

## And Justice for All

Justice is a universal human value. It is a concept that is built into every code of practice and behavior, including the codes of ethics of all engineering and other professional disciplines—and it is at the heart of environmental protection. It is the linchpin of social responsibility. An interesting aspect of justice in a society is that it is found in different venues and stated in many ways. Much understanding of justice is passed from one generation to the next. Although history has shown that human beings can be highly moral agents, it has also shown that we can be very unfair. As theologian Reinhold Niebuhr<sup>1</sup> puts it:

Man's capacity for justice makes democracy possible, but man's inclination to injustice makes democracy necessary.

Thus, society must not only have norms, it must enforce such norms. In the United States, normative justice is articulated by the U.S. Constitution and encapsulated in the “equal protection” clause of the fourteenth amendment:

All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the state wherein they reside. No state shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any state deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.

The recently contested *Pledge of Allegiance* pairs the cherished value of freedom with the principle of fairness articulated throughout the Constitution when its ending affirms that the flag represents “. . . liberty and justice for all.” Whereas the phrase “under God” has received much scrutiny of late, the concept of fairness has not.

Justice is also a key fixture of the U.S. Declaration of Independence. The Declaration's second paragraph states:

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. . . . That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness.

These unalienable rights of life, liberty, and the pursuit of happiness depend upon a livable environment. The Declaration warns against a destructive government. Arguably, the government holds a central role in overcoming the forces that will militate against equity in environmental protection. Democracy and freedom are at the core of achieving fairness, and Americans rightfully take great pride in these foundations of our Republic. The framers of our Constitution wanted to make sure that life, liberty, and the pursuit of happiness were available to all: first with the protection of property rights and later, with the Bill of Rights, by granting human and civil rights to all the people.

Engineers may be surprised to know it, but we are agents of justice. As a profession, we have arguably done more than any other in the past century to improve the quality and length of life in developed nations and are making similar strides in developing countries. The treatment of wastes, provision of potable water, controlling air pollution, handling of solid and hazardous wastes, safer modes of transportation, reliable energy sources, improved communication networks, safer buildings, and improved disaster response are examples of how engineers have enhanced people's pursuit of happiness.

Certainly, a modern connotation of "safety and happiness" is that of risk reduction. As our codes of ethics mandate, the socially responsible engineer and design practitioner must be "faithful agents." But faithful to whom? What has become evident only in the past few decades is that without a clean environment, life is threatened by toxic substances, liberty is threatened by the loss of resources, and happiness is less likely in an unhealthful and unappealing place to live.

Justice must be universalized and applied to everyone. This may seem obvious, but so few things are distributed evenly, we may be tempted to assume that systems are fair simply because "most" are satisfied with the current situation. However, the only way to preserve public health and to protect the environment is to ensure that *all* persons are adequately protected. In the words of Reverend Martin Luther King, "Injustice anywhere is a threat to justice everywhere."<sup>2</sup> Extending this logic means that if any group is disparately exposed to an unhealthy environment, the entire nation is subjected to inequity and injustice; we are all "at risk." An optimistic view (and most engineers are by nature optimistic) is that our projects and products can advance the opportunities for a safe and livable environment by including everyone, leaving no one behind. This mandate has a name, *environmental justice*, and in this book we argue that equal protection can be extended intellectually (if not legally) to matters of public health and environmental quality.

## ENVIRONMENTAL JUSTICE

The concept of environmental justice has evolved over time. In the early 1980s, the first name for the movement was *environmental racism*, followed by *environmental equity*. These transitional definitions reflect more than changes in jargon. When attention began to be paid to the particular incidents of racism, the focus was logically placed on eradicating the menace at hand (i.e., blatant acts of willful racism). This was a necessary but not completely sufficient component in addressing the environmental problems of minority communities and economically disadvantaged neighborhoods, so the concept of equity was employed more assertively. *Equity* implies the need not only to eliminate the

overt problems associated with racism, but to initiate positive change to achieve more evenly distributed environmental protection.

We now use the term *environmental justice*, which is usually applied to social issues, especially as they relate to neighborhoods and communities. *Environmental justice* (EJ) *communities* possess two basic characteristics:

- Environmental justice communities have suffered historical exposures to disproportionately high doses of potentially harmful substances<sup>3</sup> (the *environmental* part of the definition). Such exposures have often occurred for several decades. These communities are home to numerous pollution sources, including heavy industry and pollution control facilities, which may be obvious by their stacks and outfall structures, or which may be more subtle, such as long-buried wastes with little evidence on the surface of their existence. These sites increase the likelihood of exposure to dangerous substances. Exposure is preferred to *risk*, since risk is a function of the hazard and the exposure to that hazard. Even a substance with a very high toxicity (one type of hazard) that is confined to a laboratory of a manufacturing operation may not pose much of a risk, due to the potentially low levels of exposure.
- Environmental justice communities have certain, specified socioeconomic and demographic characteristics. EJ communities must have a majority representation of low socioeconomic status (SES), racial, ethnic, and historically disadvantaged people (the *justice* part of the definition).

These definitions point to the importance of an integrated response to ensure justice. The first component of this response is a sound scientific and engineering underpinning to decisions. The technical quality of designs and operations is vital to addressing the needs of any group. However, the engineering codes' call that we be faithful agents lends an added element of social responsibility to environmental practitioners.<sup>4</sup> For example, we cannot assume a "blank slate" for any design. Historic disenfranchisement and even outright bias may well have put certain neighborhoods at a disadvantage.

Thus, the responsibility of professionals cannot stop at sound science but should consider the social milieu, especially possible disproportionate impacts. The determination of disproportionate impacts, especially pollution-related diseases and other health endpoints, is a fundamental step in ensuring environmental justice. But even this step relies on the application of sound physical science. Like everything else that technical professionals do, we must first assess the situation to determine what needs to be done to improve it. At a first step in assessing environmental insult, epidemiologists look at clusters and other indications of elevated exposures and effects in populations. For example, certain cancers, as well as neurological, hormonal, and other chronic diseases have been found to be significantly higher in minority communities and in socioeconomically depressed areas. Acute diseases, as indicated by hospital admissions, may also be higher in certain segments of society, such as pesticide poisoning in migrant workers.<sup>5</sup> These are examples of *disparate effects*. In addition, each person responds to an environmental insult uniquely, and that person is affected differently at various life stages. For example, young children are at higher risk to neurotoxins. This is an example of *disparate susceptibility*. However, subpopulations also can respond differently than the

entire population, meaning that developmental and genetic differences seem to affect people's susceptibility to contaminant exposure. Scientists are very interested in genetic variation, so that genomic techniques<sup>6</sup> (e.g., identifying certain polymorphisms associated with disease susceptibility) are a growing area of inquiry.

In a sense, historical characteristics constitute the "environmental" aspects of EJ communities, and socioeconomic characteristics entail the "justice" considerations. The two sets of criteria are mutually inclusive, so for a community to be defined as an EJ community, both of these sets of criteria must be present.

One of the National Academies, the Institute of Medicine,<sup>7</sup> has found that numerous EJ communities experience a "certain type of double jeopardy." Not only must these communities tolerate elevated levels of exposure to contaminants, but they are usually ill equipped to deal with these exposures because so little is known about the exposure scenarios in EJ communities. The first problem (i.e., higher concentrations of contaminants) is an example of *disparate exposure*. The latter problem is exacerbated by the disenfranchisement from the political process that is endemic to EJ community members. This is a problem of *disparate opportunity* or even *disparate protection*. (This harkens back to the Constitution's requirement of equal protection.) The report also found large variability among communities as to the type and amount of exposure to toxic substances. Each contaminant has its own type of toxicity. For example, one of the most common exposures in EJ communities is to the metal lead (Pb) and its compounds. The major health problem associated with Pb is diseases of the brain as well as central and peripheral nervous system harm, including learning and behavioral problems. Another common contaminant in EJ communities is benzene, as well as other organic solvents. These contaminants can also be neurotoxic, but also have very different toxicity profiles from neurotoxic metals such as Pb. For example, benzene is a potent carcinogen, having been linked to leukemia and lymphatic tumors as well as to severe types of anemia. The two contaminants also have very different exposure profiles. For example, Pb exposure is often in the home and yard, whereas benzene exposures often result from breathing air near a source (e.g., at work or near an industry, such as an oil refinery or pesticide manufacturer). The Institute of Medicine's findings point to the need for improved approaches for characterizing human exposures to toxicants in EJ communities.

One of the first places to recognize the disparate exposures was in Warren County, North Carolina, but numerous other communities have experienced uneven, and arguably unjust, disparities in environmental protection. However, there is little consensus as to what defines an environmental injustice and whether, in fact, an injustice has occurred in many of these communities.

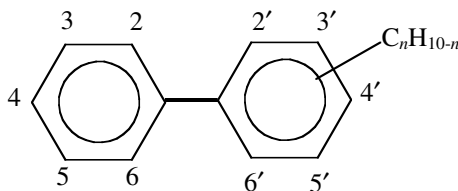
#### **CASE STUDY: THE WARREN COUNTY, NORTH CAROLINA, PCB LANDFILL<sup>8</sup>**

A rural county in North Carolina is recognized as the birthplace of the environmental justice movement. The story began in the late 1970s when the Raleigh-based Ward Transfer Company needed to get rid of more than 30,000 gallons of oil contaminated with polychlorinated biphenyls (PCBs). PCBs were first marketed in 1929 and were manufactured in various countries and with different trade names (e.g., Aroclor, Phenoclor). They were used as a heat transfer fluid in electrical transformers and, as such, were the "perfect" solution to the generation of heat during electricity transmission.

PCBs were nonreactive, did not biodegrade, were easy to use, and most important, were cheap. Millions of gallons of PCBs were used in electrical transformers all over the world.

Concern over the toxicity and persistence in the environment of PCBs caused the U.S. Congress in 1976 to enact a specific section, 6(e), of the Toxic Substances Control Act (TSCA) to address PCB contamination. This included prohibitions on the manufacture, processing, and distribution in commerce of PCBs. This is the “cradle to grave” (i.e., from manufacture to disposal) management of PCBs in the United States. Similar prohibitions and management measures were adopted worldwide.

Like all environmental problems, or any engineering problem for that matter, the first step is to understand the scientific facts of the case. To begin, what are PCBs, and why do they elicit such concern? PCBs all have the structure of  $C_{12}H_{10-n}Cl_n$ , where  $n$  is within the range 1 to 10:



polychlorinated biphenyl structure

Although all PCBs have this arrangement, they differ from each other by the number and location of chlorine atoms at each of the numbered positions. These different arrangements are known as *congeners* (i.e., a single, unique, well-defined chemical compound in the PCB category). The name of a congener specifies the total number of chlorine substituents<sup>9</sup> and the position of each chlorine. For example: 4,4'-dichlorobiphenyl is a congener comprising the biphenyl structure with two chlorine substituents, one on each of the two carbons at the 4 (also known as *para*) positions of the two rings. PCBs can exist as 209 possible chlorinated biphenyl congeners, although only about 130 of these are generally found commercially.

