

Public Health Matters

Zoning, Equity, and Public Health

Juliana Maantay, PhD, MUP

ABSTRACT

Zoning, the most prevalent land use planning tool in the United States, has substantial implications for equity and public health. Zoning determines where various categories of land use may go, thereby influencing the location of resulting environmental and health impacts. Industrially zoned areas permit noxious land uses and typically carry higher environmental burdens than other areas.

Using New York City as a case study, the author shows that industrial zones have large residential populations within them or nearby. Noxious uses tend to be concentrated in poor and minority industrial neighborhoods because more affluent industrial areas and those with lower minority populations are rezoned for other uses, and industrial zones in poorer neighborhoods are expanded. Zoning policies, therefore, can have adverse impacts on public health and equity.

The location of noxious uses and the pollution they generate have ramifications for global public health and equity; these uses have been concentrated in the world's poorer places as well as in poorer places within more affluent countries. Planners, policymakers, and public health professionals must collaborate on a worldwide basis to address these equity, health, and land use planning problems. (*Am J Public Health*. 2001;91:1033–1041)

Many public health concerns are location specific and location dependent. It behooves us to consider the role of zoning as the primary planning tool that governs what goes where. Most major US cities; many suburban, exurban, and even rural areas of the United States; and many other countries use zoning as their primary means of land use planning.^{1(p163)} Zoning is used to designate certain areas as “appropriate” for certain uses (separated into broad categories such as residential, commercial, institutional, and industrial), as well as to determine “appropriate” densities, building bulk, lot coverage, and a host of other factors. Zoning can also be employed to restrict or prohibit certain land uses in certain areas.

Zoning therefore determines the allowable uses to which land may be put. The uses to which land may be put, in turn, influence what environmental and human health impacts may result from the activities allowed to take place on the land. The determination of zoning, then, can have substantial ramifications for public health matters. In fact, the idea of zoning and much of the seminal public health legislation came of age at approximately the same time in many American and European cities.²

The modern disciplines of public health and urban planning developed from the same roots in the late 19th century, with similar objectives, strategies, and standards. Although the fields of planning and public health diverged during the intervening century, in both theoretical focus and practical applications, it may now be timely to consider the shared roots and experiences of the 2 fields and return to a state of collaborative effort and awareness of each other's work. Planners need to take into account the potential public health impacts of their planning actions, and public health professionals can benefit from understanding the implications and importance of land use planning decisions in public health issues.

This article is based on an analysis of past and present conditions in New York City's industrial areas, as well as specific case-study industrial communities within the city.³ I examined, for the 4-decade period 1961 through 1998,⁴ the location of the city's industrial zones⁵ and where industrial zones had been increased or decreased in size.⁶ I then compared these rezoned areas in terms of the proximate population's characteristics and changes over time^{7–10} and examined the public policies relevant to the rezonings.¹¹ One goal of the study was to determine whether public policies pertaining to zoning and land use planning are inherently (if inadvertently) discriminatory regarding the disproportionate distribution of potentially noxious land uses in poorer communities and communities of color.

New York City was the nation's first municipality to adopt a comprehensive zoning ordinance, and its experiences should be relevant to many other major cities as well as other places where zoning is used.

Noxious Land Uses and Zoning

In its most basic form, zoning separates land areas into broad categories of land use—for example, residential, commercial, and industrial—with the assumption that separation of land uses promotes the public health and welfare of the population. In New York City, as in many other cities developed during 19th-century industrialization and before the advent of inexpensive public transportation, industrial neighborhoods typically

Requests for reprints should be sent to Juliana Maantay, PhD, MUP, Department of Geology and Geography, Lehman College, City University of New York, 250 Bedford Park Blvd W, Bronx, NY 10468 (e-mail: maantay@aol.com).

This article was accepted December 30, 2000.

contain or are adjacent to large residential populations.

Industrial areas generally carry a higher environmental burden than do purely residential neighborhoods in terms of pollution impacts and risks.¹² Some of these burdens include adverse air quality, noise, traffic safety, congestion, and vibrations from heavy truck traffic; use and storage of hazardous materials; emission of hazardous and toxic substances, which enter the air, soil, and water; illegal dumping of hazardous materials; proliferation of waste handling facilities; and poor enforcement of environmental regulations and inadequate response to environmental complaints. These burdens all contribute to the undesirable and unhealthy living conditions in industrial areas.

In recent years, industrial processes have been accompanied or supplanted by noxious waste-related facilities in New York City's

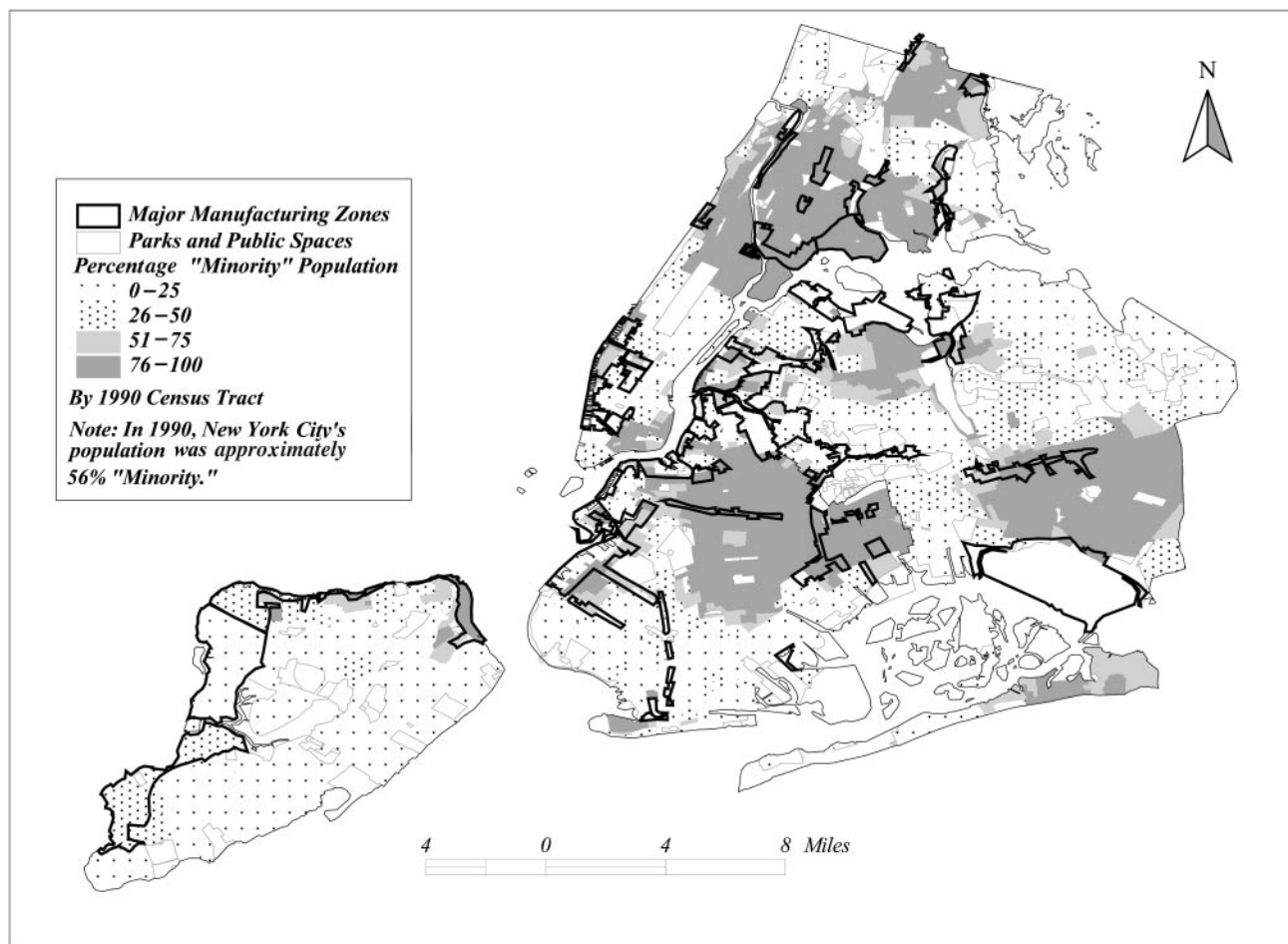
manufacturing zones, and this situation threatens to worsen with the 2001 closing of Staten Island's Freshkills Landfill, the city's last remaining landfill. Because city residents generate approximately 13 000 tons per day of municipal solid waste, alternative management plans will undoubtedly include many additional waste transfer stations and potentially thousands of additional truck trips per day on city roads.¹³

