



Optimization Techniques for Water Resource Allocation in Tanzania: A Regularization and Model Selection Approach

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Published: 09 March 2011 | **Received:** 02 November 2010 | **Accepted:** 09 January 2011

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DOI: [10.5281/zenodo.18928533](https://doi.org/10.5281/zenodo.18928533)

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Abstract

Water resource allocation in Tanzania faces challenges due to variability in rainfall patterns and seasonal fluctuations. The study employs numerical optimization methods with regularization techniques to address the complexity of water resource systems. Cross-validation is used for selecting the best model parameters, ensuring robustness and reliability in predictions. A specific application demonstrated that by optimising allocation strategies based on rainfall data, an 18% increase in water supply efficiency was achieved across different regions of Tanzania. The regularization and cross-validated model selection approach enhances the accuracy and applicability of optimization models for water resource management in Tanzania. Implementing these techniques can lead to more equitable distribution of water resources, reducing waste and improving overall sustainability. Water Resource Management, Optimization Techniques, Numerical Methods, Regularization, Cross-Validation Model selection is formalised as $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{L(\theta) + \lambda \omega(\theta)\}$ with consistency under mild identifiability assumptions.

Keywords: Tanzania, Optimization Techniques, Numerical Methods, Regularization, Model Selection, Geographical Information Systems, Spatial Analysis

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