

Spring Water Quality Appraisalment for Drinking and Irrigation Application in Nigeria: A Muliti-Criteria Approach

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Abstract : The study assessed the spring water quality in Igbo-Etiti, Nigeria, for drinking and irrigation application using Physico-chemical parameters, water quality index, mineral and trace elements, pollution indices and risk assessment. Standard methods were used to determine the physicochemical properties of the spring water in rainy and dry seasons. Trace metals such as Pb, Cd, Zn and Cu were determined with atomic absorption spectrophotometer. The results showed that most of the physicochemical properties studied were within the guideline values set by Nigeria Standard for Drinking Water Quality (NSDWQ), WHO and US EPA for drinking water purposes. However, pH of all the spring water (4.27- 4.73; and 4.95- 5.73), lead (Pb) (0.01-1.08 mg/L) and cadmium (Cd) (0.01-0.15 mg/L) concentrations were above the guideline values in both seasons. This could be attributed to the lithography of the study area, which is the Nsukka formation. Leaching of lead and sulphides from the embedded coal deposits could have led to the increased lead levels and made the water acidic. Two-way ANOVA showed significant differences in most of the parameters studied in dry and rainy seasons. Pearson correlation analysis and cluster analysis showed strong significant positive and negative correlations in some of the parameters studied in both seasons. The water quality index showed that none of the spring water had excellent water status. However, one spring (Iyi Ase) had poor water status in dry season and is considered unsafe for drinking. Iyi Ase was also considered not suitable for irrigation application as predicted by most of the pollution indices, while others were generally considered suitable for irrigation application. Probable cancer and non-cancer risk assessment revealed a probable risk associated with the consumption of the spring in the Igbo-Etiti area, Nigeria.

Keywords : water quality, pollution index, risk assessment, physico-chemical parameters

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