

Spatio-temporal Dynamic Assessment of Surface Water Reservoirs in the Upper Molopo River Catchment using GIS and Remote Sensing

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Inland water reservoirs are significant source of freshwater resources for arid and semi-arid areas environments such as those of the Upper Molopo River catchment. However, existence of these reservoirs is under threat due to climate change and anthropogenic activities. Detailed information on the spatio-temporal dynamics in surface water bodies is important for quantifying the effects of a climate change and increased water demands. This study employs Geographical Information Systems (GIS) and remote sensing (RS) in monitoring spatial and temporal changes in the surface water reservoirs in the Upper Molopo River catchment. Landsat-5 TM for the years 1996 and 2006, and Landsat-8 OLI for the year 2016 have been used to derive a spatially and temporally explicit time-series of surface water body extent. Field survey, in the form of observation and measurements, was conducted in order to Accuracy assessment yielded an overall classification accuracy of 89%, with producer's accuracy of 86% and user's accuracy of 88% for surface water reservoirs. The results showed gradual decrease in the areal extent of water bodies from 1996 to 2016. The findings suggest that GIS and RS can provide valuable information regarding surface water reservoirs dynamics, for understanding the effect of climate change and water abstraction on water reservoirs in a spatially explicit way. This information may assist hydrologists and water resource managers in establishing sustainable water resource utilization and management in the study area.