The U.S. Environmental Protection Agency (EPA) decided to control the manufacture, transportation, and use of PCBs, and included in this control was making the resale of PCB-contaminated transformer oil illegal. The Ward Transfer Company's problem was a foreshadowing of what companies handling PCBs would face in the coming decades. They had an enormous amount of PCB-contaminated oil to dispose of, so they asked another company, owned by Robert J. Burns, to remove the soil. According to Robert D. Bullard (see his biographical sketch), this latter company “chose the cheap way out,” and Burns's trucks ended up getting rid of the contaminated oil by spraying it along North Carolina roadsides. By the time this crime was discovered, 200 miles of highways had been contaminated, and the soil alongside the highways became hazardous.<sup>10</sup> PCBs adhere tightly to soil particles, so there was little danger of the chemical leaching into water, but it could not be just left there either, so the decision was made to dig up the



**Figure 1.1** The confluence of two social upheavals, the civil rights movement and environmental protection, was apparent in the demonstrations in Warren County, North Carolina. Waste transport was interrupted as one of the protests against the proposed siting of a PCB landfill in the county. (Photo credit: Jenny Labalme, used with permission.)

soil along the highways and take it to a controlled landfill facility where it could be properly managed.

After an extensive search, a site in Warren County was chosen for the PCB landfill. This did not sit well with the predominantly African American residents of the county, and the spontaneous and large demonstration (see Figure 1.1) opposing the siting of a landfill made international news.

The site is located in Shocco Township, which has a population of approximately 1300. Sixty-nine percent of the township residents are nonwhite, and 20% of the residents have incomes below the federal poverty level. Residents of Warren County and civil rights leaders passionately protested the location of the landfill in Warren County. These protests are considered the watershed event that brought environmental justice to the national level. In 1982, during construction of the landfill, then-Governor Jim Hunt made a commitment to the people of Warren County. He stated that if appropriate and feasible technology became available, the state would explore detoxification of the landfill.

An environmental response is often precipitated first by a complaint. But to complain, one must have a “voice.” If a certain group of people has had little or no voice in the past, they are likely to feel and be disenfranchised. Although there have been recent examples to the contrary, African American communities have had little success in voicing concerns about environmentally unacceptable conditions in their neighborhoods. Hispanic Americans may have even less voice in environmental matters since their perception of government, the final arbiter in many environmental disagreements, is one of skepticism and outright fear of reprisal in the form of being deported or being “profiled.” Many of the most adversely affected communities are not likely to complain.

### Biographical Sketch: Robert D. Bullard



Robert D. Bullard is Ware Professor of Sociology and Director of the Environmental Justice Resource Center at Clark Atlanta University (CAU). Prior to joining the faculty at CAU in 1994, he served as a professor of sociology at the University of California–Riverside and visiting professor in the Center for African American Studies at UCLA.

Bullard served on President Clinton's Transition Team in the Natural Resources and Environment Cluster (i.e., Departments of Energy, Interior, and Agriculture, and the Environmental Protection Agency) and on the U.S. EPA National Environmental Justice Advisory Council (NEJAC), where he chaired the Health and Research Subcommittee. He is a widely published and read author, with one of his latest books, *Dumping on Dixie: Class and Environmental Quality* (Westview Press, Boulder, CO, 2000), becoming a standard text in the environmental justice field.

Bullard's most lasting contribution was the 1983 report on the siting of Houston's municipal disposal sites. He found that six of the eight incinerators, all six of the city landfills, and three or four of the privately owned landfills were located in African American neighborhoods. His findings were used in a class action suit to block the construction of yet another landfill in an African American neighborhood. Although they lost the suit, the action was the first case that used civil rights law to challenge the siting of a waste facility.

Land use is always a part of an environmental assessment. However, justice issues are not necessarily part of these assessments. Most environmental impact assessment handbooks prior to the late 1990s contained little information and few guidelines related to fairness issues in terms of housing and development. They were usually concerned about open space, wetland and farmland preservation, housing density, ratios of single-*versus* multiple-family residences, owner-occupied housing *versus* rental housing, building height, signage and other restrictions, designated land for public facilities like landfills and treatment works, and institutional land uses for religious, health care, police, and fire protection.

When land uses change (usually to become more urbanized), the environmental impacts may be direct or indirect. Examples of direct land-use effects include *eminent domain*, which allows land to be taken with just compensation for the public good. Easements are another direct form of land-use impacts, such as a 100-meter right-of-way for a highway project that converts any existing land use (e.g., farming, housing, or commercial enterprises) to a transportation use. Land-use change may also come about indirectly, such as secondary effects of a project that extend, in time and space, the influence of a project. For example, a wastewater treatment plant and its connected sewer lines will create accessibility that spawns suburban growth.<sup>11</sup> People living in very expensive homes may not even realize that their building lots were once farmland or open space and that had it not been for some expenditure of public funds and the use of public powers such as eminent domain, there would be no subdivision.

Environmentalists are generally concerned about increased population densities, but housing advocates may be concerned that once the land use has been changed, environmental and zoning regulations may work against affordable housing. Even worse, environmental protection can be used as an excuse for some elitist and exclusionary decisions. In the name of environmental protection, certain classes of people are economically restricted from living in certain areas. This problem first appeared in the United States in the 1960s and 1970s in a search for ways to preserve open spaces and green areas. One measure was the minimum lot size. The idea was that rather than having the public sector securing land through easements or outright purchases (i.e., *fee simple*) to preserve open spaces, developers could either set aside open areas or require large lots in order to have their subdivisions approved. Thus, green areas would exist without the requisite costs and operation and maintenance funds entailed by public parks and recreational areas. Such areas have numerous environmental benefits, such as wetland protection, flood management, and aesthetic appeal. However, minimum lot size translates into higher costs for residences. The local rules for large lots that result in less affordable housing is called *exclusionary zoning*. One value (open space and green areas) is pitted against another (affordable housing). In some cases it could be argued that preserving open spaces is simply a tool for excluding people of lesser means or even people of minority races.<sup>12</sup>

#### **CASE STUDY: HABITAT FOR HUMANITY**

A recent case reflects the common problem of competing values in land use. The housing advocacy group Habitat for Humanity proposed a development of affordable houses in Chapel Hill, North Carolina, which has one of the most expensive real estate markets in the southeastern United States. Being a college town (home to the University of North Carolina), numerous groups, including churches and student coalitions, are calling for “livable housing.”

The cost of housing in this town is well above the state average, so a number of advocates have supported the Habitat model, where potential homeowners invest in their own homes through “sweat equity” and receive voluntary support. But some groups formed in opposition to the plan. In an early meeting, one neighbor stated a desire that the homes be like those in a nearby high-cost subdivision (houses costing much more than even the already expensive town average). She recommended that they be “single-family homes with a nice, friendly, college town look and feel.” (The quotes have been changed to protect anonymity, but the meanings are maintained.) Another later said that “From day 1, we have said that that parcel is not suited for a high-density project.” That may be the case, but the result of such thinking is, in the end, exclusionary. People are very passionate and protective about their neighborhoods, well beyond concern about property values. This is a form of NIMBY (“not in my backyard”), so common to the environmental engineer, who must balance science and social needs to site unpopular facilities such as landfills and treatment plants.

To serve their clients effectively, engineers must be sensitive to the fact that most of us want to protect the quality of our neighborhoods, but at the same time, engineers and



land-use planners must take great care that their ends (environmental protection) are not used as a rationale for unjust means (unfair development practices). Like zoning ordinances and subdivision regulations, environmental laws and policies should not be used as a means to keep lower-socioeconomic groups out of privileged neighborhoods.

How can the engineering profession help people who have historically had no voice or have not been taught how to make it heard? For environmental fairness, everyone potentially being affected needs a voice and a place at the table from the earliest planning stages of a project. The default seems to be changing, but some argue that environmental quality is still being used, knowingly or innocently, to work against fairness. And people who are likely to be exposed to the hazards brought about by land-use decisions need to be aware as options are considered, and well before decisions are made. This principle should be applied not only to land development and civic decisions but to everything engineers do that may have an impact on health, safety, and welfare of the public.

Sometimes we need to remind ourselves of just how far we have come in the past 50 years in battling pollution. We also need to realize that the general perception of environmental quality and the public's expectations have grown substantially in a relatively short time. The revolution in thinking and the public acceptance of strong measures to regulate the actions of private industry has been phenomenal. So what may previously have been considered to be simply the "cost of doing business" (brown haze, smelly urban areas, obviously polluted water, and disposal of pollutants in pits, ponds, lagoons, and by land burial) is now considered to constitute inappropriate and even immoral activities. However, it is not automatic that all private and public entities have gotten that message. Engineers can help continue to raise their client's appreciation of fairness and justice as well as the improvement to the "bottom line" that can result from strong environmental programs.

### **CASE STUDY: CARVER TERRACE<sup>13</sup>**

One of the key characteristics of EJ advocates has been their patience. Another is persistence. In the 1970s the citizens of Carver Terrace, in Texacana, Texas, a predominantly African American community, began to see dark, vile-smelling "gunk" oozing out of their lawns. They could not interest the local authorities in the problem, even when they started to believe that their community was experiencing a higher than usual number of medical problems.

In 1978 the problems at Love Canal made hazardous waste a national issue and problem. A year later, after Congress ordered large chemical companies to identify what chemicals they had disposed of and at what locations, the discovery was made that Koppers Company of Pittsburgh had operated a creosote plant in the area now known as Carver Terrace, and when Koppers closed the plant they bulldozed everything into the ground, including the vats and the pond holding creosote, a known human carcinogen. Because the land was inexpensive, poorer families eagerly bought lots and built homes. About 25,000 people, 85% consisting of racial minorities, lived within four miles of the former creosote plant.

When it became known that the ground contained large quantities of creosote, the U.S. EPA sent a team of hazardous waste experts who nosed around in their “moon suits” and that particular study concluded that there was no problem. The citizens knew better, and soon found out that the EPA had conducted other studies and reports that clearly showed this area to be a candidate for Superfund cleanup, but that these studies were not made available to the citizens of Carver Terrace.

In retrospect, the extent of pollution was large; 45 million gallons of shallow groundwater, along with 2150 cubic yards of soil, was contaminated to a depth of 1 foot. The situation was so bad that the citizens group urged the government to “buy out” the residents of Carver Terrace just as they were now buying out people who lived around Love Canal. They could not see why they were being treated differently from those at Love Canal. The residents pointed out that the only obvious difference between the Love Canal residents and the Carver Terrace people was that the former were mostly European American, whereas Carver Terrace was mostly African American. Eventually, through energetic and determined activism, the government also bought out the residents of Carver Terrace.

It is incorrect to conclude that the only way that environmental injustice occurs is from the profit motive and its driving corporate decisions to site environmentally hazardous facilities where people are less likely to complain. Public decisions have also brought lower socioeconomic communities into environmental harm’s way. Although public agencies such as housing authorities and public works administrations do not have a profit motive *per se*, they do need to address budgetary and policy considerations. If open space is cheaper and certain neighborhoods are less likely to complain (or by extension, vote against elected officials), the “default” for unpopular facilities such as landfills and hazardous waste sites may be to locate them in lower-income neighborhoods. Also, elected and appointed officials and bureaucrats may be more likely to site other types of unpopular projects, such as public housing projects, in areas where complaints are less likely to be aired or where land is cheaper.

