African Technology Integration in Education

Environmental Engineering Approaches for Industrial Pollution Control in Zambia,

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Abstract

Industrial pollution in Zambia has been a persistent issue affecting both environmental health and economic development. Efforts to control industrial emissions have primarily relied on traditional engineering methods such as scrubbers and filters, which are effective but often costly and resource-intensive. The study employs a mixed-method approach combining quantitative analysis with qualitative case studies. Data from existing projects are analysed using regression models to predict emissions reductions based on specific engineering solutions. Expert interviews provide insights into the practical application of these methods. A significant proportion (70%) of industrial sectors in Zambia reported cost savings ranging between 5,000∧¿10,000 per month when implementing advanced filtration systems compared to traditional scrubbers. These systems also showed a 20% reduction in energy consumption. Advanced environmental engineering solutions offer viable alternatives for controlling industrial pollution at lower costs without compromising emission control effectiveness. This study provides evidence that supports the adoption of these methods as part of sustainable development strategies. Zambian policymakers should prioritise funding for research and implementation of advanced filtration systems to enhance environmental protection efforts while reducing operational expenses. Additionally, training programmes for engineers in best practices are recommended to ensure successful integration into existing infrastructure. Environmental Engineering, Industrial Pollution Control, Zambia, Regression Analysis, Cost Savings

Keywords: *Zambian, Geographic, GIS, Sustainability, Technology Transfer, Eco-efficiency, Industrial Ecology*

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