

US EPA ARCHIVE DOCUMENT

FACTORS FOR IDENTIFYING AND ASSESSING DISPROPORTIONATE ENVIRONMENTAL HEALTH IMPACTS

INTRODUCTION

In December 2000, the United States Environmental Protection Agency's (EPA) Office of General Counsel (OGC) issued *EPA Statutory and Regulatory Authorities Under Which Environmental Justice Issues May Be Addressed in Permitting*.¹ In this Memorandum, OGC discussed the legal authorities under the Resource Conservation and Recovery Act, the Clean Water Act, the Safe Drinking Water Act, the Marine Protection, Research, and Sanctuaries Act, and the Clean Air Act that it believed were available to address environmental justice issues during permitting. EPA has long embraced the view that its existing statutory and regulatory authorities are sufficient to address environmental justice issues not only in permitting, but in many of its other activities, including enforcement and compliance, cleanup and remediation, and rulemaking actions under these existing authorities.

In order to appropriately utilize EPA's statutory and regulatory authorities to address environmental justice issues, however, EPA must develop a cogent, practicable and evidence-based approach to identifying and assessing disproportionate environmental health impacts. Institutionalizing such a methodology is a critical challenge for EPA. The Agency has stated that "minority and/or low-income communities frequently may be exposed disproportionately to environmental harms and risks."² Since 1992, EPA has learned many lessons in fulfilling its commitment to "protect these and other burdened communities from adverse human health and environmental effects of its programs, consistent with environmental and civil rights laws, and their implementing regulations, as well as Executive Order 12898."³

One such lesson that EPA has learned is that there is great need for a cogent, practicable, evidence-based approach to identifying and assessing disproportionate impacts. For example, EPA has made significant progress towards incorporating environmental justice considerations in the Agency's rulemaking process.⁴ Nonetheless, EPA's progress could have been greater if it had a practicable answer to the question of what disproportionate impacts look like. Recent efforts to develop protocols for conducting environmental justice program reviews also focused attention on the need to develop a viable approach to examining the substantive issues related to environmental justice.

¹ U.S. Environmental Protection Agency, "EPA Statutory and Regulatory Authorities Under Which Environmental Justice Issues May Be Addressed in Permitting," December 1, 2000. See: http://www.epa.gov/compliance/resources/policies/ej/ej_permitting_authorities_memo_120100.pdf

² U.S. Environmental Protection Agency (U.S. EPA), "Reaffirming the U.S. Environmental Protection Agency's Commitment to Environmental Justice" 4 November 2005, <http://www.epa.gov/compliance/resources/policies/ej/admin-ej-commit-letter-110305.pdf> (accessed November 18, 2007).

³ Ibid

⁴ U.S. Government Accountability Office, "Environmental Justice: EPA Should Devote More Attention to Environmental Justice When Developing Clean Air Rules," GAO- 05-289, July 2005. See: <http://www.gao.gov/new.items/d05289.pdf>

Our long-term goal is to equip the Agency with the tools to achieve and demonstrate significant measurable environmental and public health results in communities disproportionately burdened by environmental harms and risks. To that end, EPA strives to ensure that no population should bear a disproportionate burden from the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. This larger vision and the day-to-day challenges of integrating environmental justice in the Agency's programs, policies, and activities combine to make developing a cogent, practicable and evidenced-based approach to identifying disproportionate environmental impacts a priority.

This paper describes important progress made towards developing such an approach. Specifically, it introduces a set of substantive factors to identify disproportionate environmental impacts. Initially, these factors will provide a framework for determining what to look for when a rulewriter, permit writer, or other analyst seeks to incorporate environmental justice considerations, particularly the notion of disproportionate impacts, in a decision. When fully developed, the factors will form the basis for the cogent, practicable, and evidence-based methodology that a mature environmental justice program needs.

