



# Regularization and Model Selection in Convex Optimization for Water-Resource Allocation in Tanzania

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### Abstract

Convex optimization is a powerful mathematical framework for solving complex allocation problems in various fields, including water-resource management. The methodology reviews existing literature on convex optimization models for water resources, emphasising the application of regularization strategies and cross-validated model selection criteria. A key finding is the consistent improvement in model accuracy when incorporating L1 regularization alongside cross-validation techniques, particularly in scenarios with limited data availability. The review underscores the importance of tailored optimization models for water resource allocation that balance complexity with practical applicability. Policy makers and practitioners are encouraged to adopt these methods, especially those involving sparse solutions and robust decision-making under uncertainty. Convex Optimization, Water Resources, Regularization, Model Selection, Tanzania Model selection is formalised as  $\hat{\theta} = \operatorname{argmin}_{\theta} L(\theta) + \lambda \omega(\theta)$  with consistency under mild identifiability assumptions.

**Keywords:** African geography, Convex optimization, Regularization, Model selection, Sparsity constraints, Lasso, Quadratic programming

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