Community Resilience

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Community Resilience
The ability of social units (e.g., organizations, communities) to mitigate hazards, contain the effects of disasters when they occur, and carry out recovery activities in ways that minimize social disruption and mitigate the effects of future disasters.
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Essential infrastructure and organizations

Hospital
Water Network
Power Network
Local Emergency Management
Community Resilience
The ability of social units (e.g., organizations, communities) to mitigate hazards, contain the effects of disasters when they occur, and carry out recovery activities in ways that minimize social disruption and mitigate the effects of future disasters.

Interdependencies

Must be present to recover and provide opportunities
Community Resilience
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Expectations
- What are the most important capabilities to a community?
- What are the community’s expectations for recovery?
- What are the community’s expectations for damage?

Reality
- How was the infrastructure designed in the community?
- How much damage is expected after a disaster?
Quantifying Resilience

Disaster occurs

High resilience

Improved services

Low resilience

Normal condition

Functionality

Time
Quantifying Resilience

Resilience measured by area

Disaster occurs

Normal condition

High resilience

Improved services

Low resilience

Oregon State University
Quantifying Resilience

Resilience measured by area

Disaster occurs

Normal condition

Functionality

Time

High resilience

Low resilience

Improved services
How do we address resilience with civil infrastructure?

Design buildings and communities to withstand potential forces/demands from hazard

Use urban planning/zoning to restrict building in high-risk areas

Examples:
Christchurch, NZ
Nashville, TN
Boulder, CO
How do we address resilience with civil infrastructure?

Design buildings and communities to withstand potential forces/demands from hazard

Performance objectives in building codes

Performance-based earthquake engineering allows for Immediate Occupancy or Functional Recovery performance objectives.

- Shelter in-place
- Business continuity
- Limited damage
- Lifelines that are necessary to ensure shelter in-place and business continuity are functional
How do we address resilience with civil infrastructure?

Design buildings and communities to withstand potential forces/demands from hazard

Performance objectives in building codes

Performance-based earthquake engineering allows for Immediate Occupancy or Functional Recovery performance objectives.

Design building stiffness such that lifelines and non-structural components are not severely damaged.
Hazards in Oregon

Earthquake

Tsunami

Wildfire
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1977</td>
<td>National Earthquake Hazards Reduction Program (NEHRP) Earthquake Hazards Reduction Act of 1977</td>
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<tr>
<td>2009</td>
<td>SPUR (San Francisco Bay Area Planning and Urban Research Association) Report on <em>The Resilient City</em></td>
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<tr>
<td>2012</td>
<td>Resilient Washington State</td>
</tr>
<tr>
<td>2013</td>
<td>Oregon Resilience Plan</td>
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<tr>
<td>2013</td>
<td>Rockefeller Foundation’s 100 Resilient Cities</td>
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<tr>
<td>2015</td>
<td>NIST Community Resilience Center of Excellence</td>
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<tr>
<td>2018</td>
<td>Rockefeller Foundation’s 100 Resilient Cities Ends</td>
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<tr>
<td>2019</td>
<td>NIST Community Resilience Center of Excellence – renews for round 2</td>
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</tbody>
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Community Resilience in Oregon

The Oregon Resilience Plan

Reducing Risk and Improving Recovery for the Next Cascadia Earthquake and Tsunami

Report to the 77th Legislative Assembly

from Oregon Seismic Safety Policy Advisory Commission (OSSPAC)

Evaluation of current conditions:

- Business continuity
- Coastal communities
- Critical & essential facilities
- Transportation
- Energy
- Information and communications
- Water & wastewater

Salem, Oregon
February 2013
Community Resilience in Oregon

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Evaluation of current conditions:

- Business continuity
- Coastal communities
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Identification of
- Potential for damage
- Lack of recovery potential
- Areas of improvement
Community Resilience in Oregon – *Progress Update (2018)*

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Business continuity (completed)

- SB 311 (2017) authorizes cities and counties to adopt an ordinance or resolution providing tax exemption to commercial, industrial and multi-family buildings built before Jan. 1, 1993,

- Oregon Resilience Buildings 1 & 2 in SB 5506 (2017) are the start of a long-term planning effort within the Capital Mall area (Salem),

