



Making a Seismic Shift: Moving from Risk to Reward

Lane Preparedness Coalition Presentation
with funding from the
City of Eugene Emergency Management Program
Eugene – February 10, 2016

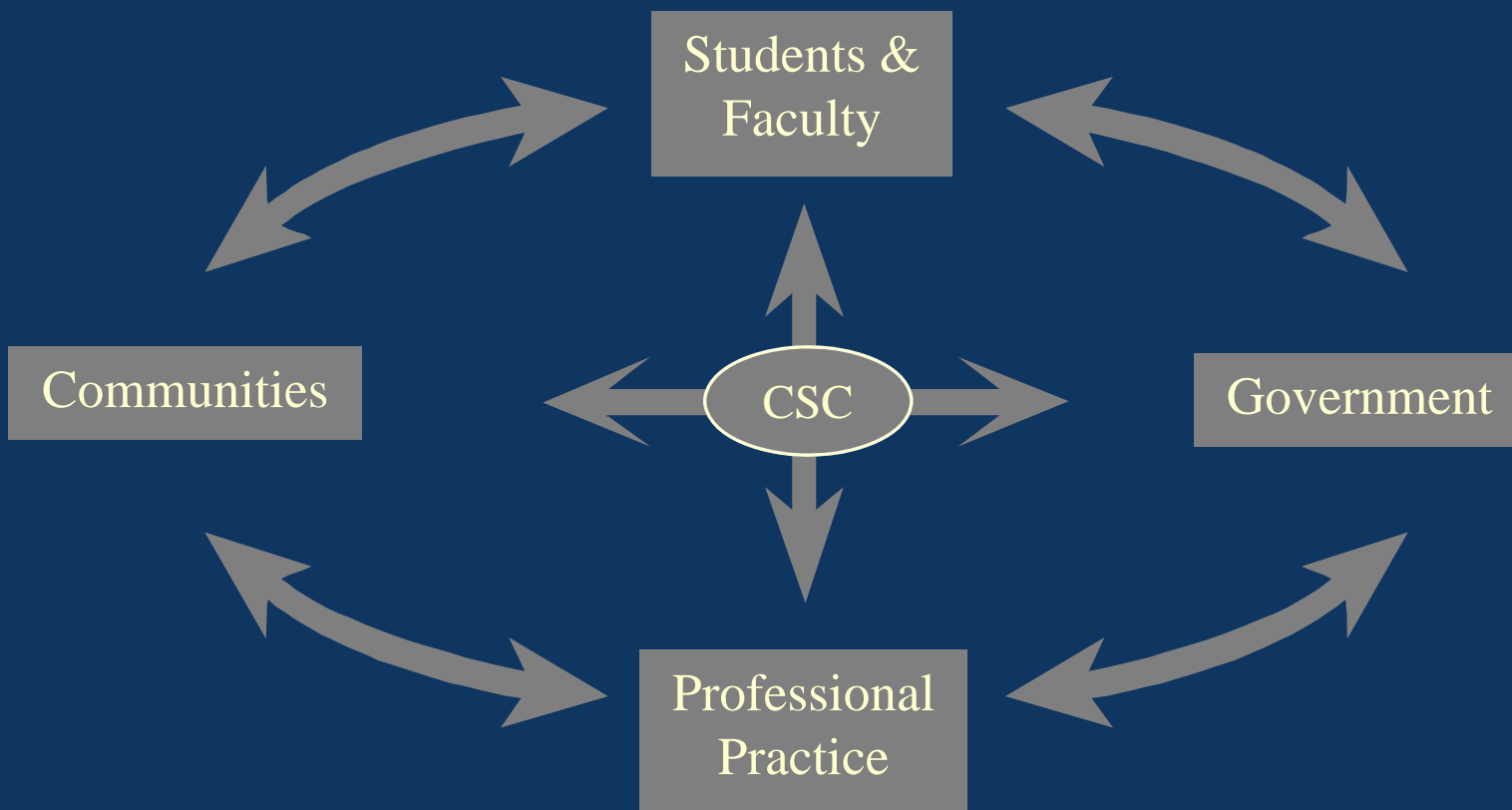


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The **CSC** is an interdisciplinary organization that creates learning opportunities for students by providing planning and technical services to Oregon Communities



THE CLASSROOM AND THE COMMUNITY

- ◆ The classroom provides a foundation for community-based learning
 - ◆ Analytical skills
 - ◆ Theory, history



The *community* provides the framework and motivation for learning

- Real problems
- Real people

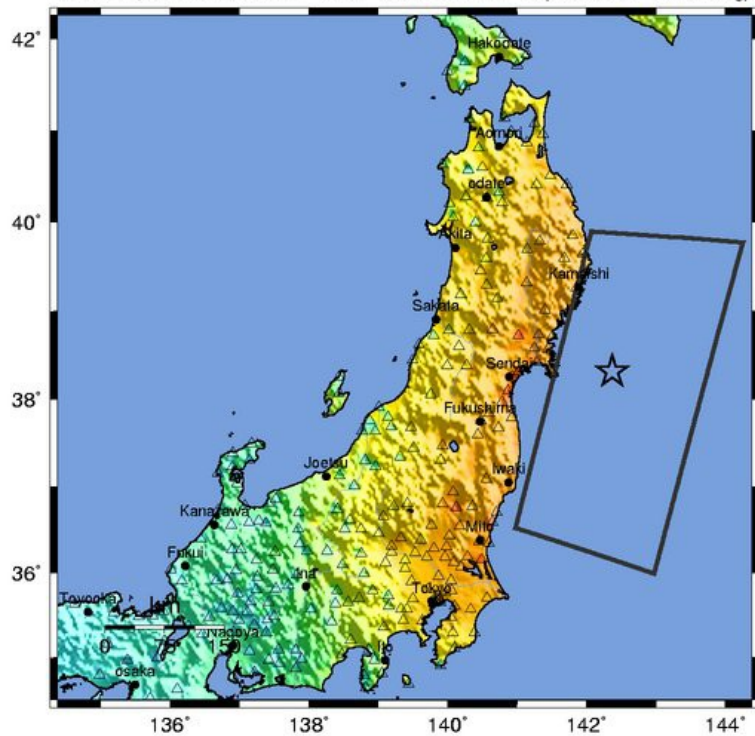
CSC Focus Areas:

- ◆ Natural Resources
- ◆ Social Planning
- ◆ Community and Economic Development
- ◆ Energy
- ◆ Food Systems
- ◆ Housing
- ◆ Transportation
- ◆ Parks & Recreation Planning
- ◆ Natural Hazards and Community Resilience

Magnitude 9.0 Paradigm Shift

Can we learn from other similar events or do we have to learn the hard way?

USGS ShakeMap : NEAR THE EAST COAST OF HONSHU, JAPAN
 Fri Mar 11, 2011 05:46:23 GMT M 9.0 N38.32 E142.37 Depth: 32.0km ID:c0001xgp

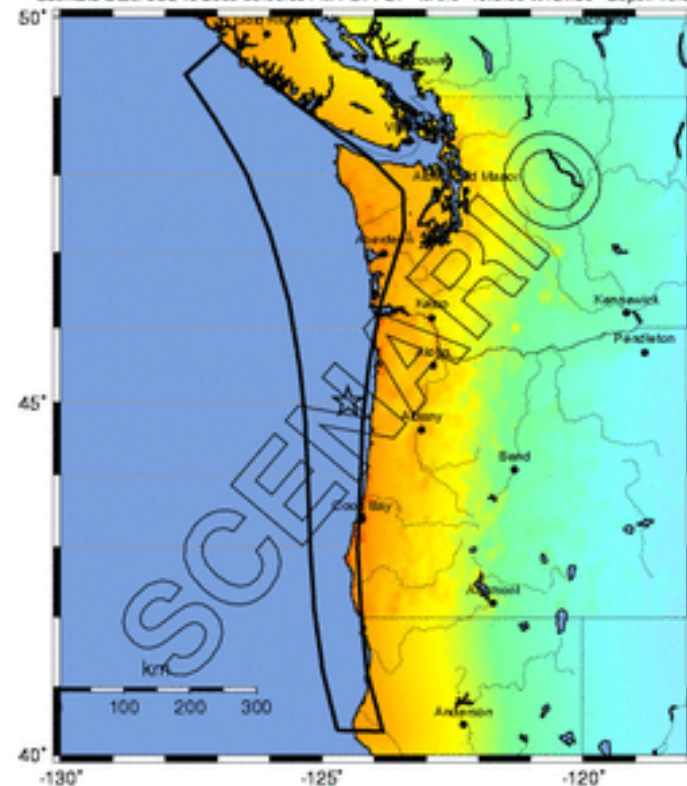


Map Version 7 Processed Wed Mar 16, 2011 11:19:52 AM MDT - NOT REVIEWED BY HUMAN

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

-- Earthquake Planning Scenario --
 ShakeMap for Casc9.0 Scenario

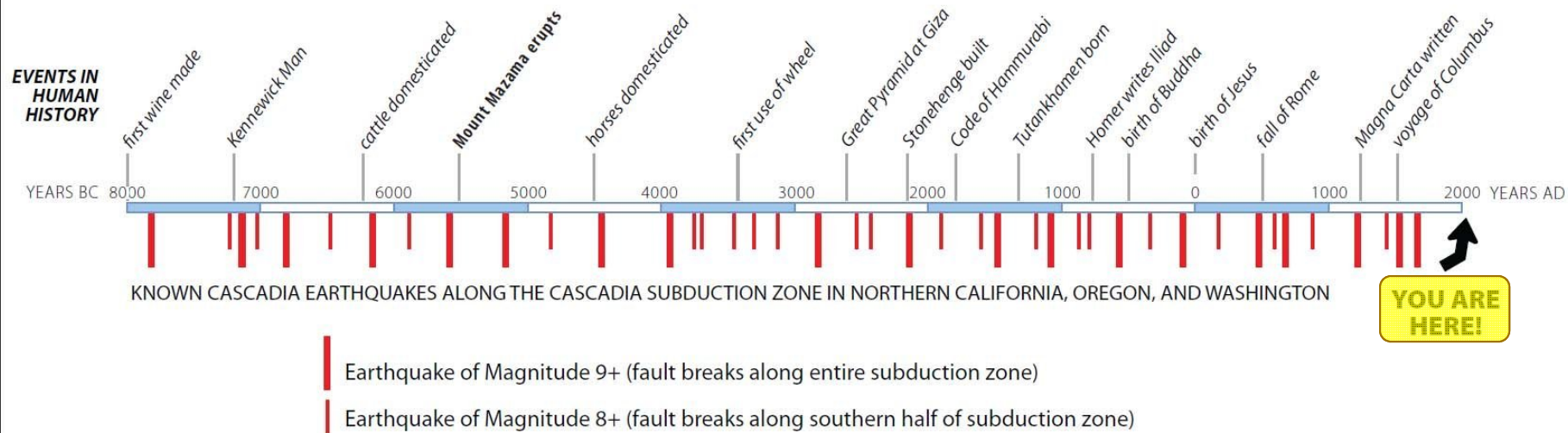
Scenario Date: JUL 16 2009 09:00:00 PM PST PST M 9.0 N45.00 W124.50 Depth: 10.0km



