RESEARCH ARTICLE OPEN ACCESS

Environmental Pollution and Contamination of Water Resources within Awka and Environs

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ABSTRACT
In Awka the State capital of Anambra state in Nigeria West Africa, numerous cases of groundwater and surface water pollution and contaminations have been reported. Shallow groundwater's that have been contaminated by leachates from landfills include those that occur below four large landfills in the outskirts of students' hostel both at temporary and permanent sites hostel. The town is endowed with numerous and accessible surface water and groundwater regions. These water bodies are continuously exploited by inhabitants of the city, for domestic, agricultural and industrial uses. The aim of an investigation of possible pollution/contamination of these water regions in this work is to give greeter insight into the degree of suitability of the available surface water and groundwater within the study area for various water demands. The ever increasing use of organic pesticides and herbicides has constituted both surface water region and groundwater contamination in the region.

Key words: Groundwater, Surface Water, Pollution, Contamination, Landfills

I. INTRODUCTION

Environmental pollution and contamination of water resources are becoming a common menace in parts of Anambra State. As a result of the ever increasing industrial establishments and mans general activities, physical, chemical, and biological substances are being fed into the ground and surface water environment on a daily basis. It is often difficult to differentiate precisely between pollution and contamination. In modern environmental literature, pollution is regarded as having higher dosage or concentration that can cause damage to biota than contamination. That means that contamination has a lesser deleterious effect to life when compared with pollution. But contamination may also render the contamination medium unusable to life. Many urban and rural areas of Anambra State have been adversely affected by large-scale pollution and contamination. In modern environmental literature, pollution is regarded as having higher dosage or concentrations that can cause damage to biota than contamination,Awosika(2002. That means that contamination has a lesser deleterious effect to life when compared with pollution. But contamination may also render the contaminated medium unusable to life. Many urban and rural areas of Anambra state have been adversely affected by large-scale pollution and contamination; Extensive nitrate contaminations of shallow aquifers have been observed within the metropolis. This has been attributed to the use of Agricultural fertilizers. This may have resulted in losses of human, material and financial resources. Volumes of these pollutants/contaminants are produced yearly through natural and anthropogenic activities such as industrial activities, agricultural practices, waste disposal systems, soil and gully erosion Egboka(1994). However as a result of the structural, Sratigraphic, Sedimentological, and geotechnical properties of the pedlogic and geologic units, no safe disposal environments have yet been found for waste products that have long half lives. High-level, medium-level and low-level waste in solid, liquid and gaseous forms are released into the environment of Anambra state at discrete intervals or at a continuous basis. They may have short or long half-lives in the environment, the consequences are health hazards.

II. LOCATION OF THE STUDY AREA

The area delineated for the present study comprises Awka, Unizik Temporary and permanent site areas, Imoka stream, Obibia stream, iyi agu, Nwosu borehole, Okika borehole, Gaddafi's and borehole, Oguocha's hand-dug well, and hotel de lamital, all in Awka area. The areas were chosen based on the level of landfills, dust bins and population density, abandoned drainage systems, open pits, mostly it houses several markets, mini industries ,factories and services as a domain for students and the locals.

Figure 1: Map of Anambra State.

III. EXPERIMENTAL PROCEDURES

In order to achieve the objectives, water samples was collected from streams, rivers, hand-dug wells, tubes wells and boreholes within the study area,Otti(2011). Samples, thus, collected was sent to water laboratories for analysis and interpretations in line with world health organization guideline for water test and quality In the field, water samples was collected from streams, rivers, hand-dug wells, tube wells and boreholes for analysis. In cases of wells and boreholes, information about the wells was collected where available they include; the total well depth, seasonal yield, total yield through pump testing analysis, re-charge zones, farm yards , leachates springs, landfills, lithologic sections, hydrogeological parameters, the nature of material inputs as stated by Otti (2011) in his Economic advantage of rainwater harvesting over water borehole. Flow direction and flow net analysis was classified out. Simple mathematical models were used to simulate the data.

Laboratory work done includes; Physical test to determine water temperature, pH level, Turbidity, odor, conductivity, color (pt/co) and residual chlorine:

i. Chemical test to determine presence and level of iron, lead, manganese, chloride, nitrate, sulphate, suspended solids and total dissolved solids, etc.
ii. Bacteriologic analysis to determine pathogens, faecal coliform, total coliform, etc.

