
In the Wake of the Storm

*Environment, Disaster,
and Race After Katrina*

Manuel Pastor

Robert D. Bullard

James K. Boyce

Alice Fothergill

Rachel Morello-Frosch

and

Beverly Wright

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In the Wake of the Storm: Environment, Disaster, and Race After Katrina

Executive Summary

HURRICANE KATRINA opened a window on a world of hurt often ignored by media, policymakers, and the public. Facing enhanced environmental vulnerability and stranded by a lack of public transit, residents of the poorest and blackest neighborhoods of New Orleans quickly educated America that disasters and rescues are not equal opportunity affairs.

Among the few not shocked by the stark images splashing across television screens were scholars and activists in the field of environmental justice (EJ). These researchers study chronic risk, generally finding that lower-income minority communities, like those of New Orleans' Lower Ninth Ward, are disproportionately exposed to hazards and other disamenities. Katrina, it seemed, simply reflected environmental injustice in an accelerated and accentuated mode.

Does environmental disparities by race and class really exist? Researchers have gone back and forth, with early studies supplanted by newer studies supplanted by still newer studies. Although the evidence is still emerging, the best assessment is that disparities are common, and researchers increasingly suspect that some observed differences in health outcomes are attributable to environmental factors, particularly in combination with social stressors related to poverty and lesser access to health care. And it is not just income: race seems to be a more significant predictor in many studies, suggesting the importance of deeply rooted systems of privilege and discrimination.

Minority and low-income Americans are also more likely to be underserved by government and private relief agencies before, during, and after environmental calamities such as Katrina. Before a disaster, minorities are more likely to be underprepared and underinsured, and to be living in unsafe, substandard housing. During a disaster, minorities and the poor are often—due to economic and

language barriers—less exposed to disaster warnings, and more likely to encounter ethnic insensitivity from relief workers and government officials. After a disaster, minorities and low-income individuals suffer slow recoveries not only because they have less insurance and lower incomes, but also because they receive less information, fewer loans, and less government relief, and encounter bias in the search for long-term housing.

This sort of “second disaster” for those with scantier economic and political resources seems to be playing out in the aftermath of Katrina. Many in the low-income neighborhoods ravaged by the hurricane are concerned that federal, state, and local officials will not prioritize their communities for cleanup and reconstruction, and worry that New Orleans will become little more than a theme park for tourists. Responding proactively to the impacts of Hurricane Katrina requires an eco-social approach—one that makes explicit the connections between public health, the environment, and social inequality.

Beyond Katrina, we need to revamp both disaster preparedness and environmental policy. There has been some progress; public and private agencies have disseminated information in more languages, hired diversity experts to educate their officials and staff, and provided increased support for disaster research. But little of that seems to have rubbed off on Federal Emergency Management Agency (FEMA) in its response to Katrina, and the U.S. Department of Housing and Urban Development has not stepped up to offer the housing vouchers for poor victims that were so effective in the wake of the 1994 Northridge California quake.

Likewise, progress on a more inclusive environmental policy has been made at the state level but seems to be stalling at the national level. The U.S. Environmental Protection Agency (EPA) has re-

versed course from the two previous administrations and sought to both take the focus off race in regulatory enforcement activities and diminish the annual collection of pollution emission data that researchers, communities, and industries use to monitor firm-level environmental performance.

If there is a will to do better, there are ways. Seizing the opportunity opened by Katrina is possible. The differential effects of this disaster were neither natural nor an accident. They were consistent with a pervasive continuum in which low-income and minority communities suffer from both higher socioeconomic stress and greater environmental exposures to air toxins, hazardous wastes, and other environmental disamenities.

Furthermore, it is not just poor and minority communities that are at risk. A hazardous facility can be sited in someone else's backyard, but research shows that the effects soon spill over into other neighborhoods. Establishing fairness as a guidepost for disaster and environmental planning is not just the right thing to do—it may be the best thing for protecting the well-being of all Americans.

Katrina did open a window on a dark side of America—the economic and environmental vulnerability of low-income people and minority communities. We can close that window, or we can use the new view to chart a better, healthier, and more equitable future for us all.

In the Wake of the Storm: Environment, Disaster, and Race After Katrina

*Manuel Pastor, Robert D. Bullard, James K. Boyce, Alice Fothergill,
Rachel Morello-Frosch, and Beverly Wright*

INTRODUCTION: LIFTING THE VEIL

ON MONDAY, August 29, 2005, the gale force winds of Hurricane Katrina swept across the Gulf Coast. Although the hurricane's wind and water pummeled many parts of Louisiana, Mississippi and Alabama, the eyes of the nation were focused on New Orleans, a city where a complicated system of levees and canals had been designed to prevent any storm from flooding neighborhoods and districts. Unfortunately, as some analysts had warned, the levees were not up to the challenge of Katrina, and breaks quickly appeared, flooding the city, and creating a humanitarian crisis of extraordinary proportions.

Even as Katrina was sweeping away businesses, homes, and lives, a stark set of images of desperate and seemingly abandoned residents began to shatter many of the illusions Americans usually associate with disasters. The first of these was that the government would always be there as an effective safety net. Amidst the confusion of coordinating various governmental agencies and a slow and now much criticized federal response, stranded individuals and families were often left to fend—or not fend—for themselves. The inadequacy of federal, state, and local efforts led to a growing wave of criticism and cynicism about government capacity. Partly as a result, the director of the Federal Emergency Management Agency first stepped down from heading the Katrina relief effort and then resigned from the agency.

The second illusion that Katrina swept away was the traditional belief that natural disasters are a sort of equal opportunity affair—acts of God that affect us all. But as the government's emergency rescue and recovery efforts floundered, particularly in beleaguered New Orleans, the country began to realize that this was not the case. It was a largely African American and often poor populace that had lived in the areas most vulnerable to the collapse of the levees, that proved unable to secure transportation to

evacuate the city, and that was now scrambling in frightening conditions to secure scarce aid for their families, their friends, and themselves. Both the impacts of and response to disaster, it seemed, were heavily affected by income and race.

Although this seemed a revelation to many reporters and politicians, one group of researchers and activists were far less surprised: those who had been laboring in the field of what is called environmental justice (EJ). Born of an intersection of emerging social movements, technological advances in geographic information systems and spatial statistics, and a growing policymaker interest in disproportionately affected communities, the environmental justice field has generally focused on the distribution of environmental costs and benefits. Although data issues and methodological disputes remain, an array of case studies and large-scale statistical analyses had long been suggesting that disparities in environmental conditions were a worrisome norm in many parts of the United States—including Louisiana, a place where a disproportionate share of African Americans were already living in a petrochemical corridor best known by a frightening nickname, “Cancer Alley.”

What is environmental justice and how does it offer a prism for thinking about disaster vulnerability? How solid is the evidence of environmental disparity—and is the seeming inequity in exposure and effects from Katrina consistent with evidence from other disaster experiences? And, given these patterns, what are the policy implications for environmental regulation, emergency preparedness, and disaster recovery?

In this report, we offer a review of the existing literature and research on the relationship between race, the environment, and large-scale disasters. Our central points are simple. First, environmental inequities by race and often by income seem to be an established part of the American urban landscape—Katrina simply tore back the cover on this unfortunate fact. Second, disasters reflect what might be termed acute

risks that, like the chronic risks targeted by environmental justice analysis, are often distributed in a way that reflects established chasms of power. Third, this uneven distribution of risk may impose heavy and unfair costs on certain populations and seems as well to lead to an overall underinvestment in prevention and preparedness, thus increasing burdens for the society as a whole. Making environmental justice principles part of preparedness and environmental policy, in short, is not simply the right thing to do—it is the prudent thing to do.

We begin our analysis by briefly reviewing the Katrina emergency using it as a platform for understanding the conceptual frameworks used in environmental justice research and the field of disaster studies. We suggest that disaster prevention is a classic “public good” with all the attendant issues: free riders who enjoy benefits but pay few costs, the consequent privatization of benefits and costs, and the skewed distribution of risk that results. The disaster studies field has long stressed the importance of socioeconomic factors in such skewed distributions, but the environmental justice framework offers new insights into the roles of race and power as well as of the market. Moreover, the broad view of the environment associated with the environmental justice paradigm—which includes not only exposure to lower air quality and proximity to hazards but also the distribution of transportation access and housing—makes the framework a good fit for understanding the impacts of disasters and their aftermath, including policies for preparedness, relief, and reconstruction.

We then look at the debate over the patterns of environmental disparities by race, class, and other factors. We note that proponents offer three main explanations for any disparities, with one explanation rooted in rational land use (and its unintended consequences), another rooted in market or income dynamics, and a third focused on the impact of differential political power. Of course, whether any of these theories account for patterns of difference depends on whether such patterns indeed exist. We therefore provide a review of the available studies, pointing to the evolution of research and concluding that the evidence is generally supportive of the hypothesis of disparity. Moreover, each of the market, power, and land use explanations finds some support in both the statistics and experience.

This essentially establishes that there is a problem. How that problem plays out in the context of disasters is seen as we review the intersection of disaster

vulnerability with race and other socioeconomic variables. This evidentiary review relies more on case studies than on the large sample statistical tests used in environmental disparity research, in part because disasters are (fortunately) few and environmental degradation is (unfortunately) widespread. We break the analysis into considerations before, during, and after disasters, and find parallels with the findings of disparity that emerge from the environmental justice research. We close this section by exploring the implications of these disparities for risk reduction, particularly with regard to homeland security, a growing area of concern in light of the terrorist attacks of September 11, 2001.

We then present what we term the second disaster—the problems that often arise in rebuilding and recovery—and stress how the environmental justice lens can lead to an approach that helps ensure that disaster recovery and reconstruction will not contribute to further inequalities. We emphasize two concepts driving the edge of research and policy in the field of environmental equity: cumulative exposure and social vulnerability. Cumulative exposure refers to the agglomeration of environmental disamenities in certain communities, a problem that is often bypassed by pollution strategies based on facility-by-facility regulation, whereas social vulnerability refers to the capability of communities to weather the health and other risks of environmental disamenities or disasters, particularly with regard to their command over economic and other resources.

We conclude by stressing that the focus of environmental justice on disparities in hazards and disamenities is but a starting point in the work. Environmental justice activists and researchers have also offered a forward-looking view that both questions the nature of America’s metropolitan landscapes and calls for a profound democratization in decision making. This emphasis on urban form and local voice can offer guidance to the rebuilding of New Orleans and the rest of the Gulf Coast. Moreover, an intriguing set of new studies suggests that environmental justice could actually be good for everyone: when the disparities between groups are lower, so is overall environmental risk. By contrast, being able to put hazards in “someone else’s backyard” ends up creating more hazards for the society as a whole.

It is a lesson that should be familiar—the civil rights movement, after all, initially focused on addressing disparities faced by African Americans in hiring, housing, and voting. The resulting sea change in

political opinion and the attendant changes in governmental policy led to changes that, though still short of what many wished, helped to make America a better and more productive nation. Taking the issues of environmental inequity seriously can likewise improve both environmental quality and disaster preparedness for all Americans.

DISASTERS, RISK, AND ENVIRONMENTAL JUSTICE

Hurricane Katrina occurred in the southern United States—a region with a long history of coping with weather-related disasters that include droughts, floods, tornados, and hurricanes. Each year, communities along the Atlantic and Gulf Coast states are hit with tropical storms and hurricanes forcing millions to flee to higher ground. Historically, the Atlantic hurricane season produces ten storms, of which about six become hurricanes and two to three become major hurricanes. The 2005 hurricane season, however, produced a record twenty-seven named storms, topping the previous record of twenty-one set in 1933, and thirteen hurricanes, besting the old record of twelve set in 1969 (Tanneer 2005).

The South is also host to the majority of the nation's African American population. Today, over 54 percent of the nation's blacks live in the South (McKinnon 2001). In the fifteen southern states, excluding Texas and Florida, blacks make up 23 percent of the population, versus about 12 percent for the nation as a whole. African Americans make up an even larger share of the three Gulf Coast states hardest hit by Katrina—Louisiana, Mississippi, and Alabama. They comprise 32 percent of the population in Louisiana, 36 percent in Mississippi, and 26 percent in Alabama.

The areas most affected by Katrina were even blacker and poorer. New Orleans was more than 67 percent black before Katrina (U.S. Bureau of Census 2000). The coastal Mississippi counties where Katrina struck ranged from 25 percent to 87 percent black. Poverty was also a common characteristic. Some 28 percent of New Orleans residents lived below the poverty level and more than 80 percent of those were black. The poverty rate was 17.7 percent in Gulfport, Mississippi, and 21.2 percent in Mobile, Alabama, in 2000, versus 11.3 percent in the nation as a whole (U.S. Census Bureau 2001).

Of course, those most likely to be left behind as the flood waters rose in New Orleans were from

neighborhoods that were even poorer and more African American. Such increased vulnerability is typical of the South, a place where the history of slavery, Jim Crow, and white resistance has affected both race relations and the region's ecology. The plantation system exploited not only humans but also the land, and the South has often been thought of as a sacrifice zone, a sort of dump for the rest of the nation's toxic waste (Bullard 1990a, 1990b, 2000). This has been helped along by local governments and businesses that take economic and environmental advantage of those who are politically and socially powerless (Schueler 1992).

It should thus be no surprise that the environmental quality that Southerners experience is markedly different from that of other regions of the country. Lax enforcement of environmental regulations has left the region's air, water, and land the most industry-befouled in the United States. Louisiana typifies this pattern. Nearly three-fourths of Louisiana's population—more than 3 million people—get their drinking water from underground aquifers. Dozens of the aquifers are threatened by contamination from polluting industries (O'Byrne and Schleifstein 1991, A5).

New Orleans is also prototypical of environmental justice issues in the Gulf Coast region. The city's location along the Mississippi River Chemical Corridor, a place hosting more than 125 companies that manufacture a range of products including fertilizers, gasoline, paints, and plastics, increased its vulnerability to environmental threats (Roberts and Toffolon-Weiss 2001). New Orleans also had a highly significant childhood environmental lead poisoning problem. There were ongoing air quality impacts and the resulting high asthma and respiratory disease rates led to frequent visits to emergency rooms for treatment by both children and adults (Wright 2005).

In short, environmental health problems and issues related to environmental exposure were hot-button issues in New Orleans long before Katrina's floodwaters emptied the city. When the hurricane hit, the existing inequalities and the history of discrimination in the American South played out in tragic yet predictable ways. Evacuation strategies, for example, left the most vulnerable populations—the poor, minorities, the elderly—inadequately protected. A *Times-Picayune* reporter, Bruce Nolan, summed up the emergency transportation plan eloquently: "City, state and federal emergency officials are preparing to give the poorest of New Orleans' poor a historically blunt message: In the event of a major hurricane, you're on your own" (2005).

Katrina Hits—and Hits Hard***Storm Costs and Insurance***

- Katrina is likely the most destructive hurricane in U.S. history, costing more than \$70 billion in insured damage. The total economic losses from the storm are expected to exceed \$125 billion (Chu 2005, A2). It was also one of the deadliest storms in decades, with a death toll of 1,325, and still counting.
- FEMA estimates that 12.7 percent of the households in Alabama, 15 percent in Mississippi, and 46 percent in Louisiana have flood insurance. Only 8 percent of the businesses in hurricane-affected counties in Alabama, 15 percent in Mississippi, and 30 percent in Louisiana have flood coverage (Chu 2005, A1).

Job Loss

- More than a million Louisiana residents fled Hurricane Katrina, of which an estimated 100,000 to 300,000 could end up permanently displaced. The powerful storm ravaged an eight-parish labor market that supported 617,300 jobs (Randolph 2005, 1A).
- In October 2005, a total of 281,745 Louisiana residents filed for unemployment benefits, citing Katrina as the cause for joblessness. This figure equated to 14 percent of the workers in the state or 47 percent of all the workers in the seven-parish New Orleans region (U.S. Bureau of Labor Statistics 2005). The unemployment rate for white Katrina evacuees was 24 percent, versus just under 50 percent for blacks and 42 percent for Hispanics (Economic Policy Institute 2005).

Katrina Toxic Contamination and Health Threats

- Katrina caused six major oil spills releasing 7.4 million gallons of oil, about 60 percent of that leaked in the Exxon Valdez incident in 1989 (Cone and Powers 2005).
- The storm hit sixty underground storage tanks, five Superfund sites, 466 industrial facilities that stored highly dangerous chemicals before the storm, and disabled more than 1,000 drinking-water systems, creating a toxic soup with E. coli in the floodwaters far exceeding EPA's safe levels (Cone 2005, A18).

Flooded Homes

- An estimated 140,000 to 160,000 homes in Louisiana may need to be demolished and disposed.
- More than 110,000 of New Orleans' 180,000 houses were flooded, and 90,000 sat for days or weeks in more than six feet of water. As many as 30,000 to 50,000 homes citywide may have to be demolished, and extensive repairs.

Flooded Schools

- Katrina displaced just under 350,000 school children in the Gulf Coast. An estimated 187,000 school children have been displaced in Louisiana, 160,000 in Mississippi, and 3,118 in Alabama (Hunter 2005).
- The powerful storm closed the entire New Orleans school system—116 schools and about 60,000 students—and left a trail of toxic muck in classrooms and playgrounds (Ritea 2006).

Local, state, and federal emergency planners had known for years the risks facing New Orleans' transit-dependent residents, particularly after the experience with Hurricane Georges in 1998 and Hurricane Ivan in 2004 (State of Louisiana 2000; Fischetti 2001; Bourne 2004; City of New Orleans 2005). Whereas 92 percent of American households own at least one motor vehicle, two in ten households (20 percent) in the Louisiana, Mississippi, and Alabama disaster area had none (Associated Press 2005a). More than 30 percent of African Americans in New Orleans do not own a car. Before Katrina, nearly 25 percent of New Orleans residents relied on public transportation (Katz, Fellowes, and Holmes 2005). The city already knew that at least "100,000 New Orleans citizens do not have means of personal

transportation" to evacuate in case of a major storm (City of New Orleans 2005).

The city's emergency plan thus called for thousands of the city's most vulnerable population to be left behind in their homes, shelters, and hospitals (Schleifstein 2005). 'It also included the use of public buses to evacuate those without transportation: sixty-four buses and ten lift vans. The plan proved woefully inadequate, especially after nearly two hundred New Orleans Rapid Transit Authority (RTA) vehicles were lost to flooding (Eggler 2005, B1).

Let Them Eat Risk? Wealth, Rights, and Vulnerability

Why were so many left at risk? Many have pointed to the incompetence of various agencies, especially



Source: © Michael Ainsworth, Dallas Morning News, Corbis.

Note: Louis Jones, eighty-one, right, and Catherine McZeal, sixty-two, left, help each other walk down flooded Poydras Street as they went to the Superdome on Thursday, September 1, 2005, days after Hurricane Katrina flooded New Orleans. The couple got together to help each other through their crisis. “They wouldn’t let our children help us,” Mrs. McZeal said, referring to the fact that people were not allowed to drive into the area to get relatives.

FEMA. We think, however, that the answers lie in a deeper analysis of the way in which our society allocates risk and protection. This is not to excuse government failures—we join the chorus of condemnation in that regard—but rather to offer a framework that explains the continuum from the acute circumstances of disasters to the chronic risks imposed by environmental degradation. Equally important, we need to understand why it is that certain populations seem to suffer differential exposures to both crises such as Katrina and the slow-motion disasters that often plague communities suffering from high levels of air pollution, lead poisoning, or nearby toxic wastes.

Vulnerability to natural disasters such as Katrina and to man-made environmental hazards such as refineries is, to a large extent, a public bad: disasters and hazards typically hit communities, not isolated individuals. By the same token, measures to reduce vul-

nerability and hazards are public goods. That is, they cannot be purchased or otherwise secured by individuals acting alone: their provision requires proactive public policies.

Yet disaster-vulnerability reduction and environmental protection are seldom “pure” public goods. A pure public good is something that when provided to one is provided to all (a characteristic known as non-excludability), and whose consumption by one does not diminish its availability to others (nonrivalness). In the twentieth century, the textbook case of a pure public good was national defense; in the twenty-first century, it may become policies to combat global warming.

