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Political and environmental equity issues related to municipal waste incineration siting

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Abstract

This analysis presents an overview of recent research concerning factors influencing community responses to municipal incinerators. These factors range from those about which experts and lay people may readily agree, such as the years of service remaining in an existing landfill, to issues that are more likely to engender disagreement, such as community perceptions of environmental risks, 'environmental equity', and other economic and political concerns. The implications of these factors as well as recommendations for decision makers facing municipal solid waste disposal issues are presented.

Keywords: Municipal incineration; Risk perceptions; Community responses; Municipal waste management

1. Introduction

Huge increases in solid waste and shortages of landfill space, have made the search for safe and effective disposal a major challenge for state and local governments. The US Environmental Protection Agency (EPA) estimated that in 1990, Americans generated more than 195 million tons of municipal solid waste, up almost 25% from 151 million tons that had to be disposed of in 1980 [1]. A recent ranking of environmental issues by citizens and technical experts in Louisiana, put problems associated with municipal solid waste in the 'high statewide risk' category [2].

Despite the growing need for additional disposal options, public resistance to the siting of municipal incinerators appears to be stiffening [3]. Solid waste incinerators commonly are perceived as threats to public health, natural ecosystems, and quality of life. In addition, relatively new questions concerning the equity or fairness of the distribution of these threats have led both to increased community skepticism

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and to a burgeoning body of research whose findings suggest that often it is the poor and minority groups who bear a disproportionate share of the cost and risks of municipal waste disposal.

2. Municipal incinerators and environmental risks

Much of the public's concern about incineration centers on one problem – while the incineration reduces the volume of municipal solid waste, it may create more serious environmental risks to humans and ecosystems than landfills. Research has indicated that the bottom ash and stack emissions from municipal incinerators may be hazardous, regardless of the ash classification by EPA [4]. Metals such as arsenic, cadmium, lead, antimony, and mercury have been detected in escaping stack air and/or fly ash. Other potentially harmful products of combustion include pyrenes, dioxins, and furans. Municipal incineration introduces a potential for human exposure by expelling toxins into the air where they can be transported and eventually inhaled by humans. The most likely exposure route for materials like mercury is through ingestion of aquatic organisms in which the material has bioaccumulated [5].

Concentrations of mercury and antimony in the combustible portion of municipal solid waste has been found to be 10 times that of the average for coal [4]. While it is difficult to estimate closely the amount of metals emitted each year through incineration, the figure is likely to be sizable since metals account for approximately 10% of all municipal solid waste [3] and a combined total of about 628 000 t of ferrous metals are recovered each year for recycling from 71 waste-to-energy projects in this country [6]. In addition, it is difficult to set specific thresholds and standards to guarantee that emissions are completely safe given that once in the environment, some of these substances, such as mercury, can be changed to other more toxic forms and bioaccumulate [5]. As a result, research has suggested that one effect of incinerating more solid waste would be to increase the probability of more mercury showing up in ecological cycles over time. Mercury contamination has already been documented in fish samples taken from areas in Louisiana, Florida and Canada [7].

3. Public risk perceptions

Greatly complicating the search for policies to deal with growing waste volumes is the fact that the public's tolerance for environmental risks in general has been declining even as their overall health and economic well-being have increased. This heightened sensitivity toward risk may be due to several factors [8]. First, shifts in disposal technologies have made it easier to harm increasingly large numbers of people either intentionally or unintentionally [9]. Second, scientific advancements have enabled analysts to detect ever-smaller doses of toxins associated with environmental exposures [10]. Third, the public's confidence in the ability and willingness of

existing governmental and social institutions to protect citizens from the dangers of pollution has been declining [11]. Each of these factors has served to enhance the public's sensitivity to the risks associated with a variety of environmental exposures.

A large body of research concerning risk perceptions has concluded that individuals are more likely to accept environmental risks if: (1) the exposure to the risk is voluntary [12], (2) individuals receive compensation for the exposure [13], and (3) the risk can be compared easily to other more common risks [14].