Yet only certain areas are zoned to accommodate the predicted increase in waste-related facilities as well as to continue to host the existing ones. Waste-related facilities can legally be located only in manufacturing (M) zones; this requirement negates the city's attempt to achieve equitable distribution of noxious waste facilities, since M zones are not distributed evenly around the city (see Figure 1).¹⁴

In addition to the uneven distribution of M zones, there is the ongoing issue of zoning

changes. Since the last major overhaul of the New York City zoning ordinance in 1961, there have been thousands of individual zoning map changes, many affecting M zones. These changes have enlarged M zones in some areas and decreased them in others. There have also been changes within the category "M zone," so that some zones have been changed from one type of M zone to another, with different uses permitted and restricted. In some industrial areas, M zones have not been changed at all.³

These zoning changes have ramifications for the distribution and concentration of noxious waste facilities, and therefore for health impacts on the nearby populations. How is policy made on changing zones from one type to another, and what are the potential impacts of these policies? What are the characteristics of the populations most affected by these zoning changes?



Source. Based on data from the New York City Department of City Planning (1993) and the US Census Bureau (1990).

FIGURE 1—Major manufacturing zones and percentage minority population, New York City.

Noxious Land Uses and Public Health

We would not be concerned about people living in or near industrial areas if these areas were not potentially noxious and harmful to human health. There are numerous reported cases of noxious land uses and of nearby communities' being affected by abnormally high rates of cancer and other debilitating, chronic, life-threatening, or rare diseases.¹⁵ These cases include such places as Triana, Ala, which was dubbed the "unhealthiest town in America" by *National Wildlife* magazine owing to high levels of serious illness, possibly caused by DDT contamination from a nearby chemical plant¹⁶; "Cancer Alley," a string of towns along the petrochemical refining corridor in Louisiana^{17,18}; Sunnyside, Ariz, where rare cancers and immune system disorders in the community may be a result of pollution caused by nearby aircraft industries¹⁹; and West Dallas, Tex, a community that has a lead smelter and several toxic waste dumps among its land uses and whose population suffers from high levels of cancer, heart disease, liver damage, and blood disorders.²⁰

In a more urban context, the industrial area of Hunts Point–Mott Haven in the South Bronx section of New York City has one of the nation's highest rates of childhood asthma hospitalization—nearly 150% higher than that of New York City overall, and 1000% higher than the rest of New York State.^{21,22} Hunts Point is also home to a disproportionately high number of New York City's waste-handling facilities, including the largest wastewater sludge pelletization plant in the Northeast and, until it was forced to close recently, the region's largest medical waste incinerator.²³

Definitive links have not been established between these land uses, the environmental burdens they impose on the nearby communities, and the health impacts borne by the communities. Although conventional wisdom and intuitive logic would suggest that there is a correlation between the high rates of respiratory illness and high levels of air pollution, there has been little research demonstrating such a correlation.

Unfortunately, it is difficult to prove a cause-and-effect relationship between noxious land uses and adverse health impacts. One reason is that there is a lack of scientific consensus on health-based standards for toxic substances. Clear data do not exist regarding the effects of exposures to many toxic substances. There are also difficulties in assessing impacts from substances that have not yet been tested, especially considering that, on average, 1500 new chemicals are introduced each year.^{24(p46)} The effects of distance on toxicity are not well documented, either:

Little is known about the relationship between distance from a pollution source, such as a hazardous waste site, and actual health risks. . . . Accurate estimation of human exposures to hazardous air pollutants across all levels of geographic aggregation is constrained by the paucity of suitable monitoring methods, relevant ambient measures, and validated models for predicting exposures to populations of interest.^{25(pp70,71)}

Another factor is the difficulty in assessing cumulative and synergistic impacts of various chemicals emitted together or in close proximity. Exposure and risk from each toxic substance is evaluated separately, because there are different thresholds and measurement techniques for each. However, chemicals can combine to create synergistic impacts that are more deadly than the impacts of individual substances, and this is not taken into account in traditional risk assessments.

There are also uncertainties in assessing the impacts of substances emitted through different media pathways, such as air, water, and soil, and whether exposure to humans occurs through ingestion, inhalation, or dermal contact. There are significant uncertainties when we try to model exposures and outcomes, since the relationship between emissions and exposures is poorly understood. The correlation between exposure dose (ambient levels), body dose (amount inhaled or ingested), and target dose (amount reaching a sensitive organ) is affected by many variables that may not be well understood and may be difficult to model.²⁶

Even for many substances for which there are standards, the thresholds are set for harm to the average individual, not the most vulnerable members of the community, such as young children, the elderly, pregnant women, or persons with compromised immune systems.²⁷ In many poorer communities and communities of color, it is precisely the preponderance of such individuals that makes the community so disproportionately burdened.

