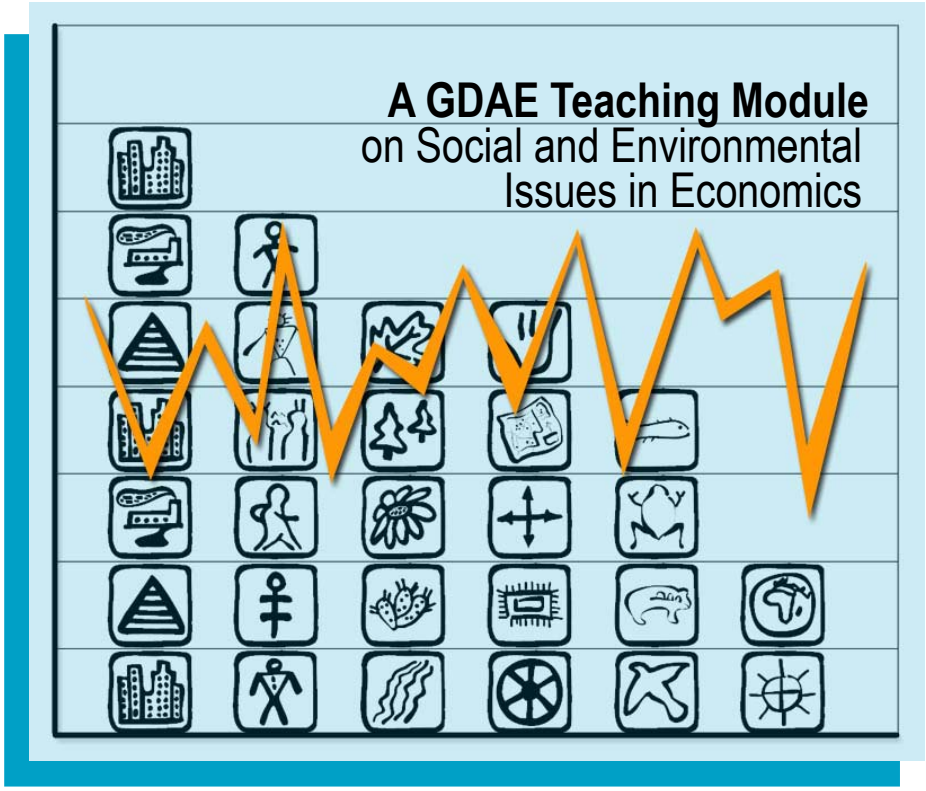
Environmental Justice: Income, Race, and Health

by Rachel Massey



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ENVIRONMENTAL JUSTICE: INCOME, RACE, AND HEALTH

1. INTRODUCTION

Protecting the environment is sometimes viewed as a luxury -- something people care about only when they have plenty of leisure time and disposable income. In practice, low-income communities and minority ethnic groups often bear the most severe consequences of environmental degradation and pollution. In this module, we explore questions related to the distribution of pollution and other forms of environmental degradation. Our discussion is centered on **environmental justice**: the recognition that minority and low-income communities often bear a disproportionate share of environmental costs – and the perception that this is unjust.

This issue affects both national and international spheres. Toxic waste dumps may often be located in poorer communities (see Box 1), and toxic wastes may be shipped to low-income nations where regulations governing toxics are weak or nonexistent. Environmental contaminants may also be carried long distances, affecting communities far from their origin (see Box 2). Some might argue that this is just the way the market works, since richer communities or nations can afford better environmental protection. Others contend that the issue involves broader questions of human rights and fundamental justice, requiring national policies, or international agreements, to modify the workings of unregulated markets.

Is environmental protection a priority only for the wealthy, and an irrelevant luxury for the poor? How are the health consequences of environmental degradation distributed among communities and ethnic groups? How do property values reflect the economic value we place on environmental goods? We explore these and other questions in the sections below. We also look at some of the solutions that communities have developed as they work toward greater equity in the distribution of environmental benefits and costs.

2. POLLUTION AND HEALTH

Environmental quality, income levels, and access to health care can all affect people's health. People with low incomes and inadequate access to health care may also be disproportionately exposed to environmental contamination that threatens their health. In this section, we look at the health effects of toxic chemical exposures, and the unequal distribution of these effects in society.

NOTE – terms denoted in **bold face** are defined in the **KEY TERMS AND CONCEPTS** section at the end of the module.

A growing body of scientific literature links environmental pollution to a range of disabilities and chronic illnesses. For example, many studies have documented increased cancer rates associated with exposure to industrial chemicals in the environment.[1] Asthma is also linked to a variety of environmental factors, ranging from car and bus exhaust to certain pesticides. Animal experiments, as well as evidence from epidemiological studies, support the view that some industrial chemicals can cause neurobehavioral disorders and learning disabilities.[2] Finally, some industrial chemicals can interfere with the normal functioning of hormones in the human body; these chemicals are known as **endocrine disrupters**, and they can cause a range of illnesses and disabilities.[3]

Rates of certain illnesses and disorders have risen steadily in recent decades. Some cancers, including breast cancer, children's leukemia, and children's cancers of the brain and nervous system, have risen significantly since World War II. Children's cancer rates have risen substantially over the past quarter century. From 1975 to 2000, cancer incidence increased 31.7% nationwide in children under the age of 15, or 29.6% in children under the age of 20.[4] (See Figure 1.)

BOX 1: TOXICS IN MEMPHIS, TENNESSEE

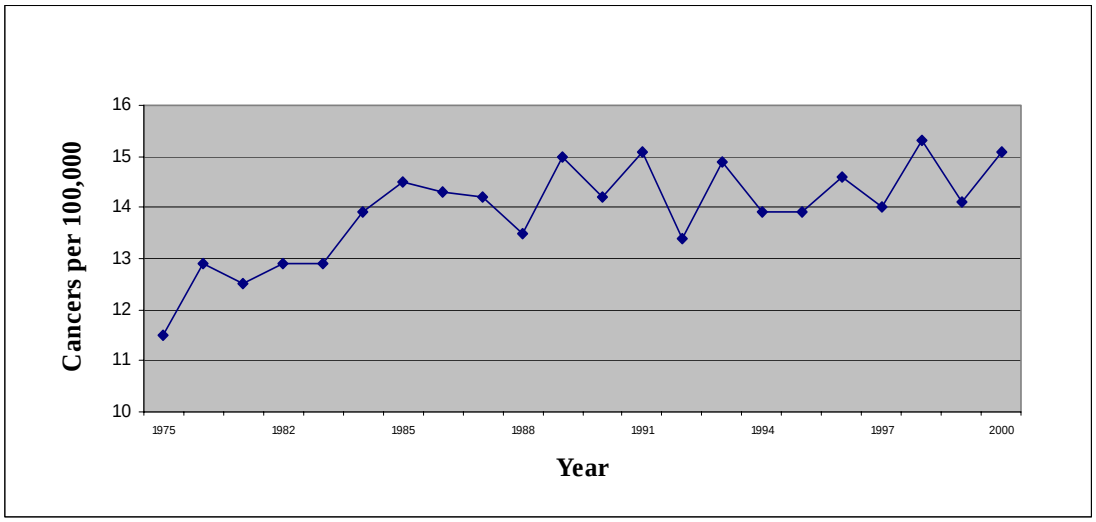
Memphis, Tennessee is home to a 642-acre Defense Depot that was operated by the U.S. Army and Department of Defense from 1942 to 1997. The Depot is bordered on three sides by largely residential areas; twelve schools are within a mile of the Depot's boundaries, and some homes are within 100 yards of these boundaries. The surrounding community is low income and predominantly black.[5]

Toxic chemicals from the Depot, including lead, chromium, arsenic, mercury, and polychlorinated biphenyls (PCBs), have contaminated the soil, water, and air in surrounding communities. Toxic runoff drains into local streams, one of which flows next through the grounds of a local high school. Community members suffer severe health problems, including high rates of cancer and reproductive disorders.