Many risk-reduction measures are “impure” public goods: when provided to one, they are provided to others, but not equally to all. For example, flood-control projects provide location-specific benefits,

restricted to those people who live or own assets in the protected area. By virtue of where they live, work, or own property, some members of society reap the benefits of such collective investments, and others do not.

This means that, in addition to the public policy question of how much risk-reduction to provide, policymakers and the public must grapple with the question of who should receive it. We face not only the classic economic problem of the allocation of scarce resources among competing ends, but also the classic political-economy problem of the allocation of scarce resources among competing individuals, groups, and classes.

This allocation question itself has two dimensions. One is normative, or prescriptive: to whom should resources for such risk reduction be allocated in principle? How, for example, should government resources be spent to prevent disasters, mitigate their effects, and compensate their victims? The other dimension is positive, or descriptive: to whom are risk-related resources allocated in practice? Who, in fact, receives a higher level of protection or recovery assistance, and what drives the pattern? And although these questions and their answers are most dramatic in the case of a crisis like Katrina, the issue of allocating risk permeates environmental practice and policy on an everyday basis.

There are two fundamentally different approaches to addressing risk distribution: the wealth- or market-based approach and the rights-based approach. The wealth-based approach—which is standard practice in most of the cost-benefit analyses that government agencies undertake—is founded on the idea that willingness of individuals to pay, to safeguard the environment or to protect themselves from hazards suggests the value of such protection. The wealth-based approach implies that the allocation of disaster-vulnerability reduction, like the allocation of goods and services in the marketplace, ought to be guided by explicit and implicit market signals: those who pay more deserve to get more.

If all individuals had roughly similar wealth and purchasing power, this approach to decision making would not translate into systematic disparities in disaster vulnerability. That is, there might be random differences in individual preferences for taking on the risks by, say, living on a fault line, but these should show little variance between rich and poor, or black and white. Disaster outcomes would thus be distributed more or less equally between groups. But in the real world, where wealth is quite unevenly distrib-

uted and racial bias exists in access to jobs and other income-earning opportunities, the wealth- or market-based approach means that richer individuals, and particular groups and classes, will get more of the impure public good of disaster-vulnerability reduction than their poorer or less powerful counterparts.

This is exactly why a wealth-based approach—which seems like a poor moral guideline for disasters—has such considerable descriptive relevance. As the world came to learn through images and then data, those left stranded and most vulnerable by Hurricane Katrina were disproportionately poor and disproportionately black.¹ These disparately affected groups lived in the lowest-lying areas of the city, and lacked the private means of transportation to flee as the storm approached. Similarly, casualties from the powerful earthquake that hit Guatemala in 1976 were distributed so unevenly across that country's population—with most of the 22,000 deaths among the poor and indigenous people—that the disaster was dubbed a “class-quake” (Wisner et al. 2004, 279–81). Their homes stood in landslide-susceptible ravines and gorges, and they could not afford the earthquake-resistant construction that would have saved their lives.

But the wealth- or market-based approach is by no means confined to the descriptive realm of what is. It also exerts a powerful influence, implicitly or explicitly, on many policymakers' prescriptions for what ought to be. One famous (or infamous) example is the 1992 memorandum in which then World Bank chief economist Lawrence Summers posed the question: “Just between you and me, shouldn't the World Bank be encouraging more migration of the dirty industries to the LDCs [less developed countries]?” Among the justifications for such a policy, Summers wrote, was that

The measurement of the costs of health-impairing pollution depends on the forgone earnings from increased morbidity and mortality. From this point of view a given amount of health-impairing pollution should be done in the country with the lowest cost, which will be the country with the lowest wages. I think the economic logic of dumping a load of toxic waste in the lowest-wage country is impeccable and we should face up to that.

Summers's memorandum, which was leaked to *The Economist*, was noteworthy not so much for the viewpoint as for the frankness with which it was expressed. In much the same vein, the wealth- or market-based approach sometimes is invoked in the literature on environmental justice to argue that there

is nothing wrong with disparate risk burdens, as long as they result from market dynamics and rational land-use decisions.

Rejecting willingness-to-pay as the underlying basis for social decisions on the allocation of risks does not mean rejecting cost-benefit criteria altogether. Weighing the costs and benefits of alternative courses of action is an inescapable task for public policy. Rather, it means choosing a different strategy to aggregate effects across the population. Instead of putting weights on different individuals on the implicit basis of their respective purchasing power, policymakers can use other, explicit principles to add total costs and benefits aggregated across all individuals. For example, they can assign equal weight to all, or even put greater weight on those who are in greatest need.²

An alternative approach is based on the notion that a clean and safe environment is a right held in common by all, not a privilege to be distributed on the basis of purchasing power (as indicated by either real-world markets or the shadow markets of benefit-cost analysis). Such a principle is, in fact, enshrined in many constitutions and laws around the world: the state constitution of Montana, for example, says that “all persons are born free and have certain inalienable rights. They include the right to a clean and healthful environment,” and the South African constitution says that “every person shall have the right to an environment which is not detrimental to his or her health or well-being.”

In short, the idea that environmental integrity should be enjoyed by all has widespread normative appeal. In the allocation of public-sector investments for disaster-vulnerability reduction, such a rights-based approach would place equal weight on mortality and morbidity impacts across the population, regardless of individual wealth and social status. The logic is similar to that used both in voting and in the allocation of basic legal rights: one person, one unit of protection rather than one dollar, one unit of protection.³

Both the wealth- and rights-based approaches are also relevant to understanding the legal and regulatory structure that governs private-sector incentives for mitigating risk. In the wealth-based framework, individual households are seen as choosing their risk level based on willingness to pay; they thus bear the burden of obtaining (or not obtaining) insurance against these risks, and any undue or unexpected burdens that arise from firm decisions to pollute or engage in hazardous behavior are to be settled through filing claims against those firms. This creates an incentive

structure for firms to locate environmental externalities where they expect that insurance levels will be low, monetary losses will be minimal, and litigation will be less likely. This is a recipe for targeting those with the least power in the social calculus.

In the rights-based framework, any infringement on the right to a safe and clean environment would constitute legal grounds for claims for restitution. Under such a framework, private firms would seek to insure themselves against any resident claims—and the more unsafe the facility, the higher the price of insurance. This weighting would allow the insurance sector to play a more central role in safeguarding against man-made disasters: even if the people whose safety is at risk cannot afford insurance, it would be the responsibility of the owners of facilities that jeopardize public safety to insure against risks to lives and health.

Although our legal system seems to have a bit of each of these elements, with residents and firms battling over liability, the difference in legal and other assets between poor communities and wealthy companies puts more onus on the former than on the latter to take preventive action—by, say, moving away rather than by reducing pollution. In a rights-based framework, more responsibility would lie with the polluter; as a result, the incentive structure would work toward both the reduction of risk overall and a more equitable distribution of risk across populations.

The Environmental Justice Framework

That the acute risks of disaster might be distributed unequally seems unfair to many observers, partly because there is a strong normative sense that catastrophes could befall us all and that the provision of emergency services should therefore also be equally distributed. Yet the pictures of those who evacuated and those who were left behind in the Katrina disaster suggest a sort of auction for rescue that reflects the privileges of wealth more than it does the equal rights of the citizenry.

Such an inequitable distribution of risks on an ongoing basis has been a central concern of the environmental justice perspective. Originally a reaction to the siting of hazards in minority neighborhoods, the environmental justice movement has grown markedly in recent decades. Firmly rooted in the rights-based approach, specific principles of the environmental justice framework include

- *The right of all individuals to be protected from environmental degradation.* This stems from a civil rights framework rooted in the Civil Rights Act of 1964, the

Fair Housing Act of 1968, the Voting Rights Act of 1965, and even the 1948 United Nations Universal Declaration of Human Rights, which recognizes that people everywhere have intrinsic rights to life and health, and to a healthy environment (United Nations 2004).

- *Prevention as the preferred public health strategy.* In the environmental justice framework, affected communities should not have to wait until causation or conclusive proof is established before preventive action is taken. For example, the framework shifts the primary focus of childhood lead issues from treatment (after children have been poisoned) to prevention (elimination of the threat via abating lead in houses).
- *The allocation of the burden of proof toward polluters-dischargers rather than affected communities.* Under a traditional regulatory system, individuals who challenge polluters must prove that they have been harmed, discriminated against, or disproportionately impacted. Few affected communities have the resources to hire lawyers, expert witnesses, and doctors needed to sustain such a challenge—and the environmental justice framework attempts to level the playing field by requiring polluters to prove the absence of harm rather than disprove allegations of harm.
- *The need to redress disproportionate impact through targeted action and resources.* This has become a source of controversy in recent years as the Bush administration has insisted that environmental justice is about protecting “all people.” Indeed, it is, but targeting resources where environmental and health problems are greatest and social resilience may be lowest—that is, poorer and more minority communities—is simple common sense (Pastor, Gallegos, and Prichard 2005; Bullard 1994, 237–66).
- *The idea that communities “speak for themselves.”* Although traditional environmental policy making is often made by a sort of battle of competing experts, the EJ perspective insists that those who are most affected by the pollution should have a central voice in the regulatory process. Thus, there is a heavy emphasis on community participation, neighborhood autonomy, and democratic decision making.

Environmental justice principles may seem a long way from current practice. Worldwide, the dominant environmental protection paradigm institutionalizes unequal enforcement, places the burden of proof on the victims and not the polluting industry, and creates an industry around risk assessment and risk management that fails to develop pollution prevention as the overarching and dominant strategy (Bullard 2000,

2005). Yet there have been major policy inroads, including the adoption in 1994 of Presidential Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.”

Executive Order 12898 reinforced the Civil Rights Act of 1964, Title VI, which prohibits discriminatory practices in programs receiving federal funds. It called for improved methodologies for assessing and mitigating impacts from multiple and cumulative exposure, and improved collection of data on low-income and minority populations that may be disproportionately at risk. It also, and significantly, encouraged participation of the impacted populations in the various phases of assessing impacts—including scoping, data gathering, alternatives, analysis, mitigation, and monitoring. Most fundamentally, it directed each federal agency to “make achieving environmental justice part of its mission” and specifically identified racial minority and low-income communities as areas of potential concern.

In the years since, environmental justice has come to gain a specific, albeit limited, place in the regulatory world. The U.S. Environmental Protection Agency, for example, defines environmental justice as the “fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people—including racial, ethnic, or socioeconomic groups—should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies” (U.S. EPA 1998, 1).

This vision clashes with the current state of environmental quality and equality. Some areas are greener than others, some areas have more hazards than others, and the decision of who lives where, particularly given entrenched housing segregation, is not simply driven by choice (Farley, Danziger, and Holzer 2002; Frazier, Margai, and Tettey-Fio 2003). Minorities are likely to bear greater health and environmental risks in their homes, schools, and neighborhoods, as well as in their workplaces (Institute of Medicine 1999). And the connection of race, place, and the environment is deep: in a recent study of all metro areas in the United States, Rachel Morello-Frosch and Bill Jesdale (2006) found a persistent relationship between increasing levels of racial-ethnic segregation and increased estimated cancer risk associated with ambient

air toxics across racial lines. Segregation, moreover, solidifies racial disparities in socioeconomic status (SES), and shapes the distribution of resources and wealth at the individual, household, and community levels that can affect access to health services to mitigate the increased environmental risk.

But it is more than just risk at play: the intersection of race and place affects access to jobs, education and public services, culture, shopping, level of personal security, medical services, transportation, and residential amenities such as parks and green space (Bullard, Johnson, and Torres 2000; Dreier, Mollenkoph, and Swanstrom 2001). This has been one of the telling aspects of the environmental justice movement in recent years: the adoption of a broad notion of the environment that includes a critique of the very nature of our contemporary urban form of sprawling suburbs and struggling cities, and how this shapes opportunity.

Disaster Vulnerability and Environmental Justice

The disaster vulnerability literature focuses on acute risks posed by one-time events. The environmental justice literature focuses on chronic risks posed by the day-to-day actions of polluters. As in public health, the chronic-acute distinction is a continuum, not a sharp break: as chronic exposure rises, acute effects become more prevalent. In both cases, the results are ill-health and death.

The social dynamics that underlie the disproportionate environmental hazards faced by low-income communities and minorities also play out in the arena of disaster prevention, mitigation, and recovery. In a sense, environmental justice is about slow-motion disasters—and disasters reveal environmental injustice in a fast-forward mode. Both revolve around the axes of disparities of wealth and power.

Lack of wealth heightens the risks that individuals and communities face for three reasons. First, it translates into a lack of purchasing power to secure private alternatives to public provision of a clean and safe environment for all. Second, it translates into less ability to withstand shocks (such as health bills and property damage) that wealth would cushion. Third, it translates through the “shadow prices” of cost-benefit analysis into public policies that place a lower priority on protecting “less valuable” people and their assets.

The wealth-hazard relationship cuts both ways: hazards also reduce the wealth of individuals and communities. This is most evident when disasters damage or destroy property. But there are also asset losses that occur during post-disaster recovery and reconstruction, when property changes hands from those who have less to those who have more. In the wake of the December 2004 tsunami in coastal Thailand, for example, powerful land grabbers arrived on the scene to take advantage of the weakened circumstances of the local residents (Vatikiotis 2005; Montlake 2005). In

Race, Class, and Katrina

Race-Ethnicity

- Damaged areas were 45.8 percent African American, undamaged areas only 26.4 percent. For the city of New Orleans alone, these figures were 75.0 percent and 46.2 percent, respectively.
- Before Katrina, the city had 475,000 people with about 67 percent African American. Current estimates indicate that soon the population will be only 350,000 with only 35 to 40 percent black.
- Approximately 24,000 legal permanent residents, 72,000 legal temporary residents, and an estimated 20,000 to 35,000 undocumented immigrants may have been affected by Katrina (Woods and Lewis 2005, 8).
- Around the time of Katrina, poor blacks were much less likely to have access to cars than even poor whites, 53 versus 17 percent (Dyson 2006, 145).

Poverty

- Damaged areas had 20.9 percent of households living below the federal poverty line, undamaged areas only 15.3 percent. For the city of New Orleans alone, these figures were 29.2 percent and 24.7 percent, respectively.
- In the city of New Orleans, before Katrina hit, women had much higher poverty rates than men, with 2004 figures of 25.9 percent and 20.0 percent (Gault et al. 2005).
- Damaged areas had 45.7 percent renter-occupied households, undamaged areas only 30.9 percent.

Note: All data not directly cited to another source comes from John Logan (2006).

the aftermath of Hurricane Katrina, there is a similar risk. Asset transfers could turn New Orleans into a little more than a theme park for affluent tourists. In the vicious circle of disaster vulnerability, those with less wealth face greater risks, and when disaster strikes their wealth is further sapped.

But risk is not just about money: as we will see, even middle-class African Americans, Latinos, and Asians face elevated environmental risks. This reflects systematic differences in power and the legacy of racial discrimination. Power also shows up in private decisions by firms choosing where to site hazards and how much to invest in environmental protection: their choices are constrained not only by government regulations, but also by informal governance exercised by mobilized communities, civil society, and the press (see Pargal et al. 1997; Boyce 2004). In both public and private arenas, then, power disparities drive outcome disparities—and the resulting patterns reflect race and ethnicity as well as wealth.⁴

Rights are not cast in stone: they are redefined and reassigned in light of society's values and perceived needs. Clashes between the principle that everyone has an equal right to a clean and safe environment and the reality that access to a clean and safe environment is rationed by wealth and power can help to propel demand for change. By bringing this contrast into sharp relief, an event like Hurricane Katrina can become a catalyst for rethinking both environmental protection and disaster preparedness.

The belief that all individuals should have equal opportunity to exercise power and to influence public policy, regardless of wealth, race, ethnicity, or gender is deeply rooted in public discourse, legislation, and case law in the United States. Although the gap between what laws and legislation say and what is actually done often remains large, the past two centuries have seen great strides toward making this vision a reality in America and across the world. Progress in implementing environmental justice and equal protection from disasters can carry us forward on the historic march towards a more level playing field—one in which we realize more fully shared American values of fairness, opportunity, and democracy.

ENVIRONMENTAL EQUITY: DEBATE AND EVIDENCE

Much as Katrina awakened the country to long-standing problems of differential disaster vulnerability, it was a landmark event back in 1982 that highlighted

long-standing patterns of environmental injustice: a decision by the state of North Carolina to place a landfill for hazardous wastes in Warren County, the poorest county in the state and one with a population that was 65 percent African American. Community protests led to the arrest of 500 people and placed the issue of the environment squarely in the tradition of the civil rights movement (Geiser and Waneck 1994).

The Warren County protests launched a wave of research on the location of environmental hazards. The early work seemed to confirm the community wisdom. For example, a U.S. General Accounting Office study, prompted by the controversy in Warren County (in fact, it was requested by a congressman arrested in the protests), found that hazardous waste landfills in the southern states were disproportionately located in black communities (1983). A subsequent study of zip code areas by the Commission for Racial Justice of the United Church of Christ (UCC) established that hazardous waste and toxic disposal facilities across the country were correlated with the proportion of African American residents (1987). And shortly after the early GAO and UCC studies, a National Argonne Laboratory study reported that 57 percent of whites, 65 percent of blacks, and 80 percent of Latinos lived in counties that failed to meet at least one of the EPA's ambient air quality standards (Wernette and Nieves 1992). This large-scale statistical research was backed up by a series of influential case studies, documenting disparities for blacks in the South and Gulf Coast (Bullard 1990a; Wright, Bryant, and Bullard 1994).

By 1990, the combination of research and activism began to provoke changes in environmental thinking and policy. Following a research conference on environmental justice held at the University of Michigan, the U.S. Environmental Protection Agency, under the administration of President George H. W. Bush, created an Environmental Equity Working Group that brought together researchers, activists, and policymakers (see Lester, Allen, and Hill 2001, 30; Bryant and Mohai 1992). The subsequent establishment of an Office of Environmental Equity (subsequently renamed the Office of Environmental Justice), and the 1992 release of the EPA report *Environmental Equity: Reducing Risk for All Communities*, signaled the growing acceptance of the basic precepts of the research demonstrating disparities. "Racial minority and low-income populations," the report concluded, "experience higher than average exposures to selected air pollutants, hazardous

waste facilities, contaminated fish and agricultural pesticides in the workplace.”⁵ Although it noted that such exposure did not always translate into documented health effects, the report expressed concern about disparities and the EPA promised to better document and incorporate the distribution of risk into its decision making. The incoming Clinton administration picked up the momentum generated under President Bush, and in 1994 issued Executive Order No. 12898, mandating environmental justice as part of the federal government’s mission.

Yet just as the government was beginning to act, a new set of research studies began to question both the existence of environmental disparities and the rationale for policy attention. Some researchers challenged the large-scale statistical work, suggesting that there were not statistically significant differences by race and ethnicity after controlling for other determinants of the location of facilities (Anderton, Anderson, Rossi et al. 1994; Anderton, Anderson, Oakes, and Fraser 1994).⁶ Other researchers disparaged the explanatory power of case studies and suggested that the focus on race stemmed from political concerns rather than concerns about environmental and health policy (Foreman 1998).

Reaction to the perceived pattern of inequality had, in short, bred a counterreaction. Yet in recent years a growing body of evidence, based on rigorous methods and sophisticated statistical techniques, has demonstrated that race is indeed strongly correlated with environmental quality. This quantitative work continues to be complemented by important case studies that illuminate the underlying political and social processes that generate these environmental disparities. Competing explanations for the existence of environmental inequality have surfaced in the course of this research.

Why Environmental Inequity? Land, Markets, and Power

Explanations for the pattern of environmental hazards fall into three categories: rational land-use planning, market dynamics, and the exercise of power. The rational land use explanation suggests that hazards are located in areas based largely on compatibility of use: landfills should be in more rural areas, transfer facilities in urban areas, industrial plants near transport corridors, hazardous waste facilities near industrial plants, and so on. Because detailed land-use measures are few and far between in the literature (for excep-

tions, see Boer et al. 1997; Morello-Frosch, Pastor, and Sadd 2001; Pastor, Sadd, and Morello-Frosch 2005a), many researchers have used proxies such as population density or the proximity of a manufacturing workforce. The inclusion of such variables in any analysis can help distinguish between biased siting and rational planning.