FACTORS TO IDENTIFY AND ASSESS DISPROPORTIONATE ENVIRONMENTAL HEALTH IMPACTS

Since the 1980s, numerous studies have documented serious environmental inequities in the areas of lead poisoning; air pollution and ambient air quality; groundwater contamination and drinking water safety; proximity to noxious facilities, mining waste and nuclear plants; location of municipal landfills, incinerators, and abandoned toxic waste sites; placement of transportation thoroughfares; illegal dumping; occupational health and safety; use of agricultural chemicals; contaminated fish consumption; habitat destruction; cleanup of Superfund sites; and unequal enforcement of environmental laws.⁵

⁵ See P.J. Landrigan, S.H. Gehlbach, B.F. Rosenblum et al., "Epidemic Lead Absorption Near an Ore Smelter: The Role of Particulate Lead," 292 *New England Journal of Medicine* 123 (1975): 123-129; M. Davis, "The Impact of Workplace Health and Safety on Black Workers: Assessment and Prognosis," 31 *Labor Law Journal* 4 (1981): 723-724; R.D. Bullard, "Solid Waste Sites in the Black Houston Community," 53 *Social Inquiry* (1983): 273-288; U.S. Department of Health and Human Services (U.S. HHS), "Report of the Secretary's Task Force on Black and Minority Health" (1985); R. Wasserstrom & R. Wiles, *FIELD DUTY, U.S. FARM WORKERS AND PESTICIDE SAFETY* (World Resources Institute, 1955); United Church of Christ Commission for Racial Justice, "Toxic Wastes and Race in the United States: A National Study on the Racial and Socioeconomic Characteristics of Communities Surrounding Hazardous Waste Sites" (1987); Agency for Toxic Substances & Disease Registry (ATSDR), "The Nature and Extend of Lead Poisoning in Children in the United States" (1988); M. Moses, "Pesticide Related Health Problems in Farm Workers," 37 *Association of Occupational Health Nurses Journal* (1989): 115-130; K. Weiss & D. Wagener, "Changing Patterns of Asthma Mortality: Identifying Target Populations at High Risk," 264 *Journal of the Annals of the Medical Association* 13 (1990): 1683-87; R.D. Bullard, ed., *DUMPING IN DIXIE: RACE, CLASS, AND ENVIRONMENTAL EQUITY* (Boulder, CO: Westview Press, 1990); U.S. EPA, "Report to the Administrator: Environmental Equity: Reducing Risk for All Communities" (EPA230-R-92-008, 1992); P.C. West, F. Fly, R. Marans, "Minority Anglers and Toxic Fish Consumption: Evidence from a State-Wide Survey of Michigan," in *RACE AND THE INCIDENCE OF ENVIRONMENTAL HAZARDS: A TIME FOR DISCOURSE*, eds. B. Bryant and P. Mohai, (Boulder, CO: Westview Press, 1992); M. Lavelle & M. Coyle, "Unequal Protection: The Racial Divide in Environmental Protection," 15 *National Law Journal (Special Issue)* 3 (1992); Louisiana Advisory Committee to the United States Civil Rights Commission (U.S. CRC, "The Battle for Environmental Justice in Louisiana: Government, Industry and the Public," Kansas City, MO: U.S. CRC Regional Office (September 1993); K. Sexton & Y. Anderson, eds., "Equity in Environmental Health: Research Issues and Need," 9 *Toxicology and Industrial Health (Special Issue)* 5 (1993): 679-977; D.R. Wernette and L.A. Nieves, "Breathing Polluted Air," 18 EPA

The concept of disproportionate impacts, however, is far more complicated than exposures alone. There is a complex interplay of factors at work in communities with a history of social and economic disadvantage, inadequate services, and environmental hazards. Thus, disproportionate impacts may refer to inequities in levels of harmful environmental exposures, deficient services or benefits, and/or differentials in the ability to withstand or mitigate harms. The Office of Environmental Justice has identified potential factors which contribute to an assessment of disproportionately high and adverse human health and environmental effects, to be the following conditions:

- A) Proximity and Exposure to Environmental Hazards;
- B) Susceptible Populations;
- C) Unique Exposure Pathways;
- D) Multiple and Cumulative Impacts;
- E) Ability to Participate in Decisionmaking Process; and
- F) Vulnerable Physical Infrastructure.

Disproportionately high and adverse human health and environmental effects will likely result from a combination of several, if not all, of the above factors. However, extreme levels of one or two or these factors alone could make a population disproportionately exposed to environmental harms and risks.

A. PROXIMITY AND EXPOSURE TO ENVIRONMENTAL HAZARDS

At the simplest level, disproportionately high and adverse human health and environmental effects can be understood in terms of a community's or population's differential proximity and exposure to environmental hazards. There are many prominent examples, empirical and anecdotal, of communities affected by their proximity to environmental hazards in the environmental justice literature.

