

Advisory Council Meeting Jun

June 14th, 2021



6th Advisory Council Meeting June 14th, 2021 (1:00 pm – 3:00 pm) Virtual Meeting

Meeting Objectives:

- Update the Advisory Council on project progress.
- Discuss various concepts of 'islanding' in the context of CSZ event impacts on travel times to various types of 'community assets'
- Harness the expertise of the Advisory Council to develop actionable knowledge to inform statewide policies and localized decision-making.



6th Advisory Council Meeting June 14th, 2021 (1:00 pm – 3:00 pm) Virtual Meeting

Meeting Agenda:

- 1:00 Welcome, Introductions (in the Chat!), Meeting Overview
- 1:10 Perspectives on Community Assets Overview presentation by Jenna Tilt
- 1:15 Perspectives on Islanding Overview presentation by Dan Cox and Dylan Sanderson
- 1:30 Q&A/ Discussion for clarity Ensure that everyone is clear on our concepts and where we are going
 Please use the Chat throughout for any comments and questions!
- 1:40 Presentation of Envision Modeling Approach and Initial Results John Bolte and Dylan Sanderson
- 1:55 Discussion All
- 2:45 Wrap up/next steps/project timeline/informal discussion of statewide and regional resilience efforts







Framework for Assessing Resilience Strategies

1. Hazard Modeling

- CSZ: Earthquake + Tsunami
- What scenario? (M9)
- Timeframe? (2040, 2060)
- Coastal erosion and sea-level rise



Probability damage of ~1,000-year event

2. Policy options/strategies and Scenarios

- Status Quo
- Protect (retrofit)
- Realign (moving, zoning)
- Restore (accommodate)



3. Resilience Metrics

- Direct losses (life safety, capital)
- Indirect losses (recovery)
- Social equity (unequal loss)





Envisioning Oregon's Coastal Futures Perspectives on Community Assets

Advisory Council Meeting

June 14th, 2021



Targeted Universalism: A framework to model equitable policies

Community Assets:

- Universal Goal: Ensuring that community assets are resilient and accessible
- Assessment: What community assets are important to underrepresented and marginalized populations? Where are these facilities located?
- Disparities: Are these community assets resilient to coastal hazards? Are they accessible after hazardous events? When?
- Structural Factors: What factors impede community assets becoming more resilient?
- Envision and Targeted Strategies: What strategies should be modeled in Envision to assess community assets resiliency?

"Islanding" impacts—accessibility to assets



Targeted Universalism:

A framework to model equitable policies

- Informed policy planning that targets specific community needs with universal community goals such as increasing resilience
- Different strategies are needed to achieve the same goal
- <u>https://belonging.berkeley.edu/targeted-universalism</u>



Community Engagement



Sharing a meal after Envision Focus Group in Newport, Oregon

Identify Community Assets

"Con respecto a nuestras comunidades es la iglesia, porque es un big building y tienen agua, tienen baños, tienen comida, cocina ahí, tienen espacio para gente si tuviera una emergencia, son bienvenidos."

With respect to our communities is the church because it's a big building and they have water, bathrooms, food, kitchen there, they have space for people if you have an emergency, they are welcoming.

(Seaside Resident)

Identify Risk Exposure



Churches in Seaside and "M-size" Tsunami Scenario

Develop and Assess Adaptation Strategies



Community Assets	Total	Within M Zone	Built prior to 1990
Assisted Living	/18	5	37
Child Care	-+0 27	5	17
Child Care	27	4	17
Health Care (e.g. community clinics, dialysis centers)	32	2	25
Schools	126	19	66
Welfare (e.g. food banks, crisis centers, shelters)	143	31	67
Churches	283	34	230
Community Centers	38	5	?
Grocery Stores	90	21	72
Libraries	29	4	18
TOTAL	816	125	532



Community Assets Accessibility

- What neighborhoods (e.g., Census Blocks) have the longest post-event travel to time to community assets?
- What are the socio-economic characteristics of these blocks?
- What are the potential socio-economic impacts of lack of accessibility to community assets for these neighborhoods post-event?
- What policies could improve access to community assets post-event?
 - Prioritization of road/bridge retrofits/repairs ("Hold the Line" Scenario)
 - Identification of critical accessibility gaps and relocation of community assets to close this gap ("Realign" Scenario)
 - Others???
- What other community assets should be examined through the lens of accessibility post-event?



