Predicting Urban Growth Patterns in the Coastal Southeastern United States (53)

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A focus of the Land Use-Coastal Ecosystem Study (LU-CES) was to evaluate the growth projections from the parcel level to the county level. Population and land development growth projected for the Southeast during the next two decades will put enormous pressure on economic, social and environmental resources. The ability to predict, not only how many people will be immigrating to the region, but also the spatial patterns and directions of growth is crucial to planning and management efforts of municipalities, counties, states and regions.

One growth projection modeling study described here investigated urban growth in the greater Charleston metropolitan area from 1973 to 1994 and found that over the 21-year period, urban land use growth has exceeded population growth by a 6:1 ratio. The prediction modeling was based on the historical trends of the 1973-1994 study and set under the current policy constraints, and the physical environment. For the statistical modeling component of the overall model, a multivariate logistic regression model was selected because of the non-linear nature of urban growth problems. A rule-based model was developed to derive the relative transition probabilities of urban growth. This model was designed to complement the pure statistical model primarily through subjective weighting of variables. The third technique used was focus group mapping. A group of experts, local officials, planners, developers, conservationists and other people were invited to a number of meetings, or interviewed individually, to express their opinions on where growth may occur during the next 30 years. Finally an integrated GIS model was designed to fully take advantage of the above three models by integrating them into one.

As an additional powerful computational and modeling tool, artificial neural networks have many advantages over conventional mathematical methods and statistical models in addressing complex systems. The use of neural networks for modeling has four major potential benefits: better performance, greater representational flexibility and freedom from current model design constraints, the opportunity to handle explicitly noisy data, and incorporation of spatial dependency in the net representation which is currently ignored. The authors applied this model to predict urban growth in coastal South Carolina. The neural network outperformed the conventional logistic regression model in most of the cases (55 of 66) and classification categories (urban, non-urban, overall).

If the current growth trends continue and the predictions hold true, the future urban growth in the modeled areas will sprawl considerably outward from the current urban boundaries. This has

several significant economic, environmental, and social implications in policy-making and urban planning. While these implications are too numerous to list here, their importance cannot be underestimated and the issues cannot be left unaddressed.