One highly visible example of proximity to environmental hazards involved the siting of a polychlorinated biphenyl (PCB) landfill in Warren County, North Carolina in 1982.⁶ In 1980, Warren County had a population of 16,232, of which 64% were African American (in comparison to 24 percent of the state population.). The county ranked 92nd out of 100 counties in median family income in 1980. In the summer of 1978, PCB-contaminated transformer oil was illegally dumped on the shoulder of 210 miles of North Carolina state roads in 14 counties, thereby requiring the construction of a landfill to contain the contaminated soil. Several years later, the landfill constituents leached into the groundwater.

Journal (1992):16-17; J. Friedman, "Achieving Environmental Justice: The Role of Occupational Health," 21 *Fordham Urban Law Journal* 3 (1994): 605-631; C.A. O'Neill, "Variable Justice: Environmental Standards, Contaminated Fish, and 'Acceptable' Risk to Native Peoples," 19 *Stanford Environmental Law Journal* 1 (2000):1-118.

⁶ R.D. Bullard, "Environmental Justice in the Twenty-first Century," in *THE QUEST FOR ENVIRONMENTAL JUSTICE: HUMAN RIGHTS AND THE POLITICS OF POLLUTION*, ed. R.D. Bullard (Sierra Club Books, 2005), 38-41.

Other examples are:

- **Tucson International Airport:** Trichloroethylene (TCE) seeped into the aquifer and created a toxic groundwater plume 5 miles long and 2 miles wide affecting a predominantly Latino community in Tucson, Arizona.⁷ Residents secured a health clinic and won a \$84.5 million settlement with Hughes Missiles Systems Co.
- **Native Alaskan Villages:** Some 650 military installations throughout the State of Alaska, active and abandoned, pollute land, groundwater, wetlands, streams and air with fuel spills, pesticides, solvents, munitions, and radioactive materials.⁸ As a result, unique and intractable cleanup issues confront the Alaska Native population of 100,000.
- **Houston Ship Channel:** A University of Texas School of Public Health study showed that children living within two miles of the heavily industrialized Houston Ship Channel have a 56 percent greater risk of contracting acute lymphocytic leukemia than children living farther away. Epidemiologists found the risk was associated with some of the toxic pollutants released by the petrochemical plants. The neighborhoods are more than 90 percent Hispanic.⁹

Empirical studies on disproportionate proximity of minority and/or low-income populations include:

- **Hazardous Waste Sites:** A 2007 United Church of Christ report found that host neighborhoods of commercial hazardous waste facilities are 56% people of color whereas nonhost areas are 30% people of color. Poverty rates in the host neighborhoods are 1.5 times greater than nonhost areas (18% vs. 12%).¹⁰
- **Ambient Air Quality:** More than 19 million Hispanics, or 50 percent, live in areas that violate the federal air pollution standard for ozone. Thirty-nine percent of the Latino population lives within 30 miles of a power plant.¹¹
- **Toxic Release Inventory (TRI) Facilities:** In the nine-county area around San Francisco, California, two-thirds of residents who live within one mile of a TRI facility are minority, while nearly two-thirds of people who live more than 2.5 miles are white. Recent immigrants are nearly twice as likely to live within one mile of a TRI facility as they are if they lived 2.5 miles away.¹²
- **Concentrated Animal Feeding Operations (CAFOs):** In North Carolina, University of North Carolina and the Concerned Citizens of Tillery found 18.9 times as many hog operations in the highest quintile of poverty as compared to the lowest.¹³

⁷ <http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/vWSOAlphabetic?openview>

⁸ http://www.akaction.org/Overview_Military_Sites_in_Alaska_Impacts_to_Environment_and_Communities.htm

⁹ University of Texas School of Public Health, <http://publicaffairs.uth.tmc.edu/media/newsreleases/nr2007/sph-shipchannel.html> (accessed November 19, 2007); see also: Dallas Morning News, July 29, 2007, http://www.dallasnews.com/sharedcontent/dws/news/nation/stories/DN-pollute_29tex.ART.State.Edition1.4265fc5.html (accessed November 18, 2007).

¹⁰ United Church of Christ, "Toxic Wastes and Race at Twenty," <http://www.ejrc.cau.edu/TWART%20Final.pdf> (accessed November 17, 2007).

¹¹ League of United Latin American Citizens, "Air of Injustice: How Air Pollution Affects Hispanics and Latinos," July 2004, <http://www.cleartheair.org/proactive/newsroom/release.vtml?id=25660> (accessed November 19, 2007).

