Building a national seismic risk model for Canada







Murray Journeay







Building a national seismic risk model for Canada



2016

2017

Risk: M. Journeay, A. Rao, V. Silva, L. Martins, M. Simionato, T. Hobbs Hazard: T. Allen, M.Kolaj, M. Pagani, K. Johnson, T. Hobbs Physical Exposure: M. Journeay, W. Chow Social Vulnerability: M. Journeay, C. Burton, J. Yip, C. Wagner OpenDRR Platform: Joost Van Ulden, Drew Rotherham-Clark, Will Chow



2018

2019

2020

2021



Integrated Seismic Hazard & Risk Model for Canada





\$

Canada

9.7 Million





2015

Y.T.

N.W.T.



GLOBAL EARTHQUAKE MODEL

United States

Canada

THE SENDAI FRAMEWORK OUTLINES SEVEN GLOBAL TARGETS TO BE ACHIEVED BY 2030:

SUBSTANTIAL REDUCTIONS

A. Reduce global disaster mortality



3. Reduce the number of affected people globally



. Reduce direct economic loss in relation to GDP



D. Reduce disaster damage to critical infrastructure and disruption of basic



Que.

Ont.



Seismic Risk



Substantially enhance international cooperation to developing countries



. Increase the availability of and access to multi-hazard early warning systems

SUBSTANTIAL INCREASES

Launch of Sendai Framework for **Disaster Risk Reduction in 2015**



Emergency Management



Community Planning

Ina







National Risk Model - Integrated Risk Assessment

What-if Planning Scenarios

Scenario models help identify actions/policies that minimize negative impacts and that increase capabilities for functional recovery through strategic investments in mitigation/adaptation measures

Scenario Models

Risk Tolerance

Disaster Resilience Strategy

Evaluation of risk reduction alternatives against specific policy goals and targets helps inform the development of disaster resilience strategies in the broader context of sustainable land use planning





Canada

Risk Models



Stage

Baseline Risk Scenarios

Hazard and risk models help make evident the likely impacts and consequences of future disaster events on people and critical assets of concern





National Risk Model – Indicator Framework

Strain on Social Fabric

Financial Agency: Income, **Employment Status, Shelter Costs, Income Assistance**

Family Structure: Support Networks, Dependency, Living Alone, Mobility

Individual Autonomy: Age, Social Marginalization, **Race and Linguistic Barriers**

Housing Conditions: Tenancy, Quality and Suitability of Housing, Capacity to Maintain



Impacts to Built Environment

Social Disruption: Household **Displacement**, **Business** Interruption

> **Economic Security:** Direct Impact Losses, Cascading Indirect Losses



Public Safety: Entrapment, **Critical Injuries, Emergency** Services, Shelter Needs

Building Performance: Damage, Recovery Time, **Disaster Debris** Recovery



OPENQUA

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Functional Recovery – pathways of sustainable development

Service Capacity Lifeline





Functional Recovery

How do we get from orange to blue?

- 1. Increase physical resistance
- 2. Accelerate response & recovery functions
- 3. Minimize burden of risk on vulnerable populations

 t_1

years

months





(iii) Economic Security – expected ground up losses

minimum expected future loss from known seismic hazards of varying magnitude (return period)





Canadä

Return Period (years)





Port McNeill

Scenario Risk - Cascadia (M9.0)

Campbell River

7.3



GEM O GLOBAL EARTHQUAKE MODEL

Tofino

oUcluelet





Physical Risk- Damage Potential

Coquitlan

Cognitlam



North





EARTHQUAKE IMPACTS - Recovery Time (baseline conditions) **2**

Distribution of **Social Disruption** Across Neighbourhood Archetypes

STRAIN ON SOCIAL FABRIC - Loss of Habitation for > 30 Days

OpenDRR Platform

Provide tools to support decision making and to inform disaster resilience planning

Key Components

- OpenQuake Engine
- GitHub Data Repository
- Federal Geospatial Platform (FGP)
- Public Portal (RiskProfiler.ca)

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