



**A RESEARCH ON: IMPACTS OF SOLID WASTE DISPOSAL ON WATER QUALITY.**

**CASE STUDY ;(UGBOHA RIVER ESAN SOUTH L.G.A).**

**CIVIL AND STRUCTURAL ENGINEERING DEPARTMENT.  
FINAL YEAR PROJECT PRESENTATION**

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## **DEDICATION**

I, **OSIKA OGHENEOGAGA JOHNSON**, respectfully dedicate this effort to God the Almighty for giving me the power and wisdom to work on it. In addition, I want to thank my family, friends, and project manager for their assistance in starting and finishing this project.

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## ABSTRACT

This project focuses on the effects of solid waste disposal effluent on the Ugboha River's water quality. Water samples from the river sources were taken for laboratory analysis as part of this research's effort to quantify the river's water quality and pollutant content.

The total hardness, dissolved colloids, total solids (TS), iron content, turbidity, total sulphate (TS), pH, temperature, and conductivity were the quality criteria taken into account.

The concentrations of pollutants in the river water were calculated using physical and chemical analyses performed on samples collected at the river's source.

The findings show that total sulphate, magnesium, chloride, iron, and total hardness are among the water quality metrics that are found to be excessive, with average concentration loads of 12.0 mg/l, 18.8 mg/l, 41 mg, 2.0 mg/l, and 44 mg/l, respectively.

The average values for conductivity, Ph, turbidity, and dissolved solids are 0.2g, 119.0cm, 6.20cm, and 129ml, respectively. All pollutants whose discharge from the river was examined in this study, with the exception of iron content, showed some high quantities.

Leachate, ambient soil, waste management, environment, and effluent are some related terms.

## **CHAPTER ONE**

### **1.0 INTRODUCTION**

#### **1.1 Background**

Water has a crucial part in every aspect of human life and is the most vital element that nature supplies for the survival of plants and animals (Nwankwoala and Nwagbogwu, 2012). Despite its critical role, water is the world's most poorly managed resource (Fakayode, 2005). Current trends in industrialization and urbanization may considerably contribute to the poor quality of water and land via the irresponsible disposal of industrial effluents, solid waste, and other harmful pollutants (Furtado et al., 2000; Chindah et al., 2004; Ugochukwu, 2004; Emongor et al., 2005). Municipal solid waste, sometimes known as refuse, is a byproduct of human activity that must be eliminated. Land filling is the most often used method of solid waste disposal. Due to low operating costs, a lack of equipment and expertise, and the absence of leachate collecting technologies, the landfills operate as open dump sites. Open dumping is an eyesore, a health hazard, and a nuisance. Toxic pests such as pigs, rats, insects, scavenging animals, and more are attracted to them. Surface or subterranean water seeping through the garbage may carry away hazardous substances that have been dissolved or leached out of dumpsites. Most of these toxins are bad, but heavy metals are especially so since they trigger bioaccumulation and biomagnification events. Heavy metals in leachate might be harmful to the environment if it seeps into groundwater. Land fill sites pose a risk to ground water safety because of rivers and bore wells used to draw ground water (Alappat and Dinesh, 2003).

Water pollution refers to the presence of any chemical or physical component in water over safe levels, endangering aquatic life. Physical elements include both dissolved and suspended solids. Some elements and compounds that are used in chemistry include cadmium, lead, manganese, copper, nitrate, and phosphate. As far as public health is concerned, groundwater should also not pose any physical or chemical hazards. Residents in the area around the dump pump ground water for consumption and other household uses. Metals including copper, lead, cadmium, mercury, etc. are the most common contaminant in soil pollution caused by rubbish seeping from landfills. Unsanitary land dumping of solid waste poses a significant threat to the environment due to the pollution of soil and ground water. Research on the impact of garbage dumps on rivers and their surroundings reveals that the Kathmandu River is highly polluted (Devkota et al., 2005).

In India, people may get water from a number of different places: rivers, lakes, ponds, wells, and tube-wells. Besides being used in homes and factories, this water is also essential in the fields and gardens that sustain our food supply. Water is often sourced from rivers and other bodies of surface water and supplied to the populous after adequate treatment, with the quality of the water having a significant impact on the economics of sourcing, treating, and distributing this resource (Kumaretal,2005). However, in rural regions, open and tube wells are often the only reliable sources of water. Permeable zones formed in the formation of rocks, sand, and gravels are the source of these aquifers. Water is pumped up from these aquifers and used by these wells, which may be shallow, medium, or deep.