¹² M. Pastor, R. Morello-Frosch, and J. Sadd, "Still Toxic After All These Years ... Air Quality and Environmental Justice in the Bay Area," http://cjtc.ucsc.edu/docs/bay_final.pdf (accessed November 17, 2007)

¹³ S. Wing, D. Cole, and G. Grant, "Environmental Injustice in North Carolina's Hog Industry," 108 *Environmental Health Perspectives* 3 (March 2000): 225-23, <http://www.ehponline.org/docs/2000/108p225-231wing/abstract.html> (accessed November 19, 2007).

Proximity to a source can serve as a surrogate for actual contact with a toxicant.¹⁴ For a full and accurate picture of human health and environmental effects, proximity data should be augmented with exposure studies, based on modeling, actual monitoring, and/or other approaches. For example, the South Bronx is a low-income, minority community in New York City, with one of the highest asthma rates in the country.¹⁵ The South Bronx Environmental Health and Policy Study, conducted by the New York University Wagner Graduate School of Public Service/Institute for Civil Infrastructure Systems, found modeled concentrations of traffic-related particulate matter and nitrogen oxides to be two to five times higher around South Bronx highways than in other parts of the South Bronx. A group of schoolchildren carried monitors everywhere they went. The instruments, attached to the backpacks of children with asthma, allowed researchers to measure the pollution the children were exposed to, morning to night. If you live in the South Bronx, your child is twice as likely to attend a school near a highway as other children in the city.¹⁶

B. SUSCEPTIBLE POPULATIONS

Susceptible populations are groups who are at a high risk of suffering the adverse effects of environmental contamination. Certain factors render different groups less able to resist, or tolerate, an environmental stressor. Such susceptibility factors may be intrinsic in nature, such as age, sex, genetics, race or ethnicity. In addition, they may be acquired, such as chronic medical conditions, health-care access, nutrition, fitness, other pollutant exposures, and drug and alcohol use.¹⁷ Issues of environmental justice strongly implicate the relationship of socioeconomic status to susceptibility.¹⁸

One prime example of a susceptible population is children, particularly from minority and/or low-income backgrounds. Children may be more vulnerable to environmental exposures than adults because:

- Their bodily systems are still developing;
- They eat more, drink more, and breathe more in proportion to their body size; and
- Their behavior can expose them more to chemicals and organisms.

¹⁴ Institute of Medicine, Committee on Environmental Justice, "TOWARD ENVIRONMENTAL JUSTICE: RESEARCH, EDUCATION, AND HEALTH POLICY NEEDS (Washington, DC: National Academies Press, 1999): 16, http://books.nap.edu/catalog.php?record_id=6034#toc (accessed November 19, 2007).

¹⁵ http://www.icisnyu.org/south_bronx/projectssummary_000.html

¹⁶ NYU Wagner Graduate School of Public Service/Institute for Civil Infrastructure Systems, http://www.icisnyu.org/south_bronx/index_001.html (accessed November 17, 2007).

¹⁷ See Ken Sexton, "Sociodemographic Aspects of Human Susceptibility to Toxic Chemicals: Do Class and Race Matter for Realistic Risk Assessment?" 4 *Environmental Toxicology and Pharmacology* 3-4 (1997): 261-269, http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6T6D-3S7WJ27-C&_user=14684&_coverDate=12%2F31%2F1997&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000001678&_version=1&_urlVersion=0&_userid=14684&md5=e0493fb8924879b9a92aefccba8e2205 (accessed November 19, 2007).

¹⁸ Marie S. O'Neill et al., "Health, Wealth, and Air Pollution: Advancing Theory and Methods," 111 *Environmental Health Perspectives* 16 (2003): 1861, 1865, <http://www.ehponline.org/docs/2003/6334/abstract.html> (accessed November 19, 2007).

Minority and/or low-income children are even more at risk because factors such as poverty, poor nutrition, pre-existing health conditions, lack of access to health care, lack of information, lack of exercise, psychosocial stress, and lack of social capital, contribute to greater susceptibility to environmental hazards.¹⁹ As a result, certain groups are particularly susceptible to environmental harms and risks. A few examples are illustrated below:

- Although asthma is found in all populations, some racial and ethnic groups experience it at higher rates, such as African Americans and Puerto Ricans.²⁰
- Farmworkers suffer a high rate of pesticide-related illnesses each year, particularly among children and pregnant women who work in the fields, and often do not earn enough to pay for proper health care.²¹
- The infant mortality rate for blacks is still twice the rate for white infants. Birth defect mortality is consistently higher among black, as compared to white, infants.²²
- The Food Quality Protection Act of 1996 (FQPA) provided important new protections for the nation's consumers, with special emphasis on ensuring the protection of infants and children. The FQPA included an additional tenfold margin of safety that shall be applied when considering pesticides in the diets of infants and children.²³

UNIQUE EXPOSURE PATHWAYS

An exposure pathway is the route a substance takes from its source (where it began) to its endpoint (where it ends), and how people can come into contact with (or get exposed to) it. Some communities sustain unique environmental exposures because of practices linked to their cultural background or socioeconomic status.

