AN AGENT-BASED MODEL FOR EXAMINING THE EFFECTS OF SOCIAL NETWORK STRUCTURE ON COASTAL LAND-USE PATTERNS

Lindsey Smart, Center for Geospatial Analytics, North Carolina State University
Jordan Smith, Institute of Outdoor Recreation and Tourism, Utah State University

Coastal landscapes are highly vulnerable to climate change. Impacts to coastal systems include beach erosion, shoreline change, severe flooding and the intrusion of saltwater into surface and groundwater supplies. The Southeast United States is particularly vulnerable, given much of the region's coastal landscapes are less than a few meters above sea level.

Additionally, many small cities and towns across the Southeast's coastal plain are especially vulnerable to climate change given that their economies and livelihoods are dependent upon the agricultural productivity of local landscapes. Landowners in these regions may respond in different ways to land loss or altered productivity. Responses can be influenced by risk perceptions, socio-economic characteristics, individual preferences for specific land uses as well as social or peer influences. Landowners are often reliant upon one another for livelihoods, management, harvesting (in agricultural areas) and water availability. Irrigation water is sometimes shared across boundaries, further strengthening the linkages between landowners' social networks and their land use decisions.

Understanding landowners' social networks is critical to understanding land-use decision making processes and landowners' resilience to climate change. To explore emergent land-use patterns resulting from different social network characteristics, we have developed an agent-based simulation model, grounded in social science theory to gain a better understanding of the ways in which social processes influence land change dynamics. Because social networks are an important component of all social processes, network-based simulation modeling has been historically used within distinct social science disciplines such as sociology and public policy. Here, we explicitly incorporated social network effects into land change dynamics by extending social network theory and methods into a dynamic land use model. In doing so, we have gained insights into how the structural characteristics of landowners' social networks influences adaptive decision making in response to rapidly changing environmental conditions. The results have direct potential to influence land use and climate change policy and improve the resilience of both human and natural communities, particularly in highly vulnerable coastal systems. Results from our agent-based simulation model are being compared and validated by actual social network data and land-use patterns in the coastal plain of North Carolina via a geospatially explicit agent-based model.