

Resilience Theory and Social-Ecological Systems

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A study of resilience of coupled social-ecological systems is becoming a frontier of ecological and social sciences. Application of these new emerging theories for pastoral systems and natural resources management in Mongolia is an exciting and timely venture, especially when our pastoral systems not yet fully lost its traditional resilience mechanisms and making transformation in response to market forcing.

A nomadic culture was emerged on the Mongolian drylands as a dissipative structure. The traditional pastoral communities and cultural landscapes (seasonal, reserve and *otor* pastures, haylands and sacred lands) used by these communities are coupled social-ecological systems evolved to increase its resilience to climate variability for thousands of years. These social-ecological systems survived the political perturbation last century, adapting to the socialist changes. Since 1990 with transitions to a market economy and democracy, these social-ecological systems experiencing diverse responses: (I) Re-emergence of traditional pastoral networks mostly at *hot ail* (several households with lead of the experienced herders) and cultural landscapes; (II) Emergence of new herders, who are causing land degradation near settlements and rivers; (III) Transformation of herders into sub-urban residents, increasing the *ger* districts - slam areas in big cities and causing many problems such as unemployment, poverty, air pollution in Ulaanbaatar city etc. A goat number has increased 3 times in response to open market of cashmere with positive social and negative ecological consequences. Global warming (the highest in this part of the Earth with almost 2⁰C increase during the century) with decreasing NPP and shrinking water resources is a critical slow variable for coupled social-ecological systems in these drylands, capable to collapse them if it is amplified by human activities. Mongolia is at the bifurcation point for collapse with increased poverty, corruption and environmental degradation or for sustainable transformation, adapting to global changes and increasing its resilience to cope with climatic, ecological, economic, social and political shocks.

(I) Strengthening of traditional and newly re-emerged pastoral communities with modern green technologies (renewable energy, ICT etc.), (II) transformation of “new” herders and rural migrants, living near cities and infrastructures, into the sustainable farmers would be desirable future in order to increase resilience and sustainability of pastoral community-cultural landscape systems to climate change and globalization.