ASSESSING THE EVOLUTION OF URBAN LAND USE AND LAND COVER: A CASE STUDY OF MATARA CITY, SRI LANKA

T.M.R.S. Bandara[1*], D.B.C Jayasinghe[2]
Department of Geography, University of Ruhuna, Sri Lanka
[*]*supun.17671@uhss.ruh.ac.lk*

Urbanization is a multidimensional phenomenon significantly influencing Land Use and Land Cover (LULC) dynamics in cities worldwide. This study focuses on Matara City, Sri Lanka, a rapidly urbanizing area with limited previous research on LULC changes. Using Geographic Information Systems (GIS) and Remote Sensing (RS) techniques, including Maximum Likelihood Classification (MLC), accuracy assessment, and change detection, we analyzed and quantified LULC variations in the years 1996, 2007, 2016, and 2023. Landsat 6 (TM) and Landsat 8 and 9 (OLI) satellite images, which are less than 10% or completely cloud-free, were downloaded from the United States Geological Survey (USGS) website. Four images were captured during the dry season. Satellite imagery enabled us to visualize and quantify changes in land cover, focusing on built-up areas, vegetation, water bodies, and homesteads. The overall accuracy rates for the four years consistently surpassed 90%, indicating a reliable classification of LULC with a strong correlation between the reference Google Maps and the classified maps. The overall accuracy for 1996, 2007, 2016, and 2023 was 92%, 97%, 91%, and 94%, respectively. The corresponding Kappa coefficients were 0.89 in 1996, 0.96 in 2007 and 2016, and 0.92 in 2023. Our findings indicated notable changes in built-up areas from 1996 to 2023, characterized by a 12.21 km² (48.8 %) increase over the entire period. The most significant expansion occurred between 1996 and 2016, with built-up areas growing by 11.82 km² (50.02 %). However, there was a slight decrease of 0.35 km² (4.72 %) from 2016 to 2023. In contrast, vegetation cover steadily declined throughout the study period, resulting in a total loss of 9.94 km². Homestead areas saw a notable decrease of 2.55 km² (10.21%) from 1996 to 2023. In contrast, water areas experienced a net increase of 0.27 km² (1.08%) despite an overall decline of 0.68 km² (2.87%) from 1996 to 2016. This category saw a significant recovery with a 0.95 km² (112.8%) increase between 2016 and 2023, indicating a partial reversal of earlier losses. These results underscore the significant impact of urban expansion on local ecosystems. To mitigate these impacts, we recommend adopting sustainable urban planning strategies, including green belts and urban agriculture, enhancing environmental quality and ecosystem services. This research provides a valuable framework for urban planning in Matara City and similar contexts, highlighting the need for updated land use regulations and sustainable development practices.

Keywords: Urbanization, land use and land cover, remote sensing, GIS, Matara, sustainable urban planning