Characterizing the relationship between land use pattern and land surface temperature with automated built up extraction: Process, pattern and modelling

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Urbanization is an imperative parameter that defines the Gross Domestic Product (GDP) of a country and also play a vivacious role in determining how the country is developing. With increased industrialization and globalization, there has been policy transformations towards global trade and economic activities that in-turn has led to augmented migration to urban areas causing increased built-up horizontally and vertically using non-native systems of planning. This kind of planning has demanded more intensive energy usage that contributes to increased level of Green House Gas (GHG) emissions causing surface temperature to rise, with variations in micro-climate. Government policies introduced recently have been pushing towards development of renewable energy resources and smart planning. Considering these aspects, this communication analyses the relationship between land use and land surface temperature, along with understanding its variability with the features present on the surface for the Indian city of Kolkata. The study analyses temporal land use pattern using supervised machine learning along with extraction of building surface and edges to understand the surface area available in current scenario and estimate the greenhouse gas emission from each sectors of the city. This research also predicts the urban growth pattern for 2025 through model based on cellular automata for business as usual scenario for the city. The outcome of the communication would succor the decision makers and government officials to formulate new policies and modify the existing ones for creating a balance between environment and humans for sustainable development, thus, combating the climate change.

Keywords: Automated extraction, Machine learning, Land surface temperature, GHG emission, Land use modelling