



Designing Climate-Resilient Urban Drainage Infrastructure in Coastal Ghana: A Methodological Approach

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Abstract

Urban drainage systems in coastal areas of Ghana are challenged by unpredictable climate events such as heavy rainfall and storm surges, necessitating resilient design solutions. The study employs a multi-step approach including data collection from historical weather records, climate projections using the Hadley Centre Climate Model (HadCM3), and statistical modelling of rainfall intensity-duration-frequency curves. Uncertainty in model predictions is assessed through bootstrapping techniques. A significant proportion (85%) of urban drainage systems exceeded their designed capacity during a simulated climate scenario, highlighting the need for enhanced design standards. The developed methodological approach successfully predicts and mitigates future flood risks in coastal Ghana's urban areas. Infrastructure designers should incorporate climate change projections into the planning process to ensure long-term resilience of drainage systems. Climate Resilience, Urban Drainage Systems, Coastal Engineering, Statistical Modelling The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u_i + v_i \epsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, GIS, BIM, sustainability, resilience, hydrology, parametric modelling*

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