



Solar-Powered Water Supply Systems in Ethiopian Villages: A Health and Economic Sustainability Evaluation

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Abstract

Solar-powered water supply systems have been implemented in various Ethiopian villages to address basic needs such as drinking water and sanitation. A comprehensive meta-analysis was conducted using a random-effects model with robust standard errors to account for heterogeneity among studies. The analysis revealed that solar-powered water supply systems significantly reduced waterborne illnesses ($p < 0.01$) and improved economic productivity by up to 25% in participating communities. Despite initial high costs, the long-term benefits of these systems outweighed their expenses, particularly in terms of health improvements and cost savings. Policy makers should prioritise funding for solar-powered water supply systems as a sustainable intervention for improving public health outcomes in rural areas. Treatment effect was estimated with $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^T p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African Geography, Meta-Analysis, Sustainability, Photovoltaics, Health Impact Studies, Cost-Benefit Analysis, Community Participation*

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