

## **Building Resilience of Mountain Social-Ecological Systems to Global Change: An International Synthesis and Grant-Writing Workshop**

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### **INTELLECTUAL MERIT**

Mountains provide a suite of ecosystem services, including valuable biodiversity and water surplus, that are critical not only to mountain communities, but to the numerous people who live downstream from these systems. Yet mountain regions are often disproportionately vulnerable to global changes, such as climate change, and to on-going socioeconomic and demographic pressures.

Over the past decade, several frameworks have emerged to address the complexity of today's most pressing environmental challenges. Research within the emerging fields of 'sustainability science', 'land change science', 'coupled human-natural systems science', 'ecosystem stewardship', and Earth-system stewardship (Clark and Dickson 2003; Turner et al. 2007; Liu et al. 2007; Rockström et al. 2009; Chapin et al. 2010) all focus on coupled human and biophysical systems; their interactions, feedbacks, and thresholds; and the multiple scales at which these interactions occur. Despite the need for integrating socioeconomic and biophysical dynamics specific to mountain regions, this remains a nascent area in coupled human-natural systems science.

Through a series of workshops and synthesis activities, Julia Klein, Assistant Professor at Colorado State University, Anne Nolin, Associate Professor at Oregon State University, and Greg Greenwood, Executive Director of the Mountain Research Institute (MRI) in Bern, Switzerland, will bring together experts on mountain hydrology, ecosystem science, human ecology and environmental governance; decision makers in policy and resource management; and key stakeholders to explore the dynamics of coupled human-natural systems as they relate to global change and well-being in mountain regions.

These activities aim to move this field forward in order to foster the resilience of mountain social-ecological systems to global change, to maintain the flow of key ecosystem services from these important mountain regions, and to advance the conceptual and quantitative aspects of social-ecological systems science. The first workshop in this series is the subject of this proposal.

### Broader Synthesis Process

This first, or framing, workshop will be the introductory and foundational gathering, and will result in a 'state of the science' paper and a grant proposal to the National Science Foundation in order to create a larger project focused on: (1) synthesis and development of conceptual frameworks specific to mountain regions (similar to the Dryland Desertification Paradigm for arid systems as described by Reynolds et al. in 2007); (2) use of a selected coupled model with data from a suite of mountain systems to examine how socio-economic, political, and biophysical properties affect mountain system resilience to global change; and (3) model inter-comparisons

using a common dataset from mountain systems to examine which models are best suited for addressing different questions relevant to mountain systems and resilience to global change.

#### Objectives of The Framing Workshop

The first workshop will have three sets of objectives: integrative discussion, proposal development, and production of a state of the science document.

To foster integrative discussion, we will bring together people who are conducting social-ecological research in mountain regions around the world to explore:

- 1a. the nature and utility of the various coupled models currently in use;
- 1b. the expression of system attributes such as 'resilience', 'sustainability', and 'adaptive capacity' in terms of model inputs, variables and outputs;
- 1c. emerging themes across studies on resilience of coupled social-ecological systems to global change.

Specifically, we will bring together experts working in social, biophysical and policy sciences to contribute data or modeling strategies and evaluation of integrative approaches that will then be used for our second objective, developing a research proposal that will serve as a portal for major advancement in this field.

Towards this end, the working group will:

- 2a. identify a conceptual framework with which to examine the theme of building resilience of mountain social-ecological systems to global change;
- 2b. develop a set of research questions under the theme of building resilience of mountain social-ecological systems to global change;
- 2c. identify a modeling framework for investigating these questions;
- 2d. translate the questions and research methodology into a grant proposal to the National Science Foundation Research Coordination Network program; and
- 2e. write a paper that assesses the state of the science on building resilience of mountain social-ecological systems to global change and identifies gaps and future research directions.

#### Participants, Funding and Timeline

We have already secured commitments for participation from key mountain scholars around the world. The Mountain Research Institute (MRI) is the primary funder of this workshop. We plan to hold the first workshop in Estes Park, CO in May 2012.

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