

ABSTRACT

*for the 3rd DNVA-RSE Norway-Scotland Waves Symposium, Oslo 16-17 September 2013*

**Åkerneset – the threat from an unstable rock slope in Storfjorden, western Norway:  
A review of research and civil protection issues.**

*CB Harbitz<sup>a\*</sup>, GK Pedersen<sup>b</sup>, and S Glimsdal<sup>a</sup>*

*a Norwegian Geotechnical Institute (NGI), Norway*

*b University of Oslo, department of mathematics*

*\* NGI, PO Box 3930 Ullevaal Satdion, NO-0806 OSLO, NORWAY*

*Tel.: +47 22023000; fax: +47 22230448. E-mail address: carl.bonnevie.harbitz@ngi.no*

An unstable rock volume of more than 50 million cubic metres has been detected in the Åkerneset rock slope in the narrow fjord, Storfjorden, Møre & Romsdal County, Western Norway. If large portions of the volume are released as a whole, the rock slide will generate a tsunami that may be devastating to several settlements and numerous visiting tourists along the fjord.

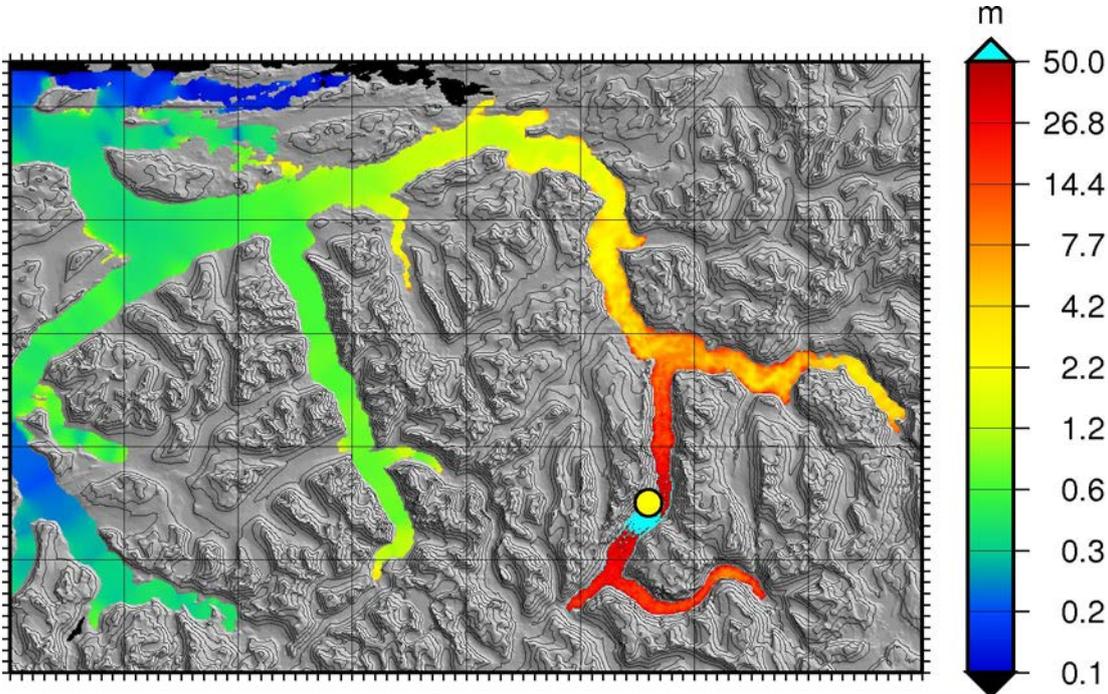
Introductory, a few well-documented rockslide tsunami events in fjords, lakes and reservoirs, as well as the present threat posed by future rockslide tsunamis, will be presented. Subsequently follows a description of the objectives and the elements involved in the Åknes/Tafjord project established for rockslide tsunami risk mitigation in the fjord system, and an overview of other rockslide tsunami risk mitigation projects.

The tsunami hazard and risk in the complex Storfjorden system are evaluated through a uniquely multidisciplinary approach comprising: 1) geological and geotechnical field work as well as numerical analyses to assess the stability of the rock slopes; 2) statistical assessments for probability of release and for run-out distance of the rock slides; 3) numerical simulations and laboratory experiments of rock slide dynamics, and of tsunami generation, propagation, and inundation; 4) hazard and risk assessment; and finally 5) risk management including the establishment of a preparedness centre for rock slope monitoring, early warning systems, public awareness, evacuation plans, and land use planning.

The scientific investigations to assess the unstable rock slope at Åkerneset and the nearby rock slope Hegguraksla are described. The analyses are made for a large set of rockslide scenarios (with corresponding annual probabilities of release) from the two rock slopes at Åkerneset and Hegguraksla.

Inundation modelling and hazard zoning are performed for more than twenty locations. Strong emphasis is put on verification, validation, and sensitivity of the numerical models.

The results provide a fruitful and immediate application of academic studies in consulting. Beyond the obvious objective of providing input to the county/municipality preparedness program in terms of rock slope stability assessment, criteria for alert levels and distribution of warning, tsunami hazard zoning, etc., objectives have also been to establish methodologies and recommended practice for future applications in other places.



*Maximum surface elevation (in meters) for a 54 million cubic meters rock slide scenario from Åkerneset (yellow bullet) in the narrow fjord, Storfjorden, Møre & Romsdal County, Western Norway.*