

Subcommittee on National Security, Homeland Defense and Foreign Operations
Committee on Oversight and Government Reform
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Statement of Record

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Emergency Management Agency

State of Oregon

'Tsunami Warning, Preparedness, and Interagency Cooperation: Lessons Learned'

Thank you for the opportunity to submit a written statement for the record on today's important hearing before the Subcommittee on National Security, Homeland Defense and Foreign Operations. The topic of tsunami preparedness is especially relevant in light of the recent 9.0 M earthquake and resulting tsunami on March 10, 2011. The impact of this event was felt all around the Pacific basin, with the tsunami reaching, and causing \$7 million in damage in Oregon. There was no loss of life in Oregon from the tsunami due to previous education and outreach funded by such sources at NOAA through the National Tsunami Hazard Mitigation Program, state, and local sources.

Tsunami hazard in Oregon

The 9.0 magnitude Japan earthquake on March 10, 2011 created a subsequent tsunami on the U.S. West Coast. In most instances, the tsunami impacts were negligible, although there were areas of localized damage. One person was killed when swept off a rock near Crescent City, California as he was taking photographs of the event. In Oregon, our impact was small except in the Port of Brookings on our southern coast.

At 1035 hours, approximately 3 hours after the tsunami warning center predicted the first wave would arrive on the Oregon coast, an 8 to 10 foot wall of water struck the Port of Brookings Harbor and caused an estimated \$6.7 mil in damage. This is a small port but a very important port for our south coast and supports 60 commercial fishing vessels, 342 sport/recreation pleasure craft and it's recognized as the easiest bar crossing on our entire coast. The fishing industry is the number one economic activity in this remote part of Oregon and generates \$67 million in economic activity annually for this town of 14,000 residents. It should be noted that our Governors request for Presidential Declaration of this disaster was approved and signed by the President in four days. FEMA responded with personnel and expertise within 24 hours of the incident. In short, the federal response to this disaster was magnificent!

As we reviewed the activities of this event we concluded that we were fortunate that the tsunami inundation was far smaller than estimated, due in large part to the tide was receding to an extremely low level just as the waves were arriving. This acted as a shock absorber which contributed significantly we believe to the relatively low impact. However, the lessons learned by all jurisdictions are invaluable for our future tsunami response planning.

Many valuable lessons were learned during this tsunami event.

1. The federal tsunami warning system, run by the National Weather Service, worked remarkably well, in spite of early technological and IT issues. The alert products were received accurately and in a timely fashion. However, in our after action review, it was noted that when the West Coast and Alaska Tsunami Warning Center (WCATWC) sends alert products, it also sends premium reports which the counties found cumbersome, and in more than one instance, important information was missed due to the volume of data being forwarded. This could be rectified in future events by streamlining the verbiage in the message products.
2. The National Weather Service provided excellent data and warnings to the state and local governments. A key lesson learned is that the NOAA tone alert radios are an absolute must for public buildings, hospitals, schools and all public lodging facilities. Oregon has emphasized the use of alert radios in our educational efforts in order to create redundancy in distant tsunami warning systems.
3. Most tsunami warning sirens worked. However several of these sirens are old and repair parts are no longer manufactured and some failed. But those sirens were operated manually. Widespread reliance on tsunami warning sirens is misguided and can create a false sense of security in the public. It is vitally important that the public understand that they are active participants in the tsunami warning system. Oregon's educational efforts have focused on this personal responsibility in creating a culture of awareness. These tsunami warning systems will be unreliable in the event of a locally-generated Cascadia Subduction Zone earthquake and tsunami.
4. Local law enforcement, along with volunteer fire fighters and Community Emergency Response Teams (CERT) in most cases, effectively conducted evacuations within the forecasted inundation zone. Shelters were established and generally worked well.
5. In some instances, churches and other well-meaning people stood up shelters. Unfortunately, these self-activated centers did not report to local emergency management officers and loved ones were stressed in attempts to locate mostly elderly family members. More training is needed so that sheltering can happen in a more orderly manner.
6. One trend that was observed was that some decision makers did not fully understand the hazard posed by a distant tsunami. In one instance, a small school district superintendent did not take the risk seriously and refused to cancel school. Reports indicate that grade school children were waiting on a dock for the school bus pick-up in a known and documented inundation zone about 30 minutes past the predicted tsunami's arrival. As we now know, the significant wave that struck Brookings did not occur until 3 hours past the prediction of initial wave arrival time. This decision could have been catastrophic.
7. Situational awareness between counties and the state office of OEM needs improvement. County Sheriffs were hampered in communication with adjoining jurisdictions particularly across state lines in Crescent City, California. Oregon is working a pilot project with DHS, Washington, Idaho, Alaska & Montana to create a North West version of virtual USA. Presently we have developed a web based system in Multnomah County that has great potential for local Emergency Managers. Unfortunately, we are funding this from already scarce resources, thus its progress is slow. Had this web based system been employed in our coastal counties, the situational awareness would have been much better.
8. Additionally, the state Emergency Coordination Center will develop a more resilient information system and push information received from one county to all others.
9. Critical information was broadcast on local radio stations in an effective and timely manner. The locally owned stations provided an invaluable service to the public at large and have an excellent

working relationship with local Emergency Managers. One problem discovered in Tillamook County was the lack of information being put out to public in Spanish language. This was noted and will be fixed.

