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Environmental Justice in California: An Analysis on the Correlation Between Toxic Release and Population Distribution

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Environmental Studies, Colby College, Waterville, ME

Introduction

Environmental Justice is a movement that was born in the early 1980s to assure fair distribution of environmental risks and benefits (Bullard 1996). In many occasions, minority communities are more affected by environmentally hazardous substances and activities than other population groups. This normally happens because they either ignore the problem or have less power to have an opinion about it (Cutter 2006).

For this research project I used GIS tools to analyze the relationship between toxic release and population distribution by ethnic group in California. I evaluated whether minorities live closer to toxic sites than the rest of the population, and therefore examine if there is a case of environmental injustice in the state.

Methods

I obtained Census tract and population distribution by ethnic group data from the United States Census Bureau (U.S. Census Bureau, 2009-2013 5-Year American Community Survey). The data on the distribution of toxic sites was obtained from the Toxic Release Inventory (TRI) as a list of addresses -TRI is a program from the EPA in which manufacturing facilities throughout the US report releases of more than 650 toxic chemicals (EPA 2015).

First, I projected the map using the NAD83, UTM Zone 11 coordinate system. The list of TRI facilities was geocoded to create a point layer that could also be displayed with the population distribution by census tract layer. A 1km buffer area was created around each TRI facility, and intersected with the population distribution layer. I repeated this process three more times using 5, 10 and 20 km buffer areas. Using the erase tool I separated the four buffer areas, and with excel I calculated the percentage population of each ethnic group living 1,5,10, and 20 km away from a TRI facility. Finally, I used IBM SPSS Statistics 22 to analyze the difference in the distribution of Hispanics in the four buffer areas.

Results

The greatest density of toxic facilities is located in the center and south of the west side of the state, in Los Angeles, Orange, San Bernardino, Riverside, San Diego, Santa Clara, Alameda, Contra Costa, San Joaquin, and Kern Counties (Figure 1). All of these, except for San Joaquin and Kern County are in the top ten most populated counties in the state, and together they account for 70% of California’s total population.

Those census tracts a km away from a TRI facility are significantly more likely to be occupied by Hispanics than Whites ($p<0.001$) - in these buffer areas the number of Hispanics is greater than Whites by 30.28%. On the contrary, as the areas around TRI facilities increased, the amount of white residents also increased - 20 km far away from TRI facilities the white population exceeds Hispanics by 20.83%.- indicating that white residents live further away from TRI facilities than do minority groups (Table 1).

Buffer zones (km)	Ethnic Groups (%)							
	White Population	Total Minorities	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Hispanic	Other Minority Groups
0-1	23.79	73.05	6.32	0.25	12.49	0.33	54.07	0.19
1-5	32.26	61.98	6.08	0.26	14.10	0.37	42.39	0.20
5-10	41.82	47.53	5.13	0.33	12.03	0.29	29.79	0.20
10-20	48.12	39.52	2.97	0.42	7.48	0.28	27.29	0.22

Table 1. Population distribution by ethnic group inside a 0-1,1-5, 5-10, and 10-20 km buffer area from a TRI facility.

