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Presenting the Newly Released Canadian Seismic Risk Model and the RiskProfiler Web Interface

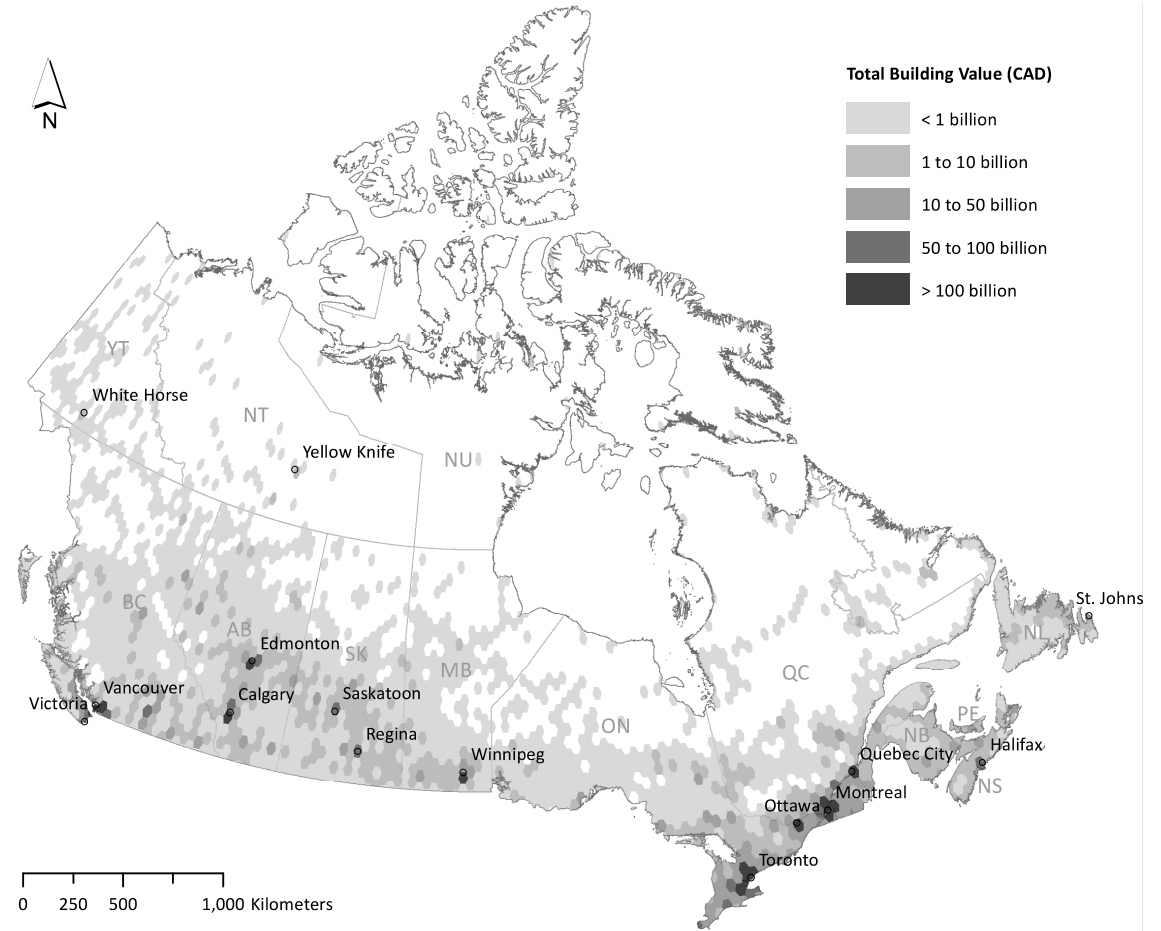
Hobbs, T.E., Journeay, J.M., Rao, A., Kolaj, M., Martins, L., LeSueur, P.,
Simionato, M., Silva, V., Pagani, M., Johnson, K., Rotheram, D., Chow, W.

