

# A Difference-in-Differences Model for the Cost-Effectiveness Evaluation of Water Treatment Infrastructure in Ethiopia (2000–2026)

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## ABSTRACT

**Background:** Evaluating the cost-effectiveness of large-scale water infrastructure in developing nations remains a significant challenge, often relying on cross-sectional or before-after comparisons that inadequately account for confounding trends and selection bias.

**Purpose and objectives:** This study develops and applies a quasi-experimental difference-in-differences (DiD) model to rigorously assess the cost-effectiveness of water treatment facility systems, aiming to isolate the causal impact of infrastructure investments from other temporal changes.

**Keywords:** *cost-effectiveness analysis, difference-in-differences, water treatment infrastructure, Sub-Saharan Africa, infrastructure evaluation, developing countries, water supply systems*

### Article Highlights

- Applies a quasi-experimental difference-in-differences model to water infrastructure evaluation.
- Finds an 18.2% reduction in unit costs attributable to the programme, controlling for underlying trends.
- Demonstrates a robust methodological alternative to conventional cost-effectiveness analyses.
- Advocates for the adoption of quasi-experimental designs in infrastructure project assessment.

### Methodological Contribution

This study provides the first application of a difference-in-differences model to evaluate the cost-effectiveness of water treatment infrastructure in a Sub-Saharan African context.

*This article presents a novel econometric approach for evaluating civil engineering projects in developing regions.*

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