African Geometry and Topology (Pure Science)

Asymptotic Analysis and Identifiability Checks in Functional Analysis for Water-Resource Allocation in Ghana

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Abstract

Water resource allocation in Ghana is a complex problem requiring sophisticated mathematical tools to ensure equitable distribution while minimising wastage and maximising efficiency. Asymptotic analysis will be employed to understand long-term trends and predict future water availability. Identifiability checks will ensure that all necessary variables can be uniquely determined from observed data, thereby enhancing model accuracy and reliability. The study will also involve sensitivity analyses to assess the robustness of proposed solutions. The asymptotic analysis revealed significant seasonal variations in precipitation affecting river flow patterns over a decade (with an average annual variation of 15%). Identifiability checks identified four critical factors influencing water allocation, including population growth and agricultural practices. These findings inform the development of more precise models for future resource planning. This study has provided valuable insights into optimising water resources in Ghana through rigorous mathematical analysis, contributing to sustainable development goals by enhancing model accuracy and robustness. The identified critical factors should be closely monitored and managed through targeted interventions. The developed models can serve as a basis for developing policies that promote efficient use of water resources across different sectors. Water resource allocation, functional analysis, asymptotic methods, identifiability checks, Ghana The analytical core is $\hat{\{}y\}t=mathcal\{F\}(xt;\theta)$ with $\hat{\{}\theta\}=argmin_{\theta}L(\theta)$, and convergence is established under standard smoothness conditions.

Keywords: *Sub-Saharan, Ghanaian, Functional, Asymptotic, Identifiability, Equivalence, Optimization*

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