The market dynamics explanation suggests that placing environmental disamenities in lower income areas has a market logic. First, lower income may be correlated with lower land values: because accurate data on land values is hard to obtain at the census tract level, household income acts as a proxy for land prices. Second, lower-income residents may be willing to trade off health risks for cheaper housing: what looks like an environmental disparity is thus really a reflection of preferences based on market choice. Third, mitigation costs—say, for forgone income from health-related problems—would be less in low-income areas: businesses thus find it cost-efficient to locate pollution sources there.⁷

The power explanation suggests that low-income people and communities of color are systematically disadvantaged in the political decision-making process. This argument can incorporate the other explanations: what seems to be rational land use, after all, may be predetermined by political processes that designate disenfranchised communities as sacrifice zones (see Pulido 2000; Boone and Modarres 1999; Wright 2005). Indeed, land use decisions often build on accumulated disadvantage. In the largely Latino community Kettleman City in California’s Central Valley, for example, an effort to place a toxic waste incinerator in a landfill already proximate to the city was viewed as building on existing disamenities but added insult to injury for an already overburdened community (Cole and Foster 2001). Likewise, income is a marker of political power as well as of market strength.

The interplay of land use, income, and power means that certain variables used in statistical analyses—such as zoning and household wealth—carry multiple explanations. To demonstrate convincingly that power is behind siting decisions requires the inclusion of some variables that are directly and irrefutably connected to power differentials.

The most important of these variables is race.⁸ Disparate patterns by race, particularly when one has controlled for income and other variables involved in the land-use and market-dynamics explanations, most clearly point to the role of unequal influence and racial discrimination. Racially disparate outcomes are also important in their own right. They can result

Debra's Story

The day before Hurricane Katrina hit, Debra was at her job as a nurse's aide at a New Orleans hospital. Her supervisor encouraged his employees to take shelter during the storm at the hospital with their family members. Debra felt so lucky. She was a single mother of a nine-year-old girl, had few resources, and no way to get out of town. *The hospital would be perfect*, she thought. She packed up her daughter, Cierra, but Debra's sister and her eighty-year-old stepmother refused to leave their New Orleans home. *I'm too old for that*, her stepmother told her, and Debra could not convince them to come.

At first, the hospital seemed like a safe spot for shelter, but soon the water in the streets rose, the power went out, the halls were pitch black, and the hospital was unbearably hot. People were screaming in the streets and the trees were smashing against the large hospital windows. *The people were screaming and the trees were screaming, too*, she recalled later. Water started to rise in the hospital basement, food and drinking water were running out, and people were scared. She explained, *it felt like the world was coming to an end*. At several points, in the darkness, she could not find her daughter. Yet the staff kept working. Debra passed nurses fanning a newborn baby, doctors giving oxygen manually, patients begging for help. *These are things you don't want your child to see*, Debra said sadly.

The hospital staff had to administer drugs and read charts with only the light of a small flashlight. Later, her supervisor informed them that they would have to "close the door" on some patients because there was nothing left that they could do for them. She was shaken, but knew he was right. Eventually, thankfully, Debra and her daughter were airlifted out of the hospital on a helicopter, and then were placed on a bus.

People were screaming, crying, people were throwing up, passing out, dying, she recounted. Eventually, they arrived at the Cajundome mass shelter in Lafayette, Louisiana. Amidst the thousands of evacuees, they rested on their cots, exhausted, fearful, and sad. It was hard to believe that they had gotten out, but now they had to figure out what to do next. She thought about how they had all been treated: *They didn't care about any of us. . . . Where are our civil rights?*

Then Hurricane Rita hit, and they evacuated again, but then returned to the Cajundome. Like all the other Cajundome guests, they filled out forms, waited for housing, and passed through the metal detectors every time they came in the door. They accepted a few donated clothes and stored them in a box under their cots. During that time they learned that Debra's elderly stepmother and sister had gotten out of their home on a mattress floating on the floodwaters, and eventually ended up in the New Orleans Superdome. *We were so scared*, they told her.

Debra's home was lost, as well as her job as a nurse's aide, because the hospital was destroyed, and she had no savings. Finally, in mid-October, her name was called over the Cajundome intercom. She was to report to the main offices immediately. There, she received the news that one of the new FEMA trailers being set up on a dog racing track parking lot outside of Lafayette would be hers temporarily. She was thrilled by the news. *This is the first time I have truly smiled since the hurricane*, she proclaimed. Debra and Cierra are now living in the trailer and Cierra goes to school, but they are still adjusting and do not feel settled. Debra finds it hard to talk about what happened, and often thinks: *This actually happened. Sometimes you want to wake up and think it's a dream.*

Note: This vignette is taken from a research project on Hurricane Katrina conducted by Professor Alice Fothergill, University of Vermont, and Professor Lori Peek, Colorado State University. The results of this study are unpublished. "Debra" is a pseudonym to protect the identity of the interviewee. As a single mother in New Orleans, Debra is not alone. More than half of New Orleans' families with related children are headed by single females (56 percent of all families with children under eighteen in New Orleans, versus 25.2 percent of such families for the nation as a whole). See Gault et al. (2005, 3).

from processes that are not so much a direct exercise of power as essentially embedded in the nature of our urban form, including housing segregation and real estate steering, informal methods that exclude communities from decision-making processes (including less provision of information regarding health risks), the past placement of hazards (which justifies new hazards as rational land use), and other forms of less direct "institutionalized" or "structural" racism (see

Feagin and Feagin 1986; Institute on Race and Poverty 2002). And it is precisely racialized risk that has galvanized a movement for environmental equity rooted in civil rights law and activism. Race and racism therefore are at the heart of the evidentiary debate.

Studies of which came first can also test the relative strength of the land use, market, and power-race explanations. Do environmental disparities reflect biases in the siting of hazards, or are they the result

of post-siting decisions by minorities and low-income residents lured, perhaps, by falling property values, to decide to move into neighborhoods marked by higher exposure and risk? Evidence that siting is more important than move-in could square with an explanation focused on power and institutionalized racism; evidence that move-in is more important would support the idea that disparities are simply the result of market dynamics.⁹

In understanding the patterns, both large-scale statistical studies and case studies are critical: the broader studies can illustrate the general pattern and case analysis can help unpack the patterns with blow-by-blow histories that elucidate the motivations of polluters, the resistance of communities, and the incentives facing decision makers. Because much of the more recent research in environmental justice has emphasized large sample quantitative work, we focus here on that; when we turn to disaster vulnerability, we rely more on the case method.

Environmental Inequality: The Evidence

The early GAO and UCC studies, and a 1992 National Argonne Laboratory study all suggested that environmental inequality was rampant, and a series of important case studies provided back-up. Bullard's landmark volume *Dumping in Dixie* (Bullard 1990a) reviewed both siting decisions and community mobilization in southern black communities, and found strong evidence of racial disparity. Sociologist Beverly Wright and others documented the rise of the petrochemical corridor between Baton Rouge and New Orleans and its impact on poor African American "fenceline communities" (Wright et al. 1994; Adeola 1998). Activists in Barrio Logan, a predominantly Latino community in San Diego, noted that one-third of chemical waste in the entire county was generated in their small neighborhood (Kay 1994, 162). Native Americans began to voice concerns about their reservations becoming the dumping grounds for toxic and radioactive waste (Churchill and LaDuke 1986).¹⁰ And minority communities in northern cities such as Boston and New York began to complain of abandoned and polluted "brownfields," poor management of nearby sewage treatment, the rising epidemic of child asthma, and other environmental issues.

In the mid-1990s, however, a series of new studies argued that: one, the scale of previous analyses—usually the zip code—was inappropriate for considering neighborhoods, and that census tracts were to be preferred as neighborhood proxies; and, two, simple

correlations between race and hazards did not take into account market and land use dynamics and the use of appropriate multivariate techniques tended to refute conclusions of racial disparities (Anderton, Anderson, Rossi et al. 1994; Anderton, Anderson, Oakes, and Fraser 1994).¹¹

The most important of the refutations, the studies by Anderton and his colleagues, have now found themselves challenged on different methodological grounds. The first is the authors' decision to restrict their national analysis to metropolitan areas that had at least one commercial hazardous waste facility. A subsequent study by Vicki Been (1995) used the same basic variables but avoided this selection bias and found evidence of racial and income disparities. A second issue involves the authors' decision to highlight findings only for the census tracts hosting transfer storage and disposal facilities. As J. Michael Oakes, a member of the Anderton team, noted in his 1997 doctoral dissertation, considering the more densely populated neighborhoods surrounding these tracts, an approach that has become standard in the field, yields significant evidence of racial disparity (see also Mohai and Saha 2006).¹² A third issue is that the use of multivariate techniques does not give researchers free rein to include as many covariates as possible; the likely result of that approach is collinearity, which will eliminate statistical significance (see the critique in Boer et al. 1997).¹³

Indeed, more recent research has tended to reinforce the basic conclusions of the early studies. A national analysis by three researchers who were initially skeptical of environmental inequality claims found evidence of disparities by both race and class, showing that these were sensitive to the geographic scale used (Lester, Allen, and Hill 2001). And though some researchers have argued that the existence of environmental inequality depends on which region is being examined, a recent national study on toxic air emissions from large industrial facilities that statistically controlled for regional variations, found sharp racial and ethnic disparities in pollution burdens, even after taking income and other variables into account (Ash and Fetter 2004). The authors note that not only are African Americans concentrated in the most polluted metropolitan areas, but also that within any given area they tend to live in the most polluted neighborhoods. Latinos are concentrated in metropolitan areas with lower pollution burdens, but within these areas they too tend to live on "the wrong side" of the environmental tracks.

A recent meta-analysis by Evan Rinquist (2005) examined forty-nine empirical studies (including the studies of Anderton and his colleagues) and used newly developed regression techniques to assess common inequity patterns in the various research efforts.¹⁴ The analysis suggests that evidence of racial disparity in environmental hazard burdens exists regardless of “the type of risk examined, the level of aggregation employed, or the type of control variables used in the analysis” (233). The author concluded that though “some scholars have protested that race-based inequities are limited in scope, produced by misspecified models, or are artifacts of aggregation bias . . . protests claiming that these factors can explain away such inequities are empirically unsustainable” (241).

Rinquist suggests, however, that the racial disparities, though statistically significant, are small, making use of Jacob Cohen’s (1988) standard for estimating impacts across different studies. But that conclusion may be problematic for two reasons. First, as Rinquist notes, the effects are actually large in those studies that use distance-based methods—that is, that take into account the location of a facility and include census tracts by proximity rather than by whether the facility is in the tract itself. In a forthcoming paper that echoes the Oakes discussion of adjoining tracts, Paul Mohai and Robin Saha (2006) show that the distance-based approach is analytically superior because hazards are often on the borders of tracts (perhaps because they are on transit corridors); indeed, the authors use data from a previous national study to demonstrate that a tract-oriented approach would miss evidence of racial and income disparity, whereas a distance-based approach confirms the racial disparity hypothesis in both simple comparisons and multivariate analysis.

Second, the Rinquist conclusion of a small race effect neglects cumulative impacts. Studies have now found disparities in proximity to a range of potential hazards, including treatment, storage, transfer and disposal facilities, the industrial facilities reporting to the EPA’s Toxics Release Inventory (TRI), Superfund sites, and estimates of cancer risk from stationary and mobile source pollution. Assuming that these burdens are additive—and detailed analysis of various hot spots in major urban areas suggests exactly such a clustering—then small differences in each of these dimensions could add up to a large difference in environmental quality. To paraphrase the late Senator Everett Dirksen: “A little overexposure here, a little

overexposure there, and pretty soon you’re talking about real disparity.”

Turning to the effects of income, Rinquist notes that the findings are mixed. This is not surprising. In very low-income areas with little economic activity, there are few nearby sources of pollution from industry, commerce, or transport. On the other hand, at very high levels of income, residents have the political power to resist unwanted land uses. Thus we might expect a nonlinear relationship in which pollution burdens peak at income levels somewhere in the middle range (Been and Gupta 1997; Boer et al. 1997; Sadd et al. 1999; Morello-Frosch, Pastor, and Sadd 2001). And this complex mix of income effects—particularly in light of the consistent effects of race—is more a challenge for the market dynamics argument than it is for the power-based set of explanations.

Research on the temporal dimension—which came first, the minority communities or the hazards?—has been the subject of a more limited range of quantitative research, primarily because of the methodological challenges of such time-series analysis.¹⁵ The results have been mixed. In keeping with the work of Douglas Anderton and various colleagues (Anderton, Anderson, Rossi et al. 1994; Anderton, Anderson, Oakes, and Fraser 1994), John Oakes, Douglas Anderton, and Andy Anderson (1996) found little evidence of either contemporary disparity or historical patterns. Using an improved database, Vicki Been and Francis Gupta (1997) found no evidence for the move-in view but did find some that Latino communities were the subject of disproportionate siting.¹⁶ Sabina Shaikh and John Loomis (1999) found in a study of Denver that minority populations rose faster in areas without hazards, countering the market dynamics view. James Mitchell, Deborah Thomas, and Susan Cutter (1999) find evidence of minority move-in for South Carolina. A study of the Los Angeles area by Manuel Pastor, James Sadd, and John Hipp (2001) found that siting was significantly disproportionate, and that the movement of minorities into affected neighborhoods was no faster than in the rest of the region.¹⁷

Although the evidence is more muddled in this temporal arena, it does suggest little support for the move-in hypothesis and some limited support for the disproportionate siting hypothesis. In a recent article, Saha and Mohai (2005) help to resolve the muddle by noting that siting processes may change over time. They suggest that disparate siting was on the rise after the 1970s, when a combination of environmental

legislation, NIMBY (“Not In My Backyard”) attitudes, and the Resource Conservation and Recovery Act of 1976 made it more “politically rational” to try to site environmental hazards in neighborhoods with less influence. They find empirical evidence of this in Michigan. This shift in the temporal dynamic may also help explain why environmental justice concerns emerged so vigorously in the 1980s and 1990s.

In cases where minorities have seemingly moved to places of higher risk, case studies reveal that the story is often more complex. For example, two almost entirely black New Orleans subdivisions, Press Park and Gordon Plaza, were built on the Agriculture Street Landfill, a site used as a municipal dump for more than fifty years, and one that included debris from Hurricane Betsy in 1965 (Lyttle 2004; Wright 2005). Both subdivisions emerged from a federally subsidized program in the 1970s to encourage lower income families to purchase their first home, with the development undertaken in cooperation with the Housing Authority of New Orleans.

In 1983, the Orleans Parish School Board purchased another portion of the Agriculture Street Landfill site for a school. The board contracted engineering firms to survey the site and found evidence of heavy metals and organics. In May 1986, EPA performed a site inspection and—despite the lead, zinc, mercury, cadmium, and arsenic found—determined that the site was not problematic enough to be placed on the National Priorities List for toxic-waste clean-up. The Moton Elementary School opened on the site with 421 students in 1989. In December 1990, EPA published a revised hazard scoring system in response to the Superfund Amendment and Reauthorization Act of 1986. Upon the request of community leaders, an expanded site inspection was conducted in September 1993. The soil was found to contain 149 toxins, forty-four of them carcinogenic, and in December 1994 the community was placed on the National Priorities List.

The Agriculture Street Landfill community, home to a low- to middle-income population that is around 97 percent African American, pushed for a buy-out of their property and relocation of residents. Instead, EPA ordered a clean-up that began in 1998 and was completed in 2001—one that residents contend was more expensive than a community preferred option of a buy-out (Lyttle 2004).

This case suggests that even when move-in has occurred, it can hide a history of public policies based on misleading or inaccurate information. Ironically, the environmental damage wrought by Katrina may

force the cleanup and relocation of the Agriculture Street Landfill community, the goal many residents had been seeking since finding out about the toxins under their homes.

In sum, research, methodologically bolstered in response to the useful challenges by critics, seems to confirm the ubiquity of environmental inequalities revealed in the first watershed studies (GAO 1983; United Church of Christ 1987). It is said that the first step of a program to eliminate addiction is to admit you have a problem. In a society seemingly hooked on putting hazards in the backyards of those already burdened by poverty and racial discrimination, owning up to the reality would make a good starting place for policy making.

Does Environmental Inequality Matter? Risk and Policy

Inequalities in health that are unexplained by income levels or insurance coverage (see Smedley, Stith, and Nelson 2003) have led some to wonder about the role of environmental disparities. The disparity concern is especially sharp with regard to children’s environmental health, particularly in view of a growing body of scientific evidence indicating that children are more susceptible than adults to the adverse effects of environmental pollution because of fundamental differences in their physiology, metabolism, exposure, and absorption patterns (see Bearer 1995; Guzelian, Henry, and Olin 1992; Landrigan and Garg 2002).¹⁸ One dramatic environmental issue is childhood lead poisoning, a preventable disease that continues to pose the number one environmental health threat to black children in the United States, especially those living in inner cities with concentration of older housing with lead paint (see Kraft and Scheberle 1995). Black children are five times more likely than white children to have lead poisoning. Although the pattern partly reflects lower incomes and older housing, nearly 30 percent of all low-income black children are lead poisoned versus fewer than 10 percent of their white counterparts. And the effects are quite real: recent studies supported by the National Institute for Environmental Health Sciences suggest that a young person’s lead burden is linked to lower IQ, lower high school graduation rates, and increased delinquency (Shannon et al. 2005; Needleman 2004).

Although some causal chains from hazard to health, such as that for lead, are relatively well established, linking environmental pollution to adverse health effects is an ongoing challenge, particularly when

populations are chronically exposed to complex, chemical mixtures (Institute of Medicine 1999). Epidemiological studies and risk assessment help elucidate whether documented disparities have potential health implications, and help to prioritize which hazards should be minimized and at what costs.

Risk assessment and prioritization are important. Finding, for example, that the vast majority of hazardous air pollutants emerge from mobile rather than stationary sources could lead one to focus on cleaner vehicles versus cleaner plants. But a focus on risk assessment should be nuanced. First, some risks are imposed and others are chosen. It may be that an effective antismoking campaign could yield more anticancer bang for the buck than an effort to curtail emissions of certain chemicals at a manufacturing facility. But the risks taken by smokers are voluntary, and those taken by residents nearby the facility are often not.

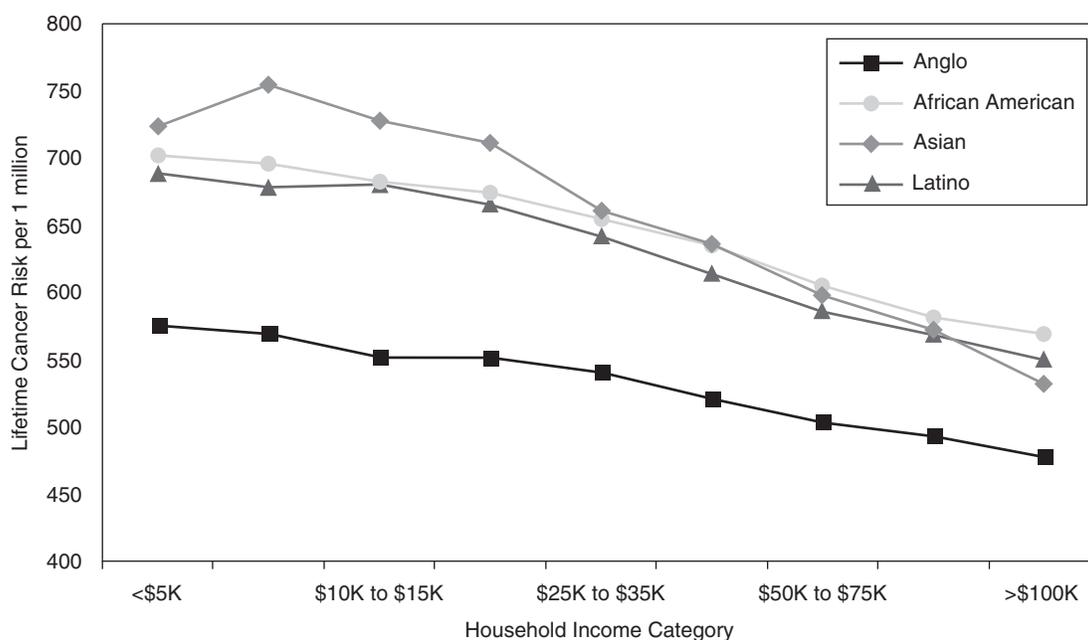
Second, even if a particular source contributes more to total risk, it does not necessarily follow that focusing on its reduction meets fairness criteria. For example, in California's South Coast Air Basin, a market-based plan to decrease traffic emissions

through the purchase and disposal of older, higher emitting vehicles was proposed to offset emissions by large petrochemical facilities involved in unloading tankers in the Port of Los Angeles. Backers of this mobile-to-stationary emissions trading plan argued that it would have a bigger impact on decreasing air pollution region wide, but communities living near the port successfully fought the plan by arguing that it could create a toxic hot spot in an area already impacted by polluting sources (Chinn 1999).

