



# Climate-Resilient Design Strategies for Urban Drainage Systems in Coastal Ghana

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## Abstract

Urban drainage systems in coastal areas of Ghana are vulnerable to climate change impacts such as increased rainfall intensity and sea level rise, necessitating design strategies that enhance resilience. A hybrid approach combining vulnerability assessment with scenario-based design methodologies was employed to evaluate and optimise the performance of proposed drainage system designs under different climate scenarios. The analysis identified an 80% reduction in flooding risk for areas with improved drainage systems compared to existing infrastructure under a high-intensity rainfall scenario, highlighting the effectiveness of integrated climate projections in urban planning. Climate-resilient design strategies significantly enhance the ability of urban drainage systems to withstand future climatic challenges. Recommendations include prioritising vulnerable coastal regions and integrating climate data into standard engineering practices. Adopting integrated climate projections for urban infrastructure planning, prioritising vulnerable areas, and incorporating resilience metrics in design criteria are recommended steps. Climate Resilience, Urban Drainage Systems, Coastal Ghana, Vulnerability Assessment The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u + \varepsilon$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Geographic, Coastal, Climate Change, Resilience, Hydrology, Sustainable, Integrated Design*

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