



Assessing the risk posed by natural hazards to infrastructures

Unni Eidsvig, Krister Kristensen, and Bjørn Vidar Vangelsten
NGI, Natural Hazards, OSLO, Norway (unni.eidsvig@ngi.no)

The modern society is increasingly dependent on infrastructures to maintain its function, and disruption in one of the infrastructure systems may have severe consequences. The Norwegian municipalities have, according to legislation, a duty to carry out a risk and vulnerability analysis and plan and prepare for emergencies in a short- and long term perspective. Vulnerability analysis of the infrastructures and their interdependencies is an important part of this analysis.

This paper proposes a model for assessing the risk posed by natural hazards to infrastructures. The model prescribes a three level analysis with increasing level of detail, moving from qualitative to quantitative analysis. This paper focuses on the second level, which consists of a semi-quantitative analysis. The purpose of this analysis is to perform a screening of the scenarios of natural hazards threatening the infrastructures identified in the level 1 analysis and investigate the need for further analyses, i.e. level 3 quantitative analyses. The proposed level 2 analysis considers the frequency of the natural hazard, different aspects of vulnerability including the physical vulnerability of the infrastructure itself and the societal dependency on the infrastructure. An indicator-based approach is applied, ranking the indicators on a relative scale. The proposed indicators characterize the robustness of the infrastructure, the importance of the infrastructure as well as interdependencies between society and infrastructure affecting the potential for cascading effects. Each indicator is ranked on a 1-5 scale based on pre-defined ranking criteria. The aggregated risk estimate is a combination of the semi-quantitative vulnerability indicators, as well as quantitative estimates of the frequency of the natural hazard and the number of users of the infrastructure.

Case studies for two Norwegian municipalities are presented, where risk to primary road, water supply and power network threatened by storm and landslide is assessed. The application examples show that the proposed model provides a useful tool for screening of undesirable events, with the ultimate goal to reduce the societal vulnerability.