



# Cost-Effectiveness Assessment of Water Treatment Facilities in Nigerian Systems Using Panel Data Analysis

Chinedu Obinna<sup>1,2</sup>, Precious Okoye<sup>3</sup>, Olusegun Adesina<sup>4</sup>

<sup>1</sup> University of Maiduguri

<sup>2</sup> Nnamdi Azikiwe University, Awka

<sup>3</sup> Department of Civil Engineering, Nnamdi Azikiwe University, Awka

<sup>4</sup> Bayero University Kano

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**Correspondence:** [cobinna@hotmail.com](mailto:cobinna@hotmail.com)

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## Author notes

*Chinedu Obinna is affiliated with University of Maiduguri and focuses on Engineering research in Africa.*

*Precious Okoye is affiliated with Department of Civil Engineering, Nnamdi Azikiwe University, Awka and focuses on Engineering research in Africa.*

*Olusegun Adesina is affiliated with Bayero University Kano and focuses on Engineering research in Africa.*

## Abstract

Water treatment facilities in Nigerian systems are crucial for ensuring safe drinking water and sanitation practices. However, their cost-effectiveness varies significantly across different regions, necessitating a methodological evaluation to optimise resource allocation. A panel data approach will be employed to analyse facility costs, operational efficiency, and user satisfaction across different regions. Econometric models will account for time-invariant and time-varying variables. Panel data analysis reveals significant cost differences ( $p < 0.05$ ) between northern and southern regions, with higher treatment costs in the north attributed to infrastructure challenges and varying water quality. The findings highlight the need for targeted interventions in high-cost regions, suggesting a shift towards more resilient and efficient facilities. Investment strategies should prioritise cost-effective solutions in northern regions, including pilot projects and technology upgrades that can be scaled up based on effectiveness. The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Sub-Saharan, econometrics, panel, stochastic, efficiency, sanitation, watershed*

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