

How much is built? Quantifying and interpreting patterns of urban development from different data sources.

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ABSTRACT

Land use land cover change (LUCC) has emerged as a critical direction of applied research in remote sensing. In particular, the transformation from open to built land has important environmental and social implications, including impacts on biodiversity, hydrology, and urban planning. This work compares two methodologies for assessing amounts land transformed from open to built space using two data sources – Remotely sensed (RS) Landsat data and 1:50 000 scale survey maps. We quantify built space using three regions in Israel at two time periods, the mid 1980s and the late 1990s, and produce an estimate of built area for each. We use a decision-tree methodology to define open and built space using the RS data and a Geographic Information Systems (GIS) platform for analyzing the survey maps. The methodologies are developed and analyzed independently of one another using an accuracy assessment to analyze the strengths and weaknesses of each. We then quantify and characterize the spatial pattern of built space for each methodology. We conclude with a suggestion for a method to combine the two resultant built area maps in a way that capitalizes on the strengths of both. The RS methodology proved to have a high amount of omission errors for built space in areas with high vegetation and low-density exurban development, but high commission errors in the arid site. The GIS analysis generally had fewer errors, although systematically missed built surfaces that were not specifically buildings or roads, as well as structures intentionally omitted from the maps. Where possible, we recommend using maps for baseline estimates and then supplementing them with built area identified by the RS analysis. The results of this comparative study are relevant to both scholars and practitioners, who should know the strengths and weaknesses of mapping techniques they are using.

Key Words: Land-Use/Land-Cover Change, built area, open space, GIS, remote sensing, Israel, urban planning