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CPRC REPORT

Racial/Ethnic Inequality in Environmental-Hazard Exposure in Metropolitan Los Angeles

Manuel Pastor, Jr.

Policy Research Program

CALIFORNIA POLICY RESEARCH CENTER

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Executive Summary

Activists and policymakers have recently been concerned about the tendency for environmental hazards to be disproportionately concentrated in minority neighborhoods. The resulting clamor for "environmental justice" led President Clinton to issue a federal executive order in 1994 requiring that the federal government take potentially disparate impacts into account in its environmental decision-making processes. California has only recently headed in a similar direction, with the passage of new legislation (SB 115) mandating the Office of Planning and Research to develop a new environmental justice program for the state.

California would certainly seem to be a prime candidate for such an environmental justice agenda. While the national-level evidence is more mixed than many activists believe, several studies have demonstrated that minority residents in the Golden State, particularly in Southern California, are in fact more likely to be living near many types of environmental hazards than are whites. For example, one study based on 1992 data from the U.S. Environmental Protection Agency's Toxic Release Inventory compared the likelihood that different racial/ethnic groups would reside in Southern California census tracts in which there were toxic air releases that the EPA considers top priority for reduction. The pattern of difference was striking: 5.4% of whites but 10% of Latinos lived in such a tract (with statistics for African Americans about midway between the two). Another recent report, which borrowed from an EPA model to translate all hazardous air pollution—be it from automobiles, factories, or dry cleaners—into estimated cancer risks, similarly showed that minority residents bore a disproportionate share of the resulting burden.

As the research has steadily accumulated, some have suggested that perhaps the problem is not related to public policy but to individual choice. In this view, the contemporary pattern may arise not because there has been discrimination in siting decisions but rather because minorities choose to move into neighborhoods with toxic facilities, perhaps in search of lower housing costs. This "move-in" argument can lead to a sort of policy passivity; after all, there is no need to reexamine or revise environmental policy if more heavily polluted areas will eventually turn minority anyway.

Which came first: the minorities or the toxics? The answer can matter greatly for policy. If the problem is one of siting, then policy might usefully be directed to altering the permitting process and encouraging clean-up. If the problem is minority move-in, then policy efforts, if any are undertaken, might be directed to providing full information to house-seekers, ameliorating housing discrimination, or both.

Which Came First?

This study disentangles the siting and move-in effects by charting the arrival of toxic storage and disposal facilities (TSDFs) against changing neighborhood composition in Los Angeles County. We focused on TSDFs for several reasons. First, while they are only one sort of hazard, TSDFs have been a standard reference point in the social scientific literature on environmental justice. Second, they are more amenable than other environmental hazards to the sort of dating necessary to conduct a full test, a task which required that we examine original business and permit records for the various facilities. Third, our own previous research established that TSDFs were concentrated in minority communities in Los Angeles as of 1990, making this a perfect candidate for teasing out causality. Finally, TSDFs can themselves pose a health risk and were among the first class of environmental hazards explored with regard to the demographic characteristics of their adjoining neighborhoods, suggesting that this work represents a natural evolution of existing research.

The current distribution of TSDFs is certainly inequitable on its face: When comparing Los Angeles County census tracts within a quarter-mile of a TSDF to those farther away, we found that the affected tracts were more minority (81% of residents in the affected tracts vs. 56% in the other tracts). Yet, as noted above, the real question is about the timing of both facility siting and demographic change.

To sort out the timing of minority move-in and toxic-hazard placement required determining the dates of siting for all high-capacity TSDFs in Los Angeles County. We then merged this information with a novel database that tracks certain neighborhood-level demographic and economic variables over the 1970, 1980, and 1990 census surveys. Simple comparisons were conducted that looked at the character of an area prior to siting, and the demographic and other shifts that occurred in the years after a siting (as compared to the rest of the county).

The basic results were straightforward. First, there were significant statistical differences in 1970 between those tracts that were to receive TSDFs in the subsequent 20 years and those that were not, especially in the ethnic and economic variables. The receiving areas were more minority, poorer, more blue-collar, had lower initial home values and rents, and had significantly fewer home owners. There was also a significantly lower percentage of college-educated residents, a pattern that suggests the importance that educational skills and an informed populace might play in resisting the placement of hazards.

On the other hand, the demographic or economic change after these tracts received TSDFs was not, in general, very different than in those tracts that did not receive such TSDFs. Housing values did seem to rise less rapidly, but even that result was not consistent. Basically, there was limited power for the move-in hypothesis, while there was strong evidence of disproportionate siting. In short, TSDFs "chased" minorities rather than minorities chasing TSDFs.

To confirm the basic results, we conducted a series of more complex statistical exercises that allowed us to control for the complex and interwoven effects of household income, home ownership, and population density. We found that the racial/ethnic make-up of a given tract still

mattered in the timing of a TSDF siting. Conversely, a similar multiple-variable model of demographic changes offered no evidence that TSDFs attracted minorities. A simultaneous model allowing for siting and demographic change to be occurring at the same time also did not support move-in arguments but did offer strong support for the disproportionate siting hypothesis.

We then noticed that one set of areas most likely to receive hazards were mixed Latino/African-American communities and other areas undergoing ethnic transition. This may be because such areas are less able to call on preexisting bonds of common culture, church, or language and thus may be weaker in organizing capacity and political power. Such transition areas were especially vulnerable to facility location over the 1970s and 1980s, a fact that suggests the importance of the sort of multiracial organizing typical of environmental justice activists.

Policy Implications

Both the overall patterns of contemporary exposure to toxic air and toxic sites, and the evidence that siting dominates move-in as an explanation, suggest an important role for policy. We believe that state policymakers should consider initiating policy shifts along four dimensions.

First, further outreach and participation are needed to bring more community members into the environmental planning process. Key to this will be reform of representation structures, especially the local assessment committees for toxic facilities, to include more residents from immediately affected areas. The provision of information by state agencies about both the nature and location of hazards should be improved. Capacity building by community groups is needed, with funding necessary from both the state and private foundations. The resulting higher level of participation should be seen as positive for all concerned: Community involvement early on in the decision-making process will help to reduce conflicts and lawsuits while improving business-community relationships.

Second, the state needs to develop some rules to protect those communities that are overburdened or may be too weak to sustain effective participation processes. For example, a simple regulation that no new facility would be allowed that would worsen current levels of inequality by race or income in the distribution of hazards—a very conservative measure since it would allow the current disparities to persist as long as they did not grow larger—would have prevented or changed the siting of nearly half of the TSDFs that came into Los Angeles County between 1970 and 1990. To implement such a measure would require collecting demographics on areas targeted for siting, a strategy resisted by earlier administrations. Even if there is no hard-and-fast rule that leads to automatic denial of a siting permit, the demographic information could at least trigger a higher level of review and allow government, business, and community organizations to go beyond the current hazard-by-hazard, neighborhood-by-neighborhood approach.

Third, the current pattern of hazard distribution suggests a need for satisfactory compensation, clean-up, and economic-development strategies. Recent levels of environmental awareness have led to both stricter requirements for siting and operations and increased opposition by communities. As a result, firms have tended to

attempt the expansion of existing sites (often in minority areas) rather than the building of new sites; even if expansions do not occur, freezing the current patterns simply solidifies the current state of inequality. Compensation should therefore be part of any discussion, and fairness requires that taxes and other mitigations go directly to the localities affected. Clean-up should also be tied to economic re-use, as in the brownfields initiatives that bring together economic developers of lightly contaminated sites with communities and local governments concerned about safety and jobs.

Fourth, the state should move rapidly to develop a broad environmental justice mandate. SB 115, passed into law in late 1999, designated the Office of Planning and Research as the coordinating agency on environmental inequity and directed the California Environmental Protection Agency to develop a model environmental justice mission. This is a positive first step that could induce state agencies to develop innovative plans, but the wording remains vague and the tasks ahead are large.

One of these tasks is the need for further research on the demographic patterns and associated health risks of various environmental hazards, especially in other parts of the state less well documented than Southern California. Of special interest would be research on hazard proximity to children and schools; recent research suggests that children may be more susceptible to certain types of pollution effects and may experience learning problems as a result. But while parts of the debate are unsettled and much remains to be done, the policy recommendations offered in this report can provide a framework for the interim period and will help to protect California's most vulnerable and contaminated neighborhoods.

After all, caution can cut both ways. While the state may not want to undertake an extensive overhaul of existing regulations, it hardly makes sense to mimic people who change their health behaviors only after a heart attack confirms what had been suspected all along: that smoking and obesity are creating a problem for them. The real risk lies in doing nothing, a strategy that would leave public agencies still under pressure from concerned and mobilized communities but without the tools, direction, and guidance that could help address these concerns.

Californians, enjoying the state's beautiful coastlines, rich agricultural lands, spectacular mountains, and stunning deserts, have often been proud to lead the nation in the areas of environmental protection and restoration. With creative policies that involve affected communities, protect the most vulnerable, and prioritize clean-up, compensation, and economic development in low-income areas, we can now take a similar leadership role in the area of environmental justice.

Racial/Ethnic Inequality in Environmental-Hazard Exposure in Metropolitan Los Angeles

Manuel Pastor, Jr.

Introduction

Across California and the nation, an increasing number of grassroots community groups have alleged that the risks of environmental hazards are distributed unequally across lines of race and income. Concern about this issue has reached the highest levels of the federal government: A Presidential Executive Order issued in 1994 directed all federal agencies to "address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations in the United States." The federal Environmental Protection Agency (EPA), including the San Francisco-based offices of EPA's Region IX, has used environmental justice as a key rationale for launching efforts to clean up and redevelop polluted, or "brownfields," sites in minority communities.

State and local agencies within California have been slower to react to the perception of environmental inequity. In 1997, Southern California's Air Quality Management District (SCAQMD) adopted a set of environmental justice principles, but this came only after significant community pressure, including a lawsuit filed by community groups. Over the last few years, state bills seeking to mandate more sensitivity in siting processes or to consider the feasibility of demographic analyses as a part of environmental impact reports failed to make it past the veto pen of former governors. The shifting political climes of Sacramento, including a new governor and a more Democratic legislature, recently facilitated the passage of Senate Bill 115, a measure that directs the state's Office of Planning and Research to coordinate the state's environmental justice initiatives with the federal government and across state agencies, including the California Environmental Protection Agency. However, the fact that SB 115 is now law does not erase the concerns that may have motivated the former executive's reluctance to act: the worry that environmental inequity remains unproved and that attempts to address it may complicate business permitting procedures and thereby dampen economic development.

This report examines the case for state action, evaluating the claims of environmental justice proponents and opponents, and suggesting potential implications for policy. Reviewing previous research on California, particularly Southern

Senate Bill 115 directs the state's Office of Planning and Research to coordinate the state's environmental justice initiatives with the federal government and across state agencies.

California, we note that there exists strong evidence of disparity by ethnicity in residential proximity to various sorts of environmental hazards. We then focus on an issue unexplored in virtually all previous research: whether toxic storage and disposal facilities (TSDFs), one common sort of hazard, were placed disproportionately in minority neighborhoods or whether minority residents moved in after these hazards were sited.[1]

While this issue may seem arcane, tracking the temporal dimension of environmental inequity matters greatly for policy. If the problem is siting, then it would be appropriate for policymakers to review zoning, permitting, and other procedures. If the pattern is driven by "minority move-in," however, individuals may simply be choosing to trade off neighborhood health risks for larger or better housing. In this case, policy passivity might be justified: Why take into account whether a hazard is being placed in a minority area if the "natural" dynamic is such that the area will eventually turn minority? Moreover, if move-in is important, then perhaps appropriate intervention should be limited to ensuring that all individuals have access to full information about hazard location so that their choices are not based on incomplete data; in addition, the state might have a rule enforcing existing statutes that limit the steering of minority house-seekers to particular neighborhoods.[2]

We focus on whether toxic storage and disposal facilities (TSDFs) were placed disproportionately in minority neighborhoods or whether minority residents moved in after these hazards were sited.

This report considers the temporal dimensions of TSDF siting in Southern California, a region where previous research has already established that minority residents live in disproportionate proximity to sites of toxic emissions and hazardous facilities. As it turns out, there is little evidence for the minority move-in hypothesis. For at least this sample of TSDFs, siting matters more than move-in: Minorities seem to "attract" toxic storage facilities, but such facilities do not, in general, attract minorities. Moreover, while the percentage of a minority group in the vicinity of a TSDF is significant in explaining TSDF placement, areas in ethnic transition seem to have been even more subject to siting than areas with older or more established minority populations. The latter result squares with a "political power" model of siting—in periods of transition, differences between groups may make it more difficult to organize neighborhood resistance to the siting of a disproportionate share of environmental hazards.

Naturally, the work presented here is limited in scope and scale, and one priority for the future would be more research to better determine proximity and appropriately calculate risk. Still, we find the current evidence to be compelling enough to suggest that the state move rapidly to develop and implement the environmental justice mandate for the state suggested under SB 115. Such a mandate should direct state agencies to review the environmental equity aspects of various decisions and should be accompanied by specific attempts to inform and empower the public to act on these issues. At the same time, the state should recognize that the most vulnerable communities may not have the power to resist environmental negatives, even in open public processes.

