International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 1 Jan. 2023, pp: 920-923 www.ijaem.net ISSN: 2395-5252

# A Review of Ground Water Quality in Urban Areas of Nigeria.

[1]Olaniyi, K.O, [2]Giwa S., [3]Mohammed T.N. [1]Sanni M. and [3]Mafe A.S.

*[1]Department of Science Lab.Technology, [2]Main Library, The Federal Polytechnic Offa, Kwara State.[3]Applied Physics Department Federal Polytechnic Offa Kwara Stata.*

Date of Submission: 17-01-2023 Date of Acceptance: 27-01-2023

**ABSTRACT**
The status of the quality of groundwater in urban areas of Nigeria is reviewed in this paper. This is done to identify the factors influencing the quality of groundwater and possible remedial measures that can be maintained. Studies have shown that groundwater quality is influenced by the geology and geochemistry of the environment, rate of urbanization, industrialization, landfill/dumpsite leachates, heavy metals, bacteriological pollution, and effect of seasons. Remedial measures suggested include protection of water sources, proper handling of wastes and construction of sanitary landfills, control of all land use polluting activities, and treatment of water before is used for consumption. Continuous monitoring of groundwater quality is necessary to forestall any unpleasant consequences.

**Keywords:** Groundwater, Quality, Pollution, Hand dug wells, Boreholes.

## I. INTRODUCTION

This review examines the quality of groundwater in urban areas of Nigeria and the factors that impact upon the quality. Estimating the extend of groundwater contamination has become increasingly essential due to the fact that access to portable water, such as groundwater is a right for human existence and a basic requirement for industrial development and hence economic advancement. Unfortunately, the government have not legitimate a decent way of waste disposal, such that the groundwater would be safe from contamination due to different from of wastes. In some cases, these non-controlled waste sites are situated beside borehole (groundwater supply) which serves as a source of drinking water to the vast populace. Dumpsites located in the vicinity of the borehole cause contamination from landfills often results from leaking "leachate", water that has percolated through waste and accumulated various ions in solution. This forms plumes, which moves from the surface to subsurface (i.e. underlyingaquifers).This is mostly common in developing countries, such as Nigeria ( Abimbola, 2005). These plumes may contain dissolved carcinogens such as heavy metals (i.e. lead, mercury, chromium, sodium, arsenic,e.t.c.), volatile organic compound (VOC) benzene, ethylbenzen,toluene, e.t.c) and less harmful ions (sodium, calcium, iron,sulfate, chlorine, e.t.c.). This contaminant becomes evident as a result of hydraulic contact between the hazardous contents of theleachate plumes and groundwater (Abimbola 2002). Hence, the study andinvestigation of estimating the extent of the groundwater quality in Nigeria is imperative because of the alarming rate of the recent reports on the outbreak of the waterborne diseases, such as diarrhea, typhoid, cholera, dysentery e.t.c. Acids dissolved in water of PH<7 releases hydrogen ions in solution which also enhances electrical conductivity.This concern has attracted overwhelmingattention of researchers in different parts of Nigeria urban areas. This borders on the fact that the public or municipal water supply is inaccessible to a large proportion of urban dwellers, and even where is available the supply is highly inadequate, unreliable and irregular.

Consequently, there is high dependency on untreated groundwater abstracted through hand dug wells and borehole systems (Ocheri, 2006; Ocheri, 2010).According to Forster et al.,(1998) urbanization affects the quality and quantity of underlying sub-surface water by radically changing the pattern and rate of recharge, initiating new abstraction regimes and adverselyaffecting the quality. In this paper, attempt is made to bring together studies carried out on Nigeria urban groundwater quality with the view to ascertaining the current status, trend and possible protection and remedial practice. It is hoped that it will be of interest to researchers, water managers, policy

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 1 Jan. 2023, pp: 920-923 www.ijaem.net ISSN: 2395-5252

makers and the general public since water is used by all.

**Sources of Water**

There are two broad categories of water sources; surface and underground sources.

**a. Surface Water:** This is water that is abstracted directly from streams, rivers and lakes. These sources generally contain larger quantities of turbidity and bacteria than groundwater and often the surface waters of rivers and lakesare polluted by the influx of sewage or industrial wastes. Jim (2008) in an article of Encyclopaedia of Earth identified four principal surface water basins in Nigeria thus;

The Niger Basin (covers an area of 584,193 km2)

The Lake Chad Basin (covers an area of 179,282 km2)

The south-western littoral basins (covers an area of 101,802 km2.The south-eastern littoral basins, (covers an area of 58,493 km2)

**b. Groundwater:** Groundwater is water obtained from wells and springs that feed streams, rivers, and lakes. In its course, groundwater dissolves soluble mineral matter. The ultimate source of all natural potable water on the earth is rain. Groundwater contains high concentrations of dissolved chemicals.Nigeria has extensive groundwater resources, located in eight recognized hydrogeological areas together with local groundwater inshallow alluvial (Fadama) aquifers adjacent to major rivers thus;

The Sokoto Basin Zone (yield range from below 1.0 to 5.0 litters persecond L/s).