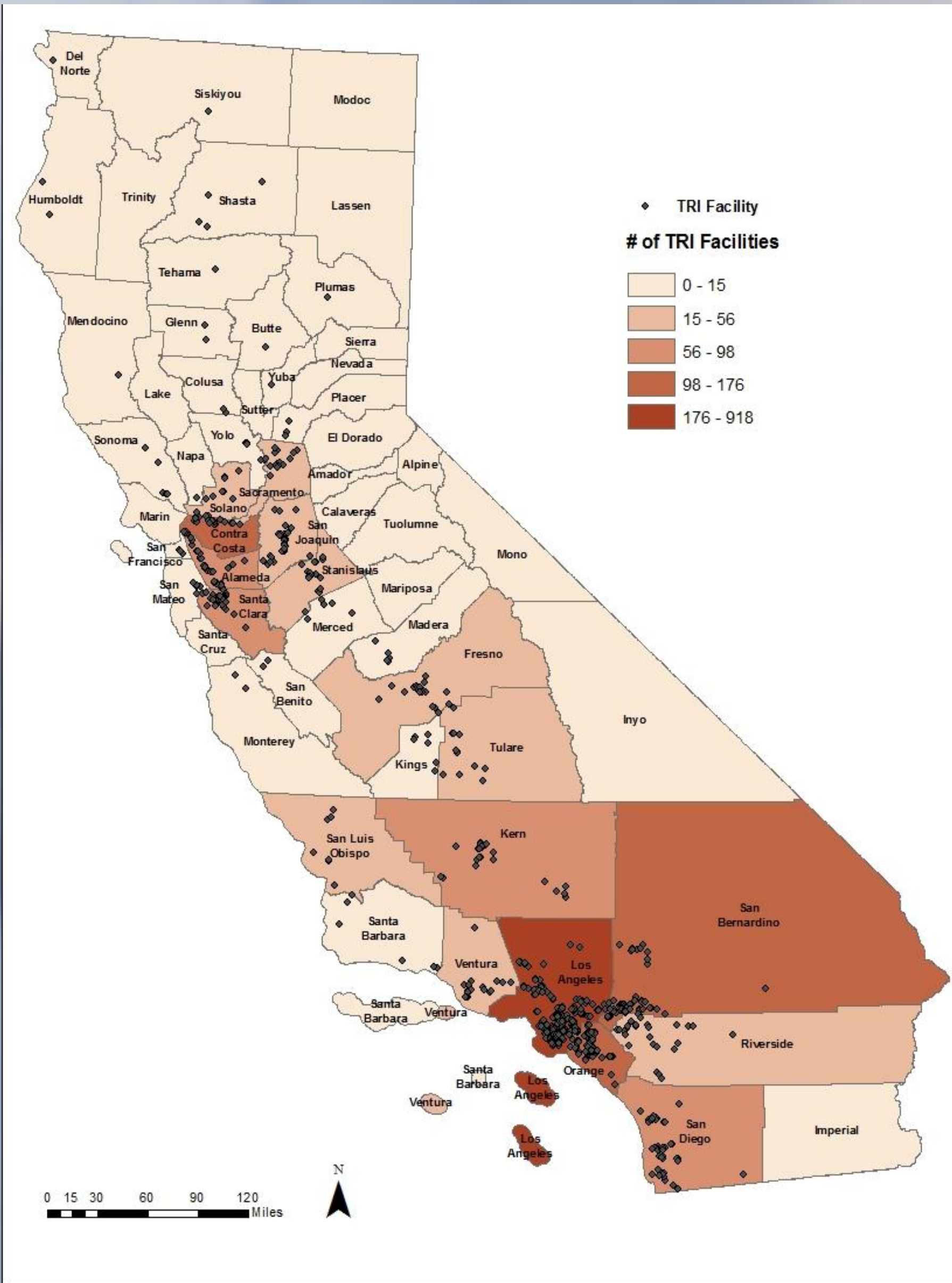


Figure 1. TRI Facility Distribution in California.

