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MUSA 509 Final Project Proposal

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Abstract

The Rose Canyon fault in California runs through San Diego City. The fault was thought to be dormant for years resulting in woefully unprepared earthquake infrastructure in San Diego. Although the risk of a high magnitude earthquake is lower than cities surrounding the San Andreas Fault, the city's lack of earthquake ready infrastructure can severely damage San Diego. Recent studies have noted that the Rose Canyon fault has the potential to produce a 6.9 Magnitude Earthquake. Additionally, the San Andreas Fault, which runs through Eastern San Diego County, can also create a significant earthquake, resulting in moderate-light damage for San Diego City. This web application explores San Diego's earthquake readiness and the potential public building costs associated with a worst-case scenario Earthquake, here estimated to be magnitude 6.9. The web application asks for a zip code within San Diego or one of its surrounding metropolitan area as an input. Once the zip code is chosen, a map of potential damage for San Diego is produced using the centroid of the selected zip code as the epicenter.

The public cost of a future earthquake is estimated by summing the expected damage to each public infrastructure site in the affected region. The damage to each infrastructure site is calculated as a function of three variables:

1. The monetary cost/value of the infrastructure in question
2. Earthquake intensity (a function of distance from the earthquake epicenter)
3. The "shaking potential" of the infrastructure site's location

We will determine the earthquake intensity by creating a series of buffers surrounding the epicenter. For this study, the earthquake intensity buffers will be the same as the average intensity distances from the epicenter of a similar 6.9 Earthquake outside San Jose in 1989. The associated damage with each subsequent buffer is exponential. Each buffer will have half of the associated damage of the previous buffer. Based on each census tract's buffer region and shakability score, the earthquake risk associated with each census tract is determined. On this page we may also give the user the option to display the location of historic earthquakes. Finally, the user is given the option to examine the earthquake's impacts within a chosen zip code for page 3. On page 3, there will be a map of all the points of affected infrastructure and the estimated damage incurred by each. There will also be a table presented with this information as well. Finally, based on the region's score, we will calculate the public building repair cost for the entire region.