A mundane but very real drawback in impact assessment is the lack of reliable measurements of actual emissions. Since most regulated polluters are responsible for reporting their own toxic emissions, these measurements are notoriously inaccurate, and of course they do not take into account the emissions of the many nearby unregulated polluters.^{28,29}

Some of the problems involved in correlating public health impacts and the environmental effects of noxious land uses are summarized by Head:

Current criteria for potential causal relationships are based on complicated assumptions and assessments of available data, because, as explained, the absolute cause-and-effect relationship is often difficult to establish. Hence, scientists may seek data associations that suggest a correlation as the basis for inferring a causal relationship. It is

interesting to note that this absolute relationship of causality may have been less of a factor when combating past public health epidemics than in current efforts related to investigating and responding to environmentally induced diseases. In those past epidemics, unequivocal cause and effect was not necessarily determined prior to action being taken to mitigate the disease (e.g., malaria).^{24(p48)}

Additionally, in many cases where an association between noxious land uses and adverse health impacts was suspected, a formal health study of the affected community was never conducted. For instance, in Texarkana, Ark, several federal agencies (e.g., the Environmental Protection Agency, the Agency for Toxic Substances and Disease Registry, and the Department of the Interior) issued reports admitting that there were severe health risks to the people living near a former wood-treatment facility. Although people were suffering from rare cancers and otherwise unexplained diseases, no public health survey was undertaken.³⁰ In most of these cases, the public health linkages remain inconclusive in terms of strict scientific proof.

With noxious land uses and environmental burdens, exposures are uncertain and risks cannot be definitively determined; therefore, health outcomes are hypothetical. The question is, should this lack of absolute certainty prevent public health action on behalf of the populations most likely to be affected by noxious land uses and zoning decisions about industrial districts?

Why Do We Have Zoning?

Zoning began as an attempt to control land use in order to protect the health, lives, safety, morals, properties, and welfare of the population within an existing constitutional framework of the state's police powers. These police powers are upheld by the courts only when such powers pass tests of reasonableness and when they are clearly related to the general interest of the community as a whole.^{31–33} Zoning case law varies widely in how "the general interest" is interpreted. "The myth begins with the assumption that there is an objective reference for the concept of what is best."³⁴ The goals of public protection have been interpreted according to the policymakers' standards and the values of the day, and they have changed and increased over time. In general, zoning ordinances do not specify a definition of public welfare. Each government is free to determine the limits to public welfare and exactly who constitutes the public that is being protected.

Zoning separates land uses from each other, as adjacency and mixture of disparate uses were seen as detrimental. In addition to

zoning's public health purpose, early planning documents overtly stated that the reason for zoning was to protect private property, and "private property" was generally understood to refer to the "better" residential and commercial properties.³⁵

It can also be said that the purpose of zoning is to prevent change, or at least to seriously retard change, so as to make real estate investment a more predictable and less risky endeavor and therefore more profitable in the long run. Encouragement of stability in the real estate industry was seen by policymakers to be beneficial to the general public.^{36,37}

Other zoning experts have argued that zoning is not a control but a "thermometer" that measures the amount of economic heat on a property: as the heat goes up, zoning responds by changing. In other words, zoning is the result of economic and real estate market conditions and trends, rather than the result of a well-considered comprehensive plan, as is considered proper planning practice. According to some observers, real estate speculation and profit seeking are actually driving the American planning process.^{38,39}

Babcock, in his 1966 book *The Zoning Game*, speculated on the purposes of zoning:

These [purposes] may vary from a fear of "Negro infiltration" to a vague identification of zoning with "good government." To most real estate brokers, and to some land economists, lawyers, and judges, zoning is a means of maximizing the value of property. . . . I suppose what really disturbs me is that because zoning is the most universal of the legal tools for shaping the character of the municipality, any unwise use of the process has a far greater impact upon our national character than does the abuse of a less widely employed device.^{40(pp116,124)}

The Nation's First Comprehensive Zoning Ordinance: New York City

New York City has a long history of legislating land use for public health purposes. As early as 1664, only a few decades after the first permanent European settlement in this area, New York City had adopted land use laws designed for the protection of public health, such as the prohibition of tanneries and tallow makers in the densely settled parts of the city. City officials believed these activities were noxious and potentially injurious to human life and, perhaps more important, injurious to property and property values. Other acts throughout the 17th and 18th centuries further restricted noxious land uses, for example, by prohibiting distilleries and slaughterhouses in heavily populated areas of the city. Comprehensive building codes, tenement house laws, and sanitary and public health regulations of the 19th century

helped make both laypeople and government officials more receptive to the promulgation of universally restrictive land use controls and environmental regulations in the 20th century.⁴¹⁻⁴⁵

In 1916, New York City was the first municipality in the nation to adopt a comprehensive zoning ordinance. Other cities had instituted laws that could be considered protozoning ordinances, including restrictions on building height in Boston, Mass, and the prohibition of certain land uses, such as brick kilns, within the city limits of Los Angeles, Calif.^{1(p881)} But New York City was the first to create a zoning ordinance that regulated land use, building height, bulk, and density for every property within the city.

The main impetus for the 1916 Zoning Resolution was the desire to protect property values for certain types of landowners, thus protecting public welfare, since real estate values were seen as critical to the success of the whole city's economy. The push for zoning in New York City was spearheaded by a strange coalition of groups. The Fifth Avenue Association was a group of owners of exclusive shops catering to the wealthy; its members feared what the encroachment of manufacturing lofts and the immigrant workforce might do to the value of their properties and to their profits from retail trade. They wanted zoning to protect them by giving them an exclusive zone closed to industry.

Another group of zoning advocates consisted of property owners in the Wall Street area, who feared reductions in property values and rent profits owing to the loss of light and air from adjacent overbuilt skyscrapers. The huge bulk and resultant 7-acre shadow of the Equitable Building, constructed in 1913 at 120 Broadway, had made property owners in the area aware of the financial impacts that a lack of land use controls could have on their properties. And then there were the good-government types, public health advocates, and reformers who wanted zoning for the same reasons they had wanted tenement building codes, sanitary infrastructure investment, and worker safety laws: to improve the lives of everyday people.^{46,47}

The 1916 Zoning Resolution divided the city into commercial zones, residential zones, and unrestricted zones where nearly any land use could go.^{48,49} Since New York City's existing industrial areas usually included residential enclaves or contiguous residential areas, these unrestricted zones had significant residential populations. These populations gained little protection from the new zoning resolution compared with the people in the officially designated residential zones, which were the city's more exclusive and affluent neighborhoods.