As a result, the state may wish to consider rules that would limit the siting of facilities that would worsen the current inequality rather than forcing community groups to organize neighborhood by neighborhood, hazard by hazard against such disproportionate siting. The state may also wish to consider methods to ensure that communities that are currently affected by hazards receive both appropriate compensation and prioritization in any clean-up efforts.

This report proceeds as follows. The first section briefly reviews the previous national and statewide evidence on the distribution of environmental hazards. The second section discusses the original research conducted as part of this project.[3] The third section builds on both the broad range of evidence and the research here to draw implications for policy, especially the need for better information and participation, firmer rules and enforcement, more efforts at clean-up, and the creation of a clear mandate for state agencies and policymakers.

Race/Ethnicity and the Current Distribution of Environmental Hazards

The Environmental Justice Movement and National-Level Research

Early research in the area of "environmental justice" claimed that various environmental hazards, especially TSDFs, tended to be disproportionately located in minority neighborhoods throughout the nation (UCC 1987, U.S. GAO 1983). These findings fortified community organizing around perceived hazards and helped to generate what is now known as an environmental justice movement. The movement took national form with the First People of Color Environmental Leadership Conference, held in Washington, D.C., in October 1991; some of the leaders of this summit have served on the EPA's National Environmental Justice Advisory Committee (NEJAC), which reviews and suggests new federal policy approaches to ameliorating environmental inequities.

We find the current evidence to be compelling enough to suggest that the state move rapidly to develop and implement the environmental justice mandate for the state suggested under SB 115.

California has seen its own share of environmental justice groupings, including San Francisco-based Urban Habitat, San Diego's Environmental Health Coalition, and the statewide Communities for a Better Environment (CBE). All of these organizations grew out of community struggles but, like their national counterparts, have been or become deeply interested in policy. CBE, for example, played a critical role in "persuading" the South Coast Air Quality Management District (SCAQMD) to adopt environmental justice guidelines. The method of persuasion is instructive: CBE created public pressure by organizing against SCAQMD decisions and then suing the agency to stop a program that CBE claimed was leading to concentrations of toxics in minority communities.[4] In general, the attention to environmental justice by policymakers has been in direct proportion to the level of activism.

Is environmental inequity really a problem? Interestingly, just as the national government was mandating environmen-

The few quantitative studies on environmental equity in California and its regions were subject to the earlier criticism that correlations between two variables are not sufficient to prove a case.

tal justice guidelines, researchers began to point to methodological problems in the early work that had undergirded the movement. One central criticism was that discovering a positive association between two variables—minority presence and toxic wastes—did not necessarily suggest discrimination per se (Been 1995, Szasz and Meuser 1997). If the underlying cause of environmental-hazard placement was land value—that it was cheaper both to build a hazardous site there and to live there—and this was correlated with income and therefore minority presence, then disproportionate exposure to hazards[5] could simply reflect market dynamics (Been 1994a, Hamilton 1995).[6]

In the mid-1990s, a new wave of studies attempted to correct for this problem by using "multiple-variable" strategies to control for the effects of income, proximity of industry, the composition of the local workforce, and other factors.[7] The early results, usually obtained via pooled national samples, suggested that race was not a significant determinant of environmental-hazard placement, especially when one took into account local residents employed in manufacturing (on the reasonable hypothesis that firms might choose to locate near such potential employees; see Anderton et al. 1994a, 1994b). However, these national-level results have been criticized for both methodological reasons (particularly the exclusion of certain areas from analysis; see Been 1995 and Bullard 1996) and data difficulties (particularly the challenges involved in ascertaining the correct addresses of toxic sites of firms listing their business headquarters).[8]

Yet another criticism has been of the national scale of the studies themselves. Several researchers have argued that the distribution of hazards is related to the industrial clusters of a region and that analysis should therefore be directed to the pattern of distribution within a region. In this view, L.A.'s furniture-making and metal-plating industries are not likely to drift up to Seattle, and Microsoft is not likely to move south to Hollywood, and so the relative equity of the distribution of toxics within a particular region is what matters (Sadd et al. 1999). As a result, many researchers have begun to look at environmental-hazard distribution at the subnational level, including metropolitan areas like Chicago and Allegheny County, and states like Ohio and Florida.[9] The results have been mixed, with some studies finding racially based environmental inequity and others failing to demonstrate its existence.

The Picture in California

There have only been a few quantitative studies on environmental equity in California and its regions.[10] Work conducted in the early 1990s used mapping strategies to demonstrate a visual correlation between the percent minority and certain hazards in both Los Angeles and Santa Clara counties (Burke 1993, Szasz et al. 1993); however, these efforts were subject to the earlier criticism that correlations between two variables are not sufficient to prove a case.[11] The most sophisticated state-level work has been a recent dissertation by Rachel Morello-Frosch (1997) from the University of California, Berkeley. Focusing on hazardous air

pollutants at the county and census-tract level, she found a consistent association between the percent of minority population and both hazardous air-pollutant concentrations and estimated likelihoods of pollutant-related cancer risk. Morello-Frosch also attempted a multiple-variable approach, and found that race often mattered even after controlling for the degree of urbanization, the density of the population, and other variables.

My own previous work, conducted largely with Jim Sadd of Occidental College, has also attempted to use multivariate techniques, with a focus on Southern California, especially Los Angeles County.[12] One earlier study, for example, focused on toxic releases into the air as recorded in the U.S. EPA's Toxic Release Inventory (TRI). In that work, we distinguished between any release into the air and those that were classified by the EPA as high priority for reduction and therefore included in the agency's "33/50" program.[13] Figure 1, for example, shows the relationship between these 33/50 releases and areas where the percent minority exceeded the average for all of Southern California (Los Angeles, Orange, Ventura, San Bernardino, and Riverside counties). Meanwhile, Figure 2 shows what might be termed the "exposure rate": the percent of all whites, African Americans, and Latinos in Southern California who live in a census tract with either an air release or the presumably higher-risk 33/50 releases. As can be seen there, Latinos have twice the likelihood of being in a tract with a 33/50 release than do whites, with the African-American probability being somewhat less pronounced.

To explain the pattern, we constructed a model in which the dependent variable was the presence or absence of various air releases in a census tract and the predictive factors were the percent of minority populations in that tract, the percent of tract areas devoted to industrial uses, the percent of residents working in manufacturing, the population density, and resident income. All these variables turned out to be statistically significant.[14] We then tested for the degree of severity of hazard in two different ways: (1) We considered whether a tract had no hazards, only an air release, or a 33/50 release, and (2) we considered the relationship between our variables and the amount of pollution released into the air. Once again, all the variables mattered and race/ethnicity was statistically significant.

A more recent effort by our research team (Morello-Frosch, Pastor, and Sadd 2001) tried to consider a broader range of hazards and actually determine the resulting health risks. Using a model developed by the U.S. EPA, we accounted for hazardous air toxics of all types in Southern California; rather than being limited to the larger TRI sources, we also considered mobile (or automotive) and small sources (like dry cleaners and smaller shops). We then used a standard public health methodology to translate these figures into excess cancer risk over an individual lifetime and mapped this against ethnicity. Racial differentials existed and persisted even as area household income rose. And in a multiple-variable regression that controlled for population density, economic factors, and the percent of land devoted to industrial, commercial, and transportation purposes, race was still significantly associated with higher levels of estimated risk.

While the evidence may be mixed at a national level, research from California suggests that environmental inequity is indeed a problem in the Golden State.

Figure 1

The Distribution of Toxic Releases in Metropolitan Los Angeles

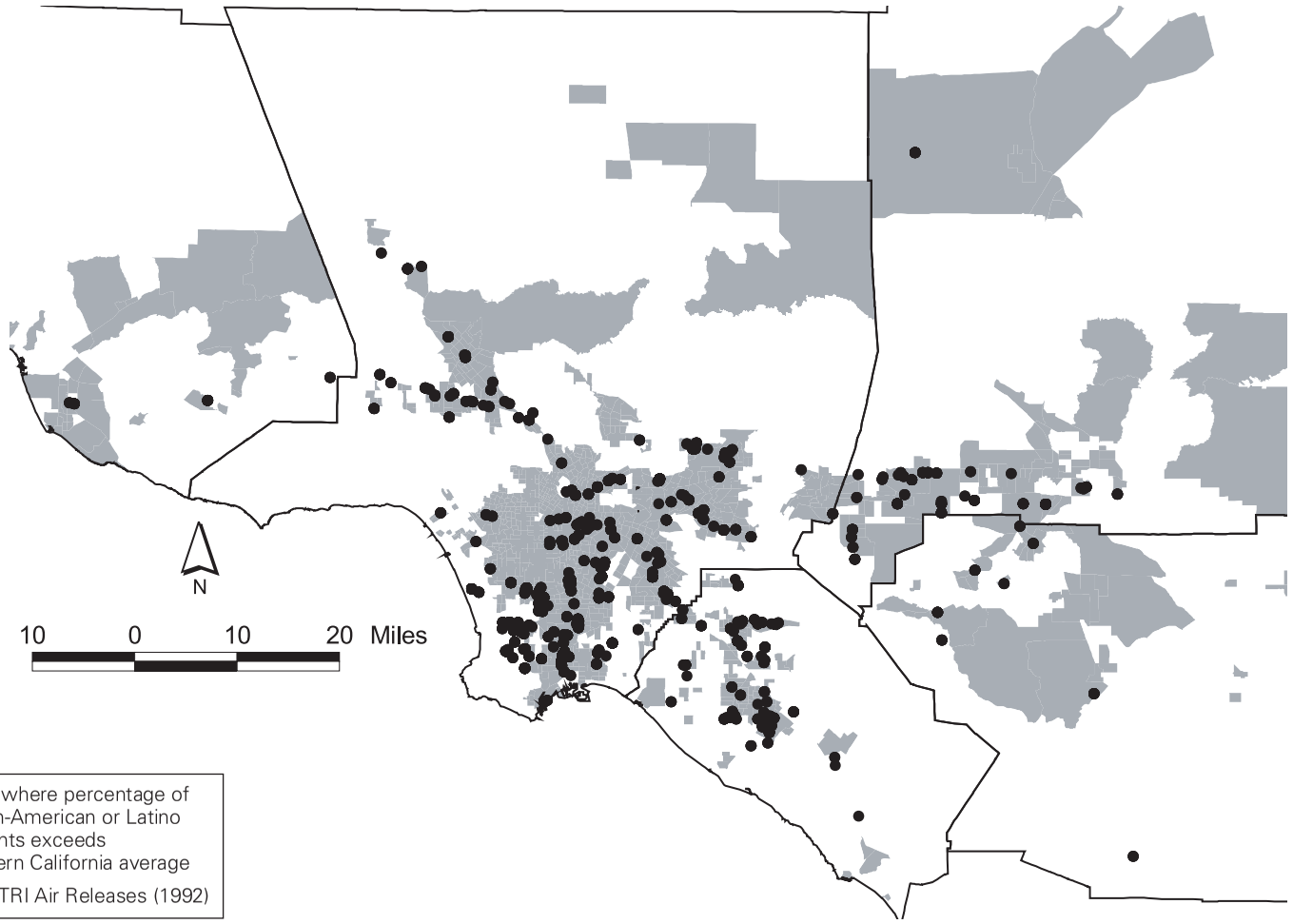
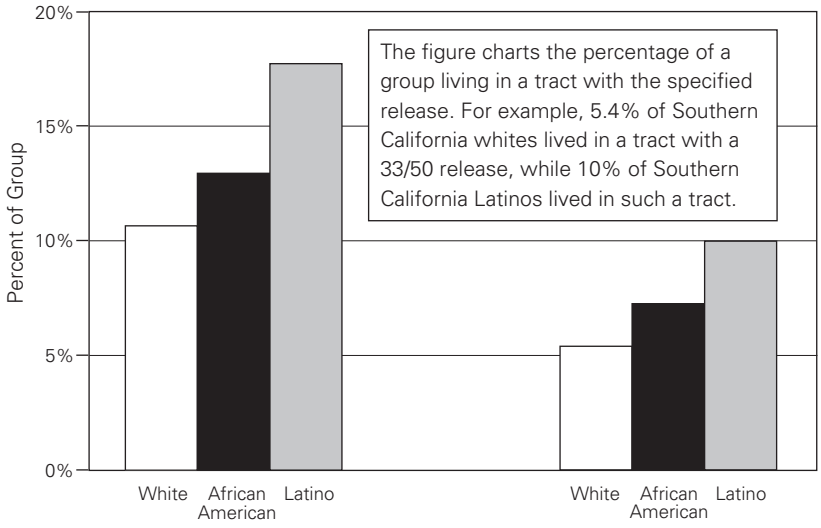


