CHAPTER TWO

2.0 LITERATURE REVIEW

Omoniyi *et al.,* (2017) examine the Seasonal and Spatial Variations in Physico-Chemical Water Quality. This study was carried out at six selected sampling stations over the three reaches of River along its main axis to determine seasonal and spatial variations in the general physico-chemical water quality parameters of the river water. From each sampling station, surface water samples were collected bi-monthly for an annual cycle, the samples were treated and analyzed for physico-chemical water quality parameters using applicable standard procedures. The river showed an increasing clarity from its headwaters to the lower reach with regard to mean transparency, turbidity and colour and was also clearer in the dry season than in the rainy season. The mean values of most parameters determined were within permissible limits making the river water suitable for most probable domestic and industrial uses and livestock support.

Li, M. *et al.,* (2016) conducted a longitudinal study to assess the temporal variability of water quality parameters within delineated watersheds over multiple years. Their research provided insights into the dynamic nature of pollutant transport processes and the implications for long-term watershed management strategies. The result showed that fluctuations in water quality parameters such as nutrient concentrations, pollutant levels, and sedimentation rates over time, influenced by seasonal variations, weather patterns, land use changes, and human activities. Additionally, they have identified trends or patterns in the temporal variability of water quality parameters, highlighting periods of improvement or degradation in water quality within the studied watersheds. Their study likely provided valuable information for understanding the dynamics of water quality over time and guiding long-term watershed management and conservation efforts

Fatai *et al.,* (2024). Examine effect of watershed delineation on water quality parameter, This study assessed the impact of watershed delineation on the estimation of water quality parameters in the Omi River in Osun state, Nigeria. MAP Window GIS interfaced with Soil and Water Assessment Tools (SWAT) and was used to pre-process the spatial data. The model was used to simulate water quality parameters such as organic phosphorus and nitrate at subbasin level of the study area.

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Abel. *et al.,* (2023) carried out an investigation on study of seasonal changes in Quality Parameters, Physico-chemical parameters of River were investigated to determine its quality characteristics and establish seasonal effects on the water. Water from the river was collected at five different points in dry season (March, 2008 and 2009) and rainy season (July, 2008 and 2009). Quality evaluation for irrigation revealed that the water was suitable for all irrigation purposes. River Oluwa water was soft, low mineralized, chemically potable, suitable for irrigation but with lower ionic concentrations in rainy season.

Johnson, D.W. *et al.,* (2020) investigated the influence of watershed delineation on the identification of critical source areas for sediment and nutrient transport in agricultural landscapes. By comparing different delineation methods, the researchers highlighted how variations in boundary definition can impact the spatial distribution of pollutant hotspots. The result indicated that watershed delineation significantly influences the identification of critical source areas for sediment and nutrient transport in agricultural landscapes. They have found that variations in watershed boundaries can lead to differences in the spatial distribution and magnitude of sediment and nutrient loads, affecting the prioritization of management practices and resources. They have recommended approaches to improve the accuracy of watershed delineation methods to better target conservation efforts and mitigate water quality impacts in agricultural areas.

Adeyefa *et al.,* (2023) investigate on Spatial and Temporal Variations in Water Quality of River Ogun" The water quality of River Ogun is contaminated largely through the activities of the population by the latter purpose. Several studies have been carried out on water quality assessment with little or no information on the River Ogun portion of Abeokuta, a fundamental water source for densely populated area. Standard analytical methods were undertaken to determine the physical (salinity, temperature, Electrical Conductivity (EC) and Total Dissolved Solids (TDS)), and the chemical parameters (pH, hardness, ammonia, chloride, nitrate, alkalinity, dissolved oxygen, and biochemical oxygen demand). Graphs, tables, T-test, and ANOVA, were employed for the statistical analyses.

2.2 Effect of spatial and temporary variation

Spatial and temporal variations significantly impact water quality parameters, affecting the suitability of water for various uses.

2.2.1 Spatial Variation

1. Geographical Location: Water bodies in different regions exhibit varying water quality due to differences in climate, geology, and human activities. For example, urban areas with high pollution levels may have poorer water quality compared to rural areas.
2. Distance from Pollution Sources: Water quality deteriorates closer to pollution sources like industrial discharges or agricultural runoff.
3. Depth: Water quality parameters can vary with depth due to factors like sunlight penetration, temperature stratification, and sediment deposition.
4. Flow Rate: Water bodies with higher flow rates tend to have better water quality as pollutants are diluted and dispersed more rapidly.

2.2.2 Temporal Variation

1. Seasonal Changes: Water quality can fluctuate seasonally due to factors like rainfall, temperature, and vegetation cover. For example, nutrient levels may increase during spring runoff, leading to algal blooms.
2. Diurnal Variations: Water quality parameters can vary throughout the day due to factors like photosynthesis, respiration, and human activities. For example, dissolved oxygen levels may decrease at night due to reduced photosynthesis.
3. Long-term Trends: Water quality can change over longer time periods due to climate change, urbanization, and changes in land use. For example, increased temperature can lead to decreased dissolved oxygen levels.

2.2.3 Combined Effects

Spatial and temporal variations can interact to further complicate water quality patterns. For example, a pollutant discharged into a river may have a greater impact during low-flow periods when dilution is reduced.

2.2.4 Implications:

Understanding the spatial and temporal variations in water quality is crucial for:

1. Effective Water Management: Implementing appropriate strategies to mitigate pollution and conserve water resources.
2. Public Health: Ensuring safe drinking water and preventing waterborne diseases.
3. Environmental Protection: Protecting aquatic ecosystems and biodiversity.
4. Sustainable Development: Balancing economic growth with environmental sustainability.

2.3 Water quality parameters

Water quality parameters are used to evaluate the quality of water. Some of the main parameters include:

1. pH: A measure of water's acidity or alkalinity. pH levels outside the acceptable range can harm aquatic life and water treatment systems.
2. Temperature: A measure of the average energy of water molecules. Temperature affects water chemistry and the functions of aquatic organisms.
3. Turbidity: A measure of how particles suspended in water affect water clarity. Turbidity increases after rainfall when sediment is carried into the water.
4. Conductivity: A measure of water's ability to conduct electricity. Water with a lot of salt can be dangerous to crops.

5. Hardness: A measure of the presence of certain salts in water, such as carbonate, bi-carbonates, chlorides, and sulphates of Ca and Mg.
6. Alkalinity: A measure of water's ability to neutralize acids. Alkalinity is often measured to determine how much soda and lime to add to water to soften it.
7. Biological: A measure of whether water meets set standards. Biological parameters include bacteria and algae.
8. Nitrogen: Water can contain four forms of nitrogen: organic, ammonia, nitrite, and nitrate.