The Depot was placed on the Superfund National Priority List in 1992. Since that time, some efforts have been made to clean up the site, including removing chemical weapons buried at the depot. But local residents complain that adverse health effects in the community have been ignored by the government.

[1] Tami Gouveia-Vigeant and Joel Tickner (2003), *Toxic Chemicals and Childhood Cancer: a Review of the Evidence*.
[2] See Ted Schettler et al. (2000), *In Harm's Way*, for a detailed discussion of toxic threats to child development.
[3] See Ted Schettler et al. (2000), *Generations at Risk*, pp. 151-188.
[4] See SEER Cancer Statistics Review 1975-2000, Section XXVII: Childhood Cancer by Site: Incidence, Survival, and Mortality. Available at http://www.seer.cancer.gov/csr/1975_2000/results_merged/sect_27_childhood_cancer.pdf
[5] Information on this case is taken from Zoll and Boyce (2003), *The New Environmental Activists*, pp. 50-51.

Figure 1: Age-Adjusted Cancer Incidence Rates, Children Ages 0-14 (1975-2000) [6]



This increase in cancer incidence has occurred during a period characterized by the rising use of a wide range of industrial chemicals. Many scientists believe that the rising use of these chemicals is at least partly responsible for rising rates of cancer and certain other chronic diseases. Rising rates of cancer and certain other diseases in children is particularly indicative of an environmental role. Diseases in adults can potentially be attributed to a wide range of factors, including smoking and occupational hazards, but the range of possible explanations is narrower; for the most part, children do not smoke, work in dangerous jobs, or suffer from extreme obesity.

Studies have established links between childhood cancer and environmental factors including exposure to solvents, pesticides, and air pollution. A recent review of many existing studies found that parental and childhood exposure to pesticides and solvents are consistently linked to some cancers; even prenatal exposures can be linked to some childhood cancers. The review also found a particularly strong link between toxic exposures and leukemia, brain, and central nervous system cancers, which account for about half of all children's cancers.[7]

Asthma rates have also risen dramatically, to the point that asthma is now considered an epidemic among children in the U.S. Rates of certain neurobehavioral disorders and learning disabilities have also increased dramatically; for example, the disorder known as autism, in which individuals are unable to engage in normal

[6] These data are drawn from the National Cancer Institute, SEER Cancer Statistics Review, 1975-2000. Available at http://www.seer.cancer.gov/csr/1975_2000/results_merged/sect_27_childhood_cancer.pdf, viewed September 2004.

[7] Gouveia-Vigeant, Tami and Joel Tickner (2003), *Toxic Chemicals and Childhood Cancer: a Review of the Evidence* (Lowell, MA: Lowell Center for Sustainable Production).

interpersonal interactions, has shot upward in recent decades.[8] Some of these disorders have a genetic component, but genetic patterns in human populations cannot change over the course of one or two generations. Thus, when rates of a disease increase dramatically over a couple of generations, it is necessary to look into social and environmental factors for the explanation.[9]

A variety of explanations have been proposed for rising rates of autism; some scientists, for example, have suggested a link to certain childhood vaccines. Chemicals that have been linked to impaired brain development include lead, mercury, manganese and polychlorinated biphenyls (PCBs).[10]

BOX 2. POLLUTION IN THE ARCTIC

In the Arctic Circle, Inuit communities lead a traditional lifestyle of hunting and fishing. Their traditional diet consists largely of fish and seal meat. The fish and seals that form the mainstays of the Inuit diet, however, are highly contaminated with industrial pollutants. These pollutants are carried northward by ocean currents, and accumulate in the bodies of fish, seals, and other animals, that form a major part of the Inuit diet.

The Inuit are not participants in the industrialized economies that give rise to these pollutants, but they bear an enormous burden of pollution from these economies' operations. Toxic chemicals produced throughout the world are found in extremely high levels in Inuit people's bodies and in Inuit women's breast milk. Inuit babies and children begin life exposed to an enormous burden of toxic chemicals, placing them at increased risk of a range of developmental disorders.

3. POLLUTION, POVERTY AND RACE

Some diseases and disabilities that have an environmental component are unequally distributed across race and income levels. For example, asthma prevalence in the U.S. is significantly higher in minority and low-income populations than in the general population (see Box 3). Unequal exposure to environmental factors that triggers or exacerbate asthma may play a role. Compounding this problem, minorities often

[8] See R. S. Byrd, The Epidemiology of Autism in California: A Comprehensive Pilot Study: Report to the Legislature on Principal Findings (2002). Cited in Ted Schettler, "Developmental Disabilities - impairment of children's brain development and function: the role of environmental factors" (February 2003), available at http://www.protectingourhealth.org/newscience/learning/2003-02peerreviewlearningbehavior.htm

[9] Note: The term "environmental" can have two meanings. In medical and public health terminology, "environmental" factors can be all those factors that are not genetic. That is, "environmental" factors can include personal lifestyle choices such as diet, smoking, drinking, and so on. "Environmental" factors can also refer to those exposures and conditions in the environment around us; in general, individuals do not have personal control over these factors. Pollution falls into this second definition.

[10] PCBs are industrial chemicals used in electrical equipment, in paints, and as lubricants in industrial processes. Their use was banned in the U.S. in 1977, but PCBs persist in the environment and continue to affect people's health.

receive lower quality health care, and may be forced to rely more on emergency room visits, rather than routine doctor visits.

Across the United States, poor and minority neighborhoods bear an unequal burden from hazardous facilities and waste sites. This pattern is evident nationally as well as on the state and local level. Pollution is unequally distributed across the country; it is also distributed unequally within individual states, within counties, and within cities. Hazardous waste sites, municipal landfills, incinerators, and other hazardous facilities are disproportionately located in poor and minority neighborhoods.[11]

One of the landmark events in the development of the environmental justice movement in the U.S. was the 1982 battle over the siting of a hazardous waste landfill in Warren County, North Carolina.[12] Warren County was one of the poorest counties in the state, and had the highest percentage of black residents; Afton, the community chosen for the landfill, was over 84 percent black. Despite low incomes, an exceptionally large percentage of residents in this area owned their own homes.