**Geologyand Ground Water Pollution**

Fundamental to the study of groundwater in any place is the geology of the environment. Geology is the main controlling factor in groundwater hydrology. The nature and the propertiesof the rock, aquifer specific yield and retention, the chemistry of water are governed by the geology of the environment (Brassington, 1988;MacDonald et al.,2005).According to Sajad et al(1998)the quality of groundwater is a function of natural processes as well as anthropogenic activities, and that the type, extent and duration of anthropogenic activities on groundwater quality are controlled by the geochemical and physical processes and the hydrological condition present (Matthess,1976). Since groundwater is a product of geological formations, some studies examined groundwater quality inrelation to influence of geology in an urban environment.Dupreez and Barber (1965) pioneered ahydrogeochemical investigation across geologicalformation of the northern part of Nigeria. They found that water from basement complex contains calcium or sodium bicarbonate, nitrate in high concentration of health implication. Water samples from cretaceous sediments of upper and lower Benue have elevated concentrations of iron especially in Binia-Yola sand and Yolde formation and also total dissolved solids, sulphate and salinity. Water samples from Jos plateau were found to be of good quality while that of Biu plateau has problem of hardness, alkalinity and salinity. In a similar study,Ezeigbo(1988)examined the influence of geology and hydrogeology on Nigeria environment and noted the following:

(i) high iron concentration was characteristic of groundwater in significant proportions practically inall states of Nigeria.

(ii) excessive concentration of manganese occur in significant proportions in parts of Rivers, Anambra and Imo States

(iii) low pH or acidic water was noted in calcareous rocks of Mamu, Nsukka, Ogwuasi-Asaba and Benin formations.

(iv) mining and processing of metallic ore and coal were noted to have affected both the surface and groundwater sources with high iron, aluminum and sulphate in Enugu coal mine and lead-zinc miningarea of the Benue Trough

(v) water hardness linked with limestone or calcareous rock formation as noted in Asu-group, Odukpani,Ezeaku shale, Awgu-Ndeabo group and Ewekero and Kalamina formation

(vi) salt intrusion in coastal areas as well as inland evaporates deposit in Uburu and Okposi in Imostate.

**UrbanizationandGround Water Pollution**

African cities have a long history of water supplyfrom surface and groundwater sources. However, due to deteriorating quality and quantity of surface water through increased urbanization and industrialization and high cost of developing new dams urban groundwater isviewed as a better option (Adelana et al., 2008).This advantage notwithstanding, urbanization has important overall implications for freshwater use and waste management, and specifically for the development,protection and management of sub-surface water in an urban environment (Eni et al., 2011).In a comprehensive study by Adelana etal., (2005) of groundwater quality of the southeastern parts of Lagos from 1999-2001on the impact of urbanization, found that of the water samples analysed, concentrations of sulphate, nitrate and chloride at objectionable proportion were noted in all the wells. Nitrate particularly was noted to be

very high andis linked with anthropogenic activities. Groundwater in Lagos is particularly vulnerable to contamination due to shallow depth and the unconsolidated permeable sandand gravel aquifer. In a similar study, Eni et al., (2011) assessed the impact of urbanization on the sub-surface water of Calabar town noted water to be acidic, nitrate and faecal coliform to have very high concentration in the wells. Results of multiple regression show faecalcoliform,pH, and chlorine have positive relationship with urbanization. High faecal coliform is often associatedwith the sanitary condition of the environment of the wells. Amadi et al., (2010) examined the effect of urbanization on groundwater quality of Makurdi metropolis. Results of analyses show water samplescollected within the vicinity of dumpsite have low pH,higher concentration of iron, manganese, calcium and total dissolved solids and total coliform when comparedto those far away from the dumpsite suggesting leachate influence. Presence of coliform is traced to sanitary condition of the well. Groundwater type is Ca-SO4. In a related study, Tse and Adamu (2012) in thechemical and bacteriological analyses of hand dug wells in Makurdi town noted water to be slightly acidic,moderately hard, low total dissolved solids. Heavy metalsuch as iron, zinc, copper, lead and cadmium occur in traces, while high concentration of coliform is noted in all the wells.

**Ground Water Quality Status Studies**

Results of a groundwater study in Nigeria in some of the major cities in the southern part, Lagos, Ibadan; in the eastern part, Warri, Benin, and Aba, and in northern part, Kano and Jos indicates that the quality of waters fell far below the WHO recommended levels for some of the quality parameters. The levels of nitrate, lead and coliform index were particularly far above the WHO limits, and some of the waters have higher levels of iron with low pH values. The quality is poor in high density or low-income areas. In addition Lagos waters also showed intrusion of salinity in the localities closer to the coast. Poor ground water quality was attributed to intrusion of silage or gray water, indiscriminate defecation, and dumping of household refuse, industrial and hazardous wastes around the premises. Lead from locally produced gasoline and heavy road traffic in the urban centres, seepage of various leachates, inadequate governmental policies and poor implementation strategies, and indifferent attitudes of communities to the environment are some of the other identified reasons.Our primary concern is the quality of groundwaterexploited for drinking as well as other domestic uses.This is because consumption of water that is pollutedhas serious health implication as such World HealthOrganization has to set safe standards for drinkingwater. This concern has attracted overwhelming studieson the quality status of groundwater abstracted fromshallow wells (hand dug wells) and deep wells(boreholes) for human consumption in urban areas ofNigeria.In a baseline study on the inorganic andmicrobial contaminants of health importance in waterfrom boreholes and open wells in Benin City, Erah etal., (2002)found that all of them were contaminated withabnormal levels of lead, chromium, zinc and faecalcoliform. They concluded that consumption of waterfrom these wells will have serious implications.