Despite the limitations of risk assessment as a regulatory and policy tool, this methodology has been useful when applied in a comparative framework in environmental justice studies. For example, recent work has compared estimates of lifetime cancer risk associated with air toxics exposures. Figure 1 shows how this estimated risk varies by race and income in Southern California (Morello-Frosch et al. 2001). Particularly notable is that though the risk declines as income rises, it is consistently higher at all income levels for African Americans, Latinos, and Asians.¹⁹

Other risks that concern environmental justice communities include respiratory hazards and vulner-

FIGURE 1 Distribution of Estimated Risk from Ambient Hazardous Air Pollutant Exposures, Southern California



Source: Chart based on risk assessment of air toxics data from mobile and stationary sources as explained in Morello-Frosch et al. 2001.

ability to asthma attacks. Asthma prevalence and mortality are three times higher among minorities than among whites (National Heart, Lung, and Blood Institute Working Group 1995; Persky et al. 1998). African American and Latino children are three to five times more likely to die from asthma than white children (Frumkin, Frank, and Jackson 2004; see also Metzger, Delgado, and Herrell 1995). Asthma disparities between whites and minorities persist even after controlling for income (Litonjua et al. 1999), and there is some evidence that such disparities are correlated with differing air toxics levels (Pastor, Sadd, and Morello-Frosch 2005b).

Health outcome patterns result not only from the cumulative impacts of environmental stressors but also from what is termed social vulnerability. Living in hazardous, deprived, and segregated neighborhoods that lack resources and have weakened social networks leads to chronic stress, which ultimately degrades health and well-being (Geronimus 2000; Schultz et al. 2002) and heightens biological vulnerability to the adverse health effects of toxic exposures (Gee and Payne-Sturges 2004; Morello-Frosch and Lopez 2005; O'Neill et al. 2003). The impacts of these intersecting individual-level and community-level processes are manifested through specific health outcomes, such as asthma, cancer, infant mortality, diabetes, and other diseases that are both socially and environmentally mediated.

Of course, risk is a fact of modern life. But what the environmental justice framework raises is the moral question posed when such risk is systematically distributed along characteristics such as race.

How have policymakers responded to this growing body of evidence and community concern? In the 1990s, various federal agencies developed their own environmental justice initiatives, and some states, such as California, worked to integrate environmental justice concerns in regulatory enforcement and research activities (Bonorris 2004). These steps were a response to political pressure to change a record of disparities in regulatory programs. For example, a 1992 *National Law Journal* study uncovered glaring inequities in the way the EPA enforces its laws, noting that white communities got faster action and better results, with stiffer penalties for polluters, than did black and minority communities, even accounting for income (Lavelle and Coyle 1992).

Unfortunately, progress at the EPA has faltered under the President George W. Bush administration. A March 2004 EPA Office of Inspector General report suggests that after a decade, the EPA

“has not developed a clear vision or a comprehensive strategic plan, and has not established values, goals, expectations, and performance measurements” for integrating environmental justice into its day-to-day operations (2004, 1). A July 2005 U.S. General Accountability Office report criticized the EPA for its handling of environmental justice issues when drafting regulations on the implementation of clean air legislation.

The same month, the EPA responded by proposing that it eliminate race and income as explicit targets for consideration in its Environmental Justice Strategic Plan. This remarkable proposal was met by a firestorm of criticism, as was the EPA's subsequent proposal to scale back reporting requirements for industrial facilities in the Toxics Release Inventory program (see Morello-Frosch, Gallegos, and Pastor 2006). This proposal, if carried out, would have a particular impact on environmental justice research and activism: the TRI has been a key data set used in assessing environmental inequality in several of the studies reviewed above. Indeed, in December 2005, the Associated Press released results from its study *More Blacks Live with Pollution*, which was based on emission information from the TRI reports that the administration hopes to weaken. Results showed that blacks are 79 percent more likely than whites to live in neighborhoods where industrial pollution is suspected of posing the greatest health danger (Pace 2005).

Reducing the availability of incriminating information will do nothing to ameliorate the disparities. The real challenge lies in the government response—or lack of response—to these health and environmental issues. And the issues of ongoing disparities and lack of action seems to have characterized governmental efforts at emergency preparedness, response, and recovery.

It Is Not Just Hazards: Parks, Transit, and Preparedness

The environmental justice framework emerged in response to hazards, risks, and disasters. Since its inception, however, the environmental justice movement has advocated a broad definition of the environment as the place “where we live, work, and play”—and thus considered not only the allocation of costs but also the distribution of benefits.

For example, environmental justice advocacy has emphasized the distribution of parks and open space. Older urban areas, home to disproportionately lower

income and minority populations, often have less access to park resources than do suburbs (Harnick 2000). The inequality is all the more striking given that the living conditions facing many in the inner city—multifamily housing in dense conditions—means that private space is scarce and thus public parks are all the more critical for public health (de Vries, Verheij, and Groenewegen 2003). A careful study of the Los Angeles area found that neighborhoods that were more than 75 percent white enjoyed thirty-two acres of park per thousand residents, whereas those that were more than 75 percent Latino enjoyed less than one acre per thousand residents, and those that were more than 75 percent black had about two acres per thousand residents (Wolch, Wilson, and Fehrenbach 2005, 17).

Environmental justice researchers and activists have also focused on the costs and benefits of transportation. Decisions about building new roads, the density of truck and automotive traffic, and the degree of pollution control for transport activities have significant consequences for air pollution (Forkenbrock and Sheeley 2004). But “transportation justice” has taken on a larger, positive meaning that includes access to affordable and quality transport that can facilitate a community’s linkage with jobs, retail shopping, parks, and other opportunities. This benefit side of the equation has been important to environmental justice advocates, and has led to debates and conflicts over the degree of funding devoted to the mass transit options frequently used by low-income and minority residents.²⁰

This issue was critical in New Orleans when Hurricane Katrina struck. Many people were stranded in the city even after the call for evacuation. But issues of transit inequality were evident before the storm: public transit use by blacks was four times that of whites (19.2 to 5.1 percent), and carpooling, another indicator of lack of independent transportation, was twice as high (19.2 to 10.1 percent). Reliance on public transit must be taken into account in disaster planning and evacuation procedures. Otherwise, the disparity in transportation access will, as in New Orleans, translate into many who get “left behind” in a time of crisis.

Environmental and transportation justice, in short, are at the heart of emergency preparedness and emergency response. The former provides a guidepost to who is most likely to be vulnerable to the disaster itself, and the latter provides information about who will need the most help when disaster strikes. It is

to the intersection of disaster vulnerability with race, income, and other social characteristics that we now turn.

THE SOCIAL ECOLOGY OF DISASTERS

Hurricane Katrina is not the first time in U.S. history that blacks, the poor, and other marginalized groups have suffered more in a disaster. It may be, however, the first time most Americans realized the degree of inequity in social and economic impacts of disasters. This inequity, however, is a fact long noted and studied by disaster scholars—including sociologists, anthropologists, economists, and geographers—who recognize that race, ethnicity, resources, income, gender, ability status, and age can shape disaster readiness and consequences.

The disaster literature often starts with a sharp distinction between natural and man-made events. The former include hydro-meteorological disasters (such as hurricanes, floods, and droughts) and geophysical disasters (such as earthquakes, volcanic eruptions, and tsunamis). Traditionally, the latter are industrial accidents and wars. Rather than a simple dichotomy, however, disasters often lie on a continuum between the natural and man-made poles.

This intermediate terrain is the common ground for many disasters for two reasons. The first is physical interaction: when a hurricane damages industrial facilities, for example, leading to oil spills and toxic chemical releases, the disaster has both natural and man-made elements. The second reason is the social fabric through which disaster vulnerability is filtered: to borrow a phrase from George Orwell, when disaster strikes, some people are more equal than others.

Experts on disasters recognize that unequal risks are structured by social differences in wealth and power that arise before, during, and after the actual cataclysmic events. When the Union Carbide plant in Bhopal released a cloud of poisonous methyl isocyanate gas in 1984, killing 7,000 to 10,000 people and injuring many thousands more, the victims were disproportionately poor and low-caste communities living in squatter settlements near the facility.²¹ During the accident, plant officials waited two deadly hours before sounding the siren to alert surrounding communities to evacuate. After the disaster, compensation to the victims reflected their paucity of wealth and power: in cases of death, the typical compensation was about \$2,500; for injuries, the average was less than \$600.²²



Source: © Shawn Thew, EPA, Corbis.

Note: A cleanup worker cleans up crude oil spilled from a local refinery in the wake of Hurricane Katrina. The toxic spill was inundating an estimated 1,500 to 2,000 homes.

Similar patterns were revealed by Hurricane Katrina. Ninety-eight percent of the residents of the Lower Ninth Ward, the lowest-lying area of New Orleans that was most vulnerable to flooding, were African Americans (versus 67 percent in the city as a whole and 37 percent in the entire metropolitan area).²³ As the hurricane drew near, many of the poor were unable to flee because they lacked private transportation. And, in the aftermath of the storm, a second disaster that involves disparities in recovery and reconstruction processes has started to unfold.

The flip side of excess vulnerability for some is favoritism for others. Before, during, and after natural disasters, the rich and powerful occupy privileged positions by virtue of residential location, quality of construction, means of escape, and preferential access to insurance and to postdisaster grants and loans (Platt 1999). These disparities are not only inequitable but also inefficient. For the affluent, the assurance of generous post-disaster government aid creates a moral hazard: being well-insured against a risk,

they have little incentive to avoid that risk. This encourages rebuilding in risky but attractive locations such as beach fronts.²⁴ At the same time, it diverts scarce government resources away from disaster-vulnerability reduction measures that could yield greater benefits to society.

The point here is that however natural the disaster's origins may be, much is often unnatural in the distribution of its costs (and possibly benefits) across the affected population. And, given that the ongoing risks of environmental negatives seem to be inequitably distributed by race, income, and privilege, it is little surprise that one group of disaster studies scholars has found that these dimensions of privilege and power also impact emergency preparedness, response, and recovery.

Preparing for the Worst

Research examining issues before a disaster often finds telling differences in risk perception and attitudes about a hazard, preparedness activities, and warning

What About the Elderly?

She called her uncle for the last time before the storm on Sunday morning. Relatives she had entrusted to take care of him had decided to ride out the storm, and by the time she discovered this change in plans, “contra flow” made it impossible to drive back into the city to get him.

It was nine days before she would hear from him again. In an anguished voice, he reported feeling the entire house shake, then feeling initial jubilation when he realized that the house had sustained minor roof damage and, of course, the loss of electricity. But with a gas stove that was working and pre-cooked food in the freezer, he felt secure. His confidence proved to be short-lived, when the water rapidly rose in the basement and approached the upstairs in a fast-paced circular motion. He decided to go to his bedroom where the bed sat somewhat high off the floor, but before he could reach his room the water rose above his ankles. As he got to his bed, the water receded. For the next several nights with no running water or electricity, he could hear the furniture downstairs floating and bumping together against the walls and stairs in the house. The only other sounds he heard were from helicopters overhead and his neighbors with one-story homes sitting on roofs and trying to summon them. He would look outside of his window and could see only water and roof tops. It felt like he was lost in the middle of the ocean.

Just as the last of his food was running out, he heard a voice on a bullhorn calling out “is there anyone here?” He made his way to the front picture window in the living room and began beating on it to garner attention. At last, he was seen and picked up by the National Guard. He was taken by boat to a dry location where he was then airlifted by helicopter to the Louis Armstrong International Airport. At that point he had no idea where they were taking him. Several hours later he landed in Lubbock, Texas, at Reese Air Force Base. It was three days before he was able to

make contact with family members, who immediately brought him to Marietta, Georgia, where his family was temporarily taking refuge. The family was relieved: the agony of not knowing, coupled with the suffering of persons aired on television every day, had made the waiting even more torturous.

Although what happened to this seventy-eight-year-old retired New Orleans public school teacher in the storm was frightening, the aftermath has been of equal concern. This elderly evacuee lived on a meager retirement package from the New Orleans public school system, for which he had worked for more than thirty years. He lived with his sister, a widow, who owned her house, which had a downstairs apartment she rented to her brother for half the cost of utilities and phone bills. The flood insurance policy was far less than what is needed to repair the house or to rebuild and he has been thrust into extreme poverty. The cost of housing alone is likely to be more than his monthly check. His health insurance premium has increased from \$200 a month to \$600, and he is not eligible for Medicare because the school system was privately insured. He has yet to receive anything from FEMA except the first \$2,000 given to most evacuees who applied.

For many elderly, home ownership is the only thing that stands between them and poverty. Another set of relatives are age seventy-two and seventy-five. Both retired and living on fixed incomes, their house was destroyed by Katrina. They were underinsured for flooding, and the homeowner’s policy that they had paid faithfully for the last forty years gave them a check for only \$3,000. They applied for an SBA loan, which was approved for \$170,000. They are both very confused. How will they ever be able to pay it back? Borrowing that amount of money this late in life was simply not an option for them. Yet they have worked hard all their lives and given much back to their communities and to their country. What will America do for them now?

Note: This story was provided by Beverly Wright, director of the Deep South Center for Environmental Justice and a Katrina evacuee from New Orleans East.

communication and response. For example, studies have found that minorities and the poor are more concerned about disaster threats, including the risks of earthquakes, floods, hurricanes, or tornadoes (Blanchard-Boehm 1997; Flynn, Slovic, and Mertz 1994; Palm and Carroll 1998). Heightened risk perception comes from both previous experiences with

vulnerability and disasters—such as Mexican Americans who lived through or heard about the 1985 Mexico City earthquake—and from a general lack of control and power these groups have in their daily lives. This heightened perception of risk, however, does not mean these groups are more prepared for a disaster situation.

The lack of power that leads to increased anxiety about the threat is also associated with an inability to translate the perception of risk into preventative action—because that requires resources that are often unavailable to the poor and minorities, especially women and children. Research on disaster preparedness behavior—such as devising disaster plans, buying insurance, gathering emergency supplies, training response teams, and educating residents about a potential disaster—finds many barriers for marginalized groups in the United States.

Wealth helps explain a portion of the preparedness differential: income levels affect the rate of adoption of some of the more costly mitigation measures, such as purchasing insurance, strengthening of homes, and purchasing fire extinguishers (Palm and Carroll 1998; Vaughan 1995; Fothergill 2004; Bolin and Bolton 1986; Blanchard-Boehm 1997). But it goes beyond income. After the 1987 Whittier-Narrows earthquake in California preparedness information was disseminated only in English despite the language needs of likely victims (Tierney 1993). Similarly, before Hurricane Hugo in 1989 in Georgia and the Carolinas, racial and ethnic minority communities were less likely to have had disaster educational opportunities to help them prepare for the storm (Faupel, Kelley, and Petee 1992).

Research has also examined issues of diversity in how disaster warnings—such as flood sirens or emergency broadcasts—are disseminated and how groups respond to those warnings of an immediate danger. Overall, groups of people with lower socioeconomic status are especially likely not to receive, understand, or believe disaster warnings (Panel on the Public Policy Implications of Earthquake Prediction 1975). Minority households are more likely than white households to report that relatives were an important information source with regard to emergencies and to rely on local television for updates (Morrow 1997; Perry and Nelson 1991). Research has also found that Hispanics are more likely than whites, blacks, and Asians to use social networks for disaster information, and both blacks and Mexican Americans preferred neighborhood meetings as a communication channel regarding hazards more than whites (Blanchard-Boehm 1997; Perry and Mushkatel 1986; Phillips and Ephraim 1992). Efforts to ensure that all groups receive accurate, timely warnings require that disaster planning organizations plan for different preferences for warning dissemination—using culturally appropriate materials through television, neighborhood meetings, radio, or informal networks of family and friends.

As we saw in the Hurricane Katrina disaster, contextually understanding the evacuation behavior of residents (especially the most vulnerable) following disaster warnings is critical. Some research indicates that race, ethnicity, and socioeconomic status have no effect (Perry and Lindell 1991, Bourque, Russell, and Goltz 1993), whereas other studies have found that the poor and minorities are less likely to evacuate or undertake protective action short of evacuation (Perry and Mushkatel 1986; Lindell, Perry, and Greene 1980; Gladwin and Peacock 1997; Morrow and Enarson 1996).

This pattern of evacuation delay, even after warnings, may also reflect differences in wealth. Research suggests that the average level of net worth (a straightforward measure of wealth) for blacks is around 20 percent of the average net worth for whites (Gittleman and Wolff 2000). However, the weight of home ownership in that bundle of assets—which can include businesses, stocks, and other financial wealth—is much higher for African Americans: home equity accounts for nearly 63 percent of black wealth but only about 43 percent for white (Oliver and Shapiro 1995, 106).²⁵ Home equity is also a disproportionately important component of Latino net worth. Thus the urge to stay behind and protect one's assets, especially if underinsured, may be understandable, albeit dangerous.

Nevertheless, evacuation delay is not primarily a matter of choice. Hurricane Andrew in 1992 provided an eerie foreshadowing of Katrina's evacuation crisis. Before Andrew hit, blacks and those with low incomes in the evacuation zone were less likely to evacuate than other groups, most likely due to the lack of transportation and few affordable refuge options (Gladwin and Peacock 1997). There were also reports of public housing residents having to walk or hitchhike out of evacuation zones (Morrow 1997), and of poor women unable to leave because they did not have enough money for supplies or transportation (Morrow and Enarson 1996).²⁶ Although the apparent abandonment by public authorities of New Orleans residents during Hurricane Katrina was perhaps the most egregious and visible to date, it was not the first instance of American residents being left with too few evacuation options as a disaster approached.

When Disaster Strikes

What are the patterns of mortality, morbidity, and injury when disaster finally strikes? In general, studies

find that more marginalized groups, often the poor, women, and minorities, are hit hardest in U.S. disasters, a pattern also seen in disasters worldwide (Wisner et al. 2004). Katrina is actually part of a long-run historic record of inequality in disaster vulnerability.

In 1822, for example, hundreds of slaves died in a hurricane in South Carolina because there was no high ground and no shelter (Mulcahy 2005). The 1927 Mississippi Flood took the lives of hundreds of blacks who were rounded up and put on levees without food, water, or shelter. White authorities did not allow them to evacuate because they feared they would lose their inexpensive labor force (Barry 1997). In 1928, a major hurricane hit South Florida and more than 2,500 people, mostly black migrant workers, drowned in what is considered one of the worst disasters in U.S. history (Gross 1995; Van Orden 2002; U.S. Weather Service 2006). In Hurricane Audrey, which hit Louisiana in 1957, the death rate was thirty-eight per thousand for whites versus 322 per thousand for blacks (Bates et al. 1963). Research conducted in the 1970s concluded that disaster-connected deaths were disproportionately high among ethnic minorities (Trainer and Hutton 1972), and research on loss from natural hazards in the United States from 1970 to 1980 further confirmed that lower income households experience higher rates of injuries in disasters such as floods, earthquakes, and fires than more affluent households (Rossi et al. 1983).

