

2016 ANNUAL REPORT

BRITISH COLUMBIA Chapter

of the Earthquake Engineering Research Institute

Report Date: February 23, 2017



This report summarizes the membership and activities conducted by the British Columbia (Canada) Regional Chapter of the Earthquake Engineering Research Institute during 2016.

MISSION & GOALS

The broad-scale scope of the EERI-BC strategic plan (2015-2017) is to focus on goals related to planning and mitigation. The three main goals are: (1) regional earthquake-scenarios (2) education on mitigation, and (3) business continuity/land planning.

MEMBERSHIP SUMMARY

The British Columbia Regional Chapter had a total of 116 members in 2014-2015, 146 members in 2015-2016 and 68 members in 2016-2017.

OFFICERS

The Board consisted of the following members:

Role	Name	Affiliation	Email
President (Interim)	Sheri Molnar	Western University	smolnar8@uwo.ca
Past President	John Sherstobitoff	Ausenco	John.sherstobitoff@ausenco.com
Secretary	Jamie McIntyre	Mott MacDonald	jamie.mcintyre@mottmac.com
Director (Interim)	Mujib Rahman Kate Thibert Jessica Shoubridge Teron Moore Solomon Tesfamariam	Fortis BC RJC Consulting Engineers CIP/PIBC, Independent Consultant Ocean Networks Canada UBCO	mujib.rahaman@fortisbc.com KThibert@rjc.ca jessicashoubridge@gmail.com tmoore@uvic.ca solomon.tesfamariam@ubc.ca

Board meetings were held by teleconference on the last Wednesday of the month, 600-730 pm (Pacific).

BUDGET & FINANCIALS

Briefly describe the chapter budget and financials, with text description or any tables and charts as needed.

EERI-BC collects membership fees in Canadian dollars from our website (outside of 'normal' EERI system). Membership fees were first collected September 2014, and were for a 15-month

period (end of 2015). Starting in 2016, membership fees are valid for an annual 12-month (Jan-Dec) period. See the membership page on our website ([link](#)) for more information.

In 2015, due to us still in the process of building up our membership (which directly affects our operating budget) and having to spread out what we had over an extended term (15 months), as of now, we have a balance budget; we could balance the book after paying the debt we had from previous year.

CHAPTER ACTIVITIES

REGULAR CHAPTER MEETINGS

Seismic Microzonation Study for Metro Vancouver

Wednesday, March 29, 2016

Venue: Geological Survey of Canada, 605 Robson Street, Vancouver, BC

Geotechnical information collected in support of urban development projects and site response data analyzed from recent earthquakes in the Georgia Basin have the potential to transform our knowledge and understanding of how seismic hazards vary spatially, and to dramatically improve our ability to assess the future impacts of destructive earthquakes in the region. The seismic Microzonation mapping initiative would evaluate hazards due to amplification of ground motion, liquefaction and earthquake-induced slope instability. EERI BC is working on this initiative so as to utilize these information in conjunction with regional basin modeling in order to refine seismic hazard assessments for Metro Vancouver. The objectives of this effort are to prepare a suite of detailed seismic soil hazard maps for the Metro Vancouver as:

1. initially for parts of central Metro Vancouver
2. subsequently for the entire Lower Mainland

Ultimately, these maps would be combined with seismic modeling and basin modeling studies to provide seismic Microzonation maps for the entire Lower Mainland (i.e. Metro Vancouver). Outputs from this initiative will be used to inform provincial risk decision makers in mitigating and reducing earthquake risk. The role of EERI-BC is to lead collaborations to ensure viable outputs as well as communicate science, engineering, planning, and emergency management perspectives of the proposed project to its members and regional stakeholders.

APRIL ANNUAL GENERAL MEETING

Wednesday, April 27, 2016

Venue: Steamworks, 375 Water Street, Vancouver, BC

EERI-BC volunteers presented updates on the advocacy work completed in the past year, including:

- EERI Housner Fellows' reconnaissance trip Nepal
- Metro Vancouver Seismic Hazard Mapping Initiative

Attendance: 24

Participated in UK-Canada Disaster Research Workshop- Cascading Risk and Uncertainty Assessment of Earthquake Shaking and Tsunami

Wednesday, September 15, 2016

Venue: Listel Hotel, 1300 Robson Street, Vancouver, BC

Participated in UK-Canada disaster research workshop, "Cascading Risk Uncertainty assessment of earthquake Shaking and Tsunami (CRUST)", Organized by UK-Canada academics (Drs. Goda, Tesfamariam, Yang, Molnar, Atkinson). Listel Hotel, Vancouver, September 15 2016.

The main purpose of the UK-Canada Disaster Research workshop is to strengthen existing links with academic/industrial partners and to create new links for future collaboration among people who are interested in multi-hazard impact modeling and assessment of mega earthquakes. The research theme is closely related to the CRUST (Cascading Risk and Uncertainty assessment of earthquake Shaking and Tsunami) project, funded by the UK-EPSRC. The workshop is built upon active research links among the UK and Canadian universities (University of Bristol, University of British Columbia, and Western University). A series of talks and discussion sessions will be held to provide overview of the project outcomes and to present the methodology and findings. Participants contribute to the workshop by giving talks on their research that is related to the theme of the workshop. This will provide the CRUST investigators and partners with opportunities to brainstorm the next step of the development/improvement of the cascading multi-hazards modeling and assessment framework and to collaborate on the research topics.

