Geophysical Research Abstracts, Vol. 9, 02297, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-02297


# Structural, Organizational, and Hybrid Mitigation Strategies in Avalanche Risk Management

C. Rheinberger (1,2) and M. Bründl (1)

(1)WSL Swiss Federal Institute for Snow and Avalanche Research SLF, Davos, Switzerland, (2) Institute for Environmental Decisions, ETH Zurich, Switzerland

(rheinberger@slf.ch / Phone: +41-81-4170357)

For more than 100 years, Alpine regions have relied on structural mitigation measures to protect traffic routes from snow avalanches. Particularly avalanche galleries are used to roof those road sections most frequently endangered by avalanche occurrences. Galleries reduce avalanche risk to traffic almost completely – but at what costs? Their construction, operation, and maintenance are expensive and imply permanent capital costs, though risks from avalanches are temporary limited to a few days per winter season.

Therefore, organizational mitigation measures are gaining in importance in avalanche management for roads. Due to recent technological improvements in forecasting and early warning, preventive road closing policies and artificial avalanche releases have become a widely implemented alternative mitigation strategy. Unlike galleries, these measures are only implied for a restricted time and consequently incur less costs than permanent measures. However, their performance highly depends on accurate forecasting and timely decisions to close the road. Despite the efforts of forecasters, there always remains a residual risk that the road is either closed and no avalanche occurs or – much worse – it is not closed and an avalanche crosses the open road.

Based on this diagnosis, the question arises if a combination of both, structural and organizational mitigation strategies, could be superior to the use of an isolated strategy. In this contribution, we present a concept to analyze the impact on avalanche risk brought about by three different mitigation strategies: (1) the construction of avalanche galleries, (2) a road closing policy that includes artificial avalanche releases, and (3) a hybrid strategy combining structural and organizational measures. We demonstrate

how these mitigation scenarios can be assessed within a generic risk analysis framework. Applying the framework to a case study example in Western Switzerland, we conclude that the organizational mitigation strategy outperforms the others as long as only direct costs of measures are assessed. When indirect costs caused by traffic interruptions are included, hybrid mitigation strategies might be most cost-effective.