USGS Subduction Zone Science Workshop 2023

Canada

National Seismic Risk Model

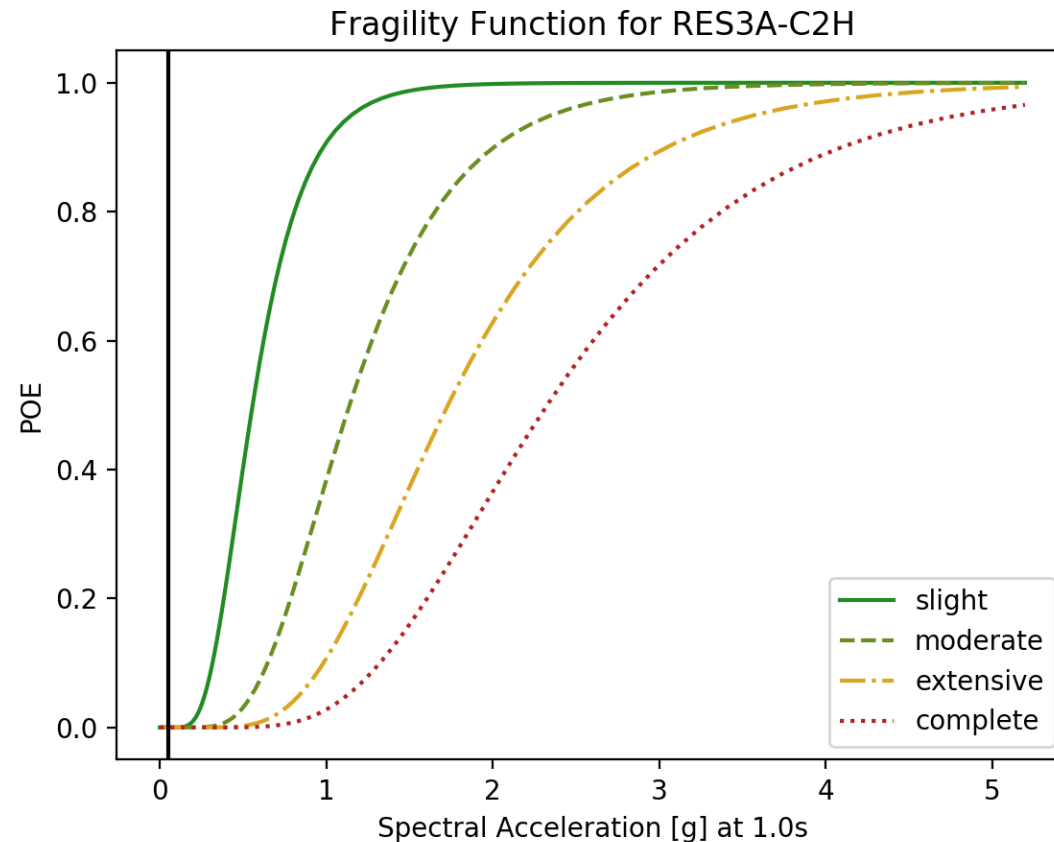
- 6th Generation National Seismic Hazard Model (Kolaj et al., 2020)
 - Seismic Source Characterization Model
 - Ground Motion Characterization Model
- Site conditions from V_{S30} model (Wald & Allen, 2007)
- Representative exposure model of Journey et al., 2022a
- Social vulnerability model of Journey et al., 2022b
- **Just accepted in *Earthquake Spectra***



Fragility and Vulnerability



Ann Abraham
(UBC Doctoral Candidate)

