IN-CORE

Steps to Conduct Safety Risk Evaluation for Communities

1. **Identify decision support options**
2. **Define hazard description**
3. **Identify built environment**
4. **Identify social environment**
5. **Perform probabilistic simulation**
6. **Calculate annualized risks**
7. **Select decisions**

The Center for Risk-Based Community Resilience Planning is a NIST-funded Center of Excellence; the Center is funded through a cooperative agreement between the U.S. National Institute of Standards and Technology and Colorado State University (NIST Financial Assistance Award Numbers: 70NANB15H044 & 70NANB20H008). The views expressed are those of the presenters, and may not represent the official position of the National Institute of Standards and Technology or the US Department of Commerce.

Resilience

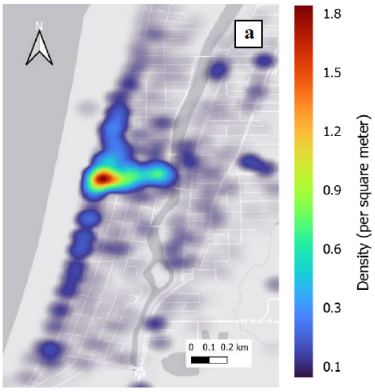
Research Brief: Seaside

"The life safety risk of a near-field tsunami strongly depends on building egress time and earthquake-induced debris."

Community Risk in Seaside, OR

The city of Seaside, Oregon, is vulnerable to earthquake ground shaking and tsunamis due to the Cascadia Subduction Zone (CSZ):

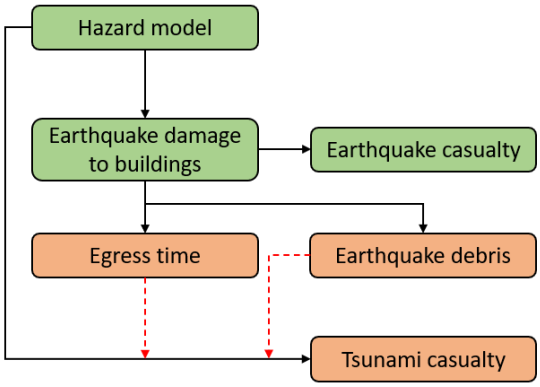
- Hazards: probabilistic earthquake ground shaking and tsunami
- Buildings: 4,679
- Transportation network: roads and bridges
- Local population: 7,115 (2020 estimate).
- Tourist population (peak summer):
  - Daytime: 20,000 on a single day.
  - Nighttime: 10,000 on a single day



Heatmap for Daytime Population

IN-CORE Technical Process

- Includes the effect of earthquake damage to buildings on building egress time.
- Incorporates the effect of earthquake-shaking-induced debris on tsunami evacuation.
- Quantifies the impact of mitigation strategies on tsunami evacuation and life safety.



Life Safety Flowchart

Published Research

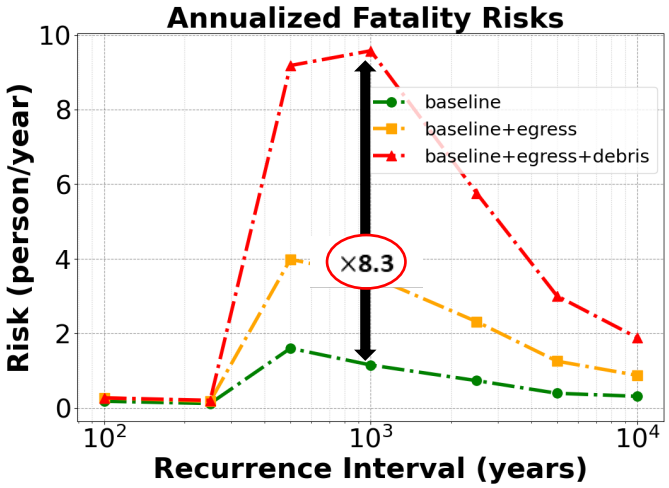
Amini, M., Sanderson, D. R., Cox, D.T., Barbosa, A.R., Rosenheim, N. (accepted). "Methodology to incorporate seismic damage and debris to evaluate strategies to reduce life safety risk for multi-hazard earthquake and tsunami". Natural Hazards. http://dx.doi.org/10.21203/rs.3.rs-1862973/v1.

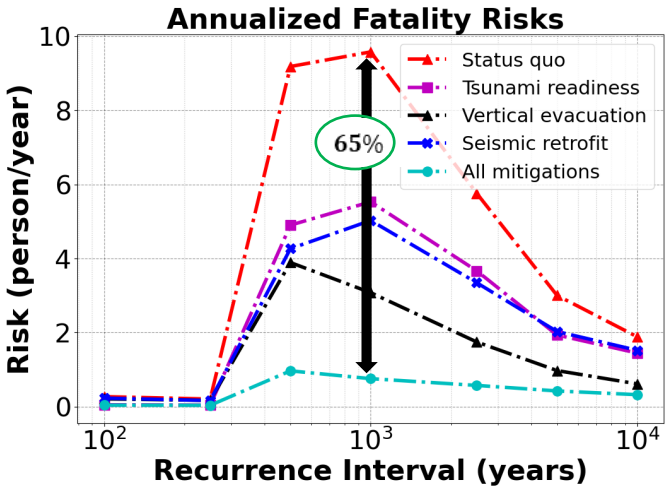
Research Findings

In the event of a tsunami and assuming a daytime population requires time to seek shelter (15 minutes for locals and 10 minutes for tourists), the annualized fatality risk (persons/year) is the combination of baseline tsunami fatalities plus those associated with building egress time and debris. For a 1000-year mean recurrence event, the addition of egress and debris **increases the risk 8.3-fold** over the baseline, state-of-the practice models.

When compared to the status quo for a 1000-year mean recurrence event, **we find a 65% decrease in annualized fatality risks when mitigation strategies** (tsunami readiness, vertical evacuation, and seismic readiness) are employed.

The findings aid understanding the tsunami evacuation modeling and provide better insight for decision makers and emergency planners in coastal communities.





Data Availability

The datasets for Seaside, Oregon, including built-, natural-, and social-systems, are available in DesignSafe. The PRJ-3390: Seaside Testbed Data Inventory for Infrastructure, Population, and Earthquake-Tsunami Hazard has been selected as a recipient of a 2023 DesignSafe Dataset Award. https://doi.org/10.17603/ds2-sp99-xv89

Information about IN-CORE and the Center of Excellence (CoE)

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http://resilience.colostate.edu/in_core/