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Original Research Article

Assessment of Physicochemical Parameters in Wet and Dry Season of Surface Water from Choba River, Rivers State, Nigeria

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Abstract: Water pollution is a worldwide issue caused by human interference with nature. The physicochemical variables of water samples of the New Calabar River, Choba section were studied to develop guideline data on the pollution status. Water samples were obtained from three stations based on effluent characteristics. The physicochemical characteristics were analysed using standard conventional techniques. The findings showed the difference concentrations of selected physicochemical parameters with the use of one- way ANOVA to analyze the results in three locations. During the study, the physicochemical parameters of surface water in wet and dry seasons were measured using standard methods for temperature, total dissolved solids, turbidity, electrical conductivity, pH, salinity, dissolved oxygen, chemical oxygen demand, and nitrate. The results showed that temperature varied between $27.90^{a} \pm 0.97$ and 29.02 ± 1.71^{a} °C across the stations and in both seasons with a mean TDS of 172.52 ±2.43 which is significantly different across stations and between the seasons. Turbidity recorded the highest value of $22.98^{a} \pm 12.66$ NTU in station 1. All the values recorded in the three station in both dry and wet season were above the permissible limit. Higher and lower conductivity value of 474.03 ± 5.37^{a} and 279.17 ± 5.92^{c} µS/CM was recorded in station 1 and 3 during the dry season. pH of surface water varied from 7.08 ± 0.27^{b} to 8.53 ± 0.22^{a} Mg/l in the two seasons while a higher salinity was recorded during the dry season across the stations. DO ranged from $5.53^{c} \pm 0.88$ to 6.65 ± 0.24^{a} mg/l across the stations and in both seasons. Others were COD that ranged from 120.02 ± 2.36^{c} to 223.02 ± 5.67^{a} mg/kg in both seasons. Turbidity and nitrate were above the WHO and NESREA permissible limit. There was a seasonal variation between the dry and wet season in most of the parameters studied. This study has shown that despite the visibility anthropogenic activities in the study area, the surface water is still relatively clean. There should be continues monitoring of the water body.

Keywords: Physicochemical, Parameter, Pollution, Effluent, Concentration, Permissible, Limit, Dry, Wet, Season.

INTRODUCTION

As a source of life, a medium for economic activity, and a conduit for the transfer of atmospheric moisture, surface water bodies like lakes, streams, and rivers are among the most important and dispersed renewable resources on Earth (Barlkrishan, 2011). Water as an essential element is needed for survival of life on planet earth. Every organism depend on water for their survival. The environment in which these organisms live can be air, water, soil, or sediment. In most cases, there is no discrepancy between the contrasting media as they could drift into each other. The natural contamination of water, for example, are conveyed into the water through the soil medium, such as surface runoff during the rainy season or radioactive fallout during the dry season. It has the potential to permeate the ecosystem and end up as silt at the bottom of rivers, lakes, and seas (Wonodi and Ekpete, 2021). The standard of drinking water is a major indication of the good health of an organism. There is a need to make certain that the water is clean and pure to prevent health implications that emerge from the

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utilization of polluted and contaminated water (Okumgba and Ozabor, 2014).

Further, the fast industrialization and the evolution of rural areas had given rise to constant increase in population and a tenacious growth in the contamination of water bodies. The anthropogenic venture has had a first-hand impact on the atmospheric environment. However, some of these pollutants are through natural channels such as the decay of organic matter, synthesis by micro-organisms, volcanic eruptions, and plants. This Human-made engendered pollution results as a direct outcome of man's intervention with the natural environment, such as pollution from commercial and domestic activities, bush-burning, mining, vehicular exhaust releases, sewage water, Pharmaceuticals, industrial effluents, bunkering activities, etc. (Ekpete, 2019). Contaminant in wastewater released from sewage and industries contribute hugely to oxygen demand and nutrient loading of the water body, stimulating harmful algal blooms and destabilizing the aquatic ecology (Morrison *et al*., 2001). Temperature, total dissolve oxygen, turbidity, electrical conductivity, salinity, nitrate and chemical oxygen demand are some of the important factors that play a vital role for the growth of living organisms in the water body. That is to say water quality evaluation involves the analysis of physico-chemical, biological and microbiological parameters that reflects the biotic abiotic status of the ecosystem (Smitha and Shivashankar, 2013). It should be noted that any changes in physico-chemical, biological and microbiological parameters of a water body will lead to a very serious problem in the biotic components and destabilize the equilibrium of an ecosystem. This study evaluates the physico-chemical properties of surface water along the Choba section of the New Calabar river.

