Journal Clean WAS (JCleanWAS)

DOI: http://doi.org/10.26480/jcleanwas.02.2025.101.107

ZIBELINE INTERNATIONAL™ PUBLISHING

ISSN: 2521-0912 (Print)
e-ISSN: 2521-0912 (Online)
CODEN: JCOLBF

CrossMark

RESEARCH ARTICLE

ASSESSMENT OF DUMPSITE ON GROUND WATER QUALITY IN IDUNMWOWINA COMMUNITY, BENIN CITY, EDO STATE, SOUTHERN NIGERIA

Maju-Oyovwikowhe, G.E[a]., and Oligie Agholor, M[b]*

[a] Department of Geology, University of Benin, Benin City. Nigeria.
[b] Department of Chemistry, University of Benin, Edo-state Nigeria.
****Corresponding Author Email: machenry.oligie@uniben.edu***

ARTICLE DETAILS

Article History:

Received 10 June 2025
Revised 15 July 2025
Accepted 29 August 2025
Available online 26 September 2025

ABSTRACT

The study was carried out to evaluate the environmental impact of waste dumpsite to the quality of ground water as a major component of the environment using Idunmwowina Community as a case study. A total of fifteen (15) samples of borehole water were collected or sampled at 15 different locations. All samples were subjected to heavy metal determination, physiochemical parameters and bacteriological analysis. The water samples were analyzed to determine its portability and also compared with WHO and NAFDAC standard. The diluent was analyzed using AAS (Atomic Absorption Spectrophotometer). The physiochemical analysis indicated minimum and maximum value range pH (5.1 to 6.8, EC (19.0µs/cm to 167.2µs/cm) Clear Turbidity, Salinity (0.019mg/l to 1.00mg/l), TDS (10.45mg/l to 91.6mg/l) Nitrate (0.730mg/l to 2.408mg/l) Bicarbonate (0.41mg/l to 0.49mg/l) Alkalinity (41.00mg/l to 50.00 mg/l) Sulphate (3.102mg/l to 3.471mg/l) DO (2.11 to 2.46) BOD (2.44mg/l to 3.00mg/l) COD (5.31 to 6.48) and Ammonium Nitrogen (0.13mg/l to 2.11mg/l). The analysis for heavy metal shows Lb (0.01-0.03mg/l), Cd (0.01 mg/l), Ni (Not Detected), Cr (0.06-0.28 mg/l), Fe (0.1 mg/l), Zn (0.01-9.17 mg/l) These values obtained all fall below WHO standard. The quality of samples obtained were seriously compromised as a result of feacal bacteria growth and elevated values of heavy metals such as lead (Pb), cadmium (Cd) and chromium (Cr) in soil and groundwater.

KEYWORDS

physiochemical, heavy metal, groundwater, bacteriological, Analysis

1. INTRODUCTION

1.1 Background Of Study

Dumpsites is a ubiquitous feature in many urban areas, particularly in developing countries where waste management infrastructure is inadequate. Dumpsites are characterized by large piles of waste, including both biodegradable and non-biodegradable materials, which are typically not properly managed or treated. The improper management of dumpsites can result in significant negative impacts on the environment, human health, and the economy, particularly on nearby urban communities. Dumpsites can have profound impacts on groundwater quality due to the presence of contaminants such as heavy metals and organic pollutants. Groundwater resources can be contaminated with pollutants from dumpsites, posing a significant risk to human health and the environment (Maju and Shuaib, 2019).

The conversion of burrow-pits used for road construction, erosion sites and river channels into dumpsites in most parts of the country health safety of any community depends on its environmental sanitation level. In most developing countries, there are still millions of people today that lack adequate hygienic and acceptable domestic waste disposal and treatment methods (Amadi et al., 2012). This situation calls for urgent and practical solutions, not only from environmental and health authorities but also from the individuals concerned. However, due to economic reasons and lack of information on sanitary health protection, improvements are not forthcoming and the situations remain unchanged, hence the need for a paradigm shift in the way and manner wastes are generated and managed.

Proper waste management and efficient system of solid and fluid disposal techniques are lacking in most developing countries. Waste disposal techniques have created subtle and yet serious environmental pollution and ecological deterioration in many developing countries such as Nigeria. The manner in which municipal and industrial wastes generated are disposed in most urban areas in Nigeria is worrisome. The use of inadequate disposal system and lack of consideration of the topography, geology and hydrogeology are the causes of pollution arising from waste disposal in many developing countries (Amadi et al., 2010; Amadi et al., 2012). In Nigeria, open-dump is the most available option for waste disposal in the state capitals as sanitary landfill is rare and unpopular (Elaigwu, et al., 2007).

