Spatial Predictive Modeling and Remote Sensing of Land Use Change in the Chesapeake Bay Watershed

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ABSTRACT

We propose to model the process by which increasing demand for developed land uses, brought about by changes in the regional economy and the socio-demographics of the region, is translated into a changing spatial pattern of land use. Our study focus is a portion of the Chesapeake Bay Watershed where the spatial patterns of sprawl, and their fundamental social and economic bases, represent a set of conditions generally prevalent in much of the U.S. Working in the region permits access to (i) a time-series of multi-scale and multi-temporal (including historical) satellite imagery and (ii) an established network of collaborating partners and agencies willing to share resources and eager to utilize developed techniques and model results. In addition, a unique parcel-level tax assessment database exists for the Maryland portion of this region. Predictions of future land use change would permit scenario analyses of future carbon dynamics as well as nutrient loadings into the Chesapeake Bay tributaries. It would also provide critical quantitative insight into the impact of alternative land management and policy decisions, since one of the states in the region (Maryland) is a leader in adopting "Smart Growth" policies aimed at curbing the detrimental effects of sprawl development. Our technical approach includes three components: (i) spatial econometric modeling, (ii) advanced remote sensing of suburban change and residential land use density, including comparisons of past change from Landsat analyses and more traditional sources, and (iii) linkages of remote sensing and the predictive model through variable initialization and supplementing parcel level data. We intend to leverage economic spatial modeling and Landsat mapping activities that have already been initiated in the area. Results from the project will be provided in a form suitable for wide distribution, including via an interactive map server on the WWW