National Institute of Technology Rourkela

Synopsis Seminar

Seminar Title	: Quantifying the impact of urban canopy parameters on the sky-view factor: A parametric study of regulated residential canyons in a typical Indian city
Speaker	: Binit Kumar (Rollno : 514pa4001)
Supervisor	: Basudatta Sarkar
Venue	: Seminar room, Department of Planning and Architecture
Date and Time	: 26 Mar 2025 (4:30 pm)

Abstract : The climatic conditions in urban areas are affected by man-made features, including buildings. Building geometry affects the sky-view factor (SVF) of a canyon. A higher SVF mitigates the urban heat island (UHI) effect, whereas a lower SVF enhances pedestrian thermal comfort during summer daytime. However, variations in building dimensions and spacing are governed by local regulations that constrain options for urban designers. This study investigated urban planning policies with the objective of understanding the impacts of varying plot parameters, building dimensions, and setbacks on SVF measured along the street. Using a vector-based method for SVF calculations, SVF was estimated for several parameterized urban canyons representing regulated residential development in India, with variations in plot dimensions, building dimensions, and setbacks permitted according to development control regulations.

The findings indicated that developments with detached housing featuring identical buildings and maintaining a straight building line exhibited a higher SVF. Multiple regression analysis revealed that front setbacks, building height, and building depth were the most influential variables affecting SVF. Maintaining a uniform building height across the street resulted in a higher SVF compared to varying building heights with larger variations, whereas varying the floor area ratio across plots along the street significantly reduced the SVF. To validate the relationships between urban planning parameters and SVF, the residential sectors of Gandhinagar were analyzed for building plan density (BPD), building view factor (BVF), and land surface temperature (LST) at a grid resolution of 30 m. A strong relationship was found between BPD and BVF (R^2=0.65), indicating the impact of urban planning parameters on UHI. However, no significant relationship was found between BPD and LST (R^2=0.15), as urban surfaces other than buildings contributed equally to the enhancement of the surface UHI effect. Accordingly, planning policies may be formulated to enhance the SVF, thereby mitigating the UHI effect.

Keywords

Sky-view factor urban canopy parameters building geometry residential development urban heat island