43. Satellite data and neural network algorithms for Urban Heat Island forecast

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This study investigates the urban heat island (UHI) phenomenon in the metropolitan area of Catania (Sicily, Italy), focusing on selected urban sectors to characterize thermal contrasts between densely built-up areas and green spaces. Landsat 8 imagery was used to derive the Normalized Difference Vegetation Index (NDVI) and land surface temperature (LST), supporting the spatial characterization and mapping of UHI patterns. Land use and land cover (LULC) were mapped through supervised classification of Sentinel-2 imagery and subsequently analysed in relation to these patterns. Future LULC scenarios were simulated using a modelling framework incorporating multilayer perceptron neural networks and cellular automata. Predictive performance was evaluated by comparing simulated LULC with observed data for a reference year, using kappa statistics to quantify agreement. The relationship between LULC and UHI was then used to assess potential future UHI conditions under the projected land-cover scenarios. By integrating satellite observations with predictive spatial modelling, this approach provides a tool to support environmental planning and decisionmaking, enabling the assessment of potential urbanization-related thermal impacts and their implications for residents' quality of life.