PLANNING SCENARIO ONLY - Map Version 2 Processed Thu Jul 23, 2009 10:30:35 AM MDT

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
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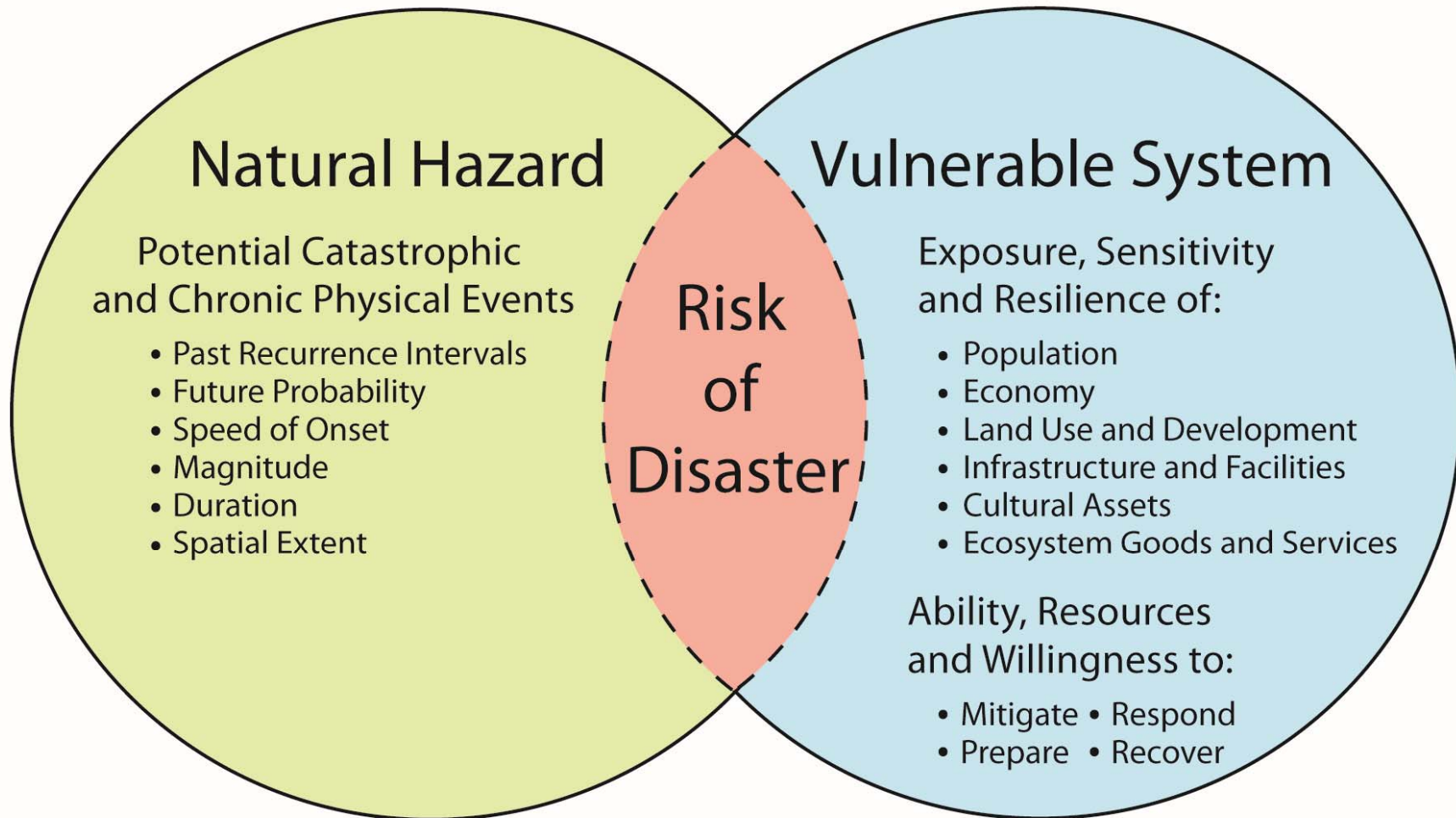
CASCADIA EARTHQUAKE TIME LINE



Comparison of the history of subduction zone earthquakes along the Cascadia Subduction Zone in northern California, Oregon, and Washington, with events from human history. Ages of earthquakes are derived from study and dating of submarine landslides triggered by the earthquakes. Earthquake data provided by Chris Goldfinger, Oregon State University; time line by Ian P. Madin, DOGAMI.

Two Key Messages - Cascadia:

- ◆ Think short-term (tomorrow) AND long-term (50 yrs)
 - ◆ Tomorrow = Organizational Preparedness
 - ◆ 50 Years = Community Resilience
- ◆ Know what's possible; focus on what you CAN do
 - ◆ Improving resilience = Opportunity
 - ◆ Educate yourself
 - ◆ Prepare a disaster kit
 - ◆ Lobby for policy changes
 - ◆ Help shape investment priorities



Current Resilience Gap

Business can only tolerate two to four weeks of disruption of essential services

Critical Service	Zone	Estimated Time to Restore Service
Electricity	Valley	1 to 3 months
Electricity	Coast	3 to 6 months
Police and fire stations	Valley	2 to 4 months
Drinking water and sewer	Valley	1 month to 1 year
Drinking water and sewer	Coast	1 to 3 years
Top-priority highways (partial restoration)	Valley	6 to 12 months
Healthcare facilities	Valley	18 months
Healthcare facilities	Coast	3 years

Physical Changes during CSZ Earthquake

Ground shaking central.com



Liquefaction



Subsidence



Landslides



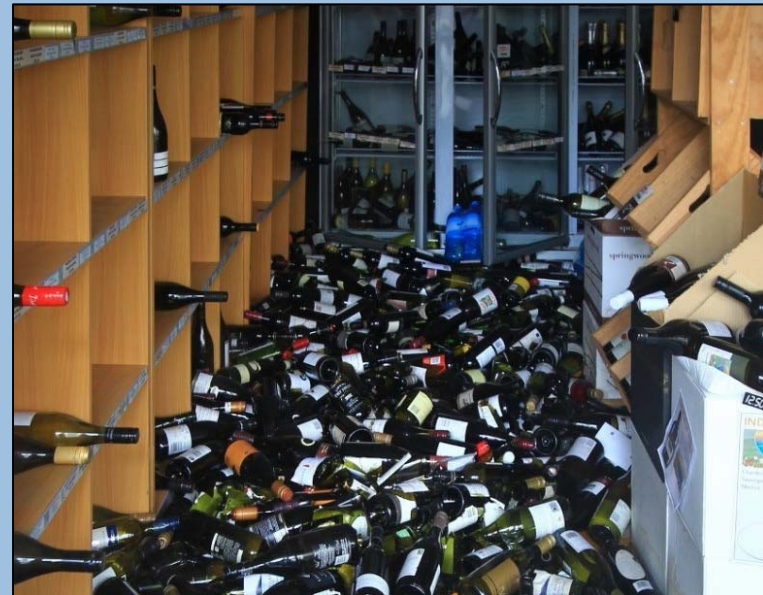
Building Impacts

<http://japanpropertycentral.com>



Photo Source: CERA, Ross Becker

Source: University of Washington International Earthquake Clearinghouse



Impacts to Transportation Networks

- 19 bridges on Oregon's Interstate 5 heavily damaged
- 56 of 135 bridges on U.S. Hwy 101 in Oregon collapse
- Disrupted rail service due to bridge damage (Portland, Olympia, Seattle)



Photo by G.W. Thorsen, Washington Division of Geology and Earth Resources.

Ports, Shipping Channels, and Airports

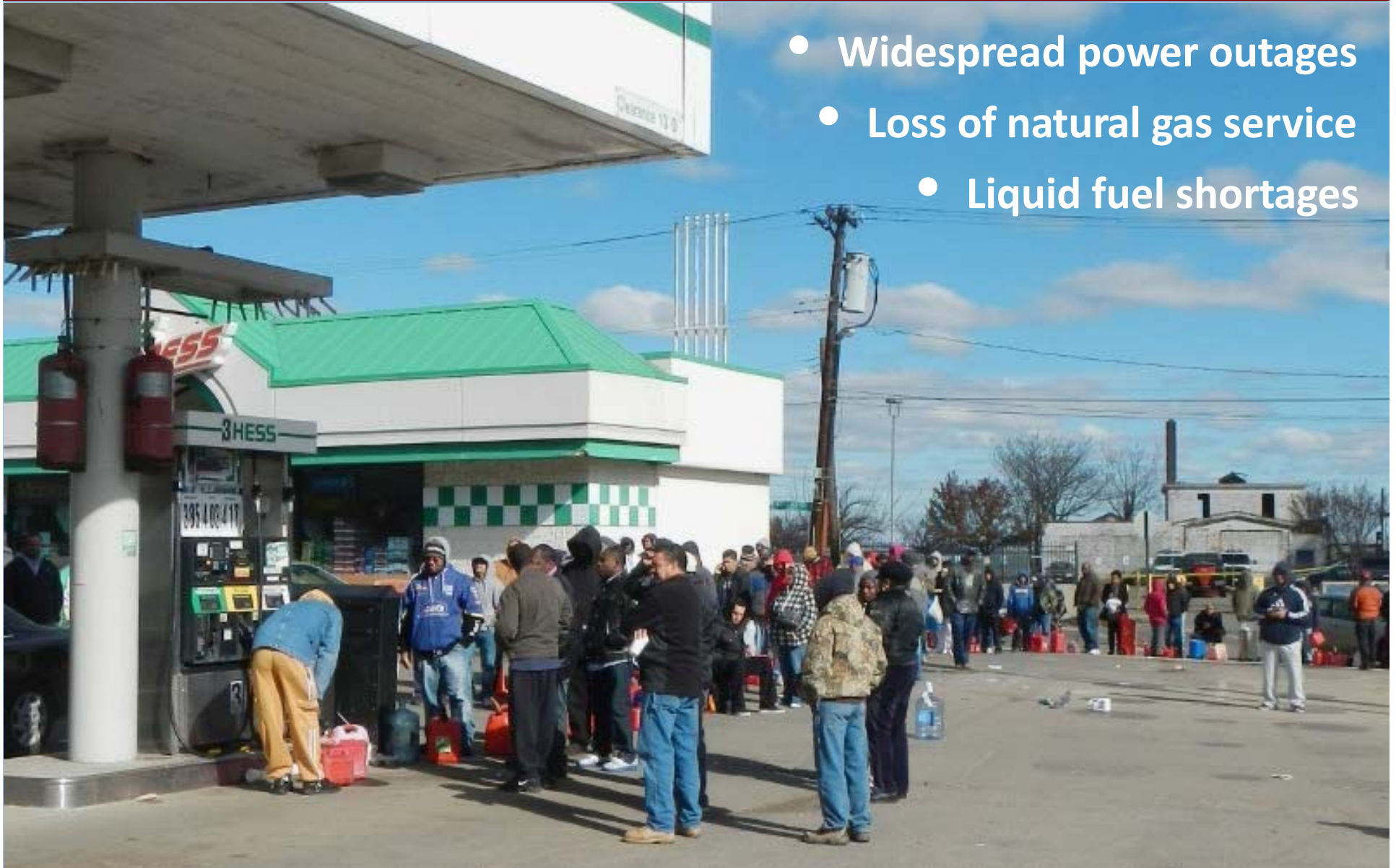


- Greatest damage at coast
- No tsunami at Seattle, Portland, or Vancouver (BC), but damage from shaking & strong currents
- Columbia and Willamette shipping channels blocked
- Slight to moderate damage to airports along I-5

