Assessing NO_2 pollution in Delhi, India: a geospatial approach to urbanisation and land use impacts

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Nitrogen dioxide (NO_2) is a major air pollutant in cities, significantly affecting air quality and public health. The present study examines the spatial link between NO_2 levels and different land use/land cover (LULC) in Delhi, India, for the year 2023. The study explores the connection between NO_2 pollution and six types of LULC: cropland, tree cover, shrubland, grassland, built-up areas, and permanent water bodies. The land cover product for the mentioned LULC types was taken from the Sentinel-2 and handled in Google Earth Engine. Then, each LULC type was approximated to determine its effect on NO_2 distribution. The findings will help improve the understanding of NO_2 pollution in Delhi. They will also provide useful information for urban planning, environmental management, and policy development to reduce air pollution and its related health risks.

Keywords: Air pollutants, air quality, geographically weighted regression, Google Earth Engine, LULC, Sentinel-2.

LULC characteristics influence NO_2 distribution. Tree cover and shrubland can act as a sink for pollutants by absorbing NO_2, while built-up areas and road networks contribute to increased emissions[6]. A recent study has also highlighted the importance of urban green spaces in reducing NO_2 pollution. They can help improve local air quality[7]. On the other hand, the growth of urban development and the resulting increase in hard surfaces can worsen NO_2 concentrations[8]. The present study looks at six types of LULC: cropland, tree cover, permanent water bodies, shrubland, grassland, and built-up areas. We obtained these from the Sentinel-2 land cover product and handled them in Google Earth Engine (GEE) to evaluate their impact on NO_2 pollution in Delhi. GEE allows for efficient processing of large-scale satellite data, which supports detailed spatial analysis of NO_2 and LULC interactions[9].

Given the dynamic nature of urban air pollution, this study analyses the spatial correlation of NO_2 with LULC factors in Delhi for 2023 to understand its seasonal patterns and key influencing factors. The seasonal variation in pollution is significantly driven by meteorological conditions, which play a crucial role in the dispersion and accumulation of pollutants like NO_2 (ref. 10). The analysis will incorporate recent advancements in remote sensing