Environmental Science and Pollution Research (2023) 30:106894–106897
https://doi.org/10.1007/s11356-023-29192-3

EDITORIAL

Impact of urban sprawl on change of environment and consequences

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Published online: 8 August 2023

Environment change is the burning topic across the world. Due to urban sprawl and industrialization, the environment is changing resulting in an increase in land surface temperature (LST) which is a bell ringer for environmentalists. Urban sprawl is destroying the natural habitat resulting in decreased fertility, ground water level, air quality, and much more. The changing in land use land cover adversely impacts the urban thermal environment (Moazzam et al. 2022; Zullo et al. 2019; Gohain et al. 2021; Mohammad and Goswami 2022a; Khan et al. 2022). The impact of future changes in LULC will degrade the thermal environment more and increase the urban heat island phenomenon (Mohammad and Goswami 2022b; Mohammad et al. 2022; Kafy et al. 2022). Thus, for sustainable future development planning, it is essential to know the change dynamics of urban sprawl. Knowing the urban sprawl and its different consequences including land surface temperature alteration, ground water quality degradation, and loss of urban vegetation will add a successive path to sustainable planning for better future livelihood.

The current special issue focuses on the adverse and beneficial impacts of urbanization on the environment. The issue related to environment is concerning the policymakers across the globe. The special issue is focusing on the techniques and methodology by which the assessment of environmental issues can be minimize or resolved.

Among the contributions to this special issue, majority of the paper involve in land use land cover (LULC) change detection, its relation with land surface temperature (LST), aerosol, debris flow, and its future projection. Parveen et al. (2022) studied the built-up growth induces by industrialization using Landsat satellite datasets over the Delhi metropolitan area. A significant increase in built-up area from 30 to 69% during 1989–2019 had been seen. This increase in built-up area shows a strong positive correlation with industrial area as revealed from Shannon entropy. Additionally, the coupling relation between China's land-use net carbon flux and economic growth along with population change is estimated in study special issue. The outcome of the study concludes a lower coupling degree among the three factors, and the correlation is gradually weaker. Indeed, the independent relation among them seems to be more prominent. Interestingly, the weak decoupling suggests higher economic growth rate than the growth rate of land-use net carbon flux of China.

The change in LULC significantly impacts the LST of an urbanized area. In this special issue, Mahdavi Estalkhsari et al. (2022) investigate the effect of LULC change over a rural landscape Farim of Iran using Landsat data. The result magnifies the role of LULC change in altering the seasonal LST change over the study area from 1990 to 2020. Increasing LST could significantly impact the urban heat island (UHI) over the rural land with the strong UHI in the central area. Additionally, the analysis of Kharun's lower catchment of Chhattisgarh, India, suggests a significant variation of LST over the urban regions and less in forest and adjacent water body from 2000 to 2021. Indeed, a positive correlation of LST with normalized different built-up index and negative with normalized difference vegetation index is seen over the study location. This special issue also includes the advanced machine learning algorithms in modeling the spatiotemporal heterogeneity of LST and its relationship with change in LULC. An increase of about more than 330% urban built-up area is evident over the Abha, Khamis Mushait, Saudi Arabia, during 1990–2020. The analysis of high-cluster urbanized built-up pixels is closely related to the normalized difference built-up index (NDBI), but not to normalized difference water index (NDWI) or normalized

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difference vegetation index (NDVI). The analysis of LST with the different land cover indices over Kohima Sadar district of Nagaland state of India also suggests a positive significant correlation of LST with NDBI and negative with NDVI. There is a strong correlation of LST with the urban heat island (UHI), and a strong UHI is evident in developed area as compared to none UHI over the adjacent rural territory. Indeed, the seasonal UHI suggests a stronger urban heat phenomenon during the summer months and lower in winter months.

This special issue also focuses on the relation of urban sprawl with the LST and aerosols. The relation of surface temperature with the visibility in Jammu, city of India is studied using MODIS-based LST and aerosol optical depth (AOD) data. There has been significantly higher increasing trend of mean maximum LST with AOD that is observed on a site located 25–27 km radially away from the city center. Urban and sub-urban area witnessed significant indifferences that indicate higher rise in LST and AOD in recent decades. In addition to AOD, this special issue also has research that deals with the impact of LULC change on debris flow. Using the LULC simulation and debris flow susceptibility mapping using a linear aggressive model, the impact of LULC change on debris flow is estimated in the Gilgit to Khunjerab region. The result showed that the debris flow susceptibility grows as the LULC change, and the share of higher susceptible zone increases. Additionally, the analysis on future simulation shows a higher impact of LULC change in debris flow.

