World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:18, No:08, 2024

Spatio-Temporal Land Cover Changes Monitoring Using Remotely Sensed Techniques in Riyadh Region, KSA

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Abstract : Land Use and Land Cover (LULC) dynamics in Riyadh over a decade were comprehensively analyzed using the Google Earth Engine (GEE) platform. By harnessing the Landsat 8 Image collection and night-time light image collection from May to August for the years 2013 and 2023, we were able to generate insightful datasets capturing the changing landscape of the region. Our approach involved a Random Forest (RF) classification model that consistently displayed commendable precision scores above 92% for both years. A notable discovery from the study was the pronounced urban expansion, particularly around Riyadh city. Within a mere ten-year span, urbanization surged noticeably, affecting the broader ecological environment of the region. Interestingly, the northeastern part of Riyadh emerged as a focal point of this growth, signaling rapid urban growth of urban sprawl and development. A comparison between the two years indicates a 21.51% increase in built-up areas, revealing the transformative pace of urban sprawl. Contrastingly, vegetation cover patterns presented a more nuanced picture. While our initial hypothesis predicted a decline in vegetation, the actual findings depicted both vegetation reduction in certain pockets and new growth in others, resulting in an overall 25.89% increase. This intricate pattern might be attributed to shifting agricultural practices, afforestation efforts, or even satellite image timings not aligning with seasonal vegetation growth. The bare soil, predominant in the desert landscape of Riyadh, saw a marginal reduction of 0.37% over the decade, challenging our initial expectations. Urban and agricultural advancements in Saudi Arabia appear to have slightly reduced the expanse of barren terrains. This study, underpinned by a rigorous methodological framework, reveals the multifaceted land cover changes in Riyadh in response to urban development and environmental factors. The precise, data-driven insights provided by our analysis serve as invaluable tools for understanding urban growth trajectories, guiding urban planning, policy formulation, and sustainable development endeavors in the region.

Keywords : remote sensing, KSA, ArcGIS, spatio-temporal
Conference Title : ICRSE 2024 : International Conference on Remote Sensing and Environment
Conference Location : Bangkok, Thailand
Conference Dates : August 15-16, 2024