Growing Risk and Vulnerability—The Mountain Challenge

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Risk and Vulnerability in Mountain Regions

Given current reported and projected trends in global environmental change, exposure to risk and vulnerability in mountain communities could increase in coming decades. Mountain communities can be exposed to various hazards simultaneously, including rapid-onset hazards such as earthquakes, landslides, and volcanic eruptions, as well as creeping processes such as soil degradation, deforestation, loss of biodiversity, and drought. It is thus urgent to increase current efforts to assess vulnerability and risk, and particularly to consider the aggregated stress of multiple hazards.

Over the past 20 years the United Nations University (UNU) has played an important role in promoting understanding of the challenges facing mountain communities and in fostering political commitment and cooperation to address them. More recently, the Institute for Environment and Human Security (EHS) of the UNU, created in 2003 and based in Bonn, Germany, was given a mandate to advance human security in order to reduce vulnerability and risk related to environmental threats through targeted research and capacity development activities. Most of the Institute’s activities are centered on vulnerability assessment—the most crucial and least known part of the risk equation. This is arguably the most difficult component to address for a variety of reasons, including lack of a common definition, multiple complex assessment tools, the need to understand complex systems, and quantification of thresholds that characterize the states of the systems considered. Despite these difficulties, there is currently a shift from a tendency to address mainly hazard in the risk equation, to increased assessment of the vulnerability component of risk.

Complexities linked to vulnerability assessment

- Risk, sensitivity, resilience and vulnerability are defined differently in different disciplines. A glossary of risk-related terms compiled at UNU-EHS provides 35 definitions of vulnerability, without claiming to be exhaustive. Although agreement on a single definition is unlikely, a broad consensus on general concepts would be useful, particularly for more effective communication among the scientific and expert communities.

- Nature cannot be dissociated from social systems, as both interact in complex, non-linear, unsteady, stochastic ways. Community vulnerability to single or multiple hazards is thus best analyzed by considering environmental, social, and economic dimensions, or by analyzing coupled human–environment or socio-ecological systems. Coupled systems are by their very nature extremely complex and difficult to model. Complexity increases in the case of interactions between elements at various temporal and spatial scales. It is also difficult to quantify the amount of disturbance that a system can absorb before it changes to a new and usually unfavorable state.

- Several vulnerability assessment frameworks have been developed in academic circles to try to capture the above complexities. One example is the Sustainability Systems Program’s vulnerability framework (Turner II et al 2003), which looks at the vulnerability of coupled systems by accounting for various interacting spatial dimensions of vulner-
vulnerability and stressors, and by
describing their exposure, sensi-
tivity and resilience. A second is
the BBC Conceptual Framework
developed at UNU-EHS, which
focuses on the social, economic,
and environmental dimensions of
vulnerability, linking and
integrating the concept of sus-
tainable development with the
vulnerability framework. It also
incorporates the notion of inter-
vention tools to reduce vulnera-
Bility (represented as a feedback
loop system in Figure 1).
Despite the availability of such
assessment frameworks, charac-
terizing vulnerability remains
difficult, as it is impossible to
collect all relevant information
and determine the required
threshold values.
Vulnerability-related activities
of UNU-EHS
In accordance with its mandate,
UNU-EHS has developed vulnera-
bility assessment methodologies and
conducted vulnerability research
looking at various hazards affecting
floodplains and coastal areas. UNU-
EHS is also part of the project on
Sustainable Management in the
High Pamir and Pamir–Alai in
Tajikistan and Kyrgyzstan. This
project has a work package dealing with
vulnerability assessment in commu-
nities facing land degradation,
which can be categorized as a creep-
ing process. Scientists at the Insti-
tute collaborate with scientists in
the region and other project part-
tners to further develop and test the
BBC Conceptual Framework and
evaluate its suitability as a tool for
assessing vulnerability to land
degradation in rural mountain com-
nunities, and to determine the
impact of better ecosystem manage-
ment in reducing vulnerability and
improving economic well-being.
Other vulnerability frameworks will
also be considered. More specific-
ally, the frameworks will be used to:

- Establish the link between moun-
tain ecosystem degradation and
community vulnerability;
- Determine the degree to which
different community social
groups are vulnerable to environ-
mental degradation; and
- Characterize the similarities and
differences in coping strategies
used by different communities.

In the process, research will
also concentrate on identifica-
tion and field testing of a set of objec-
tively verifiable environmental and
socioeconomic indicators that can
be used to: 1) assess the vulnerabi-
ity of mountain communities to land
degradation; and 2) measure the
impact of changes in ecosystem
resource management on the local
environment and socioeconomic
well-being of different social groups
in individual communities.

UNU-EHS has also initiated an
Expert Working Group on Measur-
ing Vulnerability as an exchange
platform for experts and practition-
ers from various scientific back-
grounds who deal with identifica-
tion and measurement of vulnera-
bility. The overall goal of the Expert
Working Group is to promote the
concept of security for societies vul-
nerable to natural hazards. In this
case, the development of
methodologies, approaches, and
indicators to measure vulnerability
is a key to bridging the theoretical
concept of vulnerability and practi-
cal application in decision-making
processes. The Expert Working
Group will continue to meet annu-
ally in the foreseeable future and
the results of research activities in
the High Pamir and Pamir–Alai will
be discussed in this forum.

UNU-EHS has a Chair on Social
Vulnerability funded by the Munich
Re Foundation. Activities include
research on the cultural and eco-
nomic dimensions of social vulnera-
bility, including institutional and
governance factors. Special atten-
tion is given to indigenous percep-
tions, participatory approaches, and
community-based coping practices
to detect and reduce vulnerability.
UNU-EHS and the Munich Re
Foundation also hold an annual
summer academy on social vulnera-
bility. The academy provides an
opportunity for experts and PhD
researchers from around the world
to develop new approaches to com-
plex themes such as human security
and resilience of complex social sys-
tems related to disasters. UNU-EHS
also implements a training program
for experts dealing with risk and
vulnerability assessment in large
cities, including cities in mountain
regions.

All these activities will help in
the long run to refine assessment
tools and methodologies to identify
policies and concrete actions
designed to reduce the vulnerability
of communities facing natural haz-
ards. This will have relevance and
be applicable in mountain regions
as well as other environments.

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