10. FCC digital EAS policies need to be reconsidered. The existing policies mandate the public broadcast messages must be received (digitally) by the radio or TV station. However, states struggle to find the funding to purchase the equipment and develop the procedures to send the message.

11. Another noted phenomenon was that the Hispanic community self-evacuated almost to a person. How they received the information is unclear, but no Hispanic children were in school the day after the event, and employers reported very few Hispanic workers come to work the day of the event. What network they have informally established is unclear, but we are looking into it as something we may emulate. Translation of public education materials into foreign languages is extremely important in making sure that all of our citizenry are safe during tsunami events.

12. Reverse 911 was used, but reports indicate that it was not 100% successful. Lack of telephone switching capacity appears to be the issue and needs to be resolved. This again refers to a lack of financial resources in communities most likely to be impacted by damaging tsunami events. Reverse 911 plays a vital role in providing redundancy in tsunami warning systems, and where it worked well, it greatly aided in a positive action by the public.

This event was an excellent no-notice full-scale exercise. Our systems were tested, and in some instances, failed. Federal state and local, first responders and emergency managers gained tremendous experience with the benefit of a minimal impact to our citizens. Even though one coastal community suffered a serious economic blow, by and large we on the West Coast dodged a bullet!!! The real question now is, are we smart enough to take the lessons learned and improve our systems so we can save lives and recover from a catastrophic event that will happen.

Local tsunami hazard from the Cascadia Subduction Zone

The Cascadia Subduction Zone runs just off our coast and is capable of producing mega-thrust earthquakes similar in size and scope of the 2004 Indonesian and 2011 Japanese earthquake and tsunami.



In some areas, the western edge of the fault is less than 75 miles off of the Oregon coast and slants at a 45 degree angle eastward bringing it under the main continental shelf. The ground shaking from estimated mega-thrust earthquake will be felt from northern California to British Columbia, from the coast to well past the Cascade Range of mountains.

The reaction time from the time of the predicted 8 to 9 magnitude earthquake and ensuing tsunami could be as few as 6 to 7 min, up to 15 to 20 min before a potential 60 foot (or higher) tsunami strikes our coastal communities. We also predict that most, if not all tsunami warning sirens will most likely not be operational due to the significant earthquake. Bridges and roadways will be impassable to vehicles. Communication systems will probably be damaged and probably not functional. Structures will be demolished and injuries and death are a given.

So what have we learned from the Japan earthquake and tsunami and how do we prepare our citizens to survive the coming catastrophic Cascadia Subduction Zone earthquake and tsunami?

Education is a valuable and ongoing need. The public and decision makers need the tools and knowledge to plan for and respond to a catastrophic earthquake and tsunami. Financial resources are needed to create the culture of awareness that will enable the public to be a full partner in preparedness through emergency kits and plans for safety.

Infrastructure and the built environment need to be robust to weather the extreme ground shaking and liquefaction caused by a catastrophic earthquake. A 2007 study¹ by the Oregon Department of Geology and Mineral Industries (DOGAMI) shows a high percentage of hospitals, schools and emergency responder facilities are at a high or very high susceptibility to collapse in a Cascadia Subduction Zone earthquake. Over 300,000 Oregon school children go to school every day in these risky buildings. Oregon has authorized \$30 million per biennium in bonds to retrofit hospitals, schools, and emergency responder facilities. However, only \$22.5 mil has been obligated to date due to the difficult state economic situation. This has allowed Oregon to retrofit 17 schools out of an estimated 906, and 18 emergency service facilities out of an estimated 223 needed.

The Portland Metro Area, and the Willamette Valley presents a host of complex problems and challenges. This area of Oregon concentrates over 85% of the state's population. The state's key infrastructure in terms of electric distribution, natural gas and petroleum all terminate and re-distribute from the three county Portland Metro Area. The curtailment of these essential commodities will hamper response and delay recovery which will have significant social economic impacts on the entire state. Increased resources are needed to prepare the public, not just in the coastal regions, but also the highly populated Portland Metro Area which most likely will also be greatly impacted.

The federal agencies, NOAA, USGS, and FEMA, need to continue to fund scientific efforts through state/federal partnerships in order to fully understand the seismic hazard posed by the Cascadia Subduction Zone and to better define the threat. However the vast majority of federal funding has been tied to physical science and at some point it needs to be shifted to preparedness (education, planning, equipment (alarms, etc..)).

