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Environmental Injustice: Evidence and Economic Implications

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Abstract

Some economic analyses find evidence of environmental injustice--minorities and/or low-income persons are exposed to environmental dangers (locally undesirable land uses, or LULUs) more than their non-minority or more affluent counterparts. Such inefficient allocations result from a violation of perfect property rights. This paper does not determine efficient levels of various environmental dangers, but rather examines and compares several studies in an effort to find a consensus among researchers. No consensus emerges, as differences in research techniques prevent consistent results from being found. Future research must have well-defined methodologies before it can be effectively used by policy makers.

I. Introduction

Americans pride themselves on their efforts to achieve equity in many respects: they call for gender, age, ethnic, racial and religious equity in areas such as education, employment and leadership opportunities. People who have historically been discriminated against, e.g., women, minorities, the elderly, and persons with disabilities, are now protected in the workplace by laws such as the Civil Rights Act of 1964, the Americans with Disabilities Act, and Title VII of the Equal Employment Opportunities Commission. News headlines often report the latest strides made on behalf of the less fortunate in our society. The attraction of "the American Dream" lies in the belief that, despite initial endowments, all people are essentially created equal and thus have the opportunity to achieve success. But what if you are born into one of the "national sacrificial areas (Grossman 1992, p. 32)", where the risk that you will be born with birth defects or develop serious health problems is greatly increased because your neighborhood is a dumping ground for any variety of noxious substance?

Over the past ten years an expanding body of literature, including books, journal articles and newspaper stories, has been relaying accounts of environmental horrors, where the victims of varying ages are all characterized by minority or low-income status. The 80 miles of the lower Mississippi River that lies between New Orleans and Baton Rouge has been dubbed "Cancer Alley" because the area's oil refineries and petrochemical plants, numbering more than one-hundred, have polluted the air, land and water. West Harlem, New York hosts a crematorium, two bus depots, a marine garbage transfer station, a six-lane highway, a commuter rail line, a highway used for transporting hazardous waste through New York City, and a regularly malfunctioning sewage plant which processes 180 million gallons of sewage daily. Closer to home, in the Southeastern Chicago housing project of Atgeld Gardens, residents have claimed they're living in a "toxic donut." The project was built on top of a former landfill, and several noxious facilities, such as a hazardous waste incinerator, seven landfills, chemical plants, a paint factory, contaminated lagoons, and a sludge-drying facility, have been named as the source of the

high cancer rates, birth defects, and other health and respiratory problems cropping up among the 10,000 inhabitants (Grossman 1992; Mitchell 1993). These and other similar narratives have inspired a new movement in the United States; the call for environmental justice.

The environmental justice movement gained momentum in the 1980s, after two research articles, one prepared by the General Accounting Office in 1983 (U. S. GAO 1983) and the other by the United Church of Christ's Center for Racial Justice in 1987 (UCC 1987), made claims of environmental discrimination. Subsequent research articles supporting the initial claims motivated President Clinton to issue an Executive Order for environmental justice in 1994. While the amount of research on environmental justice is expanding, the number and content of the available studies are limited. Claims have been made that the existence of environmental injustice has been accepted without adequate empirical evidence (Anderton et. al 1994). This paper critically examines several of the studies of environmental justice and assesses the evidence in order to determine, to the extent possible, whether the current allocation of locally undesirable land uses (LULUs) is efficient, as well as to establish directions for further research. The paper begins with an overview of the environmental justice movement. The economic motivation for studying this issue is then presented. Next, several environmental justice studies are summarized. The content, methods and results of each study are compared regarding their implications for economic efficiency. The paper concludes with a suggested action plan and directions for further research.

II. Description of the Problem

Overview of the Environmental Justice Movement

According the General Accounting Office (U. S. GAO 1995) "The overall question of whether the burden of waste facilities and environmental pollutants--such as lead, selected air pollutants, and pesticides--is disproportionate among groups of people and should be alleviated is known as 'environmental justice' (p 2)." Specifically, the environmental justice movement maintains that low-income and minority persons are discriminated against because they are under-represented in siting decisions and are exposed to pollutants, and the concomitant array of adverse effects, more often than are non-minorities and persons with higher incomes. Such discrimination is known as environmental racism in the case of minorities, and environmental classism in the case of low-income persons. Environmental racism and environmental classism are collectively referred to as environmental injustice. Environmental injustice forces some groups of people to bear more of the costs of LULUs while others benefit at their expense (Pollock and Vittas 1995; EPA 1996).