The pattern of differential impacts is often due to the quality of housing afforded those lower on the socioeconomic scale. The low quality construction of low-cost housing puts residents of such housing at greater risk (Aptekar 1990; Bolin 1986; Bolin and Bolton 1986; Greene 1992; Phillips 1993). For example, in the United States many ethnic group members live in older buildings with unreinforced masonry, which are dangerous in an earthquake (Bolton, Liebow, and Olson 1993). Mobile homes, also low-income housing, are the highest risk in a tornado (Bolin and Bolton 1986; U.S. Department of Commerce 1995). The poor and minorities also encounter more problems with homelessness after a disaster, as was evident in 1989 after the Loma Prieta earthquake and Hurricane Hugo (Phillips 1998; Federal Emergency Management Agency 1990). And even though beachfront property exposes all residents, regardless of SES, to the risks of hurricanes, victims with the lowest incomes have the greatest proportionate losses to their housing (Bolin and Bolton 1986; Bolin and Stanford 1991).

A lack of economic, cultural, and social capital increases the vulnerability of poor women in a disaster, including violence from spouses and partners. The most vulnerable evacuees—minorities, girls and women, elderly, and the poor—can become victims of violence, such as beatings, rapes, assault, forced labor, and forced prostitution (Barry 1997; Bergin 2006; Fisher 2005; Enarson and Fordham 2001; Fothergill 1999; Morrow 1997; Morrow and Enarson 1996). There are also issues of violence toward vulnerable, minority groups after a disaster. In New York after the 9/11 terrorist attacks, a study of Muslim students found that many of them had been confronted about the terrorist attacks, including young women having their headscarves yanked off by strangers, and many felt it was not safe to leave their homes (Peek 2003).

Research also shows that psychological impacts are experienced in different ways by different groups, depending on factors such as race, ethnicity, gender, and income. There are, of course, many different forms of stress stemming from a disaster: the trauma of the actual disaster itself, the grief and anguish over injuries and loss of life, and the challenges that emerge immediately afterward, including the strains of relocation and temporary life in tent camps or shelters. Studies show that minorities and lower income groups tend to suffer more psychological impacts along these dimensions than higher-income and white victims, and may also have less access to mental health services (Aptekar 1990; Bolin 1993; Bolin and Bolton 1986; Goltz, Russell, and Bourque 1992; Garrison 1985; Shoaf 1998; Bolin and Klenow 1988; Fothergill 2004; Perilla, Norris, and Lavizzo 2002; Yelvington 1997).

Part of the reason for higher stress is that the poor, minorities, and single mothers may already feel a lack of control over their lives, and the dislocation and increased uncertainty about the future add to underlying and persistent stress. Psychological reactions are also affected profoundly by financial concerns, increased indebtedness, and the challenges of navigating bureaucracies. Emotional distress has been found to be greater when victims find that they will not be compensated for their financial losses. Elderly blacks, especially, have slower psychosocial recovery than elderly whites, partly due to economic constraints (Bolin and Klenow 1988). This financial stress can be felt immediately. Many middle- and upper-middle-class professionals can continue to receive paychecks during a disaster, whereas those who are paid hourly, such as service workers, do not.

The research record does point to important ways in which the poor and minorities deal with or mitigate the psychological impacts of disasters and their aftermath. In one study in rural Mississippi, black children who survived a tornado fared better than white children in a different disaster because the black children had more support beyond the immediate family and more household and farm responsibilities, which helped stabilize the children and made them feel more important to the family (Perry and Perry 1959). Some research has found that family was especially important for black victims (Bolin and Klenow 1988), backing up the notion that family ties are important for emotional recovery. This is one reason why the extended family dispersion after Hurricane Katrina has been of such concern to disaster scholars and community activists alike.

The poor and minorities may also suffer disproportionately in terms of immediate disaster services. In the famous 1928 Florida hurricane, African Americans were subjected to racial segregation and inequity in aid services, and were given less time for bodies to be identified and for the burial of the dead. They were also forced to recover and handle the dead through enforced servitude in recovery crews (Van Orden 2002). In the 1989 Loma Prieta earthquake in northern California, the Red Cross declined an invitation from community-based organizations to do outreach in low-income and non-English speaking communities (Subervi-Velez et al. 1992). Overall, the poor are one of the groups most likely to “fall through the cracks” during emergency relief operations (Colorado State University 1985).

For example, after Hurricane Hugo hit Georgia and the Carolinas in 1989, service agencies found that providing assistance to the rural poor was complicated because of high illiteracy rates, physical isolation in rural communities, fear and distrust of government officials, and lack of electronic media for weeks following the storm. Moreover, due to the total lack of pre-storm interface with the rural poor, they were “invisible” until the hurricane hit, living in unmarked homes, on unmapped roads, or hidden behind large estates (Rubin and Popkin 1990). Indeed, in an eerie parallel with the lesson Katrina delivered America about poor people in its midst, emergency response workers commented that until the hurricane, they were unaware of the extent of the poverty in their own neighborhoods (Miller and Simile 1992).

Differences have also been found in post-disaster sheltering efforts. The tent cities erected after Hurri-

cane Andrew had a population roughly 50 to 60 percent Latino and 30 percent black, well above their share in the affected zone (Yelvington 1997). In the United States more generally, those lower on the socioeconomic scale are more likely to use mass shelters (Bolin and Bolton 1986; Bolin and Stanford 1990; Fothergill 2004; Mileti, Sorensen, and O’Brien 1992; Yelvington 1997).

Language is often also an issue during the emergency response phase. Local, state, and federal emergency response agencies have either too few or no bilingual personnel for bilingual populations (Phillips and Ephraim 1992; Subervi-Velez et al. 1992; Yelvington 1997). After the 1987 Whittier Narrows earthquake, officials put Not Fit for Occupancy signs on buildings with English-speaking tenants, whereas the Spanish translation for buildings with Spanish-speaking residents read Entry Illegal (Cooper and Laughy 1994, 7). After the 1989 Loma Prieta quake, some house warning tags, placed on homes to warn residents of the building’s status, were printed in English only (Phillips and Ephraim 1992). Complaints were also numerous in the Katrina response about inadequate language capacities to deal with affected Latino residents, a rapidly growing population in the South (Muñiz 2006).

Existing inequities are often played out in the interactions between relief workers and victims. For example, after the 1979 Hurricane Frederick in Alabama, black communities received less food, ice, shelter, and assistance than white communities, and white neighborhoods had their power restored first (Beady and Bolin 1986). After the Loma Prieta earthquake, shelters in well-off neighborhoods had more volunteers than homeless clients and received visits from the mayor, whereas a low-income emergency shelter reported that the mayor did not visit and that white volunteers had made racist remarks (Dhesi 1991).

Media coverage also plays a role in which communities are favored or disfavored in the process of response and subsequent recovery, partly because disaster officials themselves sometimes rely on media coverage for setting priorities. In the Loma Prieta earthquake, the English-language news focused on the damage in San Francisco and, to a lesser degree, on Santa Cruz (which was nearly 80 percent white when the quake struck), often skipping over the effects in the devastated town of Watsonville (which was nearly 65 percent Latino). Some analysts argue that the increased media attention contributed to the more

rapid recovery in the wealthier and whiter communities and continued stagnation in Watsonville (Subervi-Velez et al. 1992; Rodrigue and Rovai 1995).

Did the media do a better job in covering the disparate effects of the Katrina crisis? Reporters got on the scene quickly, often before government officials; indeed, one striking moment of the crisis occurred on the evening of September 1, three days after Katrina struck, when FEMA head Michael Brown indicated that he had just learned about evacuees at the New Orleans convention center and was asked by ABC Nightline anchor Ted Koppel: “Don’t you guys watch television?” Media also kept significant attention on those who had been displaced and were at risk—and probably helped expedite the assistance that eventually arrived.

At the same time the mass media seemed to exaggerate incidents of looting and violence in ways that cast many of Katrina’s victims as victimizers. Although lawlessness was afoot in post-Katrina New Orleans, the reporting—erroneous in part because of the chaos and incomplete information—seemed to only confirm the worst suspicions about the urban poor. Still, to the media’s credit, many reporters were horrified by the lack of governmental response, labeled it an affront to basic American values of decency and community, and highlighted important issues of race, class, and poverty in their longer-term analysis of the crisis.

The overall record suggests that the media were right to pick up on this race and class dimension of the Katrina story. The pattern of difference and neglect that was so dramatic in the immediate aftermath of Hurricane Katrina was not an exception to the historical rule, but the most recent in a long line of inequitable disaster impacts.

Relief and Recovery

The inequities before and during a disaster are often played out further in the period after a disaster. Many minorities and the poor have had greater difficulties recovering from disasters due to less insurance, lower incomes, fewer savings, more unemployment, less access to communication channels and information, and the intensification of existing poverty (Bolin and Bolton 1986; Bolin and Stanford 1998; Cooper and Laughy 1994; Hewitt 1997; Peacock et al. 1997; Tierney 1988). After Hurricane Andrew, for example, blacks and non-Cuban Hispanics were more likely than whites to receive inadequate settlement amounts, and black neighborhoods were less likely

to have insurance with major companies, a fact that may have been connected to redlining (Peacock and Girard 1997).²⁷

Studies have also addressed racial, class, and ethnic differences in who receives disaster recovery assistance. Bolin and Bolton (1986) concluded that the blacks, who had lower income than whites in their study, needed multiple aid sources to deal with large losses because they did not receive enough support from fewer sources. Blacks were also less likely than whites to receive Small Business Administration (SBA) loans, more likely to use interfaith disaster services, and tended to recover economically more slowly. Following the 1997 Grand Forks flood in North Dakota, flood relief was geared away from migrant workers, hurting primarily Hispanic single mothers (Enarson and Fordham 2001).

Upper middle-class victims in several disasters have been more likely to receive assistance than minorities and the poor because they knew how to navigate the relief system, fill out the forms, and work within the government bureaucracy (Aptekar 1990; Fothergill 2004; Rovai 1994). In addition, poorer victims had more trouble making trips to the disaster assistance centers following Hurricane Andrew because of transportation, child care, and work difficulties (Dash et al. 1997). Furthermore, the traditional nuclear family model used by some relief programs left poor, minority women at a disadvantage (Morrow and Enarson 1996).

Housing continues to be a significant issue for low-income and minority disaster victims in the recovery period. Past research has found that housing assistance favors middle-class victims, particularly homeowners. Of course, helping homeowners is important and may be especially critical for middle-class black and Latino families. Such families have much lower homeownership rates but, as noted earlier, tend to have more of their net worth tied up in home equity than their white counterparts do. Still, including renters prominently in the relief mix is part of a more racially equitable approach.

Renters are affected in several ways. Higher-income evacuees often secure the surplus housing available in a community, leaving none for lower-income victims (Quarantelli 1994). In many disasters, rebuilding services are geared toward homeowners and legal tenants, and not toward multifamily and affordable housing units which are occupied by low-income tenants. Some landlords also take active advantage of the situation. The Whittier-Narrows

earthquake, for example, occurred on the first of the month, the day rent was due. Many landlords evicted low-income renters for late rent and some even lied about building conditions to get rid of their low-income tenants (Bolton, Liebow, and Olson 1993).

There are alternatives. In the aftermath of the Loma Prieta earthquake of 1989, political pressure was put on FEMA to provide more housing for low-income victims. In mid-November 1989, FEMA agreed to provide more than 140 mobile homes in Watsonville and Pajaro, two areas with a lack of affordable housing. FEMA had initially resisted offering mobile homes, with one FEMA spokesperson referring to them as “instant slums” (Bolin and Stanford 1993, B46). But a formal petition brought against FEMA for violating regulations and statutes for low-income earthquake victims forced the change (U.S. House of Representatives 1990). And a bold plan put together by the U.S. Department of Housing and Urban Development after the 1994 Northridge quake (see profile that follows) managed to help many low-income renters quickly get back on their feet.

Legal residency is another critical issue in disaster recovery. Following disasters, many undocumented immigrants, unsure about the Immigration and Naturalization Service (INS) policy, avoid recovery assistance for fear of deportation (Subervi-Velez et al. 1992; Bolin 1993; Cooper and Laughy 1994; Yelvington 1997). Muñiz (2006) offers anecdotal evidence that this was an issue in Katrina as well. She also shows how the occasional assumption that Latino residents were undocumented rather than legal residents sometimes led FEMA to fail to offer appropriate information about housing assistance to eligible individuals.²⁸

In addition, the nontraditional family structures of immigrant households can be a challenge for disaster officials. Following Hurricane Andrew, FEMA was not prepared for some of south Florida’s family structures, particularly Haitian families, who often had several families in one household—FEMA’s temporary assistance was set up for nuclear families with one head of household (Morrow 1997).

Culture can also influence resident attempts to access service. Many Latinos have experienced or had been told, through personal networks, of earthquakes in their countries of origin, such as the 1985 Mexico City earthquake and its deadly aftershocks; they thus feared the temporary shelters set up after quakes (Bolton, Liebow, and Olson 1993; Phillips

1993). In Miami, immigrants from countries with a history of political repression, such as El Salvador and Guatemala, avoided official assistance (Enarson and Morrow 1997). In California, some residents of Central American origin refused to use the National Guard camps, because the tents and fences reminded them of death camps in their native countries (Phillips 1993).

Indeed, the presence of disadvantaged persons, already living in marginal housing, presents disaster service providers with demands that are often unanticipated within the provisions of routine shelter and housing programs (Bolin and Stanford 1990). In the context of the limited resources that might be available after a disaster, this issue is a simple reflection of the ongoing crises of poverty, inequality and discrimination in American society—and disasters often provide a window on a world of hurt being ignored on a daily basis by the media, policy makers, and the general public.

Reconstruction and Long-Term Effects

The long-term reconstruction after a disaster can simply continue the pattern of inequity and stress that has played out throughout the disaster itself. As with the stage of short-term recovery, the search for safe, affordable housing after a disaster is one of the most critical, and unsolved issues for lower income families and minorities in the United States. In virtually all of America’s major urban areas, there is already an acute housing crisis for lower income households before a disaster hits—and the disaster exacerbates existing problems.

Numerous studies have found that problems of homelessness and low-income housing shortages become even more serious in the years after a disaster (Bolin and Stanford 1990, 1991; Comerio, Landis, and Rofe 1994; Greene 1992; Phillips 1993, 1998; Wright 1989). For example, a year after the Loma Prieta earthquake, 90 percent of the affected multifamily units were still out of service; four years later, 50 percent of the affected multifamily units remained unlivable (Comerio, Landis, and Rofe 1994). Several other studies have found that poor women have the most difficult time rebuilding homes, finding new places to live, and getting out of substandard temporary housing (Enarson and Fordham 2001; Morrow and Enarson 1996).

Members of racial and ethnic minorities and the poor are also less likely to qualify for and receive various types of aid for reconstruction, including SBA

Where Is New Orleans East? Race and Invisibility

The telephone began ringing very early in the morning of November 19, 2005, for a former New Orleans resident who had, like most of her family and friends, lost her home and possessions to Katrina. They were all told that it was the storm surge that had destroyed the levees that flooded their homes and 80 percent of the city. But two and a half months after hurricane winds had buffeted the city, it was a policy surge that seemed about to complete what Katrina had begun.

The phone was ringing because today was the day that the Bring New Orleans Back Commission would unveil a report it had commissioned from the Urban Land Institute, a nonprofit organization that includes real estate professionals, academics, and others with expertise in land issues. The word on the street was that the plans did not look good for eastern New Orleans. New Orleans East, like the Lower Ninth Ward, lies below the industrial canal and is also predominantly African American. The similarities, though significant, completely dissipate for education and income. Where the Lower Ninth Ward has been portrayed as black and poor, New Orleans East has hardly been portrayed at all.

New Orleans East was a community where most of the city's black professionals, school teachers and administrators, famous musicians (from hip-hop to jazz), businessmen, and politicians lived. It was an area primarily of homeowners with flood insurance. It represented nearly 40 percent of the city's tax base, but the Urban Land Institute plan included a map showing most of New Orleans East being relegated to parks and green space or subject to a building moratorium until neighborhoods proved viability.

In the aftermath of Katrina, New Orleans East evacuees and their friends have learned that all of their education and money did not shield them from natural disasters, the neglect of the levee system and coastal wetlands erosion, and the ways in which public policy decisions reinforce the legacy of race. Their community was literally wiped off the map with no regard for the social, economic, and financial impact this decision would have on those affected. Worried residents are still waiting to see what will emerge with regard to levee protection, SBA loans, insurance settlements, and land buyouts. Will race, once again, be a factor that colors the decision-making process?

Note: This story was provided by Beverly Wright, director of the Deep South Center for Environmental Justice and a Katrina evacuee from New Orleans East.

loans, and to have trouble with the housing process. For instance, after a Texas tornado, whites were much more likely to qualify for and receive such loans than blacks (Bolin 1986; Bolin and Bolton 1986), and after the Northridge earthquake, ethnic minority households had limited access to FEMA loans and SBA grants (Bolin and Stanford 1998). In the Loma Prieta reconstruction, victims were ineligible for disaster aid if they had had illegal housing before the disaster. After the 1995 flooding in New Orleans, even though low-income elderly women were over-represented in the population applying to FEMA for low-interest loans, they were three times less likely than other elderly households to receive them (Childers 1999).

A few studies show that some of the poorest victims may temporarily do better after a disaster. This was the sentiment expressed by some, including former First Lady Barbara Bush, who after visiting Katrina evacuees in the Houston Astrodome, said: "so many of the people in the arena here, you know, were underprivileged anyway, so this is working very well for them."²⁹ But most of the empirical evidence shows that most victims—especially minority and

low-income victims—are worse off in the years that follow the disaster. For example, residents of very low-income housing, such as single room occupancies (SROs), do not easily qualify for assistance programs. Many disasters have pushed the marginally homeless population into the category of permanently homeless.³⁰ In general, disasters may also push many lower income and working class families into debt and financial insecurity, dashing hopes to buy houses, attend college, and so forth.

The Loma Prieta quake in California also shows that physical recovery can vary in different areas. This likely differentiation in long-term recovery is a source of great controversy now in New Orleans, with some plans suggesting that the black areas of the city will be the last to be brought back in a sort of phased recovery. Yet, as in contemporary New Orleans, the research suggests that many disaster victims often do not want to relocate, and remain in, or try to return to, badly damaged communities. Post-earthquake studies found that many Hispanics were connected to their neighborhoods and did not want to move away (Bolin 1993). After Hurricane Andrew, blacks were less likely than whites to relocate, and data

show that blacks remained in damaged areas (Girard and Peacock 1997). Reasons for this persistent of attachment include economic barriers, residential segregation, and a sense of place. Often overlooked in the reconstruction effort are the ways in which communities find meaning in where they live and where their families have lived for generations, and why the right of return has such special salience.

Indeed, the reconstruction of neighborhoods has an importance that goes beyond simply respecting sentiment. Although African Americans and Latinos have often been steered through housing practices to segregated areas, such areas can also constitute ethnic enclaves where minority entrepreneurs can find clientele and build up local-serving businesses. One emerging worry in New Orleans is exactly what will happen to the black middle class if the communities they have served are dispersed across the United States and their neighborhoods are not rebuilt for return. The social capital of a community and the financial capital of its entrepreneurs are often intertwined. Rebuilding must take this into account before designating certain areas as unfit for reconstruction.

Learning from History?

The historical record suggests a pattern of differential impacts: groups that lack access to resources, power, and information often find themselves further disenfranchised before, during, and after a disaster. Despite some efforts at reform, the question that results is straightforward: with so much evidence, why was so little done to address disparities before Hurricane Katrina struck the Gulf Coast?

In our view, one reason may be that unlike the environmental justice field, the disaster field has not been immersed in the difficult but fruitful interplay of rigorous scholarship with an emerging social movement. Disaster scholars have tried to affect policy—indeed, the field has been criticized for being too applied—but unlike the work of the EJ scholars, it has generally not informed, and been informed by, activists (Fothergill, Maestas, and Darlington 1999). This is partly due to the nature of disasters—one sees episodic organizing against particular abuses by, say, FEMA rather than the sort of sustained efforts around changing EPA policy typical of the EJ field. But this is a gap that should be addressed. Real policy change is usually driven by social pressures and not simply the good science and good research we associate with academic scholarship.