The landfill in Warren County was created to hold tens of thousands of cubic yards of soil that was contaminated by polychlorinated biphenyls (PCBs). Experts argued that the siting of the landfill in Warren County made no scientific sense; the water table was only five to ten feet below the surface, and area residents relied on local wells for their drinking water. The landfill was likely to contaminate residents' drinking water. National civil rights leaders and others joined with local residents in opposing the landfill. Hundreds of protesters were arrested. Despite the protests, the PCB-laden soil was placed in the landfill as planned.

In the aftermath of the fight over the Warren County landfill, the U.S. General Accounting Office (GAO) conducted a survey of siting decisions for hazardous-waste landfills. GAO found that hazardous waste landfills were disproportionately located in minority and low-income communities.[13] The imbalance was evident both nationally and locally.

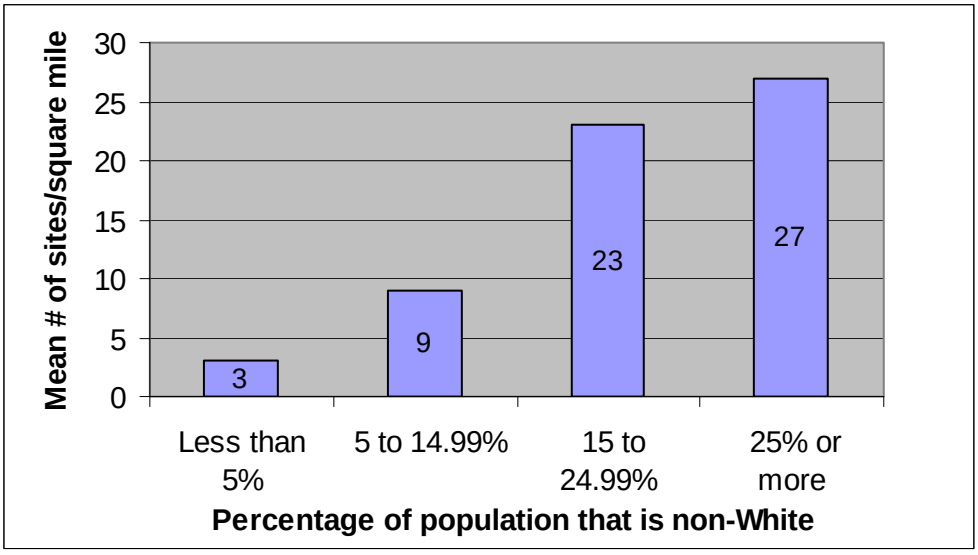
A 1987 study of toxic waste and race, conducted by the New York-based Commission for Racial Justice, also found a strong link between race and location of hazardous waste facilities. This study found that of 27 hazardous-waste landfills nationwide, a third -- representing almost 60 percent of total hazardous waste landfill capacity -- were located in five southern states: Alabama, Louisiana, Oklahoma, South Carolina, and Texas.[14] Of these, three of the largest sites were located in primarily black zip codes, and these three “accounted for about 40 percent of the total estimated

[11] Robert D. Bullard (1990), *Dumping in Dixie: Race, Class, and Environmental Quality*.
[12] Information on the Warren County experience, and hazardous waste siting in the South more generally, is drawn from Bullard (1990), pp. 29-36.
[13] U.S. General Accounting Office, Siting of Hazardous Waste Landfills and Their Correlation with Racial and Economic Status of Surrounding Communities Report, 1983. GAO Report Number: GAO/RCED-83-168.
[14] Bullard (1990), p. 33.

hazardous-waste landfill capacity in the entire United States."[15] Race was by far the most prominent factor in the location of commercial hazardous-waste landfills, more prominent than household income and home values.

More recent studies have found similar results. For example, a study of the distribution of hazardous sites and polluting facilities around Massachusetts found that communities of color and working-class communities are home to significantly more hazardous sites and facilities than wealthier communities and those with a small minority population.[16] Low-income and minority populations are also more likely to live in areas where high lead exposure is likely, due either to soil contamination or to lead paint. The researchers looked at the distribution of hazardous waste sites, landfills and transfer stations, polluting industrial facilities, power plants, and incinerators; they also created a measure of exposure to cumulative environmental hazards, looking at all the exposure sources together. They found that "high-minority communities face a cumulative exposure rate to environmentally hazardous facilities and sites that is nearly nine times greater than that for low-minority communities." Cumulative exposure in low-income communities is about three to four times higher than in other communities in Massachusetts (see Figure 3).

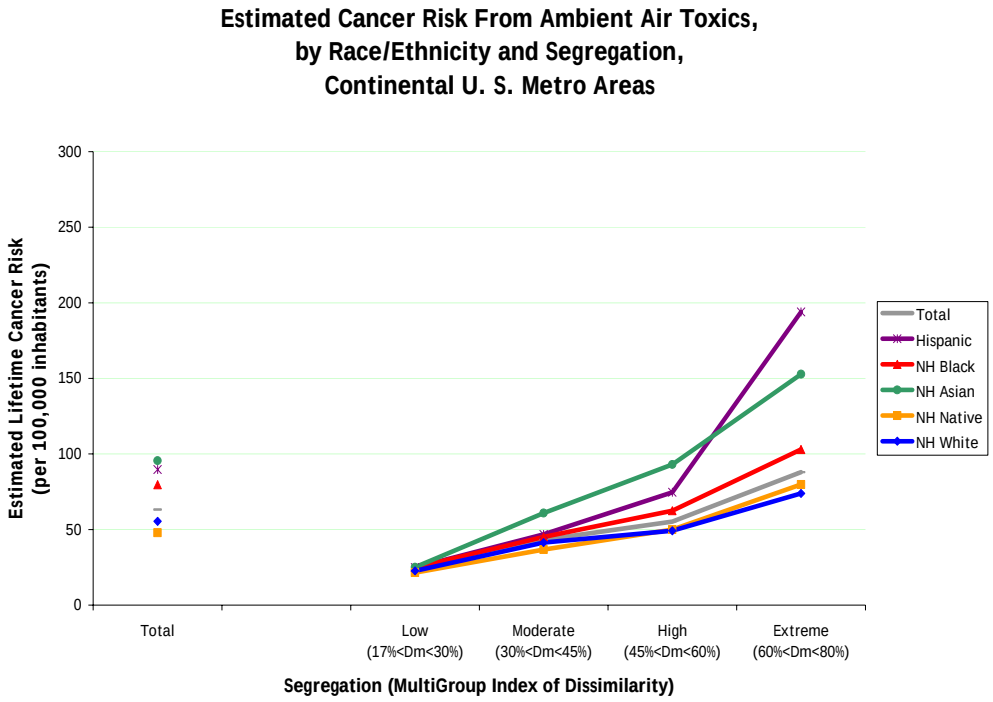
Figure 2: Cumulative Toxics Exposure and Race in Massachusetts (Faber and Krieg 2002)