## II. CONCLUSION

Studies have shown that Nigerian urban groundwater quality is under pollution threats from geology and the geochemistry of the environment, rate of urbanization, landfill/dumpsite leachates, heavy metals, organic matters and influence of seasons. This portends a danger of health hazard of utilizing groundwater for drinking water without any form of treatment. This calls for appropriate measures to protect and remedy polluted groundwater for safety purposes.Irrespective of source of pollution, the analytical results revealed that ground water from these wells requires further purification to ensure their suitability for human consumption because the levels of some of the water quality parameters exceeded the WHO guidelines for drinking water. There is also need to educate well owners on the implications of inadequate well protection from storm water/runoffs and siting wells near waste sites or septic tanks.

## REFERENCE

[1]. Abimbola, A.F., T.A. Laniyan, O.W. Okunola.,A.A.Odewale.,M.Ajibade, and T. Kolawole.(2005).Water quality test of areas surrounding selected refuse dumpsite in Ibadansouthwestern Nigeria.Journal of Water Resources, Vol.16.pp.39-48.

[2]. Abimbola, A.F., A.M. Odukoya, and A.S Olatunji.(2002). Influence of the bedrock on the hydrogeochemistrycharacteristics of groundwater in northern parts of Ibadan metropolis, Southwestern Nigeria. Journal of Water Resources, Vol.13.pp.1-6.

[3]. Adelana, S.M.A., Bale, R.B., Olasehinde, P. I. and M.Wu.2005.The impact of

anthropogenic activities over groundwater quality of coastal aquifer in Southwestern Nigeria. Proceedings on Aquifer vulnerability and Risks.2nd International Workshop and 4th

[4]. Congress on the Protection and Management of Groundwater. Raggia di Colornoparma.

[5]. Adelana, S.M.A., T. A. Abiye., D.C.W. Nkhuwa., C. Tindinugaya., and M.S. Oga. 2008. Urban groundwater management and protection in Sub-Saharan Africa in: Adelana, S. M. A and Amadi, A.N., Ameh, M.I and P.I.Olasehinde.2010.Effect of urbanization on groundwater quality within Makurdi Metropolis, Benue State. Proceedings,Annual Conference of the Nigerian Association of Hydrogeologists on Water Resources Development and Climate Change.p49.

[6]. Brassington, N.1988. Field Hydrogeology. Geological Society of London, John Wiley.

[7]. Du preez, J.W. and W. Barber.1965.The distribution band chemical quality of groundwater inNorthernNigeria, Geological Bulletin, pp.1-82.

[8]. Eni, D.V., J.Obiefuna., C. Oko., and I. Ekwok. 2011.Impact of urbanization on sub-surface waterquality in Calabar municipalty, Nigeria. International Journal of Humanities andSocial Sciences, Vol.1, Issue 10,pp.167-172.

[9]. Erah, P.O., C.N. Akujieze., and G.E.Oteze.2002. The quality of groundwater in Benin City: Baseline study on inorganic chemical and microbial contaminants of health implicationin boreholes and open wells,Tropical Journal of Pharmaceutical Research, Vol.1,No.2, pp.75-82.

[10]. Ezeigbo, H.I.1988.Geological and hydrogeological influence on the Nigerian environment.Journal of water resources, Vol.2, pp.36-44.

[11]. Forster, D., A.R. Lawrence., and B.B.Morris.1998. Groundwater in urban development. WorldBank Technical Paper No.390, Washington D.C, 121.

[12]. MacDonald, A., Davis, J., Calow andJ.Chilton.2005.Developing groundwater: A guide to rural water supply, ITDGS Publishing. U.K.

[13]. Matthes, G .1976.Effect of man's activities ongroundwater quality. Hydrological Science ITDGSPublishing, U.K.

[14]. Ocheri, M.I. 2006. Analysis of water consumptionpattern in Makurdi metropolis. Journal of Geographyand Development, Vol.1, No.1, 71-83.

[15]. Ocheri, M.I and I.I. Mile.2010. Spatial and temporalvariation in groundwater quality of Makurdi sedimentaryformation. Journal of Geography, Environmentand Planning, Vol.6, No.1, pp. 141-146.

[16]. Sajad, M.M., S.Rahim., and T.Tahir .1998.Chemistryof groundwater of Rawalpinli/Isalama,24th Conference,Islamba.

[17]. Tse, A.C and C.I.Adamu 2012.Assessment ofanthropogenic influence of groundwater in hand dug wells in Makurdi Metropolis in NorthcentralNigeria. Ife Journal of Science, Vol.14, No.1.