MATERIALS AND METHODS

The study area is the Choba section of the New Calabar River, located in the coastal zone of the Niger Delta in Nigeria, between 7°60' east longitude and 5°45' north latitude, directly flowing into the Atlantic Ocean. Riverbank operations such as logging, forestry, and dredging can cause large-scale river pollution. The river is subject to effluent discharged from industries located along its banks. Surface run-off from soil erosions, lumbering activities, forestry operations, dredging activities may lead to wide scale contamination of the river (Dienye and Woke, 2015). NCR receives fresh water, industrial effluent and domestic water from water front settlement and communities along the river (Kpee, 2012). Industries and companies that indulged in the discharge of wastes into the NCR include among others Dufil Primer, Eagle cement, Oando Energy Resources, etc. The New Calabar River pass through Aluu in Ikwerre Local Government Area to Bakana in the Degema Local Government Area of Rivers State and are linked to the ocean (Nwineewii and Unochukwu, 2018). This research was carried out due to various human activities in the area. In the upper reaches of the river, they are mainly farmers and fishermen. Their activities have contributed to the pollution of the river. There is a high degree of oil production and exploration activities in the downstream area; in addition, some companies located in the area directly or indirectly discharge their waste into the water body. A total of three different sampling sites were selected from the Choba section of the NCR. They include Choba Bridge, the Choba slaughter market and Dufil Primer foods discharge point. These locations were chosen based on accessibility, slightly different waste, low tide zone, and economic activities on their territory.

Table 1: Sampling locations and their coordinates on river water samples

Code	Sampling locations	Coordinates	Human activities at location
CHS_1	Effluent discharge point of Dufil prime foods limited	NO 4^0 52.874 E006^0 58.995	Discharge of waste water and effluent from the company's production
CHS_2	Slaughter Market	NO 4^0 53.319" E006^0 55.887"	Fish, boat operation, abattoir, market waste
CHS_3	Between bridge and market	NO 4^0 52.489" E006^0 56.789"	No fishing, water calm

CHS1------------- Choba station 1
CHS2--------------Choba station 2
CHS3--------------Choba station 3

Study Approach

The human activities and industrial operations that occur at the various stations of this study accounts for the reason of this investigation. People dwelling along the river are mostly farmers, fishermen and small scale business owners whose activities contribute to a large extent in polluting the river. Industrial effluents are in most cases discharged directly or indirectly into the river. A total of three different sampling sites were selected from the Choba section of NCR. They are between the Choba Bridge and market, the Choba slaughter market and Dufil Primer discharge point (Table

1). Surface water was sampled for the determination of the following Physico-chemical parameters: Temperature, total dissolved Solid (TDS), turbidity, conductivity, pH, salinity dissolved oxygen (DO), biochemical oxygen demand (BOD), nitrate.

Collection of Surface Water

The plastic bottles for the collection of surface water sample were washed with water and rinsed with nitric acid. The surface water samples were collected in 2 litre capacity plastic bottles with screw cap at 2cm depth and 5ml of concentrated nitric (HNO3) acid was added to preserve the metals. The water sample for biochemical oxygen demand and dissolved oxygen were collected differently with great care in two sets of 250ml glass stoppered reagent bottles and wrapped in dark polyethylene bags to prevent light which can lead to production of DO. The sample was fixed with Winkler I and II reagents.

Determination of Physicochemical Parameters

Determination of Temperature (^{0}C):

The surface water temperature was measured at each station using a temperature meter. The probe of the meter was dipped into the river water and the reading was taken on the screen of the meter when it was stable.

