

## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1. BACKGROUND OF STUDY

Water is the prerequisite of life, mankind has settled along the Nile, the Euphrates, the Tigris, the Indus and the Yangtze-Kiang (Marsha *et al.*, 1999). Since ancient times and well before the past millennium, people have sought ways of dealing with water (their main commodity and primary source of drinking, sanitation, irrigation, cultivation, transportation and communication). Two major water supplies are surface water and ground water and are the water resources for readily available water for human consumption. Surface water includes ponds, streams, rivers, oceans and lakes. Pure water rarely occurs in nature due to water's capacity to dissolve and absorb surrounding materials. Surface water is the most readily available, yet the most polluted as a result of anthropogenic, but happily, controllable activities (David, 2006). In Nigeria, surface water pollution is being associated with surface runoff, industrial effluent, cold-room effluent, domestic waste and abattoir effluent. In this study, emphasis is placed on effluent generated from abattoir processes.

The abattoir industry is an important component of the livestock industry providing domestic meat supply to over 150 million people and employment opportunities for teeming population in Nigeria (Nafarnda *et al.*; 2012). However, majority of the activities going on in most of the abattoirs present in Nigeria are never monitored for regulation purposes. Majority of the abattoirs in Nigeria are not developed and facilities for the treatment of abattoir effluents are lacking. Potential health risks from waterborne pathogens can exist in water polluted by abattoir effluents, runoff from feedlots, dairy farms, grazed pastures, fallow and sod amended with poultry litter, grassland treated with dairy manure, and sewage sludge treated land. Such contamination of water bodies from abattoir wastes could constitute significant environmental and public health hazards (Nafarnda *et al.*, 2012). In Southwestern Nigeria several pathogenic species of bacteria in abattoir effluent have been identified. These species among others include *Staphylococcus* sp., *Streptococcus* sp., in harsh environmental conditions depicting the unfriendly nature of untreated abattoir effluent to the surrounding environment and human health (Coker *et al.*, 2001). The main wastes originate from killing, hide removal or de-hairing, paunch handling, rendering, trimming, processing and clean up operations. The wastes generated from slaughter house usually constitute blood, grease, inorganic and organic solids, salts and chemical added during processing operations (Raheem *et al.*). On the average, majority of the abattoirs in Nigeria are sited near a stream, natural pond or river, like the one present in Agbarho, Ugheli north, Delta state.

Environmental issues resulting from improper management practices responsible for the pollution of the aquatic environment with various forms of contaminants has increased in geometric proportion over the last four decades with concomitant increase in water borne diseases especially typhoid, diarrhea and dysentery. Abattoirs are generally known all over the world to pollute the environment either directly or indirectly from their various processes. It is observed that in Nigeria, many abattoirs dispose their effluents directly into streams and rivers without any form of pre-treatment and the slaughtered meat is washed by the same water (Adelegan, 2002).

The Agbarho abattoir on daily basis produces several gallons of blood, and intestinal contents and tissues introducing them into the environment including the Agbarho River. On a visit to the Agbarho abattoir, during a quick survey around the abattoir, neither holding tank nor waste treatment system/facility was observed which is obviously an indication that effluent and other solid wastes generated from the abattoir are being dumped/discharged indiscriminately into the surrounding. The abattoir was said to have been in existence for years now, which implies that the water body has been receiving abattoir effluent for years.

**Note:** to avoid ambiguity, abattoir may be used interchangeably with slaughter house, also wastewater may also be used instead of effluent.

## 1.2. STATEMENT OF PROBLEM

Abattoirs are generally known all over the world to pollute the environment either directly or indirectly from their various processes hence water quality assessment is essential to the Agbarho River so as to ascertain the level of impact of the abattoir effluent periodically discharged to it. As it receives discharged waste water from the Agbarho abattoir. considering implicated certain bacteria species in abattoir effluent pollution, not ignoring other processes involved in meat and hide processing, the analysis will deal with certain physiochemical and biological parameters of the river water.

Cases of water borne diseases especially typhoid, diarrhea and dysentery has resulted as a result of contact with polluted water. It is therefore expedient to carry out such analysis on the river for awareness purpose, as the users of the river exploit it for economic and recreational purpose without the full knowledge of the danger it may pose to human health.

Until now in Nigeria, many abattoirs (Agbarho Slaughterhouse included) dispose their effluents indiscriminately into streams and river body and without any form of treatment and mismanage various their waste. Assumption is being made that publications on effect of abattoir on water quality would pilot the awakening of effective and sound regulation on wastewater treatment and abattoir waste management.

In overview, water quality usually degenerates as a result of indiscriminate and uncontrolled effluent discharge

from abattoirs, accompanied with water borne diseases with no sign of governmental mitigation plan.

However there has not been any study on the relevance of the abattoir activities on Agbarho River.

### 1.3. PURPOSE OF STUDY

The study seeks to ascertain the effect of Agbarho slaughterhouse effluent on the Agbarho river water with specific objectives which include:

- a) To check the effect of the abattoir effluent/waste on the River water quality (if it influences any change in the BOD, DO, COD, pH, Turbidity, Alkalinity, Total solids and some other physiochemical and biological properties of the river water).
- b) To check for the level of impact if there is any.
- c) To establish that there is a significant relationship between abattoir effluent and river water quality.
- d) To create awareness on various adverse impacts that may result from the discharge of untreated abattoir effluent.