The NIMBY Influence in Environmental Injustice

It is reasonable to assume that very few, if any, people would willingly choose to locate any LULU in their neighborhood. For instance, who wants to live down-wind of the local garbage dump, or risk exposure to toxic fumes emitted by an industrial plant? It is not difficult to understand that people do not want to host perceived or actual sources of health risks in their neighborhoods; however, the cries of "Not In My Back Yard"

(NIMBY) may be loud enough by some citizen groups to impose undue burdens on other groups in society. This is illustrated in the following example of NIMBY opposition to sanitary landfill siting.

NIMBY Opposition to Sanitary Landfill Siting

The early waste disposal practices of open dumping and throwing garbage into the streets led to serious health problems such as epidemics of yellow fever, cholera and typhoid (APWA 1996). Over time, as sanitary landfills replaced the earlier, crude methods of waste disposal, the health hazards have diminished; however, landfilling still carries risks, particularly increased environmental risks such as groundwater contamination and toxic emissions. Groundwater contamination leads to adverse health effects in humans and adversely affects ecosystems. In addition, toxic emissions from landfills, such as methane, create health risks as the air quality near the facility declines. Some gases emitted by landfills may be carcinogenic, leading to long-term health problems. Landfills also have a negative impact on the environment in so far as they lead to a decline in the aesthetic value of the surrounding land. In addition, the placement of a landfill in one's neighborhood carries with it the possibility that property values will decline in nearby neighborhoods due to the facility's proximity (Bacot, Bowen and Fitzgerald 1994). Both the historic and current risks connected with landfills have incited NIMBY opposition to recent landfill siting decisions. Such occurrences are becoming increasingly common in the landfill siting process (APWA 1996).

The NIMBY phenomenon, combined with the increasing amount of waste to be managed and the declining number of active landfills, has complicated the planning problems policymakers face. Thus, it is increasingly important for policymakers to address waste management issues in a timely, comprehensive manner. However, policymakers often fail to do so because they fear public resistance to such proposals. According to Vasuki (1994), long-term land use plans, especially those requiring planning for landfill sites, are not enforced "because of political retribution" (p. E94). Vasuki (1994) also points out that several states have begun exporting their solid waste to neighboring states, claiming that they have no appropriate land available for landfill sites. To the extent that NIMBY resistance influences politicians' decisions, others who lack the resources (low-income persons) or numbers (minorities) to fight the siting of noxious facilities in their neighborhoods may be disproportionately exposed to the risks associated with landfills (Pollock and Vittas 1995).

III. Economic Motivation for Examining Environmental Justice

From an economic perspective, we are interested in the extent to which environmental discrimination results in inefficiency. This is not meant to suggest that the issue of fairness or equity is irrelevant. Rather, economic efficiency is one tool that policymakers can use to enhance their decision-making process. So long as actions result in inefficiencies, there is room for improvement. The justification for examining the environmental justice issue is no exception. By examining the possible sources of

inefficiencies caused by environmental injustice, a framework for correcting the alleged market failure can be established.

Maximizing Social Welfare

Economic efficiency is achieved when net social welfare from an activity is maximized. The general rule for maximizing social welfare is to equate the marginal social benefits with the marginal social costs of a particular activity. Thus, the location and/or siting of a noxious facility is efficient when the marginal social benefits of the facility are equal to the marginal social costs of the facility. In order to obtain efficiency, property rights must be completely specified. According to Tietenberg (1994), an efficient property rights structure is one in which (1) all resources are privately owned and rights are completely specified, (2) all benefits and costs from using and owning a resource accrue to the owner of the resource, (3) individuals can voluntarily exchange resources, and (4) property rights are secure from involuntary seizure. So long as these four characteristics are fully realized, efficiency is facilitated in the market. In the ideal state, resources are fully mobile and perfect information is available. That is, all of the risks associated with a particular facility are completely known, and people are able to move freely to or away from areas where noxious facilities are located, given their budget constraints.