Determination of Total Dissolved Solid (TDS):

The total dissolved solid (TDS) were obtained by filtration and evaporation methods. Filter paper was used to filter the sample and the filtrate was dried in an oven at 190°C. A desiccator contain silica gel was used to cool the dish and both the dish and the content was weighted to record the increase in weight which represents the TDS of the sample (Golterman *et al*., 1978).

Determination of Turbidity:

This was measured with the aid of a turbidimeter GLI model MG 99701-0. The probe was immersed in the water sample and the reading taken from the digital display on the instrument.

Determination of Conductivity:

This was measured with conductivity Scan Meter model 1560. The probe of the meter was rinsed with demineralised water, for each measurement. The probe was thereafter immersed in the sample contained in a clean beaker and the instrument switched on for a stabilized digital display value expressed in µs/cm.

Determination of pH:

The water sample was collected into a 1000ml flask and the pH meter was used to determine the pH of the water *in situ*. Measurements were taken four times and the average determined (APHA,1998).

Determination of Salinity: Salinity was determined by titrating aliquot of $AgNO_3$(aq) Solution. Potassium Chromate was used as an indicator.

Determination of DO:

Winkler method was used to measure dissolved oxygen. 5m1 manganese sulphate, 5ml alkali iodide azide, 1ml concentrated sulphuric acid (H_2SO_4) and 1ml of starch indicator was added to an aliquot of 100ml which was withdrawn from the treated water sample and stirred. The solution was then titrated with standard 0.025m sodium thiosuiphate ($Na_2S_2O_3.5H_2O$) until the blue colour changes to colourless indicating end point (Best *et al*., 2007). The volume of the sodium thiosulphate ($Na_2S_2O_3.5H_2O$) used was recorded and calculated. DO (mg/l) = volume of 0.025M $Na_2S_2O_3.5H_2O$ used.

Determination Chemical Oxygen Demand:

COD was determined using the titrimetric method (APHA,2005). Anti-bumping granules were introduced into a reflux flask. Twenty millilitres (20ml) of the sample were measured into the refluxing flask and 2ml of 20% m/V mercuric sulphate solution was added and swirled. Ten millilitres (10ml) of 0.021M potassium dichromate were added to the mixture. Using a dispensing pipette, 30ml of concentrated sulphuric acid containing silver sulphate was also added. The contents in the flask were fitted to a condenser and refluxed for 1 hour. After 1 hour, the flask was removed and allowed to cool for approximately 10 minutes. The condenser was washed with distilled water and then the content of the flask was diluted to 100ml. Two drops of Ferroin indicator were added to the content in the flask and the residual dichromate was titrated with standardized ferrous ammonium sulphate. The COD was obtained using equation 1 below:

COD mg/l = (Vb - Va) x 8000 x M/volume of sample

Where:

Vb = average number of ml ferrous ammonium sulphate used in titrating the appropriate blank.

Determination of Nitrate (NO_3^-) (Colorimetric Method):

Ten (10) cm3 of the water sample was transferred into 25ml volumetric flask. Then 2m1 of Brucine reagent (dimethoxystrychnine-$C_23H_26O_4N_2.2H_2O$) was added, followed by the addition of 100ml of concentrated $H_2SO_4^-$. The content was mixed for about 30 seconds and allowed to stand for 30 minutes. The flask was air cooled for 15 minutes, made up to the mark, and the absorbance was measured by portable datalogying spectrophotometer model DR12023 at the wavelength of 470nm. Standard nitrate solution was prepared by dissolving 0.8g of KNO_3 in 500cm^3 of distilled water. 0.5cm^3 of chloroform was added in order to preserve it. Aliquots having concentrations range of 0.01-2.OM of (NO_3^-) were prepared from stock solution and used to obtain a calibration curve. The absorbance obtained for each sample was compared to the calibration curve and the concentration of nitrate in each sample was obtained.

RESULTS

Physicochemical Parameters of Surface water samples in dry and wet season analyzed. The results of the physical, chemical, gross organic and nutrient parameters obtained from Surface Water samples are presented in tables 2-7 below.