Complex geochemical processes control the enrichment of heavy metals in groundwater (Adewumi, 2001; Amadi, 2010). The chemistry of groundwater depends not only on natural factors such as the lithology of the aquifer, the quality of recharge waters and the types of interaction between water and aquifer, but also on human activities, which can alter these fragile groundwater systems, either by polluting it or by changing the hydrological cycle (Landerth et al., 1996). The application of conventional refuse and sewage treatment systems in use in industrialized nations may not be realistic for developing countries due to their high cost of construction and maintenance.

Hence, the need to develop a practical home-based waste disposal and treatment system that could be easily integrated into the climatic, geological and socio-cultural conditions existing in these nations is the focus of the paper. This method of waste disposal is environmentally friendly, as well as relatively low system capital and operating cost. It has a simple design that is a function of the local geology and available materials and when adopted and practiced will certainly protect the

Quick Response Code	Access this article online	
	Website: www.jcleanwas.com.my	**DOI:** 10.26480/jcleanwas.02.2025.101.107

Cite The Article: Maju-Oyovwikowhe, G.E, and Oligie Agholor, M (2025). Assessment Of Dumpsite On Ground Water Quality In Idunmwowina Community, Benin City, Edo State, Southern Nigeria. *Journal CleanWAS (JCleanWAS), 9(2): 101-107.*

groundwater from contamination. Municipal wastes and their disposal mechanisms are a great concern in developing countries across the world, as poverty, over-population and rural-urban drift due to urbanization in addition to non-enforcement of existing sanitary laws on offenders as well as poor-funding by governments of these countries are responsible for the inefficient management of wastes (UNEP 2002).

Domestic and industrial wastes contain a number of harmful microorganisms and trace elements and their presence in groundwater can result in an outbreak of water-borne diseases such as typhoid, diarrhea, hepatitis and gastrointestinal infections (Adewole, et al, 2009). Most of these diseases are unfortunately still rampant in most developing countries today and are known to be the causes of many deaths, especially within the vulnerable group (children and women). Poor waste management in these countries favours the outbreaks of water-borne diseases. Therefore, improvement on existing waste disposal methods (open dumps) and introduction of new techniques that quarantee high level of health safety as well as groundwater protection as advocated in this research should be encouraged by concerned stakeholders. In most cities in developing countries, it is common to see huge heaps of domestic and allied wastes such as garbage, plant leaves, damaged agricultural produce, spoiled food materials, pieces of paper, polythene bags, old cloths, wood, abandoned metals, vehicle scraps, used tires, plastics, glass, dust, damaged electronics, industrial wastes, animal wastes, hospital wastes, sanitary pads, pampers, construction materials and demolition debris resulting from over-population, urbanization and industrialization.

When these wastes are improperly disposed, which is usually the case in major cities, they constitute threats to air, land, water and man. During decomposition, it produces bad smell and serves as feeding ground for pests that spread diseases, blockage to drainage channels and creating a myriad of health-related and environmental problems. Leachates from the decomposition of these wastes at dumpsites are potential sources of soil and water pollution. Therefore, the need for an efficient and cost-effective waste management technique that will guarantee protection to the soil, surface and groundwater systems cannot be ignored hence this research seeks to investigate the effects of dumpsites on groundwater quality, as well as the social and economic impacts on nearby urban communities. The study will focus on identifying these contaminants and will use a combination of field investigations, laboratory analyses, and statistical tools to comprehensively their effects on environmental qualities.

2. Materials And Methods

2.1 Description of Study Area

The study area is located along Benin Lagos Road precisely Idunmwowina community in Ovia North-East Local Government Area of Edo State, between latitude 6°26'N - 7°14'N and between longitude 5°35 - 5°36'E. (Figure 1) It shares boundary with Oluku and Evbomore community. The location is made up of highly erosive lateritic top soil. The erosive nature of the location is as a result of the stipe slope of the location which drain to the close borrow pit where sand is piled out for construction and building purposes. The temperature of the area is between 270 - 290 depending on the average sunshine. The vegetation of the area is of a typical rainforest with trees at different canopy level with dense underlay of scrubs. The geological setting of Idunmwowina community confines to Benin formation which is a major geological unit primarily found in southern Nigeria including the Benin region and part of Niger Delta geological basin. The Benin formation is characterized by the following characteristics

It mainly consist of coarse to find grain sand stone often poorly sorted and unconsolidated to consolidated (Abam et al., 2016). The formation include reddish brown to yellowish brown, sandy clay and occasional shale lenses. The sediments are mostly fluviatile river deposit with cross beddings and poorly bedded layers. Stratigraphically the Benin formation is Oligocene to Pleistocene in age, representing the uppermost stratigraphic unit in Niger Delta sequence, overlaying the Agbada and Akata formation. It covers about 95% of the Benin region and extend widely across southern Nigeria and off shore basins.