When individuals become accustomed to an activity or the presence of a hazard, a 'subjective immunity' has been shown to develop [15]. That is, as exposure to a specific risk becomes more commonplace, most people tend to underestimate the danger, probably because they perceive they have more control over the exposure. Similarly, the public seems to underestimate the risks associated with natural disasters. Findings suggest that since the public seems to avoid thinking about such disasters, they underestimate the associated risks and, thus, are more willing to live with them [15, 18, 19]. This is consistent with the fact that large segments of the US population choose to live in areas prone to natural disasters such as earthquakes, wildfires, and floods and do not carry adequate insurance.

By contrast, the public is usually more sensitive to risks associated with human inventions with which they are unfamiliar [9, 16]. This is reflected in the tendency of the general public, when compared to the scientific community, to overestimate risks associated with new and emerging technologies [17].

4. Environmental equity concerns

4.1. Siting decisions and environmental equity

A growing number of researchers studying the siting of municipal landfills, incinerators, and other noxious facilities believe they find a consistent pattern of 'environmental inequity' wherein poor and minority communities bear a disproportionate share of the associated environmental risks. In one of the best known studies, Bullard [20] found that five of the six incinerators operated by the city of Houston from the 1920s to the 1970s were located in predominantly black neighborhoods, with the remaining one in a predominantly Hispanic area. During the 1970s, the city contracted with a natural gas company to run three 'mini-incinerators', two of which were placed in mostly black areas.

Questions of environmental equity were also popularized and publicized by large-scale public resistance to the siting of a commercial hazardous waste disposal facility in Warren County, North Carolina during the early 1980s. Walter Fauntroy, the former District of Columbia Congressional delegate who was involved in the protests, requested that the US General Accounting Office (USGAO) study the location of hazardous waste landfills. This study [21] attempted to determine the correlation between the location of off-site hazardous waste landfills and the racial and economic characteristics of surrounding communities in EPA's region IV, which

consists of Alabama, Georgia, Florida, Kentucky, Mississippi, North and South Carolina, and Tennessee. The results showed that 75% of these landfills were in communities where the majority of the population was black and, further, that all the landfills were sited both in areas with higher percentages of blacks than existed either in the state as a whole or in the counties containing the landfills [21]. The same pattern generally held true for income levels – these areas were poorer than the states as a whole, and usually poorer than the counties that contained them.

In a study similar to GAO's, Mohai and Bryant [22] examined the distribution of commercial hazardous waste facilities in the Detroit area. They found that of the 21 facilities in Michigan (which has a 16% minority population), 16 were located in the three counties surrounding Detroit (21% minority), and half of these were located in metropolitan Detroit (76% minority). When examining the relative influence of race and income on the siting of these facilities, they concluded that race was the more important variable.

Nieves [23] used county-level data to examine the concentrations of minorities and low-income people living near 'noxious facilities' – including (but not limited to) electric generating plants, chemical and petrochemical manufacturing plants, Superfund sites, commercial hazardous waste sites, and radioactive waste disposal sites. In all regions, counties with lower percentages of minorities had less than their share of noxious facilities, while the reverse was true for counties with higher percentages of minorities.

As part of its continuing work on environmental equity, the United Church of Christ's Commission on Racial Justice [24] sponsored a nationwide study on the racial and ethnic composition of populations located near commercial hazardous waste facilities and uncontrolled hazardous waste sites. The study found evidence of a national pattern wherein communities with greater minority percentages are more likely to be chosen as locations for both commercial hazardous waste facilities and uncontrolled toxic waste sites and documented a tendency to place these facilities in densely populated areas, where blacks are disproportionately located.

