Population, Land Use and Health in Frontier Regions
2004 – 2006, National Institute of Child Health and Human Development

Background

This project brings together seven research teams working on characterizations, explanations, and predictions of land use change in frontier regions around the globe. Land change science is a dynamic, emerging field that draws on multiple disciplines, is driven by global environmental and health concerns, and is still developing standardized methodologies and agreed-upon protocols for research and reporting. It is inherently and necessarily multi-disciplinary, and needs to become interdisciplinary.

"Frontier" is a land area that is relatively under-used/un-managed by humans and which has the potential/likelihood to be transformed into a more heavily used and managed landscape. Underutilization of land is a relative concept, dependent on developments in markets, technology, institutional arrangements, etc. Frontiers are important because typical agricultural transformations have had enormous impact on global land cover; these transformations, in turn, are related to local and global health issues.

Purpose

The overall goals of this undertaking are to a) synthesize knowledge of approaches, methods, data, and analyses, particularly perspectives for modeling land use change, b) develop a set of "best practices" for reporting on site, data, and methods for emerging land change science, c) plan, conduct, and validate comparative analyses using emerging agent-based techniques, and d) evaluate the potential of a future project that would be an integrated study of land use change in multiple sites.

Scope of Work

The seven teams have research sites across North America (the historical Great Plains), South America (the southern Yucatan peninsula, the Ecuadorian Amazon, the state of Para in the Brazilian Amazon), and Asia (Nang Rong district in northeast Thailand, the Wolong Nature Preserve in Sichuan Province southwestern China, and Montane Southeast Asia, which includes watersheds in the southern part of China's Yunan Province, northern Thailand, and northern Laos). All seven teams are currently funded to examine population-environment linkages and changes. Across the seven teams the following disciplines are represented: anthropology, biostatistics, botany, demography, developmental studies, ecology, economics, environmental science, geography, history, hydrology, meteorology, remote sending/GIS, reserve management, and sociology. These seven teams will be integrated into a frontier land use network. By networking across these projects, researchers will develop methods of analyses, facilitate communication across disciplines, develop standards and best practices, disseminating information and best practices.

Analytical Methods

These studies combine extensive data from censuses, remote sensing, and aerial photos, as well as statistical models, agent-based models, cellular automata models, and longitudinal analysis. The specifics of the modeling depend on the research focus, data availability, and the particulars of site and situation. The best practices document will be broad-based, covering many methodological issues.

Contributions to the Field

By synthesizing across the sites data, methods, and findings about population, land use, and environment, this work will provide a foundation for summarizing knowledge about population and land use change and will generate new ways of communicating and working together.

The factors associated with land use and land cover changes are of concern because of their consequences for human well-being. While land change can take place owing to many factors, the presence of people in the face of that change is critical to health issues. For example, human exposure to schistosomiasis in China, nombre virus in the American Southwest, and Lyme disease in New England are linked to land-population dynamics, which, in turn, can be amplified by climate change, as was the case of Rift Valley fever in Africa.

Conversely, changes in the size, distribution, and vitality of population affect land, locally and globally. Conversion of increasingly marginal lands to human settlement and agricultural production can have negative consequences for food and water security. Land use and land cover change affects the ability of biological systems to yield sufficient food, fiber, and fuel to meet human needs. There are longer term indirect impacts as well, through global climate change, loss of global biotic diversity, and reduced functioning of ecosystems.