Proposal of a management method of rockfall risk induced on a road

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Many kilometers of roads have adjacent rock slopes that are prone to rockfall.

The analysis of risks associated with these types of instabilities is a complex operation requiring the precise assessment of hazard, the vulnerability and therefore the risk of vehicles on roads along the foothills. Engineering design of protection devices should aim to minimize risk while taking advantage of the most advanced technologies. Decision makers should be equipped with the technical tools permitting them to choose the best solution within the context of local maximum acceptable risk levels.

The fulfilment of safety requirements for mountainside routes involves in many cases the implementation of protective measures and devices to control and manage rockfall and it is of key importance the evaluation of the positive effects of such measures in terms of risk reduction.

A risk analysis management procedure for roads subject to rockfall phenomena using a specifically developed method named: Rockfall risk Management (RO.MA.) is presented and discussed.

The method is based on statistic tools, using as input the data coming both from in situ survey and from historical data. It is important to highline that historical database are not often available and usually there is a lack of useful information due to a not complete setting of parameters. The analysis based only on historical data can be difficult to be developed. For this purpose a specific database collection system has been developed to provide geotechnical and geomechanical description of the studied rockside. This parameters and the data collected from historical database, define the input parameters of the Ro.Ma method.

Moreover to allow the quantification of the harm, the data coming from the monitoring of the road by the road manager are required. The value of harm is proportional to the number of persons on the road (i.e. people in a vehicle) and the following traffic characteristics: type of vehicles (i.e. bicycles, cars, buses), traffic volume (number of vehicles per hour, day, or season), and road management (i.e. speed limits, temporary closures).

Therefore the method allows the quantification of the risk value expressed in the number of fatalities/year, the last part is to compare the calculated risk value with acceptable risk threshold. Two alternative approaches are proposed for the comparison: the first involves the use of a specifically numerical developed risk abacus, otherwise the second approach is based on the evaluation of the average risk.

The Ro.Ma method can be used to calculate the risk at state of the art and the risk after building of preventive devices, during risk assessment and in the design stage, furthermore it helps the engineer to quantify the risk and it's reduction achieved through a correct design and help the decision makers to give a priority at the distribution of safety investments. These two approach are discussed with the help of two application example of the Ro.Ma method.