Final Annotated Bibliography – GEOG 350

INTRODUCTION:

The Cascadia Subduction Zone Event (CSZE) is arguably the most significant natural threat to Oregon and the Pacific Northwest at large. Projected to be 9.0+ magnitude earthquake, severe shaking is expected for 2-4 minutes, followed by a 700-mile-long tsunami reaching 100 feet in height that will inundate coastal Oregon (OEM, n.d.; Shultz, 2015). The Federal Emergency Management Agency's (FEMA) operating assumption is that "everything located west of Interstate 5 will be toast", taking months to years to rebuild and leaving coastal regions unrecognizable (Shultz, 2015; CISA, 2021; OSSPAC, 2013). Obviously, this is a very large concern for government at the local, state, and federal level and immense resources are being mobilized to research, map, and prepare for its eventual destruction. Unlike wildfires, which occur with relative frequency and are usually confined to hundreds or thousands of acres and impact relatively few people, the CSZE will be felt across the state and require a statewide rebuilding and resupply effort (CISA, 2021).

My motivations for looking into this subject are two-fold. Academically, I am interested to explore the methods that were used to map the impact of the CSZE and explore the types of data are being leveraged to model the impacts of various hazards. The scales, data types, and data sources are all interesting to me and as a geographer, knowledge of what data exist and are available will speed up and improve my own future research. I also have a professional interest in the subject and am interested in using my geography and GIS skills to work on these issues at the state level. The more knowledge I have of the various natural hazards present in Oregon and the kinds of work being done to mitigate them, the more effective I can be at my job. To achieve these goals and to narrow the scope of my research, I have developed three research questions, which are as follows:

- What lines of effort are governments at local, state, and federal levels undertaking to address the threat of the CSZE?
- What analyses and kinds of data are being used to answer these questions?
- How can we humanize the issue and use the experiences of those who have been in similar disasters in the past to inform mitigation and recovery efforts?

ANNOTATED CITATIONS:

Bauer, J. M., Allan, J. C., Gabel, L. L. S., O'Brien, F. E., & Roberts, J. T. (2020). Open-File Report O-20-03, Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford. <u>https://www.oregongeology.org/pubs/ofr/p-O-20-03.htm</u>

This source is a study conducted by researchers at the Oregon Department of Geology and Mineral Industries (DOGAMI) to evaluate the effects of the CSZE on five communities on the Oregon coast. The goal of the report was to provide tsunami evacuation models and FEMA Hazus results in order to understand potential destruction severity for a variety of impacts like building losses, injuries and fatalities, and displaced populations. In addition to the various destruction metrics, the authors created population models designed to provide spatially detailed population estimates for both permanent and temporary residents; very important considerations for locations on the coast whose population varies wildly throughout the year. To account for population distribution differences at different times of day when modeling tsunami evacuation, both daytime and nighttime scenarios were evaluated. The model also included population demographics and the socioeconomic impacts the CSZE would have on each specific community. The report concludes with destruction and fatality metrics and suggestions for government planners.

This source contributes several things to my research. Probably most importantly, it outlines methods for evaluating the impact of the CSZE on coastal communities using the robust and nationally recognized FEMA Hazus model. According to the author, this is also the first report of its kind at the structure level for the Oregon Coast, so can be expanded for use on the entire coast. The portions of the workflow can also likely be adapted for use inland where tsunami inundation isn't a threat, but where structures are still threatened by the CSZE.

Cybersecurity and Infrastructure Security Agency (CISA). (2021). Resiliency Assessment: Oregon Transportation Systems. <u>https://www.oregon.gov/gov/policy/Documents/or-transposystems-</u> <u>RRAP-RA-final-0721.pdf</u>.

This source is the most recent report on the impact of the CSZE on Oregon's various transportation systems. Conducted by the Department of Homeland Security's Cybersecurity and Infrastructure Security Agency (CISA), this Regional Resiliency Assessment Program (RRAP) report covers in greater detail the impact the CSZE will have on specific maritime, air, and road transportation networks and develops transportation routes to quickly establish post-disaster emergency supply chains between impacted areas and previously determined staging areas. As part of the analysis, "islands" of communities that will likely become functionally isolated from the rest of the state were located. These islands were the basis of rebuilding plans for quickly and efficiently reconnecting major supply routes to facilitate recovery following the CSZE. This report also built upon the 2013 Oregon Resiliency Plan and identified specific areas of the transportation infrastructure in the state that should be prioritized when creating future resiliency plans and included recommendations for what those plans should include. Timescale estimations for how long rebuilding will likely take were also included in the report.

This source contributes to my research much like other sources of this type did: by providing authoritative information about the extent of the damage that the CSZE will inflict upon Oregon. With its focus on transportation – one of the most important parts of an effective recovery – it contributed a lot to my understanding of how emergency supplies should be placed around the state and the distribution methods used to get it where it needs to go.

