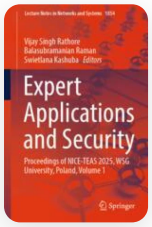
Remote Sensing Reveals Land Cover Dynamics at SIDCUL Industrial Estate, Haridwar: A Sacred City in the Himalayan Foothills, India (2018–2023)

| Conference paper | First Online: 01 April 2026

| pp 460–471 | Cite this conference paper



Expert Applications and Security

(NICE-TEAS 2025)

Pooja Joshi, Ashutosh Bhatt, Tanisha Jatav, Vedant Nainwal & Kapil Joshi

Part of the book series: Lecture Notes in Networks and Systems ((LNNS,volume 1854))

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Abstract

This study employs Sentinel-2 satellite imagery and spectral indices (NDVI, MNDWI, NDBI) to quantify land cover changes in Haridwar, India, between 2018 and 2023. Using Google Earth Engine, we computed index differences and classified land cover into five categories: Barren, Sparse Vegetation, Dense Vegetation, Water, and Built-up. Results indicate a 5.5% expansion in built-up areas (+3.68 km^2), a 2.9% decline in dense

vegetation (−1.36 km^2), and minor increases in water bodies (+14.1%) and barren land (+4.3%). These changes reflect urbanization pressures near critical Himalayan ecosystems, providing a baseline for sustainable land management.

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Author information

Authors and Affiliations

Department of Computer Science, Swami Rama Himalayan University, Jolly-Grant, Dehradun Uttarakhand, India
Pooja Joshi, Ashutosh Bhatt, Tanisha Jatav & Vedant Nainwal

Department of Computer Science and Engineering, UIT, Uttaranchal University, Dehradun Uttarakhand, India
Kapil Joshi

Corresponding author

Correspondence to Pooja Joshi.

Editor information

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Joshi, P., Bhatt, A., Jatav, T., Nainwal, V., Joshi, K. (2026). Remote Sensing Reveals Land Cover Dynamics at SIDCUL Industrial Estate, Haridwar: A Sacred City in the Himalayan Foothills, India (2018–2023). In: Rathore, V.S., Raman, B., Kashuba, S. (eds) Expert Applications and Security. NICE-TEAS 2025. Lecture Notes in Networks and Systems, vol 1854. Springer, Cham. https://doi.org/10.1007/978-3-032-18846-5_38

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DOI	Published	Publisher Name
https://doi.org/10.1007/978-3-032-18846-5_38	01 April 2026	Springer, Cham

Print ISBN	Online ISBN	eBook Packages
978-3-032-18845-8	978-3-032-18846-5	Engineering

Engineering (R0)

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