Neithal Kavasam: An AI-Driven Predictive Coastal Vulnerability and Risk Analytics Platform

ABSTRACT

Coastal regions across the world are increasingly vulnerable to sea-level rise, shoreline erosion, extreme weather events, and growing anthropogenic pressures. Conventional coastal monitoring methods are largely reactive, fragmented, and based on static assessments, which limits their effectiveness for long-term infrastructure planning and climate-related financial risk management. In this context, the present study introduces Neithal Kavasam, an AI-driven, subscription-based coastal resilience platform that delivers predictive and integrated coastal risk intelligence.The platform is developed using a scientifically robust Coastal Vulnerability Index (CVI) framework and integrates multi-source geospatial datasets, including long-term satellite imagery from Sentinel-2 and Landsat, high-resolution drone-derived Digital Elevation Models (DEMs), multispectral vegetation indices such as NDVI, and asset proximity information. Four key parameters like historical erosion rate, geomorphology and slope, asset proximity, and ecological health are systematically quantified, ranked, and aggregated using a geometric mean approach to generate a standardized coastal vulnerability score. This method ensures balanced representation of risk while maintaining sensitivity to high-impact variables.

In addition to physical vulnerability assessment, Neithal Kavasam incorporates machine learning–based predictive hotspot analysis to forecast shoreline erosion patterns and infrastructure risk over short- and medium-term periods. The results are translated into an intuitive 1–10 risk scale, effectively bridging the science-to-decision gap for stakeholders such as infrastructure managers, port authorities, insurers, and financial institutions operating under emerging climate risk disclosure frameworks. Overall, the study demonstrates that the integration of remote sensing, geospatial artificial intelligence, and cloud-based dashboards can significantly enhance proactive coastal governance, improve infrastructure resilience, and support informed climate adaptation and financial decision-making.