The Intention was to provide the 28 scheduled CRUST-Vancouver participants with an opportunity to present their current research (18 presenters), brainstorm the next steps in development of cascading multi-hazards modeling and assessment framework, and to collaborate on research topics.

Strategic Plan (2015-2017)

EERI-BC drafted our first strategic plan (2015-2017) document. It was distributed to members (via email) and presented and discussed at the annual general meeting, April 22 2015.

PDCP Funding Project

EERI-BC (Sheri Molnar), working with NRCan (Murray Journeyay), applied for a Policy Development Contribution Program (PDCP) funding which was awarded to EERI-BC late last year. In addition, EERI-BC and Natural Resources Canada (NRCan) have partnered with Emergency Management British Columbia (EMBC), the Association of Professional Engineers and Geoscientists of BC (APEGBC) the District of North Vancouver (DNV), and the City of Vancouver (CoV) to host a community forum process that will take place from January to March of 2017. Forum workshops and e-dialog sessions will be organized with support and collaboration with the Fraser Basin Council (FBC), the Institute for Catastrophic Loss Reduction (ICLR), and the Global Facility for Disaster Risk Reduction (GFDRR).

The process named as Understanding Risk- Vancouver (UR Vancouver forum) will assemble a diversity of people to share the latest science and policy recommendations and help develop innovative solutions to build long-term resilience to natural hazards and the impacts of climate change. Insights and knowledge gained through this process will be shared back to the global community through the Understanding Risk platform. The results from the online forum and two-day workshop will form the basis for draft policy recommendations to Public Safety Canada, as well as a final report, which will be disseminated to project partners.

EERI School Earthquake Safety Initiative Webinar

EERI hosted a 'School Earthquake Safety Initiative Webinar' on Tuesday, July 12, 2016. The most of EERI-BC Board of Directors attended this webinar. In this webinar, EERI's School Earthquake Safety Initiative (SESI) committee provided highlights of its activities in school seismic safety screening in Alaska and Washington schools. The webinar covered the various aspects of safety screening of school buildings, FEMA's Rapid Visual Screening methodology and its implementation to do large scale school seismic evaluations, as well as advocacy for safe school buildings throughout the US. The topics discussed included:

- Thurston County School Seismic Safety Evaluations by Cale Ash, Principal, Degenkolb Engineers
- Partnering to Perform Rapid Visual Screenings of Alaska's School by Laura Kelly, Alaska Seismic Hazards Safety Commission

[EERI-BC Executive meeting; Wednesday, September 30 2015; 600-730pm.](#)

COMMUNICATIONS

Use this section to describe any newsletters, emails, websites, social media, or other communication mechanisms used by the chapter.

EERI-BC does not currently utilize a newsletter format or social media for correspondences with our membership. Communications are made by email complete with links to our website and/or outside sources regarding chapter event details (follow-ups and details pertaining to upcoming events), regional news and other articles of interest.

Moving forward, once the chapter has developed to the point where we have the necessary resources available, we expect to issue these emails more frequently (every two weeks max) and eventually supplements them with a regularly published newsletter.

STUDENT CHAPTER COORDINATION

No reportable significant event had be organized other than regular communications with the University Chapter. It should be noted that there are overlaps in the membership of the EERI-BC Chapter and EERI UBC Chapter.

'The Great BC Shake Out' Drill, October 06, 2016:

EERI-BC participated in the 'the Great BC Shake Out' drill along with hundreds of thousands of British Columbians including school children and practiced how to "Drop, Cover, and Hold On." The goal was to spread the message and bring awareness of potential devastating impact of earthquake, enhance preparedness for such an emergency situation and practice steps to be taken during the earthquake.

ELECTION & ELECTION RESULTS

An election for officers was attempted in 2015, but we were unsuccessful in getting ballots to/from members. However, three directors that had served two-year terms stepped down and nominated executive members started serving on the executive committee in May 2015 – listed and noted as "interim" in the previous executive list. No election held in 2016m; however, EERI-BC is planning to hold its next election in Apr 2017.

2017 GOALS

The following are some of the Chapter goals for the upcoming year:

- Complete a (living) document that outlines existing earthquake scenarios for BC/Canada and accordant gaps that remain to improve public sector risk assessment and risk reduction capacity
- Work with the City of Vancouver, District of North Vancouver, City of Victoria and other partners to develop seismic retrofit policies and incentives (in a way that considers other building-related policies- i.e. heritage, energy retrofit, climate resilience)

- Host a workshop/seminar on developing a Resilience Plan (John, COV?) building off the resilient Washington/Oregon initiatives but taking into account other hazards as well/climate change (EERI would contribute expertise regarding earthquake hazard and risk). Part of this effort is about education re: building codes are about life safety, not performance, and moving towards performance-based design (Strategic Plan items 1 and 2)
- Continue pursuing funding via PDCP or other for the above initiatives and others outlined in strategic plan
- Participate in Lower Mainland microzonation mapping workshop, Held at the GSC Vancouver Office, with representatives from the GSC, Private Sector Consultants, IPREM, and several local governments- March 30 2016.

