Geophysical Research Abstracts,
Vol. 11, EGU2009-2500-2, 2009
EGU General Assembly 2009

PROTECT: A Swiss Approach to the Assessment of the Effectiveness of Mitigation Measures

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The effectiveness of mitigation measures is crucial in determining whether the required level of safety can be achieved. Moreover, an accurate assessment allows additional investigations such as cost-benefit analyses. In general, the effectiveness of mitigation measures is calculated as the difference between the initial risk without the measures and the residual risk including the measures; however due to scientific gaps as well as the uniqueness of each situation, effectiveness is not always clearly quantifiable. As a consequence, decisions regarding mitigation measures may differ considerably from one situation to another. In addition increasing frequencies and intensities of natural hazards as well as the possibility of new and unfamiliar hazard scenarios due to climate change may greatly complicate traditional approaches in the planning and the assessment of mitigation measures. To improve the situation today as well as to provide robust strategies and tools for the management of natural hazards in future, a project called PROTECT was launched in Switzerland in 2006. The results have recently been published on the web and will be broadly evaluated via practical application in 2009.

PROTECT describes a general procedure to assess the effectiveness of already existing mitigation measures as well as of planned ones and includes detailed instructions for avalanches, rockfalls, landslides, debris flows and floods. The first part of PROTECT was the defining of basic principles necessary for consideration of mitigation measures related to hazard maps. These principles make sure that a minimal level of quality, safety and sustainability is met and that mitigation measures are tested not only with respect to regular design events but also to extreme events (which might become more frequent in future). As the Swiss approach presented focuses on the safety of settlements, the basic principles are rather strict. Once the basic standards are met, the effectiveness of the mitigation measures is analyzed in more detail (measures). This approach is subdivided into three main steps. The first step is helpful in assessing whether the effect of the countermeasures may be relevant in any way to the hazard assessment. In the second step the mitigation measures are assessed technically through a determination of their reliability. Reliability is defined by analysing structural safety, serviceability and durability of the mitigation measures. These concepts from engineering practice (Eurocodes) are also well suited to characterise of mitigation measures for natural hazards. The third step involves the hazard assessment, taking the mitigation measures with respect to their reliability into account. Finally, the adaptation of already existing hazard zones and also the appropriate use of protected areas can be discussed based on this information.

Today, PROTECT is limited to structural measures which are often the preferred means to protect settled areas and, accordingly, are of great importance. In the near future, the procedure should primarily contribute to comprehensive and comparable technical evaluations of the hazard reduction effect of structural mitigation measures. The integration of non-structural measures is possible though it has not yet been done. Implementation should be the next step in order to also strengthen the integral approach in the planning and evaluation of mitigation measures.