There is a strong correlation between the water quality and the composition of the aquifers and soil layers through which ground water percolates. There is no longer a safe level of contamination for human consumption in the water. Landfills, incinerators, and other methods

of solid waste disposal may pollute groundwater and aquifers in the surrounding area by the release of leachate. Pressure on water supplies to satisfy growing demands has resulted from rapid industrialization, increasing population growth due to urbanization, changing lifestyles, and higher living standards. The issues of water scarcity and poor quality have become more urgent (chavan and zambare,2013). Keeping track of demand and supply is a difficult endeavor. Incorrect collection and disposal of municipal solid trash in a mixed form on open waste land or low lying regions, often in close proximity to rivers, ponds, and other environmentally sensitive zones, leads to water pollution and a reduction in water quality (Sahu, 2007). Waste dumps serve primarily as a breeding habitat for many infectious organisms (Sahu, 2007). Solid waste leachate, which may include a wide variety of chemical and biological pollutants, poses the greatest threat to groundwater (Bidhendietal.,2010). The area represented in this case study is representative of the type of rural community found all over the world, with the Ugboha River providing the bulk of its residents' drinking water. The problem of ground water contamination is more difficult to detect and control than that of surface water pollution. Wetlands are one of the few natural mechanisms that may help recover water before it is absorbed into the ground, therefore minimizing pollution (shivanand, 2008). Heavy metals may pollute water, changing not just the water's chemical composition but also the ecosystems and natural processes that rely on it. The resources and habitats used by fisheries may be negatively impacted by the unchecked deterioration of the aquatic environment.

## **1.2 Problem Definition**

The effluent from solid waste disposal facilities is known to pollute the surrounding area in a variety of ways, therefore it's vital to assess the water quality before collecting a sample to gauge the full extent of the problem. The wastewater from the sites is piped into this system. The investigation will focus on certain physiochemical and biological characteristics of river water and soil, with an eye toward bacterial species connected to effluent pollution and other processes associated with meat and hide processing. Poor water quality has been related to the spread of a variety of illnesses, including typhoid, diarrhoea, and dysentery. An analysis of the river like this might be useful for educational reasons given that people use it for commercial and recreational purposes without fully knowing the danger to human health.

## **1.3 Aim and Objectives**

The project is aimed at gaining a better understanding of the effects of effluent from solid waste disposal sites on quality of the water sample.

The objectives of the research are:

1. To conduct laboratory analysis on the quality of water in the vicinity of solid waste dumping depots and compared values with WHO standards.
2. To ascertain if the parameters of the water sample are in the acceptable limit in accordance with the world Health Organisation(WHO) of Drinking Water Standards.

#### **1.4 Scope and Limitation of Work**

This research aims to analyze the water quality at the discharge site according to certain physiochemical and biological criteria. Constraints on the study include the inevitability of natural and anthropogenic changes in water quality throughout the course of the research's duration, since the river and its surroundings are always changing. Analytical methods will be used to investigate the water's physical and chemical characteristics, such as its temperature, pH, hardness, electrical conductivity, total dissolved solids, and alkalinity.

#### **1.5 Relevance of the Work**

The research would be helpful to several Edo state institutions, government agencies, especially the Esan L.G.A. of Edo State. Findings from this study will also benefit the local community and society by informing and keeping them updated on the status of the waste sites in their midst. The research has important implications for a wide range of Edo state institutions particular the Esan L.G.A. The people and society in the areas around the landfills will gain knowledge and peace of mind from this study.

## **CHAPTER TWO**

### **2.0 LITERATURE REVIEW.**

#### **2.1 IMPACTS OF SOLID WASTE ON HEALTH**

Humans are negatively affected by the effects of solid waste. Human health is at risk from the improper disposal of solid waste, hence appropriate scientific solid waste disposal techniques should be used. Some of the individuals affected by these unhealthy unscientific solid waste disposal practices include;