#### **CASE STUDY: WEST DALLAS LEAD SMELTER<sup>14</sup>**

An engineering decision about where to site a facility will affect the lives of people for decades. In 1954, the Dallas, Texas, Housing Authority built a large public housing project on land immediately adjacent to a lead smelter. The project had 3500 living units and became a predominantly African American community. During the 1960s the lead smelter stacks emitted over 200 tons of lead annually into the air. Recycling companies had owned and operated the smelter to recover lead from as many as 10,000 car batteries per day. The lead emissions were associated with blood-lead levels in the housing project’s children, and these were 35% higher than the levels in children from comparable areas. Lead is a particularly insidious pollutant because it can result in developmental damage. Study after study in this area showed that the children living near this project were in danger of higher lead levels, but

nothing was done for over 20 years. Finally, in the early 1980s, the city brought suit against the lead smelter, and the smelter immediately initiated control measures that reduced its emissions to allowable standards. The smelter also agreed to clean up the contaminated soil around the smelter and to pay compensation to people who had been harmed.

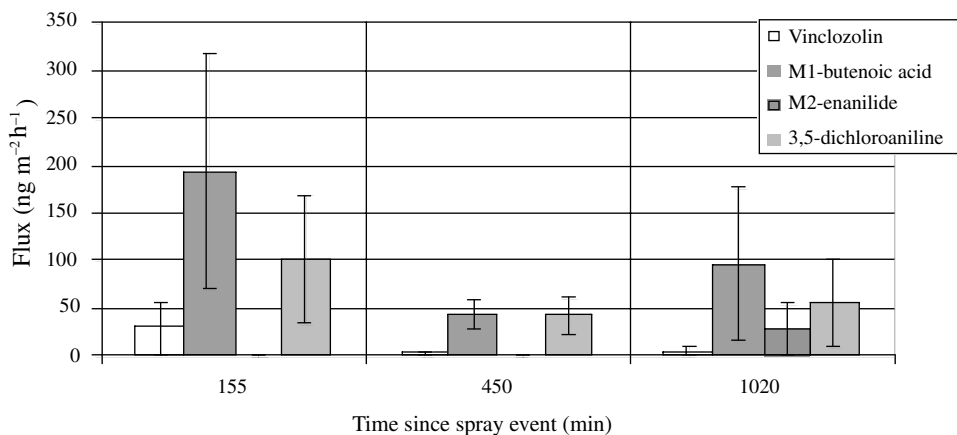
This case illustrates two issues of environmental racism and injustice. First, the housing units should never have been built next to a lead smelter. The short-sighted reason for locating the units there would have been justified on the basis of economics. The land was inexpensive and thus saved the government money. The second issue was the foot dragging by the city in insisting that the smelter clean up the emissions. Once the case had been made, within two years the plant was in compliance. By 2003, blood-lead levels in West Dallas were below the national average. Why did it take 20 years for the city to do the right thing?

Despite the general advances in environmental protection in the United States, the achievements have not been evenly disseminated throughout our history. Like much of the rest of our culture for the past three centuries, environmental science and engineering have not been completely just and fair. The history of environmental contamination has numerous examples where certain segments of society were and are exposed inordinately to chemical hazards. This has been particularly problematic for communities of low-socioeconomic status. For example, the landmark study by the Commission for Racial Justice of United Church of Christ<sup>15</sup> found that the rate of landfill siting and the presence of hazardous waste sites in a community were disproportionately higher in African American communities. Occupational exposures may also be disproportionately skewed in minority populations. For example, Hispanic workers can be exposed to higher concentrations of toxic chemicals where they live and work, in large part due to the nature of their work (e.g., agricultural chemical exposures can be very high when and shortly after fields are sprayed, as shown in Figure 1.2).

In 1992, the U.S. EPA created the Office of Environmental Justice to coordinate the agency's EJ efforts, and in 1994, President Clinton signed Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations." This order directs that federal agencies attend to the environment and human health conditions of minority and low-income communities, and requires that the agencies incorporate EJ into their missions. In particular, EJ principles must be part of the federal agency's day-to-day operation by identifying and addressing "disproportionately high and adverse human health and environmental effects of programs, policies and activities on minority populations and low-income populations."<sup>16</sup>

## LEGAL ASPECTS OF ENVIRONMENTAL JUSTICE<sup>17</sup>

The environmental justice legal footing is based on Title VI, § (paragraph) 601 of the Civil Rights Act of 1964, which makes it a crime to discriminate on the basis of race, gender, or ethnic origin. Intentional discrimination is, however, very difficult to prove



**Figure 1.2** Flux of an agricultural fungicide after being sprayed onto soil. These results are from a laboratory chamber study of vinclozolin (5 mL of 2000 mg L<sup>-1</sup> suspended in water); bars show the time-integrated atmospheric flux of organic compounds from nonsterile North Carolina Piedmont soil (aquic hapludult) with pore water pH 7.5, following a 2.8-mm rain event and soil incorporation. Error bars indicate 95% confidence intervals. The parent compound, vinclozolin [3-(3,5-dichlorophenyl)-5-methyl-5-vinylloxzolidine-2,4-dione], M1 (2-[(3,5-dichlorophenyl)carbamoyl]oxy-2-methyl-3-butenoic acid), and M2 (3',5'-dichloro-2-hydroxy-2-methylbut-3-enanilide) are all suspected endocrine-disrupting compounds (i.e., they have been shown to affect hormone systems in mammals). This indicates that workers are potentially exposed not only to the parent compound (i.e., the pesticide that is actually applied) but to degradation products as the product is broken down in the soil. [From D. A. Vallero and J. J. Peirce, Transport and Transformation of Vinclozolin from Soil to Air, *Journal of Environmental Engineering*, 128(3):261–268, 2002].

since the defendant would obviously not admit that he or she was biased against a minority. Paragraph 602 of this act, however, makes the point that discrimination can also be proven by actions, know as *de facto* discrimination. That is, if a certain minority population receives fewer benefits from, say, a local government, the only reason for such disparity would reasonably be discrimination. To prove such discrimination, however, substantial effort (read “money”) is required, and although Title VI does not explicitly give the right to sue for disparate treatment in court, the courts have upheld the right of private action under §602 for allegation of disparate impact.

Over the years, discrimination has been litigated in numerous cases. For example, in 1983 in *Guardian Association v. Civil Service Commission*, the court found that a written entrance examination required by a police department resulted in disparate results that could be identified by race. African American and Hispanic applicants did not perform as well on the exam, and thus even though the exam was supposed to be neutral, the actual fact of disparate performance demonstrated discrimination.

In 2001, however, the Supreme Court in *Alexander v. Sandoval* ruled that there is no private right of action to enforce disparate impact regulations under Title VI of the Civil Rights Act, thus removing a major judicial tool from individuals and groups who believe that they have been discriminated against. Various circuit court decisions since

### Biographical Sketch: Benjamin Chavis, Jr.

Benjamin Chavis, Jr., was born in 1949 in Oxford, North Carolina, and served as a youth coordinator with the Southern Christian Leadership Conference, working in the 1960s with Rev. Martin Luther King, Jr. to desegregate southern schools. When he became an ordained minister, he continued to agitate for racial justice, and got into trouble in Wilmington, North Carolina, where he was convicted of conspiracy and arson. He spent nearly a decade in prison before the charges were thrown out in 1980.

On regaining his freedom, he became the director of the United Church of Christ's Commission for Racial Justice. In 1982 he concluded that the selection of the PCB landfill for Warren County, North Carolina (very near his birthplace) had to be racially motivated. In his view, this poor, predominantly African American county was singled out because its people were unlikely to protest the selection of the disposal site. He called this *environmental racism*, a term he later changed to *environmental justice*.

Teaming with Charles Lee, he wrote the 1987 landmark report "Toxic Wastes and Race in the United States," which documented the uneven distribution of environmentally undesirable land use in African American and other minority communities. They found, for example, that in communities with two or more hazardous waste disposal facilities, the average minority population was more than three times that of communities without such facilities. The report also found that the U.S. EPA took longer to clean up waste sites in poorer areas than in more affluent neighborhoods.

### Biographical Sketch: Charles Lee



Charles Lee was Director of Environmental Justice for the United Church of Christ Commission for Racial Justice and worked with Ben Chavis to author the landmark 1987 report "Toxic Wastes and Race in the United States."

Presently, Lee is with the U.S. EPA working on implementation of an executive order promoting environmental justice. He is also a lecturer at the Hunter College School of Health Sciences.

2001 have supported and strengthened this legal concept. As a result, not only do individuals lack standing in court to bring claims of discrimination in violation of the Civil Rights Act, but these claims cannot be enforced through the U.S. Code.

The *Sandoval* case is interesting and deserves a closer examination. The issue developed in 1990 when the state of Alabama declared English to be the official language of the state. This declaration prompted the Alabama Department of Public Safety to administer its driver's license examinations only in English. Martha Sandoval, a Hispanic American woman, filed a class action suit under §602 of Title VI of the Civil Rights Act against the department and its director, alleging that the policy prevented her, a citizen and taxpayer, from driving a car on roads constructed with federal funds. She won her case, and this was confirmed by the Court of Appeals. But in 2001 the U.S. Supreme Court, in a 5 to 4 vote, held that Congress had not intended the Civil Rights Act to provide private right of action for disparate impact. In other words, Ms. Sandoval may have been discriminated against, but the Court argued that the law did not allow her the right to sue for relief. Justice Antonin Scalia wrote the majority opinion, and argued that a private right of action to enforce federal law has to be created by Congress, and that the Civil Rights Act does not do that.

The majority opinion went further, however, and attacked the text and structure of Title VI, asking if Congress had intended to create private action for any form of discrimination. The ruling suggested that other forms or relief, such as the withholding of funds by an agency, would be legitimate means for enforcing the law, but that private individuals do not have the right to seek relief.

The minority, led by Justice John Paul Stevens, argued that Congress had indeed intended for private right of action. It saw the right of private action as a part of an integrated remedial pattern and that Congress has given agencies broad powers to regulate §602 claims, thus making private action implicit. The minority opinion suggested that future suits might use the U.S. Code to seek relief, specifically 42 U.S.C. §1983.

With the Civil Rights Act, Congress intended to remedy discrimination, seeing this as a national problem. Those opposed to the ruling argue that it seems unlikely that Congress's intent was not to allow private individuals who felt that they had been discriminated against the right to sue for relief and to use only the power of executive agencies to seek such relief. This argument can be viewed as dangerously circular, since often it is the very agencies that practice disparate behavior. One argument is that the ideals of §601 were intended to be carried out by the remedies in §602, and that the intent of Congress was quite clear. The narrow ruling by the majority, however, prevented further court actions.

The effect of the *Sandoval* decision was felt immediately in environmental matters. In *South Camden Citizens v. New Jersey Department of Environmental Protection*, the South Camden Citizens in Action group had filed an injunction, based on Title VI of the Civil Rights Act, to prevent the final approval of a permit to a cement company for discharging its emissions. The essence of the complaint was that the emissions would most severely affect a predominantly minority community that already was the home of 20% of the city's contaminated sites. The District Court of New Jersey had already granted the injunction, basing its decision on §602 of Title VI. But five days after the state court had decided the case, the U.S. Supreme Court rendered the *Sandoval* decision, stating that there is no private right of action to enforce regulations under §602 of Title

VI. The defendant immediately requested a stay of the injunction, and eventually the courts ruled that *Sandoval* had indeed prevented such suits. More important, the Third Circuit Court ruled in the *South Camden* case that 42 U.S.C. §1983 could not be used to enforce federal regulations unless the right had been expressly given to do so. Such language is not in Title VI of the Civil Rights Act.