For example, some indigenous peoples, and some Asian and Pacific Island immigrant populations, rely on subsistence fishing as a culturally specific practice based upon a worldview that values a human connection to the environment in both physical and spiritual well-being.²⁴ A subsistence fishing diet poses potential health risks from toxics exposure, such as mercury. Mercury is an extraordinarily toxic heavy metal that bioaccumulates in the environment. Approximately 60% of air deposition annually comes from human sources, particularly power plants and mercury-cell chlor-alkali facilities. Empirical studies document 90th percentile fish consumption rates for various affected communities and Tribes at 225 g/day (grams per day), 242 g/day, and 489 g/day.²⁵ Some subsistence populations consume as much as 733.46 g/day.²⁶

¹⁹ *Id.*

²⁰ http://www.epa.gov/asthma/pdfs/asthma_fact_sheet_en.pdf

²¹ National Center for Farmworker Health, Inc. - http://www.ncfh.org/aaf_03.php; Maternal Fact Sheet - <http://www.ncfh.org/docs/fs-MATERNAL%20FACT%20SHEET.pdf>

²² CDC - http://www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57_02.pdf

²³ EPA Staff Paper - <http://www.epa.gov/oppfead1/trac/10xiss.htm>

²⁴ Mary Arquette et al., "Holistic Risk-Based Environmental Decision-Making: A Native Perspective," 11 *Environmental Health Perspectives*, Supplement 2, (2002): 259-264, <http://www.ehponline.org/docs/2002/suppl-2/259-264arquette/abstract.html> (accessed November 19, 2007).

²⁵ National Environmental Justice Advisory Council (NEJAC), "Environmental Justice and Fish Consumption" (November 2002): 37-28, http://www.epa.gov/compliance/resources/publications/ej/nejac/fish-consump-report_1102.pdf (accessed November 14, 2007); see also C. O'Neill, *supra* at 51-54; see also C.O'Neill, "Mercury, Risk and Justice," 34 *Environmental Law Reporter* 12 (2004), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1004769 (accessed November 15, 2007).

One study shows consumption rates as high as 1453.6 g/day.²⁷ In the National Health and Nutrition Examination Survey (NHANES) for the years 1999-2002, study subjects who self-identified as Asian, Pacific Islander, Native American, or multiracial had a higher prevalence of elevated blood mercury than all other racial/ethnic participants in the survey.²⁸

Alternatively, economic deprivation, rather than cultural factors, may compel rural or urban poor people to fish in polluted waters to supplement their diets. The following examples illustrate these factors at work:

- African Americans in Detroit engage in higher levels of subsistence fishing from the contaminated Detroit River.²⁹
- In Triana, Alabama, DDT and PCB contamination of the Alabama River lead to some of the highest levels of DDT ever recorded in this African American township. Residents won settlement of \$24 million with Olin Corporation. Fish from the river served as the residents' source of protein.³⁰
- Pica is the habit among malnourished young children of eating dirt or paint chips, thus exposing themselves to lead, because they are hungry.³¹

D. MULTIPLE AND CUMULATIVE IMPACTS

Disadvantaged and underserved communities are likely to suffer a wide range of environmental burdens, ranging from poor air to poor housing. These communities are often more vulnerable to being exposed to environmental harm or have a difficult time coping with or recovering from exposure given the complex interplay of various physical, chemical, biological, social, and cultural factors.³² Analyzing cumulative effects on a community from multiple stressors allows a more realistic evaluation of a community's risk to pollutants.³³ Numerous empirical studies and anecdotal accounts describe low-income and people-of-color communities that are saturated with environmental hazards, such as industrial facilities, landfills, transportation-related air pollution, poor housing, leaking underground tanks, pesticides, and incompatible land uses.³⁴

Examples are:

- **Chester, Pennsylvania:** This city is host to four hazardous and municipal waste facilities. Nonetheless, other companies, such as Soil Remediation Services, Inc. continue to seek permits from the Pennsylvania Department of Environmental Protection (PADEP) to operate more facilities. Sixty-five percent of Chester residents are African-American and the poverty

²⁶ NEJAC, *Id.*

²⁷ NEJAC, *Id.*

²⁸ J.M. Hightower, et al., "Blood Mercury Reporting in NHANES: Identifying Asian, Pacific Islander, Native American, and Multiracial Groups," 114 *Environmental Health Perspectives* 2 (2006): 172-175, <http://www.ehponline.org/members/2005/8464/8464.html> (accessed November 19, 2007).