Another recent study looked at distribution of toxic air pollutants in southern California. The researchers found strong links between race or ethnicity and exposure to toxic air pollutants. Everyone was found to face an elevated cancer risk due to toxic air pollutants, but almost 1/3 of the minority population of southern California was located in the areas with the highest cancer risk, whereas 15% of the white population lived in such

[15] Bullard (1990), p. 35.
[16] Faber and Krieg (2002), "Unequal Exposure to Ecological Hazards: Environmental Injustices in the Commonwealth of Massachusetts."

areas. The researchers also looked at local environmental conditions in the vicinity of Los Angeles public schools. They found that minority children suffered the most exposure to air pollution at school. At schools ranked in the bottom fifth for air quality, the children were 92% minority. The researchers also found a relationship between respiratory risks associated with air pollution and decreased achievement in school. Even when they controlled for the range of predictors usually associated with school achievement, such as income level and parents' academic background, the researchers found a link between higher air pollution and lower achievement in school.[17]



A study of cancer risk in neighborhoods shows that a higher level of segregation is associated with higher cancer risk for all groups in the area. While cancer incidence is higher for communities of color, it rises for all groups as segregation increases.[18] A possible explanation is that that segregated communities lack political power over decisions on waste facility siting and pollution prevention, resulting in adverse health effects for all racial and ethnic groups in the area.

[17] Rachel Morello-Frosch and Manuel Pastor, Jr., "Pollution, Communities, and Schools: A Portrait of Environmental Justice on Southern California's 'Riskscape.'" *DifferenTakes* (Spring 2001). Available at http://clpp.hampshire.edu/PDF/DifferenTakes%2012.pdf. Also see Rachel Morello-Frosch et al., "Environmental Justice and Regional Inequality in Southern California: Implications for Future Research." *Environmental Health Perspectives* Vol. 110, Supplement 2 (April 2002), pp. 149-153, available at http://ehp.niehs.nih.gov/members/2002/suppl-2/149-154morello-frosch/EHP110s2p149PDF.PDF

[18] "Separate but Unequal: the Relationship between Residential Segregation, Air Toxics, and Associated Cancer Risks." Rachel Morello-Frosch, in press.

A recent study in Alabama found that garbage dumps are disproportionately sited in poor and African American communities. Of twenty-nine dumps considered by the study, twenty were in areas that are primarily African America, low-income, or both.[19]

BOX 3. UNEQUAL DISTRIBUTION OF ASTHMA

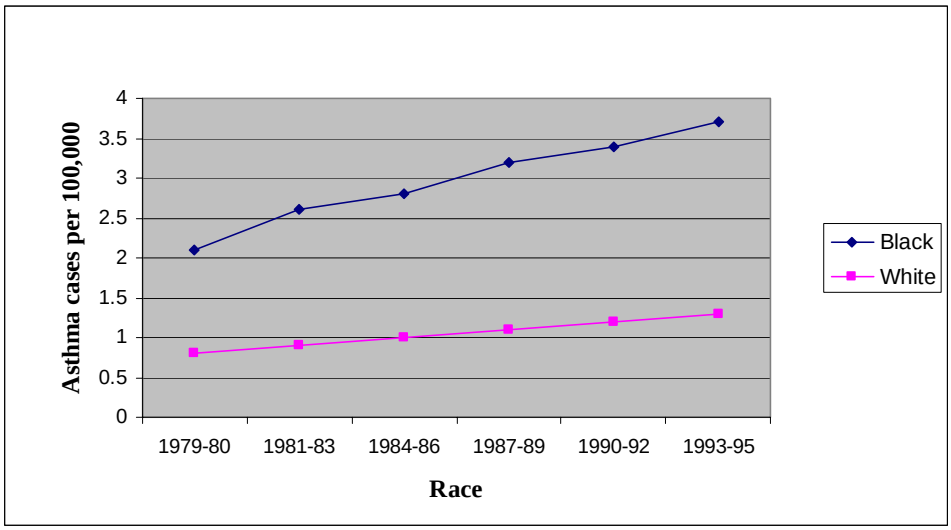
Asthma is a chronic illness in which the lungs can become constricted, making breathing difficult. Severe asthma attacks can require hospitalization, and may be fatal. Childhood asthma causes more missed school days than any other childhood illness. Children in all socioeconomic brackets are affected by asthma, but the highest rates of the illness -- as well as the largest numbers of deaths -- are in low-income and minority communities. Data collected in Washington state show that in families with incomes below $20,000 per year, childhood asthma prevalence is about twice that of other families.[20] A Massachusetts study looked at asthma rates in low-income preschoolers and found that nearly a third of these young children had this debilitating disease.[21]

The factors that lead to asthma attacks in asthmatic children and adults are relatively well understood. These can include air pollution, cigarette smoke, exposure to furred animals, indoor dust, and certain pesticides. Less information is available on the factors that cause asthma to develop in the first place, but a number of studies support the view that toxic exposures during fetal and infant development can play a significant role. Factors implicated in the onset of asthma include maternal smoking during pregnancy, exposure to cockroaches, and exposure to pesticides during the first year of life.

High rates of asthma among minority children are compounded by inadequate access to health care to treat the disorder. Controlling asthma requires consistent medical attention; yet many low-income and minority children in the U.S. have little access to medical care. In the absence of on-going medical care, many of these children are only treated for asthma when they have an acute attack that requires emergency room treatment. According to the American Lung Association, the hospitalization rate for asthma is three times as high for black children as for white children, and the rate of emergency room treatment for asthma is four times as great for black children as for white children. Death rates from asthma are substantially higher for black children than for white children. In the US, African-American children ages 10 to 14 are six times as likely to die of asthma as white children.[22]

[19] John Davis, “Most Alabama Dumps Sit in Poor or Black Areas,” *Montgomery Advertiser*, Sept. 8, 2004.
[20] U.S. EPA, *The Cost of Illness* Handbook, available at http://www.epa.gov/oppt/coi/2003.
[21] K. McGill et al., "Asthma in non-inner city head start children." *Pediatrics* 102 (1998): 77-83.
[22] U.S. EPA, *The Cost of Illness* Handbook, available at http://www.epa.gov/oppt/coi/2003.

Figure 3: Age-Adjusted Trends in Asthma Mortality by Race[23]



4. THE ECONOMICS OF POLLUTION AND HEALTH

The Theory of Externalitites

What does economic analysis have to tell us about the problem of environmental justice? Standard environmental economic theory recognizes a concept – **externalities** – that is useful in understanding some of the important issues in this area. Externalities arise when a market transaction affects individuals or firms other than those involved in the transaction. A negative externality arises when a market transaction imposes *costs* on individuals or firms not involved in the transaction; a positive externality arises when those individuals or firms enjoy a *benefit* from the transaction.

