

The sustainability of groundwater in semi-arid regions: the case of Makutupora Basin in Tanzania

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Abstract

Groundwater sustainability ensures groundwater development and uses to meet current and future needs without causing unacceptable environmental, economic, or social consequences. In semi-arid regions, water resources are typically limited, and water management is critical to ensure a sustainable water supply. Groundwater sustainability indexing is vital for groundwater management. The study used four indicators in six dimensions, i.e., quantitative and qualitative hydrogeology, environmental, social-economic, and political factors, to evaluate the sustainability of the aquifer in Makutupora basin, Dodoma, Tanzania. The resulting aquifer sustainability index is 0.59, with a 95% confidence interval between 0.3856 and 0.7944, showing that the aquifer is sufficiently sustainable. The hydrogeological analysis revealed that groundwater sustainability is promising, although groundwater use per capita is alarming. This study also recommends effective water management strategies, including improving water use efficiency, promoting water conservation, implementing policies to limit water withdrawals, and promoting alternative water sources such as recycled wastewater, especially for agricultural activities.

Keywords; aquifer sustainability, groundwater management, semi-arid, sustainability index

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