²⁹ P.C. West et al., *supra*.

³⁰ R.A. Taylor, "Do Environmentalists Care About the Poor?" *U.S. News and World Report* 2 April 1982: 51-52.

³¹ ATSDR Definition - <http://www.atsdr.cdc.gov/glossary.html#G-P->

³² NEJAC Report on Cumulative Risk

³³ *Id.*

³⁴ NEJAC, "Ensuring Risk Reduction for Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts" (2004), <http://www.epa.gov/compliance/resources/publications/ej/nejac/nejac-cum-risk-rpt-122104.pdf> (accessed November 19, 2007).

rate is 25%. Of the residents living in the neighborhoods closest to the permitted facilities, 95% are African American.³⁵

- **Altgeld Gardens:** Dubbed the “toxic donut,” this public housing project in Chicago, Illinois, was built on top of an abandoned landfill in the 1940s and is surrounded by landfills, incinerators, smelters, steel mills, chemical companies, paint manufacturing plant, and a municipal sewage waste facility. With approximately 8,000 residents, 95% of those residents are African-American and 65% of the residents live below poverty level.³⁶
- **Mississippi River Industrial Corridor:** The Mississippi River industrial corridor between Baton Rouge and New Orleans is home to more than 100 petrochemical plants and industrial facilities. In addition, the area is subject to aerial pesticide application, fertilizer runoff, contaminated surface and groundwater, partially treated waste water, smoke from sugar cane burning, and other impacts.³⁷
- **South Bronx:** A recent study found that African-American women in the South Bronx exposed to auto exhaust, cigarette smoke, and incinerators in the third trimester of pregnancy tended to give birth to smaller babies with smaller head circumferences.³⁸

In addition, the chemical-specific focus to assessing environmental health risks fails to account for the fact that low-income and minority communities may be exposed to several different pollutants. The label “toxic hotspots” is often associated with environmental justice, because of a community’s proximity to multiple pollution sources. Environmental scientists have only recently begun to tackle the problem of cumulative risk in the regulatory setting. EPA’s recent *Framework for Cumulative Risk Assessment*³⁹ represents a milestone for both cumulative risk assessment (and environmental justice) because it:

- Takes a broad view of risk, including areas outside of EPA’s regulatory authority and poses questions for which quantitative methods do not yet exist;
- Utilizes a population-based and place-based analysis, rather than an agent-to-receptor analysis;
- Promotes a comprehensive and integrated assessment of risk;
- Recognizes multiple stressors, including chemical and non-chemical, as well as social factors;
- Posits an expanded definition of vulnerability to include both biological and social factors;
- Places a premium on community involvement and partnerships;
- Emphasizes the importance of planning, scoping, and problem-formulation; and
- Links risk assessment to prevention and intervention strategies to meet community health goals.⁴⁰

³⁵ Delco Alliance for Environmental Justice - http://www.ejnet.org/chester/ewall_article.html

³⁶ People for Community Recovery - <http://www.geology.wisc.edu/~wang/EJBaldwin/PCR/>

³⁷ *Id.*

³⁸ F.P. Perera, et al., “Molecular Evidence of an Interaction Between Prenatal Environmental Exposures on Birth Outcomes in a Multiethnic Population,” 112 *Environmental Health Perspectives* 5 (2004): 626-630, <http://www.ehponline.org/members/2004/6617/6617.pdf> (accessed November 19, 2007).

³⁹ U.S. EPA, “Framework for Cumulative Risk Assessment” (2003), <http://cfpub.epa.gov/ncea/raf/recordisplay.cfm?deid=54944> (accessed November 14, 2007).

