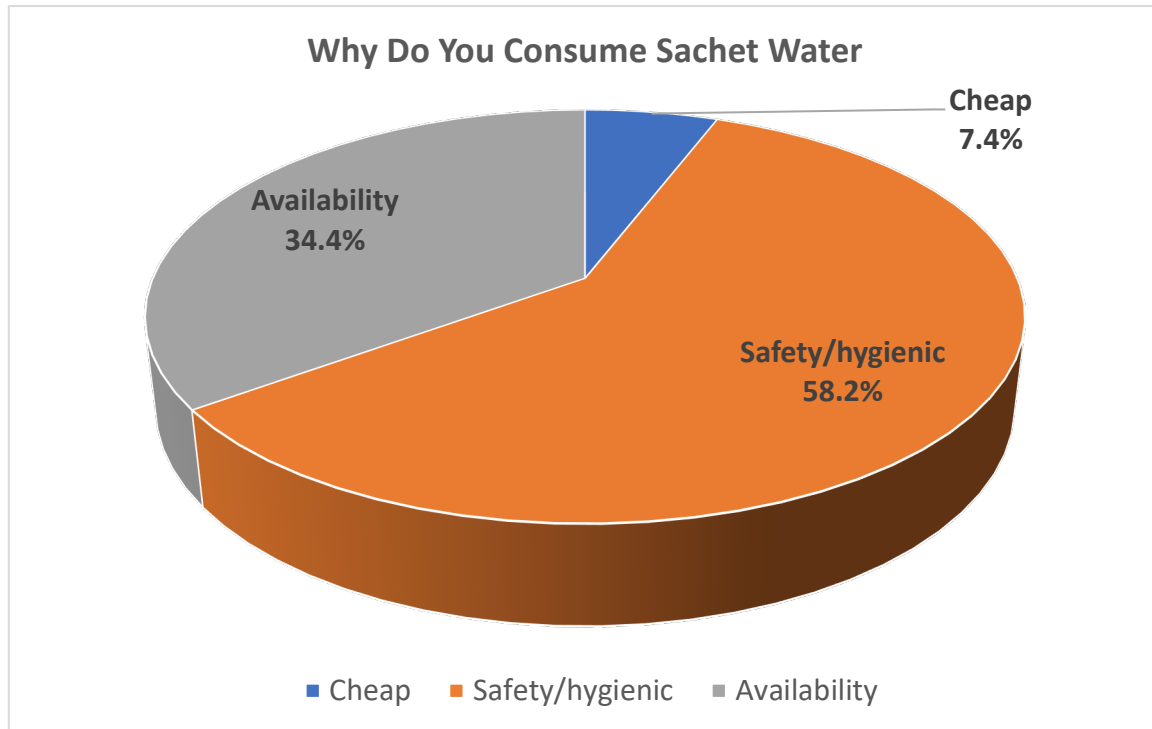


Figure 17: Reasons for sachet water consumption.

58.2% of the respondents answered that they consume sachet water because of safety/hygienic purposes while 34.4% of the respondents said they consume it because of its availability, and only 7,4% feel they consume it, because it's cheap.

4.3 Disposal Information

In this section, I studied the waste disposal pattern/ behaviour, the awareness, and importance of environmental problem associated with the packaged sachet water. Three questions were asked in this section for us to make conclusion on the problem.

The figure 18 shows the methods people use to dispose the empty sachet bags, 77 out of 122 respondents (63.1%) answered dumping into the waste bin, while 34 of 122 respondents (27.9%) said they dump empty sachet bags on ground. Only 6 respondents answered burning

the empty sachet bag, and 5 respondents said they dump the bag inside gutter, the drainage path. (Fig. 18).