Aligning with the objectives stated above the below questions are made:

- I. What possible effect does abattoir effluent have on water quality?
- II. To what extent has the release of the abattoir effluent into the Agbarho River impacted it?
- III. What relationship does the effluent have with the water quality?
- IV. What information is needed in the discharge of effluent?

### 1.4. SIGNIFICANT OF THE STUDY

1. The study will be of great benefit to a number of groups in Nigeria. Government agencies especially the Delta State Environmental Protection Agency, rank amongst the top beneficiary of this study
2. Another set of interest group that will benefit from the findings of this research will be the community and society where the abattoir is located, as the study stands to keep them informed.
3. The last set of beneficiary of this study is the international community, particularly in the area of urgent significance in the uniformity and standardization of the reporting formats for entities involved in regulation of abattoir industries or the likes.

### 1.5. SCOPE AND LIMITATIONS.

The area of this study covers a section of the Agbarho River around the effluent discharge point. The study is specifically focused on analysis of water quality around the discharge point as defined by some physiochemical and biological parameters.

The research is not without limitation as there are bound to be variation in water quality over time due to the continuous flow of the river and other activities.

## 1.6 STUDY AREA

The Agbarho river serves as the case study with respect to the abattoir effluent. Agbarho is one of the major towns in Delta State in Southern Nigeria. It lies between latitude N5° 35' 00" and longitude E5° 52' 00". Agbarho is one of the populated towns in Delta state with an estimated value of 145,000 people.

Agbarho River is an important economic river in Delta state as various socio-economic activities including vehicle washing and fishing are possible through the river. The river also serves for the purpose of sand resources as it accommodates several dredging activities at various points. People living within the vicinity draw water from the river and even swim in it. The river originates from Orho a hinterland in Warri and stretches down westward to Uvwie Local Government Area of the state where it empties with its creeks into the Atlantic Ocean. The river receives wastes from municipal dumps and from abattoir sited along its course. Although, there are more than one abattoirs in Agbarho, Oghara abattoir is implicated in this study due to its strategic location right by the course of the Agbarho River and also because it is the major abattoir which supplies about 65% of the meat for the town residence and other nearby communities.

## 1.7 OPERATIONAL DEFINITION OF TERM

**Abattoir/slaughterhouse** is usually used to refer to meat packing industry, large industry involving the slaughtering, processing, and distribution of cattle, sheep, and hogs. Abattoir operations are meant to recover the edible portions of slaughtered animals for human consumption (Fearon *et al.*, 2014). It also refers to places where animals are killed for their meat. It is one of the most important industries in Nigeria as it serves as meat resources and also supplies certain raw materials to several manufacturing industries. These industries usually generate waste in form of solid or water (i.e. **effluent/wastewater**, water that has been used, as for washing, flushing, or in manufacturing processes) that may eventually contaminate water system if not well taken care of. The aftermath effect of the contamination is usually deterioration in the water quality. **Water quality** refers to the physical, chemical and biological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purposes. Such parameters as the one categorized below define water quality.

### 1.7.1 WATER QUALITY PHYSIOCHEMICAL PARAMETERS

**Temperature:** If the overall water body temperature of an aquatic system is altered, an aquatic community shift can be expected.

**pH value:** pH is an indicator of the existence of biological life as most of them thrive in a quite narrow and critical pH range.

**Color:** is measured in (ptco)/(Lu). It is the characteristics spectrum band of a given water body. Color is vital as most water users, be it domestic or industrial, usually prefer colorless water. Determination of color can help in estimated costs related to discoloration of the water.

**Turbidity:** is expressed as the amount of suspended matter in Mg/L or parts per million (PPM).

**Specific Conductivity:** specific conductivity can be defined as the total amount of dissolved salts present in water.

**Dissolved Oxygen (DO):** DO is the concentrated amount of oxygen ( $O_2$ ) in dissolved form. It is measured in Mg/L or (PPM). DO is essential for aquatic life. A low DO (less than 2 Mg/L) would indicate poor water quality and thus would have difficulty in sustaining many sensitive aquatic lives.

**Total Dissolved Solids (TDS):** in water consist of inorganic salts and dissolved materials. In ambient conditions, these compounds are present in proportions that create a balanced solution. If there are additional inputs of dissolved solids to the system, the balance is altered and detrimental effects may be seen. Inputs include both natural and anthropogenic source.

**Biochemical Oxygen Demand (BOD):** BOD is a measure of organic pollution to both waste and surface water. High BOD is an indication of poor water quality. For this tree plantation project, any discharge of waste into the waterways would affect the water quality and thus users downstream.

**Nitrate nitrogen:** The growth of macrophytes and phytoplankton is stimulated principally by nutrients such as nitrates. Many bodies of freshwater are currently experiencing influxes of nitrogen and phosphorus from outside sources. The increasing concentration of available phosphorus allows plants to assimilate more nitrogen before the phosphorus is depleted. Thus, if sufficient phosphorus is available, high concentrations of nitrates will lead to phytoplankton (algae) and macrophyte (aquatic plant) production. This is mostly due to the usage of fertilizers.

**Oil & Grease:** To check if there is any indiscriminate dumping of waste oil or poor management of oily waste within the site.

## **1.7.2 SOME MICROBIOLOGICAL PARAMETERS**

**Total Coliform Count and Faecal Coliform Count:** These tests use coliform bacteria as indicator organisms. The presence of these indicative organisms is evidence that the water has been polluted with faeces of humans or other warm-blooded animals.

## **THE EFFECT OF AGBARHO SLAUGHTERHOUSE EFFLUENT ON THE AGBARHO RIVER WATER**

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