Madin, I. P., & Burns, W. J. (2013). Open-File Report O-13-06, Ground motion, ground deformation, tsunami inundation, coseismic subsidence, and damage potential maps for the 2012 Oregon Resilience Plan for Cascadia Subduction Zone Earthquakes. https://www.oregongeology.org/pubs/ofr/p-O-13-06.htm. This source is the scientific methods papers and resulting maps and data for the analysis conducted by DOGAMI for the 2013 Oregon Resilience Plan, which is included later in this report. Different from the broader legislative reports also cited, it is a set of technical papers that outlines how the maps of the various hazards associated with the CSZE were generated. It explains in technical terms the mechanics of the various hazards, and why they were selected for evaluation. While this report was primarily intended for the 2013 Oregon Resiliency Plan, the authors felt that the wide distribution of the data and maps to various workgroup members necessitated the creation of a specific methods paper. The data was also designed for use by those outside of the state, like university researchers and those interested in the effects the CSZE.

This source contributed to my research because it provides data and methods developed at a very high level to study this topic. I have already used this data previously myself while placing assembly areas in Coos County for anther OSU class, so can personally vouch for the quality of the data. It has also been cited and used in several other documents that I have read about the CSZE, so seems to be a very authoritative source.

Oregon Office of Emergency Management (OEM). (n.d.). *Cascadia Subduction Zone*. Oregon.gov. <u>https://www.oregon.gov/oem/hazardsprep/Pages/Cascadia-Subduction-Zone.aspx</u>.

This source is a portion of a website providing information about the CSZE created by the Oregon Office of Emergency Management (OEM). While not as lengthy or robust as some of the other sources included in this report, it provides clear, easy to understand information about the threat the CSZE poses to Oregon. It also provides links to other resources like the Oregon Resilience Plan and projects that OEM is currently undertaking with respect to Cascadia. OEM also provides information about preparedness for business, communities, and individuals.

I included this source because it is an example of the more accessible information available to the public about the CSZE. A lot of the other sources in this project are technical and full of an "alphabet soup" of acronyms that might discourage the average layperson from otherwise digesting the information. It is always important to remember that all the careful planning in the world can be for naught if those that information is inaccessible and difficult to read.

Oregon Seismic Safety Policy Advisory Commission (OSSPAC). (2013). The Oregon Resilience Plan: Reducing risk and improving recovery for the next Cascadia earthquake and tsunami: Oreg., Salem, report to the 77th Legislative Assembly.

https://www.oregon.gov/gov/policy/orr/Documents/Oregon_Resilience_Plan_Final.pdf

This source is a resiliency report commissioned by Oregon state government in 2011 in order to better understand the CSZE and the impact that it will have on Oregon and the things that go on within it. The mission statement or OSSPAC was "to lead and coordinate preparation of an Oregon Resilience Plan that reviews policy options, summarizes relevant reports and studies by state agencies, and makes recommendations on policy direction to protect lives and keep commerce flowing during and after a Cascadia earthquake and tsunami." Eight task groups were assembled and

were each assigned a specific area to work in. The task groups examined the impact of the CSZE on things like energy, transportation, communications, business, communities, and water. The result was a comprehensive document outlining vulnerabilities and state of readiness for the CSZE. The report found that at the time Oregon was not ready for the CSZE and would sustain very heavy damage that would take months to years to repair. Goals and methods for increasing resilience were also established in order to reduce the impact of the CSZE.

This source is important to my research because it provides a very comprehensive report on the state of readiness for the CSZE and identifies the specific hazards and intensity of those hazards for areas across the state. It is a document that provides not only an authoritative overview of where all of the hazards are in the state, but also how severe they are in easy-to-understand language. It also provides a reference for how the state is doing with respect to their goals eight years later.

Shultz, K. (2015). The Really Big One. The New Yorker.

https://www.newyorker.com/magazine/2015/07/20/the-really-big-one

The Really Big One was an article written in 2015 by Kathryn Shultz and published in The New Yorker that won both a Pulitzer Prize for writing and a National Magazine Award, breaking the story of the CSZE to the public for the first time. It details the history and impacts of the CSZE on the West Coast, comparing it to the earthquake and subsequent tsunami in Japan that ultimately caused the Fukushima Daiichi nuclear disaster. It illustrates how we got to be in this situation and why it will be so bad when it strikes. The history of the discovery of the Cascadia subduction zone is also included, going as far back as the expedition of the Lewis and Clark. Not sugarcoating anything, Shultz describes in vivid detail how the CSZE will unfold, and interviews people with knowledge about evacuation and long-term plans, highlighting how difficult it is to evacuate residents out of the tsunami zone and for the necessary seismic improvements to be made to buildings in the path of disaster. Her main point is that Oregon is woefully unprepared.

This source contributes to my research because it is an example of the way that most people would likely hear about a hazard like the CSZE. Much like the OEM website, the language is easy to understand and the format is accessible, but the article still contains valuable information about the topic. Not everyone will seek out and read the research behind a news article, so it is the job of the journalist to correctly interpret what the research says and accurately report the contents back to the layperson.

Saito, M. (2021). *Ten years on, grief never subsides for survivors of Japan's tsunami*. Reuters. <u>https://www.reuters.com/investigates/special-report/japan-tsunami-survivors/</u>.

