Land system transformations govern trophic status of urban wetland ecosystem: Perspectives from remote sensing and water quality analysis

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Abstract

Globally, urban wetlands are facing immense pressure of land use land cover changes (LULCCs) and associated water quality degradation that is severely affecting the trophic status of these pristine ecosystems. This study analyzed water quality degradation resulting due to the land system changes in the vicinity of Khushalsar, an urban wetland, in Srinagar city from 1980-2017. The analysis of satellite data indicated that the wetland has lost ˜18.1 ha from 1980-2017. During the same period the urban area within the wetland increased from 0.2% to 16.5%. The land cover changes assessed in the immediate vicinity of wetland indicated an increase of 119% in built-up and 62.8% in roads. The analysis of surface water quality of the wetland showed much greater degradation of Khushalsar wetland. The Trophic State Index (TSI) ranged from 73.4-84.6 thereby indicating the hyper-eutrophic nature of the wetland. A snapshot of comparative water quality data from 2002-2018 revealed that the mean concentration of NO3–N increased from 219-433 µg L-1 and total phosphorus (TP) increased from 135.4-1236 µg L-1 indicative of continuous nutrient enrichment. Hierarchical cluster analysis (HCA) clustered 8 sampling sites into 4 groups based on likeness of water quality characteristics. Similarly, discriminant analysis (DA) showed the formation of similar patterns of clusters, authenticating the outcomes of HCA. Wilk's λ quotient dispersion highlighted the role of nutrients and ions in the development of clusters. Principal component analysis (PCA) formed three principal components (PC's) accounting for a cumulative variance of 90.61%.

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