

“ECONOME-RAILWAY”

A NEW CALCULATION METHOD AND TOOL FOR COMPARING THE EFFECTIVENESS AND THE COST-EFFICIENCY OF PROTECTIVE MEASURES ALONG RAILWAYS

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PROBLEM

Public money is used to finance the protection of human life, material assets and the environment against natural hazards. This limited resource should be used in a way that achieves the maximum possible effect by minimizing as many risks as possible. Hence, every decision-maker faces the question as to the areas in which resources should be used. Cost-benefit analyses (CBA) are recognized instruments for determining the economic efficiency of investments and mitigation measures. However, a workshop with Swiss experts on natural hazards indicated that it is very difficult to compare these analyses with each other if different approaches are used. The results of such analyses strongly depend on selected methods, parameters and input variables. When the defined system boundaries (different experts, processes, scaling methods etc.) are exceeded, the comparability of CBA deteriorates.

In the beginning of 2008, EconoMe 2.1, an Online-Tool for the evaluation of the effectiveness and the efficiency of mitigation measures was introduced to practice by the Federal Office for the Environment for prioritising subsidised mitigation projects (Bründl et al., 2009). With the introduction of EconoMe 2.1, the results produced by the older Microsoft Excel ® tool used by the Swiss Railway Company SBB since 2005 (Burkard and Winkler, 2005) were no longer comparable. The development of a new calculation tool became necessary.

OBJECTIVE

The Swiss Federal Office for the Environment (FOEN) and the Federal Office of Transport (FOT) want to increase the comparability of CBA along railways in the area of natural hazards. Thus, they are collaborating with railway companies for developing a tool that allows for comparable CBA for all natural hazard processes by the end of 2011.

THE “ECONOME-RAILWAY” CALCULATION METHOD AND TOOL

“EconoMe-Railway” is an online-tool and is based on the existing tool EconoMe 2.1 (www.econome.admin.ch). EconoMe enables planning engineers, investors and authorities responsible for the mitigation of avalanches, floods, landslides, unconfined debris flows and rockfall processes to carry out comparative CBA. The comparability is achieved through the definition of conventions for the required parameters. For example, the marginal costs for the prevention of a fatality are set at CHF 5 million and the vulnerability values of objects cannot be modified by the user. The calculation of the cost-benefit ratio of a mitigation measure takes several defined scenarios, which are characteristic to a certain hazard area, into account. This can be, e.g. a 10-year, a 30-year, and a 100-year scenario of an avalanche crossing the railway track. EconoMe-Railway can be accessed by authorised users and examines direct and indirect losses due to the interruption of a railway line, which can be very important for affected companies.

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With EconoMe-Railway it is possible to consider various typical damage situations. The key element for the development of the software tool was an event tree (Fig. 1), which shows different consequences of a natural hazard process potentially occurring on a railway line.

The innovation behind EconoMe-Railway is the collaboration of the most important Swiss railway organisations for developing a common tool for the economic evaluation of mitigation measures. This is a further important step in introducing the risk concept to practice in Switzerland.

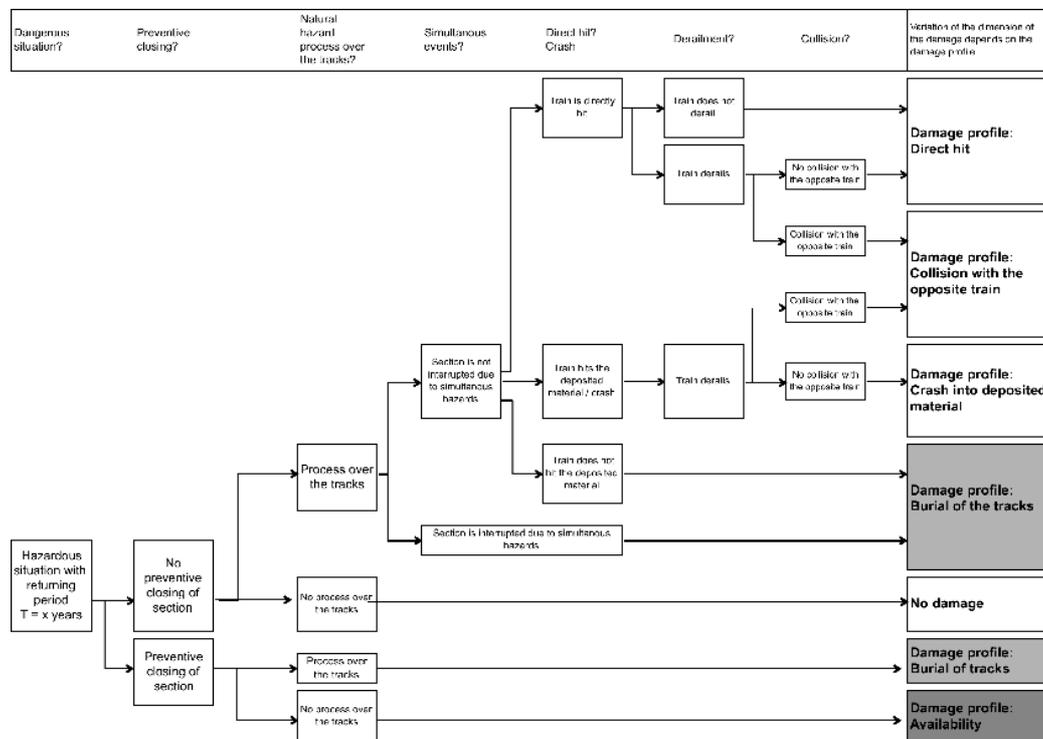


Fig. 1: Event-tree depicting various damage situations implemented in EconoMe-Railway.

CONCLUSIONS

EconoMe-Railway makes CBA and risk calculations comparable and aids authorities and consultant engineers in their decision-making regarding the efficient use of resources. Experiences with EconoMe and the new tool EconoMe-Railway indicate that a user-friendly tool supports risk-based decision making. Our presentation will present the principles of the method and of the calculation tool by a case study in the Swiss Alps, which is endangered by rock-fall. The case study will highlight special features of a risk assessment along a railways line with EconoMe-Railway.

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