



# Water Scarcity and Sustainable Management in the Nile Basin: A Comparative Study in Lesotho

Tlou Mashabane<sup>1</sup>, Motlatsi Letsoalo<sup>1,2</sup>, Mmokgalakwane Motsete<sup>1,3</sup>, Kgosientsi Mofopapi<sup>1</sup>

<sup>1</sup> National University of Lesotho

<sup>2</sup> Department of Interdisciplinary Studies, National University of Lesotho

<sup>3</sup> Department of Advanced Studies, National University of Lesotho

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**Correspondence:** [tmashabane@aol.com](mailto:tmashabane@aol.com)

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## Author notes

*Tlou Mashabane is affiliated with National University of Lesotho and focuses on Environmental Science research in Africa.*

*Motlatsi Letsoalo is affiliated with National University of Lesotho and focuses on Environmental Science research in Africa.*

*Mmokgalakwane Motsete is affiliated with Department of Advanced Studies, National University of Lesotho and focuses on Environmental Science research in Africa.*

*Kgosientsi Mofopapi is affiliated with National University of Lesotho and focuses on Environmental Science research in Africa.*

## Abstract

Water scarcity is a significant challenge in Lesotho, a small country located at the headwaters of the Nile Basin. The Nile River plays a crucial role in sustaining livelihoods and ecosystems within its catchment area. The study employs a mixed-methods approach combining quantitative data analysis from hydrological models with qualitative assessments through interviews and focus group discussions. Data sources include satellite imagery, meteorological records, and local government reports. Findings indicate that Lesotho's water resources are under significant pressure, with annual precipitation deficits affecting both surface and groundwater availability. Climate change projections suggest an increase in aridity trends over the next decade, exacerbating existing scarcity challenges. The combined impacts of climate variability and historical management practices have led to unsustainable water use patterns across different sectors in Lesotho. This study highlights a critical need for integrated watershed planning and stakeholder engagement in devising effective adaptive strategies. Recommendations include prioritising investments in sustainable irrigation systems, promoting efficient water usage technologies, and strengthening institutional frameworks for equitable resource distribution among users. The empirical specification follows  $Y = \beta_{0+\beta}^{-1} p X + \text{varepsilon}$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *African geopolitics, Nile basin dynamics, water stress, sustainable development, climate change impacts, stakeholder engagement, integrated water resource management*

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