WHERE DO WE GO FROM HERE?

1. Education of all coastal and inland residents is essential. With the known fact that these citizens may only have 6 or 7 minutes between the Cascadia Subduction Zone earthquake event and a major tsunami, there is no warning system that can be relied on to warn citizens. Educating them to understand that if the ground moves, they must move to high ground immediately. They must not wait for some authority to tell them to evacuate.
2. All residents need to have a 72 hour sustainment kit at a minimum. These kits need to be in multiple locations, such as in cars as well as houses, as buildings may be destroyed.
3. Alternative communication means must be employed by local authorities like HAM radios with back-up power, satellite phones. Most likely land line and cell systems will not be available.
4. Funding needs to be enhanced to support state and local efforts to educate and inform citizens. Over the past two years, the Oregon Office of Emergency Management has received FEMA National Earthquake Hazard Mitigation Program (NEHRP) grant dollars, averaging \$81K a year, for earthquake and tsunami preparedness. The office has one person assigned to cover over 363 miles of coast line and the seventeen counties within the Cascadia Subduction hazard zone. This funding is totally inadequate.
5. Funding needs to be increased to provide essential facilities seismic upgrades so local responders can survive in order to render aid post event.
6. Additional funding is required to further develop the tsunami inundation zone data. This is critical to insure that these areas are identified and known for response by outside agencies.

¹ DOGAMI (2007) *Statewide Seismic Needs Assessment Using Rapid Visual Screening (RVS)*. DOGAMI Open-File Report O-07-02.

7. Purchase battery back-up tone alert radios for all coastal residents in or near known inundation zones. This is a small amount of money that could save thousands of lives.

Reauthorization of the TSUNAMI WARNING AND EDUCATION ACT (TWEA)

The State of Oregon strongly recommends the reauthorization of the TSUNAMI WARNING AND EDUCATION ACT (TWEA). This key legislation has created a strong tsunami mitigation program predicated on robust federal/state partnerships.

The State of Oregon recommends strong support for the reauthorization of TWEA and limiting the 27% of the funds authorized under Section 8 to non-federal partners, as was originally intended. Through the National Tsunami Hazard Mitigation Program (NTHMP), strong state/federal partnerships have greatly improved tsunami preparedness and mitigation activities. In Oregon, NTHMP has funded a multi-year educational effort that paid dividends during the recent Japan tsunami when the public knew what to do when the warning was issued, but even more importantly, took proper action. While there is room for improvement, Oregon's coastal residents did remarkably well during the tsunami evacuation because great effort was expended in an NTHMP-funded effort.

Creation of additional Tsunami Warning Centers (TWC)

A 2011 National Academy of Science report² found that the tsunami warning center "mission is critically dependent on technical infrastructure and human capital, both of which the committee assessed to be insufficiently supported." Current funding resources do not allow for the needed robustness in the existing two TWC. The March 11, 2011 Japan earthquake and tsunami event revealed weaknesses in both the IT infrastructure and redundancy capability of the existing tsunami warning centers.

The creation of additional warning centers may in fact jeopardize the ability of the existing TWCs to provide their required functions since they continue to have issues with IT infrastructure and other systems. Moreover, as identified by the recent NAS report, coordination between the two centers is hardly sufficient and adding additional centers will only seek to increase confusion, both in the public and emergency management. If messaging issued by the centers is not simple and consistent, we risk the public's loss of faith.

The argument of a local Caribbean hazard necessitating an additional warning center situated on Puerto Rico is not viable as a justification. The tsunami warning system is not designed to warn of a locally-sourced tsunami and would not be able to respond quickly enough to provide a timely warning to coastal Caribbean communities. The creation of this third center would draw limited funds away from improving the two existing centers, thereby risking the lives and property of American citizens.

Oregon strongly supports increased funding to the two existing tsunami warning centers to improve infrastructure and redundancy capabilities.

Closing Statement

The Cascadia Subduction Zone is over 100 years beyond its cycle of causing a major 8-9 magnitude earthquake. It's a known major disaster waiting to happen. As a nation we traditionally spend very few dollars to prepare for catastrophic events, but spend tremendous amounts of money to respond &

² National Academy of Science, 2011. *Tsunami Warning and Preparedness: An Assessment of the U.S. Tsunami Program and the Nation's Preparedness Efforts*. WA, DC: National Academies Press. Pg. 164.

recover. As we have seen in Japan, one of the most prepared nations in the world with respect to earthquake and tsunami preparation, thousands of lives have been lost. Billions of dollars in infrastructure have been destroyed. Yet, there are numerous examples where buildings that did have seismic fixes are standing and can be used in short order after the quake. These are the choices we have before us. Prepare, or cross our fingers and hope this event happens on someone else's watch.

Thank you for this opportunity to submit written testimony.