Figure 2

Toxic Air Release Proximity by Ethnicity in Southern California, 1992

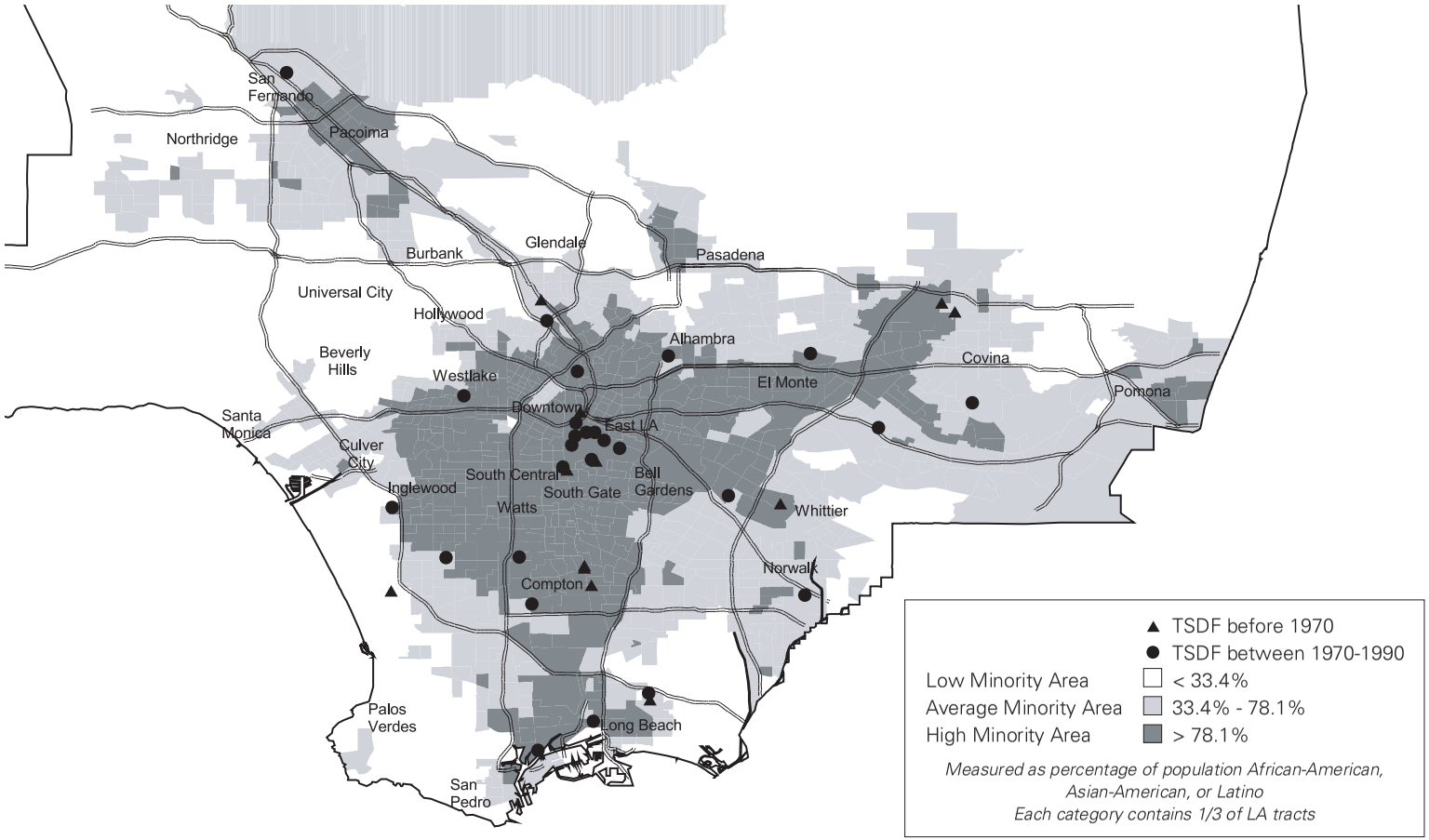


Thus, while the evidence may be mixed at a national level, research from California suggests that environmental inequity is indeed a problem in the Golden State. At the same time, this contemporary "snapshot" of hazard distribution does not establish the causal sequence of siting, that is, whether the hazards were placed in heavily minority communities or whether the minority community settled and grew around these environmental negatives. Unfortunately, the TRI air-release data are not amenable to historical analyses of which came first, the minorities or the toxics: The data were first collected in 1987, and this leaves us only the 1990 census with which to match hazards and demographics at the level of the census tract, now the standard unit in this sort of analysis. The cancer-risk variable is similarly problematic: The complex calculations required to determine hazardous air pollutants and convert this into risk have been done only for 1990.

To get at the issues of history and causality requires studying a hazard whose arrival can be accurately dated and then compared to several decades of census counts; moreover, it would be best if that hazard already had an established pattern of disproportionality so that we can focus more specifically on the causal or temporal dimension. For these methodological reasons, we have chosen to look at TSDFs in Los Angeles County. First, the arrival of TSDFs can be dated, although it requires a significant amount of archival research for each facility since permit dates may not reflect the actual beginning of plant operation. Second, our own previous research (Boer et al. 1997) established that TSDFs were concentrated in minority communities in Los Angeles as of 1990, making this a perfect candidate for teasing out causality. Finally, TSDFs can themselves pose a health risk and were among the first class of environmental hazards explored with regard to the demographic characteristics of their adjoining neighborhoods, suggesting that this work represents a natural evolution of existing research. In fact, TSDFs have been a standard reference point in the social scientific literature on environmental justice (Anderton et al. 1994a, 1994b, Been 1995).

Figure 3

Location of TSDFs and Presence of Minorities in Los Angeles County, 1990



Which Came First? Disentangling Siting and Move-In

Methods and Earlier Studies

Longitudinal studies of hazard siting and neighborhood change have been few and far between. The two most significant studies have been national in scale and have offered mixed evidence, with one suggesting that there is little evidence of environmental inequity in siting and the other suggesting that minority presence, especially of Latinos, may be correlated with a firm's decision to place a toxic facility.[15] Neither of these studies found much evidence of a move-in dynamic, although this may be partly due to the ways in which the researchers tested for this direction of effect.[16]

The research here is based on an analysis of the siting of high-capacity TSDFs in Los Angeles County.[17] As noted above, examining the issues on a regional basis has several theoretical advantages, primarily the ability to control for an area's industrial character. There are also pragmatic reasons: At the level of the county (the most populous in the state and one that contains roughly 30% of the state's population), we could more easily obtain the actual forms indicating the start-up date for each of the facilities in question and then visit a sample of the sites with a geopositioning device to check the locational information.[18]

The regional emphasis also made it easier for us to examine the areas near environmental hazards.[19] Census tracts often change shape between census years—splitting, merging, and sometimes simply changing boundary lines—and reconciling these shapes across all the relevant census years is time-consuming and expensive. Because of this, national studies have contrasted tracts with hazards against a stratified sample of tracts without hazards. This makes it impossible to consider tracts proximate to a hazard, as they may or may not be in the stratified sample.

TSDFs in Los Angeles County are often located at or near the border of two tracts. As a result, a stratified sample approach that defined the potentially affected surrounding area as only the host tract will likely misgauge potential impact. With fewer total tracts in our study than in the national studies, we were able to complete the reconciliation for all tracts across the 1970, 1980, and 1990 censuses and then create circular buffer distances of a quarter-mile and one mile around the actual facility point location in defining the potentially affected tracts and residential population.[20]

Testing for Siting and Move-In

As might be expected from previous research, Figure 3 reveals that TSDFs were disproportionately located in minority neighborhoods as of 1990. Table 1 offers some numbers: Tracts that contained or were proximate to TSDFs also tended to have higher minority populations, be poorer, have lower rents and house values, contain fewer single-family units (a proxy for home ownership), and have a higher percent of workers in blue-collar occupations, with virtually all these differences being statistically significant.[21] Interestingly, given the usual supposition that hazards should be placed where they would cause the least harm to people, population density is only insignificantly less in the quarter-mile sample than in non-TSDF areas and is significantly higher in the one-mile sample than in those areas.[22]

Did the contemporary pattern of TSDFs in minority communities occur because of siting practices or because of subse-

Table 1

Census Tracts With vs. Without TSDFs in Los Angeles County, 1990

Variable	1990 County Average	Within 1/4 mile of TSDF, 1990		Within 1 mile of TSDF, 1990	
		Difference	*Sig.*	Difference	*Sig.*
Percent Minority	56.3	25.5	***	27.2	***
Percent African-American	11.0	7.6	**	7.8	***
Percent Latino	34.7	18.6	***	18.5	***
Household Income	$38,369	-$11,379	***	-$9,796	***
Home Value	$243,257	-$73,559	***	-$70,571	***
Median Rent	$629	-$137	***	-$113	***
Percent College-Educated	22.0	-11.8	***	-11.2	***
Percent Single-Family Housing	59.8	-6.9	*	-2.8	#
Population Density	11,031.3	-2,192.4	*	1,083.2	*
Percent Blue-Collar	40.7	15.3	***	13.4	***

Difference refers to the percentage point or dollar difference between tracts proximate and not proximate to TSDFs (with values for the latter approximating the 1990 county average), and *Sig.* refers to the statistical significance of the difference between the two categories. Significance is symbolized as follows: ***=.01; **=.05; *=.10; #=.20.

quent (or post-siting) move-in? Figure 4 shows the percent of minorities and whites living within a quarter-mile of high-capacity TSDFs as of 1970, 1980, and 1990. Exposure to TSDFs rose for both groups during the 1970s (as the number of TSDFs grew faster than the population) and then stabilized; by 1980, minorities were three times as likely as whites to live near a TSDF. Figure 5 reflects the same analysis for the one-mile radius: here, the percent of Los Angeles County's minority population exposed to proximate hazards grew much faster than that of the white population. If move-in was the dominant dynamic, we would have expected the relative proximity of the minority population to increase over time. The quarter-mile pattern thus suggests little role for move-in, but the one-mile pattern does offer some support for that hypothesis.

To get at the issue more directly, we backtracked to 1970 and compared tracts that subsequently received a proximate TSDF over the 1970-90 period to those tracts that did not.[23] Table 2 illustrates that in 1970 the receiving areas had a higher percent of minority populations, were poorer and more blue-collar, had lower initial home values and rents, and had significantly fewer home owners in the most proximate areas. There was also a significantly lower percentage of college-educated residents, a pattern that suggests the importance that educational skills and an informed populace might play in resisting hazards. Population density for the TSDF tracts was far below the values for non-TSDF tracts, significantly so for the quarter-mile zone, but above the values for non-TSDF tracts (albeit insignificantly) at the one-mile level. In short, many of the relative patterns reflected in the 1990 "snapshot" were present in the soon-to-be-affected 1970 tracts, a result

Figure 4

Proximity (1/4 Mile) by Ethnicity to High-Capacity TSDFs in Los Angeles County, 1970-90

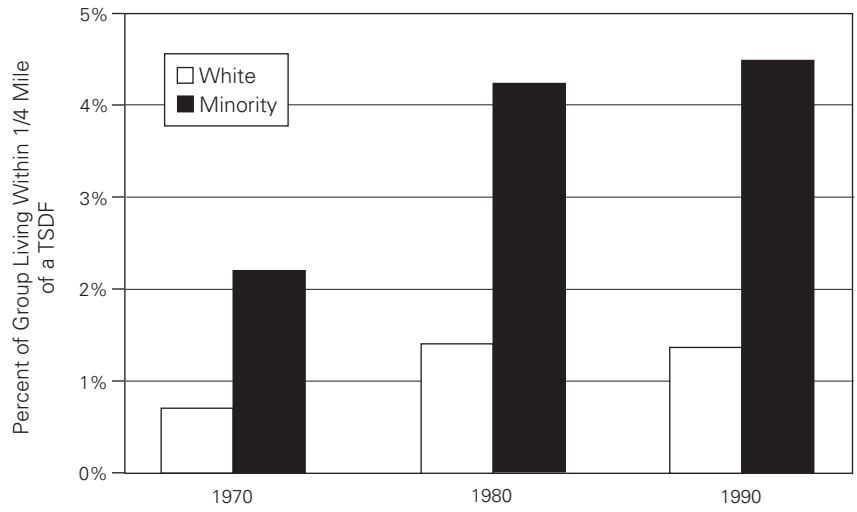


Figure 5

Proximity (1 Mile) by Ethnicity to High-Capacity TSDFs in Los Angeles County, 1970-90

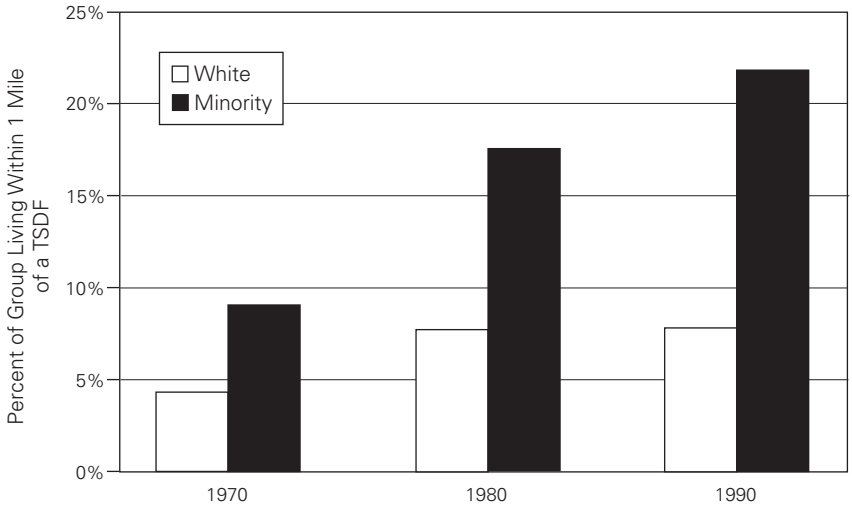


Table 2

Census Tracts That Received a TSDF in 1970-90 vs. All Other Tracts in Los Angeles County, 1970

