Assessing the land surface temperature and soil moisture index in response to land use/cover in Vavuniya district of Sri Lanka using LANDSAT 8 data

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Abstract: Agricultural productions are actively practiced in Vavuniya district. Variations in the land surface temperature (LST) and soil moisture index (SMI) can impact on agricultural production. After the civil war land use and land cover (LULC) changes can be highly observed in Vavuniya district due to the developments. LULC changes highly influence the LST and SMI. The understanding about the influence of the change in LULC in LST and SMI is vital for the effective planning of agricultural activities. GIS and Remote sensing have given a lot of possibilities to study the land features. This study has been made to assess the LST and SMI using ArcMap 10.7.1. Landsat 8 OLI/TIRS satellite imageries of 2013, 2017 and 2021 were used. For LULC mapping, maximum likelihood classification was run. The study is feasible as the methodology is designed to calculate LST and SMI using ArcGIS raster calculations based on the Split -Window algorithm. The derived LULC, LST and SMI maps indicate that, In comparison to the LST and SMI values observed in built up area and barren land, values of LST and SMI observed in forest and other vegetation cover were lower and higher respectively. The range of LST for the year 2013, 2017, 2021 were 31.99–37.82 °C, 30.74–48.26 °C, 19.55–25.29 °C respectively. Highest value of average atmospheric temperature, SMI were recorded in 2017, 2021 respectively. This study has demonstrated the efficacy of freely available satellite imagery in assessing the influence of LULC in the variation of LST and SMI.

Keywords: GIS, LULC, OLI/TIRS, Soil moisture index