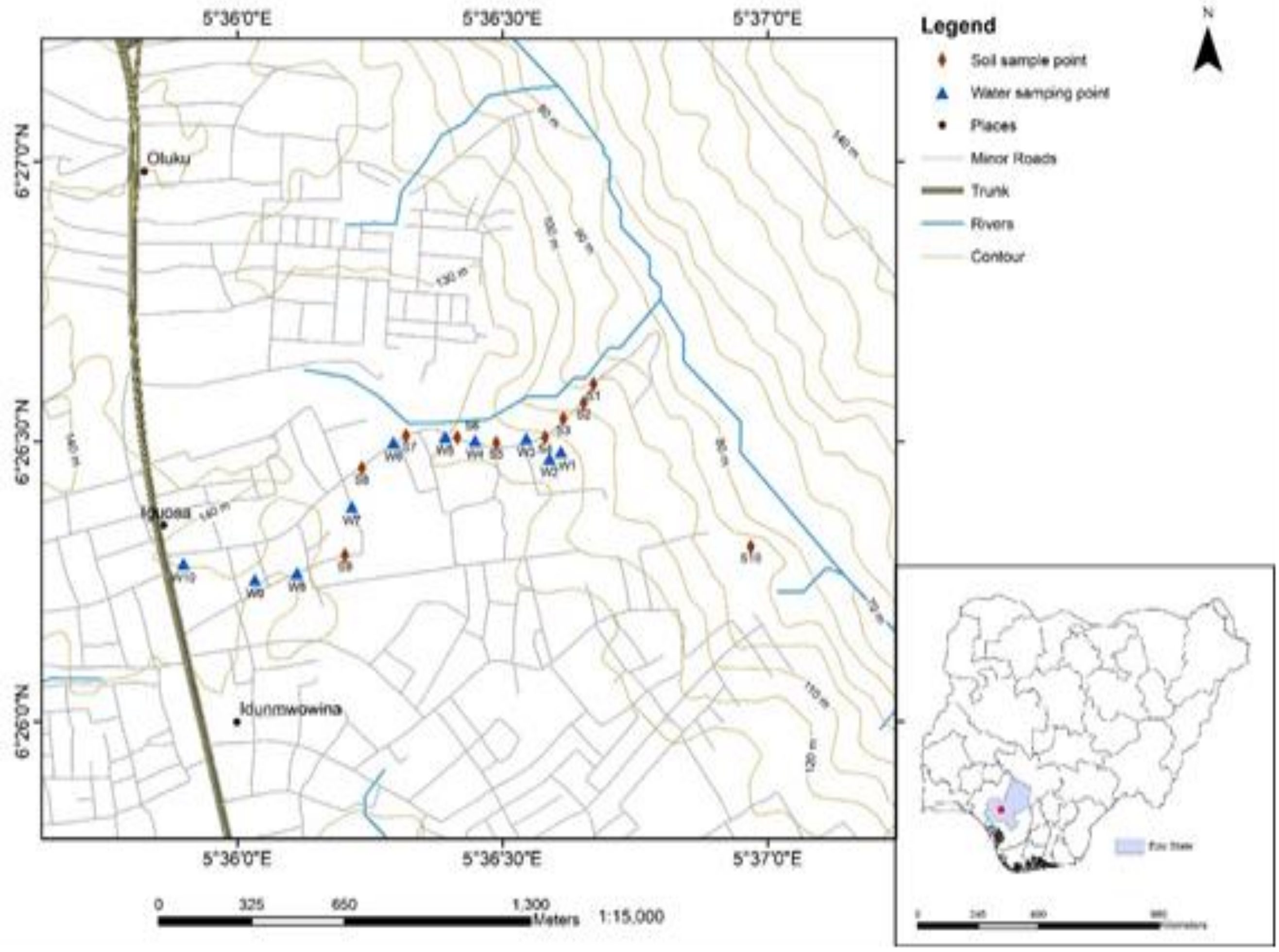

Figure 1: Map showing Point of collection of samples

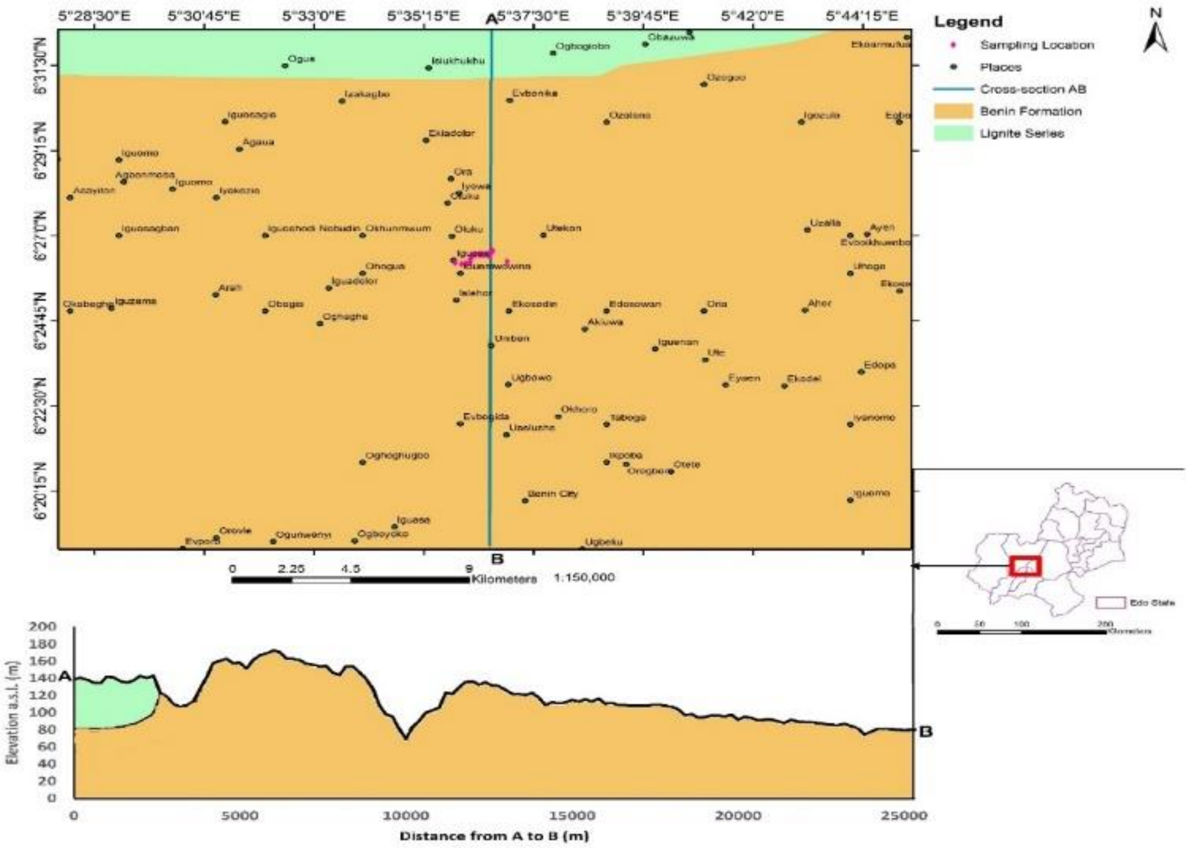

Figure 2: Geological map of study area (Idunmwowina)

2.2 Materials

- Plastic container
- GPS device
- Gloves
- Water collector

2.2.1 Water Sampling

A total of fifteen (15) Borehole water samples were collected randomly in and around the dumpsite. Each sampling location was spaced 25 meters apart to provide a representative spatial distribution of groundwater quality across the study area. The samples were collected using a clear, transparent plastic bottles (500 mL capacity) with properly fitted covers, thoroughly washed and rinsed with borehole water prior to sampling.

2.2.2 Criteria for Sample Selection

- Borehole water samples were chosen based on proximity to the dumpsite.
- Surface water samples were collected from streams based on their flow direction relative to the dumpsite.
- After collection, the water samples were stored in a refrigerator at 4°C to slow microbial growth.

Portions of the samples used for heavy metal analysis were acidified with nitric acid to lower the pH below 2.0 and preserved with 2% hydrochloric acid (Adedokun et al., 2022).

2.2.3 Heavy Metal and Physicochemical Parameters

Selected heavy metal (Pb, Cd, Li, Cr, Fe, Zn, Cu And Mg) were analysed using atomic absorption spectrophotometer (AAS) while Na and K were analysed using flame photometry. The physiochemical parameters, (e.g Ph, electrical conductivity, dissolved solid e.t.c) were also analysed.