Membership

The following are targets/goals for membership, and strategies to maintain/grow membership and participation:

- Membership target for 2017 = 125000
- Increase membership by ~50 members
- Strategies to grow/maintain membership, include: making dues payable online and in person at EERI events with the Square, sending out communications to engage members throughout the year (relevant events/publications/notable projects/etc.), using the AGM as an opportunity for a more socially-oriented event, using the results of the online survey to inform future projects and engage members accordingly

Chapter Meetings and Ongoing Activities

Expected events or activities for the upcoming year:

- Host Annual Distinguished Lecturer (2017), in partnership with the student chapter
- Support local governments who are seeking to develop seismic retrofit policies/incentives (COV Council Committee?)
- Produce a quarterly newsletter
- Hold Chapter election
- Maintain new website content and add new events/activities throughout the year
- Confer first Chapter Award- for best seismic retrofit of existing building?

Chapter Initiatives

For the upcoming year, the chapter will continue to coordinate (via its board members) with; the local student chapter (UBC), Oceans Networks Canada, Canadian Institute of Planners/Planning Institute of BC, SEABC, APEG BC, local governments in the province and lobby policy/decision makers (Minister Yamamoto, UBCM/FCM) to increase efforts for earthquake risk reduction.

(see: meetings/ongoing activities/goals for more on our initiatives)

CHAPTER NEEDS AND REQUESTS FOR THE BOARD OR EERI STAFF

- Few of EERI-BC Chapter Officers have financial hardships, who duly pay their Chapter dues, but have requested for an exemption of their EERI central dues. It is noted that EERI by-laws require Chapter Officers have to be members of EERI-BC is still struggling in finding active officers for the Board; it would really help in retaining active Chapter Officers and attracting new Officers in the Chapter Board; as such, it was suggested that affected Board of Directors could be exempted from the EERI by-law requirement. EERI-BC appreciates that exemption request has been accepted. From now on, any affected Board of Director should forward his/her exemption request to EERI-BC, who would forward that to EERI with recommendations. EERI would consider the request as a case by case basis and approve exemption considering financial hardships; however, it would be an exception to by-laws rather than a policy change.
- Beyond our engagement and contact with other regional chapters in close proximity (notably EERI-WA) for some potential collaborative projects, EERI-BC has largely been operating independently from EERI Central to date due to our residence in Canada. Moving forward, closer lines of communication, availability of funding, and more advertised positions being open to Canadian residents would be appreciated to bring us more in line with the resources offered to the other Chapters.

LIST OF ATTACHMENTS

Included at the end of this report are various attachments to supplement the information included above. A list of the attachments is included below:

- Item 1, flier for AGM 1
- Item 2, flier on proposed Seismic Microzonation Map for Metro Vancouver Region
- Item 3, flier on UK-Canada Research Workshop
- Item 4, Strategic Plan



Institute for Catastrophic
Loss Reduction

Building resilient communities

UK-Canada Disaster Research Workshop: Cascading Risk and Uncertainty Assessment of Earthquake Shaking and Tsunami

Organisers:

Katsu Goda (University of Bristol), Solomon Tesfamariam (University of British Columbia), Tony Yang (University of British Columbia), Sheri Molnar (Western University), and Gail Atkinson (Western University)

The main purpose of the UK-Canada Disaster Research workshop is to strengthen existing links with academic/industrial partners and to create new links for future collaboration among people who are interested in multi-hazard impact modelling and assessment of mega earthquakes. The research theme is closely related to the CRUST (Cascading Risk and Uncertainty assessment of earthquake Shaking and Tsunami) project, funded by the UK-EPSRC. The workshop is built upon active research links among the UK and Canadian universities (University of Bristol, University of British Columbia, and Western University). A series of talks and discussion sessions will be held to provide overview of the project outcomes and to present the methodology and findings. Participants contribute to the workshop by giving talks on their research that is related to the theme of the workshop. This will provide the CRUST investigators and partners with opportunities to brainstorm the next step of the development/improvement of the cascading multi-hazards modelling and assessment framework and to collaborate on the research topics.

What is CRUST?

CRUST tackles the global challenge of modelling cascading hazards due to mega-thrust subduction earthquakes by developing a novel methodology for multi-hazards risk assessment from a holistic standpoint. The research objectives of CRUST are: (1) to develop an integrated multi-hazards impact assessment methodology for cascading mainshock-tsunami-aftershocks sequences; (2) to evaluate the impact of uncertain earthquake slips on strong motion and tsunami simulations; (3) to assess the combined effects of mainshock-aftershock earthquakes on structural vulnerability; (4) to characterise tsunami fragility based on numerical simulations; and (5) to develop practice-oriented engineering guidelines and tools for multi-hazards impact assessment. The ultimate goal of the CRUST is to create vibrant industry and academic communities for multi-hazards impact modelling and assessment.

