Geophysical Research Abstracts
Vol. 21, EGU2019-10641-1, 2019
EGU General Assembly 2019

Integrating susceptibility modelling at catchment level into national landslide forecasting in Norway

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The importance of susceptibility maps in the initial phase of landslide hazard and risk assessment has been recognized for years, since they provide a general overview to stakeholders of the location of landslide prone areas. The value of these maps has been limited so far mainly for land use planning.

With the growing implementation of early warning systems at national and regional level worldwide, many researchers recognize that susceptibility maps may also be used to improve the performance and spatial resolution of landslide warning, and provide a better updating of hazard assessment over time.

A national “susceptibility map for landslides in soils at catchment level” was prepared for Norway using a statistical approach. The intention is the integration of the map in the landslide forecasting and warning service at Norwegian Water Resources and Energy Directorate (NVE).

The map was elaborated by combining five regional susceptibility assessments and maps carried out between 2013 and 2017 in five regions (Northern, Centre, Western, Eastern and Southern Norway). Only country-wide available data was employed for all analyses. Data and methods used to perform the regional susceptibility analyses are summarized. The national susceptibility map is being combined with landslide threshold maps by using a matrix approach to improve the existing thresholds, used in the prediction of rainfall-induced landslides. This new threshold map, which takes into account landslide spatial probability, assists national landslide forecasters in the daily hazard evaluation and predictions. Before the landslide susceptibility map was integrated in the system, too many warnings were issued in areas that are not landslide prone. This is a frequent problem in regional and national landslide early warning systems that are solely based on hydro-meteorological thresholds. Thus, after the integration of the susceptibility map in the warning system, the final issued warnings are more realistic.
Finally, we show how different susceptibility maps can be incorporated in various stages of the early warning system in order to improve landslide predictions. This contribution is part of the activities of the research-based innovation centre Klima 2050 (www.klima2050.no).