

# **Mountain hazards and the resilience of social–ecological systems: Lessons learned in India and Canada**

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Natural Hazards

Received: 16 May 2005 / Accepted: 19 January 2006

Springer Science+Business Media B.V. 2006

SpringerLink Date Wednesday, November 22, 2006

## **Abstract**

Mountain regions are subject to a variety of hazardous processes. Earthquakes, landslides, snow avalanches, floods, debris flows, epidemics and fires, among other processes, have caused injury, death, damage and destruction. They also face challenges from increased populations, and expansion and intensification of activities, land uses and infrastructure. The combination of a dynamic biogeophysical environment and intensified human use has increased the vulnerability of mountain social–ecological systems to risk from hazards. The ability of social–ecological systems to build resilience in the context of hazards is an important factor in their long-term sustainability. The role of resilience building in understanding the impact of hazards in mountain areas is examined and illustrated, in part, through examples from Canada and India. Resilient social–ecological systems have the ability to learn and adjust, use all forms of knowledge, to self-organize and to develop positive institutional linkages with other social–ecological systems in the face of hazards. The analysis suggests that traditional social–ecological systems built resilience through avoidance, which was effective for localized hazards. The more recent development and implementation of cross-scale institutional linkages is shown to be a particularly effective means of resilience building in mountain social–ecological systems in the face of all hazards.

**Keywords:** Mountains, Hazards, Vulnerability, Resilience, Social–ecological systems, Institutional linkages

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