1. Pre-school children
2. Waste workers
3. Workers in facilities producing toxic and infectious material.

People who live in close proximity to landfills and those whose water sources have been contaminated by landfill leaks or improper garbage disposal are also at a heightened risk. There is a high potential for harm, including the spread of illness and injury, when solid waste is not removed regularly. Domestic organic waste is a big contributor because it has the ability to ferment, which allows microbial pathogens to proliferate and thrive in favourable settings. Children are most susceptible to these hazardous waste products' negative effects and their improper handling makes waste workers and rag pickers susceptible to contracting chronic infectious diseases. However, chemical poisoning may also be acquired by direct contact, as shown by the fact that chemical waste is released into the environment, making it possible for it to cause illness. Many studies have been undertaken in different parts of the world to see whether there is a correlation between health problems and exposure to hazardous waste. Furthermore, industrial and agricultural

waste may pose serious threats to human health. Solid waste poorly disposed of can lead to a number of serious health risks, including:

1. People may be exposed to chemical and radioactive dangers when municipal waste and industrial hazardous waste are disposed of together.
2. Uncollected solid trash can impede storm water discharge and cause stagnant water bodies, which serve as a breeding ground for disease.
3. Groundwater sources or bodies of water can get contaminated when waste is placed close to them.
4. When garbage is dumped directly into rivers, seas, and lakes without being treated, harmful compounds build up in the food chain through the plants and animals that consume it.

Trace amounts of toxic substances enter the food chain when waste is deposited straight into waterways without being cleaned.

Dangers to public health may also be posed by waste treatment and disposal facilities. Poorly managed incinerators are a major source of air pollution, and unsanitary landfills attract disease-carrying vermin. These spots should be far outside of any potentially dangerous regions of town.

Recycle facilities can pose health risks if sufficient precautions are not followed, and landfills should be securely lined and walled to avoid leakage into nearby ground water sources.

Workers who deal with trash that has been exposed to chemicals or metals run the danger of being poisoned themselves. Medical waste disposal must be done with caution since discarded syringes might trigger the spread of Hepatitis B and C. Garbage scavengers like "rag pickers" are particularly vulnerable to injury and infection from

infectious materials they come into touch with while searching through trash piles for recyclables.

## **2.2 Solid Waste Management**

The US Environmental Protection Agency estimates that by the year 2000, India would generate roughly 200 million tons of municipal solid waste, and by the year 2010, that number will rise to 230 million tons. These predictions have increased interest in composting as a landfill and incineration-free option for municipal solid waste. Composting municipal solid waste (MSW) helps to cycle nutrients while reducing trash volume and pathogens. Despite the fact that MST may be composted, the question of what to do with the finished product arises. Due to a lack of regulations and markets, only 30% of compost produced from municipal solid waste is utilized in land-based industries like agriculture, landscaping, and gardening. 70% of the compost gets landfilled, though. Compost made from municipal solid waste is a great organic soil additive for use on agricultural grounds.

Over the past 100 to 200 years, the amount of organic matter in many soils in Minnesota and the United States has gradually reduced. The majority of agricultural cropping techniques cause an organic matter depletion. Because it has a great capacity to store nutrients, soil organic matter serves as both a source and a sink of nutrients in the soil system. It can also serve as a sizable reservoir for the storage of nitrogen, phosphorus, and sulphur, as well as other nutrients needed for plant growth. Trace metals and organic matter in soil interact, frequently lowering the toxicity of the metals to plants. The physical benefits of organic matter on soil include enhancements to soil structure and aeration, reductions in bulk density and water loss, enhancements to water retention and soil aggregation, and mitigation of soil erosion. In certain cases, the cost of trash

disposal may be reduced if compost created from municipal solid waste is applied to agricultural land.

Municipal solid trash from commercial or institutional operations, industrial solid waste, and waste produced in effluent treatment facilities are all examples of solid waste.

Therefore, a wide range of materials, including leftover food, paper, plastic, metal, glass, and others, are included under the phrase "Solid Waste/Refuse," these wastes are a product of several societal activities. Municipalities gather these garbage for disposal in a shared treatment facility. It was discovered that the yield was greater in soil treated with municipal solid waste compost compared to soil with no compost, with the exception of the first year on a sandy loam soil. Three to four years after compost application, corn yields were found to be affected by the carry-over effect of compost. On the other hand, consistent yields were obtained over the course of three years with annual compost application (40 tonnes/acre).

To achieve the highest yield, half of the nitrogen requirements for corn were added to the 40 tonnes per acre compost rate.

Compost N availability to the crop typically ranged from 5% to 11%. 23% of garbage is burned in Japan, compared to 9% in the US. The ability and inclination to make throwaway goods and packaging, as well as population prosperity, all contribute to rising trash levels. It is anticipated that this trash creation would keep growing. The cost of construction, the requirement for specialized labor, and the high maintenance and repair expenses are some of the drawbacks of incineration.