New York City revamped its entire zoning apparatus in 1961, creating 3 broad use cate-

gories—residential (R), commercial (C), and manufacturing (M)—and eliminating the unrestricted category implemented in 1916.^{50,51} This approach required a determination of existing predominant land use for each part of the city so that planners could assign the most appropriate of the 3 zones to each area. This was especially difficult in the old unrestricted zones that had permitted residential uses to exist side by side with industry. Residential, commercial, and industrial uses were supposed to be in separate zones, and the planners anticipated that the nonconforming uses would in time disappear; however, in many neighborhoods both industry and residential uses remained.^{52,53} The result is that most industrial zones in New York still have rather large residential communities within or surrounding them.

A Brief History of Industrial Neighborhoods in New York City

There are 58 major industrially zoned districts in New York City.⁵ According to the 1990 census, approximately 22% of New York City's population lives in census tracts that are within these M zones.³ Many of these industrial districts have existed since the 19th century, when New York City was the nation's most important port,⁵⁴ and most of the city's industrial areas are on the waterfront.⁵⁵ Because of historic settlement patterns, many industrial districts developed with worker housing within walking distance.⁵⁶ Therefore, most industrial districts were essentially mixed-use areas, combining manufacturing activities with residential uses.

By the second half of the 20th century, new industrial enterprises were choosing not to locate in central cities, owing to changes in manufacturing technology, transportation, and demographics.⁵⁷⁻⁵⁹ New York City, like many US cities, was entering a period of deindustrialization. This process was exacerbated by the decline of the city's port activities as a result of containerization and relocation of the port to New Jersey. New York City has lost hundreds of thousands of manufacturing and port-related jobs since the 1960s.⁶⁰

Industrial areas and their nearby residential communities were profoundly affected by this decline of industry and job loss. Historically, the populations of these communities had been predominantly working-class and employed by local industries. As industry left the city in the 1960s and 1970s, these areas became the repositories of noxious waste-related uses without the benefit of viable industries' providing jobs for local residents. At the same time, other planning policies and private sector decisions intensified the deleterious im-

pacts to industrial areas. Large-scale public housing projects, urban renewal areas, and highway projects were often located in or near industrial areas, furthering the downward spiral of neglect and decline. Considerable private disinvestment usually accompanied these planning efforts, to the further detriment of these communities.^{61,62}

As manufacturing activities diminished in industrial areas, both private and public waste-related facilities proliferated.⁶³ The substitution of waste facilities—private solid waste transfer stations, marine transfer stations, wastewater treatment plants, combined sewer overflow outfalls, sludge treatment facilities, recycled materials handling facilities, junkyards, auto salvage yards, scrap metal and construction debris processing facilities, and medical waste disposal plants—for viable manufacturing furthers the impression that these communities are being disproportionately “dumped on.” The fact that the neighborhoods most affected by waste facilities are poorer and with a higher percentage of minority people⁶⁴ and immigrants than the city average means that the health burden of the city’s waste problem falls on this already more vulnerable population.

Equity Issues in Zoning

Ironically, zoning, which was intended to protect the public health, safety, and welfare, has often proved to be exclusionary, offering differential protection to different segments of the public. Indeed, as many see it, the original purpose of zoning in this country was to promote exclusion. Some early zoning ordinances, such as San Francisco’s 1885 prohibition against laundries in residential areas, were blatant attempts to prevent Chinese people from living in White neighborhoods.⁶⁵ One of the main purposes of New York City’s 1916 Zoning Resolution was to keep the factory worker rabble away from the wealthy ladies shopping on Fifth Avenue by creating an exclusive zone for the “better” commercial and residential uses.⁴⁶

For the most part, the courts have upheld municipalities’ right to craft their own zoning ordinances in the way that serves their community best and to define the public welfare for their own jurisdictions as they see fit; however, several important legal battles have been won by groups claiming racial and economic discrimination resulting from exclusionary zoning ordinances. The best-known instance was the landmark 1974 New Jersey State Supreme Court case *Southern Burlington County NAACP v Township of Mount Laurel, NJ*. The town’s zoning and other land use regulations had made it physically and economically impossible to provide low- and

moderate-income housing in the municipality, thereby excluding low- and moderate-income people from living within the confines of the town.^{1(p420)}

In the 1960s and 1970s, it was widely acknowledged by zoning experts that many zoning ordinances are discriminatory: by requiring minimum lot sizes and house sizes, specifying allowable housing types and construction materials, and even specifying minimum dollar values, such ordinances keep out lower-income people and maintain community homogeneity.^{36,66–69} In many cases, the effort to keep out lower-income people was directed at minorities, primarily African Americans, as opposed to poor White people.⁷⁰

Thus, zoning has limited the choices of certain groups as to where they can live, often relegating poor and discriminated-against people to the least desirable locations. In addition, rezoning an area where such people already live to permit heavier industrial uses or noxious nonmanufacturing uses can further degrade the area and have adverse impacts on the people who live there.

Rezoning Industrial Areas

New York City has rezoned a substantial portion of its industrial land since 1961, mainly from manufacturing uses to other uses.⁷¹ There were 409 zoning changes affecting industrial districts from 1961 through 1998, and for every 2 changes from nonmanufacturing uses to manufacturing uses, there were about 3 changes in the opposite direction. The city was rezoning from M zones much more than it was rezoning to M zones.³

Approximately 20% of the total changes to industrial zones can be classified as large (affecting 4–10 square blocks) or very large (more than 10 square blocks). Of these 82 changes, 60 resulted in major decreases to M zones and 22 resulted in major increases to M zones, again indicating that the city was more interested in promoting new uses for zones previously designated M zones than in increasing the number of M zones overall. The Bronx, the city’s least affluent borough, had the largest number of major increases and the fewest major decreases to M zones. Manhattan, the city’s most affluent borough, had the fewest major increases and the largest number of major decreases to M zones.

The inventory and mapping of the rezoning activities indicated that there was not only a disparity between the number of actions resulting in M zone decreases and the number resulting in increases, but also a disparity in where and when these changes occurred. Some boroughs had experienced few or no major increases in M zones since the late 1960s, while

others had undergone relatively few M zone decreases.³

Race, Class, and Home Ownership in Industrial Zones and Rezoned Neighborhoods

Nearly one quarter of New Yorkers live in census tracts within major M zones.⁷² What are the characteristics of these people? In each decade between 1961 and 1998, major M zones in New York City generally had a higher percentage of minority populations than borough or city averages, except in Manhattan, where the percentage of minorities living within M zones has dropped each decade in relation to borough averages. M zones also generally contain people with lower than average incomes and rates of home ownership.

