Social Vulnerability Index & EPA Superfund Sites.

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Abstract

There has been more awareness on how often socially vulnerable individuals are affected disproportionally by environmental hazards. In 2020 European Environment Agency's report showed that people who are already disadvantaged are affected disproportionately by pollution and climate change (Kazmierczak, 2020). In the South Texas City of Donna, there is a designated Superfund site that covers the Donna River and Reservoir canal which is close in proximity to colonias, "which are rural neighborhoods with poor infrastructure inhabited by the Mexican American working poor" (Adelita Cantu, Margaret A. Graham, Ann V. Millard, & Isidore Flores, 2016; Adelita Cantu, Margaret A. Graham, Ann V. Millard, & Isidore Flores, 2016). This research aims to observe correlations between the CDC Social Vulnerability Index (SVI) and superfund sites in Hidalgo and Cameron County. In addition, to bringing awareness that often pollution affects those who are most vulnerable. Analyzing Environmental Justice is helpful as it brings awareness of how environmental pollution affects everyone at a local level, and it might encourage better community communication between research institutions and local governments. Data from the Texas Commission of Environmental Quality and the CDC Social Vulnerability website. This data will initially be looked at in ArcGIS online and then converted to a CSV based on the distance to the superfund site.

Introduction

In Hidalgo and Cameron county combined there are a total of four superfund sites located in different cities. Three out of four of these locations are not active and remediation has been completed.

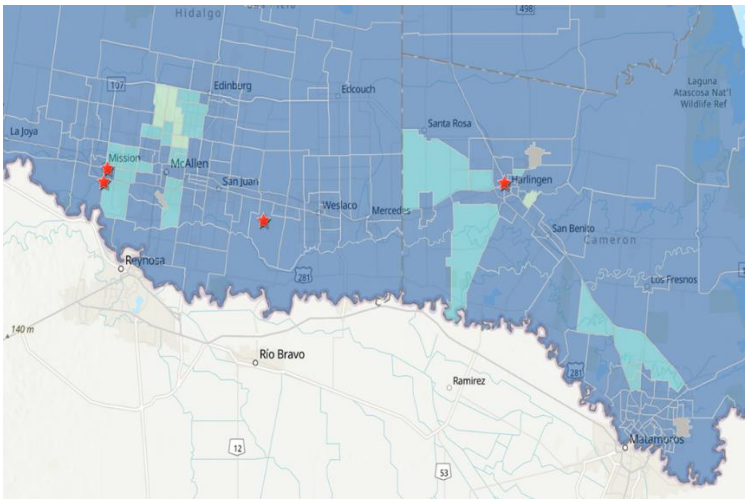

Figure 1: Superfund Site Location Cameron Co. and Hidalgo Co.

Figure 2 shows the following four superfund sites (TCEQ, 2021):

1.Site Name: Niagara Chemical
It's located near downtown Harlingen occupying 2 acres west, initially, this location was a plant producing dry and liquid pesticides from 1946 to 1962, and storage of these pesticides continue up until 1968. Soil and groundwater were found to be contaminated with arsenic and organochlorine pesticides during the remedial investigation. The current status of this site is considered complete as of 2013 and there have been no additional environmental response actions. Latitude and Longitude 26.196256, -97.701806

2. Site Name: Donna Reservoir and Canal System Donna TX
It's located south of the City of Donna, it includes 400-acres of the Donna Reservoir and extends north from the Rio Grande River 17 miles with lateral canals that extend 5.6 miles east and west. The suspected source of contamination is a concrete siphon constructed under the Arroyo Colorado River. Remediation actions began in March 2020, but contamination identification was identified in 1993 when PCBs were detected from the fish. Street Address: South Texas, North of Rio Grande River Donna, TX 78537

3. Site name: Hayes-Sammons Warehouse
It's located at Miller Avenue and Eighth Street, in downtown Mission. Contaminants were released from the contents of the warehouse building into the soil. These warehouses stored commercial-grade pesticides from 1945 to 1968. All remediation actions were completed in October 1998. Latitude and Longitude: 26.213549, -98.323194

4. Site name: Munoz Borrow Pits
It's located 0.1 miles south of U.S 83, on the east side of Texas 1016 in the city of Mission. Contaminated soil was used as fill in the late 1950s. Groundwater, Soil, Sediment, and Surface water were contaminated with Arsenic and Pesticides. The cleanup for this location has been completed. Latitude and Longitude: 26.11'15" N, -98.20'02" W.

The CDC Social Vulnerability Index (SVI) indicates vulnerability based on collected U.S Census tracts information. 15 social factors are then divided into four themes. Figure 2 shows the four themes.

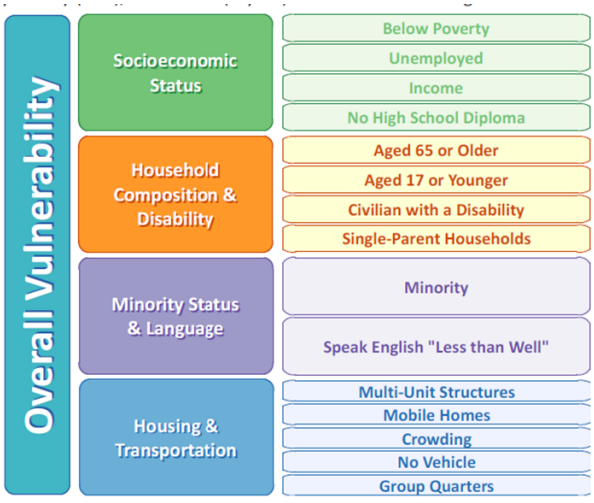

Figure 2: SVI Themes (CDC, 2017)

The tracts are then ranked among the others in the state to be easily mapped and analyzed. The track rankings are based on percentiles, which range from 0 to 1, the closer the value to 1 the greater the SVI (CDC, 2017).