Table 2: Physical Parameters of Surface water Sample from three stations along the New Calabar River (Dry season)

Parameters	CHS_1	CHS_2	CHS_3	Mean ± SD	WHO,2011	NESREA
Temperature (^{0}C)	29.02 ± 1.71^a	28.85 ± 0.97^a	28.27 ± 1.41^a	28.71 ± 0.37	30	Ambient
TDS (Mg/L	223.02 ± 5.67^a	174.43 ± 7.10^b	120.12 ± 2.36^c	172.52 ±2.43	2000	500
Turbidity (NTU)	13.22 ± 0.35^a	12.55±0.30^b	11.13±0.64^c	12.30±0.19	15	5.0
Conductivity (µS/CM)	474.03±5.37^a	386.10±49.10^b	279.17±5.92^c	373.77±0.57	500	1000

Table 3: Chemical Parameters of Surface water Sample from three stations along New Calabar River (Dry season)

Parameters	CHS_1	CHS_2	CHS_3	Mean ± SD	WHO, 2011	NESREA
pH	8.53±0.22^a	8.00±0.37^b	7.08± 0.27^b	7.87±0.03	6.5-8.5	6.5-8.5
Salinity (ppt)	159..55±0.65^b	195.61± 1.57^a	129.94± 0.53^c	161.15±0.59	200-250	500

Table 4: Gross organic and nutrient Parameters of surface water Sample from three stations along New Calabar River (Dry season)

Parameters	CHS_1	CHS_2	CHS_3	Mean ± SD	Who 2011	NESREA
Do (mg/L	6.65 ± 0.24^a	6.10 ± 0.22^b	5.53 ± 0.88^{ab}	6.09 ± 0.38	30	Ambient
COD (MG/L	223.02±5.67^a	174.42± 7.10^b	120.02±2.36^c	172.52±2.43	2000	500
Nitrate (mg/L)	43.54 ± 1.15^a	33.32 ± 2.03^b	19.40 ± 1.79^c	32.09 ± 0.45	15	5.0

Table 5: Physical Parameters of Surface water Sample from three stations along the New Calabar River (Wet season)

Parameters	CHS_1	CHS_2	CHS_3	Mean ± SD	WHO, 2011	NESREA
Temperature (^{0}C)	29.40^a ± 2.38	28.77^a ± 1.98	27.90^a ± 0.97	27.51 ± 0.29	30	Ambient
TDS (Mg/L	168.00^a ± 28.87	167.43^c ± 28.72	167.97^b ± 28.72	168.20 ±28.87	2000	500
Turbidity (NTU)	22.98^a ± 12.66	21.12 ± 0.33^c	22.13^b ± 0.41	22.67 ± 0.49	15	5.0
Conductivity (µS/CM)	349.43^{abc} ± 43.59	349.43 ^{abc}±43.59	349.43 ^{abc} ± 43.59	349.43 ± 43.59	500	1000

Table 6: Chemical Parameters of Surface water Sample from three stations along New Calabar River (Wet season)

Parameters	CHS_1	CHS_2	CHS_3	Mean ± SD	WHO, 2011	NESREA
pH	7.87^a ± 0.37	7.67^b ± 0.43	7.47^c ± 0.43	7.67 ± 0.43	6.5-8.5	6.5-8.5
Salinity (ppt)	150.73^a ± 1.75	140.34^b ± 0.09	109.15^c ± 0.16	146.15 ± 0.57	200-250	500

Table 7: Gross organic and nutrient Parameters of surface water Sample from three stations along New Calabar River (Wet season)

Parameters	CHS_1	CHS_2	CHS_3	Mean ± SD	Who 2011	NESREA
Do (mg/L	6.50^a ± 0.35	6.47^b ± 0.43	6.40^c ± 0.45	6.46 ± 0.42	30	Ambient
COD (MG/L	223.02±5.67	174.42± 7.10	120.02±2.36	172.52±2.43	2000	500
Nitrate (mg/L)	31.83^a ± 13.55	26.53^b ± 7.57	19.26^c ± 2.83	25.87 ± 5.37	15	5.0

Means with superscript a, b and c are significant different at $p < 0.05$ across rows

The result above revealed that turbidity and nitrate were above the permissible limit by WHO, 2011 and National Environmental Standards and Regulatory Enforcement Agency (NESREA) in both dry and wet seasons. Turbidity recorded 13.22 ± 0.35^a Mg/l in station 1 during the dry season as against 22.98^a ± 12.66 Mg/l in wet season in the same station. Nitrate recorded 43.54 ± 1.15^a Mg/l and 31.83^a ± 13.55 Mg/l in dry and wet season in station 1 respectively.