The study Solid waste management in class I cities in India provides details on the different composting processes. It provides waste management using all available treatment methods and has taken appropriate budgetary considerations.

The volume of waste materials has increased, making solid waste disposal a significant issue and poor solid waste disposal practices can lead to pollution of the water supply and air. Municipal solid wastes might also include other solid waste types, such as hazardous waste. Key components of SWM include public health protection; efficient resource recovery; cost-effective waste collection, storage, and disposal; and proper care for accepting and conserving recovered resources. Compost may be made from vegetable scraps, making it ecologically friendly.

Information has been provided on the effectiveness of the composting technique used as well as the physio-chemical properties of the raw material and the finished product. Current methods in India for handling municipal solid waste include collecting, transporting, and disposing of the rubbish, and sometimes recycling some of the materials that are discarded. Some microbiological and phyto-toxicological information regarding the green compost products is also provided.

### **2.3 Waste Composition**

The usual practice of using fresh fruits and vegetables in food results in a high organic content. The high organic content also makes frequent garbage disposal and collection necessary. The amount of paper, glass, and plastic is minimal; these items are sold by the public to street vendors, who collect and resell them for recycling or reuse. Therefore, just the portion that cannot be used and has no resale value is left in the garbage. Ash and fine dirt make up a sizable portion of the garbage. This is a result of the widespread practice of throwing street sweepings in public trash cans. Similar to this, it frequently happens that the surfaces next to the highways are left exposed and that a substantial amount of earth elements are swept away and mixed with the trash. Indian solid waste has a calorific value that ranges from 300 to 500 kg/m<sup>3</sup>.

## 2.4 Effects on Water Quality

Trace elements in composts made from municipal solid waste can harm plants and animals as well as infiltrate ground or surface water when they are leached (carried by water) from the soil. The amount of leaching is influenced by soil pH, organic matter concentration, and other soil properties, just like plant uptake. Although there is a dearth of data on leaching from municipal solid waste composts, evidence from long-term sewage sludge applications indicates that leaching is uncommon. Metals are only likely to leak into groundwater if there have been heavy, repeated applications of municipal solid waste composts over a long period of time in areas with sandy soils or other situations that limit the potential for metals to be absorbed by soil. Using data collected from several parts of Nigeria, we analyzed the current condition of waste management strategies.

Methods of garbage disposal that are frequently used in Nigeria, such as burial, open-air burning, and open dumping, have been found to be inefficient and harmful to the environment and human health. The inability of waste management to be properly run as a social service was also demonstrated. Instead, the waste's creator needs to be held accountable. Challenges to efficient waste management in Nigeria include the proliferation of squatter settlements, excessive traffic, instability, and a lack of education. The answer may lie in the experimental waste management model being employed in Lagos State. For the protection of public health, forward-thinking and successful waste management programs must be implemented given the rate of population growth, industrialization, and urbanization. All parties involved in such schemes, including trash producers, the private sector, the unorganized sector, and regulatory organizations, must be involved.

## **2.5 Review of related work.**

In this review, we'll be citing past works on impact of solid waste disposal affects ground water quality.

1. In 2014, Prof. Dr R.C.Chhip from Suresh Gyan Vihar University, Jaipur, investigated the impact of solid waste disposal on ground water quality at different disposal sites in Jaipur. Multiple study areas were investigated in the Shri RamSahay Sharma region of Jaipur. They used the Titration or Spectrophotometry method of analysis and observed that the above results are higher than acceptable limits of monitory organisation and indicate the effect of dumping of municipal solid waste in the study area as the ground water quality is slowly deteriorating. The study also reveals that the ground water may become completely unfit for the purpose of drinking and irrigation.
2. In 2013, Mohrana Choudhary from Gurukula kangri University, Haridwar, investigated impact of solid waste disposal on ground water quality at Gazipur municipal dumping site at Delhi. Using the Titration or Spectrophotometry technique of analysis, they found that the results above are greater than the monitory organization's permissible limits and reflect the impact of dumping municipal solid waste in the research region as the ground water quality is gradually declining. The analysis also shows that the groundwater may eventually cease to be suitable for irrigation and consumption.