From an environmental justice perspective, we can see an additional dimension to the problem of externalities: in many cases, the principal bearers of negative externalities are the poor and underprivileged. For example, distant stockholders may profit from operation of a polluting factory, while people living next to the factory become ill or die from the effects of the pollution.

Efficiency and Equity

Economists define **efficiency** in terms of total welfare gains and losses. An efficient policy is one that maximizes total net welfare gains for society as a whole. **Equity**, in contrast, is defined on the basis of *who* gains or loses. A policy that is efficient is not necessarily equitable, and may in fact be rejected on an equity basis. For example,

[23] National Institutes of Health Data Fact Sheet: Asthma Statistics, January 1999. Data are drawn from the National Center for Health Statistics, Vital Statistics of the United States.

a policy that makes a rich person $1,000 richer while a poor person grows $800 poorer is "economically efficient," because it offers a net social gain of $200. Such a policy is not equitable, however, because it benefits the wealthy at the expense of the poor. In many cases, as we have seen in the discussion above, distribution of environmental harms is not equitable. Society's pursuit of efficiency may lead to greater overall wealth, while the negative environmental externalities accompanying economic growth fall mainly on lower-income people.

Hedonic Pricing

Economists sometimes examine the relationship between pollution and location through the study of **hedonic pricing**. Hedonic pricing attempts to calculate the dollar value of environmental factors by looking at variations in the value of marketed goods, such as houses or land. For example, economists may compare property values between two neighborhoods that are largely similar in terms of home size, access to schools, and other factors. If one neighborhood contains a toxic waste site and the other is relatively unpolluted, the more polluted neighborhood is likely to have lower property values. By isolating the effect of the toxic waste site on property values, economists estimate the implicit dollar value people place on being protected from pollution. Many studies have found that as pollution increases, property values go down. Of course, this principle implies that those who can best afford to pay to avoid pollution will be able to escape negative impacts of toxic wastes.

Valuing Human Life and Health

In some uses of economic analysis, income differences can be presented as a justification for unequal distribution of environmental harms. This approach can be particularly problematic when it relies on monetary values assigned to human lives.

When an economic activity poses threats to human health or human lives, economists may undertake to discuss the "value of a human life." While one might reasonably feel that this value is inestimable, when policy decisions regarding pollution prevention are involved, the question often arises of how much it is worth spending per estimated life saved. One approach is to calculate the **value of a statistical life**. Methodologies for calculating the value of a "statistical life" include so-called wage-risk analyses and analyses of foregone future income.

In wage-risk analyses, economists collect data and perform calculations to find out how much money people are generally willing to spend in order to avoid a small risk of death. For example, they may look at the wage premium associated with working in a dangerous job, and extrapolate to estimate the value of a person's life. Analyses of foregone future income look at the amount a person would have earned over the remainder of his or her lifetime, if he or she had survived. This approach puts a higher value on people who were likely to become rich than on people who were expected to pursue a middle- or low-income career path.

BOX 4. COMPENSATION AND RELOCATION

One approach to dealing with equity in economic analysis is the principle of **compensation**. If one group of people suffers from a particular economic activity or policy, they can – in theory – be compensated for their loss. In practice, however, those who suffer from environmental pollution rarely receive adequate compensation. Indeed, it is not clear that any level of compensation is adequate when health damages are very severe.

In 1980, families in Love Canal, a community near Niagara Falls in New York State, succeeded in pressuring the Federal government to relocate them off the contaminated land where they had purchased homes and were raising children. The families in Love Canal had not been informed when they purchased their homes that Hooker Chemical, a local company, had buried tons of hazardous waste in the neighborhood before the homes were built. Highly toxic wastes were seeping into these families' homes and the school playground, causing severe illnesses in local children. Love Canal families had, in many cases, put all their savings into purchasing homes in what they thought was a safe, desirable neighborhood for their children to grow up in. In 1978, when they discovered the truth about the toxic pollution in their backyards, basements, and schoolyard, they lacked the resources to simply abandon the homes they had purchased and relocate.

After years of struggle, these families won an agreement with the Federal government in which they were given the resources to move to safer neighborhoods. Decades later, however, many other communities across the U.S. face similar situations. In many of these cases, the communities that are now fighting for relocation were there long before the industrial facilities that are driving them away. For example, the Diamond community of Norco, Louisiana has fought for relocation for decades.[24] Diamond is a primarily black community; many residents own their homes, and many families have lived on the same land for generations. In the 1950s, Shell Corporation built a chemical facility directly adjacent to the community; the plant's fence line is 25 feet from people's homes. The community is flanked on the other side by a refinery.

Residents of Diamond suffer regularly from respiratory problems, headaches, and a variety of other symptoms. A 1997 health survey found that over a third of the children in the community had asthma. A quarter of the women and children in the community had been treated in an emergency room at some point due to respiratory problems. Air samples collected by a community group found extremely high levels of cancer-causing chemicals in the air. When a Shell accident killed two residents in 1973, Shell spent a total of $3,500 to make amends: $3,000 to purchase the home of one victim, and $500 in compensation to the other victim's mother. In June 2002, after years of negotiation, the community reached a relocation agreement with Shell.

[24] Information on Norco is drawn from http://www.labucketbrigade.org/communities/norco/profile/index.shtml, viewed October 2004.

The economic methodology of human life valuation can also be the basis for concluding that the lives of people in wealthy countries are worth more than the lives of similar people in developing countries, where average pay is lower. This view was notoriously expressed in a 1991 memo by Lawrence Summers, then president of the World Bank, in which he suggested that the World Bank should encourage migration of highly polluting industries to poor countries. Summers' memo suggested that the World Bank should be *encouraging* migration of "dirty industries" to poor countries. His reasoning included the following:

> The measurements of the costs of health impairing pollution depends on the foregone earnings from increased morbidity and mortality. From this point of view a given amount of health impairing pollution should be done in the country with the lowest cost, which will be the country with the lowest wages. I think the economic logic behind dumping a load of toxic waste in the lowest wage country is impeccable and we should face up to that.[25]

Summers later said that he was not serious about this argument; he meant it simply as an exploration of where economic logic could lead. Whether or not Summers was serious about this argument, logic of this kind is incorporated into many economic analyses of environmental policy options. In 1995, economists analyzing the impacts of climate change for the Intergovernmental Panel on Climate Change (IPCC) valued lives of citizens of rich countries at $1.5 million, in middle-income countries at $300,000, and in low-income countries at $100,000.[26] This led to a major political backlash from outraged citizens of developing nations. Later IPCC reports recommended a possible compromise value of $1 million for the value of a life regardless of country of residence. Clearly, the issue of valuing human life will remain highly controversial whatever methodology is adopted.

5. INTERNATIONAL DIMENSIONS OF ENVIRONMENTAL JUSTICE

Just as poor communities often bear a disproportionate burden of pollution and environmental degradation compared with wealthier communities within the same country, poor nations may bear a disproportionate burden from toxic wastes that are exported from wealthier nations. Poor nations may also bear a disproportionate burden from **global warming** and other human-induced changes that affect the entire planet.

