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Cost-effectiveness of organizational measures against avalanche risks: a field study from Leukerbad, Switzerland

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The utilization of alpine living space has been strongly affected by natural hazards at all times. Merely within the last decade, various natural disaster events in Switzerland sustained large losses, and we will have to prepare for even larger losses as the assets at risk continue to increase. In order to cope with these risks and to minimize losses caused by natural hazards, high investments by the public sector have been made in countermeasures. As for now, the main emphasis has been put on maximal risk reduction rather than on economic efficiency of protection. However, in times of budget restrictions, cost-effectiveness plays a decisive role in defining optimal mitigation measures. Thus, one promising approach within the new Swiss strategy against natural hazards is the promotion of organizational measures. Despite their widespread use in natural hazard management, these countermeasures are still perceived as complementary to and less effective than constructive defense systems. In avalanche risk management, however, organizational measures gain in importance due to improved process predictability.

By means of a field study from Leukerbad, Switzerland, we analyze the cost-effectiveness of organizational measures against avalanche risks, and in particular of preventive road closures and artificial avalanche releases. Using an existing inventory of avalanche paths, we first assess the avalanche hazard for endangered roads in the area. We then conduct a risk analysis hypothesizing a situation without any safety measures. In a second step, we calculate the cost-effectiveness of organizational mea-

sures from data on safety investments, preventive road closures, and avalanche events that ran out over closed roads. Based on a cost-effectiveness comparison, we draw the conclusion that preventive road closures and artificial avalanche releases often outperform constructive defense systems. Organizational measures are particularly effective (i) when supported on an institutional level and (ii) where good information on weather and snow conditions is available.