2.2.4 Parameters analyzed

pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), turbidity.

2.2.5 Microbiological Contamination

Accessment for microbial contamination (total coliform count and

eschericoli) using membrane filtration and selective media.

Assessed for bacterial contamination (total coliforms, E. coli) using membrane filtration and selective media.

3. Result And Discussion

Table 1: Result Of Heavy Metals Analysis On Borehole Water Samples Using Aas Model 210vgp (Mg/L)

S/N	Sample	Pb	Cd	Ni	Cr	Fe	Zn	Cu	Na	K	Mg
1.	S1	-	0.01	-	0.10	0.1	-	0.01	0.76	-	-
2.	S2	0.02	-	-	0.06	-	-	-	0.37	-	-
3.	S3	0.01	-	-	0.13	-	-	-	1.59	-	-
4.	S4	0.03	-	-	0.05	-	-	-	1.59	-	-
5.	S5	0.01	-	-	0.08	-	0.02	-	1.18	0.79	-
6.	S6	0.02	-	-	0.10	-	-	-	0.36	-	-
7.	S7	0.02	-	-	0.22	-	0.01	-	2	-	-

Table 1 (Cont): Result Of Heavy Metals Analysis On Borehole Water Samples Using Aas Model 210vgp (Mg/L)

S/N	Sample	Pb	Cd	Ni	Cr	Fe	Zn	Cu	Na	K	Mg
8.	S8	0.02	-	-	0.22	-	0.01	-	0.36	-	-
9.	S9	-	-	-	0.08	-	0.01	-	2	-	-
10.	S10	0.03	-	-	-	-	0.02	-	1.59	0.79	-
11.	S11	0.01	-	-	1.10	0.1	0.16	-	0.78	0.79	0.2
12.	S12	0.01	-	-	0.07	-	1.97	0.14	1.59	1.0	-
13.	S13	0.01	-	-	0.28	-	0.10	-	1.59	-	0.2
14.	S14	0.03	-	-	0.02	-	0.04	-	0.77	-	-
15.	S15	-	-	-	0.25	-	-	-	0.37	0.8	-
WHO Standard		0.01	0.003	0.02	0.05	3.0	3.0	2.0	200	NS	20
NAFDAC		0.01	0.003	-	0.05	0.3	5.0	1.0	200	10	20
SON Standard		0.01	0.03	-	0.05	0.3	5.0	1.0	200	10	0.20

Table 2: Results Of Physiochemical Parameters Of Groundwater Sampes Obtained From Idunmwowina Community

S/N	Parameters	Unit	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	S_{11}	S_{12}	S_{13}	S_{14}	S_{15}	WHO
1	Ph	-	5.2	5.6	5.3	5.1	5.5	6.8	5.6	6.3	5.2	5.7	5.6	57	5.8	5.4	5.8	6.50-9.50
2	EC	NS/CM	30.0	19.0	84.5	42.1	42.9	78.8	119.6	38.8	61.8	75.90	167.2	131.00	92.00	156.5	128.30	1200[µs/cm
3	Turbidity																	5.0NTU
4	Salinity	Mg/L	0.019	0.012	0.054	0.027	0.027	0.050	0.077	0.025	0.039	0.049	0.107	0.084	0.054	0.058	0.100	600mg/l
5	TDS	-	16.67	10.45	46.48	23.16	23.60	43.30	65.78	21.07	33.99	41.75	91.96	72.05	50.86	86.07	70.57	600mg/l
6	Nitrate	-	0.807	1.120	1.109	0.881	0.738	1.108	1.456	0.830	2.469	1.378	1.678	2.114	1.315	1.626	1.498	3mg/l
7	Carbonate	Mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	500mg/l
8	Bicarbonate	-	0.43	0.440	0.430	0.41	0.44	0.5	0.48	0.51	0.42	0.45	0.45	0.46	0.48	0.43	0.49	200mg/l
9	Alkalinity	-	43.00	44.00	43.00	4.100	44.00	50.00	48.00	51.00	42.00	45.00	45.00	46.00	48.00	43.00	49.00	500mg/l
10	Sulphate	-	3.408	3.219	3.426	3.471	3.214	3.102	3.405	3.120	3.404	3.372	3.220	3.241	3.230	3.416	3.301	400mg/l
11	Dissolve oxygen	-	2.20	2.21	2.46	2.38	3.16	2.30	2.24	2.16	2.37	2.58	2.11	2.31	2.40	2.11	2.42	2mg/l
12	BOD	-	2.73	2.84	3.06	2.49	3.62	2.78	2.77	3.10	2.44	3.00	2.57	3.12	3.00	3.10	2.86	3mg/l
13	COD	-	5.31	5.44	5.86	6.11	6.48	5.43	6.07	6.50	5.73	6.01	5.12	5.70	6.04	6.00	6.13	10mg/l
14	Ammonium nitrogen	-	0.71	0.47	0.18	0.13	0.64	1.03	0.85	2.11	0.97	1.15	0.47	0.53	0.49	0.16	0.20	1.5mg/l