Envisioning Oregon's Coastal Futures Perspectives on Islanding

Advisory Council Meeting

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Oregon State University



Motivation

- Hazards creates disruption to infrastructure networks
 - Power, transportation, water, communication, etc.
- People become cut off from necessary services:
 - Health, grocery, social network, aid, etc.
- CSZ planning documents mention coastal islanding

"Due to collapsed highway bridges the Oregon coast is expected to experience extreme transportation immobility. The lack of transportation options will create isolated, geographic "islands" ..."

- DOGAMI Open File Report O-20-02 (2020)

"Coastal communities are likely to be cut off from each other and from inland areas. Even some inland areas may become isolated..."

> - Cascadia Region Earthquake Workgroup (2013)

Cascadia Island Mapping

2 Weeks Ready

2017 Total Solar Eclipse

Business Preparedness

Cascadia Island Mapping

Cascadia Subduction Zone

Community Preparedness

Hazard Mitigation

Hazards in Oregon

If You See Something, Say Something

Individual Preparedness

Preparedness Publications

ShakeAlert® in Oregon

Tsunami Safe: Hospitality Begins with Safety

Oregon OEM Cascadia Island Mapping Project

landslides

In the event d

Project" mapped coastal populations in relation to likely infrastructure damage after an earthquake and tsunami. These maps show where transportation infrastructure will be damaged (bridge failure, landslide, liquefaction) causing populations to be isolated into "islands". Workshops were held in coastal communities during the summer of 2016. Our audience for these workshops were city/county officials, public works, and others able to advise on road damage and who lives/works/plays in the "islands". The results of this project are available for download and through RAPTOR

For general inquiries about the project, contact Althea Rizzo at althea.rizzo@state.or.us.

For the GIS data, contact Daniel Stoelb at daniel.stoelb@state.or.us





Motivation

- Hazards creates disruption to infrastrue
 - Power, transportation, water, communi
- People become cut off from necessar
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immobility. The lack of transportation options

CSZ planning documents mention coast

Research Questions:

How do damage and restoration of regional and local networks impact sense of islanding?

To what extent is islanding a regional or local problem?

n OEM Cascadia Mapping Project

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"Coastal communities are likely to be cut off from each other and from inland areas. Even some inland areas may become isolated..."

- DOGAMI Open File Report O-20

Cascadia Region Earthquake Workgroup 2013)

This work

- Transportation network and airports as proxy for supplying aid.
- Could extend to other networks
- Could extend to other services (health, food, etc.).

ShakeAlert® in Oreg

Tsunami Safe: Hospitality Begin with Safety

Oregon State University



Oregon Road Network

Regional

- Statewide coastal road network
 - Coast to I-5
 - California border to Washington border
- Oregon Resilience Plan highway tiers
- Oregon Resilience Plan airports
- 18 communities along the coast





-O- Coastal Town

Oregon Road Network

Local

- 18 communities along the coast
- Grouped by urban growth boundary



Damage, Functionality, and Travel Time

- Damage:
 - DOGAMI M9.0 and "L" Tsunami
 - HAZUS road/bridge fragility curves
 - Bridges: ground shaking and tsunami inundation*
 - Roads: liquefaction and tsunami inundation
 - Probability of slight, moderate, extensive, and complete damage
 - Monte-Carlo simulation
 - Get damage state at each bridge and road segment
- Functionality:
 - Damage states related to restoration curves
 - Define functionality of road/bridge segment
- Travel Time
 - Relate segment functionality to increase travel time
 - Modify BPR Curve to Travel Time Surface











Regional Connectivity Index (RCI)

- Ratio of pre- to post-CSZ travel times
- Shortest travel time to airports throughout region
- Scale of 0 (bad) to 1 (good)

$$RCI(t) = \sum_{j \in Tiers} w_j \frac{\min_{o \in Tierj} T_{(o,d),0}}{\min_{o \in Tierj} T_{(o,d),t}}$$





Local Connectivity Index (LCI)

- Ratio of pre- to post-CSZ travel times
- Shortest travel time throughout community UGB
- Scale of 0 (bad) to 1 (good)

$$LCI(t) = \left(\sum_{o \in S} \sum_{d \in S} T_{(o,d),0}\right) / \left(\sum_{o \in S} \sum_{d \in S} T_{(o,d),t}\right)$$