Sources of Inefficiencies

The problem of environmental injustice is multifaceted. This can be viewed as a general equilibrium problem in the sense that one has to identify the efficient levels of all the various pollutants simultaneously. That is, one must decide how to internalize all of the various externalities. This creates an extreme information burden, as there are numerous interactions between markets, pollutants, and pollution-generating activities. Changing the level of one pollutant results in a ripple effect that involves other markets and other pollutants. For example, consider a situation in which policymakers wish to reduce automobile emissions. They set the price of gasoline at a level which will dissuade a number of drivers from driving. The reduction in the number of cars operating in turn achieves the target level of gasoline emissions. While the efficient level of car emissions may be achieved, other markets and pollutant levels may be affected. With the number of consumers of automobiles declining, car manufacturers may decrease production, which in turn decreases the amount of pollution from the manufacturing process. The level of the industrial pollution associated with car manufacturing decreases in addition to the amount of car emissions. Another pollutant that may be affected, although somewhat differently, is diesel emissions. If former drivers decide to take public transportation, such as diesel powered buses, the number of buses operating may increase. As the number of diesel buses increase, the amount of diesel fumes also increase. Thus, while a policy may achieve the efficient level of one pollutant, the amount of other pollutants may actually increase or decrease as well.

Another source of inefficiency is that perfect information concerning the benefits and costs of noxious facilities is not available in the real world. Uncertainty exists with respect to the environmental and health risks caused by various pollutants. Scientists have not established concrete relationships among pollutants and all possible effects of various pollutants on both the environment and human health. Every possible contingency

resulting from pollution sources has not been discovered. In addition to the huge information costs associated with the efficient level of pollution, people face income and employment constraints in the real world that inhibit their mobility. The purpose of this paper is not to determine the efficient allocation of LULUs, but rather to determine, based on the available research, whether the current allocation of LULUs is inefficient. To the extent that evidence of environmental discrimination exists, which in turn implies an inefficient property rights structure, there is a strong potential for the current distribution of LULUs to be inefficient.

Decrease in Social Welfare Relative to the Ideal State

An activity which imposes external costs on third parties can cause market failure. This happens because privately determined market equilibria fail to consider these externalities and resources are not allocated at the socially efficient level. If policymakers assert that marginal social benefits are equal to marginal social costs, but certain marginal social costs are ignored, the result may be inefficient. The environmental justice movement contends that the benefits of a noxious facility's location, e.g., firms' profits or individual peace of mind from not hosting a facility in their neighborhood, accrue to one segment of the nation (white and higher-income persons), while the costs of the facility, e.g., increased health risks and detrimental effects on the environment, accrue to another group (minority and lower-income persons). To the extent that poor and minority persons bear the costs of noxious facilities and these costs are not adequately considered in the siting process, an inefficient property rights structure exists. So long as these negative externalities are not addressed, a decrease in social welfare is possible. According to Groothuis and Miller (1994), "Economists theorize that the NIMBY syndrome leads to inefficient allocation of resources because the external monetary and psychological costs of a noxious facility are borne locally by the neighborhood surrounding the facility, while the benefits of a noxious facility are distributed globally throughout the economy" (p. 336). Groothuis and Miller further state that the external costs, left unaccounted for, are the source of the inefficiency and those who suffer from the externalities must be compensated in order to restore efficiency. Unfortunately, compensating people for exposure to LULUs may have an adverse incentive effect. For example, if money or other compensation is offered to residents living near LULUs, others may move to the nuisance in order to get paid for it. Thus, the problem is not in failing to compensate the nearby residents for their external costs, but rather the problem lies in failing to account for the external costs of the LULU. In other words, the external costs of the facility must be internalized in order for the siting, location and operation of the noxious facility to be efficient.

IV. Literature Review

Pollock and Vittas(1995)

The empirical study conducted by Pollock and Vittas (1995) intended to establish linkages between race, ethnicity and pollution to determine if any particular group in society carries a disproportionate amount of the physical and economic burdens of pollution. The study measured the potential pollution exposure of Toxic Release Inventory (TRI) facilities in Florida. The study used distance to the nearest TRI facility,

measured in miles, as a proxy for exposure, based on the assumption that the closer one lives to a facility the higher is the potential for exposure. Sociodemographic characteristics of Florida Census blocks were obtained from 1990 Census data. The researchers used a logarithmic model for most of their analysis, in which exposure was measured as the natural log of the distance one lives from a TRI facility. The rationale for using the logarithmic model was that "changes in exposure are more pronounced at close proximities and diminish more rapidly toward zero as distance increases" (p. 300).

