

(ID 180)

Analysing Sustainable Urban Growth: Spatio-Temporal Dynamics of Urban Expansion in Gampola Urban Centre

Wilamune, P.B.K.*, Jayasinghe, K.D.P.P.

Department of Geography, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

**Pramodibhagya06@gmail.com*

Abstract

Urbanization is a dynamic process which can be considered as one of the most significant indicators of development. It occurs both horizontally and vertically on the Earth's surface according to a pattern which has positive and negative implications. Some countries measure their development by the level of urbanization because it directly affects for a country's economy. During past decades, Gampola urban centre was experiencing a gradual urban growth and several implications. This study focuses on investigating urban expansion pattern of Gampola during 16 years by analysing three distinct years 2006, 2013, and 2022. Geographic Information System (GIS) and Remote Sensing (RS) techniques were employed to examine spatio-temporal transformations and urban expansion patterns of Gampola and its outskirts. Landsat images for three distinct years were classified using pixel-based supervised classification to determine Land Use Land Cover (LULC) of the study area which achieved an impressive overall accuracy of approximately 90%. Four major LULC types were identified those are prominent in the area namely, water, built-up, forest, paddy lands and bare lands. Temporal changes of vegetation cover for 16 years were analysed further using Normalized Difference Vegetation Index (NDVI). Consequent implications on Land Surface Temperature (LST) across the time period were analysed using thermal band of Landsat images. NDVI value has decreased from +0.7 to +0.5 during 2006-2013 and up to +0.4 during 2013-2022. LST analysis revealed a rise in temperature, increasing from 29.89° C up to 31.11° C during 2006-2013 and surging to 33.14° C by 2022. Quantifying the urban expansion of Gampola was performed using buffer analysis. Analysis of urban areas grown within 1km distanced five buffer zones from urban core was performed to quantify urban expansion. Fourth buffer zone exhibited the highest urban growth, while first buffer zone displayed lowest urban growth during 2006 to 2022. In the interval between 2013 and 2022, the fifth buffer zone appeared as the zone with the highest urban growth. Further, Landscape Expansion Index (LEI) was employed to identify the urban expansion patterns, and Gampola urban area displayed an Edge Expansion growth type. We recommend the development of urbanized areas in a sustainable and efficient manner to mitigate adverse consequences and promote balanced growth.

Keywords: GIS and RS, Urban expansion, LEI, LST, Sustainable development