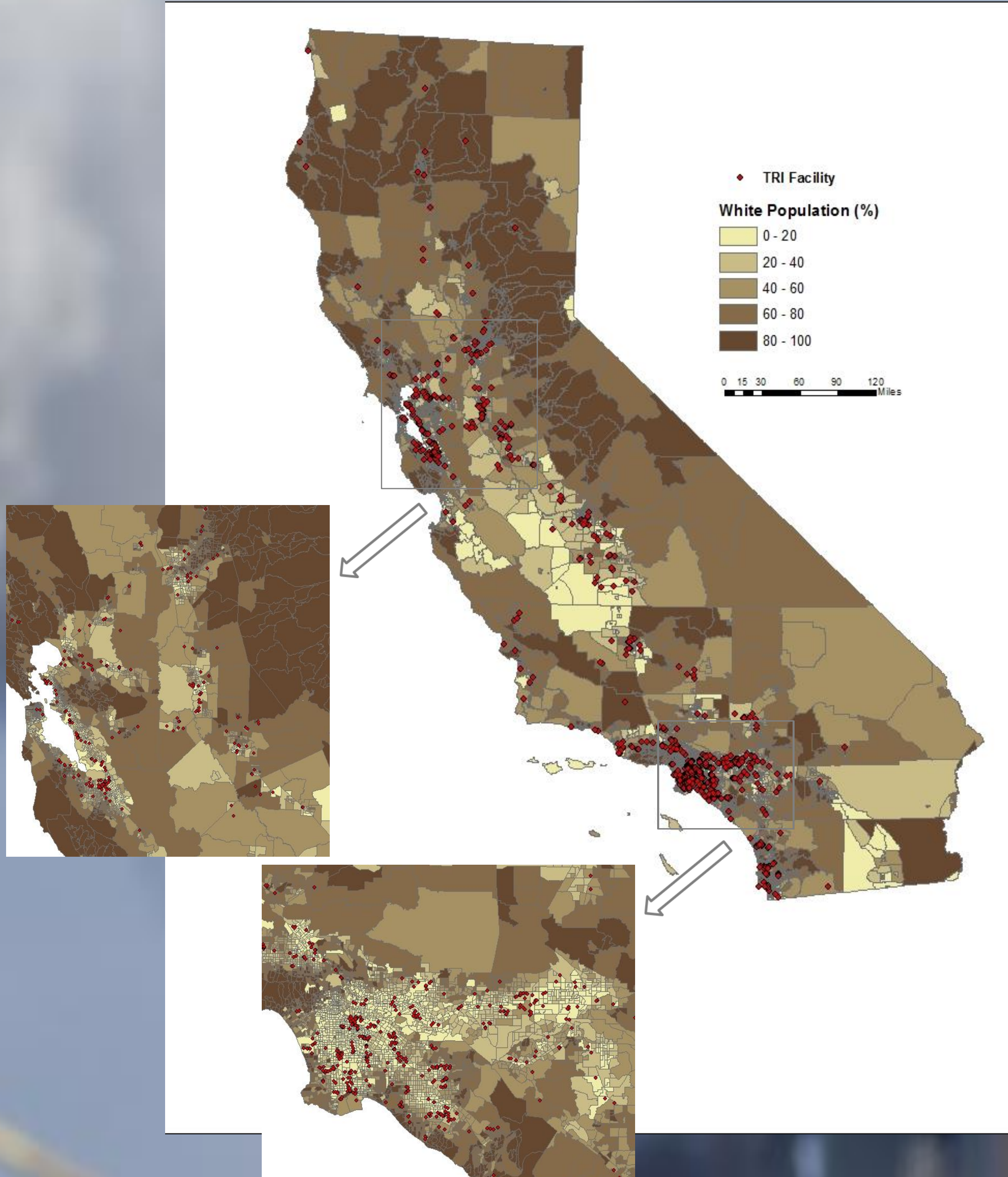


Figure 2. TRI Facilities and White Population Distribution (%) in California.