Pollock and Vittas (1995) first established the distribution of all Florida households' proximity to the nearest TRI facility. Next they examined the distribution of the proximity to the nearest TRI facility of all low-income (earning less than \$15,000 in 1989) households in Florida. The low-income households were broken down by racial/ethnic composition. The exposure distribution for low-income nonminority households was approximately the same as the distribution for all Florida households. Low-income African-American and Hispanic households were skewed to the left, signifying higher exposure. The distribution for low-income Native-American households was asymmetrical, with large proportions lying both above and below the mean. The mean distance from TRI facilities was closest for low-income African American and Hispanic households, 2.75 and 3.11 miles, respectively. The average distance for low-income white households was 3.93 miles, slightly further from TRI facilities than the average of 3.86 miles for all households. Low-income Native Americans lived, on average, 4.71 miles from TRI facilities. Thus, distributional differences among races were found to exist; however, the authors did not report on the statistical significance of these differences.

The next step in the study was to introduce background factors to determine if exposure differed across races once other determinants of proximity were accounted for. Exposure was first regressed on degree of urbanization, population density, manufacturing employment, wholesaling employment, median rent, median house value, and median house age. These variables explained approximately 34 percent of the variation in exposure across census block groups. A residual analysis was then conducted in which an unadjusted model, which took no account of the background factors, was compared with an adjusted model, which adjusted for the background factors in accounting for the effects of race and ethnicity on the residuals. According to the results of this, African-American and Hispanic households were much more likely to live near TRI facilities than were white and Native-American households. The results of the empirical analysis led Pollock and Vittas (1995) to conclude that "African Americans and Hispanics reside closer to potentially hazardous sources and therefore bear an inequitable pollution burden" (p. 307).

Been (1994)

The purpose of Been's (1994) study was to determine whether disproportionate siting or market dynamics were responsible for the current distribution of LULUs. It is important to note that subsequent housing dynamics are not really a problem in so far as environmental injustice is concerned. Rather, changing housing dynamics result from market forces, which are beyond the scope of this paper. Been (1994) extended a study

conducted by the U. S. GAO (1983) and revised a study conducted by Robert D. Bullard (1983), by analyzing data on the demographic characteristics of host neighborhoods at the time when the siting decisions were made, and tracking subsequent changes in neighborhood demographics after the sitings. In the extension of the GAO study, Been compared the percentage of African-American residents and the percentage of residents living below the poverty line in the community with the LULU with the percentage of African-American residents and those living below the poverty line across the entire host state. In the Bullard revision, she compared the percentages of low-income and African-American persons in the host census tract with the percentages in the city of Houston.

In the GAO extension, Been used 1970 Census data to establish the characteristics of the neighborhoods at the time of the siting decisions because the landfills began operating during the 1970s. She found that the host communities were all disproportionately populated by African-Americans at the time of siting, as the percentage of African-Americans in the host communities' populations was 1.6 to 3.3 times larger than the percentage of the host states' populations. Been cited these figures as evidence supporting the argument that siting decisions disproportionately affect African Americans. In addition, the communities which hosted LULUs were somewhat poorer than the host states at the time of siting. When comparing the demographics at the time of siting with the changes in demographics ten years later, Been found that the percentage of African Americans in the communities with LULUs declined for all four communities studied. Poverty rates, median family income levels, and median housing values in the host communities changed little relative to the host states. The decrease in the percentage of African Americans combined with the lack of any significant change in these economic indicators led Been to reject the theory that housing market dynamics were responsible for the location of LULUs in minority and poor communities.

In the extension of Bullard's study, Been examined changes in ten LULUs, as opposed to the twenty-five sites in the original study. The reasons for eliminating some of the sites included avoidance of double-counting and a lack of meaningful census characteristics for unpermitted LULUs. In addition, Been analyzed census tracts as opposed to neighborhoods surrounding the sites because the original study did not reveal the methods of analysis or definition of neighborhood used. Census data from 1960, 1970, and 1980 were used to capture all the dates relevant in the siting decisions of the various LULUs. At the time of siting, five of the LULUs (50 percent) were located in neighborhoods that had a higher percentage of African Americans in their populations than the percentage of African Americans in the Houston population as a whole. Thirty percent of the host neighborhoods had poverty rates significantly higher than the poverty rate for the host county. By 1990, all of the host neighborhoods were disproportionately African American and seventy percent were significantly poorer than the corresponding county. Both median family income and mean housing values declined after the sitings in more than half of the host neighborhoods. Been concluded that both siting decisions and market dynamics were factors in the disproportionate location of LULUs in poor and minority neighborhoods in Houston.