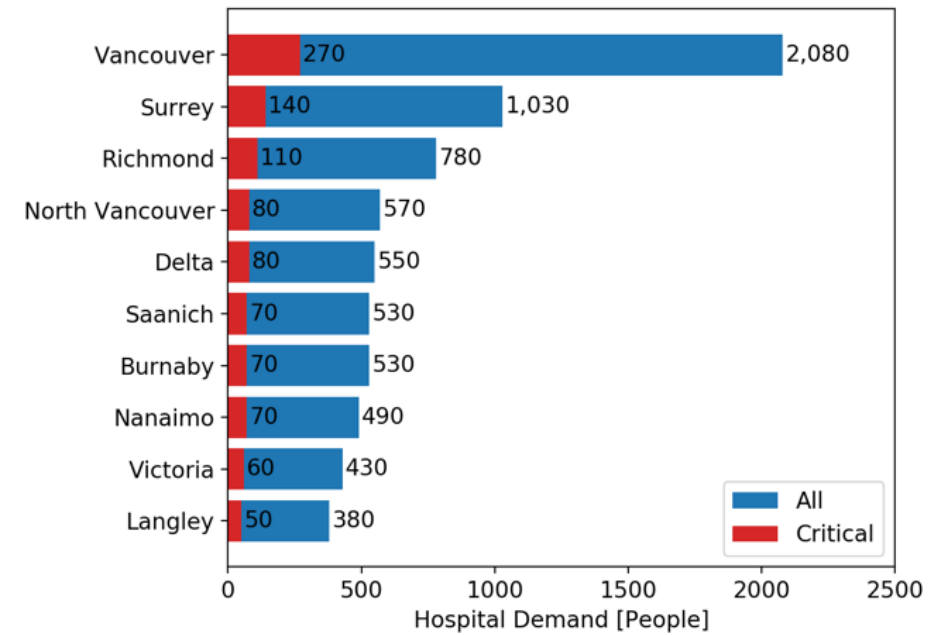
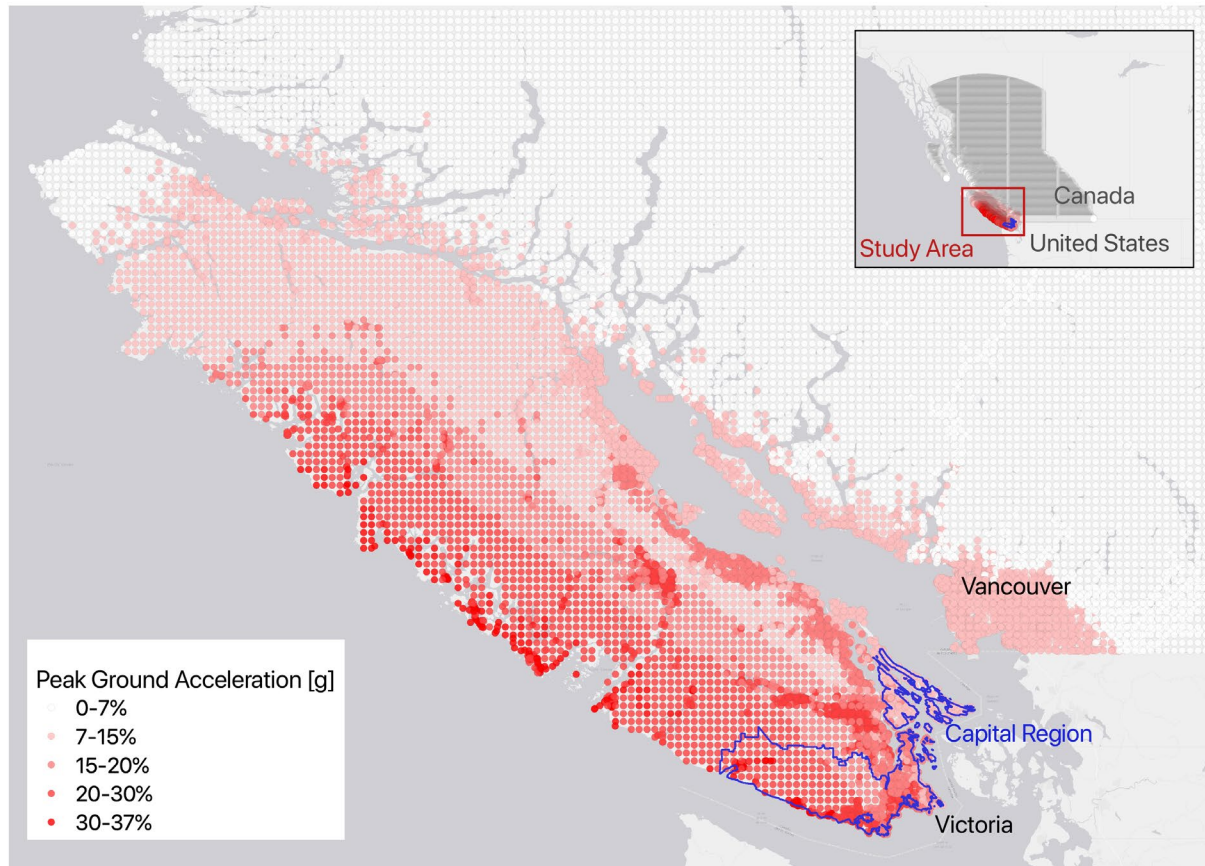