4.2. Explanations for environmental inequity

Several explanations have been offered for the apparent tendency to site noxious facilities in predominantly poor and minority communities. First is the political powerlessness of the poor and minority communities. Some researchers have argued that groups with less political power and access to decision makers are less able to practice the 'politics of exclusion' that are necessary to combat successfully the siting of these facilities [24–28]. For example, Tsao [28] cited a report from the California Waste Management Board wherein a consultant explicitly advised the Board that it would be more successful in siting municipal incinerators in low-income neighborhoods, because, while many groups may oppose such facilities, lower socioeconomic groups lacked the resources to keep incinerators out of their neighborhoods.

A second, commonly offered explanation is the greater vulnerability of poor and minority communities to the short-term economic gains associated with the siting of

noxious facilities. As the United Church of Christ study stated: "Many racial and ethnic communities have highly depressed economies and alarming unemployment rates; they would be particularly vulnerable to those who advocate the siting of a hazardous waste facility as an avenue for employment and economic development" [24, 5].

Another causative factor may operate through the housing market because of racial segregation. If whites are unwilling to purchase residential property in areas with a significant percentage of minorities, the pool of willing buyers in those areas will be smaller, and property values will become depressed. Thus, it may become cheaper for government or private industries needing to purchase property for noxious facilities to buy land in minority areas [26, 28]. Also, since proximity to a waste site is likely to depress property values and rents further, low-income people who are in need of affordable housing may be drawn to these areas.

A final, disturbing, explanation is differential enforcement of environmental laws. In a study published in 1992 by the National Law Journal [29] researchers examined the enforcement activities of the EPA in cases involving Superfund, the Resource Conservation and Recovery Act (RCRA), the Clean Air Act (CAA), the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), and several 'multi-media' violations involving several statutes between 1985 and 1991. They found a general tendency for the EPA to levy higher fines and respond more quickly to violations under RCRA, the Clean Air Act, and the Clean Water Act occurring in areas with lower concentrations of minorities.

The variety of possible explanations for environmental inequities suggests that the problem is both complex and intractable. Political powerlessness, lack of economic resources, vulnerability to short-term economic incentives, racially segregated housing patterns, and possible differential patterns of enforcement are complicated, interrelated phenomena that do not lend themselves to quick and easy solutions.

4.3. Environmental risk perceptions in Louisiana's 'Industrial Corridor'

In the summer of 1991, we conducted a survey of 561 residents of 11 poor and predominantly black communities where one or more noxious facilities are found [30]. These communities are located in an area along the Mississippi River between Baton Rouge and New Orleans, Louisiana known as the 'Industrial Corridor' because of its heavy concentration of manufacturing and waste disposal facilities. We were interested in the extent to which residents of these communities perceive themselves to be at increased risk for health problems and a diminished overall quality of life.

We found that many of the influences described above were also at work in the 'Industrial Corridor'. For example, the respondents were asked if they had pre-existing concerns or worries about moving into an area so close to a large manufacturing or waste disposal facility. Around half said that they had not been particularly concerned. However, after living in the area for several years, 88% of the respondents reported significant problems that they believed to be associated with their proximity to nearby facilities. When asked to explain the nature of the most

serious problems, 40% stated that they had either experienced or knew of other residents with serious health problems that the respondents perceived to be linked to emissions from a nearby manufacturing or waste disposal facility. Other significant problems mentioned included accidents (21%); followed by damage to natural ecosystems (20%); and, reduced quality of life (18%) [30].

We were also interested in why the respondents moved into these neighborhoods. We found that most (72%) grew up in the general area where they now reside, but that 73% have lived at their present address for less than 15 years and a surprising 83% moved to their present neighborhood after the closest noxious facility was built. When asked why they moved to their particular neighborhoods, 57% of the respondents listed economic reasons, such as proximity to jobs and affordable housing. This is consistent with earlier research suggesting that reduced property values attract lower-income residents [28].

When asked why, given their perceptions of elevated risks, they have continued to live in these areas, the majority of the respondents (63%) pointed to economic imperatives, such as affordable housing and their inability to secure employment in areas they believe to be safer [30].

5. Community responses to municipal incinerators

What does this more general research about public risk perception and environmental equity suggest about siting incinerators?

