THE DEVELOPMENT OF ENVIRONMENTAL INJUSTICES

SCOTT SMITH (3) AMY NELSON (1) BOB BOLIN (2) MAUREEN O'DONNELL (2) ED HACKETT (2) MIKE ZOLDAK (4)
(1) Center for Environmental Studies, Arizona State University, Tempe, AZ 85287-3211; (2) Department of Sociology, Arizona State University, Tempe, AZ 85287-2101
(3) IT Research Support--GIS, Arizona State University, Tempe, AZ, 85287-0101; (4) Department of Geography, Arizona State University, Tempe, AZ, 85287-0104

1. ABSTRACT

This research examines the development of environmental inequalities in the metropolitan Phoenix area. It focuses on identifying historical-geographic changes in land use and demographic compositions of neighborhoods. This research also investigates the siting and abandonment of hazardous industrial facilities that have resulted in pronounced environmental inequities. Two methodologies are developed to categorize various trajectories of land use and demographic characteristics over time. These categories were used to contextualize micro-level case studies with meso-level statistical analyses of selected census tracts across the metropolitan area. Preliminary results suggest that three land use trajectories and two demographic trajectories appear associated with the disproportionately high hazard concentrations in specific areas of the city.

This poster highlights specific elements of the described research in a series of panels. Panel 2 shows the distribution of environmental risk quantified using a proximity-based model that considers four types of technological hazards identified by the US Environmental Protection Agency. Panels 3 and 4 describe the models used to categorize historic land use and demographic trajectories and a sample of their respective results. Panel 5 summarizes various preliminary findings of this research. Works cited are listed in Panel 6.

2. DISTRIBUTION OF RISK

This research begins by identifying a set of census tracts with the highest Cumulative Hazard Density Index (CHDI) scores for further examination. The CHDI is a quantitative measure of the aggregate risk burdens each tract bears as a result of proximity to multiple hazards (Bolin et al, In Press). The hazards include: TRI facilities, contamination sites identified under CERCLIS (including Superfund sites), Large Quantity Generators of hazardous wastes (LQGs), and treatment, storage, and disposal facilitates (TSDFs).

The distribution of CHDI for metropolitan Phoenix is shown in Figure 1. The census tracts selected for further examination are mapped in Figure 2.

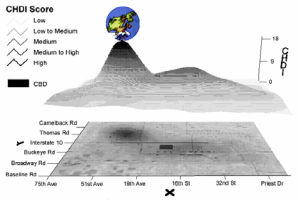


Figure 1. Distribution of CHDI scores.

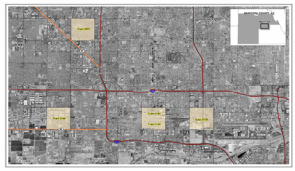


Figure 2. Case study census tracts.

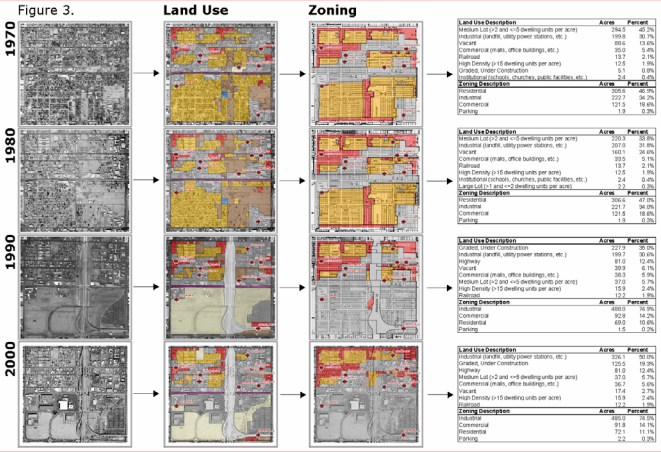
3. LAND USE TRAJECTORIES

Based on preliminary longitudinal analysis, we develop a typology of three development pathways to becoming a toxic tract. The four census tracts chosen for case studies each exemplify one of the three pathways to environmental inequality (*industrial encroachment*, *commercial redevelopment*, and *aging-in-place*). These pathways are informed by the areal proportions of each tract given to industrial, commercial, residential, institutional and other land use and zoning categories over the period 1970 to 2000.