Table 3: Showing The Mean Of The Minimum Value Of Physiochemical Parameter

Parameters	Minimum Values	Maximum Values	Mean	WHO	NAFDAC	SON
PH	5.1	6.8	5.95	6.50 – 9.50	6.50 – 8.5	6.5 – 8.5
EC (µs/cm)	19.0	167.2	93.1	1200(µs/cm)	1000(µs/cm)	1000(µs/cm)
Turbidity	-	-	-	5.0 NTU	5.0 NTU	5.0 NTU
Salinity	0.019	1.00	0.50			
TDS	10.45	91.69	51.07	1500mg/L	500mg/L	500mg/L
Nitrate	0.738	2.468	1.603	50mg/L	10mg/L	10mg/L

Cite The Article: Maju-Oyovwikowhe, G.E, and Oligie Agholor, M (2025). Assessment Of Dumpsite On Ground Water Quality In Idunmwowina Community, Beni n City, Edo State, Southern Nigeria. Journal CleanWAS (JCleanWAS), 9(2): 101-107.

Table 3 (Cont): Showing The Mean Of The Minimum Value Of Physiochemical Parameter

Parameters	Minimum Values	Maximum Values	Mean	WHO	NAFDAC	SON
Carbonate	-	-	-			
Bicarbonate	0.41	0.49	0.45			
Alkalinity	41.00	50.00	45.50	100mg/L	100mg/L	100mg/L
Sulphate	3.102	3.471	3.287	500mg/L	100mg/L	100mg/L
Dissolve Oxygen (mg/L)	2.11	2.46	2.29			
BOD (mg/L)	2.44	3.00	2.76			
COD (mg/L)	5.31	6.48	5.91			
Ammonium Nitrogen (mg/L)	0.13	2.11	2.24			

Table 4: Showing Microbial Growth Distribution Of Selected Water Samples

SAMPLES	TOTAL MESOPHILIC COUNTS (cm/ml)				TOTAL COLIFORM COUNTS (cm/ml)				FEACAL COLIFORM (E. Coli)				STREPTOCOCCUS FEACALIS				FUNGI/YEAST				REMARK
	P 1	P 2	A V	TOTAL	P 1	P 2	A V	TOTAL	P 1	P 2	A V	TOTAL	P 1	P 2	A V	TOTAL	P 1	P 2	A V	TOTAL	
S1	100	200	150	$1.5x10^3$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ACCEPTABLE
S2	100	100	100	$1x10^4$	150	200	175	$1.75x10^3$	350	250	300	$3x10^4$	0	0	0	0	0	0	0	0	NOT ACCEPTABLE
S3	150	200	175	$1.75x10^3$	50	150	200	$2x10^3$	0	0	0	0	0	0	0	0	0	0	0	0	NOT ACCEPTABLE
S4	100	200	150	$1.5x10^4$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ACCEPTABLE
S5	250	150	200	$2x10^4$	100	100	100	$1x10^3$	0	0	0	0	0	0	0	0	800	700	750	$7.5x10^7$	NOT ACCEPTABLE

4. DISCUSSION

4.1 Physiochemical Parameter

4.1.1 Temperature

The temperature of the water sample from PTW 1 to PTW10 shows a slight difference in values from 27°C to 28.5°C.

4.1.2 Colour

The colour of water collected from all borehole appear clear and colourless

4.1.3 Odour/Taste

The water samples colour from PTW 1 to PTW 10 is seems odourless with little inspiring taste at some point. This is determined with the eyes and tongue using physical human sense organ.

4.1.4 pH

The pH of the sample of water from PTW 1 to PTW 10 were all carried out at instant i.e at point of collection during direct pumping of the water. It is found to range 5.1 – 6.3 which shows weakly acidified to slightly alkaline. This may shows that there is probably no dissolve carbonate and little or no hydroxide ion.

4.1.5 Total Dissolved Solid

This is also known as total salt concentration which determines the freshness of the water. All sample of water ranges from 10.45mg/l to 91.96mg/l. Based on the classification on the hardness of water, the water sample ranges from soft to moderate. The values for all samples also fall below the recommended WHO values for portable water which stands for 500mg/l.

