AFRICAN STRUCTURAL ENGINEERING
Vol. 1 | No. 1 | 2026 | 10.5281/zenodo.18970543

Comparative Diagnostics of Water Treatment Systems in Ethiopia

A Multilevel Regression Analysis of Adoption Rates (2000–2026)

Yonas Asfaw[1] | **Meklit Gebremichael**[1] | **Alemayehu Tadesse**[2,3]

Addis Ababa University • *Department of Civil Engineering, Addis Ababa University* • *Africa Centers for Disease Control and Prevention (Africa CDC), Addis Ababa*

Correspondence: yasfaw@hotmail.com

Received: 17 November 2025 | Accepted: 23 February 2026 | Published: 20 March 2026 | **DOI:** 10.5281/zenodo.18970543

ABSTRACT

Background: The sustainable provision of safe drinking water remains a critical engineering challenge in many regions. Understanding the drivers behind the adoption of different water treatment technologies is essential for effective infrastructure planning and policy.

Purpose and objectives: This study aims to methodologically evaluate and compare the factors influencing adoption rates for various centralised and decentralised water treatment systems. The objective is to identify the most significant technical, socio-economic, and institutional predictors of successful implementation.

Keywords: *Water treatment systems, Multilevel regression analysis, Technology adoption, Sub-Saharan Africa, Sustainable development goals, Point-of-use treatment, Comparative engineering analysis*

Article Highlights

- Decentralised, community-managed systems show 24% higher adoption than centralised utilities.
- Local technical capacity outweighs initial capital investment as a success factor.
- Adoption is shaped by multi-level governance, not just technology selection.
- Modular system designs enhance local manageability and long-term sustainability.

Methodological Note

Analysis uses a three-level hierarchical linear model (HLM) fitted to a longitudinal national dataset, with inference based on robust standard errors.

This diagnostic framework partitions variance between household, district, and regional levels to inform engineering policy.

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