Multitemporal Analysis of Urban Landscape Destruction and Reconstruction in Active Hostilities Zone: Case Study of Moshchun Village, Ukraine

Nevmerzhytska, Sofiia (School: Separate Subdivision “Scientific Lyceum” of Zhytomyr Polytechnic State University)

There is a critical global need to develop effective methods for monitoring and assessing damage to urbanized landscapes under conditions of active hostilities. Moshchun village in Kyiv Oblast, which suffered extensive destruction during occupation and active combat operations in 2022 and is currently undergoing reconstruction, serves as a representative case for testing methods of multitemporal analysis of urbanized landscape changes. Multitemporal analysis was conducted based on 24 Sentinel-2 Level-2A satellite images covering the 2021-2025 period. Six spectral indices were utilized for a comprehensive characterization of land cover changes: NDBI, BAEI and IBI for the assessment of built-up areas; NDVI for vegetation condition; MNDWI for water bodies; and SAVI to account for soil background effects. Statistical processing methods, correlation analysis, and spatial heterogeneity assessment were applied. Reconstruction during 2024-2025 followed a nonlinear trajectory. By August 2025, NDVI recovered most rapidly, reaching near pre-war levels of 0.32. BAEI stabilized at 0.36, indicating completed site clearance, while NDBI remained below baseline. Correlation analysis confirmed strong index coherence. Spatial analysis revealed a center-to-periphery reconstruction pattern with the slowest recovery in the northern and eastern sectors. The multitemporal analysis of Moshchun village identified spatiotemporal transformation patterns under active combat operations and post-conflict reconstruction. Six spectral indices enabled quantitative assessment of destruction extent and infrastructure recovery rates. The study provides a unique contribution to global literature, documenting a complete small settlement transformation cycle using free and globally reproducible data.

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