The Distributions of Various Socio-economic Demographic Variables and NEI Emissions Facilities in Los Angeles County

It is important to analyze the geographic distribution of polluting facilities and their emissions to look for areas or neighborhoods that may more heavily experience the negative impacts associated with polluting centers, particularly those that release air pollutants that diffuse into the surrounding atmosphere. Based on previous findings (Ponce et al.) and personal observation, I hypothesized that the aforementioned neighborhoods would exhibit indicators of lower socio-economic conditions than those neighborhood less affected by polluting sources. In this study, I compare the spatial distribution of NEI facilities and their emissions with the distribution of key socio-demographic variables in Los Angeles County, CA.

Methods:
1. I performed a spatial join to geographically associate the NEI data with the census tract data.
2. I then mapped the census data based on census tracts.
3. I then created density surface layers for NEI facilities and NEI Emissions (CAPS + HAPS) using the Spatial Analyst Tool.
4. I overlaid the density surface maps with underlying census demographic maps and visually assessed any correlation.
5. I then used the Zonal Statistics function to calculate the mean NEI facility and emissions density per census tract (CT) and subsequently joined the output table to the census tract data.

To quantitatively assess correlation, I created scatter plots for socio-demographic variables versus mean facility and emissions density per CT and performed a correlation analysis to determine any correlation between the two variables.

Results:
Based on visual assessments of the density surfaces overlain on the underlying census maps, I observed a positive relationship between mean facility density and population density, poverty level, Hispanic/Latino population, foreign born population and the non-English speaking population. Oppositely, I saw a negative relationship between mean facility density and home value, income level and educational attainment. All of these observations were confirmed by the correlation analysis, with educational attainment, Hispanic/Latino population, and poverty level showing the strongest relationships with mean facility density. For example, census tracts (CTs) with high poverty are concentrated near downtown and areas with high facility densities. In contrast, CTs with low poverty show a strong negative relationship with mean facility density.

I then created density surface layers for NEI facilities and NEI Emissions (CAPS + HAPS) using the Spatial Analyst Tool and mapped the census data based on census tracts. I overlaid the density surface maps with underlying census demographic maps and visually assessed any correlation. The population density appears to be concentrated near downtown and near areas with high facility densities. While the correlation coefficient is positive, it does not show a direct parallel relation with facility density. In fact, the facility appears to be located in areas with low population density, which may be the result of surrounding CTs with higher population densities.

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The non-English speaking population - distributed throughout the inland LA basin and near the port of LA - showed a strong positive relationship with mean facility density. The NEI facility density surface shows three “epicenters” - where facilities appear to be concentrated. One is in northern LA county, while the other two - a central subcenter located near East LA and a southern center - both of which are located inland. You can also see “facility voids” that stretch westward and northward.

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The Hispanic/Latino Community is concentrated near downtown and East LA, as well as near the port of LA. Hispanic/Latino population showed a strong positive relationship (r = 0.572724) with mean facility density.

The non-English speaking population - distributed throughout the inland LA basin and near the port of LA - showed a strong positive relationship (r = 0.689087) with mean facility density.

The distributions of various socio-economic demographic variables and NEI emissions facilities in Los Angeles County.