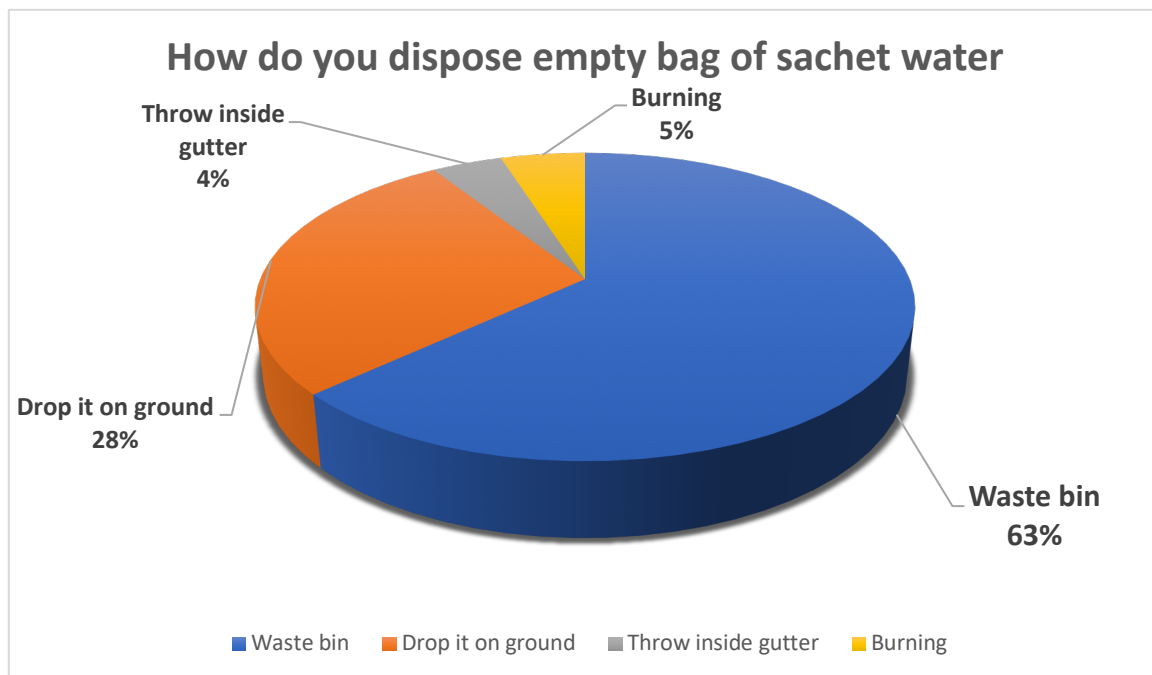


Figure 18: Disposal methods of empty sachet bag in Saki town

The *figure 19* reveals the possible environmental problems that could arise from indiscriminate dumping of empty sachet bags. Four problems were listed in the question for respondents to choose from. 61 out of 122 respondents (50%) claimed that all the described problems are related with the empty sachet bags, while 43 out of 122 respondents (35.2%) choose “Littering of the environment” as the main problem, and 14 respondents (11.5%) believed that the empty sachet bags block the drainage path (fig. 19).

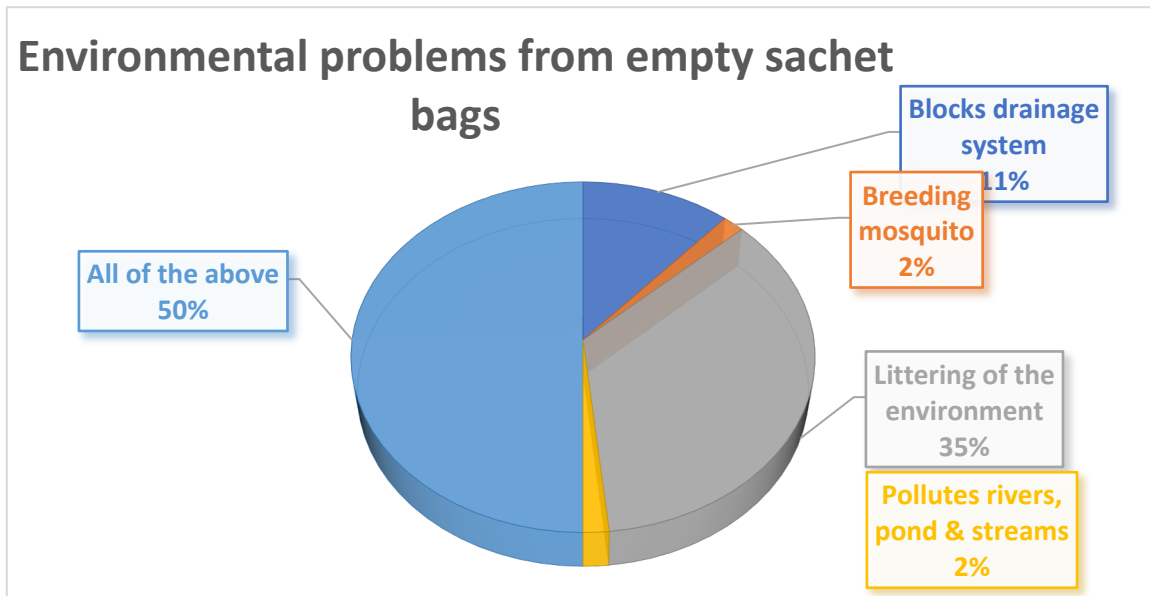


Figure 19: Environmental problems from empty sachet bags.

The last question was to know if Saki people are really concerned about this problem from sachet water bags. 117 out 122 respondents (95.9%) said they are worried about the problem, while only 5 respondents (4.1%) were not worried about the problem (fig. 20).