Communities sometimes become politicized in their reactions to the social disruption and inequities

that arise in the wake of a disaster—and disasters can open broader political dialogues on social inequalities (Bolin and Stanford 1991) or create an enhanced sense of ethnic identity (Davis 1986). After the mistreatment of blacks during the 1927 Mississippi Flood, blacks shifted from the Republican to the Democratic Party, and many left the South for the northern states (Barry 1997). After Hurricane Andrew, Mexican farm workers, Haitian immigrants, and African American church women organized and mobilized their neighborhoods (Enarson and Morrow 1997) and several African Americans were elected to public office (Peacock et al. 1997). After the Loma Prieta earthquake, coalitions of community activists, federal agencies, and private organizations pushed to build low-income housing as part of the planned reconstruction in Santa Cruz County—and these efforts not only helped to improve the living conditions of Latinos, but also helped fuel a broader movement to increase Latino political voice in the Monterey Bay region (Bolin 1993).

Katrina certainly seems to have put a spotlight on the chasms of race, poverty, and environmental injustice in the United States. Whether the window stays open for policy change with regard to disaster readiness, response, and recovery remains to be seen. In our view, part of keeping that window open involves understanding the continuum between chronic and acute risk, and building increased ties between environmental justice researchers and disaster studies scholars, and between environmental justice activists and those working in the affected communities of the Gulf Coast.

Until Hurricane Katrina, there was a gap between the work of environmental justice and the sociology of disasters, even though both areas are concerned with inequality and environmental hazards and risks. Environmental sociology books, for example, rarely discuss disaster research, and disaster studies rarely draw on environmental justice literature. Yet the goals and principles of the environmental justice field are the same as those of the disaster field: to use systematic and thorough research to uncover inequality in exposure to hazards and risks, and to support organizing and policy change to reduce risk and suffering. New research bridges are being formed. Bolin (2006) argues, for example, that environmental justice's historical equity studies might be a particularly useful tool for disaster sociologists to use to understand pre-disaster vulnerabilities and post-disaster processes.

In general, a move toward more vulnerability analyses and more use of the EJ framework could help

disaster research be more historically and geographically informed. It could help the field—and policy-makers—move away from viewing disasters as acute events, concentrated in time and space, and separate from routine, or nondisaster, social processes. Perhaps the disaster field could also use some of the concepts and themes of the EJ movement, such as taking a broad view of the environment, including housing, air quality, transportation, and the like, using a rights-based approach to environment, applying the idea that everyone has a right to the environmental quality and protection from risks, and advocating for democratization in decision making about the environment and disaster readiness.

Homeland Security and Unequal Risks

Since the tragic events of September 11, 2001, national officials have been preoccupied with the important task of fighting terrorism and preventing terrorist incidents. However, for homeland security programs—and related emergency preparedness programs for that matter—to be effective, they must have the cooperation and trust of all Americans (Working Group on “Governance Dilemmas” in Bioterrorism Response, 2004).

Yet the history of racial disparity affects popular views of the effectiveness and fairness of a government response to an emergency: for example, a 2004 RAND Corporation study in Los Angeles County found that 77 percent of white respondents perceived that the public health system would respond fairly in a bioterrorist event (Eisenman et al. 2004), while 63 percent of African Americans, 68 percent of Asian-Pacific Islanders, and 73 percent of Latinos felt that the public health system would respond fairly in a terrorist crisis. The study concluded: “To strengthen bioterrorism preparedness, public health officials must continue to improve perceived fairness among African Americans and Asian/Pacific Islander communities.”³¹

The emergency response in the aftermath of Katrina has done little to build trust in government. This is particularly so in the Louisiana petrochemical corridor so heavily populated by poor residents and blacks. Although to date no such attack has been made on a U.S. chemical facility, more than 3,000 accidents involving more than 10,000 pounds of hazardous materials have occurred since 1987, with smaller incidents occurring daily (Hinds 2001). It is little wonder that the Justice Department has determined that threat of a terrorist targeting such

plants is “both real and credible” and could be more serious than attacks on nuclear power plants, which at least undergo regular security assessments by the Nuclear Regulatory Commission (Gremaldi and Gugliotta 2002, A1).

The magnitude of a terrorist attack on U.S. chemical facilities could easily exceed the loss of life suffered on September 11, 2001. The surgeon general of the U.S. Army identified chemical plants as second only to bioterrorism in terrorist threats to the United States, and a 2002 Brookings Institution report ranked chemical facilities third in the number of fatalities that could occur from a terrorist attack (O’Hanlon et al. 2002). Of the nation’s 15,000 chemical facilities, the U.S. Government Accountability Office reports that 123 are close enough to potentially endanger more than 1 million people if a terrorist attack occurred (2004).

Railroad cars carrying chemicals are also of concern. Millions of Americans are at risk from toxic “time bombs” that travel on railroad cars through populated areas. In October 2004, government safety officials warned that more than half of the nation’s 60,000 pressurized rail tank cars did not meet industry standards, and they raised questions about the safety of the rest of the fleet as well. In January 2005, two Norfolk Southern Railway Company trains crashed into each other, releasing deadly chlorine gas in Graniteville, South Carolina, killing nine people, injuring 240, and forcing the evacuation of nearly 5,500 residents (Daily 2005). Some residents in the all-black New Hope Graniteville community complained that the Aiken County government emergency responders left the black community behind for nearly thirteen hours as they evacuated whites (Brundrett 2005; Bogdanich and Drew 2005).

Post-Katrina events have done little to stir new confidence among those fence-line communities that have been subject to pollution releases from nearby chemical facilities, or living near the potentially dangerous transit corridors discussed. In January 2006, for example, a storage tank at the Exxon Mobil Refinery in Baytown, Texas, spilled a 150,000-barrel storage tank that contained benzene, a known carcinogen. Although Exxon Mobil officials insisted the release was not harmful, a day after the incident and hours after residents bombarded the company with complaints, Exxon Mobil sent a team of thirty workers wearing jumpsuits and plastic gloves. The following day, the company distributed a letter, signed by the manager describing and apologizing for the in-

cident, to the residents and the Baytown Housing Authority.

The current Texas law calls for reporting such spills within twenty-four hours to the Texas Commission on Environmental Quality (TCEQ); Exxon Mobil took twelve hours to report, and waited a full day and a half before informing TCEQ officials that the incident went off the plant's grounds and affected the nearby community. Harris County's Pollution Control and Environmental Health Division officials learned of the off-site release from media accounts on Wednesday, more than two days after the incident. Local residents, state, and county environmental officials have questioned the delayed notification—but the penalties for late reporting and creating a nuisance are set between \$2,500 and \$10,000, at a level that is hardly a deterrent for Exxon Mobil, the largest energy company in the world, and seems to grossly undervalue the lives of fence-line communities.

Although such communities may be especially vulnerable, releases of toxic chemicals can kill and injure people relatively far from the accident scenes. Protecting those with the least resources is critical to protecting all of us. Addressing the issues of disparity that seem to plague both chronic risk, as indicated by the statistical studies cited, and the acute risks of accidents due to terrorism, accidents, and other factors would surely build the sort of widespread trust that will be needed in a real national emergency.

KATRINA, ENVIRONMENTAL JUSTICE, AND NEW POLICY

Long before Katrina struck, residents and activists had struggled against the disparate social, economic, and health impacts of the rapid proliferation of chemical facilities and sprawling industrial and residential development on poor African American residents in the Gulf Coast (Bullard 1990a; Roberts and Toffolon-Weiss 2001; Allen 2003; Lerner 2005; Urbina and Wald 2005). The evolution of this corridor, which included massive buyouts by large corporations of large swaths of small towns to build large petrochemical complexes (Markowitz and Rosner 2002), has been driven by the availability of oil, natural gas, and sulfur but has also resulted from two other important factors. One is a state government that proactively pursued the jobs and tax revenue promised by the petrochemical industry. The other is a legacy of racism that has left poor African American residents hostage to hazardous working

conditions, reduced labor rights, and worsened environmental quality.

Although Hurricane Katrina has laid bare for the entire nation the consequences of this discriminatory system and its social, political, and ecological dimensions, it also raises opportunities for civil rights, environmental, labor, and environmental justice organizations to advocate for a process of relief, recovery, and rebuilding that can begin to dismantle systemic socioeconomic and environmental inequalities that have plagued the region. Environmental justice organizing will be central to ensuring that the diverse voices of African American and poor communities are central to the long recovery and rebuilding process that lies ahead.

Preventing a "Second Disaster" After Katrina

The amount of debris left behind by Katrina—an estimated 22 million tons—is staggering (Griggs 2005, 12A). More than half, 12 million tons, is in Orleans Parish. In addition to wood debris, EPA and LDEQ officials estimate that from 140,000 to 160,000 homes in Louisiana may need to be demolished and disposed (EPA and Louisiana Department of Environmental Quality 2005). These homes include over one million pieces of "white goods"—such as refrigerators, stoves, and freezers—that require disposal. An additional 350,000 automobiles must be drained of oil and gasoline and then recycled; 60,000 boats must be staged and maybe destroyed; and 300,000 underground fuel tanks and 42,000 tons of hazardous waste must be collected and properly disposed (Varney and Moller 2005).

Currently, officials are debating about how to dispose of the debris. The EPA's Science Advisory Board (SAB) expressed deep concerns over the LDEQ debris management plan that calls for burning hurricane debris in open pits, using so-called "air-curtain incinerators" (EPA Science Advisory Board 2005, *Inside EPA*). The SAB recommended that the EPA consider actions other than open burning, such as temporary landfilling at parish collection points, significant processing, recycling and reuse at collection points, and long term land filling, outside the area if needed. The Solid Waste Association of North America (SWANA), in its September 21, 2005, report, *Hurricane Katrina Disaster Debris Management: Lessons Learned from State and Local Governments*, also noted that the use of open pit incineration in Florida after Hurricane Andrew in 1992 generated many complaints from the public, and

county commissioners responded by shutting down all debris open pit burning operations whether they used the air curtain process or not.

The disposal process, whether through burning or landfills, can have serious equity dimensions. After the 1994 Northridge earthquake, for example, the removal of concrete rubble from collapsed freeways stirred controversy when one entrepreneur in Huntington Park, a city that was over 90 percent Latino and far from the epicenter of the quake, sought to store and recycle the concrete. Already host to numerous hazards, including elevated levels of air toxics due to heavy industrial uses and truck traffic, the community found itself living next to a pile of concrete that was sixty feet high and soon nicknamed La Montaña (the mountain). With concrete dust draping cars and houses, and asthma attacks on the rise, community members organized, and pressured the city council to take action.

The city council eventually declared the site a public nuisance and, in 1998, the business owner was ordered by a judge to remove the rubble. The owner declared bankruptcy, leaving the future of La Montaña in doubt; three years later, another judge ordered the owner of the land on which the business sat to clear up the debris. But those orders were also ignored. It was not till 2004 that the California Integrated Waste Management Board took responsibility and authorized a clean-up. In the words of Linda Moulton-Patterson, board chairwoman, “if there has ever been a poster child for environmental justice, this is it” (Renaud 2004, B3). And if this is any harbinger of how timely and equitable debris removal will be, there are reasons to be worried about the aftermath of Katrina.

In the Gulf Coast, there are other critical environmental and public health threats beyond the issue of the cleanup and disposal. Katrina toppled offshore oil platforms and refineries, causing six major oil spills releasing 7.4 million gallons of oil (Cone and Powers 2005). It also hit sixty underground storage tanks, five Superfund sites, and numerous hazardous well facilities. In addition, more than a thousand drinking-water systems were disabled—E. coli in the floodwaters far exceeded the EPA’s safe levels (Cone 2005, A18).

New Orleans area residents also face complex health threats from contaminated soil and sediments left by Katrina floodwaters (CDC–EPA 2005). This includes threats from contaminated drinking water supplies, polluted floodwaters, broken sewage treat-

ment systems, oil and chemical exposures, toxic sediments and sludge. EPA tests in some New Orleans neighborhoods found elevated lead and arsenic concentrations (CNN 2005). Tests from independent sampling conducted by the Louisiana Environmental Action Network (LEAN) in several New Orleans neighborhoods showed high levels of polynuclear aromatic hydrocarbons (PAHs), many of which are known or suspected carcinogens (Dunn 2005).

How, when, and at what level of standards contaminated neighborhoods get cleaned up is a major environmental justice concern. More than 110,000 of New Orleans 180,000 houses were flooded, and half sat for days or weeks in more than six feet of water (Nossiter 2005). As many as 30,000 to 50,000 homes citywide may have to be demolished, and many others can be saved only with extensive repairs (Loftis 2005). Instead of emphasizing uniform cleanup standards, equal protection, and environmental justice for low-income and minority communities, some public officials have sent mixed signals for rebuilding low-lying black neighborhoods such as the Lower Ninth Ward (Sontag 2005). This issue has heightened the anxiety among residents who want to return home and caused division within the Bring Back New Orleans Commission created by the mayor (Rivlin 2005).

Talk of not rebuilding black New Orleans neighborhoods after a hurricane is not new. In 1965, Hurricane Betsy hit the mostly black and poor New Orleans Lower Ninth Ward especially hard, and accelerated the decline of the neighborhood and the out-migration of many of its longtime residents (Dyson 2006, 11). Given this history, many residents today do not trust the government to protect their interests and prioritize their neighborhoods for clean up and reconstruction (Remnick 2005). They are worried about some sort of “second disaster.”

Promoting an Eco-Social Approach to Recovery

In our view, understanding and proactively addressing the socioeconomic, political, and public health impacts of Hurricane Katrina requires an eco-social approach that merges the focused reconstruction process with broad attention to issues of economic and environmental justice. The joining of social and environmental concerns is critical. Although there has been substantial research documenting the ecological problems plaguing coastal communities in the Gulf



Source: © Ted Soqui, Corbis.

Note: Paul Guerra standing inside his brother's flooded home. He is trying to save their valuables and other documents. Most were destroyed by the murky flood waters and toxic black molds. The house is in the Lake View area of New Orleans.

region on one hand, and a large body of work assessing the socioeconomic and public health problems on the other, there have been few attempts to purposefully integrate these two fields in a way that makes explicit the connections between public health, the environment, and social inequality in the region (for notable exceptions, see Bullard 1990a; Colten 2005).

An eco-social approach would ensure that regulatory activities, as well as disaster management, recovery, and planning initiatives effectively integrate the goals of social equity and economic justice with comprehensive environmental sustainability objectives. Over the last decade, environmental justice advocacy has transcended reactive strategies that emphasize hazardous facility siting and has moved toward proactive approaches aimed at transforming the underlying structural causes of environmental inequality, economic inequities, and health disparities. In the realm of environmental health, EJ activists have also pushed scientists and regulatory authorities to move beyond

facility-by-facility or chemical-by-chemical risk assessment and regulation toward more holistic strategies that address a multitude of pollutant exposures and incorporate concepts of social inequality, economic disparities, and residential segregation into assessments of community susceptibility to environmental hazards (Morello-Frosch et al. 2001).

Such cumulative impact assessments are critical. They would better account for the real exposures borne by diverse populations generally exposed to a variety of pollutants where they live, work, and play—such as the air they breathe and the food and water they consume. Although data gaps pose challenges for estimating the cumulative health risks associated with multiple pollutants and emission sources, some researchers and regulatory agencies have begun thinking about how to integrate existing information to address community concerns (National Environmental Justice Advisory Council 2004). In a place like Louisiana, where environmental insult seems to have

Counting Our Blessings, Counting Our Losses

For many American families, a home is both a part of a dream of belonging and the family's greatest source of wealth. Consider a Katrina evacuee, happy to survive the hurricane and now contemplating the financial storm ahead.

She owns her home, the last payment having been made in August, the same month Katrina hit the city. Before Katrina, a similar house in her block sold for \$219,000. The only proposal that our evacuee has seen for compensating her if she is not allowed to rebuild is in a bill proposed by a Louisiana congressman, Richard Baker. The bill proposes funds such that property owners be given 60 percent of the equity in their homes less any money they receive from the insurance company. Based on this proposal, our evacuee would receive \$131,000, 60 percent of the assumed \$219,000 equity. Her insurance policies, however, paid \$28,000 more—\$159,000. Thus she would receive nothing from the government and it would be able to take over her land and prevent her from rebuilding. Her net loss from the federal bail-out is \$60,000, not to speak of the loss of control.

The story gets worse. After the death of her mother in April 2005, our evacuee, along with one sister, inherited the family house. She remembers her father saying with pride, "his house is for you, children.

Always remember, it's easier to get ahead if you don't start from scratch. This is your scratch." Her parents worked to purchase their home—in fact, they acquired two houses and three lots in Mississippi. Yet the home that her parents struggled so hard to acquire for future or generational wealth is scheduled for demolition. Her parents had more than adequate homeowner's insurance, but had only \$39,000 in flood insurance, a sum woefully inadequate to replace the family home. Like most elderly persons or couples in the New Orleans area whose homes were paid off, the flood insurance policy had not been revisited since Hurricane Betsy—forty years ago. The homeowner policy adjusters are fighting clients to ensure that they receive as little as possible from a policy that has been in effect for nearly fifty years.

It is easy to count the actual dollar loss for the family. But the social capital that spans nearly a hundred years, based on the vision and foresight of the parents and grandparents of our evacuee, cannot be measured. What this will mean for the wealth, health, and security of this family and the many families just like them is the untold story. Is this the way to treat those who bought into the American dream, worked hard all of their lives, raised and educated their children, and placed God and country at the center of their lives?

Note: This story was provided by Beverly Wright, director of the Deep South Center for Environmental Justice and a Katrina evacuee from New Orleans East.

been piled on economic and social injury, a cumulative impacts approach certainly seems warranted.

Nevertheless, scientists and policymakers are still catching up to community wisdom on this issue. For example, Alternatives for Community and Environment (ACE) has taken a holistic approach to addressing spiraling asthma rates in the Roxbury-Dorchester areas of Boston. This entails advocacy across several fronts including housing quality, transportation justice, disparities in municipal investment in neighborhood infrastructure, access to preventive health care, pollution sources and sanitation, and health education (Agyeman 2005; Morello-Frosch et al. 2006). This form of broad-based advocacy is influenced by a hard lesson from environmental justice activism. Even though local, hazard-by-hazard organizing is a powerful strategy, it drains community resources and locks organizing efforts into a reactive rather than a proactive mode (Agyeman 2005).

In the context of promoting socially equitable disaster planning and recovery in the wake of Hurricane Katrina, such a holistic strategy implies consideration of two major issues: the confluence of social vulnerability and cumulative impact. As the government response to Hurricane Katrina so tragically revealed, attention to social vulnerability is not systematically integrated into disaster planning and management. This is partly because vulnerability is deeply rooted in the legacy of racial and class-based discrimination, which requires systemic political and economic changes to overturn. But the challenges of change do not obviate the realities: the combination of socioeconomic stressors faced by disenfranchised communities coupled with the elevated environmental hazard exposures documented above has been described as a form of double jeopardy (Institute of Medicine 1999).

In New Orleans, this double jeopardy was revealed by a legacy of race and class discrimination that had

literally corralled and trapped African Americans and the poor into ecologically and economically vulnerable spaces from which many were unable to escape. Indeed, although residents were urged to evacuate the city before, in one post-Katrina study, 55 percent of the respondents who did not evacuate said that one of the main reasons they did not was that they did not have a car or other way to leave (Washington Post, Kaiser Family Foundation, Harvard School of Public Health Project 2005). This left people stranded in a rapidly flooding city, often on rooftops and in deplorable, life-threatening conditions in makeshift shelters with little food, water, or basic services. In the same survey, 68 percent of the respondents felt that the federal government would have responded more quickly to rescue people trapped by floodwaters if more of them had been wealthier and white rather than poorer and black.

But even as Katrina graphically revealed deep structural divisions across racial and class lines, the storm also washed away the illusion that the wealthy can fully insulate themselves from the invisible health risks and long-term consequences of environmental inequalities and social injustice. As sociologists Drake and Cayton noted more than fifty years ago: “The color line is not static; it bends and buckles and sometimes breaks” (1945, 101). And when the levees shielding the poorest and blackest community in New Orleans broke, the water left nearly 80 percent of the city in a toxic soup. All New Orleans neighborhoods must now contend with the reality of a new riskscape that has spilled across traditional racial, class, socioeconomic, and political lines. Indeed, after conducting preliminary soil and air sampling and analyzing state and federal regulatory data, some environmental groups have concluded that without extensive cleanup and remediation of toxic sediment, nearly 75 percent of the city will be unfit for families with children (Barringer 2005).

