



# Data Analytics for Enhanced Water Supply Management in Ethiopian Rural Commune of Gomma-Afar: Cost Savings and Sustainability Impacts,

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**Published:** 09 March 2001 | **Received:** 19 December 2000 | **Accepted:** 28 January 2001

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**DOI:** [10.5281/zenodo.18735164](https://doi.org/10.5281/zenodo.18735164)

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## Abstract

This study addresses a current research gap in Computer Science concerning Using Data Analytics to Improve Water Supply Management in Rural Ethiopian Commune of Gomma-Afar: Cost Savings and Sustainability Impacts in Ethiopia. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A structured analytical approach was used, integrating formal modelling with domain evidence. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Using Data Analytics to Improve Water Supply Management in Rural Ethiopian Commune of Gomma-Afar: Cost Savings and Sustainability Impacts, Ethiopia, Africa, Computer Science, data descriptor This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. Model estimation used  $\hat{\theta} = \operatorname{argmin} \{ \theta \} \operatorname{sumiell} ( y_i, f\theta ( \xi ) ) + \lambda | \operatorname{Vert} \theta | \operatorname{Vert} 2^2$ , with performance evaluated using out-of-sample error.

**Keywords:** *Sub-Saharan, Africa, Multivariate, Regression, Spatial, Hydrology, Optimization*

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