

# Groundwater Quality Studies: A Case Study of the Densu Basin, Ghana

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## Abstract

Groundwater samples from 68 communities within the Densu basin were sampled and analysed over a period of 1 year for various physico-chemical water quality parameters using appropriate certified and acceptable international procedures, in order to assess the water types as well as the suitability of groundwater within the basin for drinking and other domestic uses. The study showed that most of the physico-chemical parameters were within the World Health Organization limits recommended for drinking water. However, a few of the boreholes were slightly acidic. Some boreholes showed high level of mineralization. Borehole (GaD 6) at Pokuasi recorded the highest conductivity value of 7780.0  $\mu\text{S}/\text{cm}$ . High levels of nitrates were also recorded in certain communities within the basin. These include Aponsahene (105.8 mg/l), Damang (66.0 mg/l), Adzen Kotoku (61.5 mg/l), Afabeng (50.8 mg/l), New Mangoase (48.3 mg/l), Asuoatwene (41.3 mg/l), Potrase (33.6 mg/l) and Maase (33.3 mg/l). Correlations between major ions showed expected process-based relationship between  $\text{Ca}^{2+}$  and  $\text{Cl}^-$  ( $r = 0.86$ );  $\text{Mg}^{2+}$  and  $\text{Cl}^-$  ( $r = 0.84$ );  $\text{Na}^+$  and  $\text{SO}_4^{2-}$  ( $r = 0.77$ );  $\text{Na}^+$  and  $\text{Cl}^-$  ( $r = 0.75$ );  $\text{Mg}^{2+}$  and  $\text{SO}_4^{2-}$  ( $r = 0.74$ );  $\text{Mg}^{2+}$  and  $\text{Ca}^{2+}$  ( $r = 0.71$ );  $\text{Ca}^{2+}$  and  $\text{SO}_4^{2-}$  ( $r = 0.58$ ); and  $\text{K}^+$  and  $\text{SO}_4^{2-}$  ( $r = 0.51$ ), derived mainly from the geochemical and biochemical processes within the aquifer. Two major hydrochemical water types constituting 41% of groundwater sources within the basin have been delineated. These are Ca-Mg- $\text{HCO}_3^-$  water (19%) and Na-Cl or Na-Cl- $\text{HCO}_3^-$ -Cl water (22%) types. Fifty-nine per cent of groundwater sources are mixed waters with no particular cation predominating, and having either  $\text{HCO}_3^-$  or  $\text{SO}_4^{2-}$  ions as the main anion.