In general, the city was rezoning to increase M zones in areas with higher than average minority populations, lower than average incomes, and lower than average rates of home ownership. Conversely, the city was rezoning to decrease M zones in areas with lower than average minority populations, higher than average incomes, and higher than average rates of home ownership. Years after rezoning, the affected areas were often even more divergent from city, borough, and M-zone averages with regard to income, percentage minority population, and home ownership rates.

A detailed analysis of land use maps from 1956 through 1990 revealed that in industrial areas where M zones were increased or recategorized as “heavier” industrial zones, industrial uses had increased in concentration in the years after the rezoning. Conversely, in industrial areas where M zones were decreased or recategorized as “lighter” industrial zones, industrial uses had decreased in the years after the rezoning.⁶³

Planning for Zoning Changes

The zoning change applications and other documents state the ostensible planning rationales for proposing areas for rezoning. For instance, “marginal” or “deteriorated” residential neighborhoods were considered more appropriate for rezoning to industrial use than “stable” communities that have been “maintained.” Sometimes “market forces” or “market pressures” were cited as reasons for decreasing M zones, along with evidence that the proposed zoning change reflected conformance with existing (if illegal) conditions.⁷³ Thus, a zoning change can contribute to neighborhood transformation in either of 2 ways: it provides the mechanism to facilitate or jump-start the change,

or it legitimizes the change that is already under way, encouraging the trend to continue.

The Zoning Process and the Public

New York City has developed an elaborate and extensive procedure to enable public participation in certain planning activities, and these participation opportunities are theoretically available to all residents and all communities equally. However, there are great disparities in how successful various communities are in influencing the outcomes of planning decisions. Anecdotal evidence suggests that political power, relative affluence, and property-owner status all affect the amount of influence wielded by a particular community. There are few forums for proactive community planning, and there is nothing within the formal public participation process that requires the city to act on the community's advice. Thus, the status quo is generally maintained. And the status quo seems to be that M zones, which are typically neighborhoods that are poorer than average and with a higher percentage of minorities and renters than average, get "dumped on," with very little recourse in the formal structure of decision making.

The land use attorneys Kintish and Shapiro make some interesting observations about the relationship between the level of enforcement efforts and the level of affluence and influence of various communities in New York City, as well as the level of effectiveness of public participation. They mention the Bathgate industrial district in the Bronx as an example.

Enforcement problems compound the issue: zoning regulations only work if there is an ability and will to enforce them. In neighborhoods where well-organized, well-informed, and well-connected community groups demand enforcement, zoning and other rules tend to be enforced. In more troubled neighborhoods, residents tend to be less influential, they are less likely to be familiar with city regulations, and they often view public officials with mistrust. Consequently, the city is less likely to express concern about violations to industrial performance standards in these areas. Similarly, in such neighborhoods, the city is more likely to ignore abandoned cars or sweatshops and is less likely to determine that an environmental impact statement is required for a proposal project. For example, no EIS [environmental impact statement] was prepared when the city established the Bathgate Industrial Park in what had been a residentially zoned portion of the South Bronx.⁷⁴

It should also be noted that rezoning an area is costly in both time and money, thus making market forces an even more likely influence on rezoning efforts.

Is Zoning Equitable?

After looking at the general issue of equity in zoning, researching the particular case of New York City, and analyzing the data, we are left trying to answer the question, Is zoning equitable? Zoning, as a body of law, is supposed to be applied and enforced so as to protect all portions of the population equally. Other studies have determined that many environmental laws are applied and enforced differentially depending on the characteristics of the affected populations, with facilities in poor and minority communities subject to less rigorous enforcement and less stringent penalties for noncompliance than facilities in predominantly White communities.^{75,76} Do New York City's zoning regulations succumb to this unfortunate predilection? Does zoning protect some areas, and therefore some people, better than it does others? Some quotes from the zoning experts interviewed for this study:⁷⁷

No question that zoning protects some people better than others. Zoning is responsive to wealth, property, political power, and those areas or communities that are more politically empowered or connected clearly will be able to get done the zoning changes that they desire and to prevent the zoning changes they don't desire. Less politically or economically empowered communities, even though you have a formal structure [for public participation], will be less able to impact on changes that are taking place to them or around them. (ZI 6)

Of course zoning doesn't protect equally—but this is just part and parcel of our negative attitudes towards both industry and poor people. . . . Zoning segregates not just land use, but also people. Zoning protects areas of home ownership. It protects areas of higher land values. These areas need to be protected because, reading between the lines, these are presumably the people who need and deserve to be most protected. (ZI 1)

Zoning, which looks like a very egalitarian system, really isn't. The critical element being enforcement. In pre-1961 zoning, 60 to 70 percent of the city was unrestricted zones, they didn't impose rules on things. . . . [Today] there are no unrestricted zones—every zone is subject to enforcement under zoning laws, building laws, noise laws, environmental laws, etc. But in fact, these laws are only enforced in areas where people have the clout to make the complaints count. When you look at those areas and you overlay them against the rest of the city, you may come up with the same ratios as you had in 1930, when you had 60 to 70 percent of the city in unrestricted zones in terms of use. Areas of low enforcement today correspond to the old unrestricted areas. So maybe there was less hypocrisy in governing land use then. We have this fiction of zoning protecting everyone equally. . . . (ZI 5)

It is often argued that these effects are unintentional and coincidental, but even if coincidence is assumed,

[a] society that allows such a pattern of coincidence to persist has failed to equally protect its citizens. This failure, itself, constitutes an environmental injustice. . . . Whether the result of overt or covert racism, putting economic profits over the health of people, or benign neglect, this disproportionate risk can and does lead to disastrous results. An injustice exists even if it is merely a coincidence that:

- the food, air, and water that people of color and those who are poor consume are more contaminated;
- nonwhite workers are 50 percent more likely to be exposed to hazards in the workplace; and
- hazardous waste facilities are located disproportionately in communities where people of color and the poor live.⁷⁸

The Implications of Zoning Changes

Understanding the zoning change process is important because zoning changes can have a significant effect on neighborhoods and neighborhood health. A land use planning tool that governs where things may go should come under more scrutiny than it has. Zoning is the gatekeeper in terms of noxious uses and therefore requires comprehensive, rather than piecemeal, planning. The zoning change process should take into account that a zoning change in one part of the city may have far-reaching consequences for other parts of the city. For instance, reducing industrial zones in the Lower West Side of Manhattan (SoHo, Tribeca, and the Far West Village neighborhoods) in the late 1960s and 1970s was not isolated from the need to increase industrial zones in the South Bronx in the late 1970s and early 1980s. Neither was the reduction of Manhattan's industrial zones isolated from the increasing intensification of industrial land use in other industrial parts of the city.

