

Assessment of the Effects of Urban Development on Urban Heat Islands and Community Perception in Semi-Arid Climates: Integrating Remote Sensing, GIS Tools, and Social Analysis - A Case Study of the Aures Region (Khanchela), Algeria

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Abstract : This study investigates the impact of urban development on the urban heat island (UHI) effect in the semi-arid Aures region of Algeria, integrating remote sensing data with statistical analysis and community surveys to examine the interconnected environmental and social dynamics. Using Landsat 8 satellite imagery, temporal variations in the Normalized Difference Vegetation Index (NDVI), Normalized Difference Built-up Index (NDBI), and land use/land cover (LULC) changes are analyzed to understand patterns of urbanization and environmental transformation. These environmental metrics are correlated with land surface temperature (LST) data derived from remote sensing to quantify the UHI effect. To incorporate the social dimension, a structured questionnaire survey is conducted among residents in selected urban areas. The survey assesses community perceptions of urban heat, its impacts on daily life, health concerns, and coping strategies. Statistical analysis is employed to analyze survey responses, identifying correlations between demographic factors, socioeconomic status, and perceived heat stress. Preliminary findings reveal significant correlations between built-up areas (NDBI) and higher LST, indicating the contribution of urbanization to local warming. Conversely, areas with higher vegetation cover (NDVI) exhibit lower LST, highlighting the cooling effect of green spaces. Social survey results provide insights into how UHI affects different demographic groups, with vulnerable populations experiencing greater heat-related challenges. By integrating remote sensing analysis with statistical modeling and community surveys, this study offers a comprehensive understanding of the environmental and social implications of urban development in semi-arid climates. The findings contribute to evidence-based urban planning strategies that prioritize environmental sustainability and social well-being. Future research should focus on policy recommendations and community engagement initiatives to mitigate UHI impacts and promote climate-resilient urban development.

Keywords : urban heat island, remote sensing, social analysis, NDVI, NDBI, LST, community perception

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