

RELIABILITY OF STREAM FLOW IN INTER-BASIN WATER TRANSFER UNDER DIFFERENT CLIMATIC CONDITIONS USING REMOTE SENSING IN THE UPPER TANA BASIN

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Abstract: Inter-basin water transfer interventions are inherently prone to large-scale climate variability and droughts that may affect the reliability of the water supply to the recipient basin. This research evaluated the reliability of three streams of Maragua, Irati, and Gikigie in the Upper Tana basin to meet the proposed water transfers to Nairobi City in the Athi River basin. HEC HMS model was used to simulate the stream flows with NSE and R^2 of 0.6 and 0.8 respectively using remotely sensed WaPOR ET_a as input data. During the dry years, the reliability of the stream flows of Maragua, Irati, and Gikigie to meet the water transfer was 15%, 23%, and 33% respectively. In normal years, the reliability increased to 45%, 60%, and 62%; and further to 83%, 98%, and 94% in the wet years. This implies that the project will not meet its objective during the dry and normal years. The dry years had a 5 years cycle of occurrence while the wet years occurred every 10 years. Baker Flashiness index showed Irati and Gikigie flows to vary between 9% and 25% while Maragua flow, vary between 7% and 44% showing that the Maragua stream has higher variability thus lower reliability. The results showed the importance of considering water assessment of new infrastructural work on the cyclic nature of stream flows over traditional approaches that use long-average historical data. Inter-basin flood based systems coupled with storage reservoirs may enhance supply reliability thus reducing the hydrological risks of stream flow variability.

Keywords: Climate variability, HEC HMS, Inter-basin, Reliability, Stream flow, WaPOR