



Landslide Hazards and Risk in Canada in the last decade (1995-2005): Recent events and examples of multidisciplinary approaches (Plinius Medal Lecture)

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As in many other countries, Canada has experienced the consequences of several natural hazard events in the past decade. By its various physiographic regions (e.g. coast line is 202 080 km long), its population distribution (77% lives in urban areas), and its important linear infrastructure (the greatest length of linear infrastructure per person in the world), Canada is exposed to high risk from natural hazards. Everyone in Canada will remember the 1996 floods in Saguenay-Lac Saint-Jean region (Quebec), the 1997 Red River flood (Manitoba), the 1998 ice storm in the St. Lawrence River valley (Quebec and Ontario), or the 2003 floods in the Sea to Sky area (British Columbia). In addition to loss of life, these events cost several billion dollars in damages, which affected the Canadian economy significantly.

Canada's population and infrastructure have also been affected by landslide threats in the past ten years. For example, the January 19, 2005 North Vancouver District Landslide swept two houses, took one life, and severely injured another person. Exactly one year later, heavy rains, once again, posed a landslide threat to the area, which triggered a call for evacuation of hundreds of inhabitants. In November 2003, the Khyex River landslide ruptured a 300-m section of a 15-cm gas line, which left residents of two northwestern British Columbia communities without natural gas heat for 10 days. Damages were estimated at well above \$1.5 million. The last decade was also marked by the centennial anniversary of Canada's largest landslide disaster, the Frank Slide (Turtle Mountain, Alberta). After recognizing the potential threat of second slope failure at Turtle Mountain, the Alberta Geological Survey deployed a slope monitoring program. Growing interest in developing petroleum resources in the Canadian Arctic and Sub-Arctic regions has led to a national effort in improving our knowledge on

landslide hazards and risk, especially in areas underlain by permafrost.

Hence, cited examples above have helped give a brief overview of landslide hazards and risk in Canada as well as displayed several multi- and interdisciplinary approaches taken in reducing the landslide risk. Collaboration, within Canada and abroad, with engineers (e.g. civil, geological), earth scientists (e.g. geologists, geomorphologists), remote sensing experts, naturalists, and GIS experts has led to efficient and successful initiatives towards reducing landslide hazards and risk in Canada. Some contributions to advances in research are also briefly described in this presentation, especially with respect to fragmentation in large rockslides and new development in spatial analysis.