

The Impact Of Urban Expansion On Land Surface Temperatures In Sulaymaniyah City

Urban expansion is a global phenomenon that has significantly impacted the environment. The rapid growth of cities has led to the conversion of natural landscapes into built-up areas, resulting in changes in land surface characteristics and microclimates. One of the most notable consequences of urban expansion is the formation of urban heat islands (UHIs), characterized by elevated land surface temperatures (LSTs) within urban areas compared to surrounding rural areas.



The impact of urban expansion on land surface temperatures in Sulaymaniyah City by Phyllis A Unterschuetz

★★★★☆ 4.4 out of 5

Language : English
File size : 5760 KB
Text-to-Speech : Enabled
Screen Reader : Supported
Enhanced typesetting : Enabled
Print length : 88 pages



This article examines the impact of urban expansion on LSTs in Sulaymaniyah city, Iraq. Using remote sensing and geographic information systems (GIS), we analyzed Landsat satellite imagery to quantify LST changes over a 20-year period. Our findings highlight the significant influence of urban expansion on the thermal landscape of Sulaymaniyah city and underscore the need for sustainable urban planning strategies to mitigate the adverse effects of UHIs.

Urban Expansion and Land Surface Temperature

Urban expansion typically involves the conversion of vegetated land surfaces, such as forests, grasslands, and agricultural fields, into impervious surfaces such as buildings, roads, and parking lots. These impervious surfaces have a higher thermal capacity and lower albedo (reflectivity) than vegetated surfaces, which leads to increased absorption and retention of solar radiation. Consequently, urban areas tend to be warmer than their rural surroundings, forming UHIs.

The formation of UHIs is influenced by several factors, including the density and height of buildings, the amount of impervious surfaces, and the presence of vegetation. High-density urban areas with tall buildings and a high percentage of impervious surfaces tend to have more pronounced UHIs than low-density urban areas with more green spaces.

Case Study: Sulaymaniyah City

Sulaymaniyah city is the capital of the Sulaymaniyah Governorate in Iraqi Kurdistan. It has experienced rapid urban expansion in recent decades due to population growth, economic development, and political stability. This expansion has led to the conversion of agricultural land and natural areas into residential, commercial, and industrial areas.

To assess the impact of urban expansion on LSTs in Sulaymaniyah city, we analyzed Landsat satellite imagery from 2000 to 2020. We used the thermal bands of the Landsat images to derive LSTs using the radiative transfer equation. The LST data were then analyzed using GIS to examine the spatial and temporal patterns of LST changes.

Our analysis revealed a significant increase in LSTs in Sulaymaniyah city over the 20-year period. The average LST increased by approximately 2.5°C, with the most pronounced increases occurring in areas that had undergone rapid urban expansion. The highest LSTs were observed in the city center and densely populated residential areas, while the lowest LSTs were observed in rural areas and areas with more vegetation.

The spatial distribution of LSTs in Sulaymaniyah city showed a clear relationship with land use patterns. Areas with high LSTs corresponded to areas with high building density and impervious surface coverage, such as the city center and industrial areas. Conversely, areas with low LSTs corresponded to areas with more vegetation and lower building density, such as parks, agricultural fields, and the outskirts of the city.

Implications for Urban Planning

The findings of our study have important implications for urban planning and sustainable development in Sulaymaniyah city



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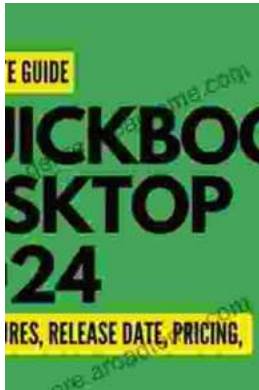
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