It is not possible to isolate the effects of the city's land use policies from the many other factors affecting the demographic makeup, economic status, and land use conditions of particular neighborhoods. However, although the results of rezoning may be unintentional, zoning changes and associated city policies are reducing some people's quality of life and improving that of others, while undermining the ideal of equal protection under the law of zoning.

Zoning is not a benign or neutral process. Decisions about the best locations for noxious uses have racial and classist implications, since industrial zones are the only places in New York City where noxious uses can be located and the people living in and near industrial zones have a much higher than average likelihood of being poor and minority. Zoning tends to concentrate noxious uses in poor and mi-

minority industrial neighborhoods as more affluent industrial neighborhoods with lower minority populations are rezoned to other uses.

As long as “market forces” govern zoning, and therefore planning, the concentration of noxious uses in poor neighborhoods is inevitable. When planning tries to address quality-of-life issues in low-income populations, this concentration is less inevitable.

Not in Anybody's Backyard

The problem of the disproportionate distribution of noxious land uses is not just a siting issue: it is not just about distributing unwanted land uses more evenly or equitably, but about eliminating or reducing the need for these noxious uses. “Not in my backyard” must become “not in anybody's backyard”: “the not-in-anybody's-backyard stand forces the debate away from the suitability [or fairness] of specific waste treatment facilities or locations, and toward a more fundamental reassessment of the propriety of a production system under private control where, in the quest for profit, the public is exposed to known risks.”⁷⁹

By taking a not-in-anybody's-backyard stand against locally unwanted land uses, we change the debate from an either-or debate—either a technical siting solution for a hazardous facility or a selfish, parochial, “not in my backyard” response—to one forcing the government and providers of private capital to deal with broader issues, “such as waste production, community control, and the process of policy making.”⁸⁰

Much of noxious industry need not exist at all, and the rest could be made less injurious by means of altered consumption patterns, technological solutions, pollution prevention strategies, more robust enforcement, and more community involvement with industry (such as the use of good-neighbor agreements and community environmental audits). Many adverse impacts could be ameliorated or eliminated altogether by the use of industrial best-management practices, application of waste reduction measures at the source, more enlightened consumer choices, improved recycling initiatives and market development strategies for using recycled materials in consumer goods, updated environmental and land use regulations, and rigorous enforcement.

Balancing economic development, community sustainability, and environmental and health conditions in industrial areas is a tremendous undertaking that will require planners, public health professionals, and experts from many other disciplines to work together. The public health community has been largely absent from or made marginal in these discussions. Public health professionals could help

immensely just by adding their thoughts and voices in addressing some of the structural changes that will be required to solve these problems.

Just as New York City took a bold lead in the then radical experiment called zoning, it is now beginning to grapple with some of these issues. However, effective and just solutions cannot be formulated on a city-by-city, or even a country-by-country, basis. As the world continues its rapid urbanization, the problems of waste production and waste disposal will continue to increase, both in extent and in the level of disparity among places. Noxious land uses have been expanded and concentrated in the poorer places on the earth, as well as in the poorer places within the relatively more affluent countries. The waste and pollution process has been globalized into one system.

These problems are exacerbated by widespread poverty, poor governments, and unwise development in many cities in the relatively less affluent countries, such as Mexico City, Mexico; Rio de Janeiro, Brazil; Calcutta, India; Manila, Philippines; Istanbul, Turkey; and Lagos, Nigeria. The burgeoning populations of these cities are among the world's most vulnerable in terms of health, so accepting additional waste and noxious land uses magnifies the existing health problems in many less affluent places. To avoid simply shifting the problem from one place to a poorer place, the connections between land use planning and public health must be forged on a worldwide basis. □

Endnotes

1. Haar C, Wolf M. *Land Use Planning—The Use, Misuse, and Reuse of Urban Land*. Boston, Mass: Little Brown & Co; 1989. (Ninety-seven percent of all US cities with populations over 5000 had zoning laws by 1967.)
2. Platt R. *Land Use Control: Geography, Law, and Public Policy*. Englewood Cliffs, NJ: Prentice Hall; 1991:65–112.
3. Maantay JA. *Industrial Zoning Changes and Environmental Justice in New York City: An Historical, Geographical, and Cultural Analysis* [dissertation]. New Brunswick, NJ: Rutgers University; 2000.
4. The 1961–1998 time frame was selected for the study because December 1961 marks the date of the last major overhaul of the New York City Zoning Resolution. Data for actions prior to 1961 would not be directly comparable to data for later actions owing to significant changes in zoning categories, procedures, and record keeping. October 1998 marks the time the archival data were researched and compiled for this study and thus represents the end point of the time frame.
5. As defined by the New York City Department of City Planning in its *Citywide Industry Study: Geographical Atlas of Industrial Areas*, January 1993. The determination of “major” industrial zones was based on the department's analysis of employment data, land use, and transporta-

tion access. The boundaries for these major industrial districts were based on neighborhood boundaries, major geographic or physical features, historic and present-day functions, and census tract boundaries (where feasible).

6. Based on comparison of archival zoning change maps, map sections 1–35, New York City Department of City Planning, 1961–1998.
7. Population characteristics (race, ethnicity, income, and homeownership status) were obtained from census data from 1960, 1970, 1980, and 1990. Digital data sources were used so that census data could be mapped and analyzed through a geographic information system (GIS) on the computer.
8. Adams TK. *Census of Population and Housing, 1960, 1970, and 1980 Extract Data*. Ann Arbor, MI: Inter-University Consortium for Political and Social Research; 1992.
9. *Census of Population and Housing, 1990 Summary Tape File on CD-ROM, Technical Documentation*. Washington, DC: United States Dept of Commerce, Bureau of the Census; 1990.
10. *1980 Summary Tape File 3a Technical Documentation*. Washington, DC: US Dept of Commerce, Bureau of the Census; 1980.
11. An extensive search of archival planning policy documents was conducted, including those at the New York City Municipal Archives, Municipal Library, the New York Historical Society, The New York City Public Library's Map Room, and the Department of City Planning. Information from archival project files at the Department of City Planning was obtained through the Freedom of Information Law (FOIL).
12. Miller D, de Roo G. Integrated zoning: an innovative Dutch approach to measuring and managing environmental spillovers in urban regions. *Am Plann Assoc J*. 1996;62:373–380.
13. *Solid Waste Management Plan*. Bronx, NY: Office of the Bronx Borough President; 1997.
14. *Locating City Facilities: A Guide to the “Fair Share” Criteria*. New York, NY: Department of City Planning; 1991. (Additionally, the city's Fair Share guidelines apply only to city-owned or -operated facilities, and many of the waste-related facilities are privately owned.)
15. These cases have been documented predominantly outside the realm of traditional epidemiology. See Novotny P. Popular epidemiology and the struggle for community health in the environmental justice movement. In: Faber D, ed. *The Struggle for Ecological Democracy*. New York, NY: Guilford Press; 1998:137–158.
16. Haggerty M. Crisis at Indian Creek. In: Bullard R, ed. *Unequal Protection: Environmental Justice and Communities of Color*. San Francisco, Calif: Sierra Club Books; 1996:23–42.
17. Wright B, Bryant P, Bullard R. Coping with poisons in Cancer Alley. In: Bullard R, ed. *Unequal Protection: Environmental Justice and Communities of Color*. San Francisco, Calif: Sierra Club Books; 1996:110–129.
18. Costner P, Thornton J. We all live downstream: the Mississippi River and the toxics crisis. *Greenpeace*. December 1989:11–13.
19. Nienaber-Clarke J, Gerlak A. Environmental racism in southern Arizona: the reality behind the rhetoric. In: Camacho DE, ed. *Environmental Injustices, Political Struggles: Race, Class and the Environment*. Durham, NC: Duke University Press; 1998:82–100.

