

A Quasi-Experimental Evaluation of Water Treatment System Reliability in Rwanda

A Diagnostic Framework for Maintenance and Governance

DOI: [10.5281/zenodo.18970529](https://doi.org/10.5281/zenodo.18970529) | Received: 21 March 2013 | Accepted: 09 May 2013 |
Published: 09 June 2013

Jean de Dieu Uwimana¹|Jean Paul Nkurunziza²

Aline Umutoniwase^{1,3}

¹ African Leadership University (ALU), Kigali

² University of Rwanda

³ Rwanda Environment Management Authority (REMA)

Correspondence: juwimana@yahoo.com

DOI: [10.5281/zenodo.18970529](https://doi.org/10.5281/zenodo.18970529)

Received: 21 March 2013 | Accepted: 09 May 2013

ABSTRACT

Background: Ensuring reliable access to safe drinking water remains a critical challenge in many regions, with system failures often linked to maintenance and governance shortcomings rather than technical design. There is a lack of robust, diagnostic methodologies to empirically quantify these operational failures and their drivers in field settings.

Purpose and objectives: This study aimed to develop and apply a novel diagnostic framework to evaluate the functional reliability of rural water treatment systems. The primary objective was to quantify system downtime and identify the principal technical and institutional factors contributing to operational failure.

Keywords: *Water treatment, System reliability, Sub-Saharan Africa, Quasi-experimental design, Maintenance management, Governance, Diagnostic framework*

Article Highlights

- Diagnostic framework quantifies water system downtime and isolates failure drivers.
- Quasi-experimental design reveals a significant 14.7 pp treatment effect on reliability.
- Chlorination component failures and spare parts procurement are key failure points.
- Findings advocate for integrating diagnostic assessments into water sector policy.

Methodological Insight

Employed a difference-in-differences model on 64 matched facilities over 18 months to isolate the causal effect of a maintenance intervention on operational reliability.

This study provides an empirical diagnostic tool for improving water system sustainability.

ABSTRACT-ONLY PUBLICATION

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

REQUEST FULL PAPER

 **Email:** info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

**Are you a researcher in Africa? We
welcome your submissions!**

Join our community of African scholars and share
your groundbreaking work.

 **Submit at:** app.parj.africa



Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global
Knowledge