- Time until connectivity indices exceed 0.75
- Uncertainty shown with violin plots
- Comparing across North, Central, and South coast communities
- Time until no longer *islanded*





- Alternative maintenance facility locations along coast
- Changes in time to LCI recovery
- Local repair rate is dependent on accessibility to maintenance facilities





Questions and Discussion



Envisioning Oregon's Coastal Futures Exploring islanding with respect to community assets: Approach and initial results

Advisory Council Meeting June 14th, 2021



Community Assets Accessibility & Community Vulnerability



Big Sur Bridge https://weather.com/news/news/big-sur-california-tourist-bridge-collapse

- What neighborhoods (e.g., Census Blocks) have the longest post-event travel to time to community assets?
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Overall Approach

- Treat the transportation network as a network, with flows of traffic controlled by road capacities and demand generated by movement between source and destination locations in the network
- A **Travel Time Model** estimates the minimum travel time between each source location and each destination location.
- An Acute Hazards Model (managed by *Envision*) generates a M9 Cascadia Earthquake/Tsunami event that:
 - Damages buildings
 - Damages the road network
- The Travel Time Model is run *pre-event* and *1, 3, 7, 30, 90, and 365* days post-event, tracking system recovery.





Community Vulnerability Analysis

- This analysis focuses on understanding potential impacts of a Cascadia event on different population groups' access to community assets.
- The Travel Time model is used on the finer-scale road network, using centroids of census blocks as the source point, and community assets as the destination, to assess pre- and post-event times to access these assets.
- Early stages, methodology, data development underway; results are very "drafty"



Results

- Travel time from census blocks to community assets
- Demographic information at each census block
- Model recovery process of road network





Results

- Travel time from census blocks to community assets
- Demographic information at each census block
- Model recovery process of road network



Community Assets	Demographic Information
Assisted Living	Total Population
Child Care	Asian Population
Churches	Black Population
Community Centers	Latino Population
	Multiple
Grocery	Native American
Health Care	
Libnem	Pacific Islander
Library	White
School	 Over 65 years old
Welfare	- Under 5 years old

Travel time from census blocks to community assets

Demographic information at each census block

Model recovery process of road network

Results

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Oregon State University Oregon Grocery Asian Black Avg. Travel Time (Housrs) Latino Multiple Race/Ethnicity Native American Pacific Islander White 0 0 1 3 7 30 90 365 Time (Days)

Community Assets	Demographic Information	Recovery Proces
Assisted Living	Total Population	Pre
Child Care	Asian Population	1-day
Churches	Black Population	3-days
	Latino Population	7-days
	Multiple	30-days
Grocery	Native American	90-days
Health Care	Pacific Islander	365-days
Library	White	
School	Over 65 years old	
Welfare	Under 5 years old	





Envisioning Oregon's Coastal Futures Discussion

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Discussion Questions:

- What types of policies can be targeted to increase community resilience from the perspectives of Damage, Connectivity, and Community Vulnerability?
 For example:
 - Prioritization of road/bridge retrofits/repairs
 - Identification of critical accessibility gaps and relocation of community assets to close this gap
 - Others???
 - What types of community vulnerability analyses are highest priority? For example:
 - Housing (Who has the ability to protect or rebuild housing? And where?)
 - Livelihood (Who has the ability to sustain employment, return quickly to employment? And where?)
 - Supporting services (Who has the ability to access services such as health care, schools, etc.? And where?)
- What types of recovery resource scenarios should be prioritized or are most likely/salient?



Envisioning Oregon's Coastal Futures Wrap up/Next steps/Project timeline/Other Resilience Efforts

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Ranked list of policies to mitigate Acute hazards From January AC Meeting

- Relocate critical infrastructure away from tsunami zones
- Reroute key transportation routes out of tsunami zones
- Provide incentives/subsidies for construction outside of hazard zones
- Hazard zone development restrictions: Development within safest site or outside of hazard zones
- Provide vertical evacuation facilities in coastal communities
- Relocate community assets (e.g., food banks, community centers, resource centers) away from tsunami zones
- Relocate housing out of tsunami zones
- Reinforce critical infrastructure
- Reinforce critical infrastructure
- Expand Urban Growth Boundaries to allow for new development away from tsunami zones
- Implement more stringent building codes
- Reinforce key road networks and bridges