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Application of Remote Sensing Technology to Study Human Encroachment Patterns in Marginal Villages of Wilpattu National Park

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Abstract

Understanding the impact of human encroachment at national parks is essential to implementing optimum management strategies for protecting wildlife and forest resources. This research used multispectral imagery (Landsat 5 and Landsat 8) to scientifically evaluate human encroachment in Wilpattu National Park's selected influenced GNDs using methods from remote sensing. The primary goal of this study is to utilise multispectral images for a quantitative evaluation of human encroachment in selected GNDs in Wilpattu National Park through a remote sensing approach, focusing on assessing spatial and temporal patterns using high-resolution satellite imagery and analysing vegetation cover using the NDVI index. The present research was focused on selected eight marginal villages (Hunuwilagama, Mahawilachchiya, Rajanganaya Track 18, Matha Kiramam, Palaikuli, Pahala Puliyankulama, Parana Eluwankulama and Andiyapuliyankulam) in Wilpattu National Park along the buffer areas. Land use maps and the Normalised Difference Vegetation Index (NDVI) were used to measure the changes in land use cover in these areas between 2009 and 2022. Image processing and supervised classification methodology were employed, and the study area was categorised into four different classes: dense vegetation, sparse vegetation, barren lands, and water bodies. Using ArcGIS Pro software, NDVI maps were created, and quantitative data was categorised throughout three separate periods (2009, 2015, and 2022). Using the change detection wizard tool, the overall change between 2009 and 2022 was evaluated according to land use category. Finally, NDVI-derived maps were crossed with developed land use maps in 2009 and 2022 to access the actual forest cover area. The results indicate that during the last 13 years. Over a decade, significant changes have occurred in forest areas, agricultural fields (paddy, coconut, chena), and residential gardens. According to the study's findings, all the GNDs experienced actual forest cover loss between 2009-2022 and Pahala Eluwankulama GND exhibited the most significant reduction in forest cover, resulting in a 12.54% loss. According to the results of the classification of the buffer zone, paddy cultivation, and human settlement areas experienced the highest expansion throughout the 13 years from 2009 to 2022. This study emphasizes the effectiveness of incorporating remote sensing data into land use change detection, especially in faraway locations like national parks and forests where access and data collection are difficult.

Keywords: *Wilpattu National Park, Land use change detection, NDVI, Remote sensing*