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Surface Water Pollution in Lagos, Nigeria

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Abstract. Surface water is one of the most vulnerable in terms of pollution in Lagos State. The risks of surface water were high in many areas of the state because of polluted activities on the water bodies. And this has reduced the quality of surface water and made it unfit for human use. The primary data for the study was collected through direct oral interviews of 25 residents of the state through random sampling technique. It also involved the use of secondary data like textbooks, newspapers and journals. This paper focused on the causes of surface water pollution in Lagos State Nigeria, which include, industrial wastewater, agricultural effluence, sawdust seepage, direct flush of septic tanks into the seas and commercial sand dredging. The research therefore concluded that revocation of hazardous activities around surface water in Lagos State such as, open defecation, commercial sand dredging and relocation of sawmills to area that could contain them without causing problems to the surface water will preserve the quality of surface water in the state.

Keywords: Lagos State, Sand dredging, Sawdust seepage, Sustainable development Surface water, Water Pollution.

1. Introduction

Water is one of the most important resources to man and environment from beginning of human existence, without water of adequate quality and quantity sustainable development will not be possible. Surface water resource deterioration is now a global problem and is increasing at a faster rate. Many rivers in Lagos State received industrial effluents, domestic waste, agricultural waste and constant commercial dredging. These effluents caused deterioration of surface water quality in the state, the accelerated pace of development and population growth have led to the scarcity of potable water. So, the knowledge of extent of pollution and the causes of surface water pollution become essential in order to preserve the valuable resources of surface water for future generation.

1.1 Statement of the Problem

Scholars such as Ayadi and Alo (2020) and Ajayi (2022) have done some works on waste and environmental pollution in Lagos State. These two recent works examined: effectiveness and efficiency of solid waste services in Lagos State, challenges and opportunities for reducing food waste in Lagos Metropolis. However, none of these works examined the Surface Water Pollution in Lagos State.

1.2 Methodology

The primary data for the study was collected through direct oral interviews of 25 residents of the state through random sampling technique. It also involved the use of secondary data e.g. textbooks, newspapers, journals etc.

1.3 Objective of the study

The objective of this study is to examine the causes of surface water pollution in Lagos State Nigeria.

1.4 Research Question

What are the causes of surface water pollution in Lagos State Nigeria?

1.5 Limitation of the Study

The limitations encountered during the field work included some respondents were hesitant to provide sufficient information relevant to the research, while

some were unwilling to participate or cooperate due to the sensitive nature of the study. Despite these challenges, the researchers remained determined and reassured respondents that their responses would be kept confidential.

2. Review of Related Literature

Water pollution is the presence of harmful substances in water that can make it toxic to humans, animals, plants or the environment (Yohannes and Elias, 2017). It can be caused by natural events like volcanic eruptions or man-made activities like industrial waste (Praveen et al., 2016). Water pollution is when water contains micro-organisms of human or animal origin, poisonous chemical substances, industrial or domestic sewage, organic and inorganic substances. Water pollution is the contamination of natural water bodies such as lakes, rivers, oceans, and groundwater by chemical, physical, radioactive or pathogenic microbial substances that change in the quality of water that has a harmful effect on any living thing that drinks or uses or lives in it (Abambagade, 2020). Most pollutants result from non-point source pollution activities including runoff from agricultural lands, urban areas, construction and industrial sites and failed septic tanks (Yohannes and Elias, 2017). About one thousand five hundred substances have been listed as pollutants in freshwater ecosystems and a generalised list of pollutants includes acids and alkalis, anions (sulphide, sulphite, cyanide), detergents, domestic sewage and farm manure, food processing water, gases chlorine, ammonia), heat, metals (cadmium, zinc, lead), nutrients (phosphates, nitrates), oil and oil dispersants, organic toxic wastes (formaldehydes, phenols), pesticides, polychlorinated biphenyls and radionuclides, in addition to oxidizable materials, domestic sewage contains detergents, nutrients, pathogens and a variety of other compounds (Abambagade, 2020).