Photo Source: Geotechnical Extreme Events Reconnaissance (GEER)

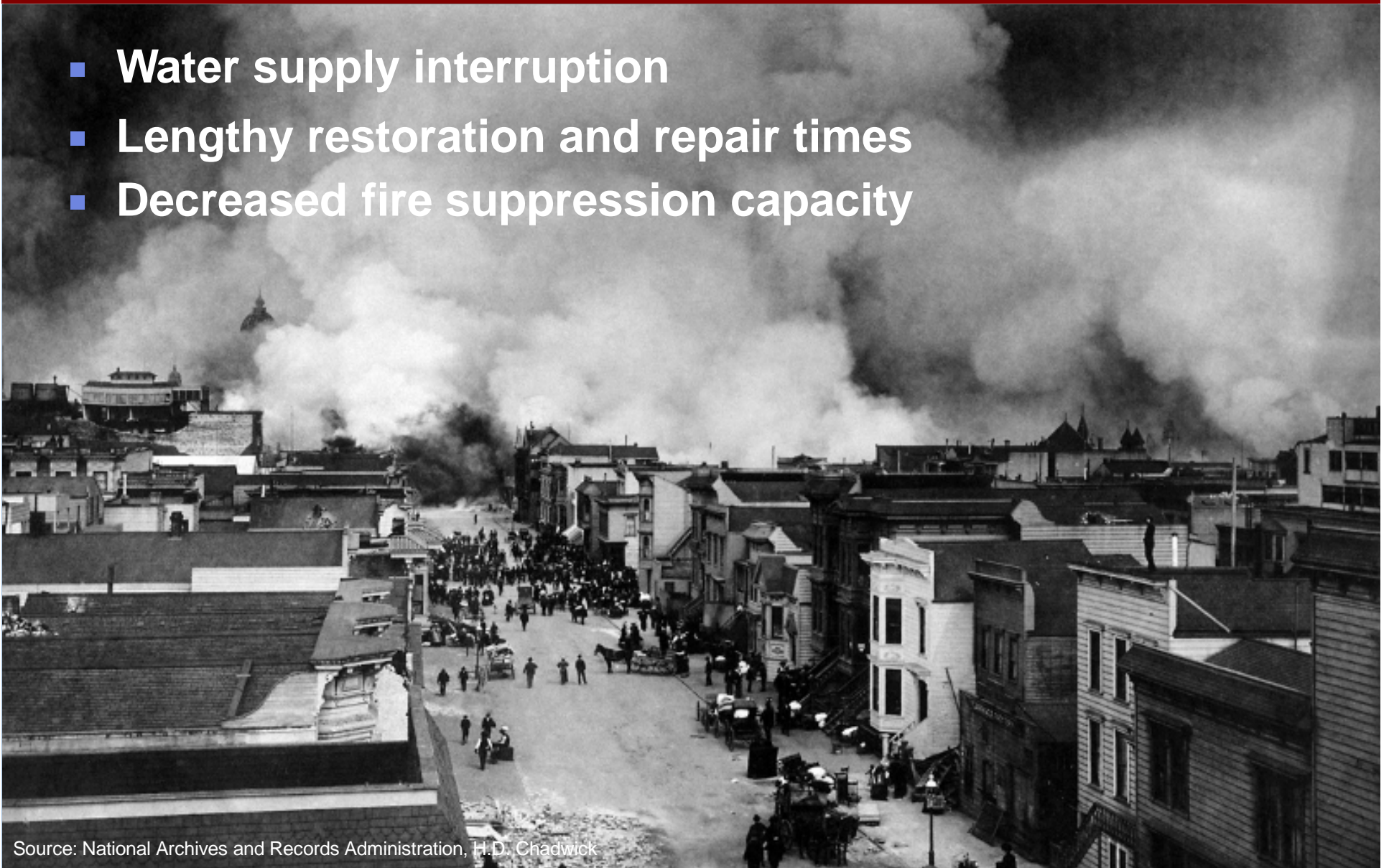
Electricity, Natural Gas, Liquid Fuel

- Widespread power outages
- Loss of natural gas service
- Liquid fuel shortages



Water Systems

- Water supply interruption
- Lengthy restoration and repair times
- Decreased fire suppression capacity



Source: National Archives and Records Administration, H.D. Chadwick

Communication Networks

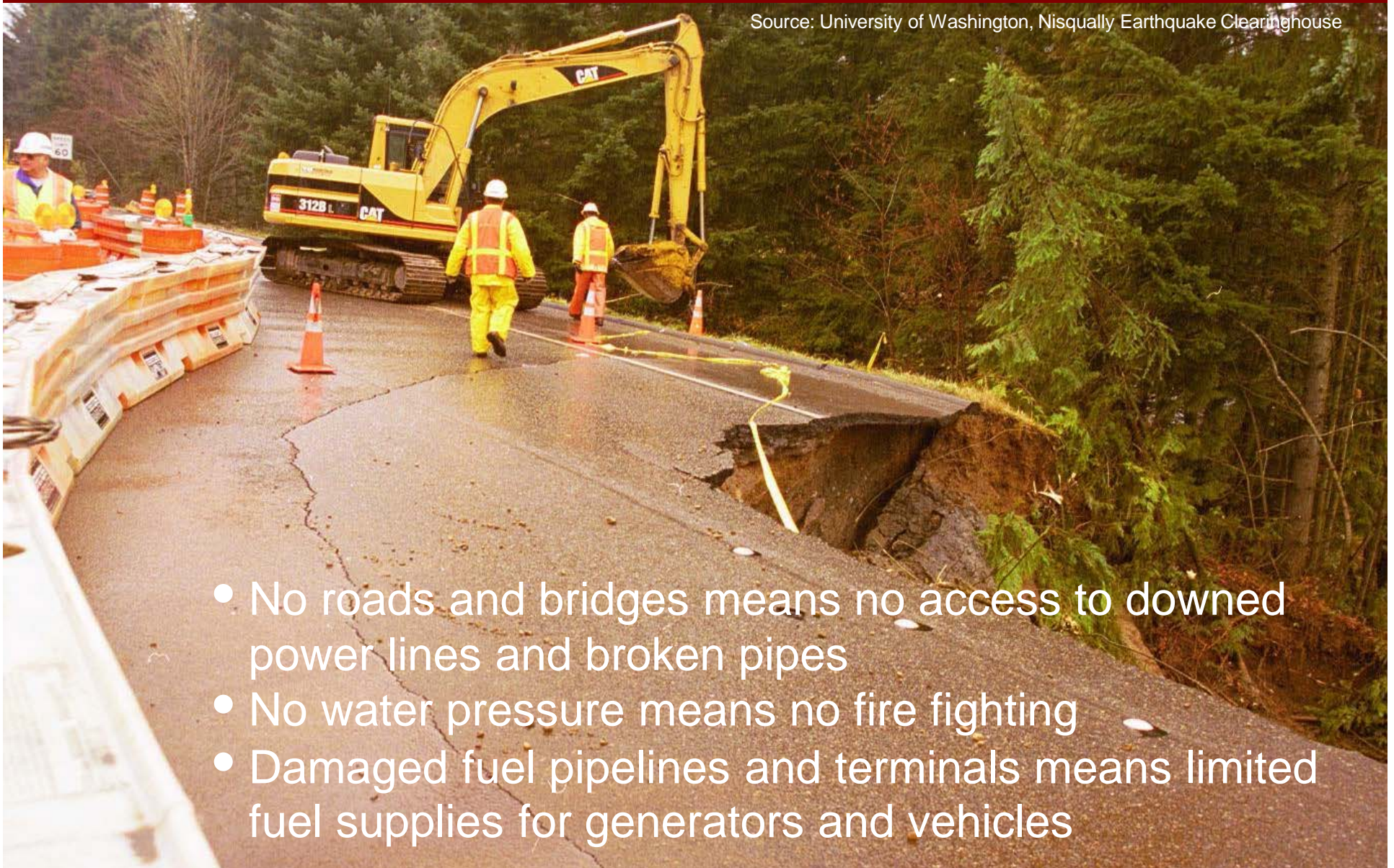
- **Landline & wireless**
 - Broken cables
 - Equipment failures and structural damage
 - Power outages
 - Jamming
- **Undersea transpacific cables severed**



Source: FM News 101KXL

Interdependence of Infrastructure

Source: University of Washington, Nisqually Earthquake Clearinghouse



- No roads and bridges means no access to downed power lines and broken pipes
- No water pressure means no fire fighting
- Damaged fuel pipelines and terminals means limited fuel supplies for generators and vehicles

Tsunami

- 15-30 minutes after ground shaking
- Multiple waves
- Variable wave heights

2011 Tohoku earthquake and tsunami
M9.0 earthquake
~18,000 deaths

Image: Associated Press via New York Times

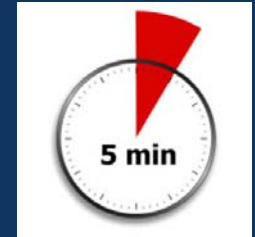


EUGENE SPECIFIC FINDINGS

- ◆ Earthquake and Winter Storm
 - ◆ Community-wide impacts
 - ◆ Impacts to Transportation, Energy and Fossil Fuel
- ◆ System interdependencies compound impacts
 - ◆ Food, water, wastewater, economy, social services
- ◆ Eugene/Springfield will become a hub
- ◆ Multiple local projects – similar conclusions:

**Expect major impacts to
community systems**

EXERCISE: INTERDEPENDENCIES



- ◆ Working with a partner, please identify ...
 - ◆ One public system/service your organization(s) rely on
 - ◆ One private system/service your organization(s) rely on
 - ◆ One natural system/service your organization(s) rely on

What is Resilience?