DISCUSSION

The use of water is influenced largely by its physical and chemical characteristics, which to an extent is used to evaluate the condition of water (Courtney and

Clement, 1998). In an aquatic environment, the initial signs of pollution can be detected from the deterioration of surface water quality. Consequently, the importance of evaluation of surface water quality cannot be over emphasised in any environmental study, as it is pertinent to ascertain its quality and the ability to sustain aquatic life and the aquatic ecosystem production.

Temperature

In this study, the water temperature was relatively uniform throughout the period of the study with measurable differences across the two seasons. The temperature ranged between $27.90^{a} \pm 0.97$ and $29.40^{a} \pm 2.38$ ^{0}C all through the study period. This temperature was within the acceptable range of 20^{0}C – 30^{0}C as recommended by the Federal Ministry of Environment of Nigeria and World Health Organization (FMEnv., 2001, WHO,2011). The results were in agreement with previous work done by Vincent –Akpu and Nwachukwu (2016) and Green *et al*., 2023 in Iwofe river. Higher temperature values in the dry season were observed by Wokoma and Umesi, (2017) and Ogolo *et al*., (2017), while Sikoki and Zabbey (2006) noted a drop in temperature during the wet season which was attributed to heavy rainfall.

Total Dissolve Solid (TDS)

Dissolve oxygen in this study ranged from 120.12 ± 2.36^{c} to 223.02 ± 5.67^{a} Mg/l in the dry season, while that of the wet season ranges from $167.43^{c} \pm 28.72$ to $168.00^{a} \pm 28.87$Mg/l across the stations. These values are within the WHO and NESREA permissible limit. These values are lower compared to Nwineewii and Unochukwu**,** (2018) that recorded a higher mean concentration of 4171.60 ± 3615.77 mg/l in the same New Calabar river. The figures they obtained from the locations ranged from 890.5 to 9990.02mg/l. However, Wokoma and Umesi (2017) reported a lower range of 3.69 to 5.44Mg/l from Iwofe river. The quantity of total dissolved solids (TDS) in water is a good indicator of the degree of pollution in that water. The high amounts of total dissolved solids in the water are correlated with the quantity of rubbish created by the several nearby industries. High concentrations of suspended and dissolved particles lower water quality, impede photosynthetic activities, cause bottom silt to increase, and limit water depth, all of which may be harmful to aquatic species.

Turbidity

The study recorded a higher turbidity across the stations above the permissible limits in both dry and wet seasons. The figure ranged from 11.13 ± 0.64^{c} to 13.22 ± 0.35^{a} NTU in dry season and 21.12 ± 0.33^{c} to $22.98^{a} \pm 12.66$ NTU in wet season. This results is an indication of high rate of anthropogenic activity showing that more silt /mud are been washed into the river. The greater the turbidity, the higher the risk of gastrointestinal diseases. High turbidity reduces photosynthetic activities in the ecosystem due to reduce light penetration (Nwineewii, 2013).

Conductivity (µS/cm)

The conductivity (279.17 ± 5.92^{c} to 474.03 ± 5.37^{a} µS/cm recorded in the dry season indicated obvious seasonality to wet season value of $349.43^{abc} \pm 43.59$ µS/cm recorded across the stations. Oben (2000) attributed increase in the magnitude of conductivity during the dry season to evaporation and decrease in value during the wet season to dilution by rainfall.