Venue:

Listel Hotel (<http://www.thelistelhotel.com/>), 1300 Robson Street, Vancouver, V6E 1C5

Date:

15 September 2016, Thursday

Participants:

	Name	Affiliation	E-mail	Dinner reception
1	Dr Katsu Goda	University of Bristol	katsu.goda@bristol.ac.uk	Yes
2	Mr Lihong Zhang	University of Bristol	lz0560@bristol.ac.uk	Yes
3	Dr Solomon Tesfamariam	University of British Columbia	Solomon.Tesfamariam@ubc.ca	Yes
4	Dr Tony Yang	University of British Columbia	yang@civil.ubc.ca	Yes
5	Prof Carlos Ventura	University of British Columbia	ventura@civil.ubc.ca	Yes
6	Prof Gail Atkinson	Western University	Gmatkinson@aol.com	Yes
7	Prof Han-Ping Hong	Western University	hongh@eng.uwo.ca	Yes
8	Dr Sheri Molnar	Western University	smolnar8@uwo.ca	Yes
9	Dr Hadi Ghofrani	Western University	ghofrani_hadi@yahoo.com	Yes
10	Prof John Clague	Simon Fraser University	jclague@sfu.ca	Yes
11	Prof Ioan Nistor	University of Ottawa	inistor@uottawa.ca	Yes
12	Dr Lucinda Leonard	University of Victoria	lleonard@uvic.ca	No
13	Dr Tania Lado Insua	Ocean Networks Canada/ University of Victoria	tinsua@uvic.ca	Yes
14	Dr Kelin Wang	Geological Survey of Canada	Kelin.Wang@canada.ca	No
15	Dr Nicky Hastings	NRCAN	Nicky.Hastings@canada.ca	Yes
16	Dr Murray Journeay	NRCAN	murray.journeay@canada.ca	Yes
17	Dr Tuna Onur	Onur Seemann Consulting	tuna@onurseemann.com	Yes
18	Mr Steven Bibby	BC Housing	sbibby@bchousing.org	Yes
19	Mr Ian Foss	Capital Regional District	ifoss@crd.bc.ca	Yes
20	Dr Daniel Stevens	Vancouver Emergency Management	daniel.stevens@vancouver.ca	???
21	Mr Robert White	BC Emergency Management	Robert.White@gov.bc.ca	No
22	Dr Kofi Addo	BCHydro	Kofi.Addo@bchydro.com	Yes
23	Dr Mujib Rahman	FortisBC	Mujib.Rahman@fortisbc.com	Yes
24	Dr Glenn McGillivray	Institute for Catastrophic Loss Reduction	gmcgillivray@iclr.org	Yes
25	Dr Martin Heesemann	Ocean Networks Canada	mheesema@uvic.ca	Yes
26	Mr Carlos Salas	Geoscience BC	salas@geosciencebc.com	No
27	Ms Alison Bird	Geological Survey of Canada	alison.bird@canada.ca	Yes
28	Ms Jessica Shoubridge	EERI-BC Regional Chapter	jessicashoubridge@gmail.com	Yes
22	Dr Martin Lawrence	BCHydro	Martin.Lawrence@BCHydro.com	No
30	Dr Steven Kuan	FPIInnovation	Steven.Kuan@fpinnovations.ca	???

cc: Tracy Waddington twaddington@pacicc.ca and Paul Kovacs pkovacs@pacicc.ca (Institute for Catastrophic Loss Reduction)

Schedule:

Session 1: 9:00-10:00 – CRUST

- 9:00-9:10 Introduction (Goda)
9:10-9:35 Goda (Bristol) – ‘Developing an earthquake-tsunami hazard-risk assessment framework for mega-thrust subduction earthquakes’
9:35-10:00 Tesfamariam (UBC) – ‘Simplified loss estimation using Markov chain: case study for non-ductile RC buildings in Victoria, BC, Canada’

Coffee: 10:00-10:30

Session 2: 10:30-12:10 – Earthquake Hazard in Canada

- 10:30-10:50 Wang (NRCan) – ‘Knowledge and knowledge gap regarding current locking state of the Cascadia megathrust’
10:50-11:10 Clague (Simon Fraser) – ‘???’
11:10-11:30 Ghofrani (Western) – ‘Simulation of ground motions in Victoria and Vancouver for Cascadia mega-thrust events’
11:30-11:50 Molnar (Western) – ‘Amplification of ground motions in the Fraser Delta’
11:50-12:10 Zhang (Bristol) – ‘???’

