The Cascadia Subduction Zone spans over 700 miles and has the capacity to cause major high-magnitude earthquakes. The latest earthquake occurred in British Columbia in 2012 with a magnitude of 7.7. These earthquakes can cause massive tsunamis, which could be devastating to the coast of the Pacific Northwest. A report compiled by the Oregon Department of Geology and Mineral Industries found that if this event occurred (at a magnitude of 9) it would cause an economic loss of an estimated $32 billion ("Cascadia subduction zone earthquakes : a magnitude 9.0 earthquake scenario", 2013).

To engage with this topic, I decided to create a more large-scale web map that shows the damage that tsunami scenarios would cause to infrastructure (roads, bridges, buildings) and people (total population). This could be used as a public-facing interactive tool that would allow the public to get a general idea of how destructive this event could be. I also decided to add a real-time monitoring component as well.

In order to visualize the impacts on people and infrastructure, multiple shapefiles from OregonGEOHub were used. These include buildings, census block data, bridges, and roads. The tsunami scenarios were obtained from the Oregon Tsunami Clearinghouse. While multiple scenarios are included, only the small, medium, large, extra-large, and extra-extra-large were used. The NOAA DART (Deep Ocean Assessment and Reporting of Tsunamis) API was used to include real-time images of ocean conditions. The coordinates for these points were found on this website and were assigned to each point.

The Leaflet library was used for the main mapping interface and for the loading of these shapefiles. Mapbox was used for a custom base map and the hosting of the buildings' GeoJSON. In order to get information about the tsunami destruction, ArcGIS Pro was used. The census and building shapefiles were converted to points and a select by location (within) was used. After viewing the statistics in the resulting attribute tables, these properties were then added to the GeoJSONs globally. Turf.js was used to calculate the number of bridges and filter the displaying of them. Another major library that was used is Chart.js. This allows for the creation of the chart object and the updating of data.

I wanted to add some animation to the tsunami scenario. I tried multiple libraries (anime.js, d3.js, cesium.js) but none of them seemed to work with the existing structure I had to load in the scenarios. Despite this, I still gained a lot of experience in building interactive cartography products. My chart functionality worked as I had planned and I was able to get all of my data layers to dynamically respond to the selected tsunami scenarios (in a somewhat hacky way).

Through this project, I gained familiarity with learning new libraries and integrating them within a mapping project. I also gained some geoprocessing skills. If I had more time, I would have liked to integrate city limits and create a "breakdown" of how each city would be affected. However, this would be time-consuming because each city limit (29 total) would need 5 separate scenarios (with 4 separate sums for each). I also think that adding an animation element may "draw" users in and be more engaged with the information presented.

Sources:

British Columbia. Geological Survey Branch., Cascadia Region Earthquake Workgroup., Washington . Division of Geology and Earth Resources., Oregon. Department of Geology and Mineral Industries., National Earthquake Hazards Reduction Program, United States. Federal Emergency Management Agency., & United States. Department of Homeland Security. (2013). *Cascadia subduction zone earthquakes : a magnitude 9.0 earthquake scenario, update 2013*. Cascadia Region Earthquake Workgroup.