



## Differences in experiences in rockfall hazard mapping in Switzerland and Principality of Andorra

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The need to cope with rockfall hazard and risk led many countries to adopt proper strategies for hazard mapping and risk management, based on their own social and political constraints. The experience of every single country in facing this challenge provides useful information and possible approaches to evaluate rockfall hazard and risk. More, with particular regard to the hazard mapping process, some important points are common to many methodologies in Europe, especially as for the use of rock fall intensity-frequency diagrams to define specific hazard levels. This aspect could suggest a starting point for comparing and possibly harmonising existing methodologies. On the other hand, the results obtained from methodologies used in different countries may be difficult to be compared, first because the existing national guidelines are established as a consequence of what has been learned in each country from dealing with past rockfall events. Particularly, diverse social and political considerations do influence the definition of the threshold values of the parameters which determine a given degree of hazard, and eventually the type of land-use accepted for each hazard level. Therefore, a change in the threshold values for rockfall intensity and frequency is already enough to produce completely different zoning results even if the same methodology is applied.

In relation with this issue, the paper introduces some of the current challenges and difficulties in comparing hazard mapping results in Europe and, subsequently, in the chance to develop a common standard procedure to assess the rockfall hazard.

The present work is part of an on-going research project whose aim is to improve methodologies for rockfall hazard and risk mapping at the local scale, in the framework of the European Project "Mountain Risks: from prediction to management and governance", funded by the European Commission.

As a reference, two approaches will be considered, proposed in Switzerland and in the Principality of Andorra, respectively. At first, the guidelines applied in the two countries will be outlined, showing which way the correspondent procedures differ. For this purpose, in both cases, the main philosophy in facing rockfall hazard will be discussed, together with its consequences in terms of the resulting intensity-frequency threshold values proposed to determine different classes of hazard. Then, a simple case study carried out in Switzerland, in the Canton of Valais, will show an application of the discussed theoretical issues, by means of a comparison between the two approaches. A rockfall hazard mapping will be performed on a 2D slope profile, following both the Swiss energy-probability threshold values and the ones used in the Principality of Andorra.

The analysis of the results will introduce some consequences the criteria for defining classes of hazard may have on land-use planning, depending on which guidelines are applied in a study site. This aspect involves not only differences in zoning concerning the extension of the areas in danger, but as well the influence on land-use that the meaning of the same hazard level may have, according to which threshold values for rockfall intensity and frequency are used. These considerations underline what role social and political decisions can play in the hazard assessment process, on the basis of the experiences and understandings of each country in this field. More precisely, it is rather evident that a possible comparison and/or harmonisation of hazard mapping results is closely linked to this aspect as well, and not only to more technical matters, such as computing and mapping techniques.