Better Safe Than Sorry?

Community participation is critical to develop long-term regional development initiatives that are economically viable and protect public health. This necessitates moving regulation, land use planning, economic development, and environmental policy “upstream” to promote “just sustainability”—that is, an emphasis social justice and economic equity as well as the need to live within ecosystem limits and preserve resources for future generations (Agyeman 2005, 79). One path toward achieving this goal is to

integrate the precautionary principle more systematically into environmental policy making, regulation, and future infrastructure investments in the Gulf region.

The meaning of the precautionary principle has been interpreted broadly by many stakeholders, which has made the framework controversial (Sustein 2003; Dorman 2005). Yet, the essence of the precautionary principle promotes planning, alternatives assessment, and anticipatory action, with the aim of minimizing environmental health and ecological calamities. The precautionary principle also seeks to mobilize environmental and public health policymaking that otherwise can be paralyzed when implementation depends too much on technocratic or scientific certainty.

In the case of environmental health, the principle would require that regulators be more proactive if scientific evidence strongly suggests, but does not yet fully prove, that a facility, chemical exposure, or production process may be jeopardizing public health, particularly among communities already disparately impacted by toxics. It acknowledges that in the never-ending quest for better data and unequivocal proof of cause and effect, environmental regulators can lose sight of a basic public health principle—namely, the importance of exposure reduction and disease prevention (Morello-Frosch, Pastor, and Sadd 2002).

Equally important, the precautionary principle shifts the burden of hazard assessment, monitoring, and data generation activities onto those who propose to undertake potentially harmful activities or chemical production (Kriebel and Tickner 2001; Kriebel et al. 2001). For example, a precautionary approach requires that the health and safety effects of new chemicals be fully examined before they are approved for widespread commercial use and released into the environment. This contrasts with our current model of environmental regulation, which presumes that chemicals and production processes are safe unless definitive data and research prove otherwise. This reactive approach to regulating industrial production inevitably creates economic and social costs (such as decreased property values and increased incidence of environmentally mediated diseases, such as cancer and childhood asthma), and does not avoid the effects of cumulative exposures locally to multiple emissions sources through various exposure pathways.³²

Opponents often argue that the precautionary principle can result in overregulation that decreases

economic efficiency and threatens jobs. Yet the precautionary principle is not really that radical. In the United States, for example, precautionary regulatory approaches are evident in current regulatory practices for marketing new drugs and pharmaceutical products: extensive testing and clinical trials are required to assess the effectiveness and safety of new products before they can be marketed to consumers and health providers. Moreover, the precautionary principle appears in several international environmental accords and treaties and enjoys widespread public support in other economically thriving industrialized countries in Europe, including codification in an innovative regulatory program just passed by the European Union Parliament (Raffensperger and Tickner 1999; Calver 2000; Sustain 2003; Dorman 2005).³³

Several states have taken the lead on both environmental justice and the precautionary principle (SERC 2003). In California, for example, the synthesis between the two is evident in the state's recently adopted environmental justice guidelines (California Environmental Protection Agency 2004). California has already taken major steps toward integrating precaution into its regulatory process by phasing out the use of a category of polybrominated diphenyl ethers, a widely used fire retardant chemical, that has problematic, albeit poorly understood, human health effects, and which has been shown to be accumulating at an rapid rate in the breast milk of San Francisco Bay area women.

States are also developing precautionary strategies to improve disaster planning and to protect vulnerable communities and workers from environmental health calamities. New Jersey recently became the first state to require developing and implementing chemical plant security measures to protect facilities from either a natural disaster or a terrorist attack. Such proactive regulatory strategies could be a model for other states, such as Louisiana, that are vulnerable to regular natural disasters and that have major industrial facilities adjacent to densely populated fenceline communities or in low-lying areas prone to flooding.

Of course, new regulatory regimes and policy initiatives, particularly when they are locally or state-based, can lead to "hazard-shifting" from one group to another. Such risk reallocation, for example, from residential communities to workers occurred in Chicago when the city, due to a moratorium on building new landfills and strict rules on incineration, sought new ways to recycle and dispose of municipal

waste. As a result, the city's corporate contractor, Waste Management Incorporated, was allowed to institute a recycling system that required workers to sort and separate waste, which exponentially increased the workplace hazards and injuries that the predominantly African American workforce in the recycling industry faces (Pellow 2000, 2002).

In the wake of Hurricane Katrina, we are witnessing risk shifting phenomena in the attempt to quickly dispose of hazardous debris from neighborhoods across New Orleans and consequent lax enforcement of safety standards for workers engaged in demolition, hauling, and reopening hazardous landfill sites (Russell 2005). Moreover, EPA has suspended air pollution regulations, ostensibly to ramp up refinery production and address the national shortfall in energy supply due to storm damage of large production facilities in the Gulf region.

The precautionary principle seeks to bridge community health and worker safety concerns to promote opportunities for introducing and promoting less toxic alternatives in production. The hope, after all, is not to simply reallocate environmental hazard burdens from one population to another, but rather to promote an integrated regulatory approach in which industry, government, and society are compelled to adopt viable strategies for pollution prevention and toxics use reduction that benefit everyone.

One highly effective approach involves using information-based (or "right-to-know") strategies at the state and federal levels. For example, the Massachusetts' Toxics Use Reduction Act (TURA) of 1989 requires that firms develop both an inventory of chemicals flowing in and out of each production process at a facility, and a toxics use reduction plan. Although firms are not required to implement these plans, the process itself helps the organizations identify more efficient production methods that prevent pollution and decrease production costs. TURA has resulted in significant toxics use reduction. After adjusting for production increases, 2003 data indicates that reporting firms decreased their toxic chemical use by 40 percent from the 1990 base year and generated 70 percent less waste per unit of product (TURI 2005).

At a national level, the Toxics Release Inventory, which was created by Congress in 1986 in the wake of the Bhopal disaster, requires large firms that emit a threshold volume of chemicals to report annually to EPA their own estimates of pollutant releases into the air, ground, and waterways. Despite some of its

limitations in terms of regulatory oversight and the number of chemicals covered, the TRI is still one of the more successful regulatory tools promulgated by EPA in over a decade. OMB Watch recently reported that since 1988, disposals or releases of the original 299 reportable chemicals have dropped by close to 60 percent (OMB Watch 2005).

Indeed, the database and its accessibility to the public are the keys to its success. With annual reporting, TRI data has been leveraged to educate and mobilize the public about those facilities with persistently high emissions of some of the most toxic pollutants. Industry has used the database to assess and improve its own performance as evidenced by some impressive emissions reductions over the years. The Bush administration has sought to reduce reporting requirements by both lowering the threshold of use that triggers a report and by having the reports required every other year rather than the current annual timetable. The rationale has to do with reducing cost but the proposal also works against the community-level and market-driven empowerment that the administration purports to support.

Social Infrastructure and Community Voice

Community empowerment is central to the precepts of environmental justice, and many EJ advocates have particularly emphasized including the voice of those who may be traditionally shut out of the regulatory and policy-making process due to challenges such as language or citizenship barriers. Although this emphasis is driven by a sense of justice, government also functions most effectively when it works in partnership with community groups that can provide local knowledge, mobilize resources, recruit volunteers, and highlight urgent issues that easily fall below the technocratic and regulatory radar screen.

Agencies charged with overseeing the recovery and rebuilding of New Orleans claim to have developed systems to ensure that decision making includes some form of community participation (such as access to information, public meetings, and hearings). Historically, however, these processes tend to be procedural and do not necessarily ensure equitable outcomes in regulatory, zoning, land use planning, economic development, and facility siting decisions. Moreover, if state and federal agencies are to truly enhance effective public participation in the recovery process, they need to consider basic tenets of EJ organizing.

First, an overemphasis on technocratic and scientific expertise for decision making can lead to a process that inappropriately frames fundamentally political and moral questions (that is, “transscientific” issues) in scientific terms (Weinberg 1972). This ultimately excludes the public from important policy debates and diminishes its capacity to participate in the production of scientific knowledge itself. Second, diverse communities have important insights and localized knowledge about ways in which environmental hazards may be affecting their health and well-being (Morello-Frosch et al. 2006). Third, although economic, technocratic, and scientific analysis will be critical to informed decision making about how, where, and whether to rebuild, this expertise should not be the sole driver of how agencies set priorities, allocate resources, and address community health concerns.

Keeping these precepts in mind is part of systematically ensuring that communities are central to shaping disaster planning, recovery, and rebuilding efforts. After all, the future resilience of New Orleans will depend just as much on repairing social infrastructure as on repairing physical infrastructure. Ensuring effective community participation in post-Katrina decision making will thus necessitate extensive preparatory work, including building capacity, and providing economic and social support. This will enable residents to return, find jobs, restart businesses, and repair the social fabric of their neighborhoods, including schools, places of worship, health care facilities, and other institutions.

In understanding the contours of community participation, history matters. Katrina was evenhanded in its winds but the disparate impact on blacks and the poor has its roots in previous inequities in the infrastructure related to storm protection and the systemic racial segregation of neighborhoods into high ground versus low-lying areas. This form of discrimination, coupled with disparities in public investments in drainage and pumping systems, consistently worked to the advantage of white, wealthier communities (Colten 2005). History both structured the disaster and affects community attitudes and suspicions about the rebuilding process.

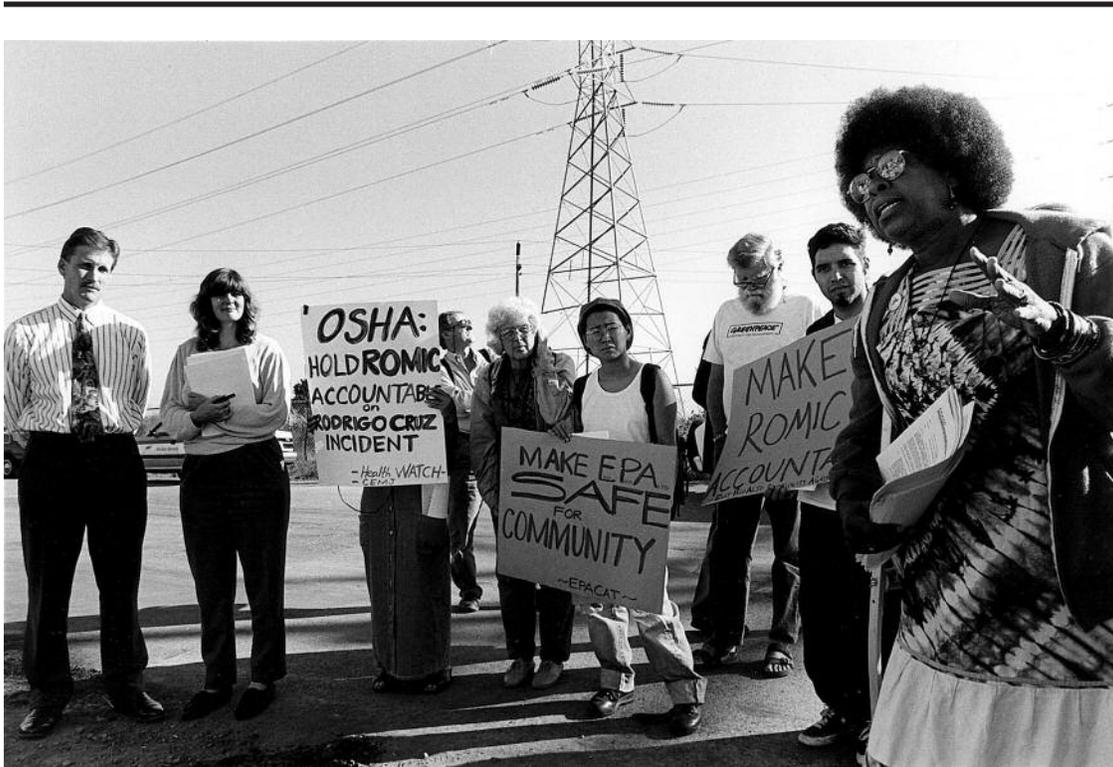
The Bring New Orleans Back Commission, formed by city government, recently released a planning report to address the reconstruction process. One of its most controversial provisions is a proposed four-month moratorium on new building permits in areas heavily flooded by Katrina (2006). The plan and other current discussions suggest that certain com-

munities will never be resettled, and the potential equity implications for future recovery efforts are problematic. A recent analysis, for example, indicates that if the rebuilt New Orleans were limited to the population previously living in zones relatively undamaged by Katrina it would be a city of fewer than 120,000 people—losing about 60 percent of its white but more than 80 percent of its black population (Logan 2006).

Community organizations are concerned. They and the residents they represent should be welcomed as valuable partners and be empowered to play a central role in rebuilding and ensuring the future sustainability of their neighborhoods. Capacity-building is critical and significant independent sup-

port is needed to allow organizations to pursue goals that may run counter to government and business interests. Such support would give communities the assistance and training necessary for them to understand and critique complex environmental impact statements, scientific data, and other technical documents and thus be able to engage effectively in policy advocacy.

Given the wide dispersion of New Orleans residents, civic engagement poses unique and significant challenges. Outreach efforts will require innovative communications and technology infrastructure that in turn provides returning and displaced residents with the means to receive and share information related to community rebuilding, support services,



Source: © David Bacon.

Note: A community protest at Romic Environmental Technologies, a firm that processes toxic waste in California's Silicon Valley. The company's main operation is located in East Palo Alto, a city with an overwhelmingly minority population—59 percent Latino, 23 percent black, and 9 percent Asian Pacific Islander. Residents concerned about company expansion plans joined labor advocates in protest after a Filipino immigrant worker named Rodrigo Cruz was asked to clean a railroad car containing toxic sludge after another worker refused because his breathing equipment indicated dangerous concentrations of carbon monoxide. Cruz complied, but his breathing apparatus had a defective line, and he wound up suffering permanent brain damage.

job opportunities, and housing. Moreover, legislation that ensures a living wage and provides affordable housing, quality schools, and opportunities to recoup economic losses and restart affected small businesses will be central to giving middle- and lower-income residents a real opportunity to return and collectively rebuild their communities in New Orleans.

Rebuilding the Louisiana, Mississippi, and Alabama Gulf Coast region will test the nation's ability and commitment to address lingering social inequality and institutional barriers that created and maintained current racial divides. In the rebuilding process for the Gulf, certain principles are, we think, key for both environmental and economic justice:

- *Enforce existing environmental and health standards.* Cleanup standards should not be weakened or compromised in low-income and minority neighborhoods. Allowing waivers of environmental standards could compound the harms already caused by Katrina and undermine health protection of the most vulnerable members of our society.
- *Ensure equal funding, equal cleanup standards, and equal protection of public health and environmental response in minority and low-income communities.* EPA, FEMA, and the Army Corps of Engineers need to enforce Executive Order 12898 regarding environmental justice in the cleanup and rebuilding in the hurricane-affected Gulf Coast region. They should report to Congress on their compliance with this provision monthly for the next twenty-four months to ensure that minority and low-income communities do not receive disparate treatment.
- *Conduct independent environmental testing and monitoring.* Because of the loss of trust in government, independent testing and monitoring of the water, soil, sediment, and air in the affected areas is needed using the best testing technology and methods available. This testing must provide an assessment of current contamination levels, as well as continuous monitoring.
- *Build healthy, clean, and safe schools for children.* It is imperative that schools and the land on which they sit are safe, clean, and free from health-threatening contamination. Existing schools and school grounds should be tested and remediated to the most protective existing cleanup guidelines set by the EPA. Repairs and rehabilitation of schools should use new green standards for school construction, with an emphasis on healthy indoor air, nontoxic materials for construction, maximum design for energy efficiency, and natural light for improved learning.
- *Update emergency transportation and mass evacuation plans.* Funding for local transportation providers is needed to furnish ongoing emergency transportation preparedness for all public transportation personnel, as well as specific training on public transportation provisions of the Americans with Disabilities Act. An emergency transportation fund is also needed to support hurricane evacuees in their return home and to support transportation needs in cities where evacuees are currently living.
- *Balance green building and social justice.* Rebuilding efforts in the Gulf Coast region should adopt smart growth and green building principles to ensure that past environmental inequities are repaired along with the physical infrastructure. However, greenness and justice need to go together. Green building in New Orleans and the Gulf Coast could involve exorbitant fees for architects, materials, and construction—and greening that fails to address issues of affordability, access, and equity may open the floodgates for permanent displacement of low income and minority home owners and business owners.
- *Recognize the right to self-determination and voice.* Katrina survivors have a right to self-determination, and displaced persons should be allowed to return to their homes and neighborhoods to exercise their democratic rights guaranteed under our constitution. Hurricane evacuees, who are scattered across the United States, should continue to have full voting rights in their home states and be allowed to participate in decision making that affects their lives and their communities. Such a democratic impulse is at the heart of the environmental justice paradigm.
- *Stress equitable development.* In the real world, costs and benefits associated with development are not randomly distributed. Equitable development strategies should be implemented that safeguard the interests of long-term residents in communities undergoing change.³⁴ Given the history of race relations in New Orleans and the Louisiana, Mississippi, and Alabama Gulf Coast region, equitable development models could address many longstanding inequities and actually offer a new start on the region's promise and, perhaps, the promise of America.

Finally, we would suggest that the principles of economic and environmental fairness that drive our rebuilding prescriptions also be incorporated into the funding decisions needed to finance the reconstruction of the Gulf Coast. If this was a national emergency—and the media and public concern signaled that it was—then we need a national response and federal

funding. Such funding should not be generated, as the Bush administration has proposed, by cutting spending on other populations suffering from economic deprivation and environmental duress. At the very least, we should remember the physician's adage: "First, do no harm." Cutting food stamps and health care for one group of poor people to fund relief for another group of poor people does not fit well with that admonition.

Disasters Beyond Katrina

Although Katrina rightly cast attention on the shortfalls in existing environmental and emergency policies, positive policy inroads have been made in recent years. Some disaster agencies, for example, have made a concerted effort to incorporate better policies for a diverse population. First, groups have worked to disseminate information in more languages to better serve non-English-speaking populations. Since the early 1990s, both warnings before and recovery information after disasters have been released in as many languages as practical in most situations in an effort to reach increasingly diverse populations. For example, the Association of Bay Area Governments (ABAG) and the United States Geological Survey (USGS), after a Bay-area earthquake, produced a large newspaper insert about the risk in a dozen languages (Mileti and Darlington 1997). FEMA has also worked to publish material in several languages and has produced materials in Spanish on their website.

Change has often been driven by community pressure and innovation. Richmond, California, for example, is home to a large Laotian community consisting primarily of low income refugees who entered the United States after the 1970s. Richmond has more than 350 petrochemical industrial facilities, including the Chevron-Texaco oil refinery, the largest refinery in the western United States. Regulatory agencies in the county had set up an early warning system to inform community members of toxic emissions from industrial accidents, but this system had a significant shortcoming: Despite the multilingual needs of the Richmond community, the warning system functioned only in English. Organizing by Asian Pacific Environmental Network's Laotian Organizing Project (LOP) led to a multilingual warning system for toxic releases.

In general, the past decade has seen an increased sensitivity by many disaster response agencies. Following criticism in the Loma Prieta earthquake, the

American Red Cross, America's leading nongovernmental disaster relief group, has become more aware of, and committed to, diversity. Still, progress is slow. A recent Red Cross Survey found that only 5 percent of its volunteers are black, 2 percent Latino, and 2 percent Asian—and its board of governors is overwhelmingly white (Muñiz 2006, 10–11). The California Governor's Office of Emergency Services (OES) also attempted to educate, prepare, and assist those in this highly diverse state. The California Department of Social Services also contracted with a consulting firm headed by a former FEMA official to lead workshops for their disaster workers and school administrators on issues of race, ethnicity, religion, culture, and issues around decision making in disasters. One of the focuses of these workshops is to get officials to think issues of language, and to use traditional and nontraditional approaches to communicating disaster risk to diverse populations.

