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Vulnerability reduction by adapted building design

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Despite the long tradition of technical mitigation on a catchment scale in European mountain regions, losses due to mountain hazards are still considerable high in number and monetary loss. Therefore, the concept of technical mitigation had been supplemented by land-use planning and – more recently – local structural protection. Local structural protection includes measures directly implemented at or adjacent to endangered objects, and has proven to be particularly cost-effective with respect to integral risk management strategies. However, the effect of local structural protection in reducing the susceptibility of elements at risk, and the associated consequences with respect to a reduction of structural vulnerability have not been quantified so far. Moreover, there is a particular gap in quantifying the expenditures necessary for local structural protection measures. Therefore, a prototype of residential building adapted to mountain hazards is presented in this study. This prototype is equipped with various constructional elements to resist the incurring impact forces, i.e. of fluvial sediment transport and of snow avalanches. According to possible design loads emerging from these hazard processes, the constructive design necessary is presented, and the amount of additional costs required for such an adaptation is presented. By comparing these costs with quantitative loss data it is shown that adapted building design is particularly effective to reduce the consequences of low-magnitude high-frequency events in mountain regions.