SAMCO: Society adaptation for coping with mountain risks in a global change context

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1. Introduction

The SAMCO project is intended to contribute to the development of a proactive resilience framework enhancing the overall resilience of societies on the impacts of mountain risks. The project aims to elaborate methodological tools to characterize and measure ecosystems and societal resilience from an operative perspective on three mountain representative case studies.

The project fully encompasses the resilience definition issued by UN/ISDR (2005); e.g. "the capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure". This is determined by the degree to which the social system is capable of organizing itself to increase the capacity for learning from past disasters for better future protection and to improve risk reduction measures (Klein et al., 2004; Birkman, 2006). These characteristics define the resilience applied to socio-ecosystems (e.g. integrated systems of people and the natural environment).

Mountains represent an important part of the global Earth system. Because of their vertical extent, climate varies drastically with elevation and thus differs from those in adjacent lowland areas. This verticality also generates landcover, habitat and species diversity over short horizontal distances. Mountain areas present also a variety of socio-economic functions (e.g. tourism, forest production, ecosystem resources) that undergo important changes in the last century with the development of our 'Modern Societies' (Huber et al. 2005). Natural processes controlled by hydro-meteorological triggers (e.g. floods, landslides, rockfalls) will add further environmental pressures on both social and natural systems, stressing the need to promptly conduct proactive adaptation plans (IPCC, 2007). The relevance of mountain hazard and risk zonation for environmental policy and decision making is set forth in the European Thematic Strategy for Soil Protection (EC, 2006a) and the associated proposal of a Framework Directive (EC, 2006b), in which hydro-meteorological hazards are considered as one of the soil threats for which it is necessary to identify risk areas where risk reduction measures have to be implemented.

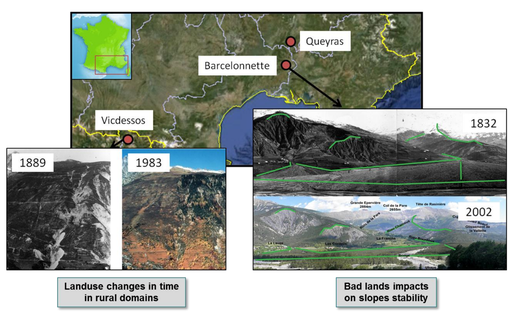

Figure 1: Vicdessos & Barcelonnette/Queyras basins as test-sites (InEE & INSU Observatories)

Birkmann, J. (Ed.), 2006. Measuring vulnerability to natural hazards. United Nations University Press. Tokyo.

2. Project objectives

However, to implement risk mitigation strategies in an integrated way (e.g. including physical but also economic and social adaptation), additional research is needed on:

• How climate controls mountain hazards occurrence. The influence of climate and climate change on slope stability and floods over various spatial and temporal scales has to be better understood and quantified;

• How mountain risks will evolve in the Anthropocene. Land use change forecasts become more and more available, but no model exists to estimate the effect of the changes on the hazard occurrence;

• How the main economic, social and political stakeholders interact for the definition of adaptation scenarios at the region scale.

Answering these questions requires multidisciplinary research efforts that are able to include the biophysical, social and economic aspects of these regions, and should integrate global to local point-of-views and information across time scales (EC, 2009).

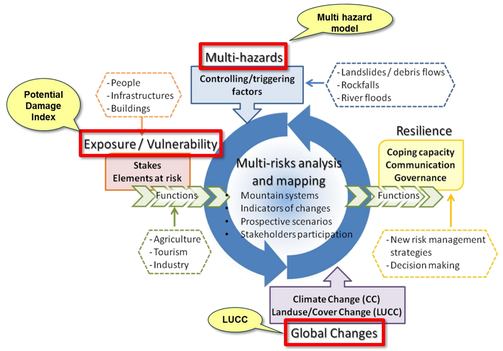

Figure 2: SAMCO's methodology

The concern of this project is to identify the most important factors of community resilience (e.g. coping capacity), the main characteristics of their temporal fluctuation and their dependence upon controlling factors (physical, social and economic environment) in order to propose risk management strategies adapted to possible impacts of global changes.

This objective will be achieved by building a conceptual and methodological framework (Figure 2) able to integrate natural and social scientists' overview, and to propose strategies to enhance community resilience exploiting Geographical Information Systems and Communication Technology. An important aspect here will be to define and identify the role of the different stakeholders in charge of risk management (mayors, local government offices, prefectures, consultancy companies, research scientists, etc) on the decision making and on their communication with the local community citizens, in order to propose options for testing risk mitigation policies.

Huber, Uli M.; Bugmann, Harald K.M.; Reasoner, Mel A. (Eds.), 2005. Global Change and Mountain Regions: An Overview of Current Knowledge. In: Advances in Global Change Research, Vol. 23, Springer, Berlin, 650p.