The effect of *South Camden* was to bar the door from any further legal action based on disparate environmental impact. The only way that environmental justice issues can now be addressed is through the various agencies. When the agencies themselves are the defendants, however, such relief is not possible.

Because the U.S. Supreme Court had not ruled explicitly on the use of 42 U.S.C. §1983 as a vehicle for seeking private relief, there was some hope that this could still be applied to environmental issues. This small hope was eliminated in the case of *Gonzaga v. Doe*, a case having to do with the release of personal information. The plaintiff sued Gonzaga University because information about sexual misconduct had been released to a teacher certification panel, in clear violation of the Federal Education Rights and Privacy Act (FERPA) of 1974. The majority opinion, written by Justice William H. Rehnquist, found that the issue is one of “rights.” That is, §1983 can be used to seek relief if rights, and only rights, have been violated. The opinion stated that “. . . Section 1983 provides a remedy only for the deprivation of ‘rights, privileges, or immunities secured by the constitution and laws’ of the United States. Accordingly, it is the rights, not the broader or vaguer ‘benefits’ or ‘interest’ that may be enforced under the authority of that section.” The opinion stated that “if Congress wishes to create new rights enforceable under §1983, it must do so in clear and unambiguous terms.” The opinion concluded that that the FERPA nondisclosure provision fails to confer such enforceable rights.

The minority opinion stated that even if the standard of rights is used, there is a federal right to have §1983 enforced and that the Court’s own rulings had implied the right of action on claims that “. . . reflect a concern, grounded in separation of powers, that Congress rather than the courts control the availability of remedies for violation of statutes.”

The net effect of the *Gonzaga* ruling was to remove the one remaining possibility of using 42 U.S.C. §1983 for seeking relief in cases of perceived environmental injustice. Despite calls for the U.S. Congress to pass legislation that would supercede *Sandoval*, giving private individuals that explicit right to sue under Title VI of the Civil Rights Act, there has been no such action.

Given the lack of ability to seek relief through the courts, some federal agencies have created their own policies on environmental justice, the most important one being the policy developed by the U.S. EPA. In 1998, in response to Executive Order 12898 from President William Clinton, the agency issued its *Interim Guidance for Investigating Title VI Administrative Complaints Challenging Permits*, and this has become the primary mechanism for analyzing disparate impact complaints. These guidelines do not create any rights enforceable by parties in litigation with the United States, but creates a systematic way of addressing such complaints.

The *Interim Guidance* document specifically lists five actions that must be taken in response to a complaint:

### Biographical Sketch: Christopher Stone



Just because an animal, a tree, or even a place cannot hire a lawyer and argue its case in court, does this nonhuman have an absence of standing? Why can't a human being who can argue the case do so on behalf of the animal, tree, or other nonhuman?

This was the question that came before the U.S. Supreme Court in 1967 in a famous case, *Storm King v. Federal Power Commission*. The Federal Power Commission wanted to lease out some federally owned land for a ski area, but the Sierra Club objected, believing that the development would harm the forests. However, the problem was that no single member of the Sierra Club could prove that he or she was being directly harmed by the construction of the ski slopes. The harm to each person would be small, and collectively the harm would be great, but there was no one person who would have standing in the court. This is the problem of the 25-cent debt. The damage to a single person is just not great enough to warrant taking up the court's time.

One of the lawyers on the case was Christopher Stone (born 1937), a professor on the faculty of the University of Southern California law school. Stone, with an undergraduate degree from Harvard and a law degree from Yale, had been active in the Sierra Club and helped them on numerous occasions. In support of the Sierra Club's case, Stone wrote an article cleverly entitled "Should Trees Have Standing?" in which he argued that natural objects have every right to be represented in court if the damage is sufficiently great. The article appeared in the law review and became part of the brief submitted to the Court. Sitting on the Court at that time was Justice William Douglas, who was an avid outdoorsman and was quite sympathetic in cases involving the destruction of natural habitats. Using Stone's arguments, Douglas was able to sway the court in favor of the plaintiffs and to stop development of the ski area. Although it is unlikely that this common law precedent will be widely used in the control of environmental pollution in the future, its successful application in the 1960s fueled and encouraged the environmental movement.

- Identifying the population affected by the facility
- Determining the racial or ethnic composition of the population
- Examining other permitted facilities within the area
- Conducting a disparate analysis
- Determining the significance of the disparity

If, using this procedure, the U.S. EPA believes that an apparently disparate impact exists, it asks the permitted agency to rebut its findings. For example, if a city is intending



to build a wastewater treatment plant in an economically depressed neighborhood, and as a result of a complaint, EPA finds that a disparate situation exists, it would ask the city to show why this is not a case of environmental injustice. The city would then have to prove that the benefits accrued by the affected population outweighs the detrimental effects of the facility. Merely demonstrating that the facility has met all of the regulatory requirements is insufficient. This process reverses the onus of responsibility, requiring the agency to prove that the action will benefit the people affected instead of requiring the people to prove that they are being harmed.

The case is examined by the Office of Civil Rights and EPA experts, and if the finding is that the planned facility is such that mitigation is not possible and that the entire project, on balance, will not be beneficial to the affected population, the EPA can then withdraw funding or permits.

There was a great deal of opposition from private parties and from the states to the use of the EPA *Interim Guidelines*, arguing that this process is in conflict with present land-use laws and regulations, that it does not provide standards on which decisions are based, and that the procedure has not been promulgated with the consent or even input from the states. Many saw this as a backdoor way of proving discrimination by disparate impact, a concept specifically struck down by the U.S. Supreme Court.

Others argued that the use of the *Interim Guidelines* resulted in unnecessary delay and litigation in cases where cities and states are attempting to achieve economic development in low-income neighborhoods. The placement of a power plant in a low-income neighborhood, they argue, would create jobs and provide economic improvement to the community. This argument is that the guidelines harm the very people they are intended to protect.

The complaints were loud enough to cause Congress to intervene, and in October 1998 a rider on an appropriations bill forbade the EPA from accepting new Title VI complaints. This drew strong opposition from the Office of Management and Budget, which called the measure inappropriate and antienvironmental. But because of such riders on appropriations bills, the EPA was unable to initiate new studies on disparate environmental impact. Finally, in 2002, the Congress ceased attaching riders to appropriations bills, believing (correctly in retrospect) that the Bush administration would not pursue such policies.

### **CASE STUDY: SHINTECH HAZARDOUS WASTE FACILITY, ST. JAMES PARISH, LOUISIANA**

Before the moratorium on processing complaints went into effect, the EPA accepted a complaint from the Tulane Environmental Law Clinic in cooperation with other environmental groups with regard to a large toxic waste disposal facility that was to be constructed by Shintech, a Japanese firm, in the St. James Parish in Louisiana. This parish is poor and predominantly African American, and is the location of a vast array of industrial plants. The company promised jobs both in the construction and operation of the plant as an enticement to the community. The complaint, however, stated that the emissions from this facility would create a disparate environmental impact on the minority population.

The allegations of disparate impact were supported in part by the fact that 18 toxic waste facilities were located in St. James Parish, and almost a quarter of all the pollutants produced in the state were emitted within a four-mile radius of the parish. The case was accepted by the Office of Civil Rights for review, but they decided not to report their conclusions until the EPA guidelines were published. During this administrative delay, Shintech decided to move the plant to a middle-class neighborhood, thus making the case moot. It should be noted that the new location was advantageous to Shintech since it was close to a Dow Chemical plant, and this allowed the waste to be pumped to the waste treatment facility, saving considerably on the cost of transport. Such decisions point to the complicated nature of environmental justice. Companies optimize on a number of variables. In this case, the cost of pumping may have outweighed any savings from siting the plant in a lower-income neighborhood.

The EPA had accepted a second case for review, and this case did not end in quite the same manner as the Shintech hazardous waste facility.

#### **CASE STUDY: SELECT STEEL CORPORATION RECYCLING PLANT, FLINT, MICHIGAN**

In 1998 the Michigan Department of Environmental Quality approved an emissions permit for a steel recycling mini-mill in Flint, Michigan, to be constructed by the Select Steel Corporation. A mini-mill uses an electric arc furnace to melt scrap steel. A local group filed a Title VI complaint asserting discriminatory impact on a minority community. The Office of Civil Rights accepted that case for review and was pressured into quick action by Select Steel's threat to move its plant to Ohio. EPA's delay in insisting on a careful review of this complaint caused significant political pressure. Michigan's Governor Engler criticized the EPA in a press conference, saying in part: "This is about every company that has ever had to deal with the EPA's reckless, ill-defined policy on environmental justice. . . . The EPA is imposing their bureaucratic will over this community and punishing the company with the latest environmental standards, all because of a baseless complaint. . . . The new result is that the EPA is a job killer."<sup>18</sup>

The *Detroit Free Press* relentlessly attacked the EPA, calling it a "rogue agency" and devoting large amounts of news space to the controversy. Whether the public bashing had any effect on EPA is still unknown, but its decision was in favor of the steel company, arguing that all of the permits had been allowed correctly and that no emission regulations would be violated from the emission from the facility. In other words, if there is no standard, the effect of the emissions is not a problem.

The point of environmental justice is not whether or not all the emission guidelines have been met, but rather, whether or not the people affected by this facility are being treated fairly.

Following the decision, Select Steel decided to relocate its plant in Lansing, Michigan, instead of Flint, saying that they no longer wanted to fight with local groups.

The Select Steel case made it quite clear that the *Interim Guidelines* had to be reviewed and modified. If the argument could be made that adverse impact is acceptable when either no standard exists or when all of the emission standards have been met, there would be no argument for disparate impact.

The effect of the Shintech and Select Steel cases demonstrated that the system for determining environmental injustices was not functioning well. The stinging criticism appeared to have an effect on EPA's thinking, and as a result, EPA sought help from its Science Advisory Board, and with considerable input from others, revised the *Interim Guidelines*. The new guidelines were published as the *Draft Revised Guidelines for Investigating Title VI Administrative Complaints Challenging Permits (Guidelines for Investigating)* as well as *Draft Title VI Guidance for EPA Assistance Recipients Administering Environmental Permitting Programs (Guidance for Recipients)*. The objective of the new guidelines was to reduce the chance of Title VI complaints by providing strategies for enhancing public participation in decision making.

The most important part of the first document, the *Guidelines for Investigating*, relates to communication and participation by all concerned parties. The *Guidelines for Recipients* suggests various approaches for analyzing the issues that may lead to Title VI complaints. One of the suggestions in the revised guidelines is the *area-specific approach*, which identifies geographic areas where adverse environmental impact may exist and encourages all interested parties to develop agreements before divisive situations arise. That is, the stakeholders can agree before any development occurs as to what would be acceptable in the specific area. These agreements would then be reviewed by the Office of Civil Rights to make sure that all interested parties have had an opportunity to participate.