2.1 Theoretical Framework

An ecological perspective of change and development: The perspective is associated with the works of Wilkinson and Boulding (1973). The theory is concerned with issues of change and development in contemporary societies, especially as they relate to environmental changes and/or ecologically related trends of population growth and the need to devise and sort out techniques of tackling development problems. The theory stated that, as the population of a society increases in size, individual members of the society exert more pressure on scarce available resources such as land and other natural endowments for survival. They directly or indirectly carryout socioeconomic activities that pollute the environment/society, and further cause harm (degradation) to the environment/society. The socio-economic activities, according to these theorists include subsistence agricultural activities of people in agrarian societies of Africa, Latin America etc. The commercial and industrial activities of people in Urban industrialised societies of the Western-Europe and North America. The perspective further argued that development is needed when a society out grow its resource base and productive system. The perspective therefore posits that as the established economic system of a given environment/society is proved inadequate and productive system becomes more problematic, societies are therefore driven to change their methods. For instance, as the population of a society outgrows the available resources, especially in agrarian societies, people are forced to migrate to urban centres/cities in search of job opportunities. Whereas some engage in several other commercial and agricultural investments such as livestocks; some still carry out some technical and entrepreneurial businesses, all for survival. The urban and city dwellers establish and carryout industrial activities that equally pollute the society. Wilkinson and Boulding concluded that these activities directly and/or indirectly pollute the environment with its attendant consequences on biodiversity (Evelyn and Tyav, 2013).

2.2 Critical Analysis

2.2.1 Causes of Surface Water Pollution in Lagos State

2.2.1.1 Industrial Wastewater

Rapid 70 ndustrializ and 70 ndustrialization caused larger volumes of wastewater to be produced and its uncontrolled discharge threatened the reliability of surface water and causing harm to human health (Adeniran et al., 2017). United Nations estimated that ninety percent of all wastewater were untreated and discharged directly into surface water bodies in Sub-Saharan Africa (Tefera and Adane, 2017). As a result, water borne illnesses that are triggered by the contaminated waters abound. The unsafe wastewater disposal practice also seriously undermined the sustainability of aquatic life and the string of human benefits derived from aquatic ecosystems including food and medicines that were often taken for granted. In addition, it is responsible for the emergence and persistence of de-oxygenated dead zones which are growing rapidly within seas and oceans. The issue of untreated wastewater discharge was primarily a concern of surface water in Lagos State Nigeria. In

view of all these problems, the world faces a water quality crisis in the 21st Century, and water may aptly be described as a resource under considerable pressure (Saad et al., 2017)

Although Lagos is an island with twenty one percent of its 3,577 square kilometers made up of lagoons and water ways (Abambagade, 2020). These surface waters have historically been unfitted for human consumption on account of pollution from urban and industrial waste, thus giving rise to a sad paradox of scarcity in the midst of plenty, as well as to an endless search for good water sources (Agbesola, 2013). As a highly industrialised city, repeated discharges of industrial effluents into surface water bodies polluted surface water, making the water too contaminated and too costly to treat for public supplies. Foster observes that dwindling and easily exhausted water resources in large cities usually compel a resort to alternative sources of water such as importations from locations that are costly and beyond the urban limits in order to meet the water needs of the growing populations. Water supply shortage is a perennial problem for Lagos State. Unable to use most of its own surface waters on account of pollution and salinity. The major potable surface water source is the Ogun River in Akute, Ogun State, a bordering state. The Water Corporation has consistently but unsuccessfully struggled to increase capacity and to find new water sources to meet the needs of the ever-increasing numbers of residents in Lagos State. In spite of its efforts to increase capacity and to find alternative sources of water however, the city's ever-growing population renders these series of capacity expansions inadequate after a few years and the Corporation met only a fraction of water demand. Likewise, the industrial wastewater were full of heavy metals, which resulted into chemical pollution of the water bodies. Such heavy metals were mercury, arsenic, copper, cyanide, iron, lead, cadmium, chromium, nickel, phenols etc which caused chronic diseases such as cancer in the inhabitants of the State and neighbouring countries using the same coastal waters, because pollution has no boundary.

2.2.1.2 Domestic Source

A combination of the increasing population, the flat terrain and lack of adequate sewage and domestic waste disposal made many localities potential health hazard areas for their inhabitants. Sanitary and sewage systems in many homes were poor and where they exist were poorly managed. Some people do not care how they dispose their trash and it was not surprising there were serious pollution problems in the communities. The heavy rainfall, flat terrain, poor drainage (blocked drains due to waste dumps, and built up of silt, etc) or lack of drainage system could lead to serious flooding problems even with minimal precipitation. In most houses, only feaces were discharged through a septic system and all other household liquids were discharged directly to storm drains where they exist into the street which later ended in surface water in the state (Olorunnibe, Oral interview, 2023).

