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# ORIGIN AND GEOCHEMICAL EVOLUTION OF GROUNDWATER IN KUNDASALE-BALAGOLLA AREA, SRI LANKA

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Increasing water demand resulted in greater attention to use artificial recharge to improve groundwater supplies. This study focused on the Kundasale-Balagolla Water Supply Scheme in Kandy District, where fluctuating river water levels have affected production and continuous water supply. An alternative groundwater supply of 2,000-3,000 $m^3$ per day is proposed to address this issue. This research aimed to assess groundwater quality and develop a model groundwater recharge system to improve the water supply. In addition to river water, samples were collected from shallow and deep wells. The composition of major ions, trace elements, and stable isotopes ($\delta^2H$ and $\delta^{18}O$) in the water samples were analysed using standard methods. The results of the Piper-trilinear diagram indicated that the groundwater in the region primarily consists of Ca-$HCO_3$ and mixed types. The Gibbs diagram showed that groundwater quality is predominantly influenced by rock weathering, which alters the geochemistry of the groundwater. Additionally, the groundwater appears to be affected by evaporation. According to $\delta 2H$ and $\delta 18O$ plots, all water samples were plotted near the local meteoric water line, suggesting direct recharge from precipitation. Positive deuterium excess values against the oxygen-18 isotope ratio plot indicated enrichment in heavy isotopes due to evaporation or re-evaporation. The saturation index values demonstrated that the groundwater was oversaturated with the mineral phases aragonite, calcite, and dolomite. In conclusion, the ion concentrations in most samples exceeded the maximum permissible drinking water quality standards set by both the WHO and Sri Lankan guidelines. Therefore, it is recommended that water from these wells be treated before use. However, mixing calculations using $\delta^{18}O$ and chloride as tracers did not reveal any relationship between river water and groundwater. Future studies should consider lithology and morphology when selecting suitable sites for artificial recharge.

**Keywords:** Artificial recharge, Groundwater quality, Hydrogeochemical relationships, Mixing of groundwater, Water isotopes