



# Technological Innovations for Enhanced Water Supply and Sanitation in Rural Ethiopian Villages

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## Abstract

Rural areas in Ethiopia face significant challenges in accessing safe drinking water and adequate sanitation facilities, which can lead to poor health outcomes. A mixed-methods approach was employed, including quantitative surveys and qualitative interviews. Data were collected from 100 randomly selected villages across three regions of Ethiopia, using a Likert scale for technology adoption measures. Technology adoption rates in the evaluated villages range between 35% to 72%, with an average of 48%. The findings suggest that community engagement and financial incentives significantly influence technology uptake. The technological interventions have shown potential in improving water supply and sanitation, though there is room for improvement regarding sustainability and equitable distribution. Further research should focus on developing cost-effective models of service delivery to ensure long-term sustainability. Policy recommendations include integrating community-led initiatives into government programmes. Model estimation used  $\hat{\theta} = \text{argmin}\{\theta\} \text{sumiell}(y_i, f\theta(\xi)) + \lambda \text{Vert}\theta \text{rVert} 2^2$ , with performance evaluated using out-of-sample error.

**Keywords:** *African Geopolitics, GIS Applications, Participatory Mapping, Community-Led Total Sanitation, Water-Harvesting Systems, Biogas Technology, Rural Infrastructure Development*

## ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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