Lunch: 12:10-13:20 [Lunch is generously provided by the Institute for Catastrophic Loss Reduction](#)



Session 3: 13:20-15:20 – Earthquake Risk in Canada

- 13:20-13:40 Ventura (UBC) – ‘???’
13:40-14:00 Yang (UBC) – ‘Seismic performance evaluation of tall buildings in Vancouver’
14:00-14:20 Hong (Western) – ‘Framework for estimating seismic loss of a portfolio of buildings under bidirectional horizontal ground motions due to scenario events’
14:20-14:40 Onur (Onur Seemann Consulting) – ‘???’
14:40-15:00 Journey / Hasting (NRCan) – ‘An integrated assessment of earthquake risk in British Columbia’

Coffee: 15:00-15:30

Session 4: 15:30-17:10 – Tsunamis in Canada & Emergency Response

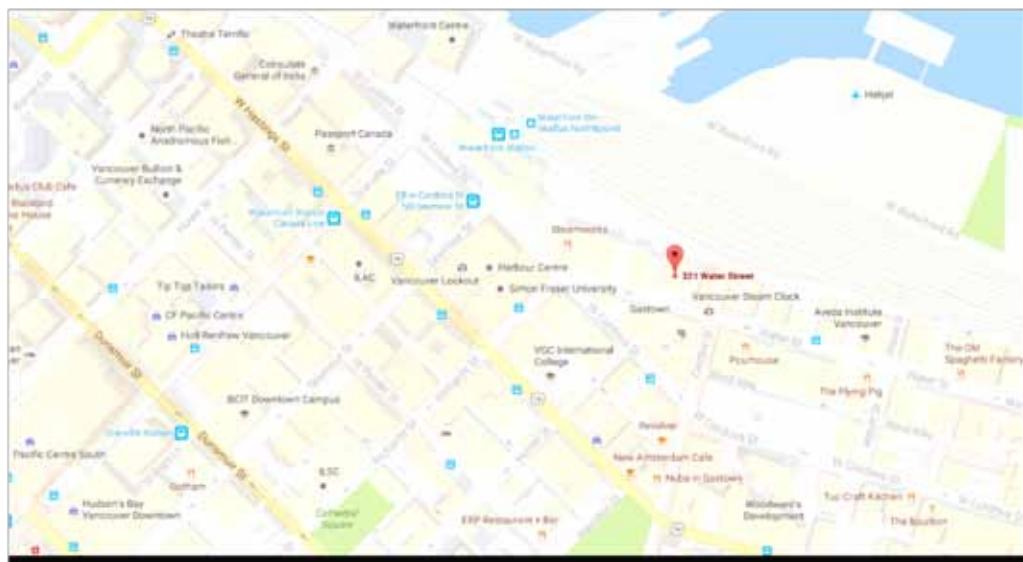
- 15:30-16:50 Leonard (Victoria) – ‘A preliminary probabilistic assessment of tsunami hazard on the Pacific coast of Canada’
15:50-16:10 Insua (Ocean Networks Canada) – ‘The Ocean Networks Canada Tsunami Project: Updates and recent models’
16:10-16:30 Nistor (Ottawa) – ‘Tsunami design standards – a brief overview and needs for Canada’
16:30-16:50 Heesemann (Ocean Networks Canada) – ‘Offshore monitoring of the Cascadia Subduction zone’
16:50-17:10 White (BC Emergency Management) – ‘Catastrophic earthquake preparedness in British Columbia’

Closing: 17:10-17:30

Dinner reception: 18:30-21:00 (no fee)

Al Porto Ristorante

321 Water Street, Vancouver V6B 1B8; P: 604.683.8376
www.alporto.ca





EARTHQUAKE ENGINEERING RESEARCH INSTITUTE BRITISH COLUMBIA CHAPTER

855 Homer Street, Vancouver, BC, Canada V6B 2W2
email: info@bc.eeri.org | website: bc.eeri.org

2016 Annual General Meeting and Social

We are kicking off our 2016 programme with an AGM and social in downtown Vancouver.

Date: Wednesday, April 27th

Time: 5 pm to 8 pm (AGM and presentations at 6 pm)

Venue: Steamworks Wine Room—[375 Water Street, Vancouver](#)

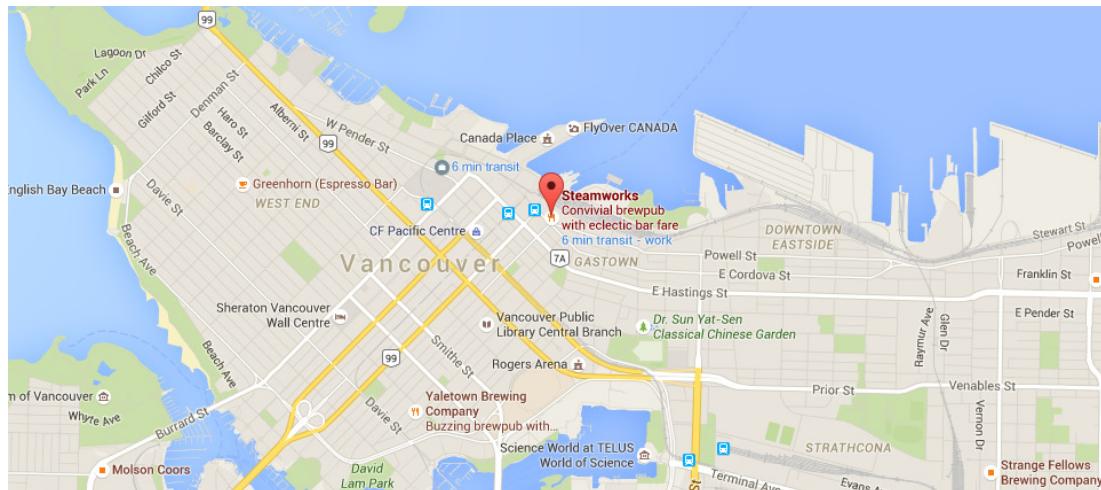
Cost: Admission and appetizers are free

RSVP: membership@eeri.bc.org

EERI-BC volunteers will be presenting updates on the advocacy work completed in the past year, including:

- EERI Housner Fellows' reconnaissance trip Nepal
- Metro Vancouver Seismic Hazard Mapping Initiative

Drop by after work to grab a bite, have a drink and network with colleagues and friends. See you there!