This source is a series of stories about survivors of the 2011 earthquake in Japan, which has been compared to what the CSZE might be like in the US. It is a hard-hitting piece full of longing and loss; stories from those who lost loved ones in the tsunami and still grieve today, a decade later. If there is one source to read of any of the ones I have included in this report, it is this one. I chose it because stories like these are what motivates me to do what I do. Preventing parents from losing children, losing loved ones, losing friends is what I want to do and how I want to serve. Stories like these humanize those impacted by a disaster. They can't be just numbers on a piece of paper. The decisions made by those in power about how to respond to a disaster have real world consequences.

University of Oregon, Community Service Center, Oregon Partnership for Disaster Resilience. (2016). Coos County Natural Hazard Mitigation Plan (Volume 1: Basic Plan).

https://www.co.coos.or.us/sites/default/files/fileattachments/sheriff039s_office/page/1425 1/coosnhmp_volumei_basicplan_adoption.pdf.

This source is the Coos County Natural Hazard Mitigation Plan. A collaboration between the Community Service Center, Oregon Partnership for Disaster Resilience, and the University of Oregon, it is a local version of the Oregon Resilience Plan and identifies specific hazards that Coos County faces and sets goals for increasing the county's resilience to specific natural hazards. The goal of the mitigation plan is the comply with federal statutes and to align with state- and country-wide mitigation and land use plans. The plan also lists occurrences and damage levels of each specific hazard identified as being present in the county.

This source is included in this report because it is an example of what a smaller jurisdiction might develop as a hazard mitigation plan. Because of the reduced resources, these plans are typically less robust then state or federal level reports, but still include information about a jurisdiction's response to a disaster. The comprehensiveness of the reports will vary by jurisdiction size, with more populous areas having more comprehensive plans than less populous areas with access to fewer resources.

Wright, K. A., Kelman, I., & Dodds, R. (2020). Tourism development from disaster capitalism. Annals of tourism research, 103070. Advance online publication. <u>https://doi.org/10.1016/j.annals.2020.103070</u>.

The last source included in this report is about tourism related disaster capitalism. The authors of the paper highlight that rebuilding homes and communities after a disaster is not always a priority for those controlling the process, and that "[t]he goal of reconstruction can instead be extractive, grabbing of resources and exploiting disaster-affected people." The paper covers several case studies that highlight methods used by those with power to remove residents from where they were living pre-disaster to promote tourism in the area post-disaster.

This paper is included in this report because it showcases a problem that occurs after disasters similar to the CSZE. While disaster capitalism is probably less likely to happen in Oregon, it is still an important consideration when planning for a recovery. Those most impacted by a disaster are usually those most vulnerable to it in the first place for a variety of reasons like access to resources, race, gender, or age. Ensuring that they receive equitable access to aid following a disaster is essential, and preventing predatory practices be those who have the most to gain is important for ensuring an effective recovery for those that need it the most.

INTERPRETATION:

After researching my topic, the takeaway I had was that while there has been a lot of work done to prepare for the CSZE, there is still much more work to be done. The vast majority of the proposals and plans that I reviewed were focused on planning for and increasing resilience to the CSZE, but very little of it showed real world application. By having conversations with those that are working on this issue at the state level, I know that there are some tangible results coming that will have impactful results, but it seems that everything is still in the planning phase. I suppose that this is understandable. After all, if a solution comes from government and requires money, the legislature needs to approve and allocate funds in a spending bill, which they are not always willing to do; a politician that is perceived as wasting money does not last long in an election. That being said, the plans that I reviewed are comprehensive, data supported, and propose measures that will have a measurable impact on response times and preparedness. The inclusion of community resources in recovery measures, especially in the Coos County Mitigation plan, was encouraging. One of my biggest takeaways from *At Risk* was that humans are a resilient bunch that are generally willing to help. Members of a community usually know what is best for their community and are willing to put in time and effort to make sure that their neighbors are taken care of.

I am encouraged that the plans I reviewed as part of this project did have a focus on equity and recognized that those most likely to be impacted most severely by a hazard are also the most vulnerable to it. There is a recognition that not everyone has the same access to resources or power and that an equitable – rather than an equal – response can help to alleviate that additional strain that poverty places upon those in a disaster. By having discussions with those tasked with implementing the Oregon Resilience Plan and the Transportation Resiliency Assessment, I believe that there is a desire to correct past wrongs and work towards a more equitable future. Those lines of effort that I have reviewed and been a part of certainly have taken into account factors like race, sex, language, education, insurance, and income that we have talked about in this class. While this class has used very few examples of disasters in the United States, the lessons learned from disasters around the world are certainly still applicable in disasters that happen here.

The Cascadia Subduction Zone Event is just another challenge that needs to be overcome. Due to its immense scale and the potential for destruction, careful planning that aims to increase resilience, eliminate risk, and mitigate the impact of the hazards on the population is needed. Finding motivation in stories from similar disasters around the world and implementing the measures that are proposed in the various plans cited above and by taking into consideration the way that the public encounters and consumes information, we have the power and resources to create a resilient future that minimizes the impact of the CSZE and mounts an effective, equitable, and efficient response.