Retrofit:

- Assume all buildings could be brought to around 60-80% of the current code
- Exception for unreinforced masonry (low code)
- Exception for post-disaster buildings (high code)



Cascadia M_w 9.0 Scenario



Cost in Canada:
\$40 Billion (13% of BC's GDP)




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Explore
Earthquake Scenarios

Consider
Probabilistic Earthquake Risk

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Scenario Catalogue ▶ Select a marker to retrieve data

🔍 Type to search

M4.9 Georgia Strait (BC) 📈 4.9

DEATHS	DAMAGE	DOLLARS
Less than 10 people	30 buildings	\$733 million

M5.0 event near Montréal (QC) 📈 5.0

DEATHS	DAMAGE	DOLLARS
110 people	500 buildings	\$11 billion

M5.5 near Ottawa (ON) 📈 5.5

DEATHS	DAMAGE	DOLLARS
10 people	90 buildings	\$2.1 billion

M7.0 Georgia Strait (BC) 📈 7.0

DEATHS	DAMAGE	DOLLARS
770 people	10 thousand buildings	\$30 billion


M7.1 Sidney (BC) 📈 7.1

DEATHS	DAMAGE	DOLLARS
900 people	6.1 thousand buildings	\$20 billion


M7.3 Leech River Fault (BC) 📈 7.3

DEATHS	DAMAGE	DOLLARS
990 people	6.9 thousand buildings	\$20 billion


Map showing earthquake scenarios across North America. Markers indicate scenario locations: Vancouver (5), Ottawa (3), and Montreal (3).



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GEM
GLOBAL EARTHQUAKE MODEL
working together to assess risk



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← Scenario Catalogue ▶ M7.3 Leech River Fault (BC) ▶ Number of buildings that are likely to collapse

Full rupture of the Leech River fault, a fault that cuts southern Vancouver Island and extends beneath Greater Victoria. Based on current science, this magnitude 7.3 earthquake scenario represents the strongest ground shaking event that could strike the region, and is one of Greater Victoria's most severe events.

INDICATORS

- Shake Map
- Injuries
- Damage**

Number of buildings with no damage

Number of buildings in the 'slight' damage state

Number of buildings in the 'moderate' damage state

Number of buildings in the 'extensive' damage state

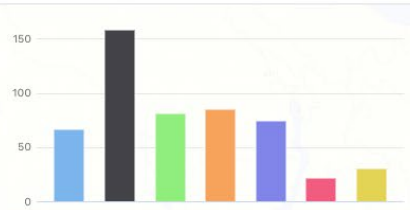
Number of buildings in the 'complete' damage state

