



Climate-Resilient Design for Urban Drainage Systems in Coastal Ghana: An Engineering Case Study

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Abstract

Urban drainage systems in coastal regions of Ghana are increasingly challenged by climate change impacts such as increased rainfall intensity and sea level rise. The study employed a combination of hydrological modelling, stakeholder consultations, and Geographic Information Systems (GIS) mapping to assess site-specific conditions and develop resilient design solutions. Model simulations indicated that an increase in rainfall intensity by 20% would necessitate a 30% reduction in drainage capacity for existing infrastructure, highlighting the need for enhanced resilience strategies. The climate-resilient design recommendations aim to mitigate flood risks and ensure sustainable urban development within Accra’s coastal zones. Immediate implementation of the recommended designs with phased upgrades based on future climate projections is advised to protect public infrastructure and ecosystems from increasing flood hazards. The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u + \epsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Geographic, Coastal, Urbanization, Hydrology, Resilience, Sustainability, Modelling*

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