



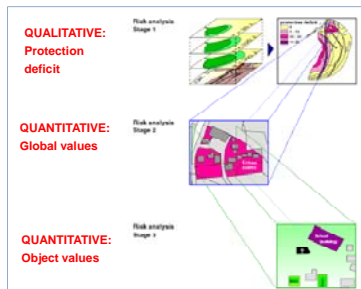
An Interdisciplinary Pilot Study On The Transalpine Transportation Corridors

Abstract

Infrastructure vulnerability is a raising topic of interest in the scientific literature for both the general increase of unexpected events and the extremely importance that certain links play in solving everyday needs. In fact, due to the topographical conditions in Switzerland, the highways and the railway lines are frequently exposed to natural hazards as rockfalls, debris flows, landslides, avalanches and others. To mitigate these associated losses, both traditional protective measures and land-use planning policies are to be developed and implemented to optimize future investments. This asks for a high level of surveillance and preservation along the transalpine lines. Efficient protection alternatives can be obtained consequently considering the concept of integral risk management. Risk analysis, as the central part of risk management, has become gradually a generally accepted approach for the assessment of current and future scenarios (Loat & Zimmermann 2004). The procedure aims at risk reduction which can be reached by conventional mitigation on one hand and the implementation of land-use planning on the other hand: a combination of active and passive mitigation measures is applied to prevent damage to buildings, people and infrastructures. With a Geographical Information System adapted to run with a tool developed to manage Risk analysis it is possible to survey the data in time and space, obtaining an important system for managing natural risks.

State of the Work

We conduct a research referred to the concept of the evaluation of the resilience within the framework of integral risk management with the aim to develop a system which integrates the procedures for a complete risk analysis in a Geographic Information System (GIS) toolbox, in order to be applied to our testbed, the Alps-crossing corridor of St. Gotthard.



The Swiss system for risk analysis of gravitational natural hazards (BUWAL 1999) offers a complete framework for the analysis and assessment of risks due to natural hazards.

The simulation environment is developed within ArcObjects, the development platform for ArcGIS. The topic of ArcObjects usually emerges when users realize that programming ArcObjects can actually reduce the amount of repetitive work, streamline the workflow, and even produce functionalities that are not easily available in ArcGIS. We have adopted Visual Basic for Applications (VBA) for programming ArcObjects. Because VBA is already embedded within ArcMap and ArcCatalog, it is convenient for ArcGIS users to program ArcObjects in VBA.

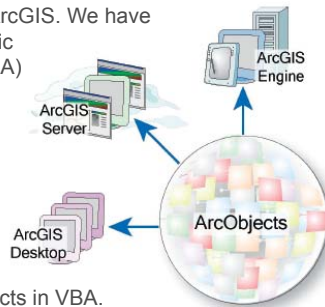
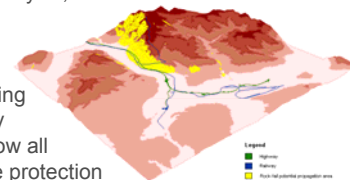


Image source: <http://www.esri.com/>

Our tool visualises the obtained data by a quantitative analysis (step 2 of the Swiss system for risk analysis of gravitational natural hazards) of historical data (aerial photo imagery, field surveys, documentation of past events) or of environmental modeling results (estimations of the area affected by a given event), and event such as route number and route position and thematic maps. As a result of this step the record appears in WebGIS. The user can select a specific area to overview previous hazards in the region. After performing the analysis, a single click on the visualised infrastructures opens the corresponding results. The constantly updated risk maps show all sites that require more protection against natural hazards.



Data recording and import

Editing data

Risk analysis: a numerical procedure

Visualisation of the results

Outlook

The initial results of the experimental case study show how useful a GIS-based system can be for effective and efficient disaster response management. In the coming years our GIS application will be a data base containing all information needed for the evaluation of risk sites along the Gotthard line. Our GIS application can help the technical management to decide about protection measures because of, in addition to the visualisation, tools for spatial data analysis will be available.

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