## CHAPTER THREE

### 3.0 METHODOLOGY

Ubiajai, in the Esan South East Local Government Area, is the focus of a case study conducted by the residents of Ugboha to assess the quality of the area's water. The goal of this study was to evaluate the quality of river water in close proximity to landfills. Many of the villagers must rely on the river for their drinking water. A methodical strategy was developed to sample and assess the water quality to ensure the impact of solid waste disposal. A preliminary examination of water, soil, and solid waste samples was carried out due to water and soil pollution from surrounding solid waste disposal. While the other samples came from locations further away, the water samples were collected from a river near locations where solid waste is dumped. When picking the location, the terrain of the region, the population density, potential sources of contamination, etc. were all taken into account. The water samples were taken from a river close to where solid waste is disposed, as opposed to the other samples, which were taken from farther away places. The terrain of the area, the density of the people, potential sources of contamination, etc. were all taken into consideration when choosing the location. The following things were examined:

1. Turbidity
2. Total Solids (TS)
3. Total Dissolved Solids (TDS)
4. Total Suspended Solids (TSS).

The chemical test included:

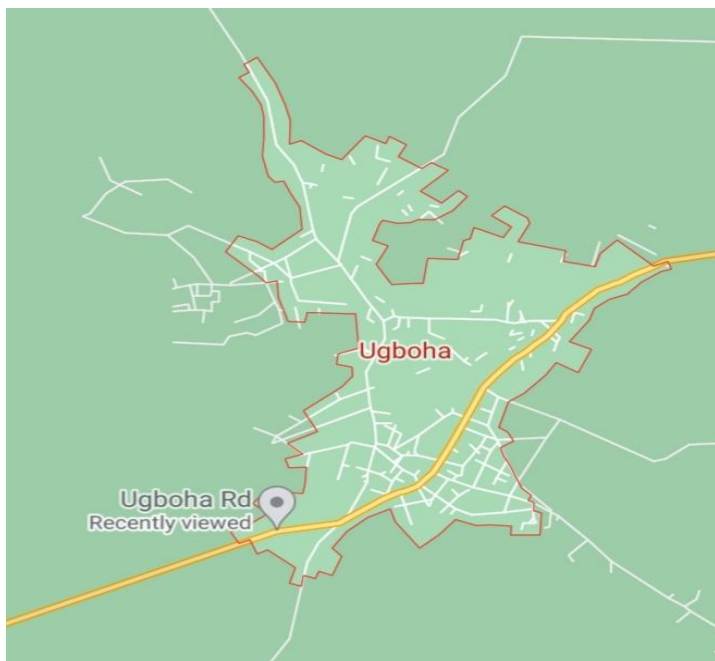
1. Determination of pH
2. Hardness

Bacteriological analysis included test for Most Probable Number (MPN), and Standard Plate Count (SPC). The standard methods were used for the present study.

### 3.1 Study Area



**Fig.1. Map of Ubiaja.**



**Fig.2. Map of Ugboha road.**

figures above is a graphical representation of the study area.

The study location was in the Esan South East Local Government Area of Nigeria's Edo State, close to Ugboha Road. Geographically, this area belongs to Ubiaja, which consists of regions with a high, undulating land surface. In the research area, solid waste effluents are routinely and unscientifically dumped on the riverbank and then immediately discharged through a number of routes into the river. For people, data collecting and processing become much simpler. The village's inhabitants frequently depend on the river for their daily water needs. A methodical plan was developed to sample the river water and evaluate its quality in order to guarantee the impact of solid waste dumping.

### **3.2 Collecting Water Samples and Treatment**

The water was sampled using a purposeful sampling strategy. The optimal number of river water samples (1 liter) were collected from three distinct locations: the upper stream (US), 100 meters upstream of the dump site; the dump site (DS1), in close proximity to the leachate outflow; and the dump site (DS2), 100 meters downstream of the dump site (DS2). One-liter plastic bottles were used to collect the water, and the EC, pH, Sulphate, TDS, total hardness, iron (Fe), temperature, and turbidity were tested at intervals of around 100 meters. In order to ensure that no contamination or other factors that may modify the composition of the sample were present, all bottles were cleansed with distilled water before the sample was taken. The bottles were rinsed with the water being tested three times before being used for sampling. For the heavy metals analysis, 90 ml of water was taken from each bottle and placed in a 100 ml plastic container with 10 ml of a 2M hydrochloric acid solution.. Using the HCl solution, water samples were protected against pathogenic and fungal attacks. The vials holding the samples were quickly sealed after collection to prevent exposure to air.