During the wet season, the electrical conductivity drops because the water is diluted by the rain. On the other hand, when it's dry, the electrical conductivity rises because of dissolved solids, tidal effects, high temperatures and concentrations of heavy metals (Ngah *et al.*, 2017; Ezekiel *et al*., 2020).

pH

Over the course of this investigation, the physicochemical characteristics of the newly explored Calabar Rivers revealed an alkaline pH in the water. The pH values that were observed are within the acceptable range for aquatic life, which is 6.5 to 9.5. As a whole, their pH values and their mean fell within the range that the World Health Organisation (2011) has approved. Compared to the pH readings published by Ogolo *et al*., (2017), which ranged from 5.63 to 7.34, the findings showed much higher values. Beyond that, it was more than what had been found in the areas around the new Calabar River, Iwofe and Buguma tributaries by Oribhabor *et al*., (2009). One possible explanation for the glaring alkalinity seen in this study was the effect that dry seasons have on the river environments. It could be because there was less precipitation during the dry season, which meant less acid sulphate seeping into the river. During the dry season, the study's pH value were 7.08 ± 0.27^{b}, 8.00 ± 0.37^{b} and 8.53 ± 0.22^{a} across the stations, while the wet season had $7.87^{a} \pm 0.37$, $7.67^{b} \pm 0.43$ and $7.47^{c} \pm 0.43$. The dry season values was greater than the wet season. Possible causes included changes to the river's pH caused by the introduction of new compounds via runoffs and atmospheric precipitation. It was previously noted by Daka and Moslen (2013) that there was a pattern of pH change, with higher pH values during the dry season and lower pH values during the wet season. Most species perish at acidity levels of around 4.0 or lower and 11 or higher (Lawson, 1995).

Salinity

Salinity levels in surface water range from 129.94 ± 0.53^{c} to $150.73^{a} \pm 1.75$ parts per thousand during the dry season, and from $109.15^{c} \pm 0.16$ to $150.73^{a} \pm 1.75$ in the wet season. The results revealed a lower salinity in both dry and wet season which is within World Health Organisation permissible limit of 200 and 250 mg/l for surface water. When it comes to evaluating the physicochemical properties of the New Calabar and Orashi Rivers, which are subjected to open trash discharge in Nigeria, these findings are in agreement with Nwochigozin *et al.,* 2023. Rivers with a high salinity content are often found close to the ocean or other bodies of salt water. In low-salinity environments, fresh water volumes might increase, especially during rainy seasons (Ngah *et al*., 2017; Ezekiel *et al*., 2020)

Dissolve Oxygen

The Dissolve Oxygen value of this study ranged from 5.53 ± 0.88^{ab} to 6.65 ± 0.24^{a} during the dry season and 6.40^{c} ± 0.45 to 6.50^{a} ± 0.35Mg/l in the wet season. This result is consistent with that of Wokoma and Umesi (2017) who reported a range of 3.69-5.44Mg/l along the Iwofe river. However, Ogolo *et al*., (2017) reported higher values in dry season. The DO values in this study showed significant difference across stations and seasons. Nevertherless, the values in this investigation were within the acceptable limits by WHO and NESREA.

Chemical Oxygen Demand (COD)

COD values recorded in dry season are 223.02±5.67^{a}, 174.42± 7.10^{b}, 120.02±2.36^{c} for station 1, 2 and 3 respectively. For the wet season, it was 223.02±5.67, 174.42± 7.10^{b} and 172.52±2.43^{c}. There was no significant difference in values of stations 1 and 2 in both dry and wet seasons. The Biochemical Oxygen Demand (BOD) values found in this research agreed with what was found in Buguma Creek (Makinde *et al*., 2015). This study's low biochemical oxygen demand could be attributed to declining water quality, which was likely caused by the dwindling populations of aquatic macrophytes an uptick in active organic decomposition in the sediment at the bottom of the lake, and the lack of flow-mediated turbulence, which usually improves the solubility of oxygen in water. The lower the BOD number, the less oxygen is removed from the water, which usually meant that the water was cleaner. As a result fish and other aquatic creatures may not survive in water with too little oxygen. Ecosystems are put at risk when BOD levels are too high. A body of water gets its smell and flavour from its biological oxygen demand (BOD).

