

A Geospatial Approach to Coastal Vulnerability Using Satellite Imagery and Coastal Vulnerability Index: A Case Study Mauritius

Authors : Manta Nowbuth, Marie Anais Kimberley Therese

Abstract : The vulnerability of coastal areas to storm surges stands as a critical global concern. The increasing frequency and intensity of extreme weather events have increased the risks faced by communities living along the coastlines Worldwide. Small Island developing states (SIDS) stands out as being exceptionally vulnerable, coastal regions, ecosystems of human habitation and natural forces, bear witness to the frontlines of climate-induced challenges, and the intensification of storm surges underscores the urgent need for a comprehensive understanding of coastal vulnerability. With limited landmass, low-lying terrains, and resilience on coastal resources, SIDS face an amplified vulnerability to the consequences of storm surges, the delicate balance between human activities and environmental dynamics in these island nations increases the urgency of tailored strategies for assessing and mitigating coastal vulnerability. This research uses an approach to evaluate the vulnerability of coastal communities in Mauritius. The Satellite imagery analysis makes use of sentinel satellite imageries, modified normalised difference water index, classification techniques and the DSAS add on to quantify the extent of shoreline erosion or accumulation, providing a spatial perspective on coastal vulnerability. The coastal Vulnerability Index (CVI) is applied by Gonitz et al Formula, this index considers factors such as coastal slope, sea level rise, mean significant wave height, and tidal range. Weighted assessments identify regions with varying levels of vulnerability, ranging from low to high. The study was carried out in a Village Located in the south of Mauritius, namely Rivière des Galets, with a population of about 500 people over an area of 60,000m². The Village of Rivière des Galets being located in the south, and the southern coast of Mauritius being exposed to the open Indian ocean, is vulnerable to swells, The swells generated by the South east trade winds can lead to large waves and rough sea conditions along the Southern Coastline which has an impact on the coastal activities, including fishing, tourism and coastal Infrastructures, hence, On the one hand, the results highlighted that from a stretch of 123km of coastline the linear rate regression for the 5 -year span varies from -24.1m/yr. to 8.2m/yr., the maximum rate of change in terms of eroded land is -24m/yr. and the maximum rate of accretion is 8.2m/yr. On the other hand, the coastal vulnerability index varies from 9.1 to 45.6 and it was categorised into low, moderate, high and very high risks zones. It has been observed that region which lacks protective barriers and are made of sandy beaches are categorised as high risks zone and hence it is imperative to high risk regions for immediate attention and intervention, as they will most likely be exposed to coastal hazards and impacts from climate change, which demands proactive measures for enhanced resilience and sustainable adaptation strategies.

Keywords : climate change, coastal vulnerability, disaster management, remote sensing, satellite imagery, storm surge

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