The ability to anticipate, absorb, adapt to, and recover from disruptions



Anticipate



Absorb



Adapt



Recover

How do you achieve Resilience?

Stockholm Resilience Center - Seven Principles:

- ◆ Maintain diversity and redundancy
- ◆ Manage connectivity
- ◆ Manage slow variables and feedback loops
- ◆ Foster complex, adaptive systems thinking
- ◆ Broaden participation
- ◆ Encourage learning
- ◆ Promote polycentric governance systems

Diversity and Redundancy

Keep your options open ...



Minamisanriku Tsunami Zone - Zero Capacity



Minamisanriku – Relocation to Higher Ground

Two Levels of Tsunami Protection: 100 yr (seawalls) and 1000 yr

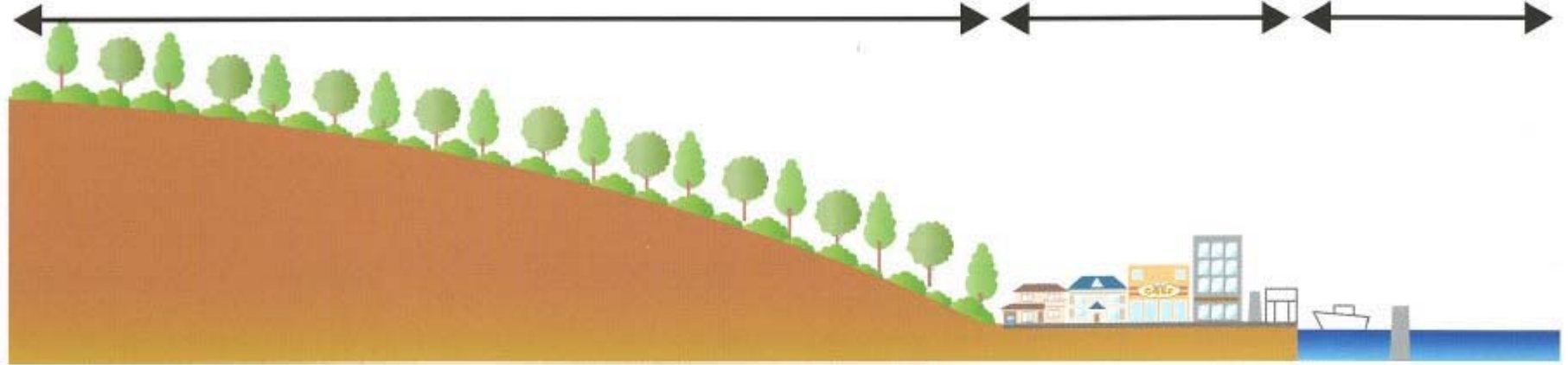
Before

Forested Hills
山

Entire City

住宅・産業・観光施設

Sea
海



Future

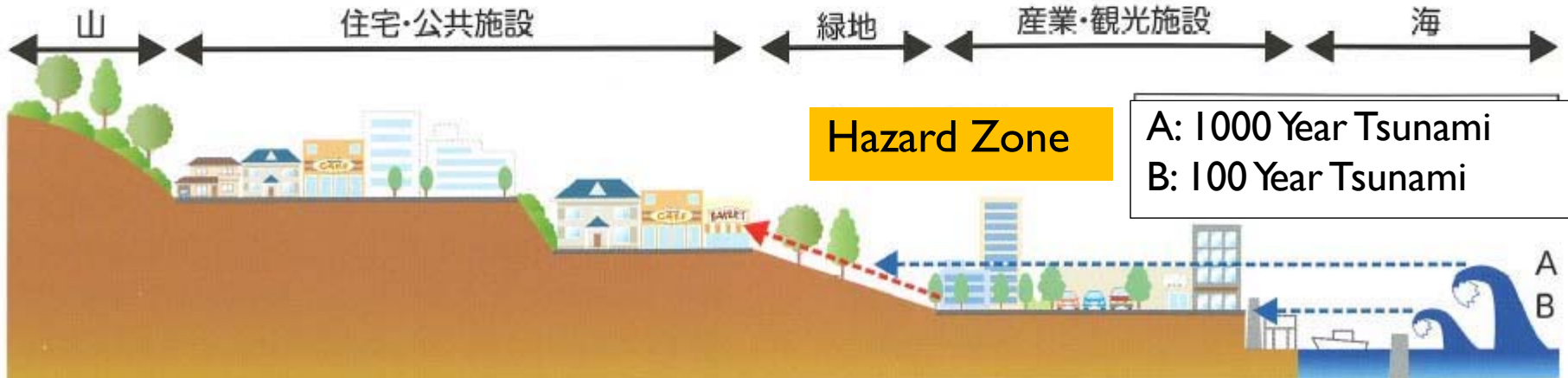
Housing/Tourism/Gov

住宅・公共施設

Indust/Comm

産業・観光施設

Sea
海



Hazard Zone

A: 1000 Year Tsunami
B: 100 Year Tsunami

Connectivity

Make friends with different kinds of folks...

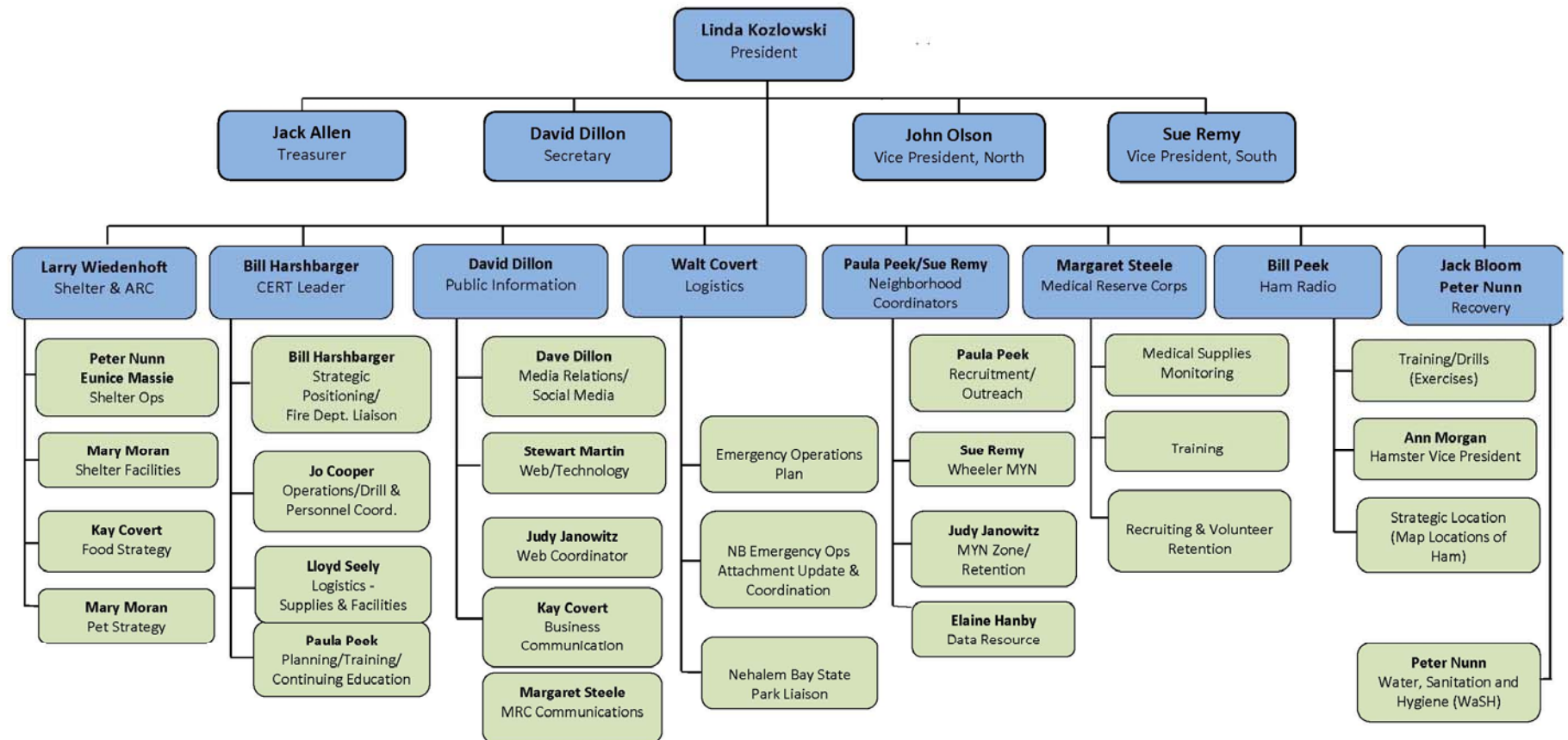


TFFF Socio-Economic Resilience Survey

How much confidence do you have in the following entities regarding their ability to increase community resilience in your area?

Entity	Average Value
FEMA	5.52
National Non-Profits	5.84
State Government	6.26
Local Government	6.27
Local Community Leaders	7.21
Local Utilities	7.36
Local Non-Profits	7.5
Your Neighbor	6.53
Your Self	8.12