The samples were taken in the middle of the stream, almost 0.30 meters below the surface. Each sample, which was taken in a plastic container, was labeled separately with a distinct identification number to provide the information needed for each sample, such as the date, location, and time of collection. The water samples for analysis were carefully transferred to the lab of the Department of Civil Engineering, Auchi Polytechnic, Auchi due to the study location's proximity, the staff's knowledge, and the availability of the tools needed to get the desired result. The bottles were kept in a clean, dry, and cold section of the lab until analysis.

### **3.3 Water Sample Analysis**

To analyse the physio chemical properties of water, the following procedures were taken. The following procedure was used for determining the turbidity in the water sample;

- i Switch on power supply and check the turbidimeter.
- ii Press the 1NTU button and tally the scale with zero by using focusing template.
- iii Again press 1 NTU button and repeat step ii.
- iv A standard formazine solution of NTU is placed on turbidimeter to measure scattered light at 90 degrees from the incident light beam.
- v The water sample is tested and placed in turbidimeter.
- vi A cell rise was then used to determine the turbidity dilution factor since it was more than 100NTU.

NB; A cell rise used if the turbidity is more than 100NTU.

The following procedure was used to determine the total solids in the water sample after the sample was collected.

- i. Prepare sample containers by cleaning and rinsing. This was done before the first sampling run and after each run.

- ii. The samples were tested for total solids analysis for seven days.
- iii. The samples was stored in a refrigerator.

The following procedure was used to measure the total dissolved solids (TDS).

- i Measure the TDS of the water sample by immersing the testers probes into the water sample and the result was recorded.
- ii Measure the TDS of the reverse osmosis water by filling a glass with reverse osmosis water and submerge the tester’s probes into the water and record the result.
- iii Calculate the percent rejection using the formula below.

$$\% \text{Rejection} = \frac{\text{Water sample TDS} - \text{Reverse osmosis TDS}}{\text{Water sample TDS}} \times 100$$

The following procedure was used to test for pH of the water sample.

- i. Rinse each test tube with the water sample.
- ii. Fill the tube to 5ml line with sample water.
- iii. Add 10 drops of wide range indicator solution from a dropper bottle.
- iv. Mix thoroughly by inverting severally.
- v. Insert a tube into wide range pH comparator up to a light source and match the sample colour to a colour standard.
- vi. pH value was then recorded.
- vii. Wash your hand.

The following procedure was used to test for sulphate value of water sample.

- i Fill the sample bottle with sample water.
- ii Rinse and fill test tube to the 2.5ml line with water from the sample bottle.
- iii Dilute to the 5ml line with the mixed acid reagent, mix and wait for 2mins.
- iv Use 0.1g spoon to add one level measure and wait 10 minutes.

- v Insert the test tube into a comparator, match the sample colour to a colour standard and record the result as mg/l.
- vi Place reacted sample in a clearly marked container. Wash hands thoroughly after the test.

#### Data Analysis

The study's findings were presented in tables, and the mean results were contrasted with the WHO recommendations' water quality limitations.

## CHAPTER FOUR

### 4.0 RESULTS AND DISCUSSIONS

Several laboratory tests were carried out on the water sample in order to fulfill the goal of this study program. A thorough explanation of the findings is provided below. The tables below include the analyses that were performed.

#### 4.1 PRESENTATION OF RESULT OF PHYSICAL PROPERTIES

**Table 4.1 TEMPERATURE READINGS**

Parameters Test For	Sample Name	Result
Temperature	Ugboha river water	27.9

**Table 4.2 TASTE READINGS.**

Parameters Test For	Sample Name	Result(description of test)
Taste	Ugboha river water	Taste clayey (muddy)

**Table 4.3 COLOUR READINGS.**

Parameters Test For	Sample Name	Result Mg/L.
Colour	Ugboha river water	15

**Table 4.4 TURBIDITY READINGS.**

Parameters Test For	Sample Name	Result(level of turbidity)
Odour	Ugboha river water	129ML(turbid) 389 NTU(turbid)

**TABLE 4.5 TOTAL DISSOLVED SOLID (NON – FILTERABLE)**

**Reading**

Parameter tested for	sample name	Weight of empty Porcelain sample	Weight of sample	Weight of sample
Total dissolved solid (TDS)	Ugboha River water	66.7g	65.2g	8.5g

## 4.2 PRESENTATION OF RESULT FOR CHEMICAL PROPERTIES

**Table 4.7 pH VALUES.**

Parameters Test For	Sample Name	Result (pH)
Ph	Ugboha river water	6.20

With the WHO pH value (6.5-8.5) as standard , this water sample is considered as unsafe for consumption and presence of pollutants.