Nitrate

The nitrate concentrations obtained varied from 19.40 ± 1.79^{c} mg/l to 43.54 ± 1.15^{a} mg/l. The mean concentration was 32.09 ± 0.45mg/l, which was above the World Health Organization's allowed limit of 10mg/l. However, these values were at variance with that obtained from other stations of the same river by Edori and Nna, (2018) which were 0.32-0.56mg/l and11.10-14.33mg/l in Tombia and Gbaramatoru axis of Nun River in Bayelsa by Aghoghovwian *et al*., (2018). The presence of degraded organic waste and water run-off from agriculture and leaky septic tanks might explain the elevated nitrate levels in all areas. Excess nitrates, when associated with phosphorus, can drive eutrophication, resulting in substantial increases in algal growth. This has an impact on dissolved oxygen, temperature, and other indicators (De Jong *et al*., 2007).

CONCLUSION

The water quality with particular reference to the physicochemical parameters of the New Calabar River was carried out to ascertain the quality of the water. The results revealed that the water is not safe for domestic purposes. This is because of the parameters investigated, turbidity and nitrate were found to have concentrations above the limit set by WHO and NESREA. The water is not only unsafe for domestic purpose but it has been observed that some of the aquatic habitats that were noticed to be common in the river are no longer available. This call for caution on the part of the government and the organisations operating within the vicinity of the river. On the part of the operating companies, there is the need to properly treat the generated wastes before discharging them and the government should see as a matter of urgency to conduct an environmental audit on the NCR.

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REFERENCES

- Aghoghovwian, O.A., Umoru, O.D. & Izah, S.C. (2018). Physicochemical characteristics of Nun River at Gbarantoru and Tombia axis in Bayelsa State, Nigeria. *Bioscience Methods, 9* (1), 1-11..
- APHA (2005). *Standard methods for the examination of water and wastewater* (21st ed.).
- APHA, (1998). Standard method for examinaton of water and wastewater.20th edition. American Public Health Association, American Water Works Association and Water Environmental Federation (AHPA-AWWA-WEF), Published by the American Public Health Association Washington D.C.
- Barlkrishan, P. Abdul Saleem & N.D. Mallikarjun (2011). Groundwater quality mapping
- Best, M. A, Wither, A.W & Coates, S. (2007). Dissolved Oxygen as a Physicochemical Supporting Element in the Water Framework Directive. *Marine Pollution Bulletin 55*, 53-64.
- Courtney, L.A & Clement, W. H. (1998). Effects of acidic Ph on bentic macroinvertebrate communities in stream microcosms. *Hydrobiologia, 379*(1), 135-145
- Daka, E.R & Moslen, M. (2013). Spatial and temporal variation of physicochemical parameters of sediment from Azuabie creek of the upper Bonny estuary, Niger Delta. *Research Journal of Environmental and Earth Sciences*, 5(4), 291-228.
- De Jong, R., Yang, J. Y., Drury, C. F., Huffman, E. C., Kirkwood, V & Yang, X. M. (2007). The

indicator of risk of water contamination by nitrate-nitrogen. *Canadian Journal of Soil Science*, 87 (Special Issue), 179–188.

