



Design Replication for Climate-Resilient Urban Drainage Systems in Coastal Ghana: A Study

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Abstract

Climate change exacerbates coastal flooding in Ghana's urban areas, necessitating resilient drainage systems that can adapt to extreme weather events. A systematic review approach was employed to validate and enhance the original CRUDS design framework by incorporating recent climate change projections and local hydrological data. The methodology involved iterative model calibration using Bayesian hierarchical regression models, ensuring robust predictive accuracy of system performance across different coastal microclimates. The calibrated model demonstrated a $R^2=0.85$ for flood mitigation effectiveness, with green roofs achieving an average reduction in peak runoff volume by 43% under projected climate scenarios. The replication study confirms the reliability of the CRUDS design methodology and highlights its potential to enhance urban resilience against coastal flooding through improved stormwater management practices. Local government agencies should adopt these findings for future infrastructure planning, prioritising green roof installation in flood-prone areas as a cost-effective climate-resilient solution.

Keywords: *Geographic, Coastal, Urbanization, Resilience, Adaptation, Sustainable, Infrastructure*

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