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Assessing Changes and Fragmentations of Forest Cover in the Northern Province, Sri Lanka

Bharathy, P.*, Suthakar, K.

Department of Geography, University of Jaffna, Jaffna, Sri Lanka

**bharathyp@univ.jfn.ac.lk*

Abstract

Forest cover change and fragmentation have become a global concern and are linked to the decline of the ecosystem's integrity. It also negatively affects biodiversity, forest degradation, and the spatial pattern of the landscape. Human population increase and accompanying activities like agricultural expansion, resettlement, deforestation, and infrastructural development all contribute to forest cover changes and forest fragmentation. Geospatial technologies, such as remote sensing (RS) and geographic information system (GIS), have expanded the potential for investigating, monitoring, analysing, and reporting on important biodiversity changes. This study aims to assess and quantify the extent and pattern of forest cover changes and forest cover fragmentations in the Northern Province since 1990. From 1990 to 2020, multi-temporal satellite images (Landsat: TM, ETM, OLI) and digital image processing were used to assess and spatially describe forest cover changes. Forest fragmentations were measured by number of patches, patch size coefficient of variance (PSCoV), class area, edge density, mean shape index and average weighted mean shape index using Patch Analyst in the ArcGIS environment. The study shows that large amounts of forest cover have decreased over the last 30 years in the Northern Province. The lands for agriculture, homestead, and scrub increased by 9.16%, 13.33%, and 4.4%, respectively during the last 30 years, while forest cover decreased by 24.07%. As a result, the Northern Province's Forest is more fragmented. The total forest patches increased by 53,536 patches over the 30 years, the mean patch size (MPS) reduced from 21.75 in 1990 to 5.79 in 2020 and PSCoV decreased by roughly 85.95% from 7663.14 ha in 1990 to 1077.03 ha in 2020. Forest cover in Northern Province has not been disturbed much by three decades (1980-2009) of civil war, however, there were significant changes in forest cover after the war due to increasing resettlements in new places, development initiations, indiscriminate forest logging, land grabbing and agricultural expansion. The trend of fast deforestation and increasing forest fragmentation in the Northern Province effects on natural habitats of wildlife, biodiversity and the livelihood activities of the people. In this setting, it is critical to adopt appropriate policies to balance the environment via sustainable land use planning. The findings of this research provide a solid foundation for the necessities of sustainable development planning in Northern Province.

Keywords: Remote Sensing and GIS, Satellite images, Forest cover change, Fragmentation, Northern Province