Emergency Volunteer Corps of Nehalem Bay

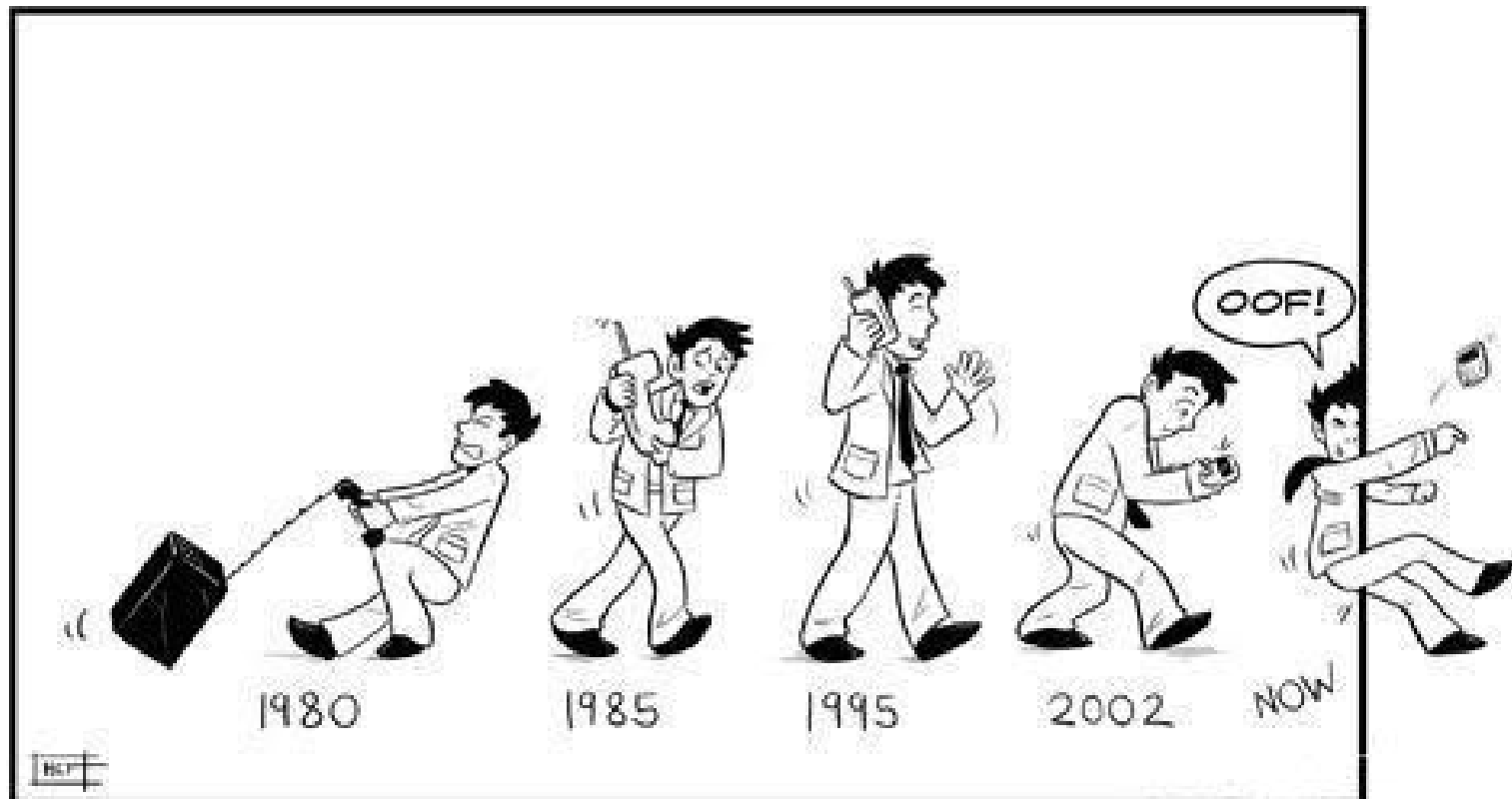


6/18/2013

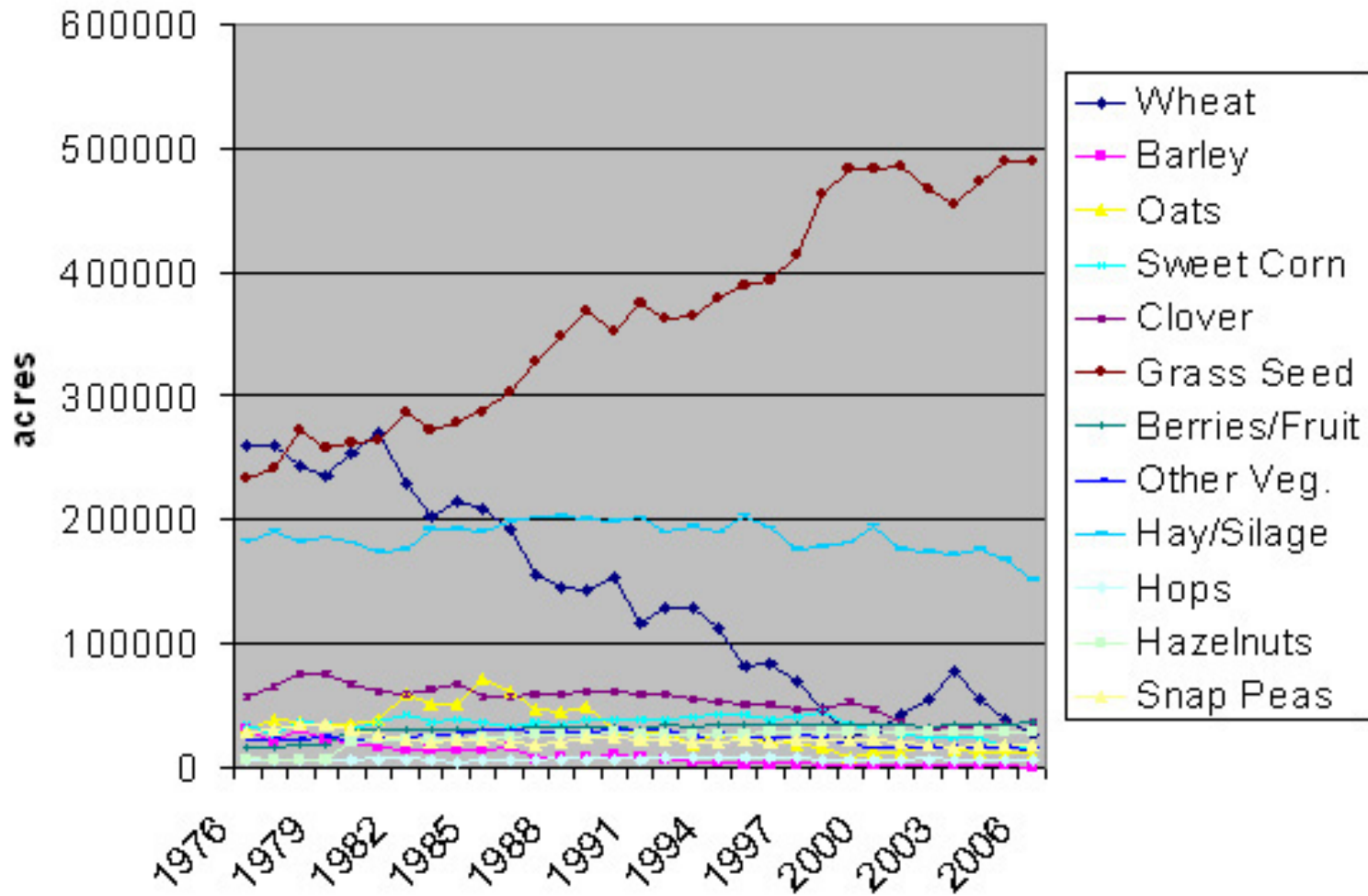
Slow Variables & Feedback Loops

Pay attention to changes over time ...

the EVOLUTION of CELL PHONES

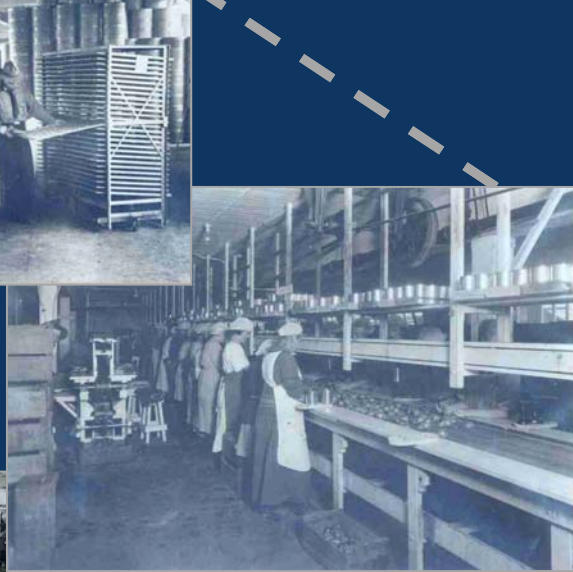


Willamette Valley Crop Trends 1



Dan Armstrong, Mud City Press

Then



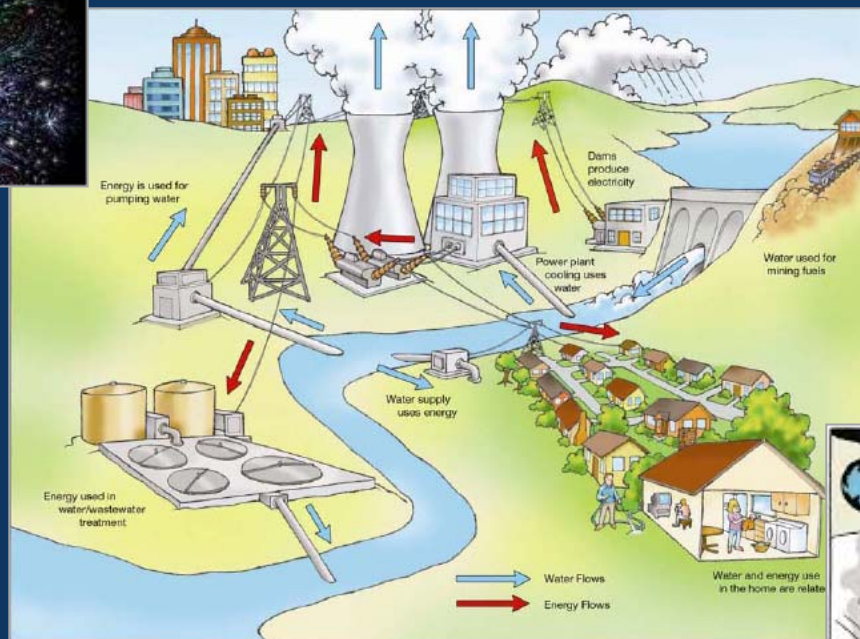
http://www.salemhistory.net/commerce/cannery_photos.htm



Now

Complex systems thinking

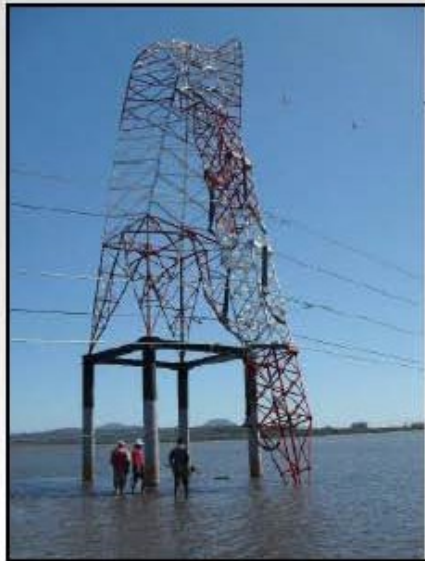
Systems, interdependencies and uncertainties matter ...



Lifeline Interdependencies

Interdependencies will make disaster recovery much more difficult. The earthquake will damage all systems at the same time.

