EconoMe-Develop – a calculation tool for multi-risk assessment and benefit-cost-analysis

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Motivation

Since 2008, it is required by the Federal Office for the Environment, to assess the effectiveness and the economic efficiency of mitigation projects with the software EconoMe (www.econome.admin.ch). For comparability reasons, calculation factors and object parameters are fixed in EconoMe. EconoMe is adapted to Swiss conditions and can be used for risk assessment of snow avalanches, debris flows, floods, rockfalls and landslides.

In order to allow for risk analyses of all natural hazard processes in Switzerland, the National Platform for Natural Hazards PLANAT have supported the development of a research and development software based on the "Guideline Natural Hazards RIKO" [1] and the operational version EconoMe [2]. The result is the online software EconoMe-Develop.

Setup and functionalities of EconoMe-Develop

EconoMe-Develop can be accessed at www.econome-develop.admin.ch. Login data are provided by the Federal Office for the Environment upon request for projects with a research background and with the potential to gain experience on risk analyses.
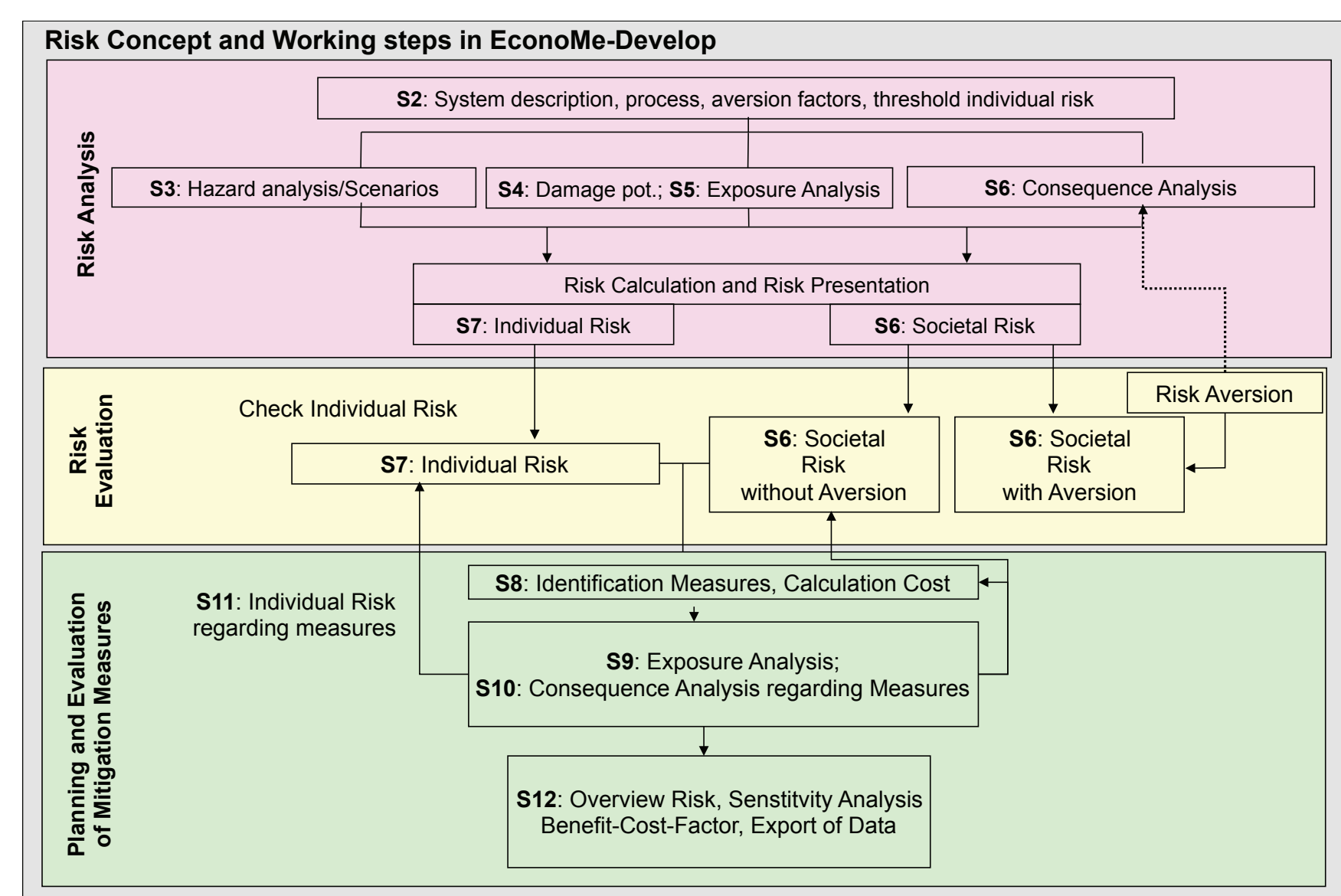

Fig. 1: Components of a risk-based planning. The „S" followed by a number refers to working steps in the software (see Fig. 3).

