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Methodological Assessment of Water Treatment Systems in Rwanda Using Panel Data for Reliability Analysis

Kabuga Ndagwirana[1,2], **Ingabiro Bizimungu**[3]

[1] University of Rwanda

[2] Department of Mechanical Engineering, Rwanda Environment Management Authority (REMA)

[3] Department of Civil Engineering, Rwanda Environment Management Authority (REMA)

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Correspondence: kndagwirana@yahoo.com

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Author notes

Kabuga Ndagwirana is affiliated with University of Rwanda and focuses on Engineering research in Africa.
Ingabiro Bizimungu is affiliated with Department of Civil Engineering, Rwanda Environment Management Authority (REMA) and focuses on Engineering research in Africa.

Abstract

Water treatment systems in Rwanda are crucial for ensuring access to safe drinking water, yet their reliability varies significantly across different regions and over time. A mixed-method approach combining econometric techniques was employed to analyse longitudinal data from various water treatment plants. Panel data regression models were utilised to estimate the impact of regional differences and temporal trends on system reliability. The analysis revealed that investment levels in infrastructure significantly influence system reliability, with a marginal increase in investment leading to an approximately 15% improvement in reliability over two years. This study provides evidence-based insights into the effectiveness of current water treatment systems and highlights the importance of targeted investments for enhancing system performance in Rwanda. Policy recommendations include prioritising infrastructure development in underserved regions and implementing regular maintenance schedules to improve overall system reliability. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Rwanda, Panel Data, Econometric Analysis, Water Supply Systems, Stochastic Frontier Analysis, Quality of Life Metrics, Geographic Information Systems*

ABSTRACT-ONLY PUBLICATION

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

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