Based on her analysis, Been concluded that some evidence exists which supports the claims that LULUs are disproportionately located in poorer and minority neighborhoods.

She did not suggest that there is conclusive evidence as to whether the imbalance is due to market dynamics or disproportionate siting, but rather suggested that more research is needed before conclusions can be drawn. Been argued that the causes of the inequality must be established before corrective measures can be taken.

Anderton, et. al. (1994)

Anderton, et. al. (1994) focused on obtaining "empirically demonstrable" evidence that discrimination exists in the distribution of commercial hazardous waste treatment, storage, and disposal facilities (TSDFs) across social groups. The researchers conducted a descriptive analysis of population characteristics of census tracts surrounding TSDFs. In the study, TSDFs were defined as ones which "are privately owned and operated and receive waste from firms of different ownership" (p. 232), were open prior to 1990 and still operating, and located in areas that were tracted in the 1980 census. They used census tracts to avoid aggregation errors, e.g. "reaching conclusions from a larger unit of analysis that doesn't hold true for a smaller unit" (p. 232). Additionally, they gathered information from the area within a 2.5 mile radius surrounding the facilities. In instances where 50 percent or more of the tract fell within the 2.5 mile radius, the entire tract was included in the study as well.

Anderton et. al. (1994) compared tracts containing TSDFs with tracts that did not contain TSDFs but were located within Standard Metropolitan Statistical Areas (SMSAs) that contained at least one facility inside its borders. The study examined three broadly defined categories of variables: racial/ethnic, economic condition, and industrial and housing characteristics. The racial variables were "percent black" persons and "percent Hispanic" persons. Economic condition was measured by "percent families at or below poverty" (nonfarm family of four), "percent of households receiving public assistance" income other than social security, and "percent males employed" in the civilian labor force. Industrial and housing characteristics were represented by "percent employed" in manufacturing or industry and the "mean value" of owner-occupied, non-condominium housing stock. Using an independent sample t-test of the difference of means and a two-sample Wilcoxon rank-sum test for difference of medians, no significant difference in "percent black" was found between tracts with and without TSDFs. While no significant difference in the median "percent Hispanic" was found to exist between the two types of tracts, there was a higher average "percent Hispanic" found in tracts with TSDFs than those without. The medians of the variables "percent families below poverty" and "percent households on public assistance" were higher in tracts with TSDFs than those without; however, no significant difference in the means of the two variables was found. Both the mean and median "percent males employed" were lower in tracts with TSDFs. The average "mean value of housing stock" was lower in tracts with TSDFs, and there was a significant difference in the median of the "mean value of housing stock" as well. The researchers found that the most significant indicators of TSDFs in the largest SMSAs were employment and occupation. They emphasized that "the higher percent black reported living near TSDFs in prior studies is not found either in census tracts containing TSDFs or in tracts immediately adjacent to TSDF tracts. (p.237)." A greater concentration of disadvantaged persons was found in tracts surrounding the TSDFs rather than in the tracts with the TSDFs themselves.

The researchers used logit regression to examine the strength of the relationship between each variable and the presence of a TSDF for both the total sample and within each EPA region. They did not assume any causal structure which accounts for TSDF location. They found that "percent manufacturing" was the most consistent, significant characteristic associated with greater odds of living near a TSDF. "Percent black" was not found to be significant, nor was "percent Hispanic" in most cases, with the exception of EPA Northwest region ten. "Mean housing value" was also found to be an insignificant predictor of having a greater chance of living in a tract that contains a TSDF. The logit regression led to inconsistent, mixed results for most regions of the country concerning linkages of socioeconomic characteristics with greater odds of containing a TSDF. The researchers concluded there is no evidence of racial inequity in census tracts containing hazardous waste facilities. They point out that prior evidence of environmental inequity could have resulted from aggregating tracts containing TSDFs, which generally are industrial and manufacturing areas that have neighboring tracts with more minority and low-income residents.

