

House Transportation Committee
 May 24, 2010

Seismic Transportation Reliability

**Oregon Seismic Safety
 Policy Advisory Commission (OSSPAC)**
 Yumei Wang, PE



About OSSPAC
 = **earthquake commission** (ORS 401.915)

- (1) The mission ... reduce exposure to earthquake hazards
- (2) Shall utilize & influence existing agencies & institutions in meeting its goals. Emphasis shall be on coordination & linking of existing resources & authorities.
- (3) To improve public understanding of earthquake hazards, reduce such hazards and mitigate the possible effects of potentially damaging earthquakes, the commission shall review & advise the Governor & the Legislative Assembly concerning all plans & proposals addressing seismic hazards

About OSSPAC

(3) To improve public understanding of earthquake hazards, reduce such hazards and mitigate the possible effects of potentially damaging earthquakes, the commission shall review and advise the Governor and the Legislative Assembly concerning all plans and proposals addressing seismic hazards in the areas of:

- (a) Any legislative proposals
- (b) Plans & proposals of statewide impact
- (c) Lists of recommendations for actions & potential rule changes specifically by state agency.

OSSPAC membership

Deborah Boone, Representative HD 32, Oregon Legislature
James Doane (stakeholder: utilities), Civil Engineer, Past Chair
Susan Steward, Building Owners & Managers Association, committee Chair
Mark Tyler, Oregon Dept. of Education, committee Chair
Yumei Wang, DOGAMI, past Chair

CHAIR: Gerry Williams (public member), Construction Research, Inc.
 VICE CHAIR: Carl Farrington (stakeholder: multi-family housing)
 Greg Ek-Collins (state agency: transportation), Emergency Manager
 Fred Girod (legislative assembly), Senator, Oregon State Legislature
 David Holton (stakeholder: American Red Cross)
 Gary Milliman (local government), City Manager, City of Brookings, committee Chair
 Michael Mumaw (public member), City of Beaverton Emergency Manager
 Althea Rizzo (state agency: emergency management), Oregon Emergency Management
 Richard Rogers, (state agency: building codes)
 Autumn Rudisel (stakeholder: banking), Umpqua Bank
 Chris Shirley (state agency), Oregon Dept Land Conservation & Development
 Jay Wilson (public member), Hazard Mitigation Coordinator
 Kent Yu (stakeholder: structural engineer), Degenkolb Engineers

**Highlights from
 2009 ODOT Seismic Bridge Report**

- ODOT bridges will likely impair transportation mobility in Cascadia earthquake
 - along Highway 101
 - between coast & valley
 - sections of Interstate 5
- >\$1 billion of damage
- Current pace ≥ 200 yrs to strengthen 900-some seismically vulnerable priority bridges

**OSSPAC View on
 ODOT Seismic Bridge Report**

- OSSPAC commends ODOT's engineering studies and other ongoing earthquake preparedness efforts
- OSSPAC is highly concerned about reliability of transportation system after a Cascadia earthquake
- State action is needed

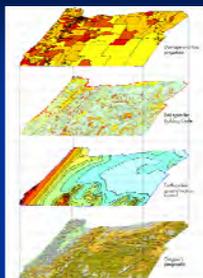
Cascadia earthquake is Oregon's most likely widespread disaster

OSSPAC *Draft* policy on Seismic Transportation Reliability

- 1) *new Seismic Transportation Reliability Plan*
- 2) *new Seismic Transportation Reliability Program*

- Draft policy agreed on by OSSPAC leadership
- Commission vote on 5/26/10
- Policy goal is a legislative concept for Legislature to improve Seismic Transportation Reliability

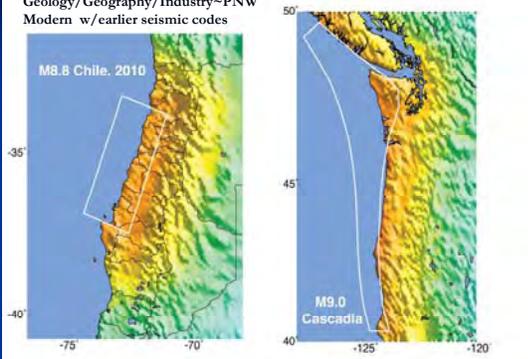
Cascadia Earthquakes



Predictive models: >5,000 fatalities
>\$30 B direct damage
>35,000 buildings red tags/closed
Damage: tsunami, poor soils, weak infrastructure

Chile M8.8 vs Cascadia M9 Analog

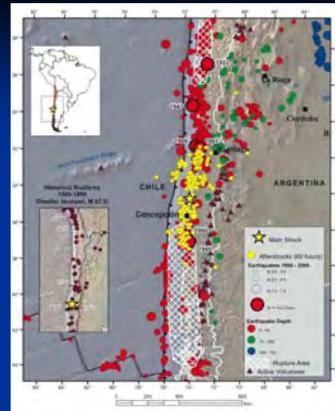
Geology/Geography/Industry~PNW
Modern w/earlier seismic codes



