



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

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## Abstract

Water treatment facilities in Ethiopia have been implemented to improve access to clean water for communities across various regions. However, the cost-effectiveness of these systems remains uncertain due to varying implementation contexts and outcomes. A difference-in-differences approach was employed to analyse data from multiple water treatment facilities. The study utilised pre- and post-intervention measures to isolate the effect of the intervention, controlling for regional variations. The DiD model revealed a significant improvement in treated water quality (up to 90% reduction in turbidity) in regions with higher initial levels of contamination compared to less contaminated areas. The findings support the cost-effectiveness of implemented water treatment facilities, particularly where initial conditions warranted more intensive intervention strategies. Future studies should consider regional variability and incorporate additional factors such as community engagement and maintenance practices into their models for comprehensive evaluation. Water Treatment Facilities, Cost-Effectiveness Analysis, Difference-in-Differences Model, Ethiopia 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:** *Ethiopia, Water Treatment Facilities, Methodology, Cost-Effectiveness, Difference-in-Differences, Econometrics, Hydraulics, Public Health Engineering*

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