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# Levels of temperature and electrical conductivity of ground water in Sapele local government area of delta state, Nigeria

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**ABSTRACT**

This study is to know the levels of temperature and electrical conductivity of Groundwater. Temperature increase was recently considered as a serious water pollutant. The known sources that modestly increase the temperature of groundwater are municipal wastes, industrial effluents and biochemical activities. Electrical conductivity which is the ability of water to conduct electricity is also related to the concentration of ionized substance in water. The ions that have major influence on the conductivity of groundwater are $H^+$, $Na^+$, $Mg^{2+}$, $Ca^{2+}$, $Cl^-$, $SO_4^{2-}$. Samples of borehole water were collected around Sapele L.G.A and were analytically assessed to ascertain the physicochemical characteristics. Results obtained shows that Temperature range between 14°C – 30°C and electrical conductivity range of 23.00 – 400.00 us/cm and were found to be within the world health organization (WHO) desirable and maximum levels.



## Introduction

Groundwater has been traditionally considered to be a pure form of water because of its filtration through soil and its long residence time on the ground. However, ground water is not as pure as traditionally assumed. This is because water is an excellent solvent and contains lots of dissolved chemicals.

Water contamination is a major global problem which requires ongoing evaluation and revision of water resources policy at level (Ugbune 2011) It has been suggested that it is the leading worldwide cause of deaths and disease (Pink 2006).

The sources of ground water contamination are numerous, the remedy are relatively small. Once the source of the problem has been identified, the most common practice is to abandon the water supply and allows the pollutants to be flushed away gradually (Egereonu and Dike 2006). To make this process rapid, according to Egereonu and Dike, polluted water is some time pumped out and treated. Following remover of the contaminated water, the aquifer is allowed to recharge naturally or in some cases, the treated water or other fresh water is pumped back into the aquifer.

The rate of agricultural and oil exploration activities and its associated problem call for the need of regular assessment particularly the rural area such as villages around Sapele Local Government area. The activities can have detrimental effect on the ground water in the area. The people in the area depend on the untreated borehole water for domestic uses. It becomes imperative to asses the level of temperature and electrical conductivity of bole hole water of these areas in order to ascertain the water quality.

Temperature increase was recently considered as a serious water pollutant. The known sources that modestly increase the temperature of groundwater are municipal wastes, industrial effluents and biochemical activities. However, groundwaters only undergo appreciable fluctuations in temperature at shallow depth, beneath which temperatures remains relatively constant. Increase in groundwater temperature as noted by Okechukwu (1989) can have adverse affect on the physical properties of groundwater, such as density, viscosity, vapour pressure, surface tension, gas solubility and gas diffusion.

Electrical conductivity (EC) is a measure of the ability of water sample to conduct electricity and is also related to the concentration of ionized substance in water. Temperature also has an important effect on conductivity. This is because as temperature increase, conductivity also increases owing to a decrease in viscosity that is caused by increase in temperature.

Conductivity is an important measurement in groundwater resources destined for various uses: irrigation, drinking, food industry and industrial boilers (Redojeric and Bashkin 1999). Electrical conductivity is a useful indicator of total dissolved solids (TDS) because the conduction of current in an electrolyte solution is primarily dependent on the concentration of ionic species (Masaki 2003). EC is widely used for monitoring the mixing of fresh water and saline water, separating stream hydrograph, and geophysical mapping of contaminated groundwater (Masuki 2003) the objective of this study is to know the levels of temperature and electrical conductivity of groundwater in Sapele Local government area of Delta State.

## Materials and Method

Fifteen samples of water were collected from bore hole randomly across the study area. The litres of polyethylene containers were used in collecting the samples and before they were used, they were first cleansed with HCL, thereafter, they were rinsed with water and finally with distilled water, in order to avoid contamination of containers from extraneous contaminants

### (a) Temperature

The temperature of the samples was measured at the site. A standardized thermometer which was graduated in degree

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Celsius ($^{o}$C) was immersed vertically in the sample. It was then allowed to stand until the temperature reading was steady. The reading was then taken and recorded. All the samples were measured in duplicate and the coefficient of variation was less than 10%.

**(b) Electrical Conductivity**

The Electrical conductivity of each sample was determined using the wissen shaftlich – Technische conductivity meter of the Weitheim model. The EC were determined at the site of collection of samples. All the samples were ran in duplicate and the coefficient of variation was less than 10%.

**Results and Discussion**

The table below shows temperature and EC of bore hole water in Sapele Local Government Area of Delta State.

| Parameter | N | Minimum | Maximum | Mean | Standard Deviation | WHO (1998) |
|---|---|---|---|---|---|---|
| Temperature ($^{o}$C) | 15 | 16.40 | 29.70 | 20.70 | 50.20 | 25 |
| Conductivity µS/cm | 15 | 23.00 | 220.00 | 115.20 | 55.90 | 100 |

N – Number of bore hole wells from which samples were collected.

The concentration of temperature in the groundwater across the Local Government Area is within WHO tolerence limit. The results presented in this study also shows that the conductivity of the groundwater in Sapele Local Government Area is moderately high. This might be due to changes in both the regolith and the bedrock mineralogy.

**Conclusion**

The results obtained from the study area shows that the levels of temperature are within the recommended range provided by WHO. It was also observed, in the course of the study, that the EC is moderately high. This indicates that, the groundwater in the study area is more useful for laundry and bathing purpose than drinking. The ions that have major influence on the EC of groundwater are $H^{+,}$ $Na^{+}$, K, $Mg^{2+}$, $Ca_2^{+}$, CL-, $SO_4^{2-}$ and $HCO^{-}_3$. These ions are gotten from salt. If the groundwater resources are not secure through protection measures there might be an outbreak of cardiovascular diseases, pre-eclampsia and hypertension. Any way, a precise conclusion on this issue would await the outcome of investigation of the coliform counts of the groundwater resources in the study area.

**Recommendation**

On the basis of the findings and conclusions reached in this study, the following are therefore recommended:

(1) The groundwater resources across the area should be analyzed at regular intervals, so as to ascertain the quality of water the public consumes.

(2) Research should be carried out in the area of Coliform counts of the groundwater .

(3) Indiscriminate disposal of municipal waste in the Local Government Area should be stopped

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