Fig. 2: Start screen after login - List of projects

Fig. 3: Working steps in EconoMe-Develop. The user has to follow the workflow. Finished steps are indicated in green, those in progress in yellow and uncompleted steps in red. EconoMe-Develop offers Import and Export via XML (e.g. from GIS systems)

Fig. 5: Input of damage potential data. Users can import their data from GIS via XML. Default object values are equal to those in the operational software EconoMe but can be changed by the user. Changed values are indicated in red.

Fig. 6: Consequence analysis: Objects can be attributed to intensity areas and the damage is calculated. Overlays of objects and intensity areas obtained by GIS-analysis can be imported via XML. Damage and risks are calculated.

Fig. 4: Hazard analysis and definition of scenarios: Definition of the uncertainty of calculation factors, definition of scenarios and expositions. As hazard basis, intensity maps are required. Exposition scenarios allow for estimating the influence of a changing number of exposed persons to risk. Intensity categories and vulnerability can be adapted by the user to specific situations.

Fig. 7: Individual risk can be compared to thresholds, which can be defined in the system description by the user. Risks above the threshold are indicated in red, those below are indicated in green. Risks between the upper and the lower thresholds are depicted in yellow.

Fig. 8: Results of risk assessment and economic assessment of mitigation measures. Benefit-Cost-Ratio (BCR) of each measure or combination of measures is shown. Measures with a BCR above 1 are considered as economic efficient.

Conclusions

1. EconoMe-Develop supports risk assessments for nearly all types of natural hazards due to the possibility for adapting calculation measures to specific conditions.

2. XML-Interfaces allow the import of own data tables (vulnerability of objects, value of objects) and the import of results from GIS-analyses. This feature greatly reduces the time needed for detailed risk analyses.