Number of buildings that are likely to collapse

Total volume of disaster debris in tonnes


By Building Type

GENERAL SPECIFIC

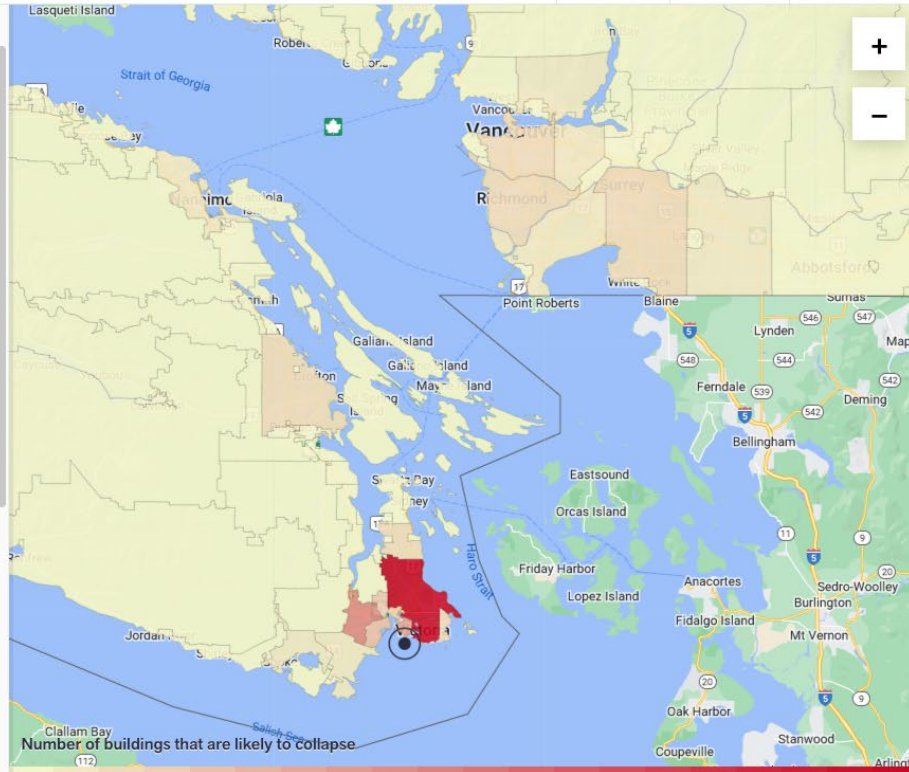


Building Type	Count
Wood	65
Steel	80
Reinforced Masonry	85
Manufactured	30
Concrete	160
Unreinforced Masonry	75
Precast	25


By Design Level





Design Level	Count
Pre-Code	340
Moderate Code	50
Low Code	110
High Code	20



Number of buildings that are likely to collapse



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← Probabilistic Risks ▶ Annual Probability of Fatality ✕

Surrey (V3V)

Risk Score

INTEGRATED SEISMIC RISK INDEX

Risk Score – Total Impact	Risk Score – Percentage Impact (Normalized)
 69.2	 35.9
VERY HIGH SCORE	VERY HIGH SCORE

AVERAGE ANNUAL FATALITIES	ANNUAL PROBABILITY OF FATALITY
0.011	0.000004
BUILDINGS WITH COMPLETE DAMAGE OVER 50 YEARS	PROBABILITY OF COMPLETE DAMAGE OVER 50 YEARS
20	0.12
ANNUAL ECONOMIC LOSS	ANNUAL ECONOMIC LOSS RATIO
\$510 thousand CAD	0.000794%

Loss Exceedance Curve

Search communities


FORWARD SORTATION AREA
Surrey (V3V)
ANNUAL PROBABILITY OF FATALITY
0.000004
[View Details](#)

Annual Probability of Fatality

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GEM GLOBAL EARTHQUAKE MODEL working together to assess risk