Chile M8.8

EQ Statistics
Lower low tide
Summer: dry
~500 deaths

Damage ("good")
~370,000 homes
~400 schools
~79 hospitals
~300 bridges



Transportation Damage in Chile *Future Damage in Oregon*

1. Coastal Areas Hit by Tsunami
-Flooded bridges & highways
2. Areas with "Poor" Soils
-Bridges w/liquefaction
3. Weak Transportation Infrastructure
-Bridges w/ poor connections (skews, short bearings, etc)

1. Tsunami



1. Tsunami
Bridge



1. Tsunami



1. Tsunami



1. Tsunami



1. Tsunami: Coastal Town Dichato
~70% homes destroyed shaking & flooding (17 dead)



1. Tsunamis



2. Poor Soils- Transportation



Tubul bridge

2. Poor Soils, Approaches



road lat spread
ministry photo

2. Poor Soils, Abutments



2. Poor Soils, Bridge



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2. Poor Soils, bridges (parallel bridges)



2. Poor Soils, Temporary bridges



2. Poor Soils
Pedestrian
Suspension
Bridge



2. Poor Soils, Lateral Spreads



2. Poor Soils



2. Poor Soils



2. Poor Soils



2. Poor Soils
Navy Dock



2. Poor Soils



2. Poor Soils, Oil Refinery (Closed)



2. Poor Soils, Energy Sector



3. Weak Transportation Infrastructure

Bridge Performance

- Foundation failures
- Substructures
- Superstructures

Chile's bridges: poor connections

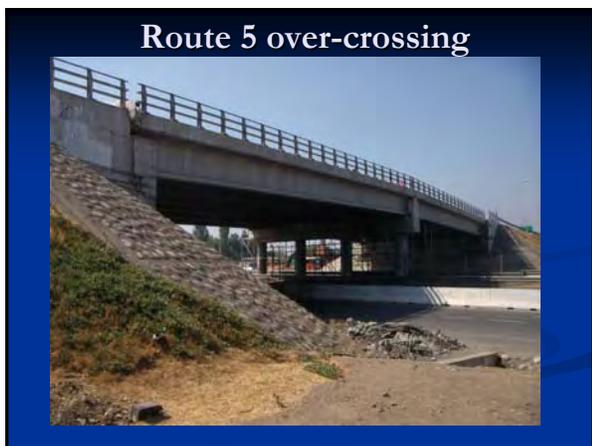


3. Weak Infrastructure



3. Weak Infrastructure





3. Weak Infrastructure: Santiago Airport



Santiago Airport control tower damage of the four anchor points of the cab structure

3. Weak Infrastructure: Santiago Airport



3. Weak Infrastructure: Railways



Co-location & Inter-dependencies



Route 5 new bridge failed



Take Home Lessons for Oregon's Transportation Sector

1. Coastal Areas Hit by Tsunami
 - ✓ Improve Safety in Tsunami Prone Areas
2. Areas with "Poor" Soils
 - ✓ Critical/Emergency Routes on Poor Soils
3. Weak Transportation Infrastructure
 - ✓ Prioritize & Fix using risk management

Recommendation #1: Improve Safety in Tsunami Prone Areas Bridges in Tsunami Zones 1964 Cannon Beach



Recommendation #2: Prioritize & Mitigate Infrastructure on Poor Soils

Oregon's fuel supply on poor soils



Recommendation #2: Prioritize & Mitigate Infrastructure on Poor Soils

Fuel Oil Terminals



Vulnerable Piers
Facilities

Recommendation #2: Prioritize & Mitigate Infrastructure on Poor Soils

Electrical Transmission

BPA
estimates
up to 25 Ft
movement
towards river



Recommendation #3: Fix Weak Infrastructure

Vulnerable Bridges



FACTS

- Cascadia earthquakes
- Vulnerable bridges & transportation system
- Mobility is important in disasters
- Transportation has interdependencies
 - Multimodal transportation
 - Economy & standard of living

What is a solution to improve resilience?

OSSPAC's Draft 2010 Legislative Concepts

New Seismic Transportation Reliability Plan

- Leverage ODOT's existing data & programs
- Identify emergency seismic routes (both state & local)
- Cascadia earthquakes' multi-hazards (landslides, tsunamis)
- Holistic approach (impact to critical infrastructure)
- Co-location & resiliency (water mains, redundant routes)
- Prioritize using cost-effective, risk-based management

New Seismic Transportation Reliability Program

- Provides funding to ODOT to implement Plan
- Public task force to oversee Plan implementation