Some institutional innovations have also been noteworthy. After Hurricane Hugo, for example, FEMA hired a civil rights organization to work with affected communities that had low levels of trust in government. Perhaps most remarkable was the successful housing plan that the U.S. Department of Housing and Urban Development (HUD) put together following the 1994 Northridge earthquake. HUD decided to provide special Section 8 housing vouchers to help the poorest victims of the quake find housing anywhere in California and quickly begin their recovery. It sold the plan to Congress and received millions in funds within a few days after the quake, and then got the state, landlords, and the region's leaders to work together to quickly distribute vouchers. This allowed many low-income renters, often forgotten in the rush to redress homeowner needs, to make their own choices about their next home, and expedited the process of getting some stability back in their lives (Katz and Muro 2005). This bold, unprecedented government plan was unfortunately not repeated after Hurricane Katrina in 2005.

Support from the National Science Foundation, which funds many disaster research projects, and from FEMA, which runs its Higher Education Project, to study and teach issues of differential vulnerability has also increased. The National Science Foundation has provided funding for many projects in an effort to understand issues of inequity and reduce vulnerability. In some cases, these efforts are participatory action projects that bring researchers and racial minorities and poor communities together

to work on hazard issues. These are exactly the sort of interactions that we think will move the field.

FEMA's efforts also include a recently developed course on differential vulnerability called "A Social Vulnerability Approach to Disasters," which is posted on its website for teachers to use in their college classrooms. In the course students learn about the feminization of poverty, political marginalization, and how racism results in hazards vulnerability. Because this is a new project, it remains to be seen how widely it will be used and whether the information will reach those who need it—one wishes that FEMA officials themselves had taken the course before Katrina devastated the Gulf Coast.

There is also evidence that local governments and communities can use a disaster situation to improve housing conditions or other aspects of the community. For example, after Hurricane Andrew some local projects were initiated to improve poor neighborhoods, and some replaced or restored public housing units were better than those there before the storm. After the Loma Prieta earthquake, the city of Watsonville established a variety of redevelopment projects and adopted an ordinance requiring that 25 percent of housing built after the disaster be affordable for farm workers and low-income families.

Still, much needs to change in the arena of disaster policy. First, attention should be given to the interactions of relief workers and victims of different classes, races, and ethnicities. There is some indication that emergency personnel who arrive in a disaster setting to offer assistance may be culturally insensitive. Cultural awareness and sensitivity—to religious, linguistic, class, ethnic, and racial differences—are imperative for disaster agencies and relief organizations. National agencies such as FEMA and the Red Cross and other groups that respond to disaster on a large scale need to continue to be educated on the diversity of various communities and plan accordingly.

Housing, as noted earlier, is a significant issue in understanding the vulnerability of the poor and minorities in disasters. Research has shown that older, low-cost housing that is brought up to safety standards often becomes unaffordable, thus creating a situation whereby low-income families cannot find housing that is both safe from natural disasters and affordable. Such circumstances are partly due to the fact that the private housing market hinders the reconstruction of low- and moderate-income rental unit rebuilding—with this in turn due partly to redlining by insurance companies, partly to exclusionary

zoning, and partly to the usual challenges of rising housing prices in an unregulated market. Policies should be initiated that address these issues, including pressure on insurance companies, strategies for inclusionary housing, and flexible rent controls in overheated markets.³⁵

Another policy thrust should encourage community participation in both preparing for and recovering from disasters. Individuals, households, and communities may be vulnerable in many ways to various risks, but also have capacities and strengths. Large-scale organizations and agencies working on disasters need to understand the specific diversity issues of each area, plan for changing demographics of the area, and ensure that members of all communities are involved in the process. These institutions should also continue efforts to disseminate disaster information in the needed languages for communities and move the voices of the most disenfranchised and vulnerable to the forefront by bringing women's, civil rights, interfaith, and environmental justice organizations to the disaster planning table.

Marginalized groups need to be a part of the rebuilding process from the beginning, especially if they have been historically excluded and marginalized in community affairs. Emergency management should identify and locate high-risk sectors on community vulnerability maps, integrate this information into GIS systems, and then involve those community members in planning and response (Morrow 1999). More inclusive participation could also be furthered by recruiting more members of the lower and working classes and minorities for disaster professions and in the research community.

The media also need to coordinate with emergency managers, public officials, and disaster relief workers to better understand disaster events. This coordination will likely lead to more accurate reporting and to inclusion of all affected groups, not just the affluent. Future research on the issues of inequality in disasters should also be developed in conjunction with practitioners working in communities and follow up with practitioners to see how research findings are, or are not, being implemented in the field.

Finally, much discussion after Hurricane Katrina has revolved around what went wrong and who was to blame.³⁶ We and many other Americans are pleased at the recent congressional report in February 2006 that focused on problems in the government's immediate response to the Katrina disaster. This report, however, did not meet the nonpartisan "gold

standard” of the 9/11 Commission—whose recommendations as a result were widely accepted—nor did it make sufficient use of outside researchers on long-term issues of disaster preparedness and recovery.

We advocate an independent, objective, scientific commission to investigate the governmental response to Hurricane Katrina and to recommend future policy and practice. In our view, a commission should include experienced researchers and practitioners who represent a wide range of views and backgrounds, and should have a broad charge. Katrina was a catastrophic event in its own right but it is also an example of the environmental vulnerabilities that affect many communities on an everyday basis. From the brownfields of Detroit to the refineries of Los Angeles, from the nuclear waste dumps on Indian Land to the pesticides threatening the health of Latino farm workers, the country boasts a sad history of inequality in exposures and government indifference. Understanding this broader pattern and suggesting how both ongoing environmental policy and disaster readiness could minimize differential risks would be a major contribution to the public debate.

CONCLUSION: JUSTICE AND THE COMMONS

Certain moments in human history somehow clarify all that has gone wrong and all that needs to change. In Selma, Alabama, in 1965, state and local police attacked civil rights demonstrators with tear gas and clubs, only to fuel a nonviolent resistance that led to the all-important Voting Rights Act. In South Africa in the early 1960s, Nelson Mandela was arrested and jailed, but his solid and dignified resistance from his prison cell helped bring about a dramatic political transition and an end to racial apartheid. In East Germany in the 1980s, activists and common citizens, who felt the sting of restrictions on their travel and other freedoms, demonstrated against a repressive government, toppling both their Communist Party leaders and the Berlin Wall.

Was Katrina such a historical moment? Surely the crisis and its disparities have cast American issues of both poverty and inequality in stark colors. Although some conservative critics have sought to dispel any “lessons from Katrina,” the sort of environmental disparities brought to light by the storm defy an American value system that insists that everyone has the right to a decent environment. The differential

effects of Katrina were neither natural nor accidental. In the Gulf Coast, the crisis built on an existing pattern wherein minorities and the poor lived in more precarious low lands and the ongoing risk from the infamous Cancer Alley was already distributed in ways symptomatic of environmental injustice. The problem is not limited to the South and its legacy of Jim Crow. Research suggests that environmental disparities by race are rampant in much of the United States, that rational land use choices and market mechanisms do not explain the pattern of difference, and that there are often important consequences for the health of diverse communities.

Research and experience also suggest that there are important racial and class differences in the experience before, during, and after many cataclysmic events. These disparities include differential readiness, gaps in the attention of relief and emergency agencies, and sharp inequalities in the process of rebuilding and reconstruction. In a sense, this is no surprise—the existing distribution of chronic risk sets the parameters for disaster and recovery—but it is disturbing nonetheless for a society that generally believes that both disaster and relief should be equal opportunity affairs.

Worries about the inequality of power, wealth, and environmental risk may seem the province of justice, but evidence is growing that the distribution of environmental health and safety can affect the level of environmental quality for society as a whole. When inequalities of wealth and power are great, after all, those at the top of the scale have (or think they have) greater opportunities to avoid reliance on public goods. Why worry about toxic pollution if you can live far from the scene of the crime? Why worry about public transportation if you have your own car? Why worry about disaster vulnerability if you can count on generous subsidies from the government to recoup your losses?

Yet emerging statistical evidence now suggests that wide disparities in environmental conditions may jeopardize overall environmental quality. In a cross-sectional analysis of the fifty U.S. states, James Boyce et al. (1999) find that those with a more unequal distribution of power—as measured by data on voter participation, educational attainment, Medicaid access, and tax fairness—tend to have weaker environmental policies, greater environmental stress, and worse public health outcomes. A recent Morello-Frosch and Jesdale analysis (2006) indicates a persistent relationship between increasing levels of racial-

ethnic segregation and increased overall magnitude of environmental degradation, such as air pollution, and health risks, such as individual estimated lifetime cancer risk (see also Lopez 2002).

Parallels may exist in the acute moments of disaster. When acute events are more likely to affect the least powerful, it is possible that the social guards will be let down. One wonders how well the levees would have been maintained had it been thought that whiter and wealthier neighborhoods would have suffered as much as they eventually did. One is curious whether chemical plant security would be an even higher priority were the distribution of the fenceline population not so predominantly minority and poor.

Yet by allowing the weak link in the social chain—the poorest communities in the low-lying areas of the city—to be exposed, all of New Orleans was put at risk. By failing to value fenceline lives and communities, the risks rise for neighborhoods far from the first releases from a chemical incident. When the political economy of environmental protection allows hazards to be placed in someone else's backyard, they often will, and there may well be more of them.

Establishing environmental justice as a serious policy concern is therefore not simply the right thing to do—it may be the best thing for protecting the “commons.” We mean this in more ways than simple disaster prevention or hazard mitigation. The environmental justice framework elevates important concerns about fairness and voice in the decision-making process. It suggests that everyone has the right to a decent environment and that such a basic human right should not simply be usurped by the vagaries of the market or the privileges of power. It returns us, in short, to basic American values of equity, democracy, and opportunity.

Will we learn from Hurricane Katrina? To do so, we need to remember the shock and concern so many felt in the days of the emergency and apply this to both new preparations for disaster and new strategies for environmental protection. More research is needed but so is political and civic leadership. Katrina has opened a window on a dark side of America—the economic and environmental vulnerability of poor and minority communities. We can close that window or we can use the new view to chart a better, healthier, and more equitable future for all Americans.

NOTES

1. A Knight-Ridder analysis focusing on deaths from Katrina suggested that there were very few differences by

- race or income (see Simerman et al. 2005). However, a reanalysis of the data shows that such a simple comparison was misleading. The most likely to die were the elderly who were often stranded in nursing homes and hospitals. But whites were much more likely to be among the old—the median age for whites in New Orleans in 2000 was 41.6 years while it was 29.4 for blacks. Once one accounts for the age distribution of whites and blacks in the affected areas, there was disparity by race for both those younger and older than 65 (Sharkey 2006). Moreover, death is only one, albeit the most extreme, form of victimhood: loss of property and community, and the suffering and grief that came with being stranded in the city, seems to have distributed quite unequally by race and income (see Logan 2006).
2. Economists have long known how to incorporate such distributional weights into cost-benefit analysis (see, for example, Little and Mirrlees 1974, 234–42; Ray 1984, 22–31; for further discussion, Boyce 2000).
 3. Extending this approach to intergenerational allocation implies that future lives and health should not be heavily discounted (as is done when a discount rate is used in conventional cost-benefit analysis), but rather valued on a par with present lives and health.
 4. The purchasing-power advantages of high-wealth individuals and communities are compounded when they wield disproportionate political power; conversely, the disadvantages of low-wealth people are compounded when they belong to politically disenfranchised racial and ethnic groups (Boyce 1994).
 5. Taken from the executive summary, <http://www.epa.gov/history/topics/justice/01.htm>.
 6. Some environmental justice activists argued that the Anderton et al. studies were biased, at least in their presentation of the results, because they were funded by a grant from the largest waste management firm in the United States. However, the techniques Anderton and his colleagues used did represent methodological advances at the time, though there have since been methodological criticisms, discussed later.
 7. For discussion, see Anderton, Anderson, Rossi et al. 1994; Been 1993, 1995.
 8. Other power-related variables have been explored in the literature, including home ownership (which is also an indicator of wealth but also highly associated with community engagement and political influence), voting turnout, and recency of immigration.
 9. Note, however, that the move-in explanation is essentially based on income, not race. Although little explored in the literature, a racial move-in pattern could be the result of housing discrimination, an explanation that would shift the locus of attention to that arena but would not obviate either the role of power or the legacy of racism.
 10. See Noriko Ishiyama (2003) for a discussion of the role of tribal sovereignty, particularly the right of a tribe to choose to host facilities that might be unwelcomed elsewhere in exchange for payment.
 11. There was also a subsequent argument that the significance of previous multivariate results may have been overstated because of inappropriate controls for spatial relationships (see Bowen et al. 1995; Bowen 2001).

12. John Oakes (1997) specifically shows charts in which percent minority and various income variables rise sharply as tracts within one mile of a TSDF tract are considered. In a polytomous logistic regression, he uses a two mile standard and finds that all the socioeconomic variables indicate disparity and are significant at the .01 level. These findings are also subtly suggested by the tests for area aggregation using a 2.5 mile buffer in Anderton, Anderson, Rossi, et al. (1994, 238–39) but are used only to dismiss previous zip code analyses.
13. Another issue is the challenge of correctly locating hazardous sites that are incorrectly listed. For efforts to correct location information, see Vicki Been (1995) and Boer et al. (1997); Sadd et al. (1999) discuss GIS techniques to improve reliability in existing large databases.
14. Earlier reviews of the literature include Paul Mohai and Bunyan Bryant (1992), Andrew Szasz and Michael Meuser (1997), and William Bowen (2001).
15. The challenges are several. First, because census tracts change shape over time, demographic information of previous years should be “reshaped” to fit new tract polygons. Second, information on facilities is sometimes incomplete for decades prior to the emergence of strict environmental standards. Third, because siting and move-in can occur simultaneously, sophisticated statistical techniques are required.
16. A longitudinal study by Yandle and Burton (1996) claimed to find no evidence of disproportionate siting, but methodological critiques of this work were quite sharp by authors associated with both sides of the environmental justice debate (Anderton 1996; Mohai 1996).
17. As indicated in an earlier note, another methodological issue involves spatial autocorrelation (Bowen 2001). This refers to the tendency of variables to be influenced by their neighbors—or in common parlance, the tendency of land uses, ethnic groups, and income classes to cluster together such that, for example, a neighborhood’s income level is influenced by its proximity to similar neighborhoods. Such clustering is likely in the spatial data typical of environmental justice studies, and it means that the error terms in statistical analyses do not satisfy the independence conditions—and thus significance levels can be overstated. This is a thorny issue, but a few recent studies have suggested that though this problem may be important in theory, its impacts on significance levels, particularly for race, are relatively slight (Pastor et al. 2004, 2005a).
18. Studies have linked air pollution exposures to preterm birth, low birth weight, and birth defects (Bobak 2000, Ritz et al. 2002, Ritz et al. 2000, Ritz and Fei 1999), and a recent study by Kenneth Chay and Michael Greenstone (2003) finds that air pollution has a significant impact on infant mortality. Pastor, Sadd, and Morello-Frosch (2005b) have suggested that differential levels of hazardous air pollutants may also impact asthma rates and the academic performance of young schoolchildren.
19. Although the clinical significance of these differences are not known, these results do have public health significance, especially given that these air toxics exposures are fairly ubiquitous and affect a significantly large number of people (Morello-Frosch, Pastor, and Sadd 2001).
20. For example, whereas the 2000 census reported that only 2.9 percent of non-Latino whites in the United States took public transit to work, the comparable figures for Latinos and blacks were 8.9 and 12.2 percent respectively. Data here and for the figures for New Orleans are taken from tables PCT65B and PCT65I of Summary File 3, U.S. Census, 2000, through runs using American FactFinder (<http://factfinder.census.gov>).
21. Amnesty International (2004) reports that in addition to those who died in the immediate aftermath of the Bhopal disaster, at least 15,000 more people died subsequently, and roughly 100,000 people suffer from chronic and debilitating illnesses as a result of the accident.
22. Death compensation from Desai (1997), who also reports that large numbers of false claims were filed; injury compensation from Amnesty International (2004, 63).
23. Data on the city and metro area percent African American taken from table P8 of the U.S. Bureau of the Census Summary File 1, 2000, and includes only non-Hispanic blacks; the numbers are virtually identical for all black residents.
24. Platt reports that 40 percent of all payouts from the government’s National Flood Insurance Program have been for “200,000 structures that have experienced repetitive losses: two or more claims while insured” (1999, 280).
25. Using a more recent database and slightly different methods and samples than Melvin Oliver and Thomas Shapiro (1995), Maury Gittleman and Edward Wolff (2000) suggest that 50 percent of black wealth and 30 percent of white wealth is due to one’s primary home.
26. The pattern is not limited by race. In a study of the 1997 Red River Valley Flood in largely white area of North Dakota, homeless, unemployed, and low-income women were less able than more affluent women to evacuate to alternative shelters (Morrow and Enarson 1999).
27. In the Coalinga, California, 1983 earthquake, whites faced more damage to their workplaces than Latinos because whites worked downtown and Latinos in agriculture (Bolin and Bolton 1986). Hispanics, however, were unlikely to have household insurance, and they were more likely to have moved more frequently after the disaster than whites. After the Northridge earthquake, many Latinos faced political and cultural marginalization, and limited housing and employment opportunities, which impacted their ability to successfully recover in the long term (Bolin and Stanford 1998).
28. Muñiz also suggests that FEMA should be more forthcoming in educating immigrants that households may be eligible for assistance even if some members are undocumented as long as there are eligible family members, including U.S. citizen children (2006, 4).
29. See http://news.minnesota.publicradio.org/features/2005/09/06_ap_katrina/.
30. FEMA’s temporary housing assistance program is designed for those who had stable housing before the disaster, and therefore SRO residents, who do not live continuously in their rooms, do not qualify.
31. See also the 2005 RAND analysis of racial differences in the perceptions of postal workers and U.S. Senate staffers in Washington after they were exposed to a letter contaminated with anthrax in 2001 (Blanchard et al. 2005; see also Hughes 2002).

32. A precautionary regulatory strategy would also address the significant problem of “toxic ignorance” that currently plagues our environmental regulation system. There are more than 80,000 chemicals currently registered for commercial use in the United States, and about 3,000 of these are high production volume chemicals. For more than 80 percent, we lack adequate toxicological data needed to assess their potentially adverse human health effects (Thorton 2000).
33. The EU’s REACH (registration, evaluation, and authorization of chemicals) program would require commercial firms to register chemicals currently produced or imported in large quantities with a central EU database. A designated EU agency would be responsible for assessing this information on a case-by-case basis and use of chemicals that exhibit certain hazardous characteristics (such as persistent bio-accumulative toxins [PBTs] and endocrine disrupting chemicals) would be banned unless specifically authorized by regulatory agencies.
34. For one set of widely endorsed principles for equitable development in the rebuilding process for the Gulf Coast drafted by PolicyLink, a national intermediary that works in low-income and minority communities, see <http://www.policylink.org/EquitableRenewal.html>.
35. As the gap between the wealthy and the poor increases in the United States, there will be more low-income residents in risky housing situations, particularly mobile homes. This situation could be remedied by enforcing and subsidizing programs to improve the strength of mobile homes in high winds, and by requiring mobile home park owners to provide tornado shelters in areas where this is an issue.
36. One criticism focused on President Bush’s decision to place FEMA within the Department of Homeland Security. It may make sense to separate the agencies, restore funding and power back to FEMA, and once again support the FEMA Mitigation Directorate. This could be accompanied by an attempt to encourage the disaster professionals who have left FEMA in the last few years, partly because of frustrations with the diversion of resources, to return and help the agency become more effective in carrying out its mission. We would leave such specifics, however, to the sort of investigation and recommendation committee we suggest.

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About the Authors

MANUEL PASTOR is professor of Latin American and Latino Studies and codirector of the Center for Justice, Tolerance, and Community at the University of California, Santa Cruz.

ROBERT D. BULLARD is Ware Professor of Sociology and director of the Environmental Justice Resource Center at Clark Atlanta University.

JAMES K. BOYCE is professor of economics and director of the Program on Development, Peacebuilding, and the Environment at the Political Economy Research Institute of the University of Massachusetts, Amherst.

ALICE FOTHERGILL is assistant professor of sociology at the University of Vermont.

RACHEL MORELLO-FROSCH is Carney Assistant Professor at the Center for Environmental Studies and Department of Community Health in the School of Medicine at Brown University.

BEVERLY WRIGHT is professor of sociology and director of the Deep South Center for Environmental Justice at Dillard University.