Global warming is an example of problems both of environmental externalities and of equity issues on a planetary scale. The "greenhouse effect" is a process in which gases such as carbon dioxide build up in the earth's atmosphere and trap energy from the sun. Factories, cars, airplanes, and other mainstays of industrialized living all increase the levels of carbon dioxide and other greenhouse gases into the atmosphere. Through the greenhouse effect, these gases contribute to global warming.

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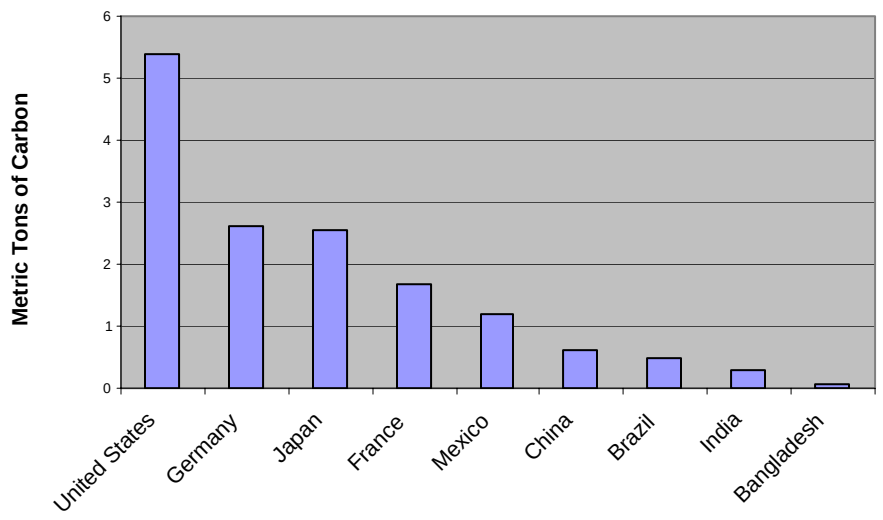
[25] Lawrence Summers, World Bank, internal memo, December 12, 1991. Reproduced at: http://www.sustainableworld.org.uk/summersmemo.htm.

[26] Ackerman and Heinzerling (2004), *Priceless: On Knowing the Price of Everything and the Value of Nothing*, pp. 73-4.

The Intergovernmental Panel on Climate Change (IPCC), an international body of scientists, has developed a series of scenarios from which predictions can be made about likely changes associated with global warming.[27] Expected changes include higher temperatures in many parts of the world, greater likelihood of droughts and flooding, increased frequency and severity of storms, and rising sea level.[28]

International negotiations are under way to allocate responsibility for bringing global warming under control before it is too late. In these negotiations, the U.S. and other developed countries have pushed to ensure that developing countries also bear some of the burden of reducing global emissions of greenhouse gases. At the same time, there is widespread recognition that the gains and losses have not been fairly distributed. Developed countries have enjoyed most of the gains from rapid industrial expansion and widespread use of automobiles and other fuel-intensive forms of transportation. Developing countries, on the other hand, are predicted to bear the most serious consequences from global warming.



Source: Carbon Dioxide Information Analysis Center (CDIAC), http://cdiac.esd.ornl.gov/

[27] See http://www.grida.no/climate/ipcc_tar/

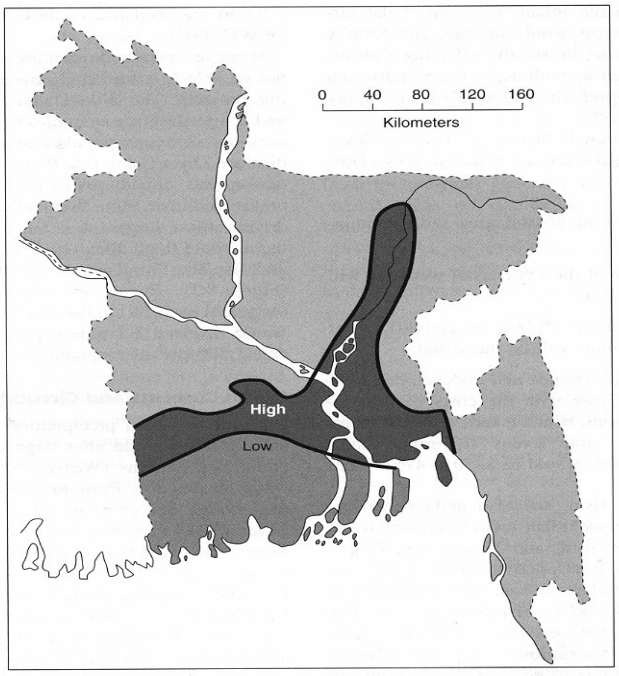
[28] For a summary, see *Summary for Policymakers: A Report of Working Group 1 of the Intergovernmental Panel on Climate Change*, available at http://www.grida.no/climate/ipcc_tar/vol4/english/pdf/wg1spm.pdf and IPCC, *Climate Change 2001: Synthesis Report* [Watson, R.T. and the Core Writing Team (eds.)]. (New York: Cambridge University Press, 2001) at http://www.grida.no/climate/ipcc_tar/vol4/english/index.htm

BOX 5. UNEQUAL BURDEN FROM GLOBAL WARMING

Bangladesh is a densely populated country of some 115 million people, living in an area of about 144,000 square kilometers. Bangladesh is located at the delta of three major rivers, and is subject to severe flooding. Some scholars have looked at the likely effects of a one-meter sea level rise in Bangladesh. According to one study, if sea level rises by a meter, over 11% of the population of Bangladesh (over 13 million people) will be displaced; nearly a fifth of the total land area of the country will be completely flooded; and unique mangrove forests will be lost. In addition, more than a fifth of the country's monsoon rice land will be covered with water; and coastal shrimp production will become impossible (See map showing areas of Bangladesh likely to be inundated under "low" and "high" sea-level rise projections).

One possible option for combating the effects of a sea-level rise of this magnitude may be to build barriers, or dykes, to protect land areas in Bangladesh. This measure would only address the specific problem of sea level rise, and would not deal with the additional problem that global warming is likely to increase the frequency and severity of cyclones and other destructive weather events.[29]

The likely effects of global warming in Bangladesh exemplify the unequal burden of environmental problems that result from some economic activities. The contribution of Bangladesh itself to global warming is minimal; yet Bangladesh will bear some of the greatest costs of rising temperatures on earth.



[29] See Saleemul Huq (1999), *Vulnerability and Adaptation to Climate Change for Bangladesh* (Boston: Kluwer Academic Publishers). Map adapted from John T. Hardy (2003), *Climate Change: Causes, Effects, and Solutions* (West Sussex: John Wiley and Sons).

International Trade in Toxics

Nobody wants hazardous waste, but hazardous waste is traded internationally just like desirable goods, such as food and clothing. Many people believe that international trade in hazardous waste places an unfair burden on the countries that receive it. The option to send hazardous waste abroad also makes it easier for firms in wealthy countries to keep producing the waste, because they do not have to find room for it within their own communities. An international treaty, the **Basel Convention,** was created in 1989 to place limits on international trade in toxic wastes.