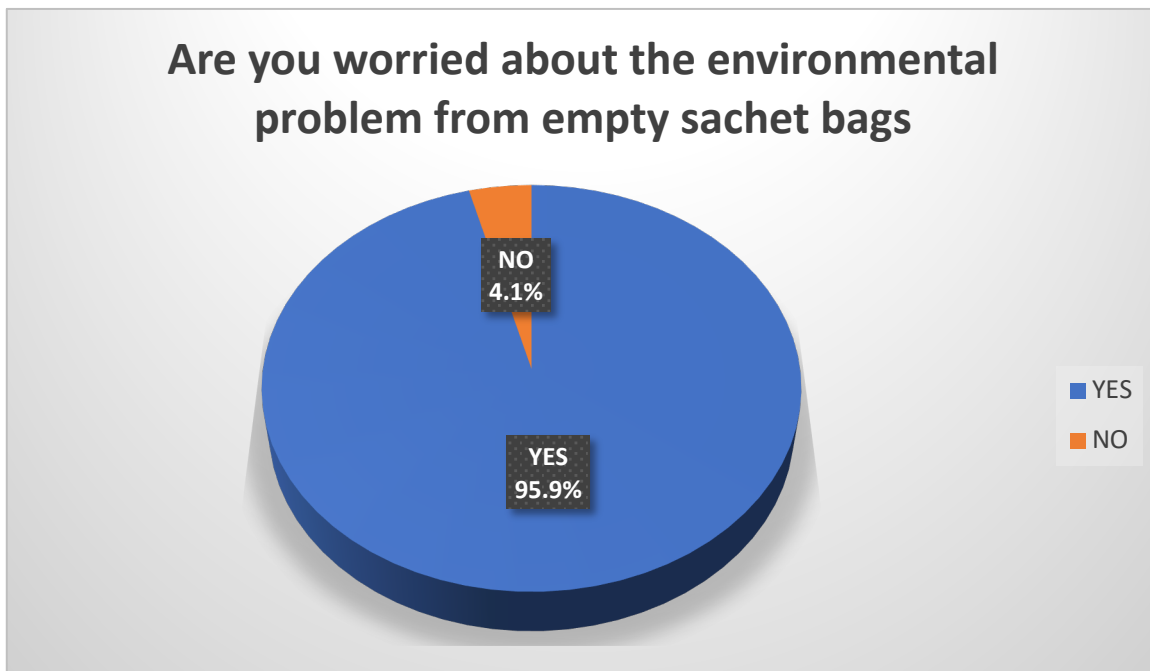


Figure 20: Being worried or not about the environmental problems.

5. Discussion

The consumption of packaged water (Sachet water) which is popularly known as “pure water” in Nigeria and many other west African countries is not a problem for only Saki town, but a problem concerning the whole developing nations consuming it. From the literature reviews, it was deduced that consuming this product would not be a problem if the sachet bag was made from a biodegradable material, or also if there was proper management for the waste generated from the empty sachet bags. The major concern about this is that there are many environmental problems associated with the indiscriminate dumping of the empty sachet water bags which in one way or the other can affect our health and the ecosystem.

From a research carried out in Saki communities, banning this product would be almost impossible and would be bad for the majority if government do so because about 98% of the respondents in this survey claimed consuming sachet water. 59.8% of the total survey use sachet water as their main source of drinking water since there is no adequate water supply from the government. This question shows the importance of sachet water to the town, and in developing countries in general. Sachet water serves the poor-middle class citizens, and rather than banning it, there should be other measures to tackle the environmental problems arising from the use of sachet water.

Comparing the communities with the highest and least response rate; Sango community (ca. 50.8%) and Ogidigbo community (ca. 5.7%) shows large differences as a result that Ogidigbo is an ancient community with a large number of elderly people with no formal education, whereas Sango community is a mixture of educated and uneducated people with a lot of young people with at least basic education. Ajegunle and Apinnite areas use to be areas where The Oke-Ogun Polytechnic students reside, but the reason for the relatively low response rate was unclear. However, it could be assumed that the questionnaire was not well established in these areas due to the fact that students were on summer vacation during this period.

The filling of the survey can be termed as accurate considering the educational level of the respondents, age group, and occupation. Student and business were the largest occupation. Thus, since 94% of the respondents were educated, it implies there could likely be many graduates that also ventured into business and other occupations apart from being civil servants.

The majority of the respondents were young people between age 21-30 (ca.78.7%), their answers have reflected in the research results but it cannot be concluded if these young people were truly interested in the environmental topics than other age groups because many of them also consume a lot of sachet water and discard the empty bags uncontrollably. But it can be assumed that many of them have easy access to the online questionnaire as young and educated people tend to use the internet more compare to uneducated elderly people. However, there could be more response from uneducated older people if the survey is conducted physically.

