Geophysical Research Abstracts
Vol. 14, EGU2012-9375-1, 2012
EGU General Assembly 2012

Ethical questions in landslide management and risk reduction in Norway

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The loss of lives caused by landslides in Norway is smaller than in other countries due to the low population density in exposed areas. However, annual economic losses from damage to properties and infrastructures are vast. Yet nationally coordinated efforts to manage and reduce landslide and snow avalanche risk are a recent challenge, having started only in the last decade. Since 2009, this has been a task of the Norwegian Water Resources and Energy Directorate (NVE) under the Ministry of Petroleum and Energy. Ongoing work includes collection of landslide data, production of susceptibility and hazard maps, planning of mitigation measures along with monitoring and early warning systems, assistance to areal planning, providing expertise in emergencies and disseminating information to the public. These activities are realized in collaboration with the Norwegian Geological Survey (NGU), the Meteorological Institute, the Road and Railway authorities, universities and private consultant companies. As the total need for risk mitigating initiatives is by far larger than the annual budget, priority assessment is crucial. This brings about a number of ethical questions.

1. Susceptibility maps have been produced for the whole country and provide a first indication of areas with potential landslide or snow avalanche hazard, i.e. areas where special attention and expert assessments are needed before development. Areas where no potential hazard is shown can in practice be developed without further studies, which call for relatively conservative susceptibility maps. However, conservative maps are problematic as they too often increase both cost and duration of building projects beyond the reasonable.

2. Areas where hazard maps or risk mitigation initiatives will be funded are chosen by means of cost-benefits analyses which are often uncertain. How to estimate the benefits if the real probability for damage can only be judged on a very subjective level but not really calculated? As a result, we may use large amounts of money to mitigate the risk for a few houses with a yearly probability of damage of 1/300 and not do anything for an isolated farm with a yearly probability of damage larger than 1/50.

3. Is it ethical to stop the plan to construct a pedestrian and a cycling way or a new road crossing exposed to potential landslide hazard, when the delay or disapproval of the implementation of the plan itself involves a severe consequence than the actual landslide hazard?

4. Most fatalities from natural hazards in Norway happen because of snow avalanches in recreational activities. On the one hand, this suggests that one should use a large share of the annual budget to prevent this type of accident, where there are most lives to spare. On the other hand, one could argue that the voluntary exposure to hazard shouldn't be given too much priority at the expense of buildings and public infrastructures.

5. More generally, how ethical is it to use large amounts of money to manage hazards that has a remote probability to occur or that will not cause human losses or property damage, instead of for example strengthening other social demands?