In 1994, signatories to the Basel Convention agreed on a total ban on exports of hazardous wastes from developed to less developed countries. The 15 countries of the European Union have implemented the Basel Convention and banned the export of all hazardous wastes to developing countries for any reason. To date, the U.S. is the only developed country that has not ratified the Basel Convention.

BOX 6. EXPORTING TOXICS -- THE CASE OF GUIYU

An investigation conducted in 2001 by the Basel Action Network, a non-governmental organization, documented highly hazardous practices in one rural area of China where electronic equipment is dismantled to recover valuable components. Around 100,000 people work in the electronics "recycling" operations of Guiyu, many of them women and children.

Electronic equipment is dismantled by hand using simple tools such as hammers and screwdrivers. Minimal or no precautions exist to protect workers from the toxic substances contained in the equipment. For example, workers dismantling used toner cartridges use paintbrushes and their bare hands to remove remaining toner; they breathe the toner dust and it covers their clothing. Printer toners contain a substance known as carbon black, a likely human carcinogen.

Other workers burn plastic-coated wires to recover the valuable copper within them. The polyvinyl chloride (PVC) coating of the wires, as well as brominated flame retardants in the wire insulation, are likely to produce the highly toxic chemicals known as dioxins and furans when they burn. Children and pregnant women live close to the burning operations, and small children play in the toxic ashes. A near-by fishpond, which is likely to be contaminated by the burning byproducts, is a major source of nutrition for the village. Glass from computer and television monitors, which contains large amounts of lead, is dumped in rivers or on open land.

At the time of this study, electronic waste "recycling" had been carried out in Guiyu for the past six years. For five of those years, drinking water has had to be trucked into the area, because all the local water sources are too contaminated to drink.

The Problem of Electronics Waste

Computers and other electronic equipment contain large amounts of heavy metals and other toxic substances. For example, a typical cathode ray tube (CRT) computer monitor contains three to eight pounds of lead. Lead is hazardous to the nervous system, blood, kidneys, and reproductive systems, and causes irreversible brain damage in children. Millions of pounds of toxic electronic waste, or "E-waste," are generated each year within the U.S. alone, as we discard outdated computers, televisions, and other obsolete equipment. [30]

With increasing knowledge about the hazards associated with these wastes, some communities within the U.S. have taken steps to protect themselves. Massachusetts and California, for example, have laws against disposing of cathode ray tube monitors -- the monitors used for most personal computers and television screens -- in municipal landfills.[31] But when toxic electronic waste of this kind is diverted from landfills in the U.S., it is often exported overseas. An estimated 50% to 80% of the televisions and computer monitors that U.S. consumers bring to recycling centers are actually exported to poor communities in Asia.

Once in Asia, this electronic equipment is not recycled in the way we might imagine. Some of the materials are recovered for further use, but the way the materials are extracted poses tragically severe health consequences for the people doing the work and for their families and neighbors. In China, India, and Pakistan, electronics "recycling" is associated with hazardous activities including open burning of plastics, which can produce highly toxic byproducts; exposure to toxic solders; and dumping of acids in rivers. Many of the workers who are exposed to these hazardous byproducts are children.

The case of trade in toxic e-waste reveals a paradox of the economic success of the computer industry. Part of the enormous growth in the computer and electronics industry has been linked to rapid obsolescence of equipment. Whereas electronic equipment was once considered a long-term investment, much of it is now designed to be thrown away after several years. According to a 1999 report by the National Safety Council, the average life span of a computer in the U.S. is now as low as two years.[32]

The flow of hazardous “e-waste” to Asia results in part from low wages in Asia and lax or poorly enforced regulations to protect workers’ health. In addition, it is legal in the U.S. to export hazardous waste, despite international laws to the contrary.

The problem of hazardous e-waste also results from the way in which these products are designed. For the most part, electronics are not designed to facilitate

[30] Unless otherwise noted, information on this electronics waste is taken from Puckett et al. (2002), *Exporting Harm: The High-Tech Trashing of Asia*.
[31] Puckett et al. (2002), p. 4.
[32] National Safety Council (1999), *Electronic Product Recovery and Recycling Baseline Report*, cited in Puckett et al (2002).

recycling. Thus, the recycling that does occur is labor intensive and hazardous, and many materials are wasted because they cannot be recovered from the products.

The solution to the problem of hazardous e-waste lies at least partly in pursuing clean production. If electronic equipment is designed to be easily and efficiently recycled, resources can be saved while workers' health is protected. New legislation on electronics in the European Union makes manufacturers responsible for eliminating some of the most toxic components of electronic equipment, and creates incentives or requirements for manufacturers to create easily recycled products.

6. EQUALIZE THE BURDEN OR ELIMINATE POLLUTION?

There are two possible solutions to environmental justice problems: spread out pollution more equitably, or reduce the total burden of pollution. In general, community groups working for environmental justice stress that their goal is the latter. In many instances, in fact, groups working for environmental justice have achieved broader goals.

For example, an environmental justice effort in San Diego, California led to broader changes in management of toxic pesticides.[33] The Environmental Health Coalition (EHC) is a community-based organization that works with primarily minority, low-income communities in San Diego. EHC undertook to end the use of the pesticide methyl bromide to fumigate incoming produce in San Diego's port district. Methyl bromide is a reproductive toxicant and an ozone depleting chemical, so it is significant both for local environmental health and for the global environment. In the low-income neighborhoods near the port, residents suffered health consequences -- including asthma, vision problems, and skin disorders -- from exposure to a range of pollutants including methyl bromide. In 1997, EHC's campaign was successful and use of methyl bromide was discontinued; San Diego adopted the first policy in the world prohibiting use of methyl bromide as a port fumigant. This successful campaign has served as a model for environmental health campaigns in other port communities, and has spurred the creation of ambitious local projects for environmental protection and reclamation.

As we saw in the discussion of electronic waste, unequal distribution of environmental harm can sometimes help to prolong serious problems at the nexus of economics and the environment, by hiding those problems from the people who have power to make changes. Solving environmental justice problems often implies solving underlying production problems. In the case of e-waste, a production problem -- electronic equipment that is nearly impossible to recycle safely -- leads to an environmental justice problem when poverty-stricken workers destroy their health attempting to extract the valuable components of old computers. Solving this problem is not a simple matter of

[33] Information in this paragraph is drawn from Daniel R. Faber and Deborah McCarthy, "Neo-liberalism, Globalization and the Struggle for Ecological Democracy: Linking Sustainability and Environmental Justice." In Julian Agyeman et al., eds. (2003), *Just Sustainabilities: Development in an Unequal World*, pp. 38-63; information in this paragraph is from p. 52-53.

shifting recycling operations to more privileged communities and introducing new rules for safe handling of old electronic equipment. It is a matter of changing the way electronic goods are manufactured. In this and many other cases, when people work to redress environmental injustices, they repair other problems in the economy in the process.