To restore electric service, you need to reopen roads



To restore water service, you need electricity



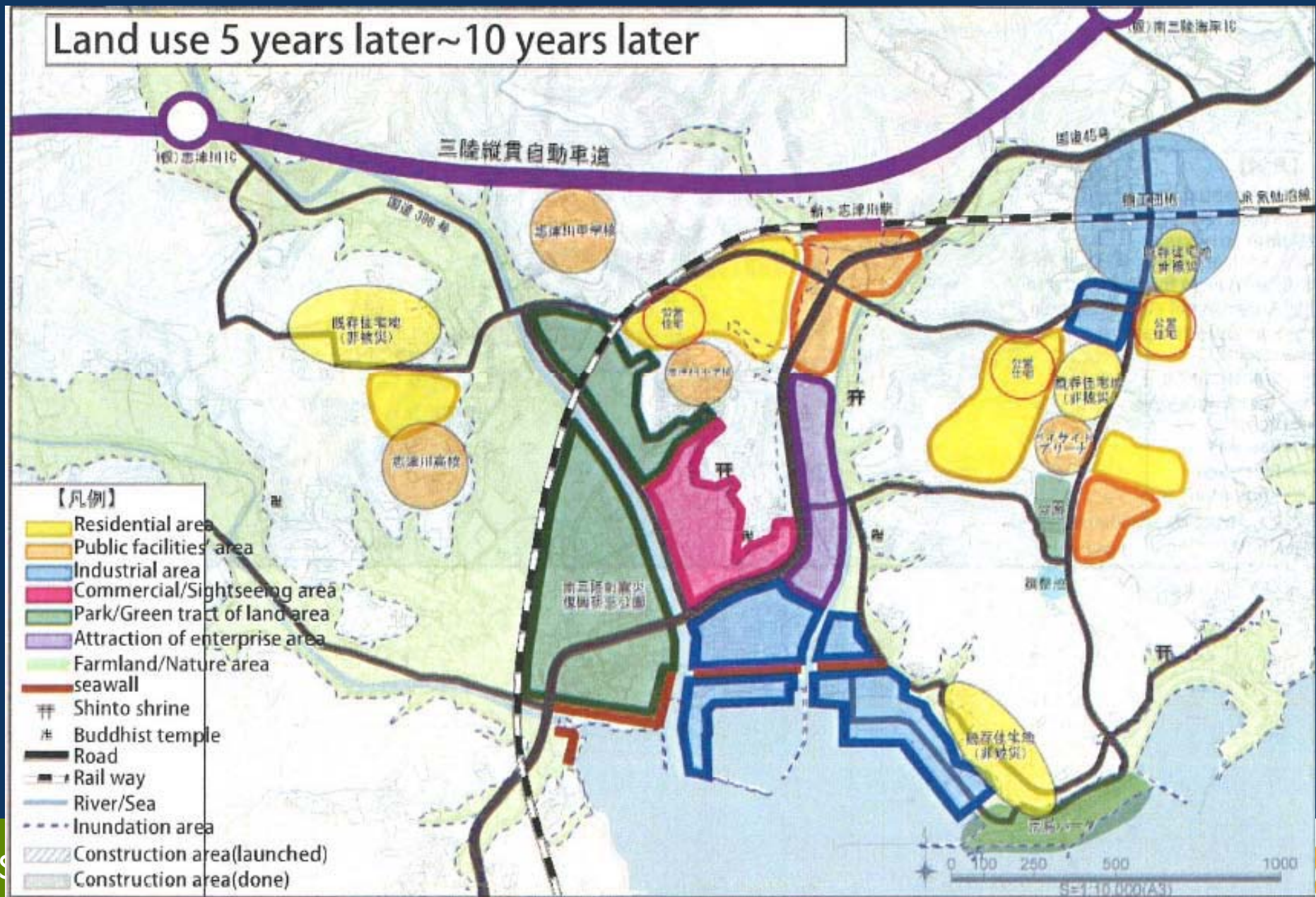
To restore fuel supplies you need electricity



To reopen roads, you need to restore fuel supplies



Minamisanriku – Recovery Plan



Broaden Participation

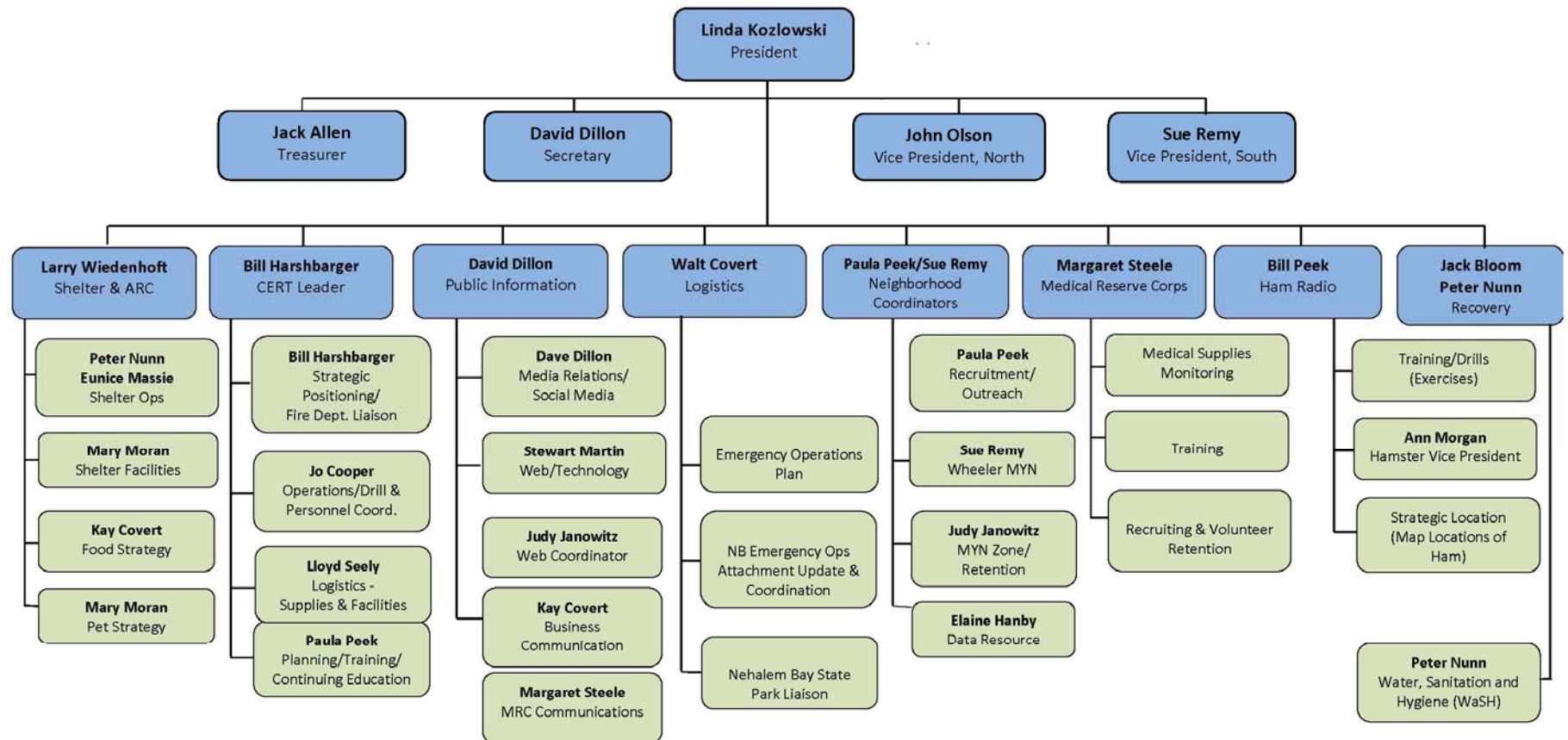
Expand the depth and diversity of engagement . . .



“If a variety of people participate, from a diversity of backgrounds and perspectives, it can uncover perspectives that may not be acquired through more traditional scientific processes.”



Emergency Volunteer Corps of Nehalem Bay



6/18/2013

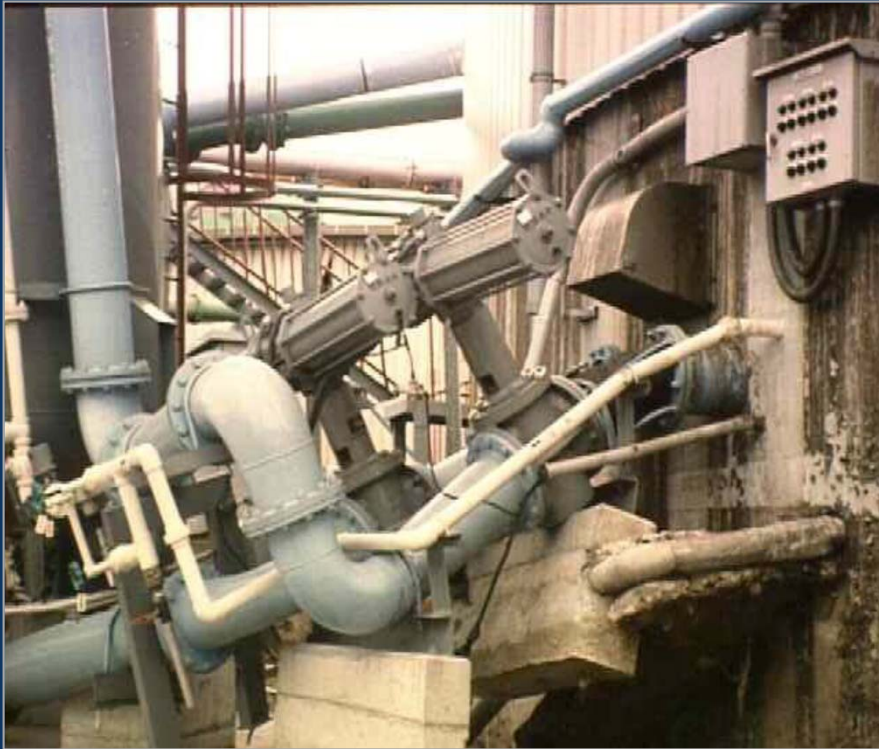
EXERCISE: PICK A PRINCIPLE



Talk with your neighbor. Which principle resonated with you the most?