20. Robinson R. West Dallas versus the lead smelter. In: Bullard R, ed. *Unequal Protection: Environmental Justice and Communities of Color*. San Francisco, Calif: Sierra Club Books; 1996: 92–109.
21. These figures are based on data from 1997 (*Asthma Facts*. New York, NY: New York City Department of Health; 1999).
22. Nossiter A. Asthma common and on the rise in crowded South Bronx. *New York Times*. March 5, 1995:A1.
23. Maantay JA. *Urban Air Pollution, Respiratory Disease, and Environmental Justice: Making the Links in the South Bronx*. Bronx, NY: Center for a Sustainable Urban Environment, Hostos Community College; 1996.
24. Head RA. Health-based standards: what role in environmental justice? In: Bryant B, ed. *Environmental Justice: Issues, Policies, and Solutions*. Washington, DC: Island Press; 1995: 45–56.
25. Perlin SA, Setzer RW, Creason J, Section K. Distribution of industrial air emissions by income and race in the United States: an approach using the toxic release inventory. *Environ Sci Technol*. 1995;29:69–80.
26. Regeski D. GIS and risk: a three culture problem. In: Goodchild M, Parks B, Steyaert L, eds. *Environmental Modeling With GIS*. Oxford, England: Oxford University Press; 1993:320.
27. Commoner B. The hazards of risk assessment. *Columbia J Environ Law*. 1989;14:372.
28. Hearne SA. Tracking toxics: chemical use and the public's "right-to-know." *Environment*. 1996; 38:6–33.
29. Maantay JA, Timander L, Graziosi GH, Meyer L. *The Bronx Toxic Release Report*. New York, NY: Center for a Sustainable Urban Environment and the United States Environmental Protection Agency, Region 2; 1997:IV–14.
30. Oliver PR. Living on a Superfund site in Texarkana. In: Bullard R, ed. *Unequal Protection: Environmental Justice and Communities of Color*. San Francisco, Calif: Sierra Club Books; 1996:77–91.
31. Freund E. *The Police Power: Public Policy and Constitutional Law*. Chicago, Ill: Callaghan; 1904.
32. Bassett EM. *Zoning*. New York, NY: Russell Sage Foundation; 1936.
33. Plotkin S. *Keep Out: The Struggle for Land Use Control*. Los Angeles: University of California Press; 1987.
34. Mandelker DR. *The Zoning Dilemma: A Legal Strategy for Urban Change*. Indianapolis, Ind: Bobbs-Merrill Co Inc; 1971:14.
35. Makielski SJ Jr. *The Politics of Zoning: The New York Experience*. New York, NY: Columbia University Press; 1966.
36. Perin C. *Everything in its Place: Social Order and Land Use in America*. Princeton, NJ: Princeton University Press; 1977.
37. Weaver CL, Babcock RF. *City Zoning: The Once and Future Frontier*. Washington, DC: Planners Press, American Planning Association; 1979.
38. Bryant RWG. *Land: Private Property, Public Control*. Montreal, Quebec: Harvest House; 1968.
39. Siegan BH. *Land Use Without Zoning*. Lexington, Mass: Lexington Books; 1972.
40. Babcock R. *The Zoning Game*. Madison: University of Wisconsin Press; 1966.
41. Citizens' Association of New York. *Report of the Council of Hygiene and Public Health Upon the Sanitary Condition of the City*. 1866. Reprint, New York, NY: Arno Press; 1970.
42. DeForest R, Veiller L. *The Tenement House Problem*. Vols 1 and 2. New York, NY: Macmillan and Co; 1903.
43. Ford J. *Slums and Housing*. Vols 1 and 2. Cambridge, Mass: Harvard University Press; 1936.
44. Lubove R. *The Progressive and the Slums: Tenement House Reform in New York City*. Pittsburgh, Pa: University of Pittsburgh Press; 1962.
45. Plunz R, ed. *Housing Form and Public Policy in the United States*. New York, NY: Praeger Scientific Press; 1983.
46. Toll S. *Zoned American*. New York, NY: Grossman Publishers; 1969.
47. Willis C. How the 1916 zoning law shaped Manhattan's central business districts. In: Bressi T, ed. *Planning and Zoning in New York City*. New Brunswick, NJ: Center for Urban Policy Research, Rutgers University; 1993:11.
48. Committee on City Planning. *The Report of the Commission on the Height and Arrangement of Buildings*. New York, NY: Board of Estimate and Apportionment of the City of New York; 1913.
49. *New York City Zoning Regulations*. New York, NY: Board of Estimate and Apportionment of the City of New York; 1916.
50. *Plan for Re-Zoning the City of New York*. New York, NY: Harrison Ballard & Allen; 1950.
51. *New York City Zoning Resolution*. New York, NY: New York City Department of City Planning; December 15, 1961.
52. *Master Plan for New York City, Volume I*. New York, NY: New York City Department of City Planning; 1969.
53. *Zoning New York City: A Proposal for a Zoning Resolution for the City of New York*. New York, NY: Voorhees Walker Smith & Smith; 1958.
54. Albion RG. *The Rise of New York Port, 1815–1860*. New York, NY: Scribners; 1939.
55. Buitenvieser A. *Manhattan Waterbound: Planning and Developing Manhattan's Waterfront From the Seventeenth Century to the Present*. New York, NY: New York University Press; 1987.
56. Blackmar E. *Manhattan for Rent, 1785–1850*. Ithaca, NY: Cornell University Press; 1989.
57. *Citywide Industry Study: Zoning Technical Report*. New York, NY: New York City Department of City Planning; 1993.
58. Hoover E, Vernon R. *Anatomy of a Metropolis: The Changing Distribution of People and Jobs Within the New York Metropolitan Region*. Cambridge, Mass: Harvard University Press; 1959.
59. Castells M, Hall P. *Technopoles of the World: The Making of the Twenty-First Century Industrial Complexes*. London, England: Routledge; 1994.
60. O'Neill H, Moss M. *Reinventing New York: Competing in the Next Century's Global Economy*. New York, NY: Urban Research Center, New York University; 1991.
61. Fitch R. *The Assassination of New York*. New York, NY: Verso; 1993.
62. Caro R. *The Power Broker: Robert Moses and the Fall of New York*. New York, NY: Vintage; 1974.
63. New York City Planning Commission/Sanborn Company. *Land Use Maps of New York City, 1956, 1980, and 1990*. New York Public Library 42nd Street Map Archives. Five case-study industrial areas were selected for detailed land use analysis.
64. The term *minority people* refers to the population that is not non-Hispanic White. Many people consider the term *minority* to be a misnomer, because in many US urban areas, as in New York City, people classified as minorities actually constitute the majority. For this study I used a derived variable of "minority" based on the census definitions and the guidelines established in Federal Statistical Directive No. 15 issued by the Office of Management and Budget in 1992, which provides standards on ethnic and racial categories for statistical reporting to be used by all federal agencies. This category is a summation of Hispanic; non-Hispanic Black; non-Hispanic American Indian; non-Hispanic Asian or Pacific Islander, Eskimo, or Aleut; and non-Hispanic other race. Other federal agencies, such as the US Environmental Protection Agency, construct a similar "minority" category for their research on environmental justice issues.
- Because this study required a longitudinal analysis, census data from 1960 through 1990 were used. One of the problems with cross-census comparisons is the lack of consistency in many census attribute data categories over the years, especially with data on race and ethnicity. Variables, methods of data aggregation, types of information collected, and census policies on issues such as confidentiality differ from one census to the next, potentially affecting the validity of cross-census comparisons.
65. Shenkel W. The economic consequences of industrial zoning. In: Andrews R, ed. *Urban Land Use Policy: The Central City*. New York, NY: Free Press; 1972:59.
66. Elias E. Significant developments and trends in zoning litigation: exclusionary zoning perspective. In: Listokin D, ed. *Land Use Controls: Present Problems and Future Reform*. New Brunswick, NJ: Center for Urban Policy Research, Rutgers University; 1974:157–176.
67. *Fair Housing and Exclusionary Land Use*. Washington, DC: National Committee Against Discrimination in Housing and the Urban Land Institute; 1974. Urban Land Institute Research Report No. 23.
68. Lauber D. Recent cases in exclusionary zoning. In: Listokin D, ed. *Land Use Controls: Present Problems and Future Reform*. New Brunswick, NJ: Center for Urban Policy Research, Rutgers University; 1974:177–178.
69. Williams N Jr, Norman T. Exclusionary land use controls: the case of north eastern New Jersey. In: Listokin D, ed. *Land Use Controls: Present Problems and Future Reform*. New Brunswick, NJ: Center for Urban Policy Research, Rutgers University; 1974:105–130.
70. Branfman E, Cohen B, Trubek D. Measuring the invisible wall: land use controls and residential patterns of the poor. In: Listokin D, ed. *Land Use Controls: Present Problems and Future Reform*. New Brunswick, NJ: Center for Urban Policy Research, Rutgers University; 1974: 57–82.
71. An inventory of industrial rezoning actions was compiled from the New York City Department of City Planning archival zoning maps from

