



## **A prototype web-GIS application for risk analysis of natural hazards in Switzerland**

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Following changes in the system of Swiss subsidy in January 2008, the Swiss cantons and the Federal Office for the Environment (FOEN) were forced to prioritize different natural hazard protection projects based on their cost-effectiveness, as a response to limited financial resources (Bründl et al., 2009). For this purpose, applications such as EconoMe (OFEV, 2016) and Valdorisk (DGE, 2016) were developed for risk evaluation and prioritization of mitigation projects. These tools serve as a useful decision-making instrument to the community of practitioners and responsible authorities for natural hazard risk management in Switzerland. However, there are several aspects which could be improved, in particular, the integration and visualization of spatial information interactively through a web-GIS interface for better risk planning and evaluation. Therefore, in this study, we aim to develop an interactive web-GIS application based on the risk concepts applied in Switzerland. The purpose of this tool is to provide a rapid evaluation of risk before and after protection measures, and to test the efficiency of measures by using a simplified cost-benefit analysis within the context of different protection projects. This application allows to integrate different layers which are necessary to calculate risk, in particular, hazard intensity (vector) maps for different scenarios (such as 30, 100 and 300 years of return periods based on Swiss guidelines), exposed objects (such as buildings) and vulnerability information of these objects. Based on provided information and additional parameters, risk is calculated automatically and results are visualized within the web-GIS interface of the application. The users can modify these input information and parameters to create different risk scenarios. Based on the resultant risk scenarios, the users can propose and visualize (preliminary) risk reduction measures before realizing the actual design and dimensions of such protective measures in the area. After designing measures, the users can re-calculate risk by updating hazard intensity and object layers. This is achieved by manual editing of shape (vector) layers in the web-GIS interface interactively. Within the application, a cost-benefit analysis tool is also integrated to support the decision-making process for the selection of different protection measures. Finally, the resultant risk information (vector layers and data) can be exported in the form of shapefiles and excel sheets. A prototype application is realized using open-source geospatial software and technologies. Boundless framework with its client-side SDK environment is applied for the rapid prototyping. Free and open source components such as PostGIS spatial database, GeoServer and GeoWebCache, GeoExt and OpenLayers are used for the development of the platform. This developed prototype is demonstrated with a case study area located in Les Diablerets, Switzerland. This research work is carried out within a project funded by the Canton of Vaud, Switzerland.

### References:

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DGE: Valdorisk - Direction Générale de l'Environnement, [www.vd.ch](http://www.vd.ch), accessed 9 January 2016, 2016.

OFEV: EconoMe - Office fédéral de l'environnement, [www.econome.admin.ch](http://www.econome.admin.ch), accessed 9 January 2016, 2016.