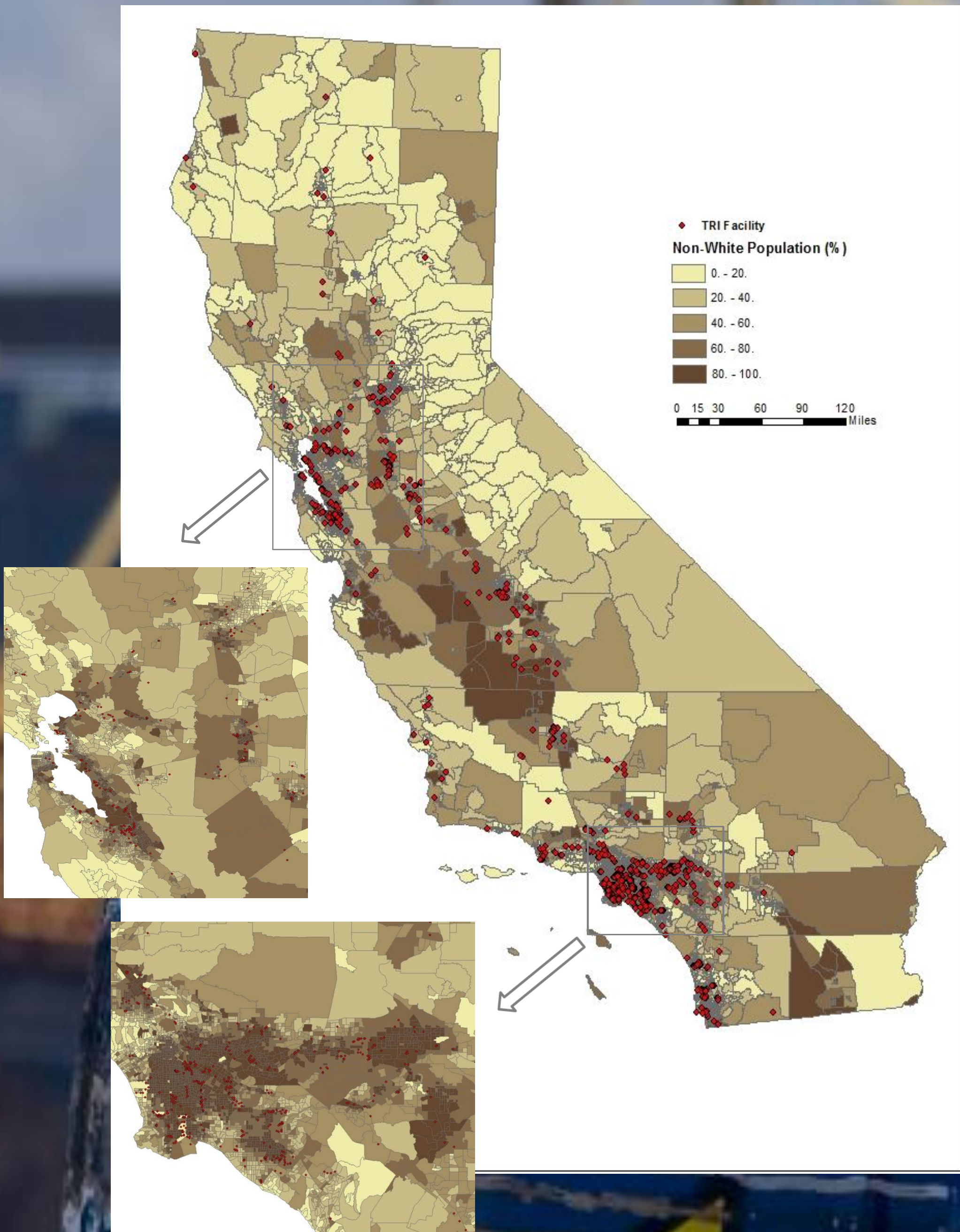


Figure 3. TRI Facilities and Non-White Population Distribution (%) in California.