Variable	1970 County Average	TSDF Sited Within 1/4 mile Between 1970-90 Difference	*Sig.*	TSDF Sited Within 1 mile Between 1970-90 Difference	*Sig.*
Percent Minority	31.8	22.2	***	22.2	***
Percent African-American	10.8	15.4	**	11.0	***
Percent Latino	18.0	4.3	#	9.0	***
Household Income	$10,032	-$1,908	***	-$1,603	***
Home Value	$26,042	-$4,621	***	-$4,270	***
Median Rent	$138	-$23.0	***	-$21.3	***
Percent College-Educated	12.6	-4.9	***	-5.2	***
Percent Single-Family Housing	64.4	-9.2	**	-1.4	
Population Density	8,724.1	-1,933.9	*	446.0	
Percent Blue-Collar	46.1	9.8	***	9.4	***

Difference refers to the percentage point or dollar difference between tracts proximate and not proximate to TSDFs (with values for the latter approximating the 1970 county average), and *Sig.* refers to the statistical significance of the difference between the two categories. Significance is symbolized as follows: ***=.01; **=.05; *=.10; #=.20.

consistent with a story of disproportionate siting.[24]

What happened after a hazardous site was established? Table 3 presents the changes over 1970-90 in tracts that received or were near hazards sited in 1960-70, as benchmarked against areas that did not receive such hazards. For the percentage variables (such as percent minority), change means the difference in percentage points over the 20-year period; for income, home value, and rent, change refers to the percent increase over the period. As can be seen, there is some modest evidence of move-in: for the quarter-mile radius, housing values rose less rapidly and the percent of Latinos grew more rapidly, although both changes are only at a modest level of statistical significance (.20). For the one-mile radius, both the percent African-American and the percent blue-collar showed relative declines, with a significance level of .10.[25] While this is fairly weak evidence by usual statistical standards, it might suggest that Latinos were replacing African-Americans in these areas of newly introduced toxic sites.

However, since one might expect these shifts to occur rapidly, we decided to look at changes in the immediate next decade, first for those areas receiving sites in the 1960s and then for those receiving sites in the 1970s (see Table 4). For the first group (top panel), there were a few moderately significant differences from other tracts in the next decade. Housing values did rise less rapidly than in nonaffected tracts for both the quarter- and one-mile radii, while the percent of the college-educated fell relative to nonaffected tracts for the quarter-mile buffer and that of

Table 3

1970-90 Demographic Changes in Census Tracts Following a 1960-70 TSDF Siting vs. Tracts Without a TSDF

		Received a TSDF Between 1960-70	
		Within 1/4 mile	Within 1 mile
Variable	1970-90 Average County Change	Difference *Sig.*	Difference *Sig.*
Percent Minority	24.6	0.2	-0.9
Percent African-American	0.2	-5.9	-3.9 *
Percent Latino	16.7	8.1 #	2.4
Household Income	275.5%	-9.5%	3.0%
Home Value	817.7%	-102.2% #	-9.8%
Median Rent	361.9%	16.3%	11.8%
Percent College-Educated	9.4	-3.9 **	0.1
Percent Single-Family Housing	-4.7	3.0	1.0
Percent Blue-Collar	-5.3	0.3	3.0 *

Difference refers to the percentage point or percent difference between the changes in tracts that received and did not receive TSDFs (with values for the latter approximating the 1970-90 average county change), and *Sig.* refers to the statistical significance of the difference between the two categories. Significance is symbolized as follows: **=.05; *=.10; #=.20.

the blue-collar presence fell more sharply for the one-mile buffer than in the rest of the county. In the tracts that received hazardous sites in the 1970s (bottom panel), the 1980s brought a less rapid increase in household income at the quarter-mile (significance, .10), declines in the relative presence of college-educated in both buffers, and a relative increase in the percent minority at the one-mile level. Strikingly, household values actually rose more rapidly for those homes situated in the one-mile zone, a trend at odds with the usual "move-in" hypothesis.

While the overall pattern offers some evidence for the move-in hypothesis—a more rapid increase in minorities in the second 10-year period and less rapid increases in housing values in one of the time periods examined—both the general pattern of statistical insignificance and certain contradictory results (including a relative decrease in blue-collar workers, a relative increase in housing values over the second 10-year period, and an apparent move-out of African-Americans over the period) suggest problems with the "market dynamics" scenario.[26] By contrast, there is strong and consistent evidence for the disproportionate siting hypothesis.

Of course, a more precise disentangling of causation requires that we can control for the effects of multiple variables. We therefore devised a model that took into account percent minority, household income (our proxy for home ownership), and population density.[27] In predicting whether a tract would receive a nearby (within a quarter-mile or one mile) TSDF in the 1970-90 period, all these variables were statistically significant. Most importantly, the percent minority was quite significant in predicting whether a TSDF would be sited in a neighborhood.[28,29]

Table 4

Demographic Changes in Census Tracts by Decade Following a TSDF Siting the Prior Decade vs. Tracts Without a TSDF

		Received a TSDF Between 1960-70			
		Within 1/4 mile		Within 1 mile	
Variable	1970-80 Average County Change	Difference	*Sig.*	Difference	*Sig.*
Percent Minority	14.2	3.1		2.5	
Percent African-American	2.0	-1.0		1.4	
Percent Latino	8.1	4.0		0.2	
Household Income	91.6%	-8.3%		-2.2%	
Home Value	254.0%	-34.5%	*	-16.9%	*
Median Rent	99.7%	-10.2%		-6.0%	
Percent College-Educated	5.1	-3.0	*	-0.6	
Percent Single-Family Housing	-2.4	-0.9		0.7	
Percent Blue-Collar	-1.8	1.8		2.2	*

		Received a TSDF Between 1970-80			
		Within 1/4 mile		Within 1 mile	
Variable	1980-90 Average County Change	Difference	*Sig.*	Difference	*Sig.*
Percent Minority	10.3	0.6		1.7	**
Percent African-American	-1.8	0.1		0.2	
Percent Latino	8.6	1.2		0.6	
Household Income	96.9%	-9.8%	*	-3.2%	
Home Value	159.1%	15.9%		8.1%	**
Median Rent	133.7%	-0.1%		3.6%	
Percent College-Educated	4.3	-2.6	**	-2.4	***
Percent Single-Family Housing	-2.3	-4.8		-0.6	
Percent Blue-Collar	-3.5	0.6		0.8	

Difference refers to the percentage point or percent difference between the changes in tracts that received and did not receive TSDFs (with values for the latter approximating the 1970-80 [top panel] or 1980-90 [bottom panel] average county change), and *Sig.* refers to the statistical significance of the difference between the two categories. Significance is symbolized as follows: ***=.01; **=.05; *=.10.

To check causality in the other direction—whether a TSDF siting caused a move-in—required that we develop a simple model predicting the percent increase in minority population over the 1970-90 period at the census-tract level. Our explanatory factors included the existing white percentage of the population, residential stability (with the expectation that more turnover in the previous half-decade would signal an area with more opportunity for move-in and demographic change), and median housing values and rents (on the expectation that lower costs would attract minorities or reflect housing discrimination).[30] We then added a variable indicating whether the neighborhood had a TSDF (within a quarter-mile or mile) as of 1970, and one indicating whether it had received a TSDF during

the 1960s. The effects were generally negative—that is, controlling for other factors, TSDFs led to minority move-out, not move-in—but were always very statistically insignificant.[31]

We then sought to determine whether the effect was more immediate: We looked at the effect of an arrival of a TSDF in the 1960s on the demographic changes of the 1970s, and the effect of an arrival in the 1970s on the demographic shifts of the 1980s. Overall, the effect was statistically insignificant and the directions of impact were mixed. The only marginally significant result (.20 level) on minority increase was for the impacts in the 1980s of a TSDF siting within one mile during the 1970s, but this was an isolated result in a general sea of insignificance and did not hold up under reasonable alternative specifications.[32]

Finally, we constructed a simultaneous model that allowed for siting and demographic change to be occurring at the same time. Here, we found that an increase in percent minority during the 1970-90 period tended to attract a TSDF; on the other hand, the siting of a TSDF, holding other factors constant, led to minority move-out, not move-in.[33] Surveying this and the preceding results, we believe that a fair summary of the evidence would suggest that siting dominates move-in as an explanation of disproportionate minority residence near TSDFs, at least in this sample.

Politics and Siting

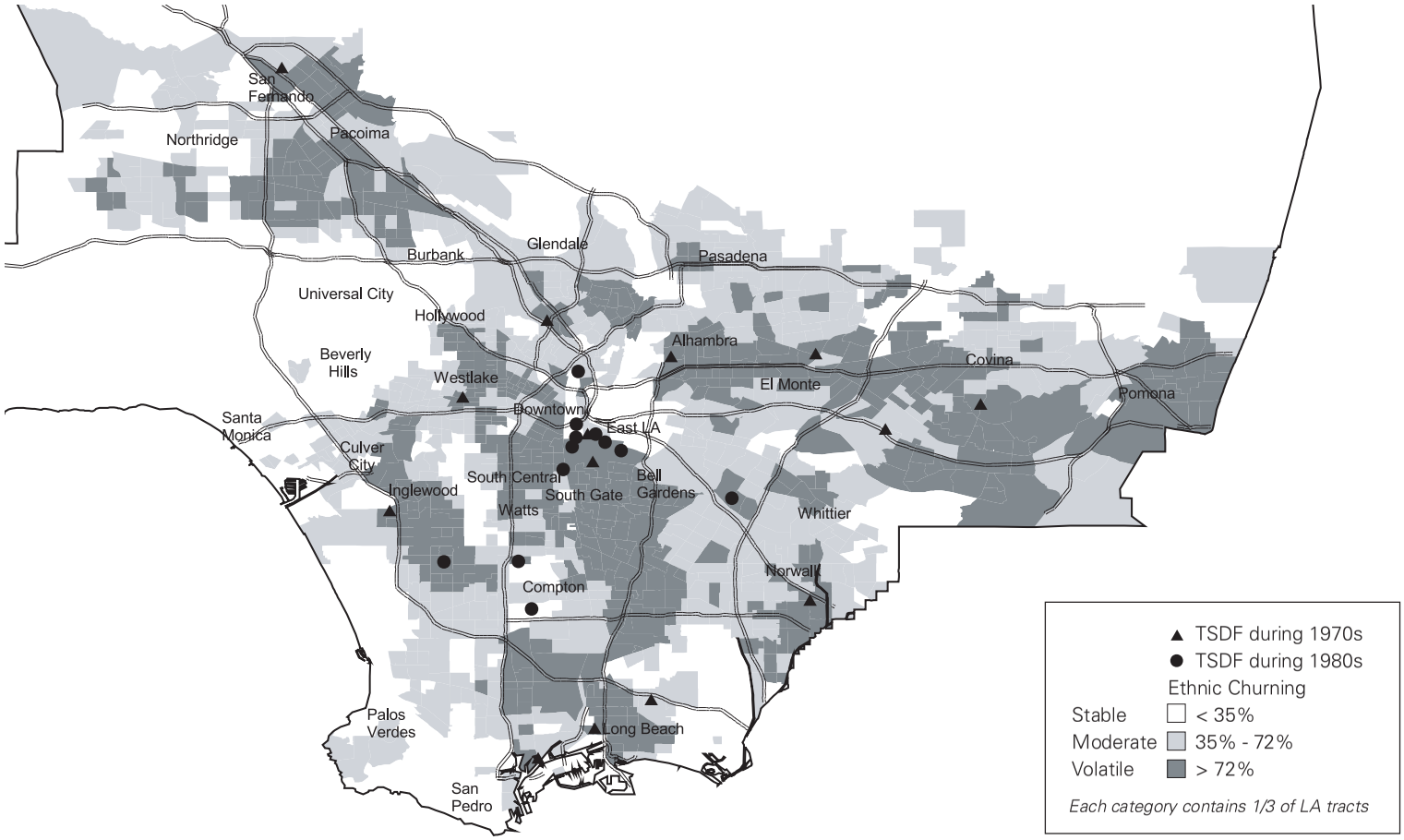
While disproportionate siting in minority areas may be more plausible than move-in as an explanation of contemporary hazard location, this does not establish discriminatory intent per se. Environmental negatives, for example, such as TSDFs, may simply be located in areas where residents lack political power and/or sophistication (Hamilton 1995).[34] This suggests one reason why home ownership is an important predictive variable: Residents more invested in the neighborhood are more likely to be politically active about zoning and other land-use decisions. The political explanation also suggests that one reason why the contemporary pattern of hazard location in the Los Angeles area is even stronger for Latinos than for African-Americans (recall Figure 2) is that the former group tends to be even more disenfranchised because of the impacts of immigration status and age structure on voting power.

