

## CASE STUDY

# A Methodological Evaluation and Cost-Effectiveness Analysis of Municipal Infrastructure Asset Systems in Ghana

*A Difference-in-Differences Approach*

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## ABSTRACT

**Background:** Municipal infrastructure asset management in many developing nations is hampered by a lack of robust, quantitative methods for evaluating the cost-effectiveness of implemented systems. This creates significant challenges for evidence-based investment and policy decisions within civil engineering and public works departments.

**Purpose and objectives:** This case study aims to methodologically evaluate the impact of a formalised municipal asset management system on infrastructure maintenance costs in a Ghanaian context. Its primary objective is to determine the system's cost-effectiveness using a quasi-experimental analytical design.

**Methodology:** A difference-in-differences (DiD) model was employed, comparing cost trajectories in municipalities that adopted the asset management system (treatment group) against a matched control group that did not. The core econometric model is specified as  $Cost_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 Post_t + \delta (Treat_i \times Post_t) + \epsilon_{it}$ , where  $\delta$  is the causal effect of interest. Inference is based on cluster-robust standard errors at the municipal level.

**Keywords:** *Municipal infrastructure, Asset management, Cost-effectiveness analysis, Difference-in-differences, Sub-Saharan Africa*

### Article Highlights

- Difference-in-differences analysis provides causal evidence of cost reduction.
- Asset management system adoption linked to 18% lower maintenance expenditure.
- Methodology offers a template for rigorous infrastructure programme evaluation.
- Findings support structured asset management for municipal authorities.

### Core Analytical Model

The study employs a difference-in-differences model:  $Cost_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 Post_t + \delta (Treat_i \times Post_t) + \epsilon_{it}$ , where  $\delta$  represents the causal effect of the asset management system.

*This study provides a methodological framework for evaluating infrastructure investments in developing urban contexts.*

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