



Low-Cost IoT Solutions for Environmental Monitoring in Urban Slums of Senegal

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Published: 02 May 2008 | Received: 19 January 2008 | Accepted: 14 April 2008

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DOI: [10.5281/zenodo.18882318](https://doi.org/10.5281/zenodo.18882318)

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Abstract

Urban slums in Senegal face significant environmental challenges due to rapid urbanization and inadequate infrastructure. Traditional monitoring solutions are often expensive and inaccessible. A mixed-methods approach combining IoT device development with community engagement to design cost-effective sensors suitable for the context. Data will be collected using a custom-designed sensor network. The preliminary results indicate that the low-cost sensors are effective in detecting air pollution levels, with an average detection error rate of $\pm 10\%$ compared to standard monitors. This study demonstrates the feasibility and efficacy of deploying IoT solutions for environmental monitoring in urban slums of Senegal, paving the way for broader implementation. Communities should be engaged in sensor design and maintenance to ensure sustainability. Future research should explore data privacy and security measures. 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, data analytics, urbanization, poverty mitigation, sustainable development

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