To explore both ethnic differences and the role of political power vis-à-vis siting patterns, we decided to try at least one set of models where the percent African-American and percent Latino were separated. We noticed a striking result: Rather than a linear relationship—more of each bringing more TSDFs—there was a curved relationship that, for example, peaked at 44% for blacks and 48% for Latinos for the 1970s.[35] We wondered if this was because when there are no dominant ethnic groups, as might be the case in an area split between African-Americans and Latinos, there is less of a sense of a collective history and thus a higher probability that local leadership will be fragmented. Under such circumstances, community organizers would face particularly tough challenges in mounting

We believe that a fair summary of the evidence would suggest that siting dominates move-in as an explanation of disproportionate minority residence near TSDFs, at least in this sample.

Figure 6

TSDFs Placed During the 1970s and 1980s and Ethnic Churning, Los Angeles County



opposition to siting environmental hazards of this type.

Are neighborhoods in ethnic transition more vulnerable to hazard siting? To get at this notion formally, we constructed a tract-level variable that was the absolute sum of racial changes in that area over the period.[36] Figure 6 maps this "ethnic churning" in Los Angeles County between 1970 and 1990 against the siting of TSDFs over the same period; as can be seen, there is a strong visual correlation. Using simple comparative tests of the sort above, we found that there was indeed a significant degree of ethnic churning in the decade prior to siting and lessening degrees of churning during and after siting; while the latter does hint at some degree of post-siting move-in, it seems mostly that the neighborhood was completing a process of change that brought new minorities and then new toxics.[37]

We then tried a simultaneous multivariate estimation that considered both a tract's level of ethnic churning during the 1970 to 1990 period and whether it received a TSDF over the same period. The results mostly parallel those for the change in minority just noted: Ethnic churning is a strong predictor of a concurrent siting of a TSDF, while TSDF siting has a negative effect on ethnic transition (squaring with the notion that most transition occurs before the siting of a TSDF rather than after). In our view, racially changing neighborhoods might be of special concern to policymakers: Simply providing information and opportunities for public participation might not be enough to level a playing field for neighborhoods undergoing ethnic transition. These results also suggest the importance of the commitment most environmental justice groups have made to building alliances between, and not just within, ethnic communities.

Ethnic churning is a strong predictor of a concurrent siting of a TSDF, while TSDF siting has a negative effect on ethnic transition

Limits to the Research

While the trends portrayed here are striking, caution is in order. We have, after all, established the direction of causality with regard to only one sort of hazard, TSDFs. Thus, we have little to say directly about toxic air releases (TRI) or other hazards, partly because the time frame of data collection on many of these other environmental measures is not long enough to allow a parallel analysis.[38] At the same time, we believe that the results profiled here are reason for concern in and of themselves, and suspect that similar results may be found for other locally undesirable land uses (LULUs).

Another limit is that the link between disparate exposure and disparate health outcomes remains the subject of debate, and many have called for more epidemiological studies and small-area health risk assessments (see Institute of Medicine 1999, Bowen 1999, and Foreman 1998).[39] However, the EPA's report on Environmental Equity (U.S. EPA 1992) takes a common-sense approach which recognizes that disproportionate exposure is likely to result in "higher than average potential … risks."[40] Our recent work with Rachel Morello-Frosch (Morello-Frosch, Pastor, and Sadd 2001) directly links exposure to estimated risk and finds disproportionate effects.

Are the risks significant? Brookings Institution scholar Christopher Foreman,

a critic of the environmental justice movement, has argued that the activist focus on company-induced hazards, such as TSDFs, has led to a de-emphasis on other epidemiological factors, such as individual behavior with regard to smoking or drinking.[41] While Foreman is correct to stress the need for better research on the risks of hazards, especially to prioritize clean-up and mitigation efforts, living near a toxic facility is unlike smoking in a key way: Given the lack of evidence for the move-in hypothesis, the facility is likely to be an imposition that is partly out of an individual's control rather than a lifestyle choice.

Moreover, perceived risk matters. Residents in neighborhoods exhibiting disproportionate proximity to hazards tend to feel that they are being unfairly targeted and may be suspicious of environmental authorities, a factor that disrupts the policy-making and implementation process. Investors may also become concerned that the commercial redevelopment of older hazardous sites near TSDFs and/or other hazards will be opposed by a worried public, causing them to put off needed revitalization for fear of litigation or simply political conflict.[42] Thus, even if the actual health outcomes remain a matter of debate, a community's disproportionate proximity to hazards can have detrimental political and economic impacts.

Some of our recommendations go beyond the specific role of the state's Department of Toxic Substances Control and consider the broader mandate for environmental justice for the state introduced by the passage of SB 115.

Policy Implications

What are the implications for policymakers in California? To get at this issue, we draw on more than the specific research presented here on the timing of TSDF siting; as noted earlier, this study itself builds on a body of work that that has confirmed disproportionate exposure to various hazards, at least in Southern California, and policy needs to therefore take into account the bigger picture. As a result, some of our recommendations go beyond the specific role of the state's Department of Toxic Substances Control (DTSC) and consider the broader mandate for environmental justice for the state introduced by the passage of SB 115.

We specifically suggest at least four major directions for policy (Table 5). First, state government authorities need to do a better job reaching out to communities to provide information and opportunities for participation at the time hazards are being placed in those communities. Second, the state should develop some reasonable rules to address and/or prevent disproportionate exposure, especially for communities that lack the social resources to organize effectively (such as communities in transition) to protect their own interest. Third, resources to clean up current environmental hazards or provide compensation for such hazards via economic development should be targeted to minority and other highly affected communities. Fourth, the state needs to broaden and rapidly implement the recently passed resolution (SB 115) directing all relevant state agencies to take environmental justice concerns into account in their research and decision making.

Table 5

Environmental Justice Policy Recommendations

Policy Area	Policy Action
Further outreach and participation to bring more community members into the environmental planning process	• access to public information, scientific knowledge, and legal rights • assistance to understand the language and rules • early notification and empowerment in the process • required minority representation • incorporation and support of community organizations • a role for foundations as well as state government
The creation of rules to protect those communities that are likely to be too weak to launch effective participation processes	• minimize and prevent existing inequities from worsening • state-level automatic triggers and "greenlining" to apply when there already is disproportionate exposure • social impact statement, including demography of affected area, to be submitted with Environmental Impact Reports
The development of satisfactory compensation, clean-up, and economic-development strategies	• increased funding to DTSC and localities for clean-up • inclusion of local communities in the initial stages of clean-up decision • taxes imposed for polluting, with revenues going directly to affected neighborhoods for education, outreach, and infrastructure improvements • brownfields redevelopment prioritized for poorest and most overburdened communities
The adoption by California of a broad environmental justice mandate	• official recognition of the problem through SB 115 • require that state agencies develop innovative plans to address environmental justice concerns in their programs • commitment by agencies to prevent further disparities • continued research in the areas of health, exposure in schools and workplaces, and other types of hazards and other areas of the state

Outreach, Participation, and Information

While community participation in key environmental decisions seems to be a logical extension of democracy, businesses often worry that public processes will introduce uncertainty and unnecessarily politicize "technical" issues. Christopher Foreman echoes these concerns, suggesting a tension between rationalizing and democratizing processes. Rationalizing processes, he argues, rely on objective scientific research on the actual risks from certain hazards; as Guana (1998) points out, such frameworks tend to produce negotiation between businesses and their hired experts, environmental

Public information on hazard location should also be easily accessible and understandable.

organizations and their experts, and government regulators in search of more efficient trade-offs. By contrast, Foreman argues, the democratizing approach favored by environmental justice activists can often lead to "theatrics," with community participation structures that facilitate "story telling" but, in the spirit of inclusion, elevate all concerns to the same level. The result, Foreman suggests, is an inability to make hard choices and prioritize health issues.

It is tempting for policymakers to follow Foreman's preference for experts. After all, environmental justice activists are often more rooted in civil rights struggles than they are in the scientific and naturalist backgrounds typical of traditional environmental groups, and they frequently bring to the table an organized and angry community less versed in epidemiological methods and more concerned about the perception of risk.[43] While this usually makes for uncomfortable meetings, regulators should understand that the communities most affected by environmental inequity are also the least likely to have access to scientific knowledge and the most likely to suspect that simply a discussion by experts will not result in a conclusion responsive to their concerns. Early outreach and information provision can help the conversation; Foreman's "theatrics" often occurs when community participation comes so late in the process that protest seems the only option.[44]

California's 1986 Tanner Act was intended to provide a framework for such information and participation in the siting decisions for the toxic waste facilities examined in the statistical portion of this report. While largely aimed at facilitating the siting of TSDFs by streamlining the state and local permitting process (Schwartz and Wolfe 1999), the act also required that governments develop local assessment committees that would be "broadly constituted to reflect the makeup of the community" and that would interact with facility proponents and opponents early in the siting approval process.[45]

While the process seems to have worked well in some cases, Luke Cole (1999) notes that the local assessment committees (LACs) formed to consider two facilities in the Central Valley were unrepresentative of the largely Latino population nearby.[46] In part, this is because the seven-member LAC mandated by Tanner requires only "three representatives of the community at large" (Schwartz and Wolfe 1999). There is no requirement that the selected community members actually come from the directly affected neighborhoods; thus, they can come from a part of the jurisdiction more likely to see the benefits of additional tax revenues without bearing the concentrated costs experienced by residents of the affected neighborhood.[47] To fix this problem, Schwartz and Wolfe (1999) recommend modifying the Tanner Act to include a provision that four of the seven be from the adjacent communities and also suggest a mandate for minority representation.[48]

Ensuring that community or neighborhood participation is effective can require preparatory work on the part of both government agencies and communities. The U.S. EPA (1996) notes that brownfields programs (designed to facilitate the

redevelopment of lightly contaminated sites) that hope to involve communities "up-front" should begin with an inventory of the language needs for materials directed to affected populations and reach out via existing social networks in schools, churches, and civic organizations.[49] The research above—on the special vulnerability of communities in ethnic transition—suggests that these changing areas could benefit from being the target of special outreach by government agencies.

Public information on hazard location should also be easily accessible and understandable.[50] Despite the problems of uneven access to computer resources, computer-based community mapping of hazard locations is an excellent way to orient community members (see U.S. EPA 1996). The U.S. EPA website (www.epa.gov), for example, has a very user-friendly program that allows residents to learn the location of local hazards and then click on them to discover both the owners of the facilities and the nature of the toxics released or used. The Environmental Defense Fund, a nonprofit, has a similarly useful website (www.scorecard.org) focused on TRI-designated air releases. The California EPA website (www.calepa.ca.gov) includes interactive mapping technology, especially for locating underground storage tanks and air emissions. However, none of these seem to connect to demographic overlay maps, and the Department of Toxic Substances Control (DTSC) site (www.dtsc.ca.gov) did not, at the time of writing, include easy mapping of TSDFs or brownfields. Improving these aspects of the agency websites could make necessary information more accessible to concerned residents just beginning their involvement.[51]

Communities also need direct assistance in understanding the complex legal and scientific documents that are part of siting processes.

Communities also need direct assistance in understanding the complex legal and scientific documents that are part of siting processes. In one study of the tax flows related to three California waste facilities, two Stanford University law students documented the challenges they faced in obtaining the necessary information, including the need to file Public Records Act requests, delays in governmental response to their requests, and high fees charged by county authorities for the necessary data (Kirk and Wade 1997). Placing such informational hurdles before low-income residents is not likely to facilitate participation.

Nonprofit programs and organizations can play critical roles in the community side of the equation; the relevant state agencies should make every effort to involve them. In terms of outreach, community groups and nonprofits often have preexisting relations with residents and know how to work around the usual obstacles to community engagement. A recent assessment by the City of Emeryville of an ambitious brownfields pilot project (done in conjunction with DTSC and the U.S. EPA, among others) suggests that the process would have gone better had officials sought out nonprofits to help with the outreach process; such inclusion could be standard practice.

Of course, effective engagement requires more than bringing community members to the table: preparation and community capacity building are also necessary. Several models for such capacity building already

Community organizations should be welcomed as a resource for broadening the range of voices and empowered to do their job in the most effective way possible.

exist in the field of environmental justice. In 1999, for example, Communities for a Better Environment (CBE) launched a nine-week Summer Institute in Los Angeles that provided training to over 60 grassroots community members on the scientific and health issues related to hazards, the use of Geographical Information Services and Web resources to identify affected neighborhoods, and basic organizational strategies to effectively change policies. In 1995, the San Diego-based Environmental Health Coalition launched a project to train low-income women in issues of environmental health (SALTA, Salud Ambiental, Latinas Tomando Acción/Environmental Health, Latinas Taking Action). In one resulting project, 200 women documented the health status of their neighborhoods, focusing especially on respiratory illnesses and lead poisoning and the impacts on children. While the resulting study did not fully conform with scientific methods, it did suggest an association between exposure to toxic chemicals and adverse health effects (see Environmental Health Coalition 1998a)—and by directly incorporating residents into a research effort, the study process bridged the divide between the "rational" (or scientific) and "democratic" impulses that Foreman characterizes with regard to resident participation.