Methods

The data was analyzed using ArcMap online and Jupiter notebook. On ArcMap online, the 2014 SVI shapefile was added as well as the State of Texas superfund site shapefile. These shapefiles were found on the ArcMap online layers, however, the data can also be downloaded and zip and added into the content section of ArcMap online.

The data was then cleaned and saved as CSVs and uploaded into Jupiter Notebook. For Hidalgo Co. and Cameron Co., the SVI for the 5 surrounding census tracts were gathered and an average was calculated. In addition, within Harris Co., Brazoria Co, Nueces Co, Cameron Co, Calhoun Co., Galveston Co. the total superfund site locations were counted and categorized with ‘yes’ or ‘no’ as being in a census tract that showed an SVI greater than .750.

Overall utilizing the python Pandas package and NumPy package to clean and understand the data was a success. However, with categorical data, I was having a hard time understanding and coding a chart that could display the spatial trends.

Results

When observing the SVI and the location of the superfund sites in both Hidalgo and Cameron County all locations had a mean SVI that was greater than .750 which indicates that they are all in areas considered to be a high vulnerability as shown in Figure 3. Out of the four sites, the Donna Canal was the one where the most SVI was shown as seen in Figure 4.

Site ID	SVI 1	SVI 2	SVI 3	SVI 4	SVI 5	mean	Site ID	Location	Site Name	Latitude	Longitude
C1	0.9627	0.8992	0.8883	0.8980	0.9095	0.91154	C1	Cameron	Niagara Chemical	26.196256	-97.701806
H1	0.9330	0.9404	0.9665	0.9791	0.9839	0.96058	H1	Hidalgo	Donna Cannal	26.152212	-98.083630
H2	0.6457	0.9269	0.7360	0.6201	0.9903	0.78380	H2	Hidalgo	Hayes-Sammons Warehouse	26.213549	-98.323194
H3	0.9012	0.5659	0.9352	0.9962	0.9903	0.87776	H3	Hidalgo	Munoz Borrow Pits	26.187500	98.333889

Figure 3. Hidalgo Co. and Cameron Co. SVI

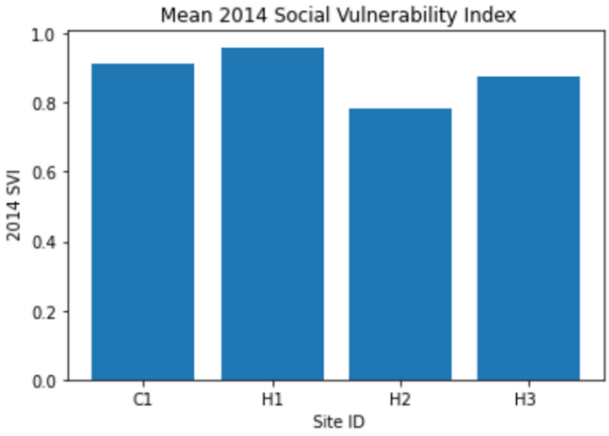

Figure 4. Mean SVI for Cameron and Hidalgo Superfund Sites.

In addition, when looking at other counties the results vary from different superfund sites being located in different areas. For example, when looking at the other eight counties total, 28 out of 49 sites are in the highest indicated socially vulnerable areas. In addition, each County seems to have a unique trend of superfund sites and SVI. For Brazoria Co, only one out eight superfund site locations was located on a tract with an SVI greater than .750.

Discussion

While this research only looked at very few locations a loose trend can be observed where superfund sites both active and inactive seem to be located for the most part on census tracts that showed a high vulnerability. In addition, when looking at Hidalgo Co. and Cameron Co the only currently active site is the one located in the highest SVI area. This area is in Donna TX and like previously mentioned the site is located close to Colonias.

However, as observed in other counties it is not always the case that the majority of superfund locations occur on only high SVI areas. This could be because of the economic and social diversity of the area and also things like population size.

These two different results show that further analysis needs to be conducted not by the overall SVI but by the SVI theme to better understand if there is a trend between superfund sites and high vulnerability.

Bibliography

Adelita Cantu, P. R., Margaret A. Graham, P., Ann V. Millard, P., & Isidore Flores, P. (2016). Environmental Justice and Community-Based Research in Texas Borderland Colonias. *Public Health Nursing*, 65-72.

CDC. (2017). *SVI 2014 Documentation .* CDC .

Kazmierczak, A. (2020, Nov 23). *How do environmental hazards affect vulnerable groups in Europe? — European Environment Agency*. Retrieved from European Environment Agency: https://www.eea.europa.eu/articles/how-do-environmental-hazards-affect

TCEQ. (2021, April 3). *Superfund Sites by County*. Retrieved from TCEQ: https://www.tceq.texas.gov/remediation/superfund/sites/county