Estimation of heat wave patterns and assessment of urban heat island and its impact in Rajshahi city corporation, Bangladesh

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A strongly significant negative correlation has been seen between Daytime Urban Heat Island Intensity (UHII) in summer and PM2.5 with 0.003 significance. Another negative correlation has been observed between Nighttime UHII in summer with 0.033 significance level. For the winter season, daytime UHII is positively correlated with PM10 at 0.011 significant level and nighttime UHII is strongly significant with O3 at 0.007 level. The daytime UHII variability is in significant correlation with SO_2 with 0.31 significance. The nighttime UHII variability has no relation with the air pollutants. This finding will help in the policymaking of the urban area to mitigate both heat island and air pollutant at the same time.

Keywords: *Heat Island, Vulnerability, Mitigate, Hazards and Concentrations*

Estimation of Heat Wave Patterns and Assessment of Urban Heat Island and its Impact in Rajshahi City Corporation, Bangladesh

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Abstract

Rapid urbanization and industrialization in developing cities intensifies urban heat island (UHI) which negatively impacts people's socio-economic activities and livelihoods. This research investigates the future trend of heat waves and perceptions of UHI. Rajshahi City Corporation(RCC) were selected purposively to perform the study. Thirty years (1992-2022) of temperature, humidity, and rainfall data were collected from Bangladesh Meteorological Department for estimating heat wave trends, and satellite images of 1998 and 2023 were derived from USGS Earth Explorer for LST and UHI calculation. In addition, a pretested semi-structured questionnaire data (QD) was collected from 300 household heads and determined through simple random samplings. Data was analyzed with Minitab-17 and ArcGIS-10.4 software to estimate the trend of future heat waves, and QD was analyzed with SPSS to determine the impacts of UHI. The result shows that UHI changed in the last 25 years of range, and the trend of heat wave is significantly increasing its duration and intensity in RCC from the last ten years (Yt = 48.81 + 1.391*t). Based on the climatic data, the future trend (in the next 10 ten years) of heat wave days will increase to 100 days. Rainfall data claims the precipitation in RCC had decreased significantly, and shifted from July to August and September. Furthermore, UHI in RCC is influenced by a sharp decline in vegetation and water bodies and a sharp increase in urban built-up area. The respondents claimed that urban built-up area expansion is the main catalyst for creating UHI. About 38.3% of the respondents had to reduce their working hours and heat-stroke, dehydration, faintness, headaches, tiredness, lethargic, etc. are raised due to excessive heat in the summer season. These findings will help policymakers to prepare a sustainable strategy for reducing UHI effects.

Keywords: *Time series, Temperature, Rainfall, Built-up area, Urbanization, UHI*

Urban Heat Island and Human Thermal Comfort in A Metropolitan City Kolkata

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Abstract

The urban heat island effect has been made worse by urbanization and the sharp rise in urban population. Concern has been raised towards the rising temperature in the urban heat island and its' effect on human health and well-being. Various research has already taken place to identify the urban heat island over a particular region based on several applications and techniques. Among those, analysis of land surface temperature extracted from satellite data is proven useful. However, gaps remain in assessing individual vulnerability beyond the level of comfort. The present study is a modest attempt towards identifying a heat island in a metropolitan city of Eastern India, Kolkata, and assessed the thermal