Sustaining such community efforts requires resources. While these can, in part, be provided by the government, it is important to note the key role of foundation support for both of the organizations and efforts discussed above. Such independent support should continue, particularly as it enables groups to pursue goals and strategies that might put them at odds with state regulators. Our general point is straightforward: Community organizations, which have sometimes had to muscle their way into the process, should instead be welcomed as a resource for broadening the range of voices and empowered to do their job in the most effective way possible.[52]

Rules to Prevent Disproportionate Exposure

As useful as public participation and involvement might be, there is a conundrum: Expecting that the currently unorganized communities most likely to receive hazards will be able to grasp the nuances of environmental regulations and then conduct a public campaign to protect their interests may be wishful thinking. This suggests the need to develop some baseline standards that can protect those least able to defend their own interests.

The main standard used by the U.S. EPA is Title VI of the Civil Rights Act of 1964, which prohibits the federal government from running programs or making decisions (such as site approvals) that have discriminatory impacts.[53] The guidance document governing the EPA's response to administrative complaints filed by community groups under Title VI suggests that the EPA use mapping technology to draw radii around proposed sites and then check the local demographic data, as we have done above, for evidence of a disparate impact (Ramírez and Stephenson 1998, p. 122).[54] Under the previous California governor, state officials did not welcome this sort of analysis of surrounding demographics. Indeed, officials from the California EPA wrote a letter to the U.S. EPA arguing that the latter could not extend

Title VI protections without a congressional decision on the issue and generally challenged the authority of either the federal or state government to take the racial character of surrounding areas into account (Payne 1998).

In our view, the nature of the adjoining community should be taken into account in a rule-based fashion. While community participation should always be encouraged, we worry that hazard-by-hazard organizing is time-consuming and often puts communities in a reactive rather than proactive mode. Moreover, the evidence we have provided regarding communities in transition suggests that certain areas might be especially vulnerable because of a lack of power and organization, and therefore need special protection. State-level rules that were invoked more automatically could systematically level the playing field in the siting process.

In the case of TSDFs, one could imagine the following trigger: A new TSDF would not be allowed in a particular location if the effect was to worsen the existing distribution of hazards by race/ethnicity or income. For example, recall from Table 1 that the census tracts within a quarter-mile of a TSDF have, on average, a population that is about 25 percentage points more minority than in the rest of the county. Under the scheme proposed, all that would be closed off—or "greenlined"—would be areas that are more than 25 percentage points above the rest of the county. This would in fact be a minimal standard: It would not significantly reverse existing inequities but simply prevent them from getting worse by curtailing the location of hazards in areas that would tip the current distribution in an even more inequitable direction.

What impact would such a standard have had on the historical patterns tested above? To determine this, we took the average income and percent minority for the census tracts with existing TSDFs in 1970. We then designated tracts with either a lower income or higher percent minority than these already disproportionately burdened areas as places to be avoided during the 1970s. We then followed the same procedure for 1980 in order to come up with the greenlined areas for that decade. By this standard, just over half of the TSDFs sited were in avoidance areas that might have been disallowed under our proposed rule.[55]

Would these facilities have then been sited in wealthier and whiter neighborhoods? While this is possible, it is equally likely that prohibiting environmentally hazardous sites from being placed in certain neighborhoods could force businesses, policymakers, and consumers to consider waste conservation and other more environmentally appropriate strategies. Morello-Frosch, for example, shows that the more income inequality or racial segregation that exists in a county in California, the more likely it is that that the county overall will have higher levels of hazardous air pollutants. Having rules to address inequity in siting—and thus ensuring that waste is processed in everyone's backyard—could help create the political momentum for overall source reduction.[56]

While there are valid concerns that rules simply preventing siting under certain conditions might not be flexible enough,

Information on hazards and demographics should be readily available for policymakers, interested businesses, and the citizenry.

surely any development that would worsen the environmental justice picture should at least trigger an extra level of review.[57] Of course, such a review is only possible if the state is collects information on disproportionate exposure in the first place. One idea, pushed through the legislature by then-Assemblywoman Lucille Roybal-Allard in 1992 and vetoed by the then-governor, would be to include a social impact statement as part of, or a side document to, an Environmental Impact Report (EIR).[58] Such a statement or analysis could include income level, racial composition (including any ongoing dynamics of ethnic transition), and the linguistic capabilities of the immediately surrounding population. The proximity of schools and the density of the population in adjacent areas (controlling for land use), all in comparison to the appropriate regional values, would also be useful data.[59] However, the expansion of EIR requirements has been sharply opposed by business interests, who already find the EIR process cumbersome.[60] Whether or not the EIR is deemed the proper vehicle, the point still remains: Information on hazards and demographics should be readily available for policymakers, interested businesses, and the citizenry.

Compensation, Clean-Up, and Economic Development

Compensation is a controversial issue. While many market-oriented academics and policymakers argue that this would be preferable to strict regulations (see Huebner 1998), some environmental activists worry that low-income minority communities will lose in any bargaining exchange with business.[61] We recognize this problem and have proposed rules that might shield the weakest populations. We also concur that source reduction is the best strategy, a position stressed by many groups concerned with environmental justice (see Environmental Health Coalition 1998b).

But environmental hazards will be sited, and compensation is due those communities affected by either new facilities or, more likely, expansion of older facilities. Kirk and Wade (1997) argue that the Tanner Act has been problematic in this regard. While the act allowed (but did not mandate) local government to tax up to 10% of a toxic waste facility's revenues, the tax flow has generally gone to the larger political authority and not to the specific community most likely to be affected by the hazard.[62] In two cases in the Central Valley, Buttonwillow in Kern County and Kettleman City in Kings County, the affected areas were unincorporated (and mostly Latino) areas, while the ultimate decision over siting lay with the county authorities, who would receive the bulk of the revenues; thus, the structure was replete with financial incentives to accept the hazard over local objections. When both the affected area and political boundaries are more contiguous, this can create its own problems: Small cities like East Palo Alto have limited bargaining power vis-à-vis corporations because they desperately need the revenue, and hence are reluctant to impose the full 10% tax. In our view, it is imperative to ensure that the tax is always imposed and that it goes directly to community education, outreach, and infrastructure improvements in the affected neighborhoods.[63]

One of the biggest issues confronting communities is the legacy of previous toxic operations.

One of the biggest issues confronting communities is the legacy of previous toxic operations. While the focus in this report has been on TSDFs, there are a whole range of sites that have been contaminated by toxics used in industrial processes. Under current law, the owner or operator of such a facility can be sued for damages even if that owner or operator did not cause the contamination. Some developers have become wary of purchasing and building on older industrial plots, arguing that such "brownfields" will land them in endless litigation; lenders have been similarly hesitant to finance such purchases.

Yet many of these sites are lightly contaminated, and agreements can be struck to limit liability and promote community economic development. The federal and state governments have therefore sought to bring together developers, community members, and public officials under a variety of "brownfields" initiatives. The Bay Area, for example, boasts a Regional Brownfields Working Group with representatives from government as well as community-based organizations, nonprofits, and funders; the group is seeking to develop a new environmental justice-oriented vision of clean-up and redevelopment even as it models a new collaborative process for decision making. In March 1998, both Los Angeles and East Palo Alto were selected as two of 16 Showcase Communities by the National Brownfields Partnership, a federal interagency demonstration project.[64] Many other areas, including Sacramento, Emeryville, Oakland, and San Diego have seen innovative brownfields efforts; in East Los Angeles, one brownfield effort involved the creative development of a site that was once the focus of community protests because it had been designated for a prison.[65]

While DTSC has enjoyed some significant successes, its record has been significantly limited by a lack of state funding to help with actual clean-up.

The state government's efforts in this arena have been generally been conducted under the auspices of the Department of Toxic Substances Control (DTSC), especially the Voluntary Clean-Up Program in which DTSC makes available for a fee its capacity to assess site contamination and certify a full site clean-up.[66] While DTSC has enjoyed some significant successes, including the conversion of an oil refinery in Carson to an open-air shopping mall,[67] its record has been significantly limited by a lack of state funding to help with actual clean-up; moreover, what funds are available are often targeted to Superfund sites rather than to the less dangerous but perhaps more economically viable brownfields opportunities. As for public participation, DTSC does attempt to include local communities in the initial stages of clean-up, and recent regulations included as part of the state Superfund reauthorization prepare the way for even more participation and capacity building. Still, many of the environmental justice groups concerned about brownfields redevelopment say that they have had more interaction with the U.S. EPA-supported brownfields pilot projects or with nonprofits such as the California Center for Land Recycling.[68]

In prioritizing areas for future clean-up and redevelopment, it might be useful to employ our greenlining rule in reverse: Target first those neighborhoods where the reduction in toxicity will tend to improve the current maldistribution of

Expanding the demographic research of this report to consider other areas of California would help establish whether the historical pattern in Los Angeles is typical.

environmental hazards by race and/or income. Moreover, localities need monies not simply to study and assess the problem, but also to pursue the actual clean-up and site redevelopment.[69]

Some business-oriented critics have suggested that the pursuit of both environmental justice and brownfields redevelopment represents a conflict: One can't be protecting communities from hazards on the one hand and seeking to develop contaminated land on the other.[70] Yet a recent EPA study of seven of its Brownfields Pilot Study sites across the country found that "Title VI concerns have not slowed down, blocked, or otherwise negatively impacted redevelopment activities to date at these Pilots" (U.S. EPA 1996, p. 6). Interestingly, the study also found that sites that have been targeted by environmental justice movements tend to involve communities early in planning for brownfields re-use and run into fewer political and legal problems.[71] In short, community involvement in agenda setting and implementation can be key to success in devising compensation, clean-up, and redevelopment strategies that will be sustainable politically and economically.

An Environmental Justice Mandate and the Need for New Research

Federal authorities report that the Executive Order issued by President Clinton in 1994 facilitated the development of an environmental justice agenda by not only ensuring that the U.S. EPA would take action, but also by encouraging other departments to consider how their own policies—such as the development of freeways or public transportation, or both—might or might not square with the goals of environmental equity. SB 115, initiated by State Senator Hilda Solis and passed in late 1999 by both the Assembly and the Senate, offers the beginning of a parallel mandate for environmental justice efforts in the state.

The legislation requires that the Office of Planning and Research (OPR) consult with the California EPA, Trade and Commerce, and other state agencies on environmental justice issues, and suggests that OPR coordinate with the federal government's efforts in this regard. While the bill was substantially weakened from its initial version—which directed OPR to suggest changes in the California Environmental Quality Act (CEQA), particularly the requirements for Environmental Impact Reports—it represents an important step forward in policy development, especially since the state often has a more important role in siting and other environmental decisions than does the federal government.[72]

To adequately respond to the mandate, new research is needed.[73] Expanding the demographic research of this report to consider other areas of California, for example, would help establish whether the historical pattern in Los Angeles is typical. Our current knowledge base on hazards needs to be improved, particularly because of the data gaps caused when smaller operations either emit toxics below threshold reporting requirements or simply evade regulators; this creates the possibility that community groups or regulators may go after large polluters but miss the bulk of the actual health problem.

Further research on community risk and health outcomes from those environmental negatives would also be helpful.

New research is also needed in the area of children's health. While the recent controversy over the Belmont Learning Center in Los Angeles—apparently built over a field of potentially explosive methane gas and other toxics[74]—has dominated the news, there is a larger issue: Most studies have focused on the distribution of hazards with regard to the residents of an area, but many children spend much of their day not at home, but at school. Using residential demographics is the only feasible strategy for the sort of temporal study presented here, mostly because the data are collected and maintained. Still, charting TSDFs, air releases, and other potential hazards against school demographics would be a useful exercise for policymakers, as would re-norming safety standards to take account of the need to protect children from nearby workplace hazards.[75]

Finally, both state and university researchers should begin to work more effectively with the Cumulative Exposure Index, a measure that calculates the likely health risks from various hazardous air pollutants considered together. While this database is not appropriate for historical analysis (as it does not span a significant period of time), statistical work with this data could deal, at least partially, with the concern raised by Foreman (1998) and others that current studies test for proximity but not for exposure and the subsequent health risks.[76] Research could also help prioritize hazards for action and could be done in an iterative fashion that takes into account both community perceptions and scientific information which can correct any perceptions that are inaccurate.

While further research is definitely needed, policymaker caution can cut two ways: Although the state may not want to undertake an extensive overhaul of existing regulations before hazard disparity has been fully confirmed, it hardly makes sense to mimic those persons who change their health behaviors only after a heart attack confirms what had been suspected all along: that smoking and obesity are creating a problem for them. The available evidence from recent studies, obtained after criticism of earlier research strategies led to methodological improvements, strongly suggests that environmental inequity is pervasive across a range of hazards. As a result, the state should take environmental justice seriously and develop an appropriate agenda for the future.