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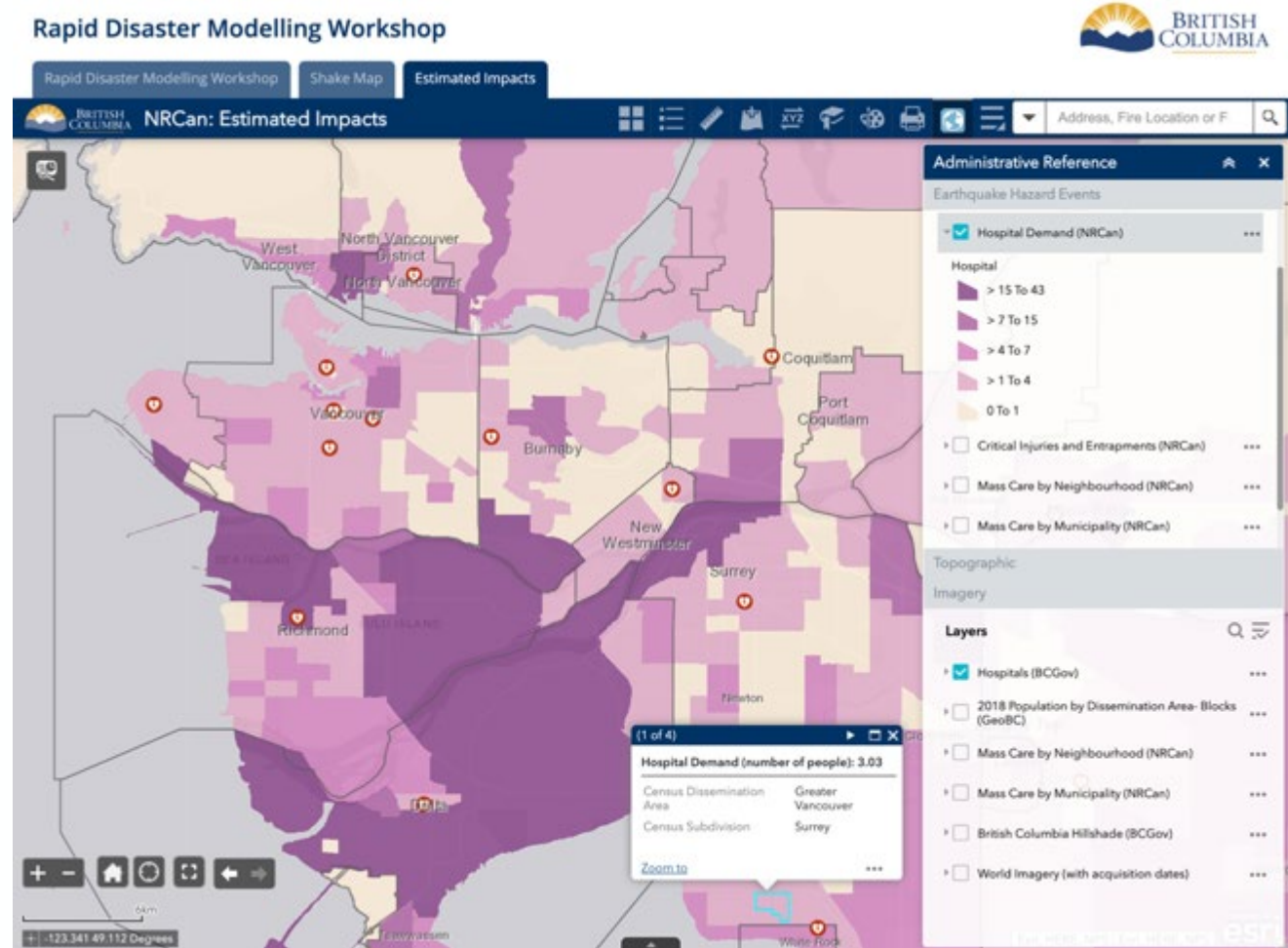
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Rapid Disaster Modelling



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Hobbs et al., 2020, URBC



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