The system would work in this way: An economically depressed neighborhood would agree in advance that the placement of a certain industry or municipal facility in the neighborhood would be acceptable and desirable. This plan would then be shelved until the day that such a facility was actually proposed. With the *a priori* agreement in place, there would be no cause for opposition and complaints based on Title VI discrimination.

The *case-by-case* approach allows state and local agencies (recipients of the federal grants) to develop criteria to evaluate permit actions that are likely to raise Title VI concerns. These criteria would then be applied to each case and would dictate whether the complaints had merit. These guidelines are useful for preventing future conflicts, but they do not resolve existing problems.

But even after these guidelines were published, the EPA was still restricted by Congress from pursuing Title VI complaints, and as a result a large backlog of complaints built up. EPA's appropriations bill for fiscal year 2002 did not include this restriction, and the then EPA Administrator Christine Todd Whitman responded by setting up a task force to clear away the backlog.

One way of clearing away the backlog is simply to deny as many of the complaints as possible, something that the task force had been accused of doing. As of June 20, 2003, of the original 136 pending complaints, only 16 had been accepted and three are still under review. The remainder, 86%, were rejected, dismissed, suspended, resolved, or referred to another agency.<sup>19</sup>

## ARGUMENTS AGAINST ENVIRONMENTAL JUSTICE

Criticism of the environmental justice movement usually takes three forms:

- Denial that there is such discrimination
- If there is such discrimination, the discrimination is beneficial
- If there is discrimination, and if it is not beneficial, at least it is not racially motivated<sup>20</sup>

Let's consider these arguments in turn.

### Argument 1: Environmental Injustice Does Not Occur

This argument questions whether injustice is actually occurring. One argument is that the appearance of disparate treatment is anecdotal and that rigorous studies have not been

#### Biographical Sketch: Gaylord Nelson



Perhaps President Bill Clinton said it best when he presented the highest civilian award, the Presidential Medal of Freedom, to Gaylord Nelson: “As the father of Earth Day, he is the grandfather of all that grew out of that event: the Environmental Protection Agency, the Clean Air Act, the Clean Water Act, and the Safe Drinking Water Act.”

Gaylord Nelson, born in Wisconsin in 1916, received his B.A. degree at San Jose State College and his law degree from the University of Wisconsin. He was a state legislator, a two-time governor of Wisconsin, and a U.S. senator, serving a total of 18 years in that capacity. In 1969 he had what has been called one of the most powerful ideas of his time: Earth Day. The national event, during the time of dissent over the Vietnam war, drew over 20 million participants and put into motion the string of legislation that forms the backbone of our environmental law today.

In 1961, while governor of Wisconsin, he created the Outdoor Recreation Acquisition Program, funded by a penny-a-pack tax on cigarettes, then acquired a million acres of parkland in Wisconsin. While in the U.S. Senate, he authored the legislation that preserved the 2100-mile-long Appalachian Trail. After leaving the Senate, he served for many years as a consultant to the Wilderness Society. He died in 2005, leaving a legacy of environmental protection and care of the planet.

done. The second approach is to argue that federal agencies such as the U.S. Environmental Protection Agency have not won any cases for complainants, and that a large number of complaints have been dismissed after review. In addition, the decisions of the U.S. Supreme Court and various Appeals Courts suggest that there are no legal grounds for such a case, and hence it does not exist. This is of course a spurious argument. Just because there are no legal precedents for correcting environmental injustice and just because agencies do not pursue with diligence complaints regarding discrimination does not mean that it does not exist.

A second type of denial of the existence of injustice centers on demographics and statistics. First, since it is nearly impossible to agree on an absolute definition of “race,” it ought to be impossible to argue for discrimination. If we are somehow able to define race (the argument goes), we have to show that statistically, people of identifiable racial characteristics are being discriminated against.

To illustrate these arguments, let us define a town with four neighborhoods that has the following racial characteristics:

Neighborhood	Percent Minority
A	10
B	5
C	35
D	95

Which of these neighborhoods is considered a minority neighborhood? That is, where would the line be drawn?

A related problem with defining a minority neighborhood is in choosing the size of the land area. The seminal report by the United Church of Christ Commission for Racial Justice, for example, used zip codes to identify locations. This is a blunt tool at best, since so many small communities have only one zip code. The community discussed above, for example, might have a single zip code, and thus the uneven distribution of minorities would never be evident. A wastewater treatment plant located in neighborhood D would not even be on the environmental justice radar screen; and if this town had, say, 45% minority population, it would not show up as a minority community, and any suggestion of environmental discrimination would disappear.

There are numerous variations on the themes of this argument. For example, another argument against environmental justice is that it is not the percentage of people in a neighborhood that matters, but rather the absolute number of people affected. Using our hypothetical community, for example, suppose that neighborhood D in the community above is sparsely populated, and even though it is 95% minority, there are only a few people in that neighborhood.

The point of these arguments is to deny problems with disparate distribution of pollution and the resulting exposure because we cannot conduct well-documented studies to show that the disparity exists. This classical “head in the sand” approach flies in the face of a precautionary approach. Indeed, if such arguments were universally held, few engineering projects would be implemented for want of 100% known conditions.

A third denial argument is that the undesirable land-use facilities often are not constructed in lower-socioeconomic neighborhoods, but rather, the neighborhoods grow up around such facilities because the land there is affordable. Experience has shown that this point has some validity. The location of airports has often caused major shifts of more affluent, at least more mobile, populations away because of the noise from airplanes. As these shifts may make these neighborhoods more affordable, families of lower socioeconomic status replace the previous owners. People with fewer resources are able to afford homes in areas vacated by the more affluent, even though they are aware of the high noise levels. The shifts can even change the land use, changing neighborhoods from predominantly single-family dwelling units to multiple-family apartments and commercial use.

Certainly, airports are not the only type of driver for displacement. Many company towns have changed character over the decades as the workers who had to live near polluting facilities are better able to afford better housing in suburbia and exurbia. In fact, neighborhoods such as those in Gary, Indiana, Saugat, Illinois, and Detroit, Michigan were once vibrant, albeit heavily polluted neighborhoods. They are now almost completely populated by people with little if any affiliation with the adjacent industry.

The need of some citizens to seek more economical housing is not, of course, an excuse for exposing them to higher levels of environmental contaminants. People do not move to less expensive neighborhoods to be nearer contamination and unhealthy conditions. They move there because this is all they can afford.

Finally, some reports claim that all socioeconomic groups resist the siting of undesirable facilities and land use in their neighborhoods, and the final siting of these facilities in lower-socioeconomic-class neighborhoods is as a result of inability or unsophistication in being able to fight off such decisions.<sup>21</sup> The argument goes that sites are initially equally and equitably distributed, and the lower-socioeconomic neighborhoods are not very good at protecting their communities.

Although this may be true, it does not provide justification for disparate treatment. In fact, it is a tacit admission of injustice. The inability to summon sophisticated and expensive resistance to unfair siting practices demonstrates a type of second-order discrimination that results from first-order practices that have led to lower education levels and histories of discrimination in these neighborhoods. If engineers are to take a life-cycle view of their projects (one of our common themes in this book), we have to some extent failed when, after some time, our projects lead to injustices. We have a “social contract” with the public. Breaching of this contract must be avoided.

### **CASE STUDY: THE ORANGE COUNTY LANDFILL AND UNKEPT PROMISES<sup>22</sup>**

Chapel Hill, now a booming community, was once a quaint village hosting the University of North Carolina, the flagship university in the North Carolina higher education system. The town has a storied past: the university being the first state institution to open its doors to students and the town surviving the invasion of Union troops during the Civil War.

Chapel Hill remained a village until the 1960s, when expansion of the university caused a surge in population and pressure on new developments.

During that time, Chapel Hill also was becoming a Mecca for retired people, with its mild climate, great golf courses, beautiful gardens, and of course the advantages of a first-rate university drawing people from the Northeast. The village was becoming a city of over 56,000 people.

During the 1960s progressive era, Chapel Hill organized the first truly integrated school system in North Carolina, carving out the central section of town in a way that essentially integrated all schools. This forward-looking liberal attitude carried through in the election of municipal officers, and it was no wonder that Chapel Hill was the first town in North Carolina to elect an African American as mayor.

Howard Lee was a talented and hard-working mayor who went on to become a state senator. During his tenure as mayor, he had to grapple with intense development pressures that necessitated the organization of many municipal services, including the creation of a bus service.

At that time the town was using a small landfill owned by the university for the disposal of its solid waste, but this landfill was rapidly running out of space and the university wanted to close it, so in 1972 a search began for a new landfill site. Searches then were not nearly as intense as they are today, and the entire process was quite informal. The town council decided that it wanted to buy a piece of land to the north of the town and make this the new landfill. This land seemed like a good choice since it was between Chapel Hill and Hillsborough, the county seat of Orange County, and within a short distance of Chapel Hill. It was also a convenient location for Carrboro, a small community next to Chapel Hill. There were no new housing developments near the proposed landfill site, and it was off a paved road, Eubanks Road, and this would facilitate the transport of refuse to the landfill.

However, a vibrant African American community, the Rogers Road neighborhood, abutted the intended landfill area, and these people expressed their dissatisfaction with the choice of a landfill site and went to Mayor Lee for help. The mayor talked them into accepting the decision, promised them that this would be the only landfill that would be located near their neighborhood, and that if they could endure this affront for 10 years, the finished landfill would be made into a neighborhood park. Most important, they were told that the next landfill for Chapel Hill would be somewhere else and that their area would not become a permanent dumping site. The citizens of the Rogers Road neighborhood grudgingly accepted this deal and promise and then watched as the Orange County Regional Landfill was built near their community.

The site for the landfill was 202 acres, cut into two sections by Eubanks Road, and abutting Duke Forest, a research and recreational facility owned by Duke University. On one side of the site was the Rogers Road neighborhood. The landfill, which had no liner or any other pollution control measures, was opened in 1972. The three communities contributing to the landfill, Chapel Hill, Carrboro, and Hillsborough, along with Orange County, formed a quasi-governmental body called the Landfill Owners Group (LOG) to op-

erate the landfill. The LOG was comprised of elected officials from the four governmental bodies. One of the early actions by this group was to establish a sinking fund that would eventually pay for the expansion of this landfill or a new site when this became necessary.

As the population of Orange County exploded in the 1970s it became quite clear that this landfill would not last very long and that a new landfill would be needed fairly soon. The LOG, using money from tipping fees, purchased a 168-acre tract of land next to the existing landfill, called the Green Tract, with the apparent intent of using it when the original landfill became full, but without actually publicly declaring that this was the intended use for this land.

In the early 1980s it became apparent that a new landfill would be necessary, but by that time the Green Tract was considered to be too small for the next landfill. This would not be a long-term solution, and a need was apparent for a larger site that would accommodate the solid waste needs on a long-term basis. The four governmental agencies asked the LOG to initiate proceedings to develop a new landfill, which could be opened in the mid-1990s.

The LOG set up a landfill selection committee (LSC) to oversee the selection of the new landfill and asked Eddie Mann, a local respected banker and civic-minded citizen, to chair the LSC. The LOG directed the LSC to seek technical help with the selection process, and as a result, Joyce Engineering, a Virginia firm that had assisted other communities in the selection of landfills, was hired to conduct the search.

