Abstract

This study aims to determine the impact of Land Use and Land Cover (LULC) changes on Land Surface Temperature (LST) in the Dera Ismail Khan district. In this regard, the LULC maps for the years 2002, 2013, and 2022 were created by processing satellite images and performing maximum likelihood classification. The thermal bands for the years 2002, 2013,2021, and 2022 were also analyzed to determine the district LST. The Cellular automata (CA) and Markov, were applied to simulate future (2032) LULC and LST maps. According to the LULC analysis, between 2002 to 2022, the built-up area and vegetation increased by +90% and +93% respectively. While the barren land and water bodies have decreased by -17% and -35% respectively. In the future (2032), both land covers are anticipated to change by +157% (vegetation) and +110% (built-up) from the year 2002. Moreover, water bodies and barren land continue to decrease in the future. The findings of the LST showed that the summer season is impacted significantly by an increase in maximum temperature of 8.2°C; while, the maximum LST in the winter season has increased by 0.41°C during 2 decades and it is anticipated to continue rising in 2032. For a comparative study, the LST maps of the summer and winter seasons were reclassified into four classes in degree Celsius i.e., 17 – 25, 25 – 32, 32 – 39, 39 – 49, and 8 -18, 18 – 22, 22 – 26, 26 – 33 respectively. From 2002 to 2022, for summer season, the area under the LST of 17 – 25, 25 – 32, 32 – 39, 39 – 49 was observed to change from 3.48%, 36.30%, 60.21%, 0.01% to 1.28%, 15.33%, 43.58%, 39.81% respectively. While for winter season, during 2002 to 2021, the area under LST of 8 -18, 18 – 22, 22 – 26, 26 – 33 was observe to change from 0.02%, 7.92%, 56.23%, 35.94% to 2.43%, 33.85%, 51.30%, 12.42%. The same trend continues for the predicted year. These results shows that the thermal profile of urban areas and the whole land cover is greatly impacted by changes in LULC specifically in the summer season. Considering this, appropriate and urgent actions are needed to address it. Policy interventions are needed to protect against the effects of anthropogenic activities on the local climate of the district.