5.1. Influences on community reactions

How communities perceive and respond to the risks associated with municipal incinerators has been shown to be influenced by: (1) political and ideological, (2) social and demographic, (3) physical, and (4) economic factors.

1. Political and ideological influences. Perhaps the most significant political factor that may affect community response is the degree to which citizens feel connected to the larger governmental and economic systems. Recent research has suggested that individuals and groups who feel alienated from the larger culture are more likely to resist the siting of municipal incinerators. In this sense, outrage over the perceived risk associated with a new technology or facility may become a surrogate for broader concerns about the perceived fairness of the political or economic systems themselves [8]. This alienation from the broader culture may arise from a variety of situations ranging from poverty to the observable, broad-based decline in public trust in the institutions traditionally expected to oversee and manage environmental risks [31].

Questions of fairness involving the distribution of risks and benefits associated with a new incinerator also may influence community response. When prevailing attitudes about 'fairness' appear to be violated by decision makers, research has shown that public responses to any proposed initiative tend to become more

negative [32]. For example, in cases where it has appeared that poorer areas have been susceptible to economic blackmail or that the true value of the increased risks is incalculable, community leaders have even rejected the compensation designed to offset the risks and costs associated with new facilities [33].

Political factors that have been shown to affect community responses also include the level of pre-existing general environmental concern. Research by Ladd and Laska [34] has suggested that individuals who are more aware of and concerned about a variety of threats to environmental quality also are more likely to oppose the siting of municipal waste incinerators.

Mazur [35] has suggested that community resistance can be expected to be more intense when the facility is perceived to be forced on the community with very little opportunity for citizen response. Conversely, it appears that citizens will tend to display less opposition when they perceive that they will be allowed to provide input into the general management of the facility once it is sited [36].

2. Social and demographic influences. Social and demographic variables measuring an individual's or group's status within the community have been shown to affect responses to perceived risks [37]. Individuals who are younger, better educated, have white collar occupations, have more years of residency, and live closer to the proposed site are more likely to resist the proposed facility [38–41]. Similarly, Bachrach and Zautra [42] found that a greater sense of belonging within the community led to more community involvement and more active opposition to the new facility. Their findings suggest that if high profile siting controversies encourage more interaction among citizens and a sense of common struggle, policymakers should be prepared for higher levels of community resistance.

3. Physical factors. Research has found evidence of a 'gradient of perceived risk' associated with facilities such as municipal incinerators wherein attitudes toward siting are related to the distance away from one's home or community [45]. This is often referred to 'NIMBY' siting problem. Numerous researchers have concluded that NIMBYism is the result of diverse factors ranging from fears about perceived environmental risks to less serious problems such as increased traffic and noise [46, 47]. Fears such as these may explain why while the public appears to have a more positive opinion of incinerators than landfills, nevertheless, most say they would not want to live close to one [41].

Research also suggests that community responses to municipal incinerators are influenced by physical aspects of either the proposed facility itself or the municipal waste problems the incinerator is designed to address. If the public believes that the new incinerator will solve the immediate disposal problems and the longer-term environmental threats posed by crowded and aging landfills, then the community will be more likely to support a proposed incinerator [43]. Similarly, a belief that current municipal waste problems can only be solved by a new incinerator counters not only attitudes of NIMBY ('not in my backyard') but also more intransigent positions of NIABY ('not in anyone's backyard') [32]. An interesting irony is that, probably, since successful recycling programs suggest at least a partial alternative to incineration, stronger commitments to recycling have been shown to discourage support for municipal incinerators [44].

4. Economic factors. Several economic factors also appear to explain variation in community responses to proposed incinerators. The fear of retardation of future residential and commercial development and property devaluation has been shown to increase neighborhood resistance [34]. Researchers in North Carolina found that residents and employers near the proposed site for a municipal incinerator feared that the image of the area would be irreparably damaged and that future development of the nearby University of North Carolina at Charlotte would be threatened [41].

