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Designing Climate-Resilient Urban Drainage Systems for Coastal Ghana: A Methodological Approach

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Abstract

Urban drainage systems in coastal regions of Ghana are increasingly vulnerable to climate change impacts such as sea-level rise and increased rainfall intensity. Current designs often lack resilience, leading to frequent flooding episodes that threaten public safety and economic development. The methodology involves conducting a series of workshops with stakeholders, including engineers, planners, and community members, to gather input on current challenges and desired outcomes. A mixed-methods approach is employed, combining quantitative surveys ($N = 150$) *assessing existing drainage systems ' performance against climate projections* , $\wedge$ *qualitative interviews* nto local needs and preferences. Quantitative analysis revealed that the proportion of urban areas experiencing flooding during high tide events increased by 45% under future climate scenarios. Qualitative data highlighted a strong preference for drainage systems that not only manage peak flows but also reduce surface water runoff to mitigate coastal erosion. The methodological framework successfully identifies key design parameters and preferences, providing actionable insights for the development of resilient urban drainage systems in Ghana's coastal regions. Local authorities are encouraged to incorporate these findings into planning processes and advocate for funding support from international climate resilience funds. Engineers should prioritise integrating green infrastructure solutions such as permeable pavements and wetland restoration areas into their designs. Urban Drainage, Climate Resilience, Coastal Ghana, Mixed-Methods Approach

Keywords: *Geographic, Coastal, Climate Change, Resilience Engineering, Hydrology, Sustainable Infrastructure Design, Urban Planning*

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