CUMULATIVE ENVIRONMENTAL IMPACTS AND SOCIAL VULNERABILITY IN SAN JOANQUIN VALLEY, CALIFORNIA

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Environmental justice (EJ) proponents seek to redress inequitable distributions of environmental hazards (pollution, industrial facilities, crime, etc.) and equitably distribute access to environmental goods (such as nutritious food, clean air and water, parks, recreation, health care, education, transportation, safe jobs, etc) among communities with different incomes and ethnicities (Sze and London 2008). Quantifying the spatial distribution of environmental hazard and communities' demographic characteristics would provide valuable knowledge for EJ advocacy work, policy discussion and the academic community. Furthermore, cumulative impacts from mulitple hazards and the communities that are suffering from them are seldom studied. In this paper, the spatial pattern of multiple environmental hazards and communities' demographic characteristics were quantified in San Joaquin Valley, California.

The eight-county San Joaquin Valley is the southern expanse of California's 450-mile-long Central Valley, which is well-known for its bountiful agricultural production with reaches to statewide, national, and global markets (Walker 2006). The magnitude of pesticide application is rather incredible compared to the rest of California, which itself uses a disproportionately high amount of pesticides relative to the rest of the United States (Harnly et al. 2005). Latest figures indicate that the Valley accounts for 62.81% of the total pounds of pesticides used in California in 2006, while the three heaviest-application counties are also the highest users of pesticides and have maintained that status at least since 2000 (CPR 2007). In addition to the large magnitude of pesticides applied in the San Joaquin Valley, the Valley has also been associated with some of the worst air quality in the nation. The American Lung Association "State of the Air" report (ALA 2007), ranked U.S. metropolitan statistical areas (MSAs) and counties in top 25 lists for their pollution level of particulate matter and ozone. California had eight MSAs and nine counties in the top 25 list of most polluted by short-term particle pollution, with half of these MSAs located in the San Joaquin Valley. In terms of year-round particulate pollution, California placed five MSAs and seven counties in the top 25 list of most polluted by year-

round particulate pollution. Four of these MSAs were found in the San Joaquin Valley. Likewise, four Valley counties were among California's seven for this category. California and the San Joaquin Valley ranked relatively high in terms of the worst ozone-polluted areas, as well. The state had nine MSAs and 16 counties in the top 25 list for each category. Of these, the Valley accounted for 6 MSAs and 6 counties.

For this project the authors created a database, including demographic characteristics, pesticides application, toxic release inventory (TRI) sites, and air quality monitoring data. A Census-based unit, block group, was used as the unit of analysis in this study. Demographic data come from Census 2000 at the block group level including median household income, percent people of color, percent people receive less than nine-year education and percent households that are linguistically isolated. Pesticide application data, measured as total pounds applied, comes from California Department of Pesticides Regulation at a resolution of 1 square mile. TRI site data come from US Environmental Protection Agency as a set of geo-coded points. Air quality data including particlate matter, ozone, NO_x, and SO_x comes from the California Air Resource Board based on each monitoring sites. A social vulnerability index was calculated at the block group level based on the demographic data (Figure 1). It ranges from 1 to 5, with the higher number indicating less income, less education, more people of color and more linguistically isolation in the neighborhood. Pesticides data, TRI sites, and air quality data were summarized at the block group level and then combined for an environmental index. It ranges from 1-5, with the higher number indicating more pesticides use, closer to TRI sites, and worse air quality.

Our results reveal a significant correlation between the distributions of social vulnerability index and the environmental index. We find that communities with lower income, less education, more people of color and more linguistic isolation are suffering more from multiple environmental hazards in the San Joaquin Valley. The results are consistent with what local residents and EJ groups found and other qualitative studies (Perkins 2008; Liévanos, London, and Sze in press).

As an ongoing collaboration with local EJ groups, several "hotspot" communities will be selected to conduct case studies based on our regional mapping results. The community case studies will include public participatory GIS workshops and door-to-door health survey. Overall, the project aims at providing insights on multiple scales on the spatial relationships among the multiple environmental hazards, health situation, and the demographic characteristics of neighborhoods.

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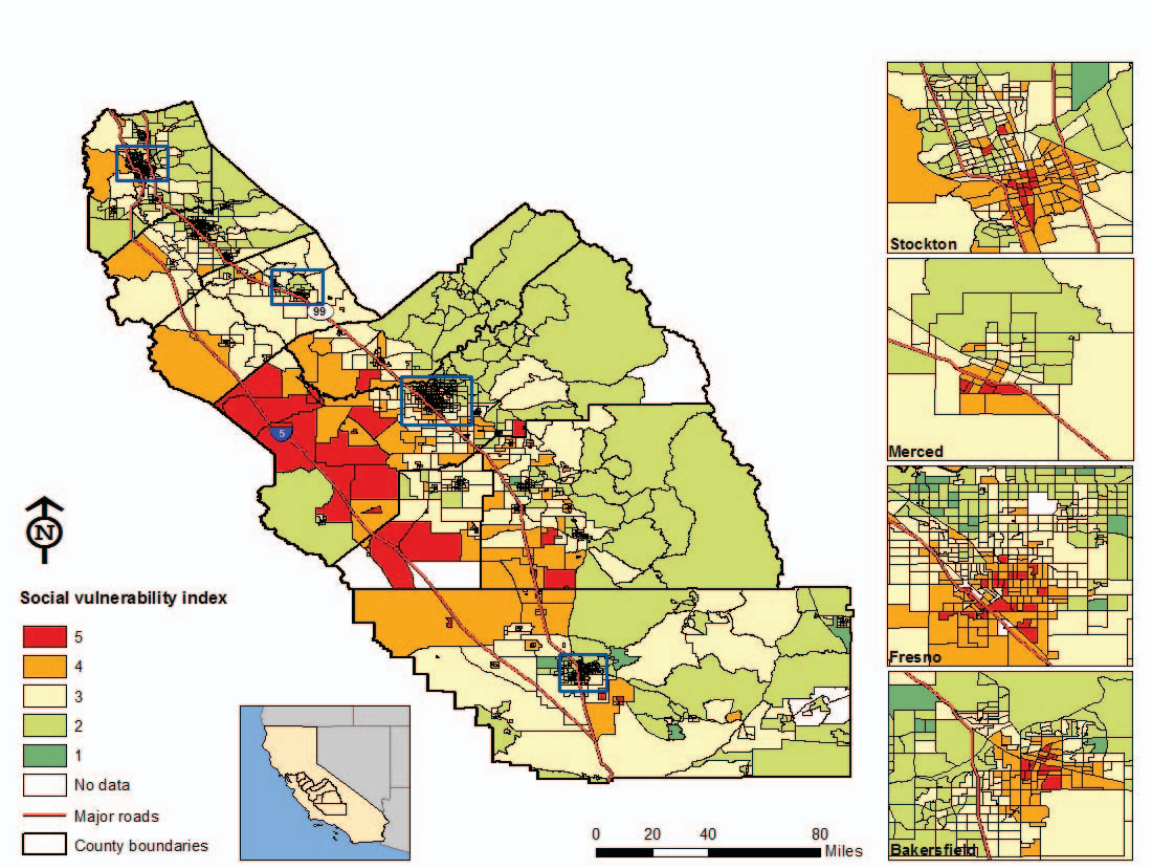

Figure 1 Social Vulnerability Index by Census Block Group in San Joaquin Valley (2000).