After a study of Orange County, Joyce Engineering selected 16 locations as potential landfill sites, using criteria established by the LSC such as proximity to cities, airports, and environmentally sensitive areas. One of the 16 sites chosen by Joyce was the Green Tract, which became known as OC-3.

The next step was to hold public hearings and then to cull the list of 16 down to a smaller list for final discussion. As the 16 sites were being considered, each was placed in one of three categories: (1) to be considered further, (2) to be placed in reserve for possible consideration later, or (3) not to be considered further.

Following these hearings, the LSC pared down the original 16 sites to five, one of which was the Green Tract. The LSC did not consider persuasive the argument that the former mayor of Chapel Hill had promised the residents in that neighborhood that future landfills would be located elsewhere. Since Howard Lee, the former mayor of Chapel Hill, did not represent Carrboro, Hillsborough, or Orange County, the well-intentioned promise was not considered binding by the other governmental entities. In addition, although Lee acknowledged making this promise, it was never found on any written document. (This is not uncommon in the southeastern U.S., where oral tradition often holds primacy over written documentation, which in part explains the discrepancy between Northern and Southern histories.) Further, the people who were least able to resist the backdoor expansion of the existing landfill, the Rogers Road neighborhood, were told that the promises made by elected officials were null and void because the new politicians could not be held to



these promises. The effect of this argument was to suggest that any promise made by one administration does not need to be kept by another. This is analogous to buying savings bonds from the federal government with no guarantee that they will be redeemed in 10 years since a new administration will be in Washington. Or, in environmental parlance, all political decisions are unsustainable.

One of the problems with the Green Tract was that it was too small to afford a long-term solution, a source of encouragement to the Rogers Road neighborhood. But this was all changed when late in the process and well after the public hearings, Eddie Mann introduced a new site, OC-17. This site abutted the existing landfill and the Rogers Road neighborhood and included a large tract of land in Duke Forest, a section called the Blackwood Mountain region. The introduction of this site and its acceptance by the LSC as a finalist was a case of local politics at their worst.

The opponents of these two tracts, OC-3 (the original Green Tract) and OC-17 (the new Blackwood Mountain area), began to fight the selection process, aided by many Chapel Hillians who saw the inequity in this process. The resisters packed the LSC committee meetings, printed T-shirts (“WE HAVE DONE OUR SHARE”), wrote letters to the newspaper, and fought valiantly to keep the inevitable from happening.

In 1995 the LSC approved the selection of OC-3 and OC-17 as the new landfill but suggested that some form of compensation be made to the citizens in the Rogers Road neighborhood. The decision next went to the LOG for their consideration. The vote in the LOG was 6 to 3 in favor of the selected site. Two of the negative votes were by the representatives from Carrboro. The town of Carrboro would not be directly affected by the location of the landfill in the Eubanks Road area, and thus Carrboro ought to have had a clear selfish motive for choosing this site. But the two Carrboro representatives on the LOG, Mayor Mike Nelson and Alderwoman Jacquelyn Gist, based their negative vote on the promise made by Howard Lee to the Rogers Road neighborhood and announced that they would fight the selection of this site.

Nevertheless, having been approved by the LOG, the decision next went to the four governmental bodies for approval. Chapel Hill, Hillsborough, and Orange County approved the site with little debate. In the meeting of the Chapel Hill Town Council, the previous promise by Mayor Howard Lee was not even brought up. But Mayor Nelson and Alderwoman Gist convinced the Carrboro council to delay the approval until compensation could be worked out *in advance* of the decision, citing the previous broken promises as loss of trust in politicians.

This delay by Carrboro allowed Duke University to marshal its forces and to hire appropriate lawyers and scientists to come to the defense of Duke Forest. The university trustees voted unanimously to fight the siting, and the president of Duke, Nan Keohane, wrote a strong letter to the LOG and the four governmental bodies threatening legal action if the land in Duke Forest was to be taken. Using his knowledge of the area, Jud Edeburn, the manager of Duke Forest, quickly located areas with endangered species and several

wetland locations, thus reducing the available acreage for the landfill. A historic African American cemetery was discovered in the forest and placed on the protected National Registry, further reducing the availability of land. But Joyce Engineering found ways to redesign the landfill so as to accommodate these restrictions and still use the major part of the tract for burial of solid waste. Demands for public hearings and more tests did not change the decision, and a year after the vote, OC-17 remained the first choice of the LOG and the three governments. The government of Carrboro was under increasing pressure to withdraw the opposition.

Then, in 1997, Duke University announced that it had deeded the Blackwood Mountain section of Duke Forest to National Aeronautics and Space Administration (NASA) for its use in conducting experiments. The federal government now controlled this land and the fight was over. It took clever legal work, the effective battle fought by the citizens of the Rogers Road neighborhood, and the courage of Carrboro's Mayor Nelson and Alderwoman Gist to stop the landfill from being sited at a location where the people had already done their share, although a just outcome was reached. Unfortunately, this is an example of consequentialist ethics—that is, the ends justify questionable means. This is a common complaint about the legal profession, but it is not uncommon to engineering.

Like many environmental justice problems, the local community on Rogers Road continues to be under the threat of public decisions, even after an apparent compromise is reached.

The most recent threat was in the spring of 2006 when the Orange County Commission was considering the landfill site to be the possible location for a transfer station where trucks unload garbage that is to be taken to another site. A local advocate, Reverend Robert Campbell, stated that the transfer station “is something that we don't want because a transfer station is going to create even more traffic, going to also create more waste along the highway.”<sup>24</sup>

Gayle Wilson, the director of the county solid waste management department, said the department would “make it the best we can for the citizens out there. We will meet with them; try to meet their concerns as best as possible.”<sup>24</sup> This is likely to be little solace for the citizens. Wilson's choice of words “citizens out there” is quite telling. It is almost unthinkable that the landfill or transfer station would ever be considered in one of Chapel Hill's gated suburban communities, as it is unlikely that these communities would be thought to consist of “citizens out there.”

### Example:

#### Know Your Acronyms

The public hearings in the Orange County Landfill Case were classic NIMBY (“not in my backyard”) exercises. Two other useful and colorful acronyms have recently emerged in this area: BANANA (build absolutely nothing anywhere near anything) and NOPE (not on planet earth). Language reflects culture so engineers must be

prepared, technically and mentally, for conflict on even the most (seemingly) benign project proposals. This perception is a challenge for the engineer who seeks to “improve” the landscape. Roland K. Vosburgh,<sup>23</sup> Director of the Columbia County (New York) Planning Department sums up this challenge as:

These acronyms cause us to chuckle, but it is no laughing matter if the focus in favor of preservation and *status quo* win in the end. And it has become virtually impossible to develop (read change) a piece of real estate without someone opposing it.

Vosburgh goes on to lament that even environmentally necessary actions, such as reclaiming abandoned industrial sites (known as “brownfields”) are avoided because of the unflinching opposition to land use changes. This was manifest in the Chapel Hill landfill siting process. Neighbors who lived around their proposed sites hired lawyers and environmental scientists or were fortunate enough to have lawyers, physicians, and engineers as neighbors, and these representatives tried to persuade the LSC that their site simply was inappropriate. In other cases the members of the LSC themselves had a reason to eliminate a specific site from consideration. Often, the classification of a site into the third (not to be considered further) category was on what appeared to be flimsy evidence. In one case, a member of the LSC who happened to live near a site said that this was nice farmland and that sheep would graze on the hillside. This apparently was given as a sufficient reason for eliminating the site from further consideration. There appeared to be no overt collusion or visible trading of votes, but it became quite clear to observers that the decisions had been made far in advance of the public hearing. The Rogers Road neighborhood (and the Green Tract, which was one of the possible sites being considered) was represented on the LSC by a graduate student who did not live in the neighborhood and who, by her level of participation, seemed to have little interest in the outcome.

## Argument 2: If Environmental Injustice Does Occur, It Is Not Bad

The second line of argument advanced against the environmental justice movement is to admit that there might be environmental discrimination but that the discrimination is not harmful. Suppose that the price of land in our imaginary community is as follows:

Neighborhood	Percent Minority	Land Cost (\$/acre)
A	10	20,000
B	5	15,000
C	35	10,000
D	95	3,000

Now suppose that a municipal facility such as a solid waste incinerator would need 100 acres. The cost to the municipality would be \$2,000,000 if the facility were built in

neighborhood A, and \$300,000 if it were built in neighborhood D. This is a large savings that would be passed on to the taxpayers in the community. Hence (the argument goes) it is more advantageous to build the plant in neighborhood D because all members of the community, including the residents of neighborhood D, would share in the cost savings by having lower taxes. In addition, the lower property values in neighborhood D caused by the undesirable facility will also represent a savings to the property owners since the property taxes will be lower.

It goes without saying that the greatest savings in taxes would be for those who pay the most, and thus the argument that everyone shares in the economics of using lower-priced land is not persuasive. In addition, lower taxes should not be an excuse for unfair and unequal treatment of all citizens. This also points to the problem of valuation in design decisions. Many values, such as social justice and ecosystem protection, do not readily lend themselves to monetized value. This often means that those benefits and costs that can easily translate into dollars, such as taxation, supplant other values.

Another utilitarian (greatest good) argument for using the lower socioeconomic neighborhood is that people who live there would probably have high unemployment, and a facility located there would provide jobs. These critics point to the influx of less-advantaged people around such urban facilities as incinerators and suggest that the facilities were actually beneficial to the neighborhood. But this is not the point. By disparate distribution of environmental contamination we are still treating unfairly some less advantaged part of our population.

Finally, another argument advanced against environmental justice is to say that whatever the situation might be, the cure is far worse than the disease. For example, the elimination of pollution would be extremely costly, and in the long run, impossible. We could not as a nation set a goal of zero pollution and still hope to pay for other social needs.

This is true, but not germane. In fact, such arguments were posited in the early 1970s against new environmental standards. The issue now is the fair distribution of environmental costs and benefits. The issue then was the overriding need to save the precious ecological resources and to protect public health.

### **Argument 3: If Environmental Injustice Does Occur and It Is Bad, It Is Not Racially Motivated**

The third argument against environmental injustice accepts that there certainly seems to be disparity in the siting of pollution-producing facilities and acknowledges that the less advantaged residents often do not have much choice in the placement of such facilities: that is, that discrimination does occur. But the argument goes, this unfairness is not racially motivated.

Proponents of environmental justice argue, as does philosopher and activist Kristin Shrader-Frechette, that there seems unlikely to be any other reason for such injustice. “If the area closest to a noxious facility tends to have a population of nonwhites rather than whites, then regardless of what zip codes (or any other system of aggregation) reflect, there is likely to be environmental racism.”<sup>25</sup>

Racism is a difficult and often contentious issue. It is like any other -ism: It is a belief in something that is taken on faith and cannot be proven. Even further, sometimes

rational proof does not change the thinking of one who is a true believer. Racism is the belief that some racially identifiable group is inferior to some other group or does not deserve equal moral or legal protection. This belief then leads to racial discrimination or to actions that are manifested based on this belief, that is, to *de facto* discrimination.

