Assessing the Economic Efficiency of Local Structural Protection Measures - Prevent-Building – A Tool for Building Insurances -

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INTRODUCTION

Over the last years, avalanches, debris flows, floods, rock fall, and landslides have caused damage of several billion Euros in Switzerland and other Alpine countries. In order to deal with the increasing damage to buildings the foundation for prevention of the cantonal building insurances (CBI) has initiated the development of a method and a software tool for the evaluation of the effectiveness and the economic efficiency of local protection measures for buildings (LOP). We present the method and the software Prevent-Building for assessing the effectiveness and the economic efficiency of LOP.

METHOD

The method is based on the general risk concept, which has been suggested as the key concept for assessing natural hazard risks by several authors in the last decades and years. It is organized in the following steps (**Fig. 1**):

System definition: This includes the identification of the building at risk as well as neighboring buildings, which could be affected by an averted hazard from the building under assessment.

Hazard analysis: Characterization of the natural hazard regarding its frequency and intensity.

Building assessment: The type of building and its purpose is identified and described, focusing on the impact of the natural hazard on the building.

Damage assessment: For each scenario, the damage to building structure and to assets is estimated by damage experts of the building insurance.

Calculation of risk before measure: Based on the damage estimated for each scenario, the risk per scenario and the overall risk are calculated.

LOP effectiveness: The effectiveness of the LOP is determined by the hazard expert in collaboration with the damage expert of a CBI.

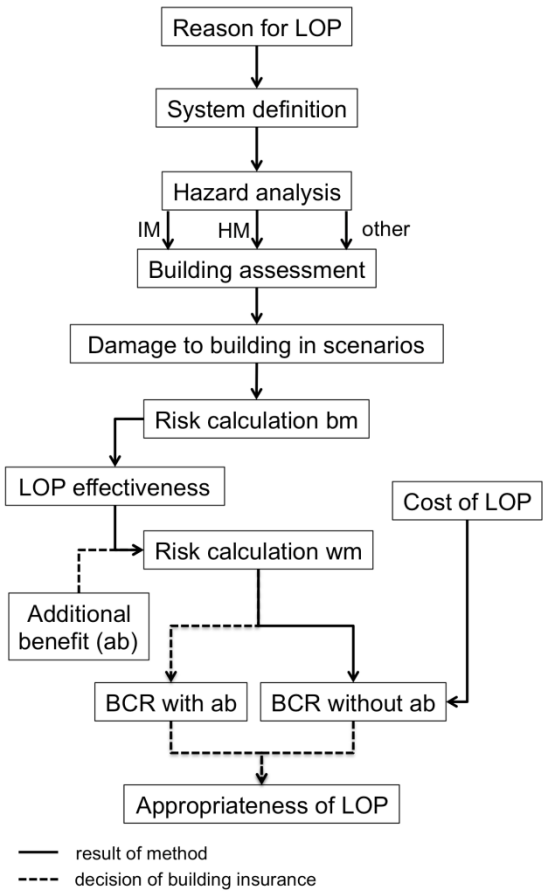

Fig. 1 Workflow for assessing the benefit-cost-ratio of a local structural protection measure. Abbreviations: LOP = local structural protection measure; IM = intensity map; HM = hazard map; bm = before measure; wm = with measure; ab = additional benefit.

Calculation of risk with measure: By taking the effectiveness of the measure into account, the risk after realization of the measure is calculated.
Cost of measure: The annual cost of the measure is calculated.
Benefit-Cost-Ratio: The difference between the risk before measure and the risk after realization of the measure is divided by the annual cost yielding the annual benefit.
Appropriateness of measure: The appropriateness of the measure is determined by the expert of the CBI.

SOFTWARE-TOOL

The software 'Prevent-Building' was developed as a password-protected Online-tool with SSL encrypted data transfer to enable the secure access for all CBI. The login data is provided by CBI administrators upon the request from persons who are in charge of evaluating the LOP of buildings. The workflow in the software is organized according to the workflow depicted in **Fig. 1**. A screenshot of the step *damage assessment* in the Prevent-Building workflow is shown in **Fig. 2**.

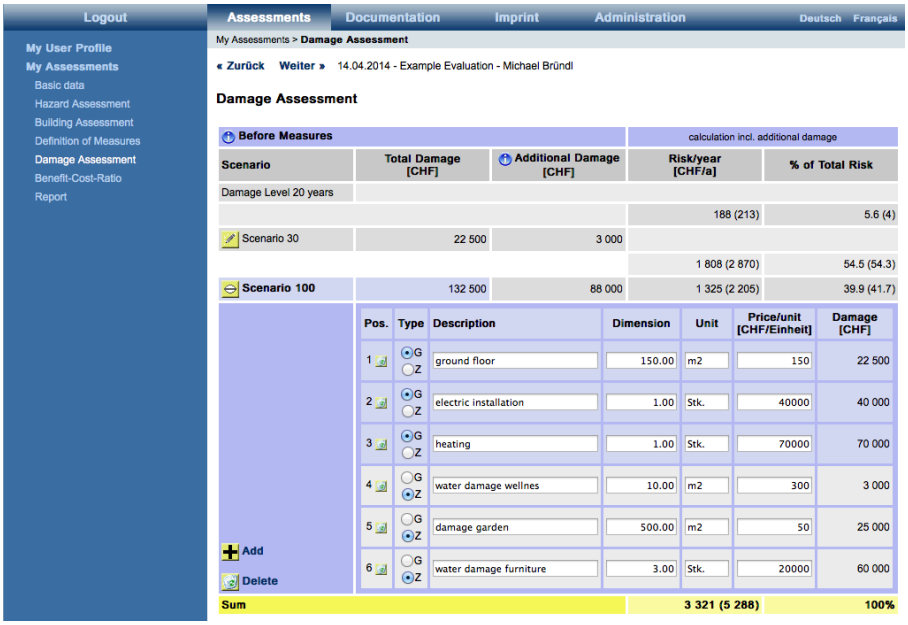

Fig. 2 Screenshot of Prevent-Building. In this step, damage can be entered in detail. The risk for each scenario and the total risk are calculated by the tool.

CONCLUSIONS

First tests with Prevent-Building indicated that experts at CBI appreciate the tool, which allows an easy and rapid evaluation on the economic benefit of measures. However, it also became clear that the economic efficiency is only one criterion indicating whether an LOP should be realized. Other criteria like aesthetics, financial strength of the building owner, and the usability of a building after the realization of the measure must also be taken into account.

Keywords: building damage, risk assessment, building insurance, local structural protection measures, benefit-cost-ratio