Conclusion: The Challenge of Environmental Justice

While environmental problems affect everyone in California, a series of studies have shown that many sorts of hazards are disproportionately located in minority communities. Community organizations pressing to address this problem of "environmental justice" have sometimes been confronted with the argument that those who live near environmentally hazardous sites choose to do so. Build a hazard and minorities will come, this argument goes, perhaps because they are seeking to trade off some degree of health risk for larger or better housing. If this is the case, some argue, policymakers may have little reason to consider race in siting locally undesirable land uses (LULUs)—such an impacted area will simply become more heavily populated by minorities over time.

This study suggests that the current disproportionate exposure of minorities to

The real risk lies in doing nothing, a strategy that would leave public agencies still under pressure from concerned and mobilized communities but without the tools, direction, and guidance that could help address these concerns.

TSDFs in Los Angeles County is due primarily to these facilities being sited in communities of color rather than to any move-in of minorities to these toxic-laden areas. While the research does not resolve the issue with regard to other potential hazards or even other areas of California, it does suggest that caution about siting issues might usefully be applied to other LULUs. At the least, we can be somewhat confident that policies to alter siting practices will not simply reproduce the present pattern of disproportionate proximity by race/ethnicity because of housing choice.[77] Moreover, the relative stability of the demographics of hazard-proximate neighborhoods (that is, their tendency to have population changes over time similar to those in less proximate neighborhoods) suggests that the current patterns of disproportionate proximity will probably persist for some time, particularly since it has become so difficult to site a new hazardous waste facility that most of the permit requests are for expansion of existing facilities (Kirk and Wade 1997).

We have argued that the state needs to address this legacy of environmental inequity in several ways: engage in innovative community outreach and capacity building to encourage participation, develop some firm rules that could protect those least able to organize, think through new ways to compensate or otherwise develop affected communities, and implement an environmental justice mandate that could spur state agencies to pursue their own research and devise their own creative approaches to the issues raised by environmental justice advocates.

In making these recommendations, we are aware of the limits to this research and understand the reasonable concerns of those who feel that policy action will move too far ahead of the established knowledge regarding either the demographic patterns or the health risks. Further study is clearly warranted and policy action may, in the interim, necessarily be modest. Yet the real risk lies in doing nothing, a strategy that would leave public agencies still under pressure from concerned and mobilized communities but without the tools, direction, and guidance that could help address these concerns.

A new state effort in the field of environmental justice is needed and could become a model for the nation as a whole. Californians—enjoying beautiful coastlines, rich agricultural lands, stunning deserts, and spectacular mountains even as we struggle through some of the country's most severe problems of air pollution and urban sprawl—have often been proud to lead the nation in the areas of environmental protection and restoration. With creative policies that involve affected communities, protect the most vulnerable, and prioritize clean-up, compensation, and economic development in low-income areas, we can now take a similar leadership role in the area of environmental justice.

Notes

1. Some activists have argued that the answer to this question would make little difference to policy. Cole (1996, p. 451), for example, explores causality, then suggests that "[e]ven if communities of color 'came to the nuisance' … does this mean we should do less today to remedy the disproportionate exposure of these communities to the hazards?" We concur that clean-up efforts would be appropriate in any case but, as we argue, causality makes a difference to the type of preventive policy that would be pursued (see also Bowen 1999).

2. Helfand and Peyton (1999, p. 79) also point to informational disparities but are referring more to education about the nature of hazards.

3. While some attention is given in this work to the methodological details involved in constructing the database and testing for evidence of inequity, the focus here is on the broad lessons of that work. A more detailed version of this portion of the research is available in Pastor, Sadd, and Hipp (2001); copies can be obtained from either the author of this report (mpastor@cats.ucsc.edu) or the California Policy Research Center (cprc@ucop.edu).

4. The CBE suit was intended to stop an emissions trading scheme. Under such programs, firms can choose to meet their own pollution reduction targets by paying for another firm or social actor to reduce its emissions. While such a program is more efficient than traditional "command and control" strategies, it can exacerbate preexisting inequities in the distribution of hazards. For example, the program which was the focus of the CBE suit allowed oil processing firms to evade clean-up of their facilities by purchasing older polluting vehicles and removing them from the road. While the overall air basin was better off, the communities living by the oil facilities saw no improvement and were hence relatively worse off. For more on CBE's lawsuit and its specific impacts, see Kuhn (1999).

5. By "exposure," we mean residential proximity to hazards. For our standard proximity, we have used quarter-mile and one-mile zones surrounding TSDFs.

6. Helfand and Peyton (1999) argue that one should not be concerned about an unequal distribution of hazards since it is highly unlikely that environmental negatives would be distributed completely equally across an urban landscape. This important point obfuscates the issue. The question is whether the inequality is random or is systematically correlated with attributes of the residents, land-use patterns, or other variables.

7. The regressions used in such multivariate exercises were generally logistic, given that the dependent variable is dichotomous (that is, an area has a hazard or it does not).

8. Some have also argued that these studies were biased because they were funded by a grant from the largest waste management firm in the U.S. However, the Anderton et al. studies did reflect a significant advance over earlier research in terms of method and data collection.

9. See Baden and Coursey (1997), Bowen et al. (1995), Glickman and Hersh (1995), Yandle and Burton (1996), and Rinquist (1997).

10. There are also some very good case studies, with one of the best being Pulido (1996). See also Boone and Modarres (1999).

11. A later study, put out by Communities for a Better Environment in Los Angeles, also offers a visual correlation of hazards but covers a full range of potential problem sites, including TRI, TSDF, leaking underground storage tanks, Superfund sites, and others. See Bansal and Davis (1998).

12. This work has also included several configurations of student researchers and, more recently, a public health expert. See Boer et al. (1997), Sadd et al. (1999), and Morello-Frosch et al. (2001).

13. The 33/50 program was an EPA program designed to demonstrate how voluntary partnerships could augment traditional monitoring and enforcement. The program targeted 17 priority chemicals, most of which are carcinogens, and set as its goal a 33% reduction in releases and transfers of these chemicals by 1992 and a 50% reduction by 1995 (using a 1988 baseline).

14. The effects were especially significant when we tested not just for whether a tract itself had a release but also whether it was within one mile of a release, a radius of influence typical of such studies. As for variable signs, we expected that minority presence would have a positive effect on the likelihood of an air release, as would industrial use and the percent of residents involved in industry (presumably because either industries would be attracted to such a population or because industrial workers might live closer to the polluting firms where they worked). We also predicted a negative impact of population density since locating air pollution sources in areas with less people seems like rational public policy. For income, we predicted a U-shaped relationship: Low levels of income would indicate such dire economic conditions that not even industry would be present, high levels of income would enhance political power and thus the ability to resist polluting industries, and moderate levels of income would be (controlling for other factors) most highly associated with the presence of air releases.

15. Oakes et al. (1996) find no correlation, while Been and Gupta (1997) do. Yandle and Burton (1996) also provide a longitudinal look, examining the characteristics of tracts with the characteristics of metropolitan areas in Texas at the time of siting of hazardous landfills. The article, however, has been sharply criticized on methodological grounds (see, for example, Anderton 1996 and Mohai 1996) and our own approach is more consistent with the regression strategies taken in the Been and Gupta (1997) and Oakes et al. (1996) studies. Krieg (1995) purports to look at the historical dimension of toxic waste siting in the Boston area by controlling for industrialization. However, the actual empirical analysis is a simple cross-section, and he uses towns as the unit of analysis, a questionable choice given the widely varying size of the geographic unit. Szasz and Meuser (2000) look at tract-level changes for Santa Clara County, mapping the changes in industrialization (as a proxy for environmental problems) against demographic and other changes from 1960 to 1990, but they do not undertake the more complex statistical analysis typical of Oakes et al. (1996), Been and Gupta (1997), and our study.

16. Some of the small-area studies have found some evidence of move-in; see, for example, Lambert and Boerner (1997) and Baden and Coursey (1997).

17. High-capacity TSDFs are defined as those that processed or stored at least 50 tons of hazardous substances. Although only about half (44/83) of the TSDFs in the study area are classified as high-capacity, these facilities handle nearly all of the hazardous waste among TSDFs in the region (644,317 of 644,511 total tons) according to output and facility information as of 1996.

18. We took the data from the EPA Hazardous Waste Permit Application (EPA Consolidated Permits Program Form 3510-3 (6-80); Form Approved OMB No. 158-S80004) for each TSDF facility in Los Angeles County. This form is required of all legally operating TSDFs under Section 3005 of the Federal Resource Conservation and Recovery Act (R.C.R.A. 1976), and the Part A Form 3 portion of this application requires the owner or operator of an existing facility to provide the date that facility operation began. Copies of this application were obtained for all TSDFs in the study area from the files of the California Department of Toxic Substances Control. Gaining access to EPA Hazardous Waste Permit information is time-consuming and required that a separate public records act request be filed for each facility, but it is the most accurate method of identifying when a neighborhood was first affected. Permit dates, which have been used in other studies, can be misleading, given interim process permits and the fact that many firms began operations prior to regulations being in place.

19. These nearby areas are often more minority; see Anderton et al. (1994a, 1994b) and Boer et al. (1997).

20. To do this, we relied on a data set made available by the California Department of Finance (DOF) that allocates certain variables from the 1970 and 1980 censuses, including ethnicity, to the 1990 tract boundaries, accounting for shape and boundary changes. We checked the DOF database to verify tract shape and boundary changes and also automated a few other series from the 1970 and 1980 censuses, developing our own algorithm to mimic the DOF procedure. We stick here with the DOF data, since its reconciliation was done by others and therefore does not reflect any researcher biases. Note that because of our use of radii of influence, there are slightly more affected tracts at the quarter-mile radius than there are TSDFs; of course, there are even more affected tracts when we extend out to the one-mile circle.

21. Since home ownership is not available in the DOF database, we use percent single-family housing units as a proxy. A 1990 measure of home ownership taken from the census and the 1990 single-family housing measure from DOF are correlated at the .863 level with a significance of .001.

22. We also found that TSDFs were located in or proximate to areas with significantly more land used for industrial purposes and a significantly higher percentage of manufacturing employees. However, because these two variables are not available for the 1970 and 1980 data we use as well as for comparability across the years, we dropped their consideration in this research. For a full discussion, including how we modeled to see whether other variables were adequate substitutes, see Pastor, Sadd, and Hipp (2001).

23. Fewer than 10% of the affected tracts had more than one TSDF site, and all but one of these had received sites in different decades; in these cases, we counted each occurrence in the comparisons and regressions. This strategy allowed us to see in our regressions whether the existing presence of a TSDF was positively related to the arrival of a new one. The other alternative—assigning a tract the first date of a TSDF and then eliminating it from subsequent analyses—does not affect the pattern of the other results.

24. The actual statistical tests are more complex than those presented here; for methodological details, see Pastor, Sadd, and Hipp (2001).

25. The relative decline in the percent blue-collar is at odds with the usual notion that such sites can bring useful employment to local residents. However, this variable is not a perfect measure of local industrial employment or general job growth in an area, as it focuses on the residence and not the workplace of the workers.

26. A further problem for the market hypothesis may be that household income actually plunged in the quarter-mile zone in the 1980s. If siting really did involve a market trade-off between environmental protection and job creation, one would not necessarily expect the relative decline in income to be statistically significant.

27. The reason for reducing the list is that certain variables (such as house value, rent, and income) are so highly correlated that they essentially wash each other out in the analysis, largely because they are measuring (nearly) the same thing. We use a curvilinear or U-shape for income because previous research has indicated that it is neither the poorest nor the richest communities that receive such hazards: The poorest neighborhoods have little economic activity and are not attractive to firms, while the wealthiest seem to enjoy political power sufficient to resist such placement of facilities.

28. When the percent African-American and percent Latino were simultaneously but separately entered into the model, each was also significant. In quarter-mile test, income was significant at only the .20 level, but significant at the .01 level for the one-mile buffer.

29. In a similar effort focused on Denver, Shaikh and Loomis (1999) do not find an independent effect of race on the siting of new stationary sources of air pollution when using a multivariate analysis. However, the effect evaporates there mostly because they include multiple collinear variables rather than the more parsimonious explanations employed here and in Boer et al. (1997); they also use the zip code as the unit of analysis, a unit that has been eschewed in favor of the tract by most researchers in this area. Shaikh and Loomis also look at the decadal percentage change in minorities after the siting of, in their case, a stationary source of air pollution. They find no evidence of move-in and indeed some suggestion that communities without polluting sites experience larger increases in percent minority.

30. The basic model performed quite well, yielding an adjusted R^2 of .408 with all variables significant in the expected directions. In practice, we enter both the percent white and its square in order to estimate a U-shaped relationship. The idea is that tracts with very few whites have little room left to add minorities, tracts highly populated by whites tend to resist minority move-in through various mechanisms, and peak minority movement occurs somewhere between these two extremes (see Massey and Denton 1993). In the 1970s, Los Angeles County tracts with about 59% whites represented the peak likelihood to see minority move-in in the subsequent decade; this is similar to the "tipping" point discussed in the housing literature. If we drop the white quadratic, the overall model is less powerful (implying the superiority of our model's fit), but the other variables in our housing model have the same signs and enjoy equally high significance.

31. Oakes et al. (1996) also found that the existence of a TSDF led to a modest minority move-out effect.

32. The positive effect of a 1970s TSDF on the 1980s move-in at the one-mile level is significant at the .20 level. But this is diluted when we also control for the previous decade's change in percent minority, with the previous decade's change itself being quite significant, presumably because neighborhoods become more open to minority house-seekers as a result of the earlier move-in.

