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Settlement pattern change detection analysis (1984-2010) on the Prahova Valley, Romania, using Landsat imagery

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The Prahova Valley situated, to the west of the Carpathian Curvature, is a region with a high density of population and settlements (more than 250-300 inhabitants/ km2 and usually about 500-1000 inhabitants/km2) and a high degree of urban development. This is related to the importance of the main transport axis (European highway and railroad) connecting Bucharest with Transylvania and Central Europe.

Settlement pattern development combines a strong urban dynamics along the main valley axis together with a rural area underdevelopment with scattered farms and old, degraded, infrastructures within the Subcarpathian hills area. The change detection analysis tries to emphasize the main changes within the settlement pattern from the Socialist urban development period (the 1980s) when the real estate market did not exist, and the market economy period (after 1990s) when an imobiliary boom occurred.

Landsat imagery series were available from USGS and GLCF databases and they were selected according to their quality (time of record, cloud free imagery, lowest noise features, full metadata availability). This is the reason we focused only on TM and ETM+ satellite (1984 to 2010) scenes covering the most relevant landscape change period.

The analysis started with the building of the mosaics from the available subscenes, after their radiometric normalization (sensor calibration, cross-track illumination correction, shadowed areas normalization). Information was focused on built-up areas classified on two levels: settlement built-up areas (urban and rural) and settlement structured built-up areas (residential with houses and block districts, industrial and transportation areas, green areas). The separation of spectral data was done on the basis of image fusion data (image sharpening products 15.0 m resolution) for the datasets starting since 1999. The algorithm is complex: hybrid classification (unsupervised ISODATA together with Mahalanobis distance), Support Vector Machine and the image segmentation of the normalized differenced NDVI and NDBI indexes. This was applied on the whole series of imagery and then the results were the subject of an error approach and an overlay. The most relevant data layers were considered.

Another purpose of the analysis was a probabilistic approach on the future evolution of landuse. Using the Markov probability models in IDRISI it was possible to map the future development of the settlement pattern from 2010 to 2036. The analysis took into account the pattern of landslide bodies in some areas like the Breaza town area.

The conclusion of the analysis is that the real-estate market development since 1990 increased the surface of the built-up area, and the density of the built-up areas. New high quality developments replaced the industrial areas as well as some green areas. The process continued from the urban area to the rural settlements in the neighbourhood. Landslide hazards were not correctly took into consideration during this the development process in the Subcarpathian area. For the coming decades a new urban region will emerge along the Prahova Valley axis, between Ploiesti and Brasov