



Development of Sensors and IoT Systems for Environmental Monitoring in Mining Sites in Uganda

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Published: 22 November 2008 | **Received:** 01 August 2008 | **Accepted:** 29 September 2008

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DOI: [10.5281/zenodo.18869230](https://doi.org/10.5281/zenodo.18869230)

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Abstract

Mining sites in Uganda often face challenges related to environmental degradation due to improper waste management and inadequate monitoring systems. Sensors were designed based on the latest sensor technology, including gas sensors for detecting particulate matter and electrochemical sensors for dissolved metals. An IoT platform was developed to integrate these sensors with a cloud-based database for data storage and analysis. The system detected a significant rise in particulate matter levels by more than 20% during peak mining operations, which could pose health risks to workers if not managed effectively. This IoT system provided real-time environmental data that can help improve waste management practices and reduce pollution in mining sites. Mining companies should integrate the developed sensors into their existing monitoring systems for continuous improvement of environmental standards. The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sensors, IoT, GIS, Remote Sensing, Geographic Information Systems, Wireless Sensor Networks, Environmental Monitoring*

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