Asymptotic Analysis and Identifiability in Dynamical Models for Water Resource Allocation in Kenya

Mogingo Mutemi[1]**, Okutoyi Okeyo**[2,3]**, Ndirangu Njoroge**[4]**, Kisangai Matioko**[5]

[1] Department of Interdisciplinary Studies, Technical University of Kenya

[2] Technical University of Kenya

[3] Jomo Kenyatta University of Agriculture and Technology (JKUAT)

[4] Moi University

[5] International Centre of Insect Physiology and Ecology (ICIPE), Nairobi

Author notes

Mogingo Mutemi is affiliated with Department of Interdisciplinary Studies, Technical University of Kenya and focuses on Mathematics research in Africa.
Okutoyi Okeyo is affiliated with Technical University of Kenya and focuses on Mathematics research in Africa.
Ndirangu Njoroge is affiliated with Moi University and focuses on Mathematics research in Africa.
Kisangai Matioko is affiliated with International Centre of Insect Physiology and Ecology (ICIPE), Nairobi and focuses on Mathematics research in Africa.

Abstract

Water resource allocation in Kenya is a complex dynamical system influenced by seasonal rainfall variability and human intervention. We developed a mathematical model incorporating climatic and socio-economic data, applied asymptotic analysis techniques, and conducted sensitivity tests on parameter identifiability. Our model demonstrates that the annual rainfall proportion significantly impacts water availability across different regions of Kenya. Sensitivity analysis revealed critical parameters affecting water resource distribution. The developed models provide a robust framework for understanding water resource dynamics in Kenya, facilitating more effective management strategies. Policy-makers should consider climate variability when planning future water resources allocations and investments. Water Resource Allocation, Dynamical Systems, Asymptotic Analysis, Identifiability The analytical core is $\hat{y}_t = mathcal{F}(x_t; \theta)$ with $\hat{\theta} = argmin_\theta L(\theta)$, and convergence is established under standard smoothness conditions.

Keywords: *Kenyan, Dynamical Systems, Identifiability, Asymptotic Analysis, Optimization, Sustainability, Stochastic Models*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

✉ REQUEST FULL PAPER

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa

Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge