



# Comparative Low-Cost IoT Solutions for Environmental Monitoring in Urban Slums of Nigeria

Suleiman Musa<sup>1</sup>

<sup>1</sup> University of Lagos

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**Correspondence:** [smusa@gmail.com](mailto:smusa@gmail.com)

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## Author notes

*Suleiman Musa is affiliated with University of Lagos and focuses on Computer Science research in Africa.*

## Abstract

Environmental monitoring in urban slums of Nigeria is crucial for improving living conditions and health outcomes. However, traditional high-cost solutions are often impractical due to resource constraints. A comparative analysis was conducted using IoT devices equipped with sensors designed specifically for urban slum environments. Data from multiple sites were collected over six months and analysed to determine the suitability and reliability of each solution. The analysis revealed significant differences in data accuracy between solutions, with Solution A achieving a precision level within  $\pm 5\%$  relative error across all monitored parameters. Solution A was found to be the most effective for low-cost IoT environmental monitoring in urban slums of Nigeria, particularly in terms of air quality and water contamination detection. Public health authorities should consider implementing Solution A as a cost-effective strategy for improving environmental monitoring practices in Nigerian urban slums. Low-Cost IoT, Environmental Monitoring, Urban Slums, Nigeria Model estimation used  $\hat{\theta} = \operatorname{argmin}\{\theta\} \operatorname{sumiell}(y_i, f\theta(\xi)) + \lambda \operatorname{Vert}\theta \operatorname{Vert}^2$ , with performance evaluated using out-of-sample error.

**Keywords:** *African geography, IoT, sensor networks, wireless communications, smart cities, data analytics, environmental informatics*

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