Consider an EERI membership! Visit bc.eeri.org

EERI BC Chapter Strategic Plan 2015-2017

The mission of the Earthquake Engineering Research Institute (EERI) British Columbia Regional Chapter (hereafter referred to as EERI-BC) is dedicated to reducing the earthquake risk in British Columbia, by advancing the science and practice of earthquake engineering; by improving understanding of the impact of earthquakes on the physical, social, economic, political and cultural environment; and by advocating comprehensive and realistic measures for reducing the harmful effects of earthquakes.

The broad-scale scope of the EERI-BC strategic plan (2015-2017) is to focus on goals related to planning and mitigation, and not to focus on goals related to response and recovery, as these latter goals have currently achieved greater advancement.

Following is a list of **Goals** (with specific objectives [projects, steps, etc.] to accomplish goals). **Proposed Actions** are defined activities or projects in the strategic plan work program that implement objectives and are used to support the accomplishment of a goal and the overall mission. They are linked to specific resources and will be assigned to a sub-committee for implementation.

If you are interested in any listed goals and/or proposed actions (e.g., heading a sub-committee), or want to propose a specific goal and/or proposed action, please contact info@bc.eeri.org.

Goal 1: Regional Earthquake-Scenario Loss Modelling

- § **Objective 1.1:** Building on/Peer reviewing/Database of existing earthquake scenarios & loss modelling from various disciplines, public & private for Metro Van, the CRD & Victoria
 - Owners: Emergency Management, Utilities, Insurance (IBC, AER), EMBC
 - **Proposed Actions:**
 - § Validation of scenarios
 - § Fragility curves specific for BC structures
 - T. Onur's thesis contained 31 proto-types based on expert opinion
- § **Objective 1.2:** Data Asset Inventories (Buildings and hazard maps, i.e., soils/ V_{S30} /amplification, liquefaction, slope stability): Issue is a variety of public and private inventories exist of different stages of development/completion at different resolution scales for local urban areas (municipalities/districts), but has never been all assembled into a comprehensive picture of regional risk & maintained together for free use.
 - **Proposed Actions:**
 - § EERI BC to work (with EMBC?) on amalgamating what is currently freely available
 - § Will privately owned datasets be freely provided for regional hazard purposes?
 - § Who manages the datasets?
 - § How do municipalities include/pay for mapping as part of land planning?
 - § Website (e.g. ABAG Earthquake Hazards Program) or warehouse for data inventories? Lower Mainland local government association (LMLGA); Union of BC municipalities (UBCM).

§ Further development of hazard maps and building inventories?

Goal 2: Education

- § Distribute EERI newsletters to BC Chapter members
- § **Objective 2.1:** Building Code is a minimum standard
 - Highlighting why the building code is not adequate for building resilient communities in an area of active deformation (*scale, *statistical probabilities, *life safety vs. functionality)
- § **Objective 2.2:** Performance Based Engineering (PBD)
 - **Proposed Actions:**
 - § Develop/maintain inventory of PBD designs & approaches to showcase innovations (e.g., combining incentives for heritage/energy/seismic repairs for older buildings in Victoria)
 - § Showcasing how San Francisco is using PBD for all new city facilities and how developers are even just doing it, going above and beyond the minimum code standards
- § **Objective 2.3:** Seismic Triggers
 - **Proposed Actions:**
 - § Commentary L of NBCC [U.S. – Chapter 34 of IBC]
 - § UBC study determined only Vancouver & Victoria have seismic triggers (Vic follows Van), Richmond does not have
 - § Triggers: construction costs (Vancouver uses x% of assessed cost), change in occupancy, change in operations, alterations, repair.
 - § Develop an energy/green retrofit trigger?
 - § Most US cities have added URM clauses (e.g., Seattle has tried to pass URM ordinances twice, unsuccessful)
- § **Objective 2.4:** Retrofits
 - **Proposed Actions:**
 - § Promote CSA retrofit standards
 - § Target audience?: general public, municipalities, 'building continuity', construction companies
 - § A piece on retrofit approaches for the main types of buildings (concrete, URM, single family wood frame, etc.) and associated ballpark costs
 - § Educate that San Fran has mandatory ordinances regarding URM soft-storey, Los Angeles is focused on non-ductile concrete
 - § Working to champion the merging of energy retrofit with seismic retrofit (i.e., working with groups such as the Int. Living Future Institute to showcase how this can be done in a cost effective manner)
- § **Objective 2.5:** Seismic Mitigation Accomplishments
 - **Proposed Actions:**