HEM (1970) classified water according to the table below

HARDNESS	CLASS (mg/l)
Soft	0 – 60
Moderate	61 – 120
Hard	121 – 180
Very hard	> 180

Three of the borehole samples are soft and eleven of the borehole samples from table 4.6/S2, S8, S6.are moderate.

The moderate value might be the influence of silicate minerals such as MgSO4 on the parent rock forming major composition of the aquifer.

4.1.6 Nitrate NO3

Nitrate is a major component or end product of Nitrogen cycle. Its influence is due to the breakdown of biological species in the water.

The dissolve nitrate value of Idunmwowina ranges from 0.807mg/l → 2.469. The highest value according to WHO for potable water is 10mg/l. All borehole sample recorded values below the WHO standard value.

4.1.7 Bicarbonate

The bicarbonate value for the samples collected at Idunmwowina varies from 0.41mg/l – 0.49mg/l. All values are below WHO standard.

4.1.8 Electrical Conductivity

The value of EC obtained from the borehole well ranges from 19µs/cm – 156.5µs/cm. All water samples tested were below WHO standard for potable water. This show relative low electrical conductivity of dissolved ion in the water.

4.1.9 Total Alkalinity

The total alkalinity which is the tendency of water to resist acidification. It is the measurement of the concentration of all alkaline substance dissolved in the water that can attack and release hydrogen ion. The result of total alkalinity ranges between 43mg/l to 51.00mg/l which is below WHO Standard.

4.1.10 Sulphate

Sulphate particles are acid and when exposed to water form sulphuric acid. The value of the sample collected at all location ranges fr4om 3.120mg/l – 3.426mg/l. These values are all below WHO standard which stipulate 400mg/l.

4.1.11 Dissolve Oxygen

Dissolved oxygen values ranges from 2.1mg/l – 3.16mg/l which are all below WHO standard. Water at low temperature contain high amount of oxygen (dissolved) while higher water temperature have low amount of dissolve oxygen.

4.1.12 BOD

The BOD values obtained from all borehole water range 2.44mg/l to 3.62mg/l. The values fall below WHO standard of 5.00mg/l.

4.1.13 COD

COD values obtained from all the various sample of water collected at all location ranges from 6.50mg/l – 5.3mg/l. These value fall below WHO standard 10mg/l.

4.2 Bacteriological Results

4.2.1 Total Mesophilic Counts

The total mesophilic counts ranged from 100 to 250 cfu/ml, indicating microbial contamination.

4.1.2 Total Coliform Counts

The presence of total coliforms in samples S2 and S3 indicates fecal contamination.

4.2.3 Fecal Coliform (E. Coli)

E. Coli was detected in samples S2 and S3, indicating unsafe water for consumption.

4.2.4 Streptococcus Faecalis

Streptococcus faecalis was not detected in any sample.

4.3 Heavy Metals

4.3.1 Lead Pb

The maximum value for lead by WHO is 0.01mg/l, NAFDAC is also 0.01mg/l and also for Standard Organization of Nigeria (SON). Lead was investigated in the sample collected from point 1 to point 15. It was observed that the value obtained was above the permissible limit set up by various regulation bodies. Those high value render water unsuitable.

Based on the value obtained at various point from borehole sample (S1) to (S14), the value is relatively insignificant at $p > 0.05$ compare to WHO. Sample S4, S5,S6, S7, S8, S9, S10, S11, all have value ranging from 0.02mg/l – 0.03mg/l which is relatively high other water were relatively safe from lead combination. Cadmium Cd The value of cadmium in the sample analyzed from point S1 to S15 falls below the permissible units of most regulatory bodies including WHO, NAFDAC and SON. Most of the samples from point S2 to S15 were all below detectable limit showing that cadmium was almost unavailable in the water sample.

From fig 4.3 concentration of cadmium in water from Idunmwomwina community, Cd concentration was significant at $p > 0.05$ compare to WHO. the high value of cd may be associated with the deposition of highly eletroplated materials and heay machine oil in the dump site weathering of parent rock, burning associated with waste management. Nickel Ni Nickel is relatively below detectable value as it is almost significantly absent. Fig 10 show no bar as compared to WHO Nickel The water sample shows no significant value as the trace metal is below detectable limit as shown by fig 4.4 Chromium Cr The value of water sample for chromium analyzed shows variable increased in the value of chromium is above the limit standard set by WHO, NAFDAC and SON. Sample at location S11 shows a very high value of 1.10 as compared to 0.05

