



# 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. A mixed-methods approach was employed, integrating hydrological simulations with community consultations to identify key design strategies. Hybrid green-grey systems showed a 20% reduction in peak flow rates during heavy rainfall and maintained water quality within acceptable limits. The designed systems significantly improved drainage capacity under future climate scenarios without additional costs, enhancing resilience at both local and global scales. Implement the recommended design strategies in coastal cities to ensure sustainable urban development aligned with climate goals. Urban Drainage Systems, Climate Resilience, Coastal Ghana, Green-Grey Infrastructure The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u + v + \epsilon$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Geographical Information Systems (GIS), Climate-Induced Risk Analysis, Urban Planning Theory, Resilience Engineering, Sustainable Infrastructure Design, Coastal Erosion Management, Hydrological Modelling*

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