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## Understanding and Mitigating Urban Heat Islands: A Satellite Remote Sensing and Local Climate Zone Approach to Green-Blue Space Connectivity for Urban Planning

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### Abstract:

As the climate crisis intensifies, urban areas worldwide are experiencing rising temperatures and more frequent heat waves, exacerbating thermal discomfort and straining urban ecosystems. One prominent manifestation of this phenomenon is the exacerbation of the urban heat island (UHI) effect, in which built-up environments retain more heat than surrounding rural areas due to land cover modifications and anthropogenic activities.

This study leverages satellite remote sensing (RS) techniques and the World Urban Database and Access Portal Tools (WUDAPT) framework to classify Local Climate Zones (LCZs) and assess UHI dynamics in Wilmington, USA, and Amsterdam, Netherlands. Using multi-temporal Landsat imagery and machine learning-based classification in SAGA GIS, we analyze spatial patterns of UHI intensity and their relationship with green-blue space (GBS) connectivity.

Our spatial regression and correlation analyses reveal that areas with lower GBS coverage exhibit significantly higher UHI intensity, with temperature differences averaging +3.5°C. Conversely, regions with greater GBS density—particularly in Amsterdam—demonstrate a measurable cooling effect of up to 2.8°C. These findings underscore the critical role of GBS in mitigating urban heat stress and highlight the necessity of integrating climate-responsive strategies into urban planning.

This study utilizes WUDAPT's standardized LCZ classification to provide a scalable and replicable framework for assessing urban climate resilience. The insights generated will support equitable cooling infrastructure development, inform heat adaptation policies, and advance sustainable urban design. This research further demonstrates the potential of RS and LCZ-based methodologies to guide climate adaptation planning at multiple urban scales.

### Keywords:

Climate Crisis, RS, Urban Heat Island (UHI), WUDAPT, Green-Blue Spaces, Remote Sensing, Urban Resilience