- ◆ Maintain diversity and redundancy
- ◆ Manage connectivity
- ◆ Manage slow variables and feedback loops
- ◆ Foster complex, adaptive systems thinking
- ◆ Broaden participation

BUSINESS IMPACTS



*Oregon Resilience Plan Figure 8.15:
Damage from liquefaction/lateral spreading at
Higashinada WWTP, Kobe, Japan, 1995
(Source: Photo by Don Ballantyne)*



FEMA



USGS

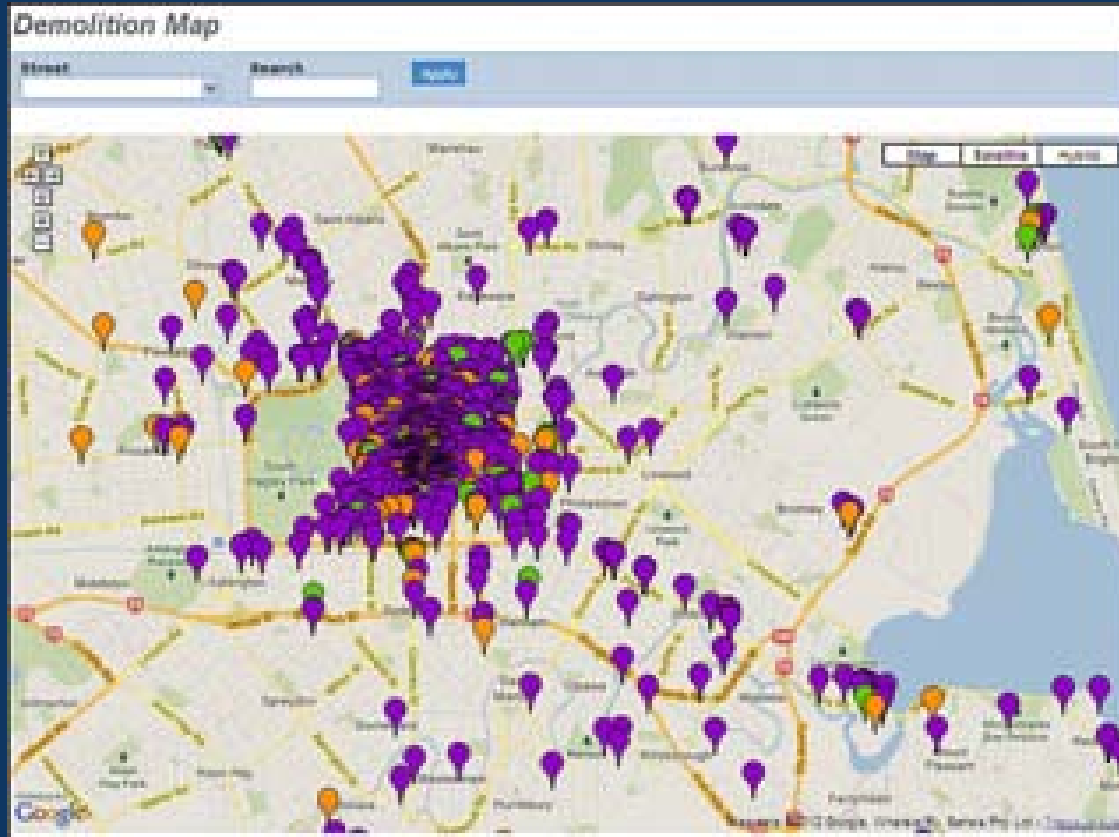
SOBERING BUSINESS STATISTICS ...

- ◆ 40% never reopen (FEMA)
- ◆ 25% failure rate within one year (FEMA)
- ◆ 90% failure rate after two years (US SBA)



Christchurch NZ,
2011 – The Central
Business District is
still closed today ...

POST FEBRUARY 2011 QUAKE ...



Christchurch NZ, demolition map



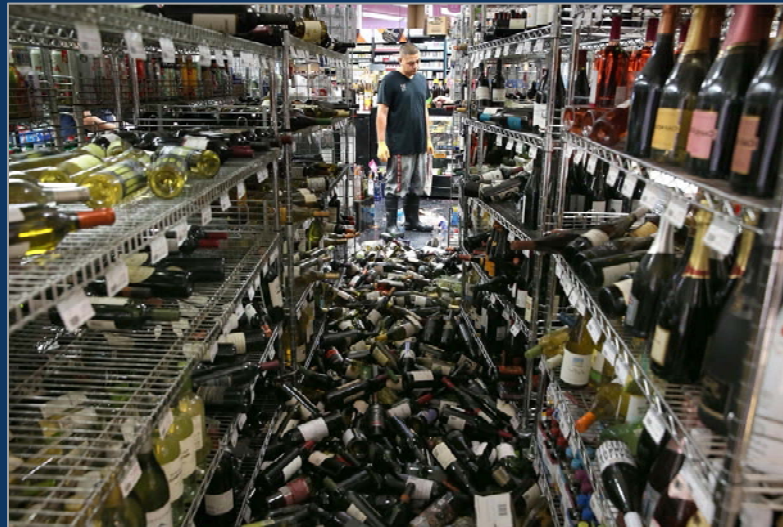
Christchurch NZ, CBD Closure



Re:Start Mall

BEFORE – PREPARATION AND PRACTICE

- ◆ Business Capacity Assessment
 - ◆ How long can businesses last?
 - ◆ What would you do without your people?
 - ◆ What would you do without your place?
 - ◆ What would you do without your things?



BEFORE – PREPARATION AND PRACTICE

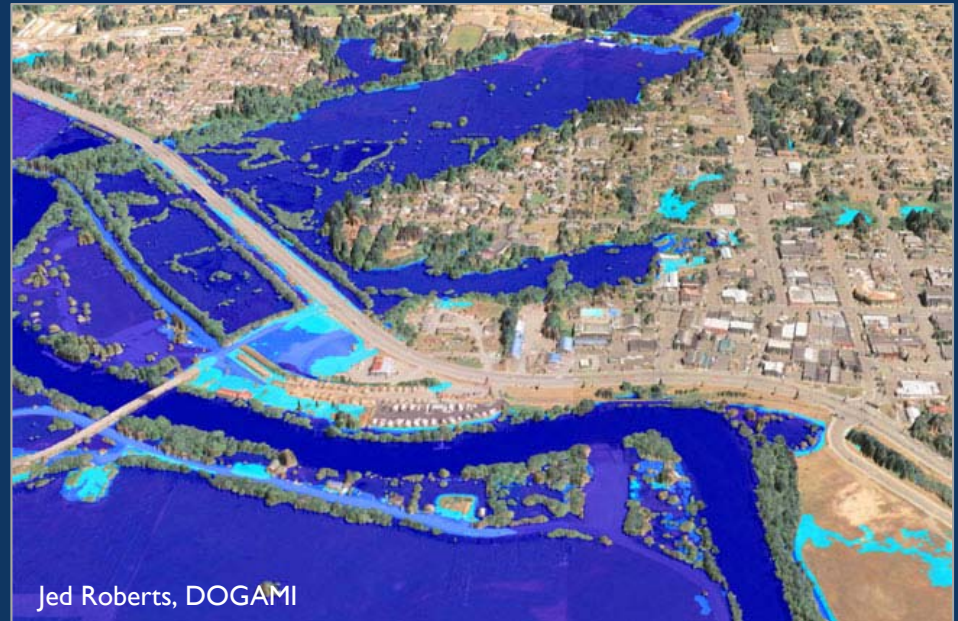
- ◆ Catalogue Business Services and Assets
 - ◆ Pre-disaster business registry
 - ◆ Pre-approval for service
 - ◆ Establish local contracts pre-event
 - ◆ Adopt policy that gives preference to local businesses
 - ◆ Identify equipment, tools, resources



The “Farmy Army” post earthquake
Christchurch, NZ

BEFORE – PREPARATION AND PRACTICE

- ◆ ID At Risk Businesses
 - ◆ Where are businesses located?
 - ◆ Floodplain, inundation zone, wildfire, earthquake
 - ◆ How old are the buildings?
 - ◆ Building codes change over time
 - ◆ What are the buildings made of?



BEFORE – PREPARATION AND PRACTICE

- ◆ Mitigate Business Risks
 - ◆ Structural
 - ◆ Relocation, retrofit, elevation, energy efficiency
 - ◆ Non-Structural
 - ◆ Equipment elevation / anchoring
 - ◆ Furniture, fixtures, inventory
 - ◆ Continuity of Business / Continuity of Operations
 - ◆ Data, material supply, distribution, etc.



BEFORE – PREPARATION AND PRACTICE

- ◆ Workforce Retention Strategy
 - ◆ Employee preparedness programs
 - ◆ Home preparedness
 - ◆ Train, Practice, Exercise



BEFORE – PREPARATION AND PRACTICE

- ◆ Understand Post-Disaster Recovery Funds
 - ◆ How long? Paperwork? Match? Volunteer Tracking?
- ◆ Post-Disaster Economy Forecasting
 - ◆ Community Economic Development Strategy
- ◆ Business Involvement in Community Emergency Response Teams (CERT)
 - ◆ Train and encourage participation in CERT model
- ◆ Locally administered Small Business Disaster Recovery Loan Funds?

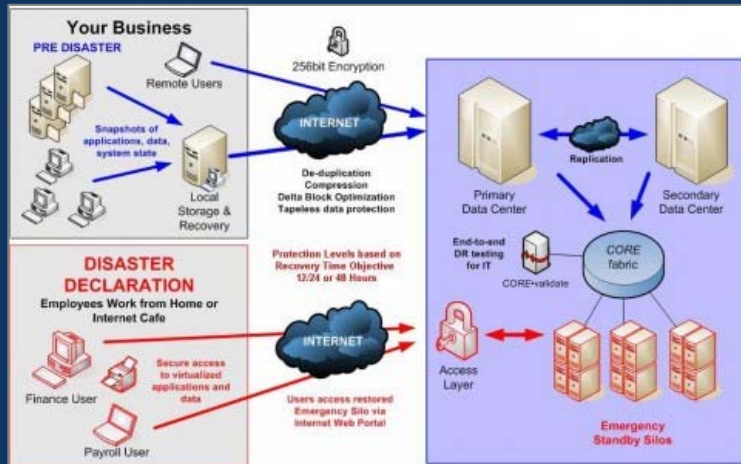
DURING – GAME DAY ...

- ◆ #1 - Protect Lives and Key Assets
 - ◆ Evacuate, Fight, Defend
 - ◆ Approach will depend on disaster type ...



DURING – GAME DAY ...

- ◆ Implement Disaster Response Protocol
 - ◆ People, Place, Things
- ◆ Mobilize Available Resources
 - ◆ Access Off-Site Back Ups, Notify Insurer(s), Equipment
- ◆ Assist Business Network



AFTER – RESTORATION & RECOVERY

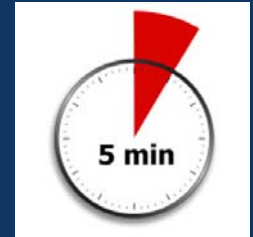
- ◆ Implement (or develop) revitalization strategy
 - ◆ Vision, goals, objectives, timeline
 - ◆ Develop temporary and long-term strategies
- ◆ Identify, evaluate and prioritize projects
 - ◆ Historic rehab? Business district? Infrastructure? Business relocation?
- ◆ [Re]develop historic, recreational & tourist attractions



AFTER – RESTORATION & RECOVERY

- ◆ Establish a Business Recovery Center
 - ◆ Technical assistance, information and support
 - ◆ Identify flexible transition spaces for businesses
- ◆ Convene Economy and Recovery Finance Group
- ◆ Implement grant management and in-kind tracking
 - ◆ NGO? Business? Government office?
- ◆ Inventory and Promote Local Funding
 - ◆ Loans, Grants, Donations

EXERCISE: ESTABLISH A TEAM



- ◆ Work in groups of three to five:

You have been appointed to a subcommittee tasked with convening an Economy and Recovery Finance Working Group. The group will be responsible for organizing the business community pre-event and assisting with business recovery post-event.