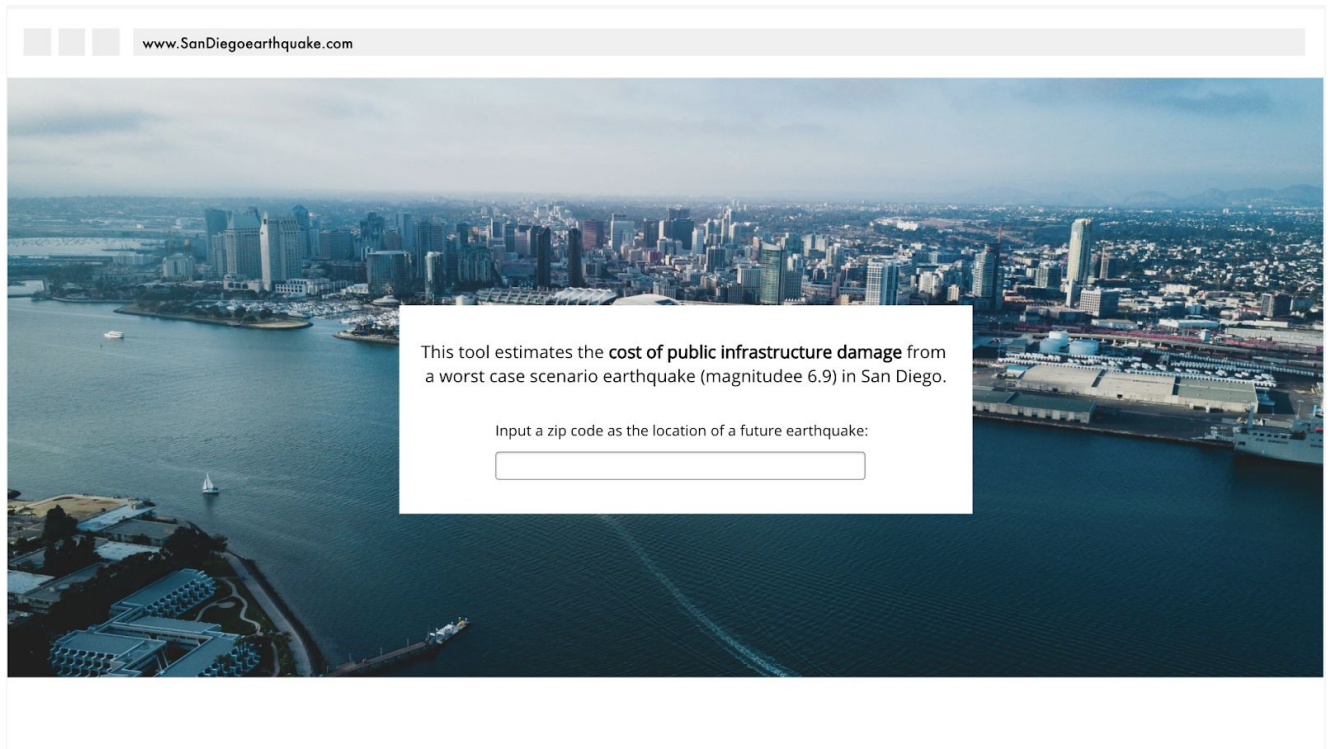
Data Sources

1. San Diego Infrastructure dataset -geojson available
 - <https://data.sandiego.gov/datasets/facilities-assessment/>
2. Census data - For census tracts and zip code
3. Earthquake shaking potential as polygons-
 - GeoJSON:
https://opendata.arcgis.com/datasets/6c4b37155b6a40e1b40f8211f8d8dde7_0.geojson
4. Past Earthquakes within the San Diego Metropolitan Area
 - <https://earthquake.usgs.gov/earthquakes/map/?currentFeatureId=ci3329122&extent=32.07094,-117.70203&extent=33.90006,-114.45007&range=search&sort=largest&timeZone=utc&search=%7B%22name%22:%22Search%20Results%22,%22params%22:%7B%22starttime%22:%221600-11-11%2000:00:00%22,%22endtime%22:%222020-11-18%2023:59:59%22,%22maxlatitude%22:33.312,%22minlatitude%22:32.343,%22maxlongitude%22:-116.027,%22minlongitude%22:-117.378,%22minmagnitude%22:2.5,%22orderby%22:%22time>
5. San Diego address dataset - geojson available
 - <https://data.sandiego.gov/datasets/address-points-apn/>
6. San Diego Municipal Boundary
 - https://opendata.arcgis.com/datasets/ccbaf8862171465cad234108cd098b47_0.geojson

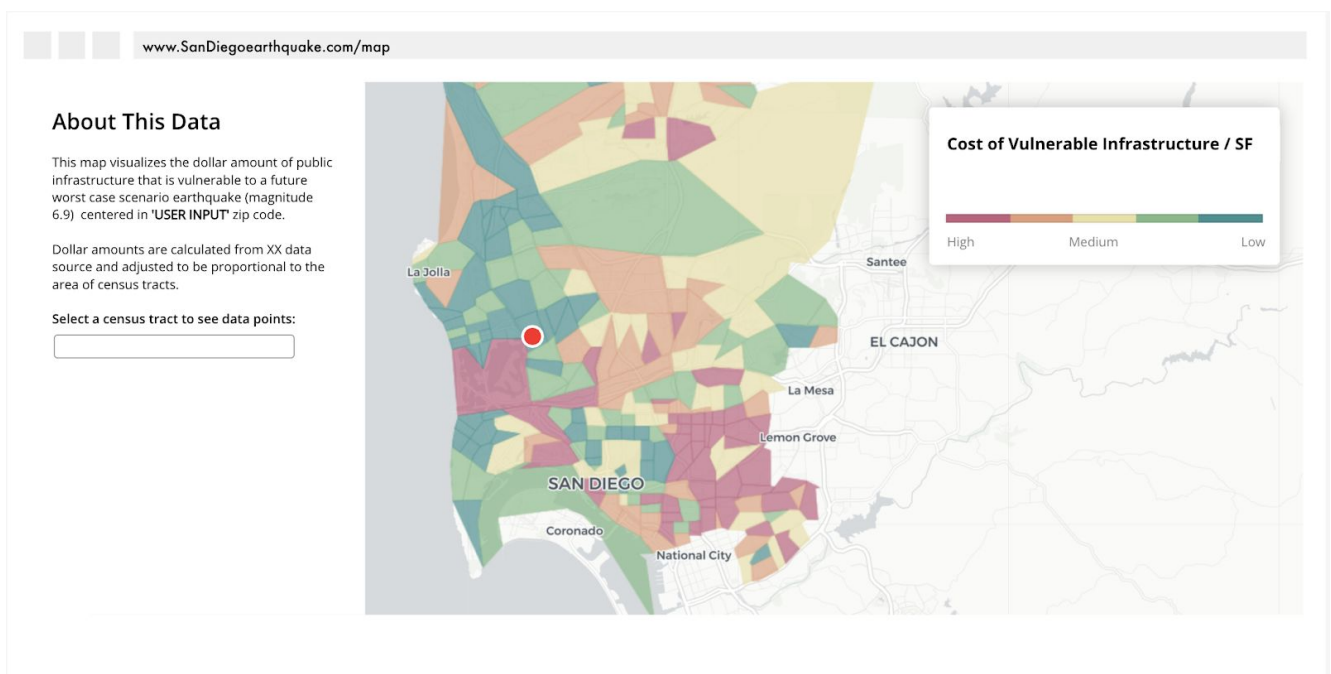
The largest dataset is the address dataset. There are 1,300,000 address points within San Diego County. However, this dataset will be clipped to only include San Diego City, which has 480,000 address points. It will be used to understand infrastructure density (number of buildings per square KM) as part of the metric. We plan to host the dataset on AWS RDS.

