

Interactive Changes of Ecosystems and Societies on the Mongolian Plateau: Coupled Regulations from Land Use and Changing Climate

Abstract

The semi-arid region of the NEESPI domain includes two governments with similar ecological settings but contrasting socioeconomic systems on the Mongolia Plateau - Inner Mongolia (IM) of China and Mongolia (MG). The plateau is predominately inhabited by Mongolians with mobile pastoral practices. Yet, the majority of the pastoral households in both MG and IM began settling around permanent towns or immigrated to large urban centers in recent decades because of rapid economic growth and new policies. In 2007, the number of livestock in MG reached 40 million – an increase of 15.7% from 2006, resulting in >60% of pastureland being overgrazed. These changes play a critical role in current and future land use and change. IM and MG have also developed contrasting political systems since 1979, with much more rapid changes in IM than that in MG, producing distinct land cover changes between 1992 and 2004 (see project Webpage). As a consequence of the land cover changes, severe and frequent catastrophes (e.g., dust storms) have been notoriously increasing in IM. The land-use changes in these politically polarized countries are expected to be dramatic over the next two decades. Additionally, significant increases in air temperature since 1952 have been observed due to global warming, with the increases varying significantly and being nonparallel among ecosystems. Worse yet, the IPCC (2007) predicted that this already water-limited region will experience a warming trend above the global mean warming (3.3°C by 2100; longer, more intense and frequent summer heat waves), altered summer and winter precipitation patterns and more extreme precipitation events. Clearly, our research priority should be given to the coupled effects of climatic change and land-use practices on both natural systems (*NS*) and human systems (*HS*) as well as their interactions and feedbacks. The similarities and differences in the past, present and future of the two regions will provide a unique opportunity for us to examine these feedbacks and learn lessons for similar analysis in other regions. **The objective of this study is to examine and model the interactive changes of *NS* and *HS* in time and space in IM and MG under similar climate but different land-use conditions. Specifically, we aim to understand how global climate change (including warming trends and climatic variability) and land-use change regulate both biophysical and socioeconomic functions through exploring the underlying processes in IM and MG on the Mongolia Plateau.** The land cover and land-use changes will be used as intermediaries to link the changes of *HS* and *NS*. The functional changes of *HS* will be measured at the *household, enterprise and government levels*, while *NS* will be quantified by the level and fluxes of *water, carbon and energy*. The five major underlying processes for *NS* are: albedo/radiation, heat flux, precipitation/ET/soil water, primary production and ecosystem respiration, while the five processes for *HS* include economic growth, population growth, urbanization, technology advancement and lifestyle change. A variety of remote sensing products, existing spatial data and new ground data (vegetation, soil, social surveys) will be used in a set of biophysical and socioeconomic models to examine the historical changes and predict the future under various climatic change and land-use scenarios at three organizational levels: biome, county and region. This study is built upon our current and previous studies on similar topics (10 items).