- ◆ How big is the group?
- ◆ Who needs to be represented?
- ◆ How do you maintain it over time?

DON'T TAKE MY WORD FOR IT ...



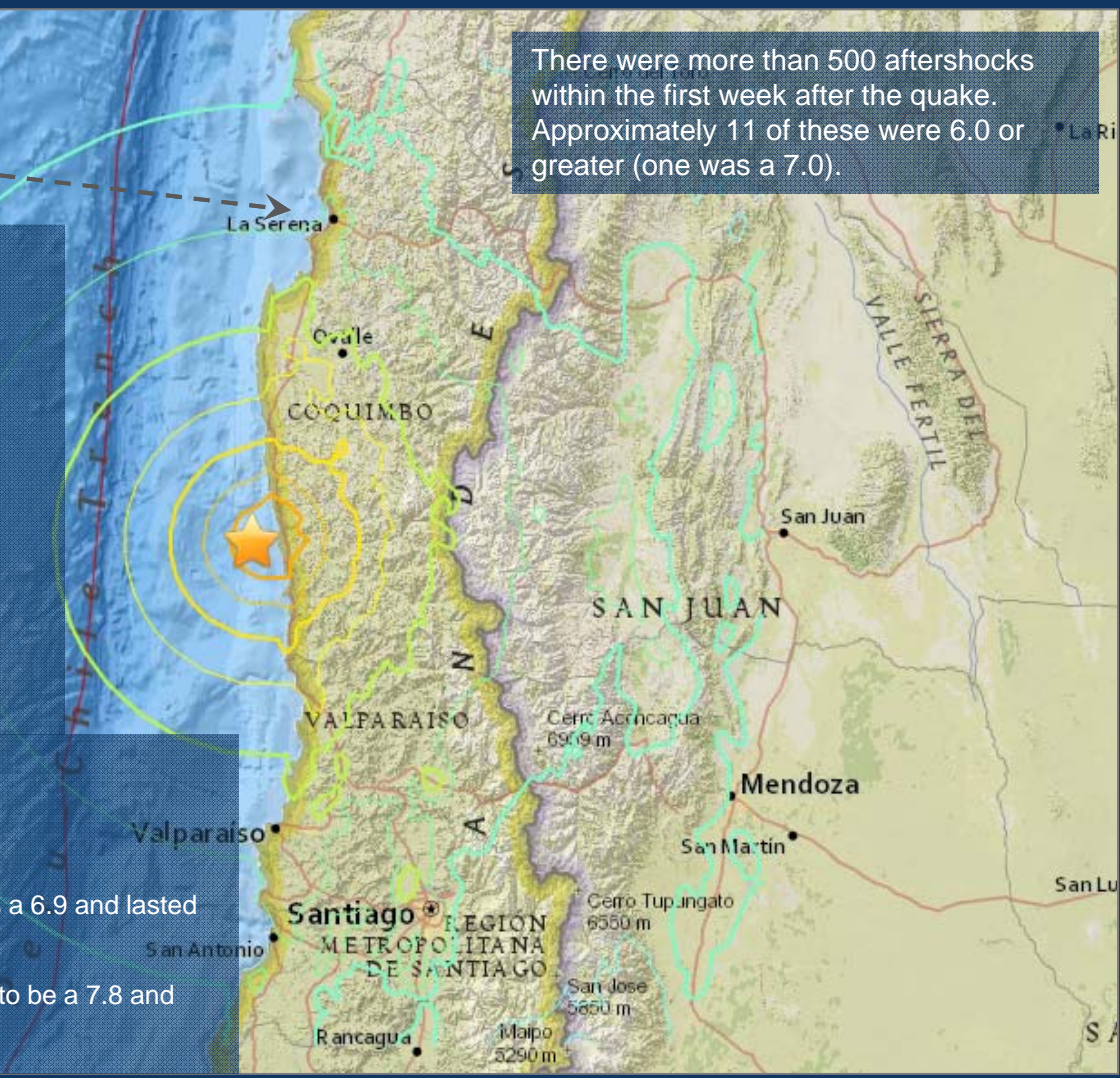
Fast facts about 2015 Chile earthquake:

- Date: September 16, 2015
- Time: 7:54 p.m. CST
- Duration: 3 minutes
- Magnitude 8.3 USGS
- Depth: 25.0 km (15.5 miles)
- Epicenter: Illapel
- Max. intensity: VIII (Severe)
- Tsunami: Yes

Comparisons:

- Largest quake in the world in 2015
- Sixth largest quake in Chile's history
- 1989 Loma Prieta World Series quake was a 6.9 and lasted for approximately 15 seconds
- 1906 San Francisco quake was estimated to be a 7.8 and lasted for approximately 60 seconds

There were more than 500 aftershocks within the first week after the quake. Approximately 11 of these were 6.0 or greater (one was a 7.0).



ADVICE/CONFIRMATION FROM THE FIELD:

- ◆ Keep cell phone and other devices charged.
- ◆ Keep gas tank half full; gas may not be readily available . . .
- ◆ Keep cash with your emergency kit.
- ◆ Keep an extra raincoat ready by the door.
- ◆ Include warm clothes and blankets/sleeping bags in your kit.
- ◆ Include first aid supplies and any essential medications.
- ◆ Hand sanitizer! It keeps sickness down when you may not have access to water for a while.

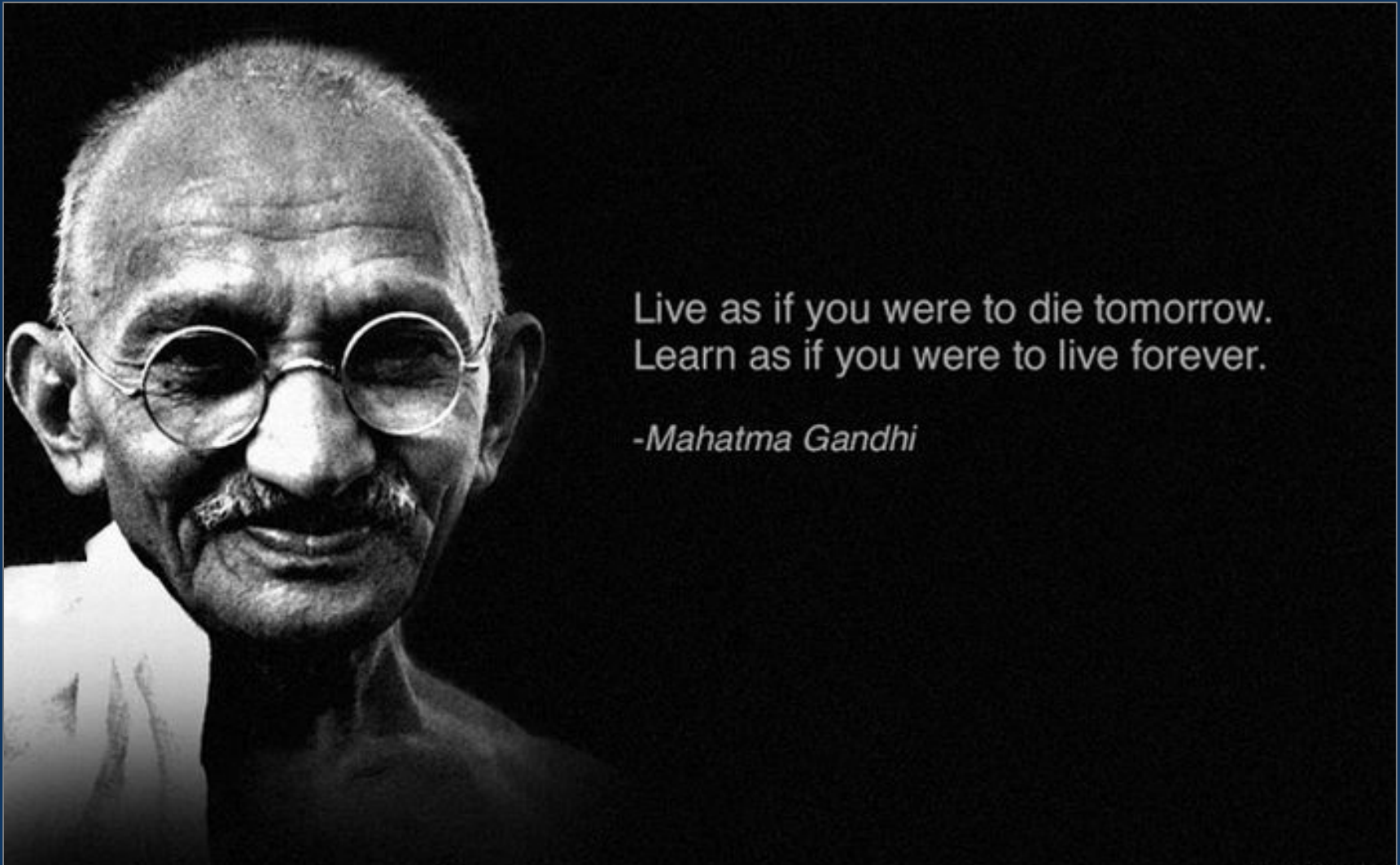
ADVICE/CONFIRMATION FROM THE FIELD:

- ◆ Hand sanitizer! It keeps sickness down when you may not have access to water for a while.
- ◆ Extra diapers - if you have kids.
- ◆ Talk to your kids about earthquakes! Kids in the PNW are not used to them.
- ◆ Do not listen to hearsay afterwards ...
- ◆ Make sure you have a communication plan! You might only be able to get one message out. We are way too reliant on the internet.
- ◆ Be prepared for the emotional/fear issues that may come up. It's normal!
 - ◆ “A big event is unnerving and the aftershocks really screw with your mind. Different people deal with the stress differently...”

Two Key Messages - Cascadia:

- ◆ Think short-term (tomorrow) AND long-term (50 yrs)
 - ◆ Tomorrow = Organizational Preparedness
 - ◆ 50 Years = Community Resilience
- ◆ Know what's possible; focus on what you CAN do
 - ◆ Educate yourself
 - ◆ Prepare a disaster kit
 - ◆ Lobby for policy changes
 - ◆ Help shape investment priorities
 - ◆ Coordinate and communicate

Thank You!



Live as if you were to die tomorrow.
Learn as if you were to live forever.

-Mahatma Gandhi