3. Approach and potential impacts

► **Position of the project with respect to the scientific and societal contexts**

In the frame of a multidisciplinary context involving social and natural sciences, the SAMCO project will develop a **conceptual and methodological approach to define how the resilience capacity of local mountain communities confronted with natural hazards and disasters can be characterized and measured**, taking into account potential exacerbation of the hazards/risks due to global change as underlined by IPCC (2007) and the European Commission Green Paper '*Adapting to Climate Change in Europe – Options for EU Action*; SEC(2007) 849). It is built around two main underlining research ideas: an analysis of the way in which increased knowledge about global change processes increases the uncertainty regarding hydro-meteorological events and hazard/risk assessment, and in turn, its effects on resilience (Figure 3-5);

The project covers the main requested key actions of the call since it addresses the issues **(1) of forecasting the (changing) vulnerability of mountain areas induced by both climate and human activity changes, and (2) of proposing new risk management strategies for adaptation of the local societies' resilience to these possible changes**.

► **Position of the project with respect to the call of proposal and international initiatives**

The project will **improve the knowledge on the relation between natural processes and consequences for the environment**. It will effectively link the **natural science approaches** of mapping, monitoring and modelling hazard (including historical information) with the **social science approaches** of analysing the vulnerability of systems (including socio-economic demands). It will synergize the different concepts and develop a (harmonized) methodology for risk assessment that will be presented to different categories of stakeholders within a **GIS demonstrator**. A **multi-hazard risk approach** will thus be proposed to effectively estimate the possible joint spatial and temporal probabilities of hydro-meteorological processes and their impacts on assets, using **probable scenarios**.

► **Application to natural laboratories of excellence: *South Alps* and *Eastern Pyrénées***

To be reliable, the project focuses on **two mountain study areas** located in the French Alps (*Barcelonnette Basin*, *Queyras*) and in the Pyrénées (*Vicdessos*) (Figure 1). These study areas are part of national observation strategies, namely the **INSU Observatory 'OMIV: Observatoire Multidisciplinaire des Instabilités de Versants'** in the Barcelonnette Basin and the **InEE Observatory Hommes-Milieux 'OHM Vicdessos'** for which IPGS & GEODE are respectively responsible. Local authorities are integrated in these observatories. Moreover, Vicdessos is part of the **LABEX DRIIHM**, and the Barcelonnette Basin is one of the pilot areas of **CIMA 'Convention Inter-régionale du Massif des Alpes'** dedicated to applicative research on natural risks. It is also part of a **'Training and Research Centre on Natural Risks and the Environment'** (Séolane) that has been recently implemented by local authorities (city councils, department, region, state).

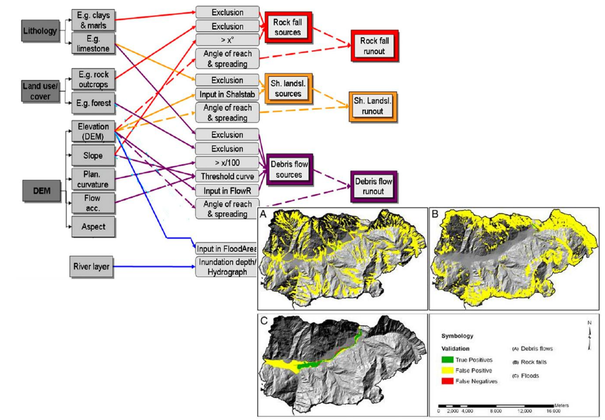

Figure 3: Multi-hazard assessment model

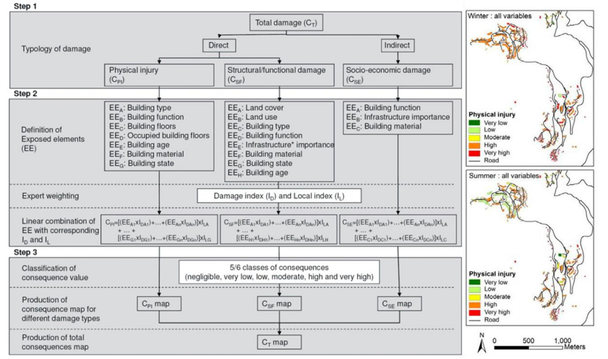

Figure 4: Potential Damage Index method

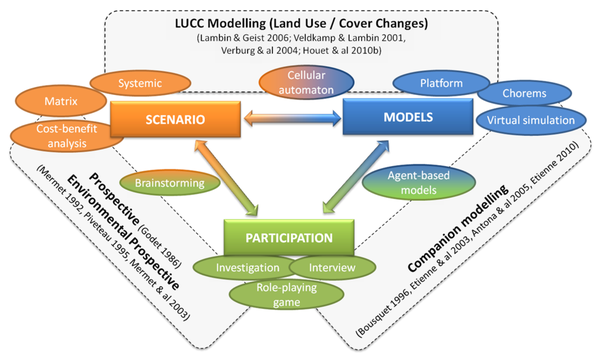

Figure 5: Land Use / Climate Changes modelling

IPCC (Intergovernmental Panel on Climate Change), 2007. Summary for Policymakers. In: Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J., Hanson, C.E. (Eds.), Climate Change 2007: Impacts, Adaptation and Vulnerability. Cambridge, UK. Cambridge University Press.

Klein, R. J. T., Nicholls, R. J., Thomalla, F., 2004. Resilience to natural hazard: how useful is this concept? Environmental hazards 5. Amsterdam.

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