For example, if the belief is that “Orientals” (the title given to Asians throughout much of U.S. history) do not value human life as highly as do Western people (an opinion once famously expressed by General Westmoreland during the Vietnam war), it is a small matter to kill indiscriminately all who have Oriental features, including noncombatants. Drawing such distinctions can be a tool for desensitization. Such dehumanization has been a common tool in warfare throughout history.

In the case of environmental justice, racial discrimination can be defined as “. . . those institutional rules, regulations, and policies of government or corporate decisions that deliberately target certain communities for least desirable land uses, resulting in the disproportionate exposure of toxic and hazardous waste on communities based upon prescribed biological characteristics. Environmental racism is the unequal protection against toxic and hazardous waste exposure and the systematic exclusion of (disadvantaged groups) from decisions affecting their communities.”<sup>26</sup>

But saying that this occurs and proving it are two different issues. There seems to be no doubt as to the fact that racially identifiable socioeconomic groups have been unfairly treated in terms of environmental contamination. But is this due to *racial* discrimination? If such discrimination can be shown to be racially motivated, the Civil Rights Act Title VI §601, which makes racial discrimination illegal, can be used to correct the injustice. Proving racial discrimination is, however, quite difficult. What has to happen to prove that racial discrimination has occurred is for the person responsible to admit that he or she intentionally discriminated on the basis of race. This is an admission of guilt and thus unlikely ever to occur.

Also, much of the alleged discrimination is “corporate” (i.e., there is no single person or small group of persons engaging in the acts of discrimination). It is more a manifestation of company or other corporate policies and actions. Finding the “guilty parties” can be a tortuous process.

In fact, some disparate exposure to pollutants may not have been brought about by overt individual or corporate discrimination, but may be the direct result of demographic shifts. For example, at one time in the history of many U.S. cities, working-class whites lived near factories and other facilities known to release contaminants into the air and water. People wanted to live near the plants because transportation was limited. As better transportation systems evolved, along with improved wages as a result of unions and other social movements in the first half of the twentieth century, the people working in the factories were able to move farther away into the suburban or exurban housing developments. This left the remaining neighborhoods adjacent to the pollution sources less desirable and consequently, available at relatively low prices. As a result, lower-socioeconomic-status families moved into these areas. Thus, an entirely new demographic group evolved (i.e., people who received no wages or other monetary benefits of the factories received most of the exposure to the pollutants being released). Although this is not an example of direct discrimination, it does reflect an overall injustice: People are put at risk without any contravening benefit except a cheap place to live. In a sense, they are tenants or owners of “last resort.”

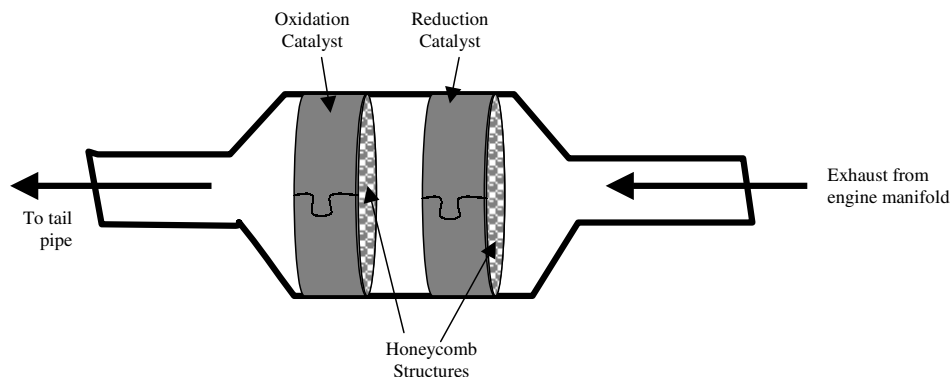
### ***Discussion: Engineering Justice Systematically***

One of the key lessons learned as we crossed the threshold into this new millennium is that of the need to provide sustainable solutions (See Chapter 6). In environmental matters, no project can be viewed as truly independent. It affects and is affected by other projects. In order to ensure that the public health and welfare are protected, engineers must make certain to view each design as a part of a system. We can take a lesson from thermodynamics, which requires that we account for every input and output of mass or energy within a control volume. Every element of that system is related in some way to every other element. Although the elements may be independent, they are always interrelated to every other element in the system. This systematic reality has been recognized in the political arena as well. For example, Executive Order 12898 calls upon the agencies of the federal government to determine up front whether their projects and decisions will burden any groups unfairly.

However, the track record for a systematic view is not so good in the relatively brief history of environmental science. One would hope that the entire project life, from design through use to decommissioning (i.e., the “life cycle”) would be part of every important environmental decision. And, by extension, one of the lessons learned for environmental justice is to think about long-term impacts on society. Unfortunately, there are a number of cases that indicate our approach is all too often that of reaction and “retrofitting,” much like the decisions of convenience in the 1970s regarding the best way to remove pollutants found in car exhaust that were contributing to smog. At that time, decision makers in the government and in automobile companies were assessing the optimal means of reducing hydrocarbons that were being released from mobile sources (i.e., cars, trucks, buses, and trains). The options boiled down to whether to redesign and retool internal combustion engines to improve efficiency and consequently reduce emissions or to find a way to retrofit or “add on” a product without making major changes to the engines.

The large U.S. automobile manufacturers decided to retain the basic engine designs, merely adding a catalytic converter to the exhaust system. A catalytic converter uses metal catalyst pellets (e.g., platinum) to oxidize hydrocarbons to water and CO<sub>2</sub> and convert carbon monoxide, CO, to CO<sub>2</sub> (see Figure 1.3.) This could be likened to putting “Band-aids” on inefficient engines, but the automotive engineers insisted that this would be the most cost-effective way to reduce emissions. These same engineers were shocked and embarrassed when Japanese automobile manufacturers, most notably Honda, chose the second alternative, to produce highly efficient engines that did not require catalytic converters. The Japanese engineers decided that the reduction of emissions was an essential and integral part of engine design. American engineers, on the other hand, decided to use a bolt-on device to solve the problem without attacking the fundamental source of the emissions.<sup>27</sup>

A case can be made that this is what is often the approach taken to address environmental injustices. At the federal level, each department and



**Figure 1.3** Design components of a catalytic converter. The hydrocarbons in the exhaust are first catalytically reduced (e.g., the addition of hydrogen atoms), followed by catalyzed oxidation (e.g., to carbon dioxide and water). If untreated, the exhaust's volatile organic compounds will react photochemically in the atmosphere to form ozone and other air pollutants.

agency has a unique mission defined by enabling legislation. These agencies are evaluated by the American people and their elected representatives on how well the missions are accomplished. That is one of the purposes of congressional oversight, for example. So when a new initiative comes along, agencies are more likely to see it as an ancillary objective, or worse, as an obstacle in the way of the “real” business of achieving their mission. This was a common occurrence in the early days of the National Environmental Policy Act (NEPA), which called upon federal agencies to rethink their missions regarding the environment. Like the EJ executive order, NEPA defined a new “ethic” in how the federal government does business, making environmental policy a leading priority. Specifically, NEPA created the environmental impact statement (EIS), which was required for any major federal action with potential impacts on the environmental quality.<sup>28</sup> But agencies often resisted the new policy. The frustration of environmental advocates was that the agencies were simply “making environmental silk purses from the bureaucratic mission-oriented sow ears.”<sup>29</sup> Can this be said about the governmental and legal response to past environmental injustices today?

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## WHAT ENGINEERS CAN DO

Environmental injustice may seem intractable, but progress is being made. It is a problem that we are not going to solve in this book, although we do hope to give a few pointers on how to recognize and deal with injustice. The facts are that environmental inequality exists and that often it is the minority populations and lower socioeconomic groups in our country who bear the brunt of the pollution. We may help to solve some of these

problems if the engineering community is increasingly aware of its influence on preventing injustice. As such, we point out a few things along the way that the individual professional can do to avoid inadvertently becoming a party to injustice and to take positive steps in one's profession to be empathic to all clients, not just those who procure our services directly.

The problems highlighted above seem to be a blend of legal, moral, and technical factors with one common outcome (i.e., injustice). But engineers are trained to be technical experts only. Yes, we practice in a milieu of law, politics, and social sciences, but our forte is within the realm of the physical sciences and engineering principles.

The contemporary engineering profession is demanding that we be better equipped technically and technologically as well as in the social and human sciences. This calls for a systematic approach to engineering education and practice, which is consistent with elements defined by the National Academy of Engineering to be included in guiding strategies for the engineer of the future: Applying engineering processes to define and to solve problems using scientific, technical, and professional knowledge bases requires:

- Engaging engineers and other professionals in team-based problem solving
- Using technical tools
- Interacting with clients and managers to achieve goals
- Setting boundary conditions from economic, political, ethical, and social constraints to define the range of engineering solutions and to establish interactions with the public<sup>30</sup>

The remainder of this book navigates through both of the engineer's worlds, the technical and the social. It does so without excuses. If an equation, reaction, or chemical description is pertinent to a discussion, it is included. If a topic were watered down to make a point about a social issue, it would lose its import and impact. The only way to be a just engineer is to know one's business and to apply that business in a manner sensitive to contemporary social needs. Thus this book is both technical and presents the lessons with an eye toward the socially important issues surrounding each engineering core competency.

### **CASE STUDY: THE WARREN COUNTY PCB LANDFILL REVISITED**

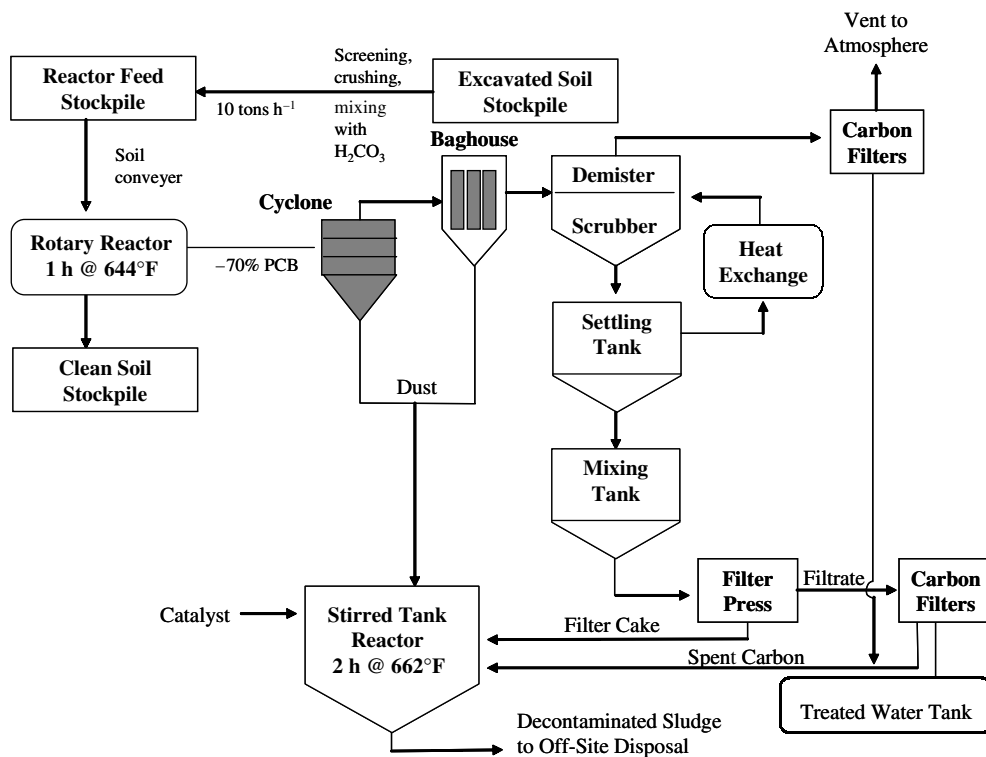
As noted above, the Warren County PCB landfill was constructed in 1982 to contain soil that was contaminated by the illegal spraying of oil containing PCBs from over 340 km of highway shoulders. The landfill received soil contaminated with over 100,000 liters of oil from 14 North Carolina counties.

