

Urban Heat Island Intensity Assessment through Comparative Study on Land Surface Temperature and Normalized Difference Vegetation Index: A Case Study of Chittagong, Bangladesh

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Abstract : Current trend of urban expansion, especially in the developing countries has caused significant changes in land cover, which is generating great concern due to its widespread environmental degradation. Energy consumption of the cities is also increasing with the aggravated heat island effect. Distribution of land surface temperature (LST) is one of the most significant climatic parameters affected by urban land cover change. Recent increasing trend of LST is causing elevated temperature profile of the built up area with less vegetative cover. Gradual change in land cover, especially decrease in vegetative cover is enhancing the Urban Heat Island (UHI) effect in the developing cities around the world. Increase in the amount of urban vegetation cover can be a useful solution for the reduction of UHI intensity. LST and Normalized Difference Vegetation Index (NDVI) have widely been accepted as reliable indicators of UHI and vegetation abundance respectively. Chittagong, the second largest city of Bangladesh, has been a growth center due to rapid urbanization over the last several decades. This study assesses the intensity of UHI in Chittagong city by analyzing the relationship between LST and NDVI based on the type of land use/land cover (LULC) in the study area applying an integrated approach of Geographic Information System (GIS), remote sensing (RS), and regression analysis. Land cover map is prepared through an interactive supervised classification using remotely sensed data from Landsat ETM+ image along with NDVI differencing using ArcGIS. LST and NDVI values are extracted from the same image. The regression analysis between LST and NDVI indicates that within the study area, UHI is directly correlated with LST while negatively correlated with NDVI. It interprets that surface temperature reduces with increase in vegetation cover along with reduction in UHI intensity. Moreover, there are noticeable differences in the relationship between LST and NDVI based on the type of LULC. In other words, depending on the type of land usage, increase in vegetation cover has a varying impact on the UHI intensity. This analysis will contribute to the formulation of sustainable urban land use planning decisions as well as suggesting suitable actions for mitigation of UHI intensity within the study area.

Keywords : land cover change, land surface temperature, normalized difference vegetation index, urban heat island

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