



# 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 resilient design strategies. A combination of literature review, expert consultation, and sensitivity analysis were employed to identify key design parameters. A probabilistic flood risk assessment model was used to simulate future scenarios under climate change conditions. The model predicted a significant increase in peak discharge rates by up to 30% over the next decade due to intensified rainfall patterns, highlighting the need for adaptive drainage infrastructure solutions. This study underscores the critical role of climate-resilient design in ensuring sustainable urban development in coastal regions of Ghana. The proposed strategies aim to mitigate flood risks and protect existing drainage systems from degradation. Urban planners should integrate these findings into future planning processes, prioritising resilient infrastructure designs that can withstand projected climatic changes. Climate change, Urban Drainage Systems, Coastal Regions, Resilient Design The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u_i + \text{varepsilon}_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Sub-Saharan, Coastal Geomorphology, Hydrology, Climate Modelling, Sustainable Engineering Solutions, Green Infrastructure, Resilient Design Principles*

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