Module (February, 2-3, 2015)
NATURAL HAZARDS IN MOUNTAIN AREAS

Learning objectives

- Basis terms related to and process behaviour of the most common natural hazards in mountain areas
- Most commonly used techniques for hazards identification
- Standard techniques for hazard analysis and mapping

Terms and concepts

Elements at risk: These include people, their well-being, buildings, infrastructure, economic activity, and all other things valued by the community.

Hazard (physical): A hazard is a potentially damaging process or condition, for example, an earthquake above certain intensity or a landslide of sufficient size, depth, or displacement to cause damage or disruption or, as an example of a condition, the presence of weak foundation material.

Hazard (temporal condition): The probability of a potentially damaging event (a landslide) occurring in a unit of time.

Risk: Expected consequences emanating from a hazard, expressed as the probability and severity of loss to the elements at risk for a unit area, object, or activity, over a specified period of time. Risk is a function of the magnitude and frequency of hazard, the elements exposed to the hazard and their vulnerability.

Susceptibility: The propensity of a designated area to experience a particular physical hazard.

Vulnerability: The degree of damage expected from given magnitude of hazard, usually expressed as a ratio of the existing value.

References and further reading

Alcantara-Ayala, I., Goudie,A. (Eds.),2010. Geomorphological Hazards and Disaster Prevention. Cambridge University Press, Cambridge, 291pp

Crozier, M.J., Glade, T., 2010. Hazard assessment for risk analysis and risk management. In: Alca´ntara-Ayala, I., Goudie, A. (Eds.), Geomorphological Hazards and Disaster Prevention. Cambridge University Press, Cambridge, pp. 221–232.

Marston, R.A., 2008. Land, life and environmental change in mountains. Annals of the Association of American Geographers 98, 507–520.

Remondo, J.,Soto,J., Gonzalez-Dıez, A., Dıaz De Teran, J.R.,Cendrero,A.,2005. Human impact of geomorphic processes and hazards in mountain areas in northern Spain. Geomorphology66,69–84.

Slaymaker,O., 2010. Mountain hazards. In:Alcantara-Ayala, I., Goudie, A.(Eds.), Geomorphological Hazards and Disaster Prevention. Cambridge University Press, Cambridge, pp.33–47.

Stoffel, M.; Marston, R., (eds.) 2013. . Treatise on Geomorphology. Volume 7, Mountain and Hillslope Geomorphology. Elsevier and Academic Press San Diego.

Weblinks

http://map.geo.admin.ch/

http://map.bafu.admin.ch/?lang=en

http://www.planat.ch/en/

https://www.un.org/earthwatch/mountains/

http://geohazards.cr.usgs.gov/

http://www.dendrolab.ch/index.php

Additional information

The intersection of human activity with the high-energy geomorphic systems, together with the accelerating pace of social and environmental change, enhances hazard and risk, and exacts an increasing toll on mankind (Slaymaker,2010).

In simple terms, in order to make rational decisions with respect to living or carrying out activities in a hazardous area it is essential to know **'what'** might happen (nature of the hazard faced), **'where'** and **'when'** (or at least **how frequently**) it might happen, and ultimately what damage it might do – in short, all the components of the risk. With this information, those that have the options and resources (and many people in the world do not), choices can be made and priorities set which may involve, avoidance, education, the adoption of best practice, or other mitigating measures such as warning systems and engineering works.

Hazard and risk are not static. Their assessments in any region are subject to becoming redundant with time. Consider the **causative factors** of landslides. These include pre- conditions, preparatory factors, and triggering factors. **Pre-conditions** such as stratigraphic disposition, slope gradient, and slope material are generally considered constant. Nevertheless, slope conditions and material are constantly being modified by urban development, mining, and quarrying. **Preparatory factors** relate to changes that lower the stability of the slope, such as deforestation or groundwater changes alongside reservoirs. These are increasingly being changed by accelerating demand for resources. **Triggering factors** that initiate movement on unstable slopes are primarily the result of rainfall, earthquakes, and slope under-cutting. Global environmental

changes are likely to enhance both rainfall intensity and slope modification. The bottom line is that historical assessments of hazard are subject to dramatic changes in the future. The capability to predict, cope with, and mitigate such changes requires the specialist to realize and anticipate the rates and impact of climate and social change.