Scary Science: Communicating Scientific Risk and Uncertainty to Stakeholders and the Public

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Conclusion

- Communicating (sometimes scary) science about the nature and impact of coastal natural hazards is essential for individuals and communities to make informed decisions.
- The uncertainties inherent in the large, dynamic, and complex systems that drive coastal hazards make it hard for humans to make confident decisions. Such decisions do not play to our cognitive strong points.
- People tend to take one view (or model) of the situation as the one correct model and seek the “optimal” strategy for success within that model. More resilient strategies consider a range of models and choose actions that perform “pretty well” over a range of scenarios and that can be adapted as needed by different groups.
- Communicating science in a manner that fosters robust, adaptive strategies will hopefully lead to more hazard resilient coastal communities.
- Key to this communication is a willingness by scientists, educators, and communicators to help decision makers “learn their way through” today’s problems with an eye toward developing resilient strategies to coastal natural hazards.

Sea Grant Extension
Hazards Outreach Specialist

- Oregon State University Extension Faculty, based in Astoria
- I extend research based information and engage local stakeholders in applying science to local problems.
- Focus areas: Impacts of climate change, tsunami preparedness, beach sediment management.
- Stakeholders: Coastal residents, elected officials, federal/state/local agency staff, researchers, NGO's, media.
- "Hazard Resilient Communities" is a key program focus in the NOAA Sea Grant college program implementation plan (2009 – 1013).

Hazard Resilient Coastal Communities

- Hazard Resilient communities are a key program focus in the NOAA Sea Grant college program implementation plan (2009 – 1013). This reflects a "systems" view of the world—like this conference.

- Resilience is a term describing the ability of a system to adapt changes in its environment, without losing control of its function and structure and moving into another state.

- Resilient strategies are "robust"--pretty good over a wide range of modeled future outcomes, and "adaptive" in that they can be modified in response to new information. Assumes uncertainty and multiple decision makers.

- Optimal strategies, by contrast, adopt one preferred model of the world and are strategies deemed to be the "best single choice" for that model. Assumes accuracy of single model and a single decision maker. Optimal is traditional.

- Robust, adaptive, strategies by coastal decision makers can help build hazard resilient coastal communities.

On Human Nature…

- “It ain’t what you don’t know that gets you in trouble. It’s what you know for sure that just ain’t so.” Mark Twain
- Human brains evolved to be afraid of direct threats like lions jumping out on the path in front of us. We did not evolve to fear uncertain threats like climate change or large earthquakes and tsunamis. Our thought processes still reflect this bias and puts us at a disadvantage with regard to climate change and tsunamis.
- It would be nice to think that we are intelligent enough to change our behavior in anticipation of we now know is likely to happen, but there is no evidence to support that notion.
- Humans tend to be systematically overconfident in the face of uncertainty. Recent events and fresh memories have a large effect on peoples’ judgment of uncertain occurrences. Analysis takes a back seat to an intuition based on prior experiences.
- “People don’t change behavior when they see the light, people change their behavior only when they feel the heat.” (Author unknown)

Challenges Communicating Risk and Uncertainty to Public Audiences

- It is hard to describe complex ideas in simple terms.
- Public audiences are diverse. Often non technical, sometimes non critical thinkers.
- Opinions are often viewed as equal to scientific reasoning, especially decisions involving uncertainty.
- People will use what you put out there incorrectly for political purposes.

Communicating the Risks and Impacts of Sea Level Rise on the Oregon Coast

- Larger context: 20,000 BP sea level was 20 miles out! SLR is old news, but is it faster than we can adapt?
- Distinguish impacts of chronic conditions based on cycles (ENSO) within cycles (PDO), from catastrophic events (CSZ quake and tsunamis, Greenland ice sheet collapse).
- Emphasize what is certain from what is uncertain (It is certain that burning carbon CO2 warms the atmosphere, how much, how fast is uncertain.)
- What's at risk and what is not? The coast is great. Problem is putting good things in bad places.
- Reflections on previous regimes (e.g. Bayocean spit, La Nina's of the 1940 - 70s), to remind us of past.
- Individual risk management: If you want to pass down your beach house, set it back, or buy across the street!
- Collective risk management: Ability to adapt and develop robust resilient communities one decision at a time. Cheaper to mitigate than rebuild.

Communicating the Risk of Earthquakes and Tsunamis on the Oregon Coast

- Distinguishing the different scenarios and impacts of local events from distant events. People tend to overestimate impact of distant, underestimate impact of local. (Recall Mark Twain!)

- Distinguish what is certain from what is uncertain. It is certain that the PNW will experience another CSZ, it is uncertain when. These events occur regularly in geologic time. We are 308 years into a 300 – 500 year average recurrence interval. It could happen today or in 200+ years.

- Attributing probabilities to both. CSZ roughly 1:6 in next 60 years. Or, a roll of the dice in your lifetime. Every day that goes by increases the odds of it happening in your lifetime, but not the probability of it happening. Distant event about 1:2 in 20 years. Probably during your career.

- Most coastal residents are in ignorance, denial, or resignation regarding a CSZ earthquake and tsunamis. They have no context for the event. This is my greatest professional challenge.

- Driving cars is one of the most dangerous things we do. That's why we have drivers Ed. Shouldn't we at least have tsunami Ed?

Strategies for Communicating Risk and Uncertainty to Stakeholders and the Public

- Frame within a larger context. Put it in a temporal perspective. Remind peole that we conduct risk assessments all of the time.
- Emphasize what is certain from what is uncertain. Name and contain the fear.
- Relate probabilities to familiar concepts (roll of the dice, gambling odds, luck fishing/hunting, finding parking spots, coin flips)
- Point out the value and weight of the positions of professional organizations compared to individual researchers. Organizations need to be credible. Consensus documents are typically conservative. Individuals are easier to influence than groups.
- When people challenge the use of modeling in climate change and tsunami inundation as speculative, or “smoke and mirrors”, remind them that their retirement investment portfolios are using the essentially the same methodologies. We trust in probabilistic models all the time. (Maybe a bad example given recent events…)
- Expect that confusion will be common when addressing diverse groups. Try to educate stakeholders as you go. Most people “get it” with time. Worry about “most people” not the extremes.

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