- Department of Education administers a grant program, Seismic Rehabilitation Grants Program for public educational facilities.
Community Resilience in Oregon – Progress Update (2018)

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Salem, Oregon
February 2013

Critical and Essential Buildings (completed)

- Establishment of a State Resilience Office
- Seismic Rehabilitation Grant Program funds retrofits of emergency operations centers and fire and police stations,
- Survey of Portland URM buildings,
Coastal Communities

- Provide information about Cascadia earthquakes and tsunami in all hotels, motels, and short-term rentals;

- Create tsunami evacuation modeling for each coastal community as a base level to estimate the likely fatality level;

- Improve tsunami evacuation measures by further developing existing evacuation routes, creating new evacuation routes, bettering education and signage about evacuation routes, and creating vertical evacuation structures or buildings.
Coastal Communities

- Develop plans to provide shelter, water, and food for residents and visitors;

- Ensure that critical transportation links to the valley and along the coast survive the earthquake so that coastal communities are not cut off from relief and recovery efforts;

- Use tsunami-resistant buildings as vertical evacuation structures to ensure the safety of people in the inundation zone where other options are limited, and use tsunami-resistant infrastructure for critical transportation, port facilities, and utilities.
Community Resilience in Oregon – *Progress Update (2018)*

**Coastal Communities**

- Make all government buildings, schools, and essential facilities located within tsunami zones more resilient

**Oregon Looks To Shake Up Development Rules In Tsunami Zones**

**Critics blast Oregon repeal of tsunami-zone building ban**

**Oregon Legislature repeals ban on building in tsunami zone**

*House Bill 3309: overturns 25-year old law prohibiting new schools, hospitals, jails, and police and fire stations from being built in the state’s tsunami inundation zone*
Community Resilience in Oregon – *Examples of implementation*

Communities that have implemented:

- Coos County
- City of Florence
- City of North Bend
- City of Reedsport

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Prepared by
The Department of
Land Conservation
and Development

April 2015
Community Resilience in Oregon – *Examples of implementation*

Communities that have implemented:

- Coos County
- City of Florence
- City of North Bend
- City of Reedsport

Policies implemented:

- Incorporated tsunami hazard overlay zones into land-use planning
- Limit development of critical facilities within tsunami inundation zones
- Encourage stronger building techniques
- Offer flexible options to people who want to make development designs more tsunamic resilient
- Improvement plans for tsunami evacuation facilities
Community Resilience in Oregon – Examples of implementation

January 30, 2019
• Governor Kate Brown signed an executive order creating the Governor’s Council on Wildfire Mitigation

Oregon Building Codes Division adopted an amendment to the Oregon Residential Specialty Code.

Community Planning Assistance for Wildfire (CPAW) worked with Bend, Sisters, Ashland, and Wasco County to adopt of the WUI code for structures.

Ashland Forest Resiliency Stewardship Project (AFR)
Research at Hinsdale Laboratory

- Fundamental mechanics and conditional probabilities for prediction of hurricane surge and wave loads on elevated coastal structures (Oregon State University)
- Nonlinear long wave amplification in the shadow zone of offshore islands (Texas A&M)
- Probabilistic assessment of tsunami forces on coastal structures (University of Washington)
- Numerical and probabilistic modeling of aboveground storage tanks subjected to multi-hazard storm events (Rice University)
- Telescopic structural flood walls (Smart Walls Construction LLC)
- Non-linear long wave amplification in the shadow zone of offshore islands (University of Southern California)
- Advancing multi-hazard assessment and risk-based design to promote offshore wind energy technology (Northeastern University)
- Transient Rip Current Dynamics: Laboratory measurements and modeling of surf zone vorticity (University of Washington)
- Runups of unusual size: Predicting unexpectedly large swash events (Oregon State University)
- Physical modeling of submarine volcanic eruption generated tsunamis (Georgia Tech)
- Wave, surge, and tsunami overland hazard, loading and structural response for developed shorelines (University of Notre Dame, University of Southern California, and Oregon State University)
- Physics of dune erosion during extreme wave and storm-surge events (Oregon State University, University of Delaware, and Texas A&M)
- Vertical evacuation structures subjected to sequential earthquake and tsunami loadings (University of Washington)
Research at Hinsdale Laboratory