

# Randomised Field Trial of Water Treatment System Diagnostics for Risk Reduction in Rwanda

Jean de Dieu Uwimana<sup>1</sup>, Jean Paul Mugabo<sup>2</sup>  
Chantal Uwase Niyigena<sup>1,3</sup>

University of Rwanda | Department of Civil Engineering, Rwanda Environment Management Authority (REMA) |  
Department of Electrical Engineering, Rwanda Environment Management Authority (REMA)

Correspondence: [juwimana@outlook.com](mailto:juwimana@outlook.com)

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## ABSTRACT

**Background:** Inadequate water treatment infrastructure in many regions contributes to persistent public health risks. Systematic diagnostic protocols for existing facilities are needed to prioritise interventions and quantify potential risk reductions.

**Purpose and objectives:** This study aimed to evaluate a novel engineering diagnostic protocol for rural water treatment systems by measuring its efficacy in reducing microbial risk through a randomised field trial.

**Keywords:** *Randomised controlled trial, Water treatment diagnostics, Sub-Saharan Africa, Risk assessment, Infrastructure evaluation, Public health engineering, Rwanda*

### Article Highlights

- Diagnostic intervention achieved 2.4 mean log-reduction in E. coli versus 1.5 in controls.
- Structured assessment most effectively identified failures in coagulation and filtration.
- Protocol designed for integration into routine maintenance schedules of rural facilities.
- Findings support systematic diagnostics to prioritise infrastructure interventions.

### Trial Design

Randomised controlled trial across 40 community water treatment facilities in Rwanda, using a linear mixed-effects model to estimate treatment effect on microbial log-reduction.

*This trial provides empirical evidence for engineering-led diagnostic protocols in low-resource settings.*

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