3. Since calculation factors (e.g. vulnerability) in risk analyses are adjustable, the influence of uncertainty of import variables on final results can be considered for the interpretation of results.
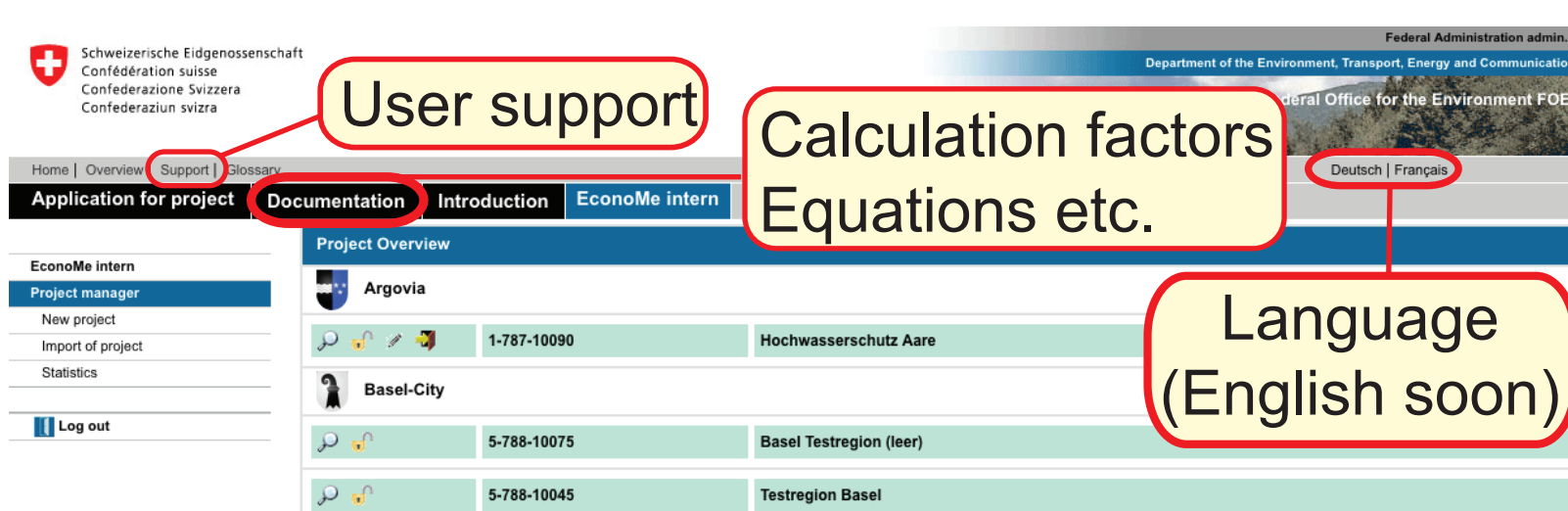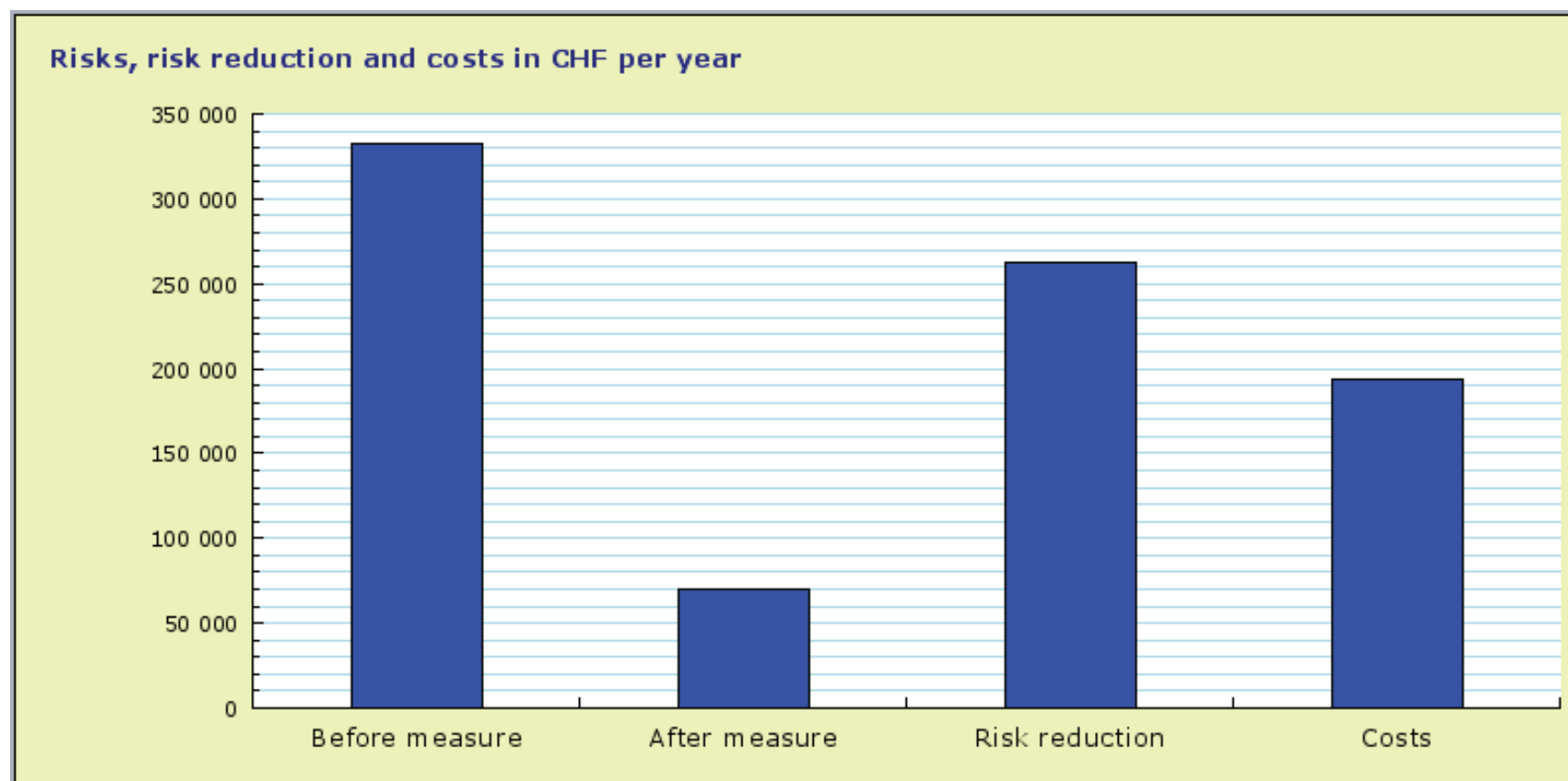
References
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[2] Bründl, M., Romang, H. E., Bischof, N., and Rheinberger, C. M. (2009). The risk concept and its application in natural hazard risk management in Switzerland. Nat. Hazards Earth Syst. Sci., 9(3), 801-813.