IV. IDENTIFIED SOURCES OF POLLUTANTS AND CONTAMINANTS WITHIN AWKA METROPOLIS

Two main sources of pollutants and contaminants were discovered in Awka town. There are:

1. Point source and 2. Distributed source. Pollutants/contaminants from the two sources may be released continuously or at discrete intervals

TABLE 1: Point sources of pollution and contamination within Awka

Sources of pollution	**Examples**
Sewage disposal system	Sewage lagoons, septic systems Cesspools Barnyards/feed lots.
Surface waste disposal sites	Landfills/garbage dumps, surface waste dumps.
Underground waste disposal sites.	Storage tanks (1000-, medium-, high-level wastes), pit latrines, tunnels, trenches, caves etc
Spills, washing and intrusions.	Oil/gas/waste spills, Auto workshop washing, research/Laboratory washings seawater/saltwater intrusion.
Mining sources	Acid mine drainages, Gas explosions and seepages, mine dumps and gangue deposits, tunnels/excavations outflows.
Natural mineral/ore deposits.	Saline ponds/lakes, Hot springs/mineralized water, Anhydrite/pyrite deposits/evaporites.

TABLE 2: distributed source of pollution and contamination with Awka

Sources of pollution	Examples
Agriculture	Cropland, pasture and Rangeland, irrigated land, Wood land, feed lot.
Aquaculture	Growing stock, fisheries, logging.
Construction	Urban development, Highway construction
Mining	Surface and underground mining.
Terrestrial (many and scattered)	Landfills, Dumps etc.
Utility maintenance	Highways and streets, Deicing.
Urban run-off	Floods and snowmelt

Precipitation.	Rainfall, snowfall, etc.
Background sources	Native forests, Prairie land, etc.

Point sources of pollution can be geometrically defined and the dimensions amenable to mathematical analysis in assessing pollution loads and determining rates of discharge. They may assume any geometrical shape such as circular, triangular, spherical, etc. The area sources of pollutants/contaminants or leachates are comparatively smaller, easily mappable, and readily distinguishable,Bupulu&Sinha(2005).

However, where the input/output load functions from point sources into the hydrogeologic environment are continuous, the polluted/contaminated area may eventually become widespread. Distributed sources of pollutants/contaminants are much more widespread and can rarely be geometrically defined as precisely as a point source. Hence it is more difficult to subject the input/output sources to precise mathematical analysis. Rather a measured and intelligent assumption of the affected area is made for use in modeling and analysis. In heavily polluted/contaminated areas like in students' hostel at ifite Awka, and near Queens's suits in temporary site, UNIZIK, here both point sources and distributed source were occurring together or independent of one another,Egboka(1994).

V. SOURCES OF POLLUTANTS AND CONTAMINANTS

In his prospects and processes human waste management in rural areas Nigeria, Otti(2011) agreed that water pollutants result from many human activities within the areas. Pollutants from industrial sources pour out from the outfall pipes of factories or may leak from pipelines and underground storage tanks. Polluted water may flow from mines where the water has leached through mineral-rich rocks or has been contaminated by the chemicals used in processing the ores. Awka and other residential communities within contribute mostly sewage, with traces of household chemicals mixed in,Nwabineli(1999). Sometimes industries discharge pollutants into city sewers, increasing the variety of pollutants in municipal areas. Pollutants from such agricultural sources as farms, pastures, feedlots, and ranches contribute animal wastes, agricultural chemicals, and sediment from erosion,Stoorvogel&Smeling(1970).

VI. ENVIRONMENTAL/ HEALTH HAZARD IMPLICATIONS

Various environmental problems that can arise as a result of groundwater pollution in the studied area include the potential contamination of surface waters,Ofodile(1988). It was discovered that the imoka rivers, iyi Agu streams, and in the area is recharged by a polluted aquifer with abundant leachates springs. The areas near Aroma, Udoka and Ngozika housing estate where contaminated surface water recharges aquifer that recharges most of the hand dug wells and boreholes. Chemicals used to kill unwanted animals and plants, for instance on farms or in suburban yards, may be collected by rainwater runoff and carried into streams, especially if these substances are applied too lavishly. Some of these chemicals are biodegradable and quickly decay into harmless or less harmful forms,Nwabineli(1998), while others are non biodegradable and remain dangerous for a long time. Nitrates, a pollutant often derived from fertilizer runoff, can cause methemoglobinemia in infants, a potentially lethal form of anemia that is also called blue baby syndrome. Heavy metals, such as copper, lead, mercury, and selenium, get into water from many sources, including industries, automobile exhaust, mines, and even natural soil. Like pesticides, heavy metals become more concentrated as animals feed on plants and are consumed in turn by other animals. When they reach high levels in the body, heavy metals can be immediately poisonous, or can result in long-term health problems similar to those caused by pesticides and herbicides.

VII. CONCLUSION AND RECOMMENDATION

Contamination of surface and groundwater is a major problem in the studied area said byTerzaghi&Peck(1967). It was discovered that parts of Awka urban and rural hydro environment are being polluted with a wide variety of hazardous substances. It is in the bid of struggling to become industrialized without adequate plans to contain the spread and hazards of pollution, within their water bodies. There is little or no public or government awareness because the danger seems to be ignored or overlooked. Government should establish environmental laws and enforced it. Groundwater recharged by leachates needs considerable treatment with lime before it can be used to supply domestic homes and industries.

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