Land Use and Land Cover Change Detection and Prediction for Urban Planning in Riyadh, Saudi Arabia

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Key words: Geoinformation/GI; Land distribution; Land management; Land readjustment; Real estate development; Remote sensing; Spatial planning; Urban renewal; Urban Growth; LULC Patterns; Change Detection; Land Use and Land Cover

SUMMARY

This study presents a comprehensive analysis of Land Use and Land Cover (LULC) changes in Riyadh over a ten-year period (2013–2023), utilizing the power of the Google Earth Engine (GEE) platform for advanced geospatial data processing. 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.

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FIG Congress 2026
The Future We Want - The SDGs and Beyond
Cape Town, South Africa, 24–29 May 2026