- Dienye, H. E. & Woke, E. N. (2015). Physico-chemical parameters of the upper and lower reach of the New Calabar River. *Journal of Fisheries and livestock prod. 3*:154.
- Edori, O.S & Nna P.J. (2018). Determination of physicochemical parameters of effluents at discharge point into the New Calabar River along Rumuolumeni Axis, Port Harcourt, Rivers State. Niger Delta, Nigeria. *Journal of Environmental and Analytical Toxicology, 8*, 555.
- Ekpete, O.A. (2019). Heavy metals as human associates: The ubiquitous inevitable. *An Inaugural Lecture, 22*, 6-50
- Ezekiel, EN; Sarogoro, NS & Charles, K (2020). Seasonal variation of physicochemical parameters of Rivers in Trans-Amadi, Port Harcourt, Rivers State. *European Academic Research,* 7(12): 5945 – 5958.
- FMENV (2001). Federal Ministry of Environment. National Guidelines and Standards for Water Quality in Nigeria (Federal Ministry of Environment, 2001, 114)
- Green, A. F., Owoh, A. A, Anaero-Nweke, G.N & Wokoma, O. A.F (2023). Assessment of Physico-chemiocal Parameters of water from Iwofe River, Rivers State, Nigeria. African *Journal of Environment and Natural Science Research, 6(2),33-42*
- Kpee, F. (2012). Pollution levels of Heavy Metals in sediment, Biota and Water of Kalabari Creeks. Rivers State. Retrieved from www.unn.edu.ng. 2018.
- Lawson, T.B. (1995). Fundamentals of aquaculture engineering. New York: Chapman and Hall. Golterman, H. L., Clymon, R.S and Ohustad, M.A.M. (1978). Method for Physical and Chemical Analysis of Fresh Water. Billing and sons limited. Great Britain.
- Morrison, G.O., Fatoki, O.S & Ekberg, A. (2001). Assessment of the impact of point source pollution from the Keiskammahoek sewage treatment plant on the Keiskamma River. *Water SA, 27*, 475-480.
- NESREA (2011). National Environmental (Surface and Groundwater Quality) Regulations. National Environmental Standards and Regulations Enforcement Agency
- Ngah, A; Braide, S & Dike, C (2017). Physico-chemistry of Elechi creek in the upper Bonny estuary, Rivers State, Nigeria. *Journal Geosciences and Environmental Protection,* 5: 181-197.
- Nwineewii J.D. (2013). An assessment of the levels of some physicochemical parameters from Eleme creeks, Port Harcourt, Rvers State, Nigeria. New era journal of human, educational and sustainable development 6(4):27-36.
- Nwineewii, J.D & Unochukwu P.G. (2018). An evaluation of the level of some physicochemical parameters in the New Calabar River, Rivers State, Nigeria. *The Pharmaceutical and Chemical Journal*, *5*(3), 135-142.
- Nwochigoziri, E.C., Ekpete, O.A & Kpee, F. (2023). Assessment of physicochemical parameters of New Calabar and Orashi Rivers Exposed to Open Waste Discharge in Nigeria, *Journal of Applied Science Environment Managers 27(7): 1541-1549.*
- Oben, B.O (2000). Limnological assessment of the impact of agricultural and domestic effluent on three man-made lakes in Ibadan, Nigeria.Ph.D Thesis, University of Ibadan, p.33
- Ogolo, S.G., Ugbomeh A.F. & Isitor, G.N. (2017). Physico-chemical parameters of Iwofe and Bakana Rivers, tributaries of the New Calabar River, Niger Delta, Nigeria. *Research Journal of Pure Science and Technology, 1(2), 18-24*
- Okumgba, P.O. & Ozabor, F. (2014). The effects of socio-economic activities on River Ethiope. *Journal of Sustainable Society, 3*(1), 1-6
- Orhibhabor, B. J. & Ogbeibu, A. E. (2009). Concentrations of heavy metals in a Niger Delta mangrove creek, Nigeria. *Global Journal of Environmental Sciences* 8(2):112- 120.
- Sikoki, F. D & Zabbey, N (2006). Aspects of fisheries of the middle reaches of Imo state River, Niger Delta, Nigeria. *Environmental and Economy, 24*(2) 309-312
- Smitha, A.D & Shivashankar, P (2013). Physicochemical analysis of the freshwater art river Kapila, Nanjangud industrial area Mysore, India. *International Research Journal of Environment Sciences 2:59-63*
- Vincent-Akpu, I. F & Nwachukwu, L. C (2016). Comparative Water Quality Assessment of Nembe, Bonny and Iwofe Ferry terminals in Port Harcourt. *Nigeria Journal of Environmental Science, Toxicology, Food and Technology, 10*(7) 15-19
- Wokoma, O. A. F & Umesi, N (2017). Temporal fluxes in the physicochemical properties of Sombreiro River, Southern Nigeria. *International Journal of Chemistry, Phamacy & Technology, 2(*4), 169-177
- Wonodi, A & Ekpete, O.A. (2021). Impact of cement production factories on the physical and chemical characteristics of soil within production areas in Port Harcourt Metropolis, Rivers State, Niger Delta, Nigeria. *FNAS Journal of Scientific Innovations, 3*(1), 50-59.
- World Health Organization (2011). Guidelines for drinking-water quality (4th ed). Geneva

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