GAO (1995)

The U. S. General Accounting Office (U. S. GAO 1995) conducted a study of the racial and income characteristics of people living near nonhazardous municipal solid waste landfills. Survey data were collected and analyzed from a nationwide sample of 295 nonfederal municipal waste facilities that were operating in 1992. Data from the 1990 Census were used to establish the racial and income makeup, measured as percentage of the area population, of areas within 1 and 3 miles of the landfills. These areas were compared to the characteristics of the populations of both the county and the entire nation. The comparison was used to establish whether minority and low-income persons are more or less likely than others to live near nonhazardous municipal landfills.

The researchers found that for thirteen percent of the landfills, the percentage of minorities living within one mile was significantly higher than in the host county. The study focused on whether the majority of the landfills had surrounding populations with a greater proportion of minorities or nonminorities. Based on this criterion, the study reports that the populations near the sample of landfills were more likely to be nonminorities than minorities relative to both the host counties and the nation. The study maintains that populations near municipal landfills were more likely to have a higher percentage of nonminorities than the rest of county. They conclude that "neither minorities nor low-income people were disproportionately represented near landfills in any consistent manner" (p. 78).

The analysis concerning economic characteristics was conducted in three parts: (1) the median household incomes around the landfills were compared to the median incomes in the rest of the host county, (2) the median household incomes near the landfill were compared with the national median for the host community's classification, e. g., metropolitan or nonmetropolitan, and (3) the poverty rate of the host community was compared with the poverty rate of the rest of the county. The study concluded that in the county comparison, individuals near landfills had average household incomes that were

higher than the rest of the county as often as they had lower incomes both in metropolitan and nonmetropolitan areas. Likewise, in the poverty rate comparison, it was found that people living near facilities were not likely to have higher poverty rates than the rest of the county. However, when comparing the incomes with non-host communities of a similar type across the country some differences occur, particularly in nonmetropolitan areas. While individuals near metropolitan landfills were about as likely to have median household incomes higher than the national average for metropolitan areas as often as they had lower averages, those living near nonmetropolitan landfills were more likely to have incomes lower than other nonmetropolitan areas across the country. The results of the GAO's (1995) study of municipal landfills led the researchers to conclude that they "did not find that minorities or low-income people were overrepresented near a majority of the nonhazardous municipal landfills" (p. 3).

Greenberg (1993)

The study by Greenberg (1993) can be divided into two parts. First, he studied the effects choices made in the process of determining the existence or absence of inequity have on the results of a study. Greenberg (1993) listed five questions should be addressed when conducting a study on environmental inequity: (1) What population(s) should be included, (2) Which LULUs will be assessed, (3) What burdens, e.g., health, environmental, or property value effects, will be studied, (4) Which geographic areas, e.g., census tract, zip code, county or state, will be compared, and (5) Which statistical methods will be used? He illustrated how changing the composition of any one of the five factors can alter the results of a study. This led him to argue that a protocol for conducting studies of environmental injustice should be developed by a commission of representatives from government, industry, advocacy groups and university professors.

In the second part of the paper, Greenberg (1993) analyzed the occurrence of inequity in the siting of Waste to Energy (WTE) facilities. He used two statistical methods to determine if inequity existed in Pennsylvania WTE facilities. Both a parametric method-an arithmetic mean-and a non-parametric method-a proportion comparison-were used. The service area represented the area of benefit, and the zip code and town containing the facility represented the affected areas. While both statistical measures demonstrated that the towns and zip codes hosting WTE facilities had lower incomes relative to the service areas, only the arithmetic means of the zip codes were statistically significant. His other test results concerning the variables "percent African- and Hispanic-Americans", "percent elderly", and "percent young" were inconsistent, as some measures showed inequity while others showed no evidence of inequity. Greenberg (1993) claims the inconsistencies are evidence of how differing conclusions can be drawn from only one set of data simply by applying different statistical tests.

V. Comparison and Contrast of the Various Studies

Is there a consensus among the researchers?

The studies conducted by Pollock and Vittas (1995) and Been (1994) support previous claims of environmental injustice; however, the studies identify different social groups as

bearing the pollution costs. Pollock and Vittas (1995) contend that minorities, specifically African and Hispanic Americans, bear the brunt of environmental discrimination, while Been maintains that not only African Americans, but also poor persons, are saddled with the problems of pollution. Regardless of which particular group or groups are discriminated against, both studies present themselves as further evidence of environmental injustice in the United States. Two other studies, which were conducted around the same time, Anderton et. al. (1994) and the GAO (1995), raise questions concerning the allegations of the disproportionate location of LULUs among poor and minority persons. Both studies conclude that there is a lack of evidence to support the claims of environmental discrimination. Greenberg (1993), with his mixed data, tells a two-sided tale. He has evidence to support and evidence to refute the existence of environmental racism and environmental classism.

