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A National Earthquake Early Warning (EEW) System for Canada

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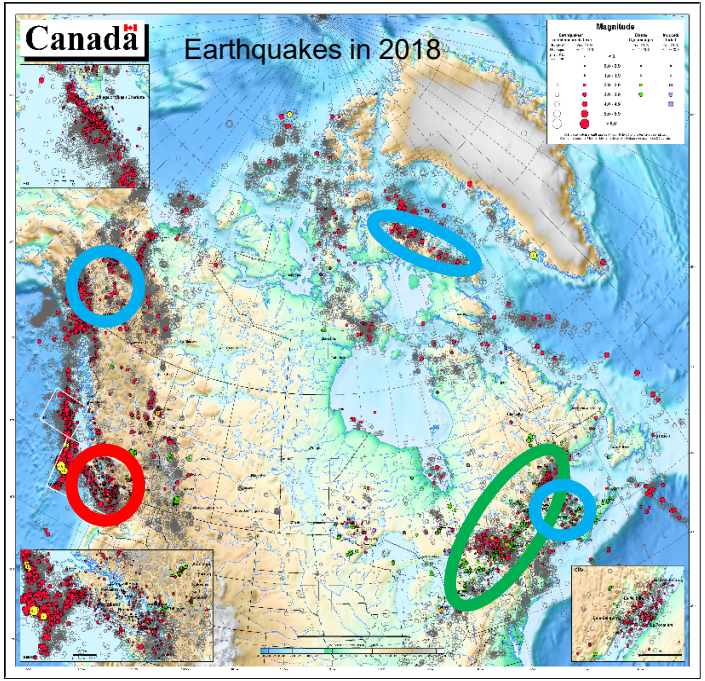
Canada

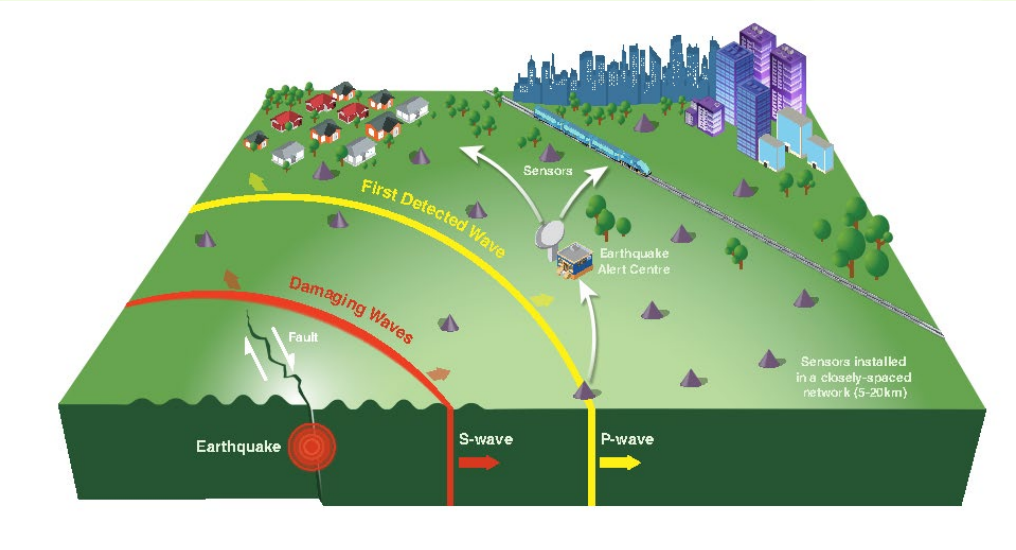
Why EEW?