From the survey the main reasons for consuming sachet water could be found out. More than half of the respondents claimed safety/hygienic reasons as the main reason for the consumption, followed by the availability. To support this, from the literature review, it was found out that packaged water (sachet water) is mostly meant for low-middle class people because of poverty, or no adequate provision of clean water from their government. In Saki town, the environmental problem lies on improper dumping of the empty sachet bags. We could see from the survey that more than half of the respondents (63.1%) claimed dumping the empty sachet bag into waste bin. This means that either they drop it in the home waste bin or their waste bin at work, but the question remains, where do empty sachet bags from the waste bins end up. It can only go to landfill where the wind will blow it around to add to littering every nook and cranny of the town together with the waste dumped directly on ground.

It can be assumed that part of this littering happens during any ceremonial event like open field graduation, birthday, and wedding party. Lastly, it was positive that half of the respondents know that all the four environmental problems listed in the survey are associated with the empty sachet bag, and again, almost all of them (95.9%) are worried about these environmental problems. This means convincing Saki people to adopt any implemented solution to curb the problem is possible in the future.

It can be argued that 6% of the respondents that chose burning as a disposal method do so in their backyards. This is as well not environmentally sustainable because of the air pollution arising from it. If people were able to properly dump waste inside waste bins, government environmental agencies should be able to collect and make final disposal. But this is not the case here because of poor waste management from the government.

Despite the fact that the larger percentage of the respondents were educated (ca. 94%) and all of them believe at least in one or more environmental problems associated with dumping of empty sachet bags, the littering still continues. As a result, it can be assumed that this is more of environmental behaviour problem. Even though they know, they still dump empty sachet bags out of negligence. According to African Research Review (Edmund & Okeoma, 2009. P.156), many young Nigerians were not well committed to positive behaviour of environmental cleanliness. Therefore, their educational level has no reflection on their daily environmental habit.

6. Conclusion & Recommendation

It is very clear that Nigeria and other developing nations are facing environmental problems from the consumption of sachet water, which calls for solutions. From the research conducted in Saki town, it can be concluded that sachet water is the main source of drinking water in the town with high consumption rate (*98% according to the survey*). Empty sachet bags are dumped uncontrollably on ground and also end up on landfills after dumping in waste bins. This has led to many environmental problems such as drainage blocking which could cause flooding, breeding mosquitos which could cause malaria, environmental littering, and river pollution.

However, if governments would be able to provide adequate clean and potable water for people, the demand for the sachet water (“pure water”) might not be as large. So, there will be less problem from empty sachet bag. It is also concluded that, people are worried about the environmental problems that arise from the empty sachet bag pollution, and might feel helpless. So, based on the findings from this research, the following recommendations were made:

- Government should make provision for safe drinking water available to the Saki residents to decrease the rate of sachet water consumption in order to prevent the environmental problems connected to it.

- Since the banning of sachet water is almost impossible, controlling the production is recommended to NAFDAC by making strict policies and enforcement of reuse and recycling strategy as part of their registration requirements to producing companies.
- Public awareness on the consequences of improper dumping of empty sachet bags, as well as waste management education should be taken seriously. This should be often made on mass media (Radio, Television, and Newspaper).

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Appendixes

Sachet Water Bag (Plastic) Survey

This questionnaire is to assess the environmental impact of Sachet Water Consumption in Saki town. This is in completion of a Bachelor thesis writing at Novia University of Applied Sciences, Finland.

***Required**

All sections are required to be filled

BACKGROUND INFORMATION

Please choose your community/Area closest to your community *

Ajgunle
 Apinnite
 Ogidigbo/Igboro
 Sanngo
 Gender? *

Male
 Female

What is your age? *

Less than 20
 21 - 30
 31 - 40
 41 - 50
 50 above

What is your marital status? *

Single
 Married
 Divorced
 Widow

What is your level of education? *

Elementary school
 High school
 University/College
 None

What is your occupation? *

Business
 student
 Civil servant
 Farming

INFORMATION ON SOURCE OF DRINKING WATER

What is your main source of drinking water? *

Pipe or pump

River

Sachet Water/Pure Water

Well

Do you consume Sachet/Pure water? *

Yes

No

How often do you consume Sachet/Pure water (500ml) per day? *

1 - 4 times

5 - 8 times

9 and above

Why do you consume Sachet/Pure water? *

Cheap

Safety/Hygienic

Availability

I don't know

DISPAOSAL INFORMATION

How do you dispose empty bag of Sachet/Pure water after drinking? *

Waste bin

Drop it on ground

Throw inside gutter

Burning

Environmental problem with the Sachet/Pure water bag in Saki? *

Blocks drainage system

Breeding Mosquitoes

Littering of the environment

Pollutes rivers, pond, and streams

All of the above

Are you worried about the environmental problem from empty pure water bag? *

Yes

No