33. This move-out effect weakened somewhat when we considered just tracts that did not already have a TSDF or when we controlled for whether a tract had a preexisting TSDF; the rationale for this regression was that the current presence of a TSDF might signal that the area is either zoned appropriately or perceived to be otherwise amenable to a TSDF location. This squares with a test done for the more traditional siting model (non-simultaneous) in which a dummy variable for the preexisting presence of TSDFs was significant. It is important to stress, however, that the inclusion of such a variable produced only a modest shift in the coefficients and had no effect on the pattern of significance for the other variables, including minority presence (that is, even controlling for prior siting, minority communities tended to disproportionately receive TSDFs).

34. Sometimes the intention to avoid political conflict has been directly documented. A report by Cerrell Associates, Inc. (1984), which provided advice to the California Waste Management Board on locating waste incinerators, suggested that "all socioeconomic groupings tend to resent the nearby siting of major facilities, but the middle and upper-socioeconomic strata possess better resources to effectuate their opposition. Middle and higher-socioeconomic strata neighborhoods should not fall at least within the one-mile and five-mile radii of the proposed site."

35. Formally, this was done by entering the percent African-American and the percent Latino, and their respective squared values.

36. An area that experienced a decrease of 20 percentage points in the African-American population matched by a 20-percentage-point increase of Latinos would be awarded a shift of 40 percent rather than a zero percent in percent minority.

37. The test discussed here is for 1980s sites, the only group for which we have racial-change data from the previous decade.

38. We did look at the TRI releases over the late 1980s to the mid-1990s to see whether reductions were bigger or smaller in minority neighborhoods. The general pattern was that TRI reductions were smaller in minority neighborhoods, but the fact that we had only one census year (1990) meant that we were unable to test for demographic change over the same period.

39. See also Wartenberg (1999) for an excellent discussion of the methodological challenges in small-area environmental justice analyses.

40. Moreover, Berry and Bove (1997) contend that those studies which fail to find an association between residential proximity to environmental hazards and health are methodologically flawed.

41. Foreman (1998) does concur that child exposure to lead and the occupational exposure of mostly Latino farmworkers to pesticides are well-documented hazards and should be the focus of preventive policy.

42. A recent study by the EPA, discussed later in this report, suggests that developers are not scared off specifically by the EPA Title VI guidance but does confirm that fears of general liability have forestalled development in some locations.

43. For one attempt to better synthesize a framework that incorporates both traditional science/specialized knowledge and social dynamics, particularly for nondominant groups, see Irwin (1995). Two community groups that seem to have very effectively combined high-quality health research with activist strategies are Communities for a Better Environment (CBE) and the Environmental Health Coalition in San Diego.

44. The U.S. EPA has a guidance document on public participation that notes the need to address problems of language difference and the lack of access to information of many minority and low-income communities (Ramirez and Stephenson 1998, p. 118).

45. Despite the hope that the Tanner Act would facilitate siting, very few facilities have been successfully sited through the Tanner Act process (Schwartz and Wolfe 1999).

46. According to Cole (1999), in one case government officials were hostile to the committee and the committee was actually forced to sue the county government that had created the LAC. In a related suit, the court ruled that the county had been remiss in dissolving the committee before all state and local permit processes were complete.

47. This is particularly true with regard to hazard siting in unincorporated county territory.

48. Been (1994b) notes that Massachusetts's Hazardous Waste Facility Siting Act includes a tighter requirement that members of the committee live in the affected areas. Another problem some authors find with the current version of the Tanner Act is that LACs can request technical assistance but local authorities can refuse; Schwartz and Wolfe argue that reasonable requests should be honored and suggest that the Massachusetts act includes enhanced power and technical assistance for the LAC (Schwartz and Wolfe 1999).

49. There are certainly information problems related to language and experience. In a poll of voters commissioned by the Latino Issues Forum, a nonprofit public-policy and advocacy institute, 21% of U.S.-born Latinos were aware of a TSDF within five miles of their home, but the figure dropped to 13% for naturalized voters and 9% for voters who chose to be interviewed in Spanish (Flegal and Arteaga 1999). This study also reports that 61% of interviewees believed that "virtually all decisions relating to environmental policy" were made by white leaders and 55% agreed that most people who called themselves "environmentalist" were white, middle-class suburbanites, suggesting a high degree of alienation from mainstream environmentalism. At the same time, Baldassare (2000) reports from a statewide survey that Latinos were more likely than whites to believe that environmental problems pose a serious threat to health and well-being. This could constitute the base for an ethnic-environmentalist alliance on issues of common concern.

50. Such information could also allow house-seekers to understand the relationship between hazards and potential areas of move-in. If policymakers were convinced that move-in was a serious problem, they might consider having the location of nearby hazards become a standard part of residential real estate disclosure. This would be very cheap given current technology, it would provide full information to house-seekers, and it might induce another group—potential home sellers—to be interested in lobbying for compensation and clean-up of nearby sites.

51. There are plans afoot to better develop the DTSC website and incorporate more of this interactive mapping potential. DTSC reportedly provided technical assistance to the City of Emeryville for its excellent web-based parcel map.

52. Cole (1992) notes that such outreach and involvement can also help improve monitoring. While lawyers and other experts may be able to win a ruling regarding an environmental hazard, the enforcement of that ruling and any accommodations or mitigations may depend on the strength of community organizing and oversight. Kuhn (1999) also shows how community monitoring can spur action, as when Communities for a Better Environment (CBE) pioneered the use of a community-based "bucket brigade" (involving the use of a simple and inexpensive device to record air quality) to monitor air agency actions. In a related vein, Grant (1997) finds that states that have right-to-sue or well-funded right-to-know programs tend to have significantly lower rates of toxic emissions (using a dummy variable approach in a state-level multivariate model). The percent minority variable is also significant (and positive) in the regression results, suggesting that communities of color may be even more sympathetic to environmental concerns.

53. For a general discussion of Title VI and the EPA, see Kracov (1998). While activists have been enamored of Title VI as a lever on federal policy, particularly because it has been interpreted to require proof of discriminatory impact and not the more stringent standard of discriminatory intent, no environmentally oriented lawsuit filed solely on these grounds has been successful. Ramirez and Stephenson (1998) note that the Seif case, which was filed by residents in Chester, Pennsylvania, who sued the state over a permit granted for a solid-waste facility, was based on the grounds that the policy violated regulations under Title VI rather than Title VI itself (see also Kracov 1998). This case wound its way up to the Supreme Court, which declared the case moot (at the plaintiffs' request) because the company in question was denied an operating permit during the appeals process. This has left open any decision as to whether there is a right to file such a lawsuit under Title VI without alleging discriminatory intent on top of disparate outcomes. Some civil rights lawyers have been concerned that further filings under Title VI could lead to an evisceration of the act by a Supreme Court eager to affirm the stricter standard of discriminatory intent, and reject the lower bar of disparate outcomes. Thus, environmental justice lawyers have recently avoided the courts but continued to file administrative complaints through the EPA, alleging disparate impacts under Title VI.

54. One author reports that the de facto standard employed is whether the affected minority population is roughly twice that of the surrounding county or the state (Payne 1998).

55. The 1980 standards reflect the environmental inequity that accumulated over the previous decade—which would not have occurred had our suggested rules been in place—and so the potential shift in hazard siting might have been larger.

56. Other states have preferred to avoid hard-and-fast rules regarding siting. In Texas, the state's Natural Resource Conservation Commission has an Environmental Equity Office that seeks to find solutions that are acceptable to both affected communities and businesses. The commission's chair argues that "(t)he role of state government is to participate with local government, citizens, and businesses in finding . . . neighbor-to-neighbor solutions" (quoted in Ramirez and Stephenson 1998, p. 123). While such cooperation is always preferable, the past history of siting in California might suggest that a firmer and more defined approach might be needed.

57. In a similar vein, sites whose clean-up could ameliorate the current distribution of hazards might be given priority in funding and agency attention. We return to this point in the next section.

58. More-modest efforts to consider environmental equity issues, including a bill that hazardous waste management plans include demographic information within a 10-mile radius of each facility, were also vetoed by the then-governor.

59. The scan of linguistic abilities would be useful in understanding whether additional outreach efforts should be emphasized as part of a public participation process.

60. CEQA does allow for communities to sue, but winning such a suit simply requires that the company redo the EIR so as to be more comprehensive and does not necessarily alter or stop the project. Of course, the EIR has become a tool for community groups to hold up the permission process and negotiate around their concerns (Kirk and Wade 1997). This is one of the reasons why business leaders have been less than receptive to adding elements to the EIR.

61. For a general review of compensation theory and specific state-level programs, see Been (1994b).

62. Under the Tanner Act, the actual permitting authority at the local level varies depending on whether the facility will be located in a particular city or in an unincorporated area of the county (in which case the county decides). Decisions may also be made by a planning commission at the appropriate governmental level.

63. Florida has a required (albeit lower) tax and requires that the spending be devoted to facility-related costs, such as monitoring, development on an emergency plan, etc. (Kirk and Wade 1997, pp. 240-241).

64. For a general analysis of brownfields initiatives throughout California, see Brewster (1998). See also Marcus (1998).

65. For an extensive discussion of the origins of the brownfields effort as well as the experience in Chicago, see Trumball (1999). Of course, the combination of environmental justice and economic development is not without its controversies. When reaching to community organizations, public officials have sought to involve both environmental justice advocates and more traditional community development corporations (CDCs). Environmental justice groups are often unfamiliar with development, and CDCs have often not addressed public health. Moreover, environmental justice groups are often more political and are using environmental justice as a way to get communities to think more deeply about processes of environmental degradation and racism, a goal broader than that held by many CDCs.

66. The other major tool DTSC employs is the Prospective Purchaser Agreement, which generates a covenant not to sue, and therefore facilitates redevelopment.

67. More recently, DTSC participated in clean-up in and around Suva Elementary in the Montebello School District, an area that was the target of significant protest by community residents concerned about perceived clusters of cancer. DTSC officials are especially pleased that they were able to respond promptly to community concern.

68. See, for example, the discussions in Hernández (1999). DTSC officials report that participation in brownfields redevelopment is a key priority and point to community involvement processes in Sacramento and Emeryville. These are areas where environmental justice groups have been less active, explaining part of the discrepancy in perceptions about DTSC's role.

69. Trumball (1999) notes that municipalities have received a federal pilot grant to assess sites but they cannot use the money for clean-up. Funding for assessments is clearly helpful. In East Palo Alto, for example, Sun Microsystems backed out of developing a project on the grounds that site remediation would be too costly. The U.S. EPA gave a grant for technical assistance to the city to determine the actual costs; they were far lower and developer interest rose (see Marcus 1998). Still, more flexibility in the use of funding would be helpful.

70. On the other hand, some activists are concerned that brownfields will become an excuse for not truly cleaning up. They have argued that some cities applying for brownfields grants are including community groups in their planning processes but subsequently returning little of the money directly to the community or the capacity-building needs of community organizations.

71. One brownfields project in San Diego illustrates the point. In 1997, the U.S. EPA gave the San Diego Redevelopment Agency (RDA) a grant to analyze the recycling of a site with a chrome-plating plant; under the 1990 Polanco Act, RDAs have special powers to address contaminated sites, conduct an investigation and clean-up, subsequently recover the clean-up costs from the parties responsible for the contamination, and pass on liability limits to the next owner (see Daehnke 1998). The RDA was prepared to buy the property for the fair market value when the owner backed out. Worried that the delay would lead the EPA to withdraw the $40,000 necessary for a toxicity assessment, the Port District and the City Council quickly moved to expand the redevelopment area to include the contested area and take the land at a jointly shared cost of $300,000. Those familiar with the case suggest that the ability to move so rapidly was helped by the fact that community groups, including the Environmental Health Coalition (EHC), had been included at the decision-making table since the earliest phases (even though they had been at odds with the port earlier over methyl bromide fumigation of fruits) and hence were able to help mobilize community support for the deal.

72. It would be even more useful if local governments—which make many of the critical decisions on zoning, mitigation, and other matters—were to make similar environmental justice concerns part of their decision-making process. This research is, however, more concerned with state policy; for recommendations on local action, see Sadd et al. (1999).

73. There is also a need for state agencies to familiarize themselves with current research on the issues and methods in the field of environmental justice. The relative lack of attention to this issue under the previous governor, as well as the unsettled state of the debate, has meant that implementing SB 115 has involved somewhat of a learning curve for state officials.

74. See, for example, Boyer and Wilson (1999).

75. The Children's Environmental Health Protection Act proposed by State Senator Marta Escutia tries to do this. DTSC has issued a white paper on hazards and schools that is available on the agency's website (www.dtsc.ca.gov).

76. One such effort with the Cumulative Exposure Index is that of Morello-Frosch et al. (2001).

77. Indeed, none of the major quantitative studies, including ours, has found any serious evidence of a minority move-in effect after a hazard has been situated, leading one to wonder why the argument still has such currency, beyond its obvious ideological appeal.

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