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**Hydrogeochemical assessment of groundwater quality in the Soutpansberg Basin around Tshikondeni, Limpopo Province, South Africa**



Malaza, N.

Cape Peninsula University of Technology, P.O. Box 652, Cape town 6000. [malazan@cput.ac.za](mailto:malazan@cput.ac.za)

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The objective of this study was to investigate the impact of anthropogenic and natural sources of contamination on the groundwater quality of the upper unconfined aquifer system of the Soutpansberg Basin around Tshikondeni. Fifteen groundwater samples were collected and analyzed for physical and chemical parameters. Groundwater samples were analyzed for pH, EC, TDS, major cations ( $\text{Na}^+$ ,  $\text{Ca}^{+2}$ ,  $\text{K}^+$ , and  $\text{Mg}^{+2}$ ), major anions ( $\text{Cl}^-$ ,  $\text{SO}_4^{-2}$ ,  $\text{NO}_3^-$ ,  $\text{CO}_3^{3-}$  and  $\text{HCO}_3^-$ ). Groundwater in this area was found to be above the desirable Department of Water Affairs and Forestry (DWAF) and World Health Organization (WHO) limits for drinking water. After the physicochemical analysis of groundwater samples were categorized, it was found that 52.6% samples fall in Na-Cl, 33.3% in Ca-Cl, 10.5% in Ca- $\text{HCO}_3$  and 1.7% samples in Mg- $\text{HCO}_3$  and rest were Ca- $\text{SO}_4$  type. Interpretation of hydro-geochemical data suggests that leaching of ions followed by weathering and anthropogenic impact (mainly mining and agricultural activities) control the chemistry of groundwater in the study area. Groundwater suitability for drinking purpose was also evaluated by using the synthetic pollution index (SPI); it suggests that most of the samples fall in seriously polluted categories based on DWAF and WHO standards. The calculated values of alkali and salinity hazard (SAR), sodium percentage (Na%), residual sodium carbonate (RSC), permeability index (PI), and magnesium hazard (MH) have shown that except at few locations, most of groundwater samples are not suitable for irrigation purposes.



