LCLUC Abstract

Land-Cover and Land-Use Change in the Southern Yucatan Peninsula Region

<http://earth.clarku.edu/lcluc>

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The project seeks to improve understanding of global land-use/cover change through a study of the southern Yucatán peninsular region (SYPR). SYPR contains one of the largest expanses and oldest tropical forest in the Americas outside Amazonia. Akin to the Amazonia frontier, SYPR has witnessed significant changes in its land uses and land covers over the past 30 years registered in a boom-bust pattern. Following the international science plan on Land-Use/Cover Change (LUCC) of the IGBP-IHDP, this project seeks to contribute to NASA,s LCLUC program specifically by: (i) identifying the regional dynamics and their linkages that are driving land-use/cover change in SYPR, both documenting in detail and modeling the land-use changes (Focus 1); and (ii) extending these findings to the land-cover changes that have occurred there, leading to new versions of probbility (e.g., Markov-chain) analysis for near- to mid-term projections of land-use and land-cover change (Focus 2).

Focus 1 identifies the "regional situation" or basic character of land-use/cover change (tropical deforestation and agricultural development and expansion) over the past 30 years as detailed through the transforming processes acting on the land managers. The evidence will be derived from analysis of historical data (e.g., census documents, local land-use maps), structured and informal surveys with current land managers, and observations. The results will provide the details (narrative) of the history of land-use change, a test of certain critical variables required for a new, generic LCLUC model, and the development of a spatially explicit, SYPR -LCLUC model linked to remotely sensed imagery.

Focus 2 links land uses with land covers, extends the spatial coverage of both over the entire region, and develops new generation of empirical probability (Markov-chain) models useful for LCLUC analysis. The use-cover linkage and spatial reach is made through the use of remotely sensed imagery (Landsat TM data) and geographical information systems. The evidence generated informs the development of „probability‰ models based on past changes but improved through the addition of spatial explicitness (where the change takes place) and the consideration of the type of manager/user in charge of the land (the socioeconomic condition/character of the land managers).

Both approaches will be linked to field studies of ecosystem fragmentation and diversity issues, conducted by Harvard Forest and ECOSUR-Chetumal. The aim is to link explicitly land-use changes with its land-cover impacts as defined, and to assess the biophysical impacts of the cover changes on land use and management strategies.

The Focus 1 and 2 approaches not only provide understandings of LCLUC in SYPR, they can be compared and merged. Comparisons provide insights about the robustness of two kinds of models, indicating in what conditions (e.g., temporal scales) Markov based and behavioral and structural based models are useful, as well as role of biophysical impacts on both. And, by linking Focus 1 models to the pixel and Focus 2 pixels to the social and biophysical dynamics, ultimately the two approaches merge into hybrid model. The outputs of the study provide a basis for monitoring and assessing LCLUC in SYPR as well as for projecting scenarios of change, both major needs of the global change community of researchers. Finally, a longer term aim of the

project is to compare results with those elsewhere in the tropical Latin American transect of the IGBP to determine the value added or lost by "scaling up" to a pan-Latin American model˜a central need of the human dimensions program on LUCC.

The work will link various major units in the global change community. The SYPR involves research: (i) at the GPMI, Clark University, on land-use/cover change models of various kinds (Focus 1 and 2); (ii) at ECOSUR-Unidad Chetumal on various land-use and -cover analyses of the region (the unit seeks to develop long-term monitoring and assessment of LCLUC in this tropical forest realm); (iii) at Harvard Forest on land-cover change; (iv) in cooperation with Carnegie Mellon University's "Center for Integrated Study of the Human Dimensions of Global Change" on advances in LCLUC modeling and its place within integrated studies more generally; and finally, (v) comparisons with Focus 1 modeling efforts in Costa Rica by Wageningen Agricultural University (Netherlands) and in Amazonia by the University of New Hampshire and University of Florida.