Fusion of multispectral and multitemporal satellite data for urban environmental changes analysis

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Environmental urban changes assessment is providing information on environmental quality for identifying the major issues, priority areas of the policy making, planning and management. Effective planning is based on the completely and precisely understanding of the environmental parameters in urban area. Remote sensing is a key application in global-change science, being very useful for urban climatology and landuse-landcover dynamics and morphology analysis.

Multi-spectral and multi-temporal satellite imagery (LANDSAT TM and ETM, MODIS and IKONOS) for Bucharest urban area over 1988 – 2008 period provides the most reliable technique of monitoring of different urban structures regarding the net radiation and heat fluxes associated with urbanization at the regional scale.

The main objectives of this investigation aimed: to develop and validate new techniques for mapping and monitoring land cover and land use within and around Bucharest urban area using satellite sensor images and new digital framework data; to analyze the spatial pattern of land cover and the detailed morphology of urban land use across the study area, and hence quantify the degree of order and structure that underlies the apparently irregular geometry of land use parcels; to devise a methodology for automatic updating of digital urban land-use maps; to develop an improved information base on urban land-use and land-use change for land-use/transportation models, urban development planning, urban ecology and local plans.

Bucharest town, the biggest industrial, commercial center in Romania has experienced a rapid urban expansion during the last decades. A large amount of forest and agricultural land has been converted into housing, infrastructure and industrial estates. The resultant impervious urban surface alters the surface energy balance and surface runoff, which in turn could pose serious environmental problems for its inhabitants (e.g., urban waterlogged and thermal pollution). The changes over the years of surface biophysical parameters are, then, examined in association with landuse changes to illustrate how these parameters respond to rapid urban expansion in Bucharest and surrounding region. This study attempts to provide environmental awareness to urban planners in future urban development. The land cover information, properly classified, can provide a spatially and temporally explicit view of societal and environmental attributes and can be an important complement to in-situ measurements. Changes in urban land cover include changes in biotic diversity, actual and potential primary productivity, soil quality, runoff, and sedimentation rates, and cannot be well understood without the knowledge of land use change that drives them. Urbanization, the conversion of other types of land to uses associated with growth of populations and economy, is a main type of land use and land cover change in human history. It has a great impact on climate. So called “peri-urban belt” is a zone located outside the city and characterized by a mix of farmers and households working downtown with a great impact on urban ecosystem. Urban and periurban dynamics evaluation is aimed to get the information on environmental condition and in support of the policy making and selection during environment planning and management.