

Characterization of Surface Water and Groundwater Quality in the Lower Tano River Basin Using Statistical and Isotopic Approach.

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This research is part of a PhD research work “Hydrogeological Assessment of the Lower Tano river basin for sustainable economic usage, Ghana, West - Africa”. In this study, the researcher investigated surface water and groundwater quality in the Lower Tano river basin. This assessment was based on some selected sampling sites associated with mining activities, and the development of oil and gas. Statistical approach was applied to characterize the quality of surface water and groundwater. Also, water stable isotopes, which is a natural tracer of the hydrological cycle was used to investigate the origin of groundwater recharge in the basin. The study revealed that Pb and Ni values of the surface water and groundwater samples exceeded the WHO standards for drinking water. In addition, water quality index (WQI), based on physicochemical parameters (EC, TDS, pH) and major ions (Ca^{2+} , Na^+ , Mg^{2+} , HCO_3^- , NO_3^- , Cl^- , SO_4^{2-} , K^+) exhibited good quality water for 60% of the sampled surface water and groundwater. Other statistical techniques, such as Heavy metal pollution index (HPI), degree of contamination (Cd), and heavy metal evaluation index (HEI), based on trace element parameters in the water samples, reveal that 90% of the surface water and groundwater samples belong to high level of pollution. Principal component analysis (PCA) also suggests that the water quality in the basin is likely affected by rock – water interaction and anthropogenic activities (sea water intrusion). This was confirm by further statistical analysis (cluster analysis and correlation matrix) of the water quality parameters. Spatial distribution of water quality parameters, trace elements and the results obtained from the statistical analysis was determined by geographical information system (GIS). In addition, the isotopic analysis of the sampled surface water and groundwater revealed that most of the surface water and groundwater were of meteoric origin with little or no isotopic variations. It is expected that outcomes of this research will form a baseline for making appropriate decision on water quality management by decision makers in the Lower Tano river Basin.

Keywords: Water stable isotopes, Trace elements, Multivariate statistics, Evaluation indices, Lower Tano river basin.