

Natural Hazards Mapping, Assessment, and Communication: the case of Newfoundland & Labrador, Canada

Although Newfoundland & Labrador is commonly perceived by both its residents and other Canadians to have relatively few natural hazards, the province is subject to hurricanes, storm surges, slope failures, avalanches, extremes of heat and cold, droughts, floods, tornadoes, blizzards, extreme snowfall, ice storms, and earthquakes.



The October 18, 1929 Burin tsunami was responsible for the greatest death toll from a single seismic event in Canadian history. Prior to Dec. 2004, only limited measures had been taken to mitigate the impact of a future event. Discussions have proceeded at a slow pace since.



Tropical storms and extratropical transitions such as Chantal (2007) and Rita (2005) regularly impact the province, with a modal frequency of 4 per year. Damage primarily results from flooding and slope failure. Ongoing adaptation efforts include redesign of culverts and roadways, relocation of housing damaged by flooding (Stephenville, top right), rezoning of affected terrain, and re-enforcement of sea walls. In Stephenville, the designated floodway area was expanded after Rita, with increased expropriation of properties, at the request of the residents and municipal officials.



Storm surge activity affects coastal communities throughout the year, with the most significant damage associated with winter and spring storms. Increases in both the frequency and intensity of mid-latitude cyclonic events have been noted since 1990, with consequent increases in impact.



Slope failures are linked to coastal erosion, rain-on-snow flooding, and freeze-thaw action. All of these processes have shown increased activity since 1990.



Annual snowfall can exceed 7 m in many communities. Increased snowfall is associated with strongly positive North Atlantic Oscillation phases, and with strong La Nina events. Snowfall has led to roof collapses, as well as economic disruptions to business and transportation. Rain-on-snow flooding is also becoming an increasing concern. Building directly adjacent to streams is common. The steep topography is an additional factor contributing to flood risk.

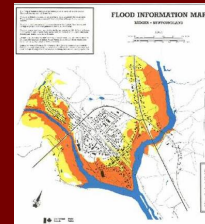


Summer storm events, including thunderstorms, lightning strikes, waterspouts, and tornadoes, have also increased in number and magnitude since ca. 1980.



Interruptions to transportation, communications, and power supply are among the most significant impacts of winter storm activity. As more than 90% Newfoundland's food is imported by ferry, interruptions to the service are critical. "Normal" storm activity (without extreme events) results in disruptions and delays to more than 15% of the scheduled ferry crossings annually. Disruptions to ferry and highway traffic cost in excess of \$6 million annually. Power and communication failures resulting from freezing rain and sea spray accumulation also represent significant hazards; power can remain unavailable for periods in excess of 7 days.

Between 2000 and 2007, direct economic costs resulting from natural hazards exceeded \$94 million in Newfoundland & Labrador.



Failures to effectively communicate information have been significant. Although detailed flood risk mapping was available, construction on floodplains proceeded in several communities, such as Badger (illustrated here). Losses due to ice-jam flooding in Feb. 2003 have exceeded \$20 million.

Identification of natural hazards, assessment of their impacts, and suggestions for adaptation have proceeded, but further work needs to be accomplished. Most natural hazard mapping and assessment has concentrated on a 'single hazard' approach, involving mapping only one type of hazard in each community (e.g. flood risk mapping, or coastal erosion, or slope stability), without considering the interplay between the hazards or the vulnerability of the community as a whole. As well, fragmentation of databases; loss of records, institutional, community, and individual memories; limited financial and personnel resources; and difficulties with effective dissemination of the available information have all hampered efforts to assist people understand and cope with risks in their community environments.

Comprehensive mapping and assessment, involving an integrated approach encompassing risk and vulnerability assessment of all natural hazards in concert, together with consideration of socioeconomic factors, is a vital aspect of reducing risk and effective emergency planning under both current and future climate conditions.

A comprehensive assessment of natural hazards is being undertaken for selected communities, representing a diverse suite in terms of the hazards to which they are exposed, the demographic and socio-economic conditions, and the amount and effectiveness of municipal planning and preparation for emergency response. Effort was concentrated on the practical aspects of assessment of hazards; discussion of impacts, including impacts of previous events and potential future impacts; and suggestions for better adaptive and planning strategies. Consultation with communities and residents formed a major component of the research, intended to document previous events that may not have been recorded in writing, determine their perceptions of risks and hazards, and to better assist in municipal planning and development and emergency response.