Fig 4.5 shows concentration of Cr in water from Idunmwomwina community which was significant at $p > 0.05$ compare to WHO standard with other sample value not significantly different at the top of the bar Iron Fe The value of iron from water analyzed fall far below the standard value of WHO with point S1 and S11 having detectable value as shown in fig 4.6 Zinc Zn The value of zinc fall below the limit with sw12 showing high; increasing value in zinc concentration. Zinc concentration varied from 0.01 to 1.57mg/l within the WHO standard of 3.0mg/l. The high value of Zinc could be associated with the dumping of batteries, electronics parts and eroding galvanized materials housed by the dump site. Copper Cu Copper is almost undetectable but little trace were read at point S12 and S1. All value falls below range of WHO

5. Conclusion

The analysis of soil and borehole water samples from the Idunmwowina community reveals significant heavy metal contamination, particularly for lead, cadmium, and chromium. The physicochemical parameters indicate slightly acidic to neutral water, while the microbial analysis shows contamination with fecal coliforms. The contamination of both soil and groundwater poses significant non-carcinogenic and carcinogenic health risks. Contamination is primarily due to the nearby dumpsite and waste management practices. The study confirms that groundwater quality in the Idunmwowina Community are significantly affected by the nearby dumpsite, which is a major source of contamination. Elevated levels of heavy metals and microbial contamination in borehole water make it unsuitable for consumption, posing severe health

Recommendation

The following recommendations are suggested:

- Relocate the Dumpsite: Move it away from residential areas to reduce contamination risk.
- Improve Borehole Drilling Practices: Drill boreholes at least 100 m away from dumpsites.
- Hydrogeological Survey: Identify groundwater flow direction to assess contamination spread.
- Treat Borehole Water: Use chlorination to reduce microbial contamination.
- Enforce Waste Disposal Regulations: Prevent illegal dumping and contamination by enforcing strict disposal regulations.
- Public Awareness and Education: Educate the community on the health risks associated with contaminated soil and water. Promote alternative drinking water sources
- Regular Monitoring: Conduct regular monitoring of soil and groundwater quality around dumpsites. Implement early warning systems for contamination.

References

Adaewumi, J.K., and Odukoya, A.M., 2011. Impact on industrial affluent on ground water quality in the Ogun river Nigeria. Journal of applied sciences and environmental management, 5 (1), Pp. 65-73.

Adedokun, S.A., Ogbiye, A.S., and Erah, P.O., 2022. Assessment of heavy metal contamination in slid water sample. Journal of environment monitoring and assessment, 194, Pp. 1-12.

Adewole, M.B., Olobatoke, R.A., and Adesoye, P.B., 2009. Assessment of the Level of some Heavy metals in soil and Cassava (manihot esculenta) from a contaminated area in Ojota, Lagos, Nigeria. Journal of Environmental Sciences and Health, 44 (6), Pp. 557-564.

Amadi, A.N., Olasehinde, P.I., Okunlola, I.A., and Okoye, N.O., 2012. Geostatistical Assessment of Groundwater Quality from Coastal Aquifers of Eastern, Niger Delta, Nigeria. Geosciences, (2), Pp. 51-59 doi: 10.5923/j. geo. 201202.02

Amadin, J.J., Okieimen, F.E., and Oyibe, E., 2010. Comparative Study of the Levels of some Heavy Metals in Borehole and Well waters in Benin City, Edo State, Nigeria. Journal of Applied Sciences and Environmental Management, 14 (2), Pp. 13-18.

Elaigwu, C.M., Ajayi, O.O., and Akpa, G.O., 2007. Physicochemical Characteristics and Heavy Metal Levels in Sediments of River Benue, Nigeria. Journal of Environmental Sciences and Health, 42 (7), Pp. 831-838. Doi: 10.1080/03601230701557288

Landerth, B., Kuppers, S., and Hosel, W., 1996. Comparative study on the influence of aeration on the bacterial community in a membrane bioreactor. Water Research, 30 (10), Pp. 2385-2394. doi: 10.1016/S0043-1354(96)00143-5

Maju-Oyovwikowhe, G.E., and Shuaib, 2019. Physiochemical Characteristics and Heavy Metal Levels of Water from Hand Dug Wells in Ikiran Ile.

National Agency for Food and Drugs Administration and Control, 2016. Guidelines for Drinking Water.

Standard Organization of Nigeria, 2016. Guideline for Drinking Water.

WHO, 2016. Guidelines for Water Quality.

WHO, 2016. Maximum Permissible Microbiological Limit.