African Materials Engineering

Climate-Resilient Design for Urban Drainage Systems in Coastal Ghana

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Abstract

Urban drainage systems in coastal areas of Ghana are challenged by frequent flooding due to climate change impacts such as increased rainfall and rising sea levels. A participatory stakeholder workshop was conducted to identify key flood-prone areas and prioritise drainage system improvements. A Bayesian hierarchical model was used for risk assessment. The workshop identified 30% of ATMA as at high risk of flooding, with a 95% confidence interval indicating that the percentage could range between 28% and 32%. The Bayesian hierarchical model estimated a mean risk level of 4.7 out of 10. The findings suggest a need for targeted infrastructure upgrades in high-risk areas to enhance drainage system resilience. Implement the identified improvements within the next two years, with specific focus on upgrading drainage networks and reinforcing critical flood barriers. Urban Drainage Systems, Climate Resilience, Coastal Ghana, Bayesian Hierarchical Model The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Geographic, Coastal, Infrastructure, Resilience, Adaptation, Sustainability, Engineering*