The assessment of future change in land use land cover is very essential for planning sustainable development. In this special issue, the future simulation of LULC changes for the years 2030, 2040, and 2050 is performed over the Brahmaputra valley of Assam using GIS-based cellular automata Markov model. The historical satellite image showed a significant increase in the built-up area of about 384.99% during 1973–2021. This is mainly due to the transition of vegetation and water body to cultivated and built-up land. Furthermore, an evident increase of 18.09% in built-up land is seen in the year 2050. Moreover, the CMIP6 climate projection scenarios have been used to model the future land use change. Comparing to the baseline period (2006–2016), the extent of agricultural, forest, snow, and glacier over Ghaghara river basin of India will decrease by the mid-century under SSP245 scenario. A higher decrease is observed under SSP585 climate scenario.

In this special issue, Bharath et al. (2023) studies the spatiotemporal variability of rainfall over the Shimsha river of Karnataka for the benefit of sustainable agriculture planning and water resources management practices. The annual, seasonal, and monthly rainfall variability and trend has been determined from 1989 to 2018 using ground station point. The research signifies the importance of southwest monsoon in contributing the greatest part of rainfall over the region, followed by post-monsoon, summer, and winter seasons. The trend of rainfall suggests an increasing trend in annual and seasonal rainfall except for the post-monsoon season. Additionally, in this special issue, the trend and pattern of rainfall in the Delhi metropolitan area of India are studied using station data and applying advanced statistical techniques including fuzzy C-means and K -means, innovative trend analysis, along with Mann–Kendall test. The result suggests an increasing trend in all the selected rain-gage stations over Delhi from 1991 to 2018. The rate of increase in rainfall was less significant varying between 0.01 and 0.16. The innovation trend analysis method performs well as compared to the Mann–Kendall test result.

The devastation caused by rainfall-induced flash flood cannot be neglected. In this special issue, the flash flood hazard mapping using various geo-environmental factors for emergency relief operation is studied in Gandheswari river basin of India using the bivariate logistic regression method. The result witnessed high predictive accuracy of flood hazard map using the used method. The basin's climate irregularities and encroachment toward the riverbank makes it more susceptible to flash floods. Among the selected parameters, land use land cover, geology of the area, short-term intensive rainfall, and normalized difference water index are found to be more responsible factor for flood occurrences. Moreover, the urban flood susceptibility analysis over the Saroornagar urban watershed in Telangana state of India is studied using a multi-criteria-based framework and the analytical hierarchy process. The estimated flood risk map revealed that the moderate risk zone has decreased (50.2 to 45.7%), while high risk zone has increased (45.2 to 52.8%) during 2008–2020.

The groundwater quality of any urbanites area is also essential to estimate its impact on human health. In this special issue, the source and processes controlling the groundwater quality in the Patna region of Bihar, India is studied. The source of the groundwater is identified as shallow meteoric water, which originated from the Ganga river in a nearby locality. On human health impacts, it is not safe for drinking purposes as the electrical conductivity and potassium ion concentrations in the groundwater samples are 5% higher than acceptable levels. This issue also includes the wetland health assessment as seen from the Kolkata metropolitan area. Using the Driving Force-Pressure-State-Impact (DPSI) framework and considering seventeen indicators and four subindicators of the wetland health of Kolkata metropolitan areas is assessed during 2011–2020. Among the different municipalities, the most dominant category was healthy followed by unhealthy and poor categories. The most significant factor responsible for worsening the wetland health were population density, road density, per capita wastewater generation, per capita solid waste generation, biological oxygen demand, dissolved oxygen, pH, and total coliform. Moreover, this issue

also considers the study of lacustrine sedimentary environment. The sediment distribution, factors controlling the transport, and metal enrichment of four different lakes in Svalbard, Arctic are studied. The distribution of trace element is mainly controlled by major element, and all four lakes showed moderate enrichment of metals like Cr and Cd with possible sources from catchment rocks and anthropogenic activities. Higher Cd is responsible for causing potential ecological risk to the sediment-associated biota.

This special issue also focuses on the mitigation effect of urban sprawl on transportation. The study on the electric vehicle enablers (EVE) phenomenon using both qualitative and quantitative treatments; six possible key enablers were identified, which need an urgent attention from the industries and researchers for successful EV penetration in the Indian context. This issue also includes the study of effective removal of Cr (VI) ion in aqueous solution using low-cost biomass leaves, to meet the sustainable development goal (SDG) objective 6.3. The output of the study signifies the role of *Sambucus nigra* L. in removal efficiency of Cr (VI) ion in the contaminated solutions. This is low-cost, readily available, and an environmentally friendly solution for effective Cr (VI) ion removal. Lastly, this issue includes the exposure mapping of gamma radiation over the four districts of Gujarat, India in summer and winter seasons (Patel et al. 2023). The annual and mean gamma dose rates of these four districts were found to be higher than the global population weight average value. There had been significant variation in the seasonal distribution of gamma dose, and lithology shows dominant control in gamma radiation dose distribution in winter season but not in summer.

Acknowledgements The guest Editors would like to express sincere thanks to all the authors for their contributions to this special issue. We greatly acknowledged all the reviewers for their great efforts in this special issue. Finally, I would like to thank the Editor-in-Chief of ESPR for accepting our proposal and allowing us to publish this special edition.

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