

The Integration of Geographic Information Systems to Monitor and Analyze Coastal Erosion in the Central Region of Ghana

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SUMMARY

The coastal region is characterized by a dynamic land forms that experiences rapid changes throughout time. Geographic Information Systems (GIS) are extensively utilized as a crucial element due to their ability to provide complete insights into the dynamics of coastal land forms. Therefore, it is crucial to maintain accurate identification and consistent monitoring of shorelines in order to appreciate the coastal processes and dynamics connected with various coastal features. The main aim of this study was to investigate the changes occurring in the coastal region of the Central Region of Ghana. The analysis was carried by utilizing the Digital Coastline Analysis System (DSAS), which is an extension of the ArcGIS software. The process of extracting shorelines was made easier by employing Landsat Satellite data from the years 1999, 2010, and 2023. The data underwent processing using the ENVI 5.3 software and thereafter underwent analysis using the ArcGIS 8 workstation. The estimation of rates of shoreline change was carried out using three analytical methodologies: End Point Rate (EPR), Linear Regression Rate (LRR), and Least Median of Squares (LMS), employing the Digital Shoreline Analysis System (DSAS). The study's findings suggest that a considerable proportion of the examined region is presently undergoing erosion. The primary factor contributing to major erosion difficulties in the research area was determined to be the illicit extraction of sand, as revealed through comprehensive interviews conducted with members of the local community. Furthermore, the rates of shoreline change have been impacted by a variety of geological processes taking place within the coastal region. Hence, it can be deduced from the present investigation that the adoption of suitable beach restoration strategies in the examined area is crucial for alleviating potential hazards. Moreover, the study provides evidence of the advantages and suitability of DSAS (Digital coastal Analysis System) in assessing alterations in coastal conditions when compared to traditional manual methods of shoreline change analysis. This observation underscores the potential of DSAS in facilitating the efficient execution of coastal area management initiatives.

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