7. SUMMARY

Environmental justice is the recognition that minority and low-income communities often bear a disproportionate share of environmental costs – and the perception that this is unjust.

Environmental quality, income levels, and access to health care can all affect people's health. People with low incomes and inadequate access to health care are often disproportionately exposed to environmental contamination that threatens their health.

Environmental pollution is linked to a range of disabilities and chronic illnesses including cancer, asthma, and certain learning disabilities. Rising rates of these problems affect everyone, but in many cases, poor and minority communities are disproportionately affected.

Across the United States, poor and minority neighborhoods bear an unequal burden from hazardous facilities and waste sites. Pollution is also distributed unequally within individual states, within counties, and within cities. Hazardous waste sites, municipal landfills, incinerators, and other hazardous facilities are disproportionately located in poor and minority neighborhoods.

A variety of economic concepts are relevant to the study of the interrelationship among income, pollution, and health. For example, economists sometimes examine the relationship between pollution and location through the study of hedonic pricing. Hedonic pricing attempts to calculate the dollar value of environmental factors by looking at variations in the value of marketed goods, such as houses or land.

The difference between efficiency and equity is also important for an understanding of the economics of pollution and health. Economists define efficiency in terms of total welfare gains and losses. Equity, in contrast, is defined on the basis of *who* gains or loses. A policy that is efficient is not necessarily equitable, and may in fact be rejected on an equity basis. In many cases, distribution of environmental harms is not equitable.

Externalities arise when a market transaction affects individuals or firms other than those involved in the transaction. A negative externality arises when a market transaction imposes *costs* on individuals or firms not involved in the transaction; a positive externality arises when those individuals or firms enjoy a *benefit* from the transaction.

In some uses of economic analysis, income differences can be presented as a justification for unequal distribution of environmental harms. This approach can be particularly problematic when it relies on defining the monetary value of a human life. Methodologies for calculating the value of a "statistical life" include so-called wage-risk analyses and analyses of foregone future income.

Just as poor communities often bear a disproportionate burden of pollution and environmental degradation compared with wealthier communities within the same country, poor nations may bear a disproportionate burden from toxic wastes that are exported from wealthier nations. Poor nations may also bear a disproportionate burden from global warming and other human-induced changes that affect the entire planet. For example, global warming is caused by fossil fuel use, which historically has been concentrated in developed countries; yet the adverse effects of global warming may be concentrated disproportionately in certain developing countries.

KEY TERMS AND CONCEPTS

Compensation: providing monetary payments or other resources to those who suffer an inequitable burden from economic activities, policies, or environmental externalitites.

Efficiency: The term "efficiency" in economics is often used to refer to Pareto efficiency. A resource allocation is Pareto efficient if it maximizes cumulative welfare across society. Pareto efficiency does not take account of equity concerns: a situation in which all resources are concentrated in the hands of a few can be efficient.

Environmental Justice: the recognition that minority and low-income communities often bear a disproportionate share of environmental costs – and the perception that this is unjust.

Endocrine disrupters: chemicals can interfere with the normal functioning of hormones in the human body.

Equity: Equity is a measure of *who* gains or loses from a situation or policy.

Externality: an effect of a market transaction on individuals or firms other than those involved in the transaction. A negative externality arises when a market transaction imposes *costs* on individuals or firms not involved in the transaction; a positive externality arises when those individuals or firms enjoy a *benefit* from the transaction.

Foregone future income: the income an individual would have been expected to earn in the absence of an illness, disabling event, or death. Foregone future income is one measure used to place a monetary value on an illness, disability, or death.

Global warming: the increase in average global temperature as a result of emissions from human activities.

Hedonic pricing: a method for estimating the dollar value of environmental factors by looking at variations in the value of marketed goods, such as houses or land. For example, economists may compare property values between two neighborhoods that are similar in most respects but that differ in level of pollution, and estimate the price differential related to the different levels of environmental quality.

Value of a statistical life: a monetary value placed on the possibility of loss of human life associated with a particular policy or course of action**.**

Wage-risk analyses: a methodology for estimating the monetary value individuals place on their physical safety, health, or life by measuring the wage increase associated with high-risk jobs.

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WEB LINKS

Environmental health
Collaborative on Health and the Environment
http://www.cheforhealth.org/

Community environmental justice projects
Silicon Valley Toxics Coalition Health and Environmental Justice Project
http://svtc.igc.org/envhealth_just/index.html
http://svtc.igc.org/envhealth_just/program_area.htm
Basel Action Network
http://www.ban.org/
Center for Health, Environment, and Justice
http://www.chej.org/
Louisiana Bucket Brigade
http://www.labucketbrigade.org/
Collaborative on Health and the Environment
http://www.cheforhealth.org/

Global warming
Intergovernmental Panel on Climate Change (IPCC)
http://www.grida.no/climate/ipcc_tar/

Government pages
U.S. EPA: Environmental Justice in Waste Programs
http://www.epa.gov/oswer/ej/index.html
Office of Solid Waste and Emergency Response "Success Stories" report, 2002
http://www.epa.gov/oswer/ej/pdf/ejss2001.pdf
Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations: Executive Order 12898 (Feb. 11, 1994):
http://www.epa.gov/oswer/ej/html-doc/execordr.htm

Other resources and vidoes
Listing of environmental justice videos: http://www.ejrc.cau.edu/videoarch.html
Listing of environmental justice resources: http://ecoethics.net/bib/1997/otca-005.htm.

DISCUSSION QUESTIONS

1. Consider a company that is seeking to build a new hazardous waste facility. Three possible locations are under consideration: a middle class suburban community, a rural high-income community, and an urban low-income community. What political, economic, and geographic factors might affect the company's decision about where to site the facility?

2. Consider a neighborhood where a typical home costs $80,000. Most residents own their homes and have lived in the neighborhood for more than ten years. Five years ago, an oil refinery was constructed within half a mile of the neighborhood. There have been several accidents at the refinery in which toxic gases were released into the air. What factors will affect residents' decisions about whether to remain in the neighborhood or sell their homes and move elsewhere?

3. *Wage-risk analysis* is one approach to estimating the monetary value of a human life. In a wage-risk analysis, economists look at the pay increase that is associated with taking a high-risk job. For example, a job that poses a 1 in 10,000 risk of death may command a higher hourly pay rate than a similar but safer job. Economists use this risk premium to estimate the value that people place on a 1 in 10,000 risk of death. Suggest one reason why the results of a wage-risk analysis may fail to give an accurate representation of people's values.

4. In the US, the Clean Computers Campaign is working to convince electronics manufacturers to build machines that are easier to recycle and contain fewer hazardous components. In the European Union, new laws will require manufacturers to take back used electronic equipment and to use safer components starting in 2006. Suggest some ways in which these efforts might affect the Chinese workers who currently disassemble U.S. and European electronic equipment.