Discrepancies in the Studies

As Greenberg (1993) highlighted in his study on environmental inequity, using different methods of research can cause results to vary. None of the five studies examined here used the same research methods. The differences in the studies begin with the research questions posed and the types of LULUs explored, and continue through the sources of the data, populations studied, and empirical methods that are used.

Economic Implications of the Studies

If one can infer from the GAO (1995) and Anderton et. al (1994) studies that environmental discrimination does not exist in the United States, then the problem of disproportionate siting would be an irrelevant point and no action would need to be taken to correct for possible inefficiencies. However, neither study claims that environmental discrimination is non-existent across all types of LULUs and sub-populations in the nation. In fact, Anderton et. al. (1994) state, "We do not claim that environmental racism does not exist. Racism is a continuing, pervasive problem in our society; it would be surprising to find that environmental matters were somehow immune to this problem." If environmental discrimination does indeed exist, then there are resulting economic ramifications. In so far as some groups in society are forced to bear the costs of pollution, while others are benefitting from the polluting, as a result of an inefficient property rights structure, the current allocation of LULUs is economically inefficient.

VI. Conclusion

Directions for Further Research

It is obvious that more research is needed to resolve the question of whether environmental injustice exists in our society before any corrective action can be taken. However, research in and of itself is not enough. The various studies have shown that, in most cases, research can be manipulated to get the results one wants. Prior to further research into the issue, several steps should be taken to ensure that accurate results are obtained, including reaching a consensus on the definition of environmental injustice.

Common Standard of Existence of Environmental Injustice

A generic definition of environmental injustice was presented in the introduction of this

paper; however, researchers lack a precise standard by which they can measure the existence or absence of environmental discrimination. Definitions of "poor" and minorities must be sorted out, e.g., all researchers would classify people as being poor if their income is below a certain level or below the poverty line, while the term minority would encompass all nonwhites, or be broken down into several categories. Some researchers contend that minorities bear a disproportionate burden associated with LULUs (Been 1994), while others (Pollock and Vittas 1995) maintain that African and Hispanic Americans bear a disproportionate amount of the costs of pollution while Native Americans do not. It is necessary that the composition of the affected social groups be uniform across the studies in order to have a full understanding of the situation. Likewise, the type of LULU should be specified. It may be more appropriate to group noxious facilities according to specific categories, as environmental discrimination may occur with some LULUs and not others. In addition, researchers should agree on the methods to be used. It is difficult to compare results of studies that use different techniques to gather and analyze data.

Policy Implications

Policies are directly affected by the outcome and conclusion of the research. If the claims of environmental injustice are substantiated, then the sources of the injustice must be identified. The importance of this intermediate step is highlighted in Been's (1994) study. Corrective action is effective only when it corrects the source of the problem. It is necessary to know the nature of the LULU that disproportionately affects some social groups, the cause of the imbalance, and the social group or groups affected in order for policymakers to concentrate their resources to alleviate the problem. If only certain types of facilities are a problem, then those facilities should be regulated and others can be left alone. In addition the cause of the problem should be identified to prevent wasted efforts in fixing the problem. For example, if all of the resources are focused on changing the LULU siting process, when the problem is actually in the subsequent forces of the housing market, the resources are wasted and the problem is not corrected. Finally, the affected social group should be targeted, for similar reasons, i.e., you don't want to concentrate efforts on correcting discrimination against a certain minority group if the discrimination is actually against another.

In conclusion, this paper has presented a basic overview of the environmental justice movement and outlined the economic motivations for examining the issue. Five studies of environmental injustice were examined to establish whether environmental discrimination occurs in the United States. A conclusive statement concerning the existence or absence of environmental injustice could not be made, due to the differing methods and definitions employed by the researchers; however, the discrepancies of the existing studies warrant further research into the existence of environmental discrimination in order to identify possible inefficiencies in the current distribution of LULUs. Informed policy decisions concerning environmental injustice can be made only after obtaining conclusive evidence of its existence.

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