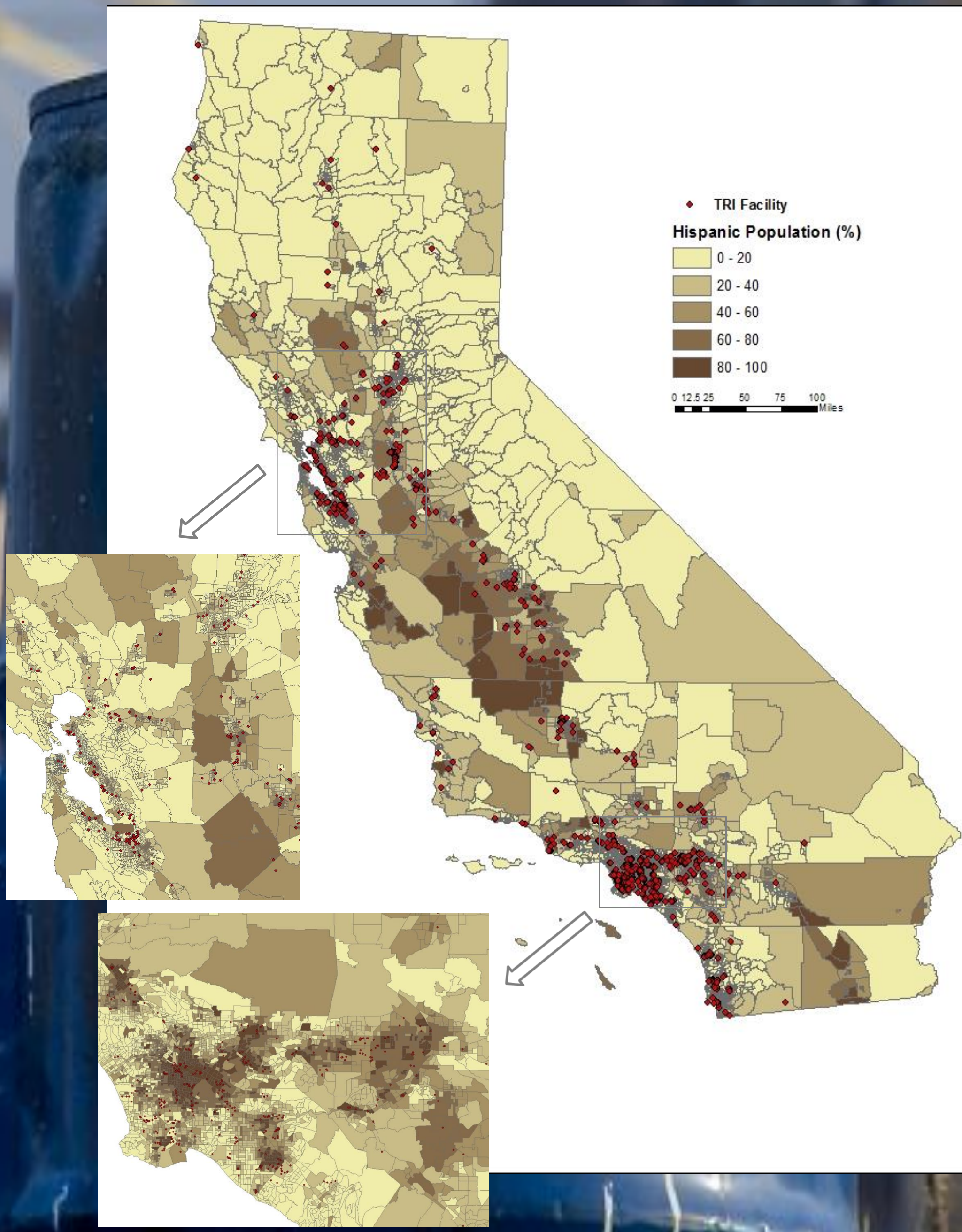


Figure 4. TRI Facilities and Hispanic Population Distribution (%) in California.

