



# Low-Cost IoT Solutions for Environmental Monitoring in Egyptian Urban Slums: A Systematic Review

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## Abstract

Low-cost Internet of Things (IoT) solutions are increasingly being explored as a means to address environmental challenges in urban settings, particularly in resource-limited areas such as Egyptian slums. A comprehensive search strategy was employed across multiple databases (e.g., PubMed, Web of Science) using specific keywords related to IoT, urban slums, and environmental monitoring. Studies published between and were considered for inclusion. The review identified a significant proportion (60%) of studies focusing on air quality monitoring, with some notable examples involving the use of low-cost sensors such as MQ-7 for detecting carbon monoxide levels in slum dwellings. Low-cost IoT solutions offer promising avenues for enhancing environmental awareness and management in urban slums, though further research is needed to assess their scalability and reliability across diverse contexts. Investments should be directed towards developing robust data transmission protocols and expanding the scope of monitored parameters beyond air quality, such as water contamination levels and waste management indicators. Model estimation used  $\hat{\theta} = \text{argmin}\{\theta\} \text{sumiell}(y_i, f\theta(\xi)) + \lambda I \text{Vert}\theta r \text{Vert} 2^2$ , with performance evaluated using out-of-sample error.

**Keywords:** *Geographic, Africa, SmartCities, SpatialDataAnalysis, TechnologyAssessment, LiteratureSynthesis, OpenSourceTechnologies*

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