Other data, obtained from CERCLIS is used to locate and date contamination events and sources of contamination. Business directories are used to date the establishment of selected industrial and waste handling facilities in the tracts. In pursuing this approach we offer both a methodology for assessing current cumulative environmental hazards at the tract level and a historical geographical analysis of how environmental inequities develop in areas of the city.

Figure 3 provides an analysis of tract 1139--bounded by 16th St (west), 24th St (east), Van Buren St (north) and Buckeye Rd (south)—which has experienced an *industrial encroachment* pathway to toxicity. This tract has changed from a predominantly residential neighborhood in 1970 to an emerging industrial node in 2000. The major transition occurred between 1980 and 1990 when nearly 40% of the residential land was converted to industrial uses making way for the development of potentially hazardous sites (represented by the red stars).

Figure 3.



4. DEMOGRAPHIC TRAJECTORIES

This research uses a semi-parametric, group-based approach for modeling demographic trajectories (Nagin, 1998). The modeling strategy explicitly recognizes uncertainty in group membership and allows an examination of the impact of multiple factors on probability of group membership.

Using this approach, we clustered census tracts with similar demographic patterns to identify distinctive clusters of individual trajectories within the region and for profiling the characteristics of neighborhoods within the clusters. Figures 4-6 show how study area tracts (highlighted in bright yellow) compare to other census tracts with respect to age, income, and race and ethnicity over time. The associated charts present the growth curve and statistical significance of each trajectory as well as the percentage of census tracts represented within each group.

Figure 4. Race and Ethnicity Trajectory

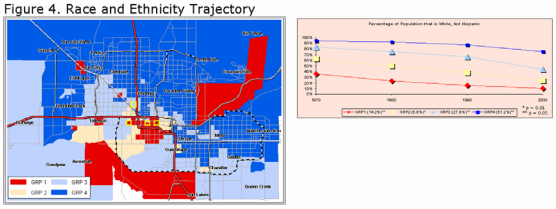


Figure 5. Income Trajectory

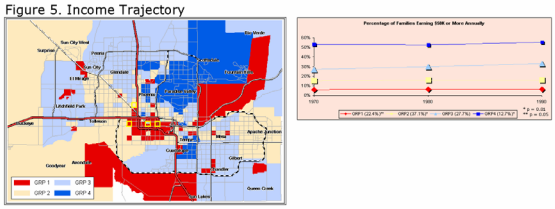
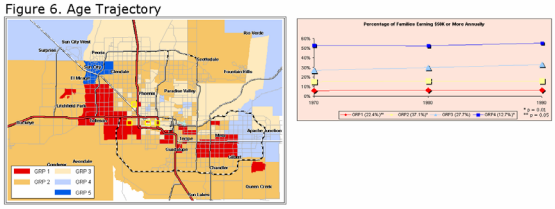


Figure 6. Age Trajectory



5. PRELIMINARY FINDINGS

We believe that the production of urban riskscapes is likely to involve a complex mix of market driven siting decisions, land availability, restrictive zoning, development planning, racial segregation, immigration, white flight and any number of other factors. Thus, the creation of contaminated communities cannot be reduced to some singular general cause (Boone and Modarres, 1999). Nevertheless, the initial findings outlined below may lead us to better understand the urban processes by which toxic trajectories are formed.

- Neighborhoods that have experienced transitions to industrial land uses in earlier periods (i.e. 1970 to 1980) are more likely than other neighborhoods to have disproportionate risk burdens (r^2=0.62, p=0.01).
- Neighborhoods that have experienced transitions to residential land uses in earlier periods are progressively more likely to be proximate to hazardous industry.
- Neighborhoods follow disparate pathways toward environmental inequity.

6. WORKS CITED

Bolin, B., A. Nelson, E. J. Hackett, K. D. Pijawka, C. S. Smith, D. Sicotte, E. K. Sadalla and E. Matranga. In press. The ecology of technological risk in a Sunbelt city. *Environment and Planning A.*

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ASU ARIZONA STATE UNIVERSITY

CAP LTER Central Arizona–Phoenix Long-Term Ecological Research

Poster prepared by:
C. Scott Smith
Research Support Lab
GIS Services
ASU Information Tech.

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