

(047)

GIS-Based Assessment of Coastal Tourism Sustainability and Environmental Vulnerabilities: A Case Study of Trincomalee District, Sri Lanka

Sawjanya, S.*

*Faculty of Graduate Studies, University of Sri Jayewardenepura,
Nugegoda, Sri Lanka*

**sawjanyasathyaseelan@gmail.com*

Abstract

Coastal tourism is one of the fastest-growing sectors in Sri Lanka, and Trincomalee has become a major destination known for its high-quality beaches, coral reefs, whale-watching tours, and heritage sites. However, the unplanned and unsustainable growth of tourism has increased pressure on ecologically sensitive coastal ecosystems, including coral reefs, mangroves, and seagrass beds, and has worsened issues like coastal erosion and waste management problems. This study aims to evaluate the sustainability of coastal tourism development in Trincomalee using an integrated geospatial (GIS-based) approach. Multi-temporal Land Use and Land Cover (LULC) data from 2010 to 2025 were analyzed through supervised classification to examine patterns of built-up expansion along the coast. Spectral indices and ecosystem vulnerability data were combined with tourism infrastructure records and GPS surveys conducted in the field to map environmental sensitivity layers and tourism activity hotspots. A Multi Criteria Decision Analysis (MCDA) model was used to combine environmental sensitivity, accessibility, infrastructure availability, and socio-economic factors in order to develop a Sustainable Coastal Tourism Suitability Index (SCTSI). The findings show significant built-up growth along Nilaveli and Uppuveli, encroachment near Pigeon Island's coral ecosystems, and an uneven distribution of tourism infrastructure with limited community involvement. The final suitability map identifies priority areas for eco-tourism development, conservation zones, and regions needing sustainable infrastructure planning, providing a practical spatial decision-support tool for policymakers to balance tourism growth with long-term environmental preservation in Trincomalee.

Keywords: *Coastal tourism, GIS, Trincomalee, Ecosystem vulnerability, Multi-criteria analysis*