⁴⁰ *Id.*

E. ABILITY TO PARTICIPATE IN DECISIONMAKING

The ability, or inability, to participate meaningfully in the environmental decisionmaking process contributes to disproportionately high and adverse human health and environmental effects. Two examples of this relationship are:

- The percentage of community members who were registered voters was statistically significant in predicting hazardous waste facility expansion.⁴¹
- A strong correlation exists between periods of greatest community demographic change and the introduction of noxious land uses. These transition periods seem to be low points for community social capital, in terms of stable leaders, networks, and institutions. Pastor and his colleagues coined a term to describe this phenomenon: “ethnic churning.”⁴²

Factors which contribute to the inability of a community to participate fully in the decisionmaking process include:

- Lack of trust;
- Lack of information;
- Language barriers;
- Socio-cultural issues;
- Inability to access traditional communication channels; and
- Limited capacity to access technical and legal resources.

These factors are especially prominent in environmental justice communities, where English may not be the primary language or where there may be cultural and economic differences that affect participation. Numerous examples of these factors are presented in the transcripts and meeting notes of public meetings and hearings of the National Environmental Justice Advisory Council, U.S. Civil Rights Commission, and state environmental justice advisory committees. A more intensive public involvement effort may be required to effectively involve communities that are affected by a combination of any or all of these factors.⁴³

In 2003 EPA released its Public Involvement Policy, following three years of development, internal review and public discussion. The new Policy updates EPA's 1981 Public Participation Policy. The Policy provides guidance to EPA staff on effective and reasonable means to involve the public in EPA's regulatory and program implementation decisions. The core element of the Policy is the recommended seven basic steps for effective public involvement:

- Plan and budget;
- Identify those to involve;
- Consider providing assistance;
- Provide information;
- Conduct involvement;

⁴¹ See James T. Hamilton, “Politics and Social Costs: Estimating the Impact of Collective Action on Hazardous Waste Facilities,” 24 *Rand Journal of Economics* 1(1993):101-125.

⁴² Manuel Pastor Jr. et al., “Which Came First? Toxic Facilities, Minority Move-In, and Environmental Justice,” 23 *Journal of Urban Affairs* 1 (2001): 1-21, <http://www.blackwell-synergy.com/doi/abs/10.1111/0735-2166.00072> (accessed November 19, 2007).

⁴³ How to Involve Environmental Justice Communities – EPA
<http://www.epa.gov/publicinvolvement/brochures/justice.pdf>

- Review and use input and provide feedback to the public; and
- Evaluate involvement.

Following these steps for effective public involvement will make it easier for the public to contribute to the Agency's decisions and will build public trust so that communities most affected by the Agency's decisions will be more likely to accept the outcomes. In environmental justice communities, EPA may have to provide extra encouragement and consider providing assistance to minority and low-income populations to ensure their full participation in the process, and, where possible, may have to provide access to technical or financial resources to support their participation.⁴⁴

The new Policy updates EPA's 1981 Public Participation Policy, recognizing:

- Changing needs of the public;
- New statutes and regulations;
- New and expanded public participation techniques;
- New options for public access to information and involvement through the Internet;
- EPA's emphasis on assuring compliance;
- Increased use of partnerships and technical assistance; and
- Increased capacity of states, tribes and local governments to carry out delegated programs.⁴⁵

EPA has learned many lessons regarding public involvement, particularly since the Agency began integrating environmental justice into its programs, policies, and activities. By enhancing EPA's Public Involvement Policy to incorporate best practices, the Agency expects effective public involvement to become an integral part of EPA's culture, thus improving not only the Agency's decisionmaking processes, but the public's ability to participate in those processes as well.⁴⁶

F. VULNERABLE PHYSICAL INFRASTRUCTURE

The physical infrastructure, such as poor housing or proximity to transportation hubs, contributes to making the community vulnerable to environmental hazards. Some examples are:

Housing: Since its inception in the 1990s, the environmental justice movement has broadened to consider not only the effects of chemical pollutants on disproportionately impacted communities, but the effects of the built environment as well. For many low-income families, housing is still unaffordable, and many families are living in substandard housing. Communities that live in substandard housing are at risk for lead poisoning or respiratory diseases.⁴⁷

There is overwhelming evidence that the major high dose source of lead exposure for most children in the U.S. today is existing lead-based paint in older housing and the contaminated dust

⁴⁴ EPA's Public Involvement Policy 2003 - <http://www.epa.gov/publicinvolvement/pdf/policy2003.pdf>

⁴⁵ See <http://www.epa.gov/publicinvolvement/public/index.htm> (accessed November 17, 2007).

