Land-surface temperature dynamics in the fringes of north Bhubaneswar, India: an empirical analysis

Priyanka Mishra[1], Damodar Jena[2,*], Nimay Chandra Giri[3], R. R. Thakur[4] and Debendra Nath Dash[5]

[1]KIIT School of Architecture and Planning, KIIT Deemed to be University, Bhubaneswar 751 024, India
[2]KIIT School of Rural Management, KIIT Deemed to be University, Bhubaneswar 751 024, India
[3]Department of Electronics and Communication Engineering, Centurion University of Technology and Management, Khordha 752 050, India
[4]Odisha State Disaster Management Authority, Bhubaneswar 752 001, India
[5]Mahatma Gandhi National Council of Rural Education, Department of Education, Government of India, Hyderabad 500 004, India

The urban fringes are experiencing a significant surge in surface temperature during the transition from rural to urban, inducing imperceptible disturbances. The present study analyses the temperature modulations from 2000 to 2022 in Kalarahanga and Raghunathpurjali fringes in North Bhubaneswar to understand the relationship between spatiotemporal changes and land-surface temperature in the fringes. The investigations reveal a consistent decrease in the area under water bodies and crops, with an increase in the built-up area. Besides, there exists an inverse correlation between the area under high and medium temperature with the area under cropland (–0.820) and the area under water bodies (–0.799), and a positive correlation coefficient (0.813) with the built-up area/impervious surfaces. This insists on eco-sensitive planning of the urban fringes with consistent monitoring of land use and thermal dynamics for apt control of the changes in the urban microclimate.

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heat islands[6,7]. This process further influences the flow of material and energy in the urban ecological systems, which changes soil properties, urban hydrologic systems, and biological habitats, leading to unpredictable climate changes[8].

Remote sensing and geographic information systems (GIS) facilitate land use mapping, monitoring and analysing the extent and pattern of urban sprawl[9]. This makes them effective tools for studying the formation of urban heat islands (UHI) and their relationship with land-use land-cover (LULC) indices, thereby advancing the understanding of the intricate relationship between their patterns over both space and time[10,11]. However, most studies have primarily focused on larger cities, urban core areas, or rural regions, overlooking the mapping of these changes in the peripheries[11–13].

Urban sprawl in Delhi was studied from 1972 to 2014, and it was observed that there is an increase in the spatially average ambient temperature by 1.02°C, which has resulted in a rise in thermally discomforting hours from an average of 10 h to 13 h a day[14]. Dutta *et al.*[9] found