The landfill was located on a 142-acre tract about three miles south of the town of Warrenton and held about 60,000 tons of contaminated soil collected solely from the contaminated roadsides. The U.S. EPA permitted the landfill under the Toxic Substances Control Act, which is the controlling federal regulation for PCBs. The state owns approximately 19 acres of the tract, and Warren County owns the remaining acreage surrounding the state's property. The containment area of the landfill cell occupied approximate 3.8 acres enclosed by a fence. The landfill surface dimension was approximately 100 meters by 100 meters with a depth of approximately 8 meters of con-



taminated soil at the center. The landfill was equipped with both polyvinyl chloride and clay caps and liners, with a dual leachate collection system. The landfill was never operated as a commercial facility.

In 1994, a state-appointed working group, consisting of members of the community and representatives from the state, began an in-depth assessment of the landfill and a study of the feasibility of detoxification. Tests using landfill soil and several treatment technologies were conducted. In 1998, the working group selected base-catalyzed decomposition (BCD) as the most appropriate technology (see Figure 1.4). Approximately \$1.6 million in state funds had been spent by this time. In 1999 the working group fulfilled its mission and was re-formed into a community advisory board. In the BCD process, PCBs are separated from the soil using thermal desorption. Once separated, the PCBs are collected as a liquid for treatment by the BCD process. BCD is a nonincineration chemical dechlorination process that transforms PCBs, dioxins, and furans into nontoxic compounds. In the process,



**Figure 1.4** Base-catalyzed decomposition. This is the process recommended to treat PCB-contaminated soil stored in Warren County, North Carolina. (From Federal Remediation Technologies Roundtable, *Screening Matrix and Reference Guide*, 4th ed., FRTR, Washington, DC, 2002.)

chlorine atoms are chemically removed from the PCB, and dioxin and furan molecules and replaced with hydrogen atoms. This converts the compounds to biphenyls, which are nonhazardous. Treated soil is returned to the landfill and the organics from the BCD process are recycled as a fuel or disposed off-site as nonhazardous waste.

The cleanup target of 200 parts per billion (ppb) was established by the working group for the landfill site and was made a statutory requirement by the North Carolina General Assembly. The EPA cleanup level for high-occupancy usage is 1 part per million (ppm). EPA's examples of high-occupancy areas include residences, schools, and day care centers. The plan is an example of a conservative and precautionary design, since these areas are likely to have greater exposures than those at a landfill, which limits contact and access, and because the cleanup target is five times lower than the EPA requirement.<sup>31</sup> The removal of PCBs from the soil will eliminate further regulation of the site and permit unrestricted future use.

A public bid opening was held on December 22, 2000 for the site detoxification contract. The IT Group, with a bid of \$13.5 million, was the low bidder. Existing funds were sufficient to fund phase I. A contract was established into with the IT Group, and a notice to proceed was issued on March 12, 2001. Site preparation work was completed in December 2001. Work included the construction of concrete pads and a steel shelter for the processing area, the extension of county water, an upgrade of electrical utilities, and the establishment of sediment and erosion control measures.

The treatment equipment was delivered in May 2002. An open house was held onsite the next month so that community members could view the site and equipment before startup. Initial tests with contaminated soil started at the end of August 2002. The EPA demonstration test was performed in January 2003. An interim operations permit was granted in March based on the demonstration test results. Soil treatment was completed in October 2003. A total of 81,600 tons of material was treated from the landfill site. The treated materials included the original contaminated roadside soil and soil adjacent to the roadside material in the landfill that had been cross-contaminated. The original plan, which specified using the BCD process to destroy the PCBs after thermal desorption and separate them from the soil, was overdesigned. With only limited data available to estimate the quantity of liquid PCBs that would be collected, conservative estimates were used to design the BCD reactor. In practice, however, the quantity of PCBs recovered as liquid was much less than anticipated. Thus, the BCD reactor tanks were too large to be used for the three-run demonstration test required under TSCA to approve the BCD process. As an alternative, one tankload of liquid containing PCBs was shipped to an EPA-permitted facility for destruction by incineration. Most of the equipment was decontaminated and demobilized from the site by the end of 2003. Site restoration will be complete once vegetation has become established. The total cost of the project was \$17.1 million.

## REFERENCES AND NOTES

1. R. Nieburhr, *The Children of Light and the Children of Darkness*, Charles Scribner's Sons, New York, 1944, foreword.
2. Martin Luther King, Letter from Birmingham Jail, in *Why We Can't Wait*, HarperCollins, New York, 1963.
3. Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, February 11, 1994.
4. For example, this is the fourth canon of the American Society of Civil Engineers' *Code of Ethics*, ASCE, Washington, DC, adopted in 1914 and most recently amended November 10, 1996. This canon reads: "Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest."
5. Even this is a challenge for environmental justice communities, since certain sectors of society are less likely to visit hospitals or otherwise receive early health care attention. This is not only a problem of assessment but can lead to more serious, long-term problems compared to those of the general population.
6. W. Burke, W. D. Atkins, M. Gwinn, A. Guttmacher, J. Haddow, J. Lau, G. Palomaki, N. Press, C. S. Richards, L. Wideroff, and G. L. Wiesner, Genetic Test Evaluation: Information Needs of Clinicians, Policy Makers, and the Public, *American Journal of Epidemiology*, 156:311–318, 2002.
7. Institute of Medicine, *Toward Environmental Justice: Research, Education, and Health Policy Needs*, National Academies Press, Washington, DC, 1999.
8. The principal source for the facts and timelines associated with the Warren County PCB landfill is the North Carolina Department of Environment and Natural Resources, Warren County PCB Landfill Fact Sheet, [http://www.wastenotnc.org/WarrenCo\\_Fact\\_Sheet.htm](http://www.wastenotnc.org/WarrenCo_Fact_Sheet.htm), accessed June 28, 2005.
9. A *substituent* is an atom or group of atoms that replace the hydrogen atom on an organic compound. In this case, the substituent is chlorine (Cl), but numerous other elements can replace hydrogen. After replacement, the physical and chemical properties can change significantly. For example, halogens such as Cl frequently raise the flash point and boiling point and make compounds less water soluble. Unfortunately, the replacements may render a rather nontoxic compound carcinogenic or increase the toxicity of an already toxic compound.
10. Both Ward and Burns were convicted and did jail time for their crime.
11. B. B. Marriott, Land Use and Development, in *Environmental Impact Assessment: A Practical Guide*, McGraw-Hill, New York, 1997.
12. See M. Ritzdorf, Locked Out of Paradise: Contemporary Exclusionary Zoning, the Supreme Court, and African Americans, 1970 to the Present, in *Urban Planning and the African American Community: In the Shadows*, J. M. Thomas and M. Ritzdorf (Eds.), SaGE Publications, Thousand Oaks, CA, 1997.
13. From K. Shrader-Frechette, *Environmental Justice: Creating Equality, Reclaiming Democracy*, Oxford University Press, New York, 2002.
14. From D. E. Newton, *Environmental Justice*, Oxford University Press, New York, 1996.
15. Commission for Racial Justice, United Church of Christ, *Toxic Wastes and Race in the United States*, UCC, Cleveland, OH, 1987.
16. Presidential Executive Order 12898, note 3.
17. Much of the materials for the next two sections can be found in *Not in My Backyard: Executive Order 12898 and Title VI as Tools for Achieving Environmental Justice*, U.S. Commission on Civil Rights, Washington DC, October 2003.

18. <http://www.great-lakes.net/lists/enviro-mich/1998-09/msg00016.html>, accessed June 29, 2005.
19. Around the Nation: Congressman and 120 Arrested at PCB Protest *The New York Times*, September 27, 1982, p. A16.
20. Shrader-Frechette, note 13.
21. R. Rosen, Who Gets Polluted? The Movement for Environmental Justice, in *Taking Sides*, T. D. Goldfarb (Ed.), McGraw-Hill, New York, 1997.
22. This case is based on the report by S. Azar, The Proposed Eubanks Road Landfill: The Ramifications of a Broken Promise, Duke University, Durham, NC, 1998.
23. R. K. Vosburgh, *Economics, Change, and the Law of Unintended Consequences*, Pace Law School, New York, February 19, 2003.
24. E. Coakley, "Landfill Transfer Station Opposed," *The Herald-Sun*, Durham, NC, March 19, 2006.
25. Shrader-Frechette, note 13.
26. B. Bryant, (Ed.), *Environmental Justice: Issues, Policies, and Solutions*, Island Press, Washington, DC, 1995.
27. Often, there are blessings in disguise in environmental protection. In this case, the fact that the auto makers vied for catalytic converters led to the need for oil companies to provide gasoline without lead compounds. Up to the 1970s, gasoline commonly contained lead-based, antiknock, octane-enhancing compounds because this allowed for less expensive refining. A common engineering economics concept is that of the law of diminishing returns, which in this case meant that the costs of refining to get just a bit more caloric efficiency (octane boosting) become far more expensive with each incremental increase. Thus the companies would refine to a certain octane rating and then add compounds, in this case tetraethyllead, to the fuel. However, since the lead has affinity for the metal pellets (catalysts) in the catalytic converter, after a few tanks the converters were rendered ineffective (i.e., the pellets were coated with lead, which is not a catalyst). This meant that "no lead" gasoline had to be provided. As a result, studies began to show marked decreases in the concentrations of lead in the air and soil near roadways, which in turn led to an all-out lead ban in most of North America in the coming decades. This is an example of doing the right thing for the wrong reasons.
28. Section 102 of NEPA, 42 U.S.C. §4321 et seq., Public Law 91-190, 83 Stat. 852.
29. Although we have been unable to locate the citation, this is very close to a mid-1970s quote heard by Vallero from Timothy Kubiak, who at the time was an EIS reviewer for the U.S. EPA and who had studied NEPA under Lynton K. Caldwell, a strong advocate for a national environmental policy, at the University of Indiana.
30. National Academy of Engineering, *Educating the Engineer of 2020: Adapting Engineering Education to the New Century*, National Academies Press, Washington, DC, 2005.
31. Similar protective approaches have frequently been used in emergency response and remedial efforts, such as those that followed the attacks on the World Trade Center towers. For example, the risk assessments assumed long-term exposures (e.g., 30 years) to contaminants released by the fire and fugitive dust emissions, even though the exposures were significantly shorter.