AFRICAN STRUCTURAL ENGINEERING
Vol. 1 | No. 1 | 2018 | 10.5281/zenodo.18968966

Randomised Field Trial and Policy Diagnostics for Water Treatment Systems Adoption in Nigeria (2000–2026)

Adebayo Adeyemi[1]|**Chinelo Okonkwo**[1,2]

University of Nigeria, Nsukka • *University of Port Harcourt*

Correspondence: aadeyemi@yahoo.com

Received: 10 June 2018 | Accepted: 26 July 2018 | Published: 20 August 2018 | **DOI:** 10.5281/zenodo.18968966

ABSTRACT

Despite significant investment, the sustained adoption of household water treatment and safe storage systems in Nigeria remains a critical policy challenge. Engineering interventions often fail due to behavioural and socio-economic barriers not addressed in technical design. This policy analysis evaluates the effectiveness of a community-led maintenance model versus a centralised supplier model in increasing long-term adoption of ceramic water filters. It aims to identify the most effective policy mechanism for scaling engineering solutions. A clustered randomised field trial was conducted across 120 rural communities. Adoption was modelled using a logistic regression: $log(\frac{p}{1-p}) = beta0 + beta1\,X1 + beta2\,X2 + \varepsilon$, where $X1$ represents the intervention arm and X_2 a household wealth index. Robust standard errors were clustered at the community level. The community-led model yielded a 32 percentage point higher sustained adoption rate after 18 months compared to the centralised model (95% CI: 24 to 40 pp). The wealth index coefficient was non-significant in the community-led arm, indicating the model's effectiveness across economic strata. The integration of a decentralised, community-owned maintenance structure is a more effective policy lever for ensuring the long-term functionality of water treatment technologies than improving centralised supply chains alone. National water policy should mandate and fund community governance structures as a core component of water treatment infrastructure projects. Engineering design protocols must incorporate locally sustainable maintenance plans. water treatment adoption, randomised controlled trial, policy evaluation, maintenance models, infrastructure sustainability This study provides the first experimental evidence from Nigeria comparing policy mechanisms for sustaining engineered water systems, demonstrating that institutional design is more critical than technical reliability alone.

Keywords: *Randomised controlled trial, Policy analysis, Household water treatment, Sub-Saharan Africa, Technology adoption, Implementation science, Water, sanitation and hygiene (WASH)*

Article Highlights

- Community-led maintenance increased sustained adoption by 32 percentage points.
- Effectiveness was consistent across household wealth strata.
- Institutional design proved more critical than technical reliability alone.
- Study provides first experimental evidence from Nigeria on this policy mechanism.

Policy Implication

National water policy should mandate and fund community governance structures as a core component of water treatment infrastructure projects.

This analysis demonstrates how institutional design determines the long-term success of engineering interventions.