Figure 1: *Clogged drain and Surface water pollution in Lagos State*

Source: *Researcher's Photography*

2.2.1.3 Commercial Source

Commercial source refers to shops, super markets, road side markets and business centres that were consistently battered by the sellers of different food items and cosmetics, other daily markets and weekly community markets where residents were buying and selling farm produces, such as cattles, donkeys, sheeps, poultry and other household materials. These types of markets constituted more than ninety percent of the markets available in Lagos State. During daily operations reasonable quantities of different wastes that were dumped on surface waterways were consistently

generated. Road side sellers, disposed various items such as cans of soft drinks, banana and orange peels, wrappers of sweets, street mechanic dusts. Abattoirs in the state were generally performing opposite (anti-sanitation) function, blood, feaces and related wastes from animal slaughter find their ways into gutters and the so-called drainage system and the final destinations were surface streams like rivers and lagoons (Efe, Oral interview, 2023).

Figure 2: *Commercial waste*

Source: *Researcher's Photography*

2.2.1.4 Agricultural Effluence

Agriculture, as the single largest user of surface water on a global basis and as a major cause of degradation of surface water resources through erosion and chemical runoff. The associated agro- food processing industry is also a significant source of organic pollution in most countries of the world. A wide range of contaminants can reach these rivers, lakes and streams either by groundwater or through drainage ditches including artificial fertilizer residues, insecticides, herbicides, pesticides and farmyard waste all of which were potentially harmful. The primary agricultural pollutants were nutrients (particularly nitrogen and phosphorus), sediment, animal wastes, pesticides and salts. Agricultural waste polluted surface water through direct surface runoff or through seepage to ground water that discharges to a surface water outlet. Various farming activities resulted in erosion of soil particles (Chukwu, 2017). The sediment produced by erosion can damage fish habitat and wetlands and often transported excess agricultural chemicals resulted in contaminated runoff. This runoff in turn affects changes to aquatic habitat such as temperature increases and decreased oxygen. The most common sources of excess nutrients in surface water were chemical fertilizers and manure from animal facilities. Such nutrients caused eutrophication in surface water. Eutrophication is thus depriving the river of oxygen (called oxygen debt). As algae dominated and turn the water green, the growth of other water plants were suppressed. (Chukwu, 2017). Death of invertebrates and fishes follow on and their dead remains in turn lead to excess bacterial activity and fishing is an occupation to some of the populace in Lagos State especially areas like Badagry, Bayeku, Ebute Meta, Eko, Epe, Majindu, Makoko, Isheri, Ipakodo, Ijede, Ofin, where they were blessed with rivers, lagoons and oceans while some eat the aquatic organisms most especially the fishes (Olorunnibe, Oral interview, 2023)

2.2.1.5 Sawdust Seepage.

Lagos has a ascendent population and this led to increased business activities. The city is located close to the rain forest with a lot of trees transported to the state which resulted in many sawmills of different sizes located on the shores of the Lagos Lagoon. Oko baba in Ebute Meta is a typical example of such area where the lagoon is being used as a commercial sawmill zone known for residential and commercial activities. Woods which used majorly for construction activities were processed in this area and logs were suspended on the lagoon to increase the durability and quality of woods, because the longer it stays in water, the stronger it becomes (Elijah and Elegbede, 2015). A lot of solid waste were generated by these sawmills which include sawdust, wood off cuts, wood backs, plain shavings and wood rejects that were not properly discarded. It became a habit that these solid waste materials were burnt in

open air along banks of the Lagos Lagoon caused serious air pollution or these substances are dumped into the lagoon (Dosumnu and Ajayi, 2002). Wood waste decomposed when left over long periods of time and it released a harmful greenhouse gas such as methane also these heaps became the breeding ground for pests and vectors of diseases (Owoyeni et al., 2016). The major waste product from these sawmills was sawdust which is a threat to the environment, water resources, ecology and human health as massive amounts of this wood product was accumulated on the banks of the Lagos Lagoon.