- § Highlight what is being accomplished in BC, e.g., by FortisBC, BC Hydro, school retrofits, etc.
 - § Organize an event/seminar/workshop to showcase current mitigation work & share current mitigation work
-

Goal 3: Business Continuity/Land Planning

- **Objective 3.1:** Database of structural engineers for voluntary post-earthquake rapid damage assessments
 - o Action item requested by EMBC
 - o SEABC/Disaster Response Committee generating self-reporting ballot of volunteer structural engineers in BC – will be held by APEGBC.
 - o **Proposed Actions:**
 - § Extend to other municipalities other than Vancouver?
 - § Extend to Pacific Northwest? EERI BC to connect with EERI Washington, Oregon, and California Chapters to see if each state already has a list of structural engineers? What do their lists contain? Will they amalgamate with BC?
 - § EERI-BC holds list? Compiles a list of organizations with lists? List of ATC-20 trained persons in BC?
- **Objective 3.2:** Foster interaction of EERI-BC with:
 - o Union of BC municipalities (UBCM), Lower Mainland Local Government Association (LMLGA), EPICC, EPBC, UBC SCARP, Planning Institute of BC (PIBC)
 - o **Proposed Actions:**
 - § Bridge between efforts (by city, EMBC, etc.) & end-users (businesses) to develop overall continuity plan
 - § Organize event around visit of 2015 Distinguished Lecturer, Dr. Robert Olshansky

Appendix: Summary of EERI Regional Chapter Projects

Northern California:

- Oakland code developments: spoke at city meetings, interacted with architects – basically informed building officials on their legislation
- "Adopt a city": Albany California (1 mi^2), performed inventory, volunteer HAZUS run (several year project)

Southern California:

- Updated earthquake scenario; San Diego/Tijuana (funded by FEMA)
- 1-day online short course
- Joint meetings with Structural Engineers (Jan), Civil Engineers (Feb), lecturer (Mar)...
- Lucy Jones (USGS) is seismic expert to the Los Angeles mayor

Utah:

- Short course on liquefaction
- FEMA funded earthquake scenario for Utah; previous scenario did not engage public, hired creative writer
 - § Town Hall Meeting open to public: "Utah Earthquakes and You"
- "Meet the Mentors Roundtable" with Youd & Arabasz who shared their knowledge of earthquake engineering, seismology, risk reduction, purpose to interact with student chapter

New Madrid:

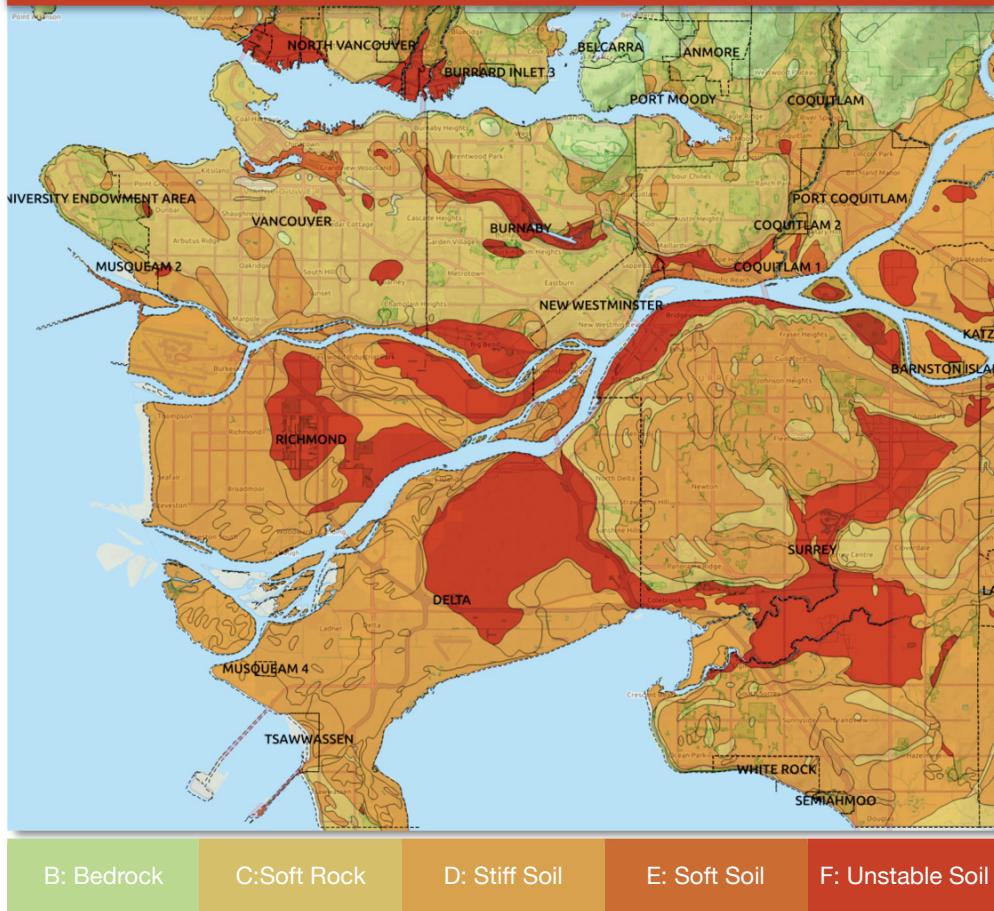
- New Madrid Earthquake Scenarios (NMES) created by executive committee; scenario locations from Chris Cramer at University of Memphis; HAZUS loss estimation performed; web-based document
- "Map your Neighbour" (MYN) Program, outreach event of NMES; for neighbours to assist each other for any type of disaster response; 9-step Neighbours Disaster Response Form
- Missouri Mass Care Committee (MSSC) volunteer-based procedure for building inventory; purpose is to compare with HAZUS default data for census tracts