**+ Table 4.8 CHLORIDE READINGS**

Parameter tested for	Sample	Initial burette reading	Final burette reading	Final burette reading	Chloride (CL) mg/L
Chloride	Ugboha river water	50mL	36.5mL	13.5mL	41mL

**Table 4.9 TOTAL DISSOLVED SOLID (FILTERABLE)**

Parameter tested for	Sample name	Weight of filter paper	Weight of filter paper suspended	Weight of sample volume 4-3
Total dissolved solid (TDS)	Ugboha River water	.2g	.4g	.2g

**Table 4.10 TOTAL HARDNESS/NON CARBONATE (FOR UNBOILED EDTA SALT) FOR UNBOILED EDTA**

Sample name	Volume used	Initial burette reading	Final burette reading	ml of EDTA solution used	Hardness mg/L
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Jgboha River water	100ml	10ml	5.6ml	4.4	4.4
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Total hardness

Mg/l (unboiled) =  $\frac{\text{ml of edta used} \times 1000}{\text{ml of sample}}$

Total hardness =  $\frac{4.4 \times 1000}{100} = 4.4 \text{ mg/l}$

100

**TABLE 4.11: RANGE OF VALUES FOR IRON AND THEIR COLOUR**

S/N	Colour Change	Value Range
	Colourless	Nil
	Faint pink	0 – nil mg/l
	Pink	0.1 – 0.3 mg/l
	Dark pink	0.3 – 0.5mg/l
	Faint red	0.5 – 1.5 mg/l
	Red	1.5 – 3.0 mg/l
	Dark red	Above 3 mg/l

Parameter Test For	Sample Name	Colour	Range Of Value For Colour Change.
Iron	Jgboha River water	Red	1.5 – 3.0mg/l

**TABLE 4.12 CONDUCTIVITY RESULTS (EC)**

Parameter Test For	Sample Name	Conductivity ms/cm
Conductivity	Ugboha River water	119.0

According to the WHO standard, the electrical conductivity of water must not exceed 400ms/cm. Hence, 119.0ms/cm is suitable .

**TABLE 4.13 NITRATE RESULTS**

PARAMETER TEST FOR	SAMPLE NAME	SULPHATE RANGE	INFERENCE
Sulphate	Ugboha River water	0 - 12mg/l	Opacity (opaque) Sulphate present

The nitrate range for our sample was recorded as 0-12mg/l as against the WHO standard of 5-50mg/l.

**Table of comparison against WHO standards.**

Test results.	WHO Standards.
Sulphate 0-12mg/l	5-50mg/l
Electrical conductivity 119ms/cm	400ms/cm
pH 6.20	6.5-8.5

From the the table above, it was inferred that the pH value of 6.20 against WHO standard of 6.5 doesn't meet the the standards and is considered as acidic, the sulphate levels also doesn't meet the standards. It is therefore valid to say that the water from Ugboha river is unsuitable for consumption.

## CHAPTER FIVE

### CONCLUSION AND RECOMMENDATIONS

#### 5.1. Conclusion

In conclusion, the test findings that were compared to the WHO guidelines show that the improper disposal of solid waste has had a detrimental impact on water quality, and that it is dangerous and not an acceptable supply of water for the residents of the Ugboha village.

#### 5.2 Recommendations

Based on the research's findings, the following suggestions are made:

- i) To ensure that trash disposal doesn't harm the local environment or endanger the health of the population, proper procedures must be followed.
- ii) The findings indicated that the river water was not very acceptable for human purposes or other uses due to the detrimental impacts of the solid waste and effluents being released into the river.
- iii) For garbage disposal, only workable solutions should be kept, such as keeping a safe distance from the nearest body of water, and the dumping site should be well-managed.

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**APPENDIX.**



**Fig 5.0 view of ugboha river**



**Fig 5.1. Taking water sample at ugboha river.**



**Fig 5.2 Collecting water samples.**



**Fig 5.3 Collecting water samples.**