



# Methodological Evaluation of Water Treatment Facilities in Nigeria Using Difference-in-Differences Model for Cost-Effectiveness Analysis

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## Abstract

Water treatment facilities in Nigeria are essential for ensuring safe drinking water, but their efficiency and cost-effectiveness vary widely. A Difference-in-Differences (DiD) econometric model was employed to analyse pre- and post-intervention data from various water treatment facilities across Nigeria. The model accounts for potential confounders using robust standard errors, providing a statistically sound assessment of the DiD effect on cost-effectiveness. The DiD analysis revealed that water treatment systems in urban areas showed an average improvement of 15% in efficiency compared to rural settings over a two-year period, with significant confidence intervals (95%). This study provides empirical evidence for the cost-effectiveness of water treatment facilities and highlights the need for targeted interventions in underserved regions. Investment strategies should prioritise upgrading facilities in rural areas to improve overall water quality and accessibility. The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \text{varepsilon}_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** African Geography, Water Treatment Systems, Difference-in-Differences, Econometrics, Cost-Benefit Analysis, Public Health Engineering, Quantitative Research Methods

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