1961 through 1998. A database of rezonings was created and then mapped with a GIS. The rezonings were classified by type and magnitude and were aggregated both by decade and by borough.

72. To examine the pattern of industrial zones and zoning changes, I used a GIS to map the major M zones and the rezoning actions. These locations were overlaid with a spatial database of census tracts linked to attribute data of population characteristics. New York City was divided into 2218 census tracts for the 1990 census. Census attribute data from 1960, 1970, 1980, and 1990 were mapped and compared by a standard deviation classification method to allow longitudinal comparison of deviation from the average, since absolute numbers for income and percentage minority changed drastically over the 4-decade period. For each of the 4 census periods, population information was aggregated at the following geographic levels: citywide, boroughwide, census tracts within major M zones, census tracts within 0.5 mile of large and very large M zone increases, and census tracts within 0.5 mile of large and very large M zone decreases.
73. Analysis of policy trends is based on a review of

archival documentation such as zoning amendment applications, city planning commission calendars, uniform land use review procedure applications, urban renewal plans, environmental impact assessments, planning studies, and letters and other documents obtained through New York State's Freedom of Information Law (Public Officers Law, art 6, §§ 84–90) for the years 1961 through 1999. Documents from 1916 through 1961 were also consulted, as available, for context and background on later policy developments. A complete list of archival sources appears in appendix C of Maantay, *Industrial Zoning Changes* (see note 3).

74. Kintish B, Shapiro J. The zoning of today in the city of tomorrow. In: Bressi T, ed. *Planning and Zoning in New York City*. New Brunswick, NJ: Center for Urban Policy Research, Rutgers University; 1993:164.
75. Lavelle M, Coyle M. Unequal protection: the racial divide in environmental law. *Natl Law J*. September 21, 1992.
76. Bullard R. Overcoming racism in environmental decision-making. *Environment*. 1994;36:11–40.
77. To gain a wider perspective on zoning policy and decision making, past and present, I interviewed a number of zoning experts for this study.

This was not a representative sample of New York City's planners; the intention was to obtain as wide a range of opinions and experiences as possible. The interviewees included former city planning commissioners, land use attorneys, past and current staff at the Department of City Planning, academics, and planners for nonprofit, community, economic development, and good-government groups. Since most of those interviewed are still active in New York City planning and politics, they requested that they not be quoted by name. Therefore, quotations are attributed to "ZI 2," for example, meaning zoning interviewee 2. The complete list of names and professional affiliations of those interviewed appears in appendix B of Maantay, *Industrial Zoning Changes* (see note 3).

78. White HL. Race, class, and environmental hazards. In: Camacho D, ed. *Environmental Injustices, Political Struggles*. Durham, NC: Duke University Press; 1998:75.
79. Heiman M. From "not in my backyard!" to "not in anybody's backyard!": grassroots challenge to hazardous waste facility siting. *Am Plann Assoc J*. Summer 1990:361.
80. Lake R. Rethinking NIMBY. *Am Plann Assoc J*. Winter 1993:90.