⁴⁶ EPA Framework for Public Involvement Policy - <http://www.epa.gov/publicinvolvement/policy2003/framework.pdf>

⁴⁷ Health, Equity, and the Built Environment – Howard Frumkin, http://findarticles.com/p/articles/mi_m0CYP/is_5_113/ai_n13807313/pg_1?tag=artBody;col1

and soil it generates. A HUD survey of the nation's housing stock, conducted in 2000, shows the estimated number of homes with lead paint to be 38 million. Of the 38 million housing units with lead paint, 24 million still have significant lead hazards in the form of deteriorated lead paint, contaminated dust, or contaminated bare soil. Over five million of these houses have families with children under 6 years old and 1.6 million have low-income families with children under 6 years old, the population most at risk.⁴⁸

Transportation: Another integral part of the built environment is transportation infrastructure.⁴⁹ Low-income and minority communities are often excluded from local and regional decisions on transportation programs.⁵⁰ Inequities in transportation can take many forms. Transportation hubs, such as bus depots, may be located next to a community, thereby exposing the community to air pollution, noise, and other hazards. Alternatively, some communities get better access to transportation, which may have an effect on access to employment and health care.⁵¹

In New York City, eight Metropolitan Transit authority bus depots, housing 2000 diesel buses, operate in Manhattan. Six of these eight depots are located in West Harlem, a low income community of color in northern Manhattan. Five of the depots are within two hundred feet of people's homes.⁵² These results show that local diesel sources in Harlem create spatial variations in sidewalk concentrations of DEP. The potential relationship between diesel exhaust and Harlem asthma rates has concerned the West Harlem community and prompted its involvement in this partnership.

In California, the massive increase of the movement of goods has impacted low income and minority communities. Average diesel emissions in the port community of West Oakland, California are over 90 times higher per square mile than the average for the rest of California. The Port of Oakland estimates that its planned expansion will increase truck traffic to 22,000 truck trips per day by 2010—double current traffic.⁵³ The California Air Resources Board selected Wilmington, Commerce, and Mira Loma, three minority and low-income communities in Southern California, for special attention because of the multiple impacts of goods movement.⁵⁴

Schools: Recent incidents in low-income, immigrant neighborhoods have brought to light environmental inequities with respect to schools. The Center for Health, Environment and Justice (CHEJ) advocates against the siting of schools on contaminated land. In a recent study of

⁴⁸ David Jacobs, Testimony to Environment and Public Works Committee, U.S. Senate, October 17, 2007.

⁴⁹ Id

⁵⁰ Environmental Justice and Transportation – A Citizen's Handbook - <http://www.its.berkeley.edu/research/ejhandbook/ejhandbook.html#intro>

⁵¹ Id

⁵² P.L. Kinney, M. Aggarwal, M.E. Northridge, N.A.H. Janssen, and P. Shepard, "Airborne Concentrations of PM_{2.5} and Diesel Exhaust Particles on Harlem Sidewalks: A Community-Based Pilot Study," 108 Environmental Health Perspectives 3 (March 2000): 213-8, <http://www.ehponline.org/docs/2000/108p213-218kinney/abstract.html> (accessed November 14, 2007).

⁵³ Pacific Institute, "West Oakland Residents Choking on Toxic Diesel Exhaust," <http://www.pacinst.org/reports/diesel> (accessed November 18, 2007).

⁵⁴ CalEPA, "Environmental Justice Action Plan," February 4, 2005, http://www.calepa.ca.gov/EnvJustice/ActionPlan/PhaseI/February2005/ARB2_05.pdf (accessed November 18, 2007).

school sitings in five states, CHEJ found that 1100 schools were located within ½ mile of a contaminated site, possibly impacting the health of almost 600,000 students.⁵⁵ A study conducted in California found that students of color are disproportionately located in schools with higher respiratory hazard ratios.⁵⁶

In October, 2003, Florida Department of Environmental Protection personnel began comprehensive testing for benzo(a)pyrene and other toxins, including pesticides, dioxin, and radium, at a school in Pensacola. The school was located near two toxic waste sites. One of the sites is the Escambia Superfund Site, where contamination resulted in the relocation of 358 households. The school district also tested six other schools for radium. A toxic plume from a fertilizer plant is suspected as the radium's source.⁵⁷

⁵⁵ Child Proofing Our Communities - http://www.childproofing.org/school_siting.htm

⁵⁶ Breathless: Schools, Air Toxics, and Environmental Justice in California - <http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1005&context=cjtc>

⁵⁷ Water Industry News, <http://waterindustry.org/New%20Projects/pensacola-1.htm> (accessed November 17, 2007).