Figure 3: *Saw dust seepage on Lagoon in Lagos State*

Source: *Researcher's Photography*

2.2.1.5 Direct flush of septic tanks /soak ways in to the sea.

The risks of surface water were high in many areas of Lagos State, because of unhygienic and inadequate excreta and waste disposal provisions. The main sanitation systems available in the major residential areas of Lagos State was water closet septic tank (Gbehe, 2004). However, the major environmental concerns in Lagos State were collection, treatment and disposal of sewage and other related wastewater problems. Although the use of pail system (soil men) in Lagos metropolis has been banned, yet the government machinery via Lawma and Laswmo of ministry of environment has not totally devised an efficient system of disposing of the septage from septic tank / soakaways (Efe, Oral interview, 2023). Therefore, all these untreated excreta together with the commercial and industrial wastewater are usually discharged into the Lagos lagoon. For example, in Badagry, Bayeku, Ebute Meta, Epe, Lagos Island, Ipakodo, Makoko, Mile 12, Majindun and Ofin toilet pipes were ran directly to Lagoon. It was on record that sewage and waste products were discharged into water bodies, scientific evidence has also shown that residents in many instances delight in defecating on the ground surface, sometimes directly into nearby streams and water channels (Efe, Oral interview, 2023). Human excreta contain a lot of organisms, which are major vectors of water-related diseases. These organisms include viruses, which can cause poliomyelitis, viral meningitis, hepatitis, fevers, diarrhea, cholera and typhoid.

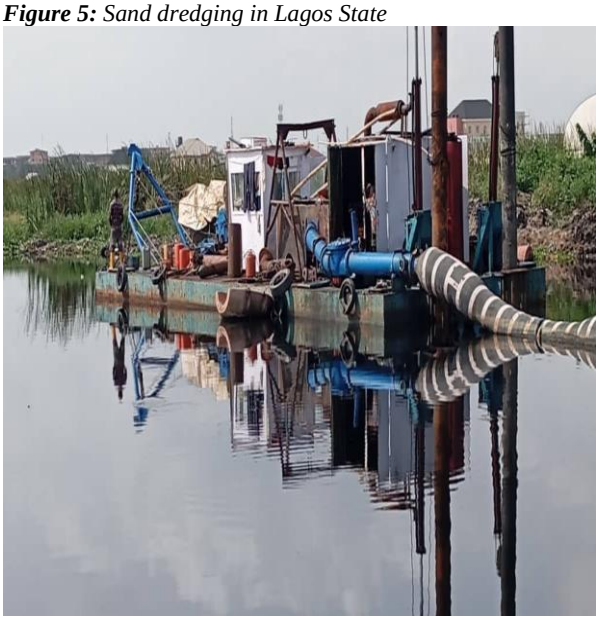
Figure 4: *Construction of toilets on Lagoon in Lagos State*

Source: *Researcher's Photography*

2.2.1.6 Sand Dredging

Lagos water bodies are under intense pressure due to various kinds of human activities. The most noticeable one is the indiscriminate extraction of construction grade sand by dredging operators. The sector faced with the daily dredging activities that caused a major change for surface water. Sand dredging was equally a direct cause of erosion which has destroyed lives and property of citizens and still threatens lives and property of others in the State. It also impacts negatively on aquatic life, as sea animals that depend on sandy beaches for their nesting are sent into near extinction, destroys fishery and caused economic problems for people who rely on fishing for their livelihood. Also, it puts fisher folks out of business, thereby worsening poverty and encouraging criminal activities as these people become desperate for survival. Sand dredging can be classified into two, namely, hydraulic and mechanical dredging (Sowunmi et al., 2016). Hydraulic dredges remove and transport sediment in liquid slurry form. They are usually barge mounted and carry diesel or electric-powered centrifugal pumps with discharge pipes ranging from 6 to 48 inches in diameter. The pump produced a vacuum on its intake side and atmospheric pressure forces water and sediments through the suction pipe. The slurry is transported by pipeline to a disposal area (Sowunmi et al., 2016).
Mechanical dredges remove bottom sediment through the direct application of mechanical force to dislodge and excavate the material at almost in situ densities. Backhoe, bucket ladder, bucket wheel, and dipper dredges are types of mechanical dredges. Sediments excavated with a mechanical dredge are generally placed into a barge or scow for transportation to the disposal site. Hydraulic dredging is the most common among the large-scale sand dredging firms while there were small scale sand dredgers that make use of locally made boats and baskets (Efe et al. Oral interview, 2023).

Figure 5: *Sand dredging in Lagos State*



Source: *Researcher's Photography*

3. Conclusion

The research concluded that deposition of commercial waste, agricultural waste, sawdust, sand dredging and other industrial wastes in the surface water has reduced the quality of surface water and made it unfit for human use in Lagos State Nigeria. However, there is need to develop workable monitoring mechanisms, regulations and enforcement measures by relevant regulatory bodies in the state to secure future of surface water resources.

4. Recommendations

In other to control surface water pollution in Lagos State, the following point could be adopted:

- Revocation of hazardous activities around surface water in Lagos State, such as open defecation, commercial dredging etc.
- Relocation of sawmills to area that could contain them without causing problems to the surface water in the state.
- Regular biological assessment must be carried out on the surface water in the state.

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