- Parts of Canada with significant populations are exposed to substantial earthquake risk:
- Insurance Board of Canada study† shows large but plausible earthquakes could result in total direct losses of $75 billion in the West and $60 billion in the East
- EEW can provide seconds to minutes of warning before the arrival of strong shaking to allow protective measures and reduce the impact of an event
- Canada currently has earthquake monitoring, but no national warning system
- EEW systems exist in other countries with high earthquake risk: Japan, Taiwan, China, USA…

† Insurance Bureau of Canada, *Study of Impact and the Insurance and Economic Cost of a Major Earthquake in British Columbia and Ontario/Québec, 2013*



EEW Basics: General Principles



Constraints:

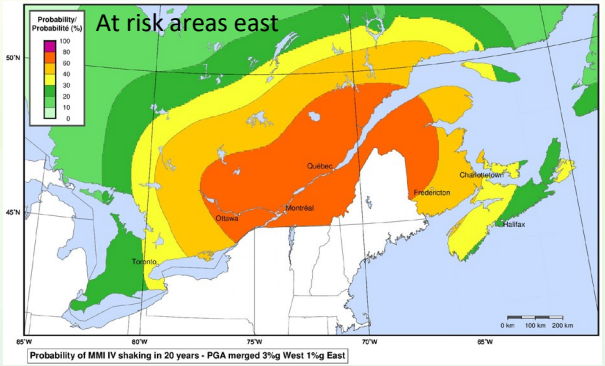
- System cannot predict an earthquake
- Warning time is short
- Much of the at risk areas may be affected by an earthquake in USA
- System itself does not protect, but requires that recipients of an EEW message must act

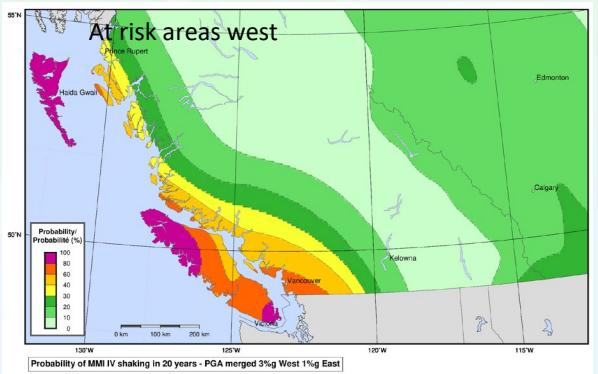
NRCan: National EEW Program

- Federal Budget 2019 included funding for ‘Ensuring Better Disaster Management Preparation and Response’, including Earthquake Early Warning
- Implementation phase of the EEW program runs from 2019-2024, with operation and sustainment thereafter
- Principal components:
  - Sensor networks
  - Cross-border interoperability and data sharing with US
  - Use of US processing software
  - Alert distribution in Canada
- Authoritative source of alerts and information

How Will the System be Built?

- Dense networks of sensor stations
  - In areas at greatest risk: SW BC and areas within Ottawa to Quebec City corridor
  - Cover significant critical infrastructure and population centres
  - Station density, a station every < 10-20km
  - Selected areas in other parts of the country
  - Cross border data sharing
- Communications – high speed, redundancy, security
- Processing
  - Processing software in redundant data centres
  - NRCan will adopt US system for data handling and alert generation: ShakeAlert

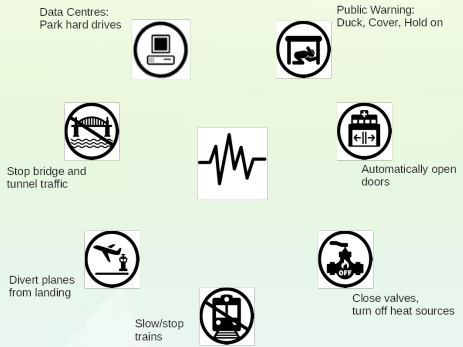




Alerting and Acting

- To critical infrastructure operators
  - EEW connected systems can **automatically** take protective actions
  - Shakemaps help with damage assessment business resumption
- To FPT operations centres
- General public - NPAS
  - Currently operational for severe weather, Amber alerts, etc.
  - Effective EEW requires much lower latency, not within current capabilities for cell distribution
- Personal Protection
  - Public education campaign needed
  - Introduce via Shakeout exercises

Automated Responses



Personal Protection

Summary

- Earthquake Early Warning has the potential to reduce the impact of major earthquake in Canada
- Natural Resources Canada is initiating a five year program to construct such as system with initial operation to begin in ~2024
- Close cross border integration with systems in the United States
- Engaging potential partners:
  - Station placement
  - Alert recipients
  - Public communications