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Development of Sensors and IoT Systems for Environmental Monitoring in Nigerian Mining Sites: A Comparative Study

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Abstract

The environmental impact of mining activities in Nigeria has led to a need for advanced monitoring systems. A comparative study was conducted using statistical analysis and qualitative assessments to evaluate the performance of different sensor technologies in real-world conditions. In one specific site, the IoT system detected a 15% higher concentration of particulate matter compared to standalone sensors over a three-month period. The IoT systems demonstrated superior performance in integrating data from multiple sources and providing real-time alerts for environmental threats. Further research should focus on integration with existing infrastructure and exploring cost-effective deployment options. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African Geography, Environmental Monitoring, IoT Systems, Sensor Technology, Geographic Information Systems, Statistical Analysis, Qualitative Research*

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