A Proposed Seismic Microzonation Study for Metro Vancouver



Surficial Geology Shaking Hazards Liquefaction Hazards Landslide Hazards

A Generalized Site Classification Map for Assessing Amplification and Ground Deformation Hazards in the Metro Vancouver Region



Although we cannot predict earthquakes, we can work together to identify those areas most likely to sustain damages from intense shaking and related ground deformation hazards.

Invitation: Geotechnical information collected in support of urban development projects and site response data analyzed from recent earthquakes in the Georgia Basin have the potential to transform our knowledge and understanding of how seismic hazards vary spatially, and to dramatically improve our ability to assess the future impacts of destructive earthquakes in the region. Please join us for a workshop session on March 29th, 2016 to explore how this information might be used in conjunction with regional basin modelling to refine seismic hazard assessments for Metro Vancouver, and the benefits of investing in a regional seismic microzonation study for mitigation planning, emergency planning and land use decision making. The workshop will be co-hosted by the Geological Survey of Canada, The Earthquake Engineering Research Institute and seismic hazard experts from private and academic sectors.

When: Tuesday, March 29th, 2016 (1:00 - 4:00pm)

Where: Geological Survey of Canada Office: Suite 1500-605 Robson St, Vancouver, BC

On Shaky Ground: Southwestern British Columbia is one of the most seismically active regions in Canada. A large magnitude earthquake in the Metro Vancouver area has the potential to cause significant damage and loss through a combination of shaking, permanent ground deformation and other related seismic hazards. Ground shaking hazards vary as a function of distance away from the earthquake epicentre, and the extent to which seismic waves are modified by subsurface basin structure and overlying surficial deposits that can either amplify or dampen the intensity of ground shaking at any given location of the earth's surface. Intense shaking from an earthquake can also cause a range of related ground deformation hazards including liquefaction of water-saturated soils and seismically induced landslides along steep unstable slopes — both of which have the potential to cause additional damage to buildings and linear infrastructure.

Rationale: Insights gained from recent earthquakes in New Zealand, Japan, China and South America demonstrate that knowledge about the spatial variability of seismic hazards can have a profound influence on our ability to anticipate and plan for the likely impacts of a destructive earthquake event. The likelihood of experiencing a MMI VII earthquake in the Metro Vancouver is estimated to be ~14% in the next 50 years. Yet, we know very little about the spatial variability of seismic hazards at a scale that is required for effective risk-reduction planning at the municipal level.

The primary aim of this study is to compile and interpret available geological, geophysical and geotechnical information from across the Metro Vancouver region to identify those areas exposed to site amplification, liquefaction and earthquake-triggered landslide hazards. The intended outcome is a folio of detailed seismic microzonation maps, similar to those developed for the city of Seattle, that can be used to refine quantitative assessments of earthquake risk at the neighbourhood level. We are seeking financial support through a public-private consortia whereby project partners pool available resources to increase available knowledge about seismic hazards, thereby increasing our collective ability to model earthquake risks at a scale that is relevant for emergency planning and land use decision making at the municipal level in Metro Vancouver.

Draft Agenda

- 1:00-1:15 pm: Overview - *Murray Journeay*
- 1:15-1:45 pm: A profile of regional seismic hazards for Metro Vancouver (*John Cassidy*)
- 1:45-2:15 pm: Spatial variability of seismic hazards and risk at the community level - *Tuna Onur*
- 2:15-2:45 pm: Toward a seismic microzonation for Metro Vancouver - *Pat Monahan*
- 2:45-3:00 pm: Break
- 3:00-3:20 pm: Increasing capabilities for earthquake risk reduction - *Tuna Onur & Murray Journeay*
- 3:20-3:50 pm: Roundtable discussion
- 3:50-4:00 pm: Next steps and closing remarks

Project Team: The proposed seismic microzonation study brings together hazard experts from public-private and academic sector organizations who share a mission to increase our capacities for earthquake risk reduction in the public domain. The project will be led by Tuna Onur (Onur-Seeman Consulting) and Pat Monahan (Monahan Consulting) in collaboration with private sector consultants (Kourosh Hadavi & Victor Levson), and researchers from the Geological Survey of Canada who will be working with academic partners from the University of British Columbia (Carlos Ventura), Simon Fraser University (John Clague) and Western University (Sheri Molnar).