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Analysis of Urban Growth and Land Use Changes in Selected Divisional Secretariats (DSD) in Anuradhapura District, Sri Lanka, Using Geographic Information Systems (GIS) and Remote Sensing (RS)

Mendis, C.C.D., Bandara, W.M.J.Y., Ariyarathna, T.D.S.*, Fernando, S.N.I.

Department of Zoology and Environmental Management, Faculty of Science, University of Kelaniya, Dalugama, Sri Lanka
**dulshanariyarathna@gmail.com*

Abstract

The process of urban growth and its associated land use changes have a significant impact on sustainable development and resource management. Changes in land cover led to deforestation and because of that human-wildlife conflict escalated in the Anuradhapura district, Sri Lanka. Therefore, this research aims to analyze the urban growth patterns in 18 Divisional Secretaries (DSD) (i.e., *Padawiya, Kebithigollewa, Medawachchiya, Nuwaragampalatha, Rambewa, Kahatagasdigiliya, Horowpathana, Galenbindunuwewa, Mihintale, Anuradhapura, Rajangane, Talawa, Tirappane, Palugasewewa, Kekirawa, Ipalogama, Galnawa and Nuwaragam Palata*) in Anuradhapura district between 2010 to 2024 using Geographical Information Systems (GIS) and Remote sensing (RS). After obtaining United States Geological Survey (USGS) images covering the study area for the years 2010 and 2024, supervised classification based on the maximum likelihood classifier was applied to the imagery to prepare Land use/Land cover (LULC) maps with four land cover classes: forests, water bodies, croplands, and built-up areas. Land extents for each LULC type were calculated, and the changes in the area between 2010 and 2024 were compared using ArcGIS 10.8. The supervised classification indicates that forest cover and the cropland areas decreased (1,876.38 km^2 to 1,006.25 km^2 and 1,553.62 km^2 to 850.80 km^2, respectively) while water bodies and built-up areas increased (333.92 km^2 to 1,127.38 km^2 and 1,713.80 km^2 to 2,494.99 km^2, respectively). The overall accuracy for the 2010 and 2024 (LULC maps) are 0.84 (84%) and 0.81 (81%) respectively, highlighting the reliability of the results. The decrease in forest cover may be contributing to the increased human-wildlife conflict in the Anuradhapura district and the decrease in cropland areas shows the pressures that have been exerted by expanding built-up zones. The increase in water bodies most probably indicates the construction of reservoirs to support urban expansion. So, overall, these findings indicate the severe changes in land use patterns throughout the study period, escalated largely by urbanization and its impacts on the natural environment. This study emphasizes the need for efficient urban planning and resource management strategies in the Anuradhapura district to balance developmental requirements with environmental sustainability. By applying remote sensing and GIS technology, this research provides a valuable tool for policymakers to monitor and manage land use changes and ensure the long-term sustainability of the area's natural resources.

Keywords: *Land use classification, Maximum likelihood supervised classification, GIS, Deforestation, Sri Lanka*