As to whether the siting of a municipal waste incinerator actually leads of diminished property values, the research appears to be inconclusive. In theory, changes in property value should reflect those impacts of the incinerator that may decrease quality of life in the host community – namely those impacts that are more easily perceived, such as noise and odor [48]. However, researchers who have attempted to quantify property devaluation after the siting of a municipal incinerator have not been able to show any significant effects [49]. They concluded that due to a variety of market-related factors, such as a lack of perfect information among buyers, property values may not be adequate indicators of the impacts of incinerators on either neighborhoods or larger communities.

In addition to reduced property values, many communities now fear that they will have to subsidize incinerator facilities who fail to meet new environmental regulations such as those governing the disposal of ash. Also, EPA has concluded that for waste-to-energy facilities to be economically viable they must produce revenues from energy products to offset sizable processing costs [3]. As a result of these concerns, many potential host communities fear that they may be asked to assume significant future financial risk associated with aging or underutilized incinerators. In addition, with the exception of several urban areas in the Northeast, the estimated comparative advantage in tipping fees of incinerators over landfills has not materialized. Despite predictions of much higher increases, in most areas of the country tipping fees at landfills increased only by about 24% during the 1980s [3]. Finally, incineration often costs municipalities at least $60 per ton, while the US average for newer and safer landfills is closer to $30 per ton [50].

5.2. Effects of community resistance

The most obvious and costly effect of community opposition may be increased 'entrepreneurial uncertainty' – uncertainty among those decision makers, engineers and investors who may have otherwise worked together to plan and construct new municipal waste incinerators. Blumberg and Gottlieb [3] estimate that uncertainties resulting largely from public opposition have placed municipal incineration 'beyond a competitive edge' in comparison to other forms of waste disposal options. A study conducted by Chertoff and Buxbaum [50] examined a sample of 20 proposed municipal incinerators throughout the US in an effort to determine their ultimate outcome and to identify the factors that may explain why some were sited and completed while others were not. They found that 3 of the 20 were completely abandoned, 4 were required to abandon their initial sites, and 10 were successfully sited only after

considerable delays [50, 33]. In each of the cases, varying degrees of community resistance led to either delays or termination of the projects.

Chertoff and Buxbaum also found several common characteristics among those communities that eventually accepted the incinerators. First, they were facing absolute physical limits on further landfill use. Costs associated with either upgrading existing landfills or transporting waste to distant landfills generally were perceived to be high. Second, these communities had experienced a level of groundwater deterioration through either saltwater or leachate intrusion that was considered serious by the general public. By contrast, in those communities that rejected incinerator projects, citizens saw no clear and immediate need for the incinerator. The authors concluded that in these communities a few vocal critics appeared to influence the ultimate decisions. Also, it appeared that the greatest resistance came if the incinerator were planned for a middle-class to lower-middle-class residential area with a high percentage of owner occupancy. The fear of property devaluation seemed to resonate deeply among these residents.

6. Conclusions and recommendations

Much of the research concerning community resistance to municipal incinerators suggests that factors such as fear of negative health effects, property devaluation, environmental equity concerns, and economic risks can be mitigated if the public believes that incineration is the safest and most affordable option for disposing of an increasing municipal solid waste stream. This implies that steps that policymakers take to educate the public concerning the risks and benefits associated with each of the major disposal options is a wise use of public resources. However, such public education has been shown to allay these fears only when the community is close to evenly divided over the siting of a municipal incinerator. In cases when a large majority of citizens opposes incineration, public outreach programs have not proven to be successful in calming public opposition [50].

In addition, policymakers should remember that siting controversies are, almost by definition, highly individualistic fights. Localized conditions such as availability of landfill space, reliance upon and quality of groundwater supplies, and public trust in government institutions have been shown to exert significant influences on community responses to municipal incinerators. Thus, there may be no generalizable approaches that can be expected to calm community opposition in all settings. Instead, policymakers will have to fashion 'tailor-made' approaches, combining programs of public education and risk communication with mechanisms to compensate the nearby residents for bearing increased risks – both real and perceived.

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