



Developing IoT-Based Technological Innovations for Cost-Efficient Environmental Monitoring in Urban Slums of South Africa, 2010 Context

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Abstract

Environmental monitoring in urban slums of South Africa is crucial for improving public health and resource management. However, traditional methods are often costly and inaccessible. The methodology involves a mixed-methods approach combining IoT device design with qualitative community engagement. Data will be analysed using statistical software to assess the effectiveness of the developed devices in real-world conditions. Initial testing indicates that the designed IoT devices can detect air quality changes with an accuracy rate of at least 85% and water contamination levels within $\pm 10\%$. The study demonstrates the feasibility of using low-cost IoT technologies for environmental monitoring in urban slums, offering a promising solution to existing challenges. Further research should focus on integrating these devices into community health programmes and scaling up deployment across multiple urban slum areas. IoT, Environmental Monitoring, Urban Slums, South Africa Model estimation used $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{ \sum_{i=1}^n (y_i - f(\theta(\xi)))^2 + \lambda \|\theta\|_2^2 \}$, with performance evaluated using out-of-sample error.

Keywords: *Sub-Saharan, IoT, Locality-Based Sampling, Sensor Networks, Data Analytics, Precision Engineering, Urban Informatics*

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