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NASA-Funded Research to Examine Urban Transitions, Land Change in Ghana

Hoping to illuminate the driving force behind rapid land change and urban transition in developing African countries, a research team that includes UC Santa Barbara geographers has launched a study of demographic and agricultural shifts in Ghana.

Researchers from San Diego State University (SDSU), UCSB, George Washington University, and the University of Ghana are part of the collaborative effort with a three-year timeline. The project, "The Urban Transition in Ghana and Its Relation to Land Cover and Land Use Change Through Analysis of Multi-scale and Multi-temporal Satellite Image Data," has netted a $993,000 grant from NASA's Interdisciplinary Research in Earth Science program.

The study is being led by principal investigator (PI) Doug Stow, a professor of geography at SDSU and advisor for the UCSB-SDSU joint Ph.D program in geography. Stow earned bachelor's ('76), master's ('78), and doctoral ('85) degrees from UCSB. David Lopez-Carr, a UCSB geography professor, is serving as institutional PI.

The primary goal of the project, which will focus on three mid-sized cities and surrounding regions outside Ghana's capital, Accra, is to decipher "what is driving what," Stow said. "Are people shifts driving land cover change, or shifts in

agriculture, or is agriculture impacting demographics, which are influencing land cover change?

"Looking at these regions and what kinds of agricultural changes are occurring, we hypothesize that things are shifting from small, family-subsistence agriculture to large agri-business," explained Stow, a remote-sensing expert. "As you get that kind of shift, your workforce and the number of individuals involved is reduced, so a lot of people move to cities, which affects population distribution. That's the whole basis for this –– this back and forth between population shifts, land cover, land use change, and the quality of peoples' lives."

Quality of life implications and health impacts of these shifts –– particularly child and infant mortality rates –– are a key component of the study, which will analyze remote sensing images and data, as well as demographic and health surveys taken in and around Ghana between 1993 and 2008.

UCSB geographer and land-change expert Lopez-Carr will manage the latter aspect, looking at surveys of several thousand households over four different time periods to examine the components of demographic change believed to be the drivers of interregional and intra-urban land cover and land-use change.

Over the course of their three-year effort, Lopez-Carr said, the researchers hope to show that these changes are impacting the quality of life, as measured by socioeconomics and health, in major Ghanaian cities. Further, he added, they aim to prove that "rapid increase in land consolidation, induced by international investments and measured remotely by a signature pattern shift from mottled, mixed land-use small farms to large, mono-cropped industrial plantations, is a key independent driver of urbanization vis à vis rural farm labor displacement."

"Increasingly, urban transitions and land transitions are happening in these fringe areas that are not quite rural and not quite urban –– middle-sized cities. Research hasn't caught up with that," Lopez-Carr said. "We might be able to offer some technical expertise in terms of the imagery we use and how to analyze that imagery, and how we connect social surveys, which for this topic I think is going to be important in terms of looking at the sustainability of human livelihoods and human health. The topic, I think, is really at the forefront of the crucial issues of coupled human and environmental sustainability."

Also serving as co-PIs on the project are John Weeks and Li An, of SDSU; Ryan Engstrom, of George Washington University; Foster Mensah, of University of Ghana; and SDSU-UCSB Geography Ph.D students Magdalena Benza-Fiocco and Sory Toure.

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David Lopez-Carr

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