Wireframe

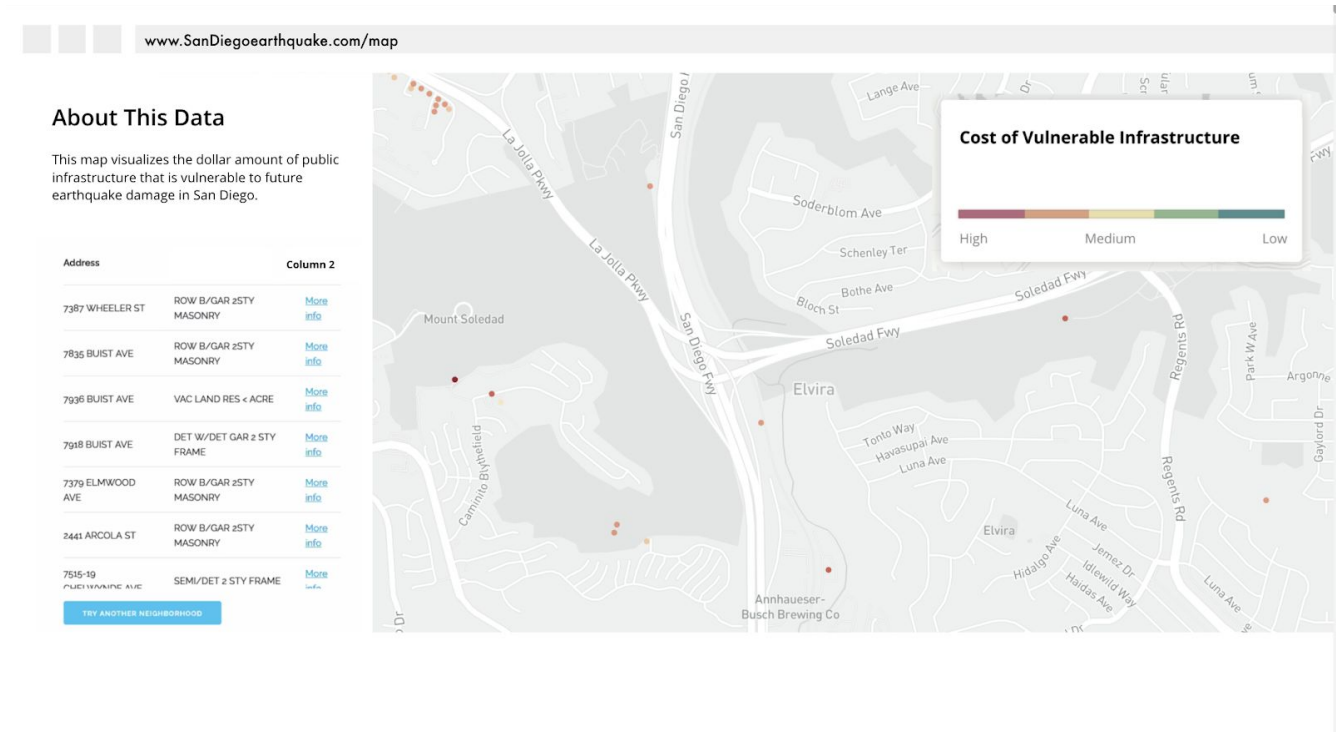
Page 1:



Page 2:



Page 3:



Information Sources

- Earthquake Scenario Overview:
<https://www.earthquakeauthority.com/Blog/2020/rose-canyon-fault-earthquake-prediction>
- Loma Prieta Earthquake Link:
<https://earthquake.usgs.gov/earthquakes/eventpage/usp00040t8/dyfi/intensity-vs-distance>

Document Link

https://docs.google.com/document/d/1IGzItlYVaia1FZ_RE2AISQhjEEpv7q5iaqYktGPTGQ8/edit