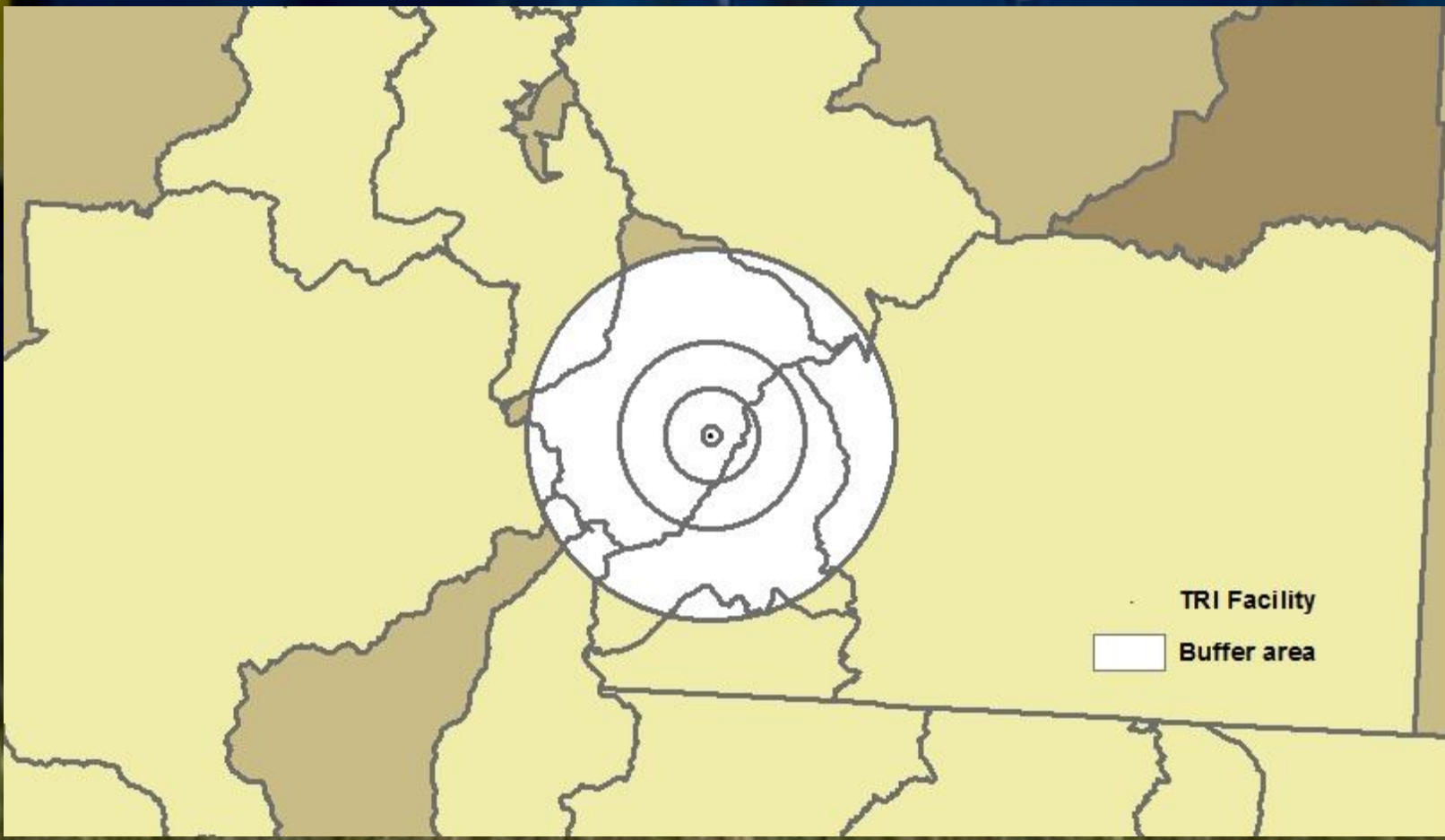


Figure 5. Illustration of the 4 different buffer areas used to calculate the population distribution by ethnic group.

Discussion

It is very interesting to notice the difference in the population distribution of the minority groups inside the buffer areas, since the majority of the non-white residents are Hispanics. An explanation for this relies on the amount of Hispanics that live in California compared to the rest of minority groups. According to the Census Bureau, while 38.4% and 39% of the population in California are Hispanics and Whites respectively, only 22.9% belong to any other minority group (6.6% are Black or African American, 1.7% are American Indian and Alaska Native, 14.1% are Asian, and 0.5% are Native Hawaiian and other Pacific Islander). However, as already noted, although the proportion of Hispanics and Whites is almost the same, the number of Hispanics that live from 0 to 1 km from a TRI facility is significantly greater than that of white residents.

Although these results clearly show that TRI facilities are disproportionately distributed near Hispanic populations, it was impossible to obtain a 100% accurate population distribution by ethnic group for each buffer area. Instead, it was assumed that populations from all ethnicities were distributed equally throughout each tract, and, since the buffer areas and the boundaries of the census tracts did not coincide, their populations were re-calculated on the portion of the tract that fell inside the buffer.

Conclusion

Overall, the results show that in California, TRI facilities are disproportionately located near minority group populations, more specifically around Hispanics. Although the amount of Hispanics is greater than any other minority group in California, it is almost the same as the amount of white inhabitants. However, the number of Hispanics closer to TRI facilities is significantly greater than that of white residents, meaning that at least in some areas, Hispanics appear to bear most of the cost of toxic release from TRI facilities in California.

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