



Designing Climate-Resilient Urban Drainage Systems in Coastal Ghana: A Methodological Framework

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Abstract

Urban drainage systems in coastal areas of Ghana are vulnerable to climate change impacts such as sea level rise and increased rainfall intensity. Effective design is critical for ensuring resilience against these challenges. A mixed-method approach combining scenario analysis, hydrological modelling, and stakeholder consultations was employed. Statistical models were used to simulate climate impacts on drainage systems' performance under different scenarios. The simulations indicated a need for at least a 20% increase in drainage capacity to accommodate projected rainfall intensities without overflow risks. The methodological framework provides a robust pathway for designing climate-resilient urban drainage systems, enhancing both the technical and social resilience of coastal communities. Adoption of the proposed design principles should be supported by policy frameworks that prioritise community engagement in planning processes. climate change, urban drainage, coastal adaptation, scenario analysis, hydrological modelling The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u + \epsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Geographical Information Systems, Geographic Information System, Remote Sensing, Climate Change Adaptation, Hydrology, Quantitative Methods, Spatial Analysis*

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