Anticipating a Tsunami

Settlement Relocation and Adaptation on the Washington Coast

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Internet media









▲ Figure 1. Story-source location map. Estimated 1700 rupture from Wang et al. (2003).





Japanese Clues to a Parent Earthquake in North America

Ludwin, R. 2005. Dating the 1700 Cascadia Earthquake: Great Coastal Earthquakes in Native Stories. Seismological Research Letters 76 (2), p.141. How to plan for an event that last happened 300 Years ago?

... and might not happen again for another 200 years?

Answer: you don't! (only partly joking) Tensions in hazard mitigation and disaster recovery planning, especially with rural and indigenous communities

- Learn from the past / Past trends are not linear
- Make decisions quickly / Know long-term implications, mitigate future hazards
- Need assistance mobilized at a large scale and from outside / Need local initiative and locally sensitive interventions
- Maintain cultural identity / Improve connectivity

<u>Constraints</u> in hazard mitigation and disaster recovery planning, especially with rural and indigenous communities

- Weak capacity for long-term investment
- Complex and informal property rights
- Difficult to implement disaster insurance
 - → Long-distance relocation is much less acceptable

<u>Opportunities</u> in hazard mitigation and disaster recovery planning, especially with rural and indigenous communities

- Strong cultural and economic ties to location and environment
- Rich store of traditional ecological knowledge
 - → <u>Availability of long-term feedback loops</u> and time-tested hazard mitigating practices

What is adaptive planning (vs. only mitigation)?

- Community anticipates an event before it happens
- Begins adaptive process in advance:
 - Take concrete actions beforehand to mitigate an event's harm
 - Move toward future that is capable of incorporating changes produced by a rare but extreme event, while still adapting to other more gradual, on-going and unpredictable changes

2 and ½ Projects

"Project Safe Haven" Vertical evacuation for life safety

- FEMA RiskMap Community Resilience Assessment
 - Replacing conventional hazard mitigation with asset-based long-term adaptive planning
- Magnitude 9 Earthquake Scenarios
 - Probabilistic Modeling, Warnings, Response and Resilience in the Pacific Northwest

PROJECT SAFE HAVEN:

TSUNAMI VERTICAL **EVACUATION** ON THE WASHINGTON COAST



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Neah Bay and La Push Context Map



Figure 1: Neah Bay and La Push context map

Both Tribes are in Clallam County, the northwestern tip of Washington state. Map: Josh Vitulli



Figure 13: The Neah Bay Conversation Café. At the meeting, Makah Tribal members discussed a variety of tsunami evacuation strategies.





Figure 14: Discussion at the Evaluation Meetings Tribal members used maps and suggestions from the Project Safe Haven team members and Design Charrette, then added their local knowledge and priorities to come up with preferred strategies for tsunami vertical evacuation and long-term strategies.

Ocosta Elementary School

Westport, Grays Harbor









Shizugawa High School, Minami Sanriku, Japan





Figure 25: Post-earthquake subsidence at Neah Bay

After a Cascadia subduction earthquake, the land will subside and some of the coastline will be lost. The white arrows show the general route of tsunami evacuation. The map shows post-tsunami development. Graphics: Josh Vitulli

Quinault Indian Nation



Taholah Village Relocation Master Plan Project

WHY RELOCATE THE VILLAGE?



EFFECTS OF A TSUNAMI



Modeled Area of Tsunami Inundation

FEMA RiskMap Community Resilience Assessment

Whole Community Resilience

An Asset-Based Approach to Enhancing Adaptive Capacity Before a Disruption

Robert C. Freitag, Daniel B. Abramson, Manish Chalana, and Maximilian Dixon

By starting the exercise with a broad definition and inventory of assets for everyday quality of life, and then returning to a summary of the comprehensive plan after discussing the earthquake scenario, we found that it was relatively easy for participants to link mitigation and predisaster recovery planning with ideas for enhanced wellbeing in general (i.e., things they want to do regardless of a threat, but which would also be especially helpful if a threat is realized).

Does starting discussions with a focus on community values and assets, as opposed to hazard scenarios and community vulnerabilities, lead to more creative and adaptive community planning ideas and decisions?

Three Rounds of Play (3 hours total)

- Describe your community in terms of quality of life and note the providers of goods and services.
- 2. Reconstruct quality of life right after a disaster.
- 3. Can community reconstruction create a better community?

Round 1

Think about what defines your community (Neah Bay)?

- What goods and services and providers of these contribute to your quality of life?
 - Record goods and services in column 1.
 - Record providers in column 2.

Risk Assessment: Goods and Services for Quality of Life by Noviders						
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	Column 1	Column 2	Column 3	Cotumn 4	Column S	
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Security						
Good Social Relations						
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Round 2

- Immediately following the earthquake What / Who provides the goods and services you listed in Round 1?
 - Record providers in column 3.

	roviders						
Question / Category	Round 1 (Group presentations will follow team discussions)		Round 2 (Group presentations will follow team discussions)	Round 3 (Group presentations will follow team discussions)			
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	Column 1	Column 2	Column 3	Column 4	Column 5		
	Goods and Services	Providers	Post-Event Providers	Providers needed to get community back to a new normal	Parking Lot		
			·				
Basic Material							
for a Good Life							
Health							
Security							
Security							
Good Social Relations							
		N	(
							

Round 3

- Following a Disaster For each of the goods and services that are needed for quality of life from column 1, identify the providers from columns 2 and 3 that would do ALL of the following: (a) best help the community recover over the long term, (b) put the community in better position should another disruption occur, and (c) meet the community's goals for an even better quality of life.
 - Record in column 4. If you think of any providers that do not yet exist, list them in column 5, the "Parking Lot".

			Risk Assessment: Goods and Services for Quality of Life by Pro-	vidura	
Question / Category	Round 1 (Croup presentations will follow team discussions)		Round 2 (Group presentations will follow news discussions)	Round 3 (Group presentations will follow team discussions)	
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	Goods and Services	Providers	Post-Event Providers	Providers needed to get community back to a new normal	Parking Lot
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Cascadia megathrust earthquakes: reducing risk through science, engineering, and planning



Is the consideration of multiple scenarios, framed probabilistically, more likely to reveal a community's adaptive capacity than considering a single conventional generalized/"worst-case" scenario?

Aberdeen















Aberdeen Workshop

Participatory GIS

- Inexpensive compared to other options
 - Regular projector
 - Wii Remote
 - Infrared pen
- Project an image onto a table, and use the pen to create georeferenced shapes









Aberdeen Workshop Results

All groups

- Identified frequently-occurring hazards in Aberdeen
- Identified the Port as a major economic driver for their community and a key to community resilience

Asset-based groups

- Focused on ties with community. Much more open to positive aspects of community
- More open to relocation and cooperation with other communities

Hazard-based groups

Very focused on disaster



Broad Lessons

- The indigenous experience presents extreme cases of the challenges and opportunities facing <u>all</u> efforts in disaster preparedness and recovery
 - <u>All</u> communities can learn from successful adaptation by indigenous communities facing disaster
- Preparedness and recovery planning should:
 - be integrated with general short- and long-term developmental goals
 - make use of both scientific and traditional historical-ecological knowledge
 - strive to increase developmental choice for community members, <u>and to</u>
 - maintain a degree of local self-sufficiency
- Strong social relations within the community can not only help a community to recover from a disruption more quickly but <u>also</u> help it cope with the <u>prospect</u> of unpredictable future disruptions