



DISTRICT OF NORTH VANCOUVER

Determining tolerable risk

By Paul Kovacs

THE SCIENCE

The risk of damage, injuries, and fatalities due to natural hazards can be reduced but, in most circumstances, it cannot be eliminated. Best practices for managing risk, including extreme weather risk, include the determination of acceptable or tolerable risk as a minimum target for risk reduction efforts. The idea of clearly determining acceptable risk is widely used in private industry but is only used selectively in the public sector at this time. For example, the provincial and territorial governments provide maps identifying high risk zones for unacceptable flood damage, and building codes set out minimum standards to prevent losses from identified magnitude hazards. The District of North Vancouver is an international leader in the application of tolerable risk of loss from natural hazards at the community level.

THE TRIGGER

Eliza Kuttner was killed and Michael Kuttner was seriously injured by a landslide while sleeping in their home in the District of North Vancouver. A wall of mud and debris destroyed their home when the backyard on top of the slope over the home gave way. Six other homes above or beside the former home of the Kuttners have been demolished and the land is now used as a community park because the risk was determined by the community as unacceptable.

The Coroner found that the deadly landslide was “predictable and preventable.” The area was subject to previous landslides, with several properties in the District identified as subject to significant risk. Moreover, the Coroner was critical of the lack of action by the District and the province to address the risk of loss from landslides. This tragic event led the District to embark on an aggressive, long-term program to reduce the risk of loss and damage in the community from landslides and other hazards. This included the development of natural hazard risk-tolerance criteria - along with comprehensive risk assessments, hazard development permit areas, structural mitigation and ongoing public communication.

THE APPROACH

The District established a Natural Hazards Task Force that reviewed disaster risk reduction best practices from countries including Hong Kong, the United Kingdom, and Australia. This included an assessment of the concept of targeting disaster management efforts to result in reducing the risk of loss until it is As Low as Reasonably Practical (ALRP). This concept has been used in Canada to guide medical decisions and other public safety actions but had never been used by a local government to identify acceptable or tolerable risk of loss from natural hazards.

Under the ALRP approach it must be possible to demonstrate that the cost to reduce a risk further would greatly exceed the benefit gained. This approach is



Figure 9: Six other homes above or beside the former home of the Kuttners have been demolished and the land is now used as a community park because the risk was determined by the community as unacceptable. (Source: Google Maps)

used to determine tolerable risk based on science, engineering, and economic considerations. In contrast, acceptable risk is largely determined based on judgement. A private corporation may ask their Board of Directors to identify the maximum acceptable risk for the organization. The District's risk tolerance criteria were developed through research, public input, and prior regional knowledge.

THE OUTCOME

Risk tolerance criteria have been used on an interim basis to manage landslide risk in the District of North Vancouver since 2005. The Council-approved criteria and risk reduction strategy have been in effect since 2008 to manage the risk of loss from several hazards including landslides, wildfire, flood and earthquakes. The District's approach to hazard risk reduction has been widely praised as innovative and effective. Indeed, the District has been recognized as a "role model city" for the United Nations' Resilient Cities campaign. In 2011, the District won the United Nations' Sasakawa Award for Disaster Risk Reduction.

Consistent with research by the Institute for Catastrophic Loss Reduction and others, the cost of disaster risk reduction is moderate when renovating an existing home

or building, and very low for new construction. Appropriately, the natural hazard risk tolerance criteria established by the District of North Vancouver have different objectives for renovations and for new developments. An overview of the criteria shows that the tolerable expected loss of life must be:

- Less than 1 in 10,000 (plus ALRP) a year for re-developments and major renovations
- Less than 1 in 100,000 (plus ALRP) a year for new developments and subdivisions.

Published risk tolerance criteria provide clear objectives for developers. Developers are permitted to decide the specific risk reduction actions they will use but they must demonstrate that the overall risk of loss meets the community expectations.

A WORD FROM THE DISTRICT OF NORTH VANCOUVER

The District of North Vancouver's risk tolerance criteria have been in place for more than a decade. As part of the Official Community Plan implementation review, the policy is slated for review in 2019. There are two main anticipated next steps. First, the application of the concept of ALRP will need to be refined - perhaps by creating a peer review panel of qualified professional engineers and geoscientists to review development applications that may fall into the tolerable risk range. Then, examples of risk reduction best practices at the site level (construction methods, setbacks, bedroom placements, etc.) will need to be provided to aid developers and property owners in designing and building disaster resilient structures that meet the ALRP criteria.

When asked what advice she would give to other communities across Canada, Fiona Dercole, Director, North Shore Emergency Management and staff lead for the North Vancouver project to establish risk tolerance criteria said "An important reason for a community to implement disaster resilient building policies is to limit the creation of new risk. Most communities already have their hands full dealing with existing risks – these demands will only increase as the impacts of climate change become more and more apparent."