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Urban Environments, 1850–1960

Late nineteenth-century industrialization was a second major phase in the development of the United States economy, following the market revolution of the early to mid-nineteenth century. Urbanization is a core topic for environmental history because the increasing density of industry, transportation, and housing transformed both the land and the lives of urban dwellers. After the Civil War, industrialization — particularly in large Eastern and Midwestern cities — was accompanied by air, refuse, noise, and water pollution. This chapter deals with the evolution of environmental problems brought about by and associated with industrialization, urbanization, suburbanization, and the efforts of engineers, citizens, and legislators to deal with them.

Urbanization, Industry, and Energy

Living nature disappeared from everyday experience for most Americans by the mid-twentieth century. Amidst the urban world's masonry, steel, and asphalt, manicured remnants of greenery camouflaged the built environment's dependence on the natural world of forests, waters, air, and wildlife. Urbanization and industrialization, the twin processes propelling this shift, had moved into high gear following the market revolution of the early nineteenth century.

In 1800, only 320,000 people — or 6 percent of the population of the United States — lived in urban areas of more than 2,500 persons. Except for the northeastern seaboard, the country was largely rural. By the advent of the Civil War sixty years later, urban dwellers had jumped to some six million (20 percent of the total population); by 1920 to almost 54 million (about 50 percent); and by 1970 to more than 149 million (72 percent).

The rapid growth of urban population was fostered by the growth of manufacturing on an ever-larger scale, using ever-more potent methods for extracting energy from the natural environment. Human muscle and animal power were first augmented by the energy of falling water, as stored be-

hind milldams and transmitted by waterwheels, drive shafts, and belting to the grindstones of gristmills in colonial and rural America. In the last decade of the eighteenth century, waterwheels drove the small textile mills that arose along the fall line of coastal New England. This early hydropower peaked in the 1820s and 1830s along the Merrimac River in northeastern Massachusetts and southern New Hampshire. Here, large mills, which had improved on British machinery for spinning and weaving, vibrated with energy drawn from White Mountains snowmelt rushing to the sea. Similarly, in western New York, the thundering falls of the Genesee River energized a clattering assemblage of large, mechanized flourmills.

The renewable but all too variable energy of falling water was soon supplanted by the nonrenewable energy of ancient plant life, as fossilized in coal and transmitted reliably to machines by steam engines. Steam, generated more efficiently by fossil fuel than by firewood, drove both production and propulsion. The stationary steam engine freed energy-hungry industries from scarce water-power sites to seek inland locales with better access to raw materials, labor, and markets, while the steamboat and the steam locomotive brought inputs to their doors and delivered outputs to their customers. Coal mining itself became a major industry, exploiting at first Pennsylvania's limited supplies of clean-burning anthracite (or hard) coal, and soon moving west to mine abundant supplies of sooty-burning bituminous (or soft) coal, from West Virginia to the Rocky Mountains. Coal quickly replaced wood for heating and cooking in urban homes.

Iron and steel superseded the infrastructure of timber and masonry when coal combined with iron ore to usher in a new industrial order. Coal-fueled ironworks and open-hearth steel mills, as well as the foundries and machine shops that fabricated their output into rails, cars, and locomotives for railroads, girders for bigger buildings and bridges, a new generation of heavy machinery for factories, pipe for water and sewers, and ironwork for a multitude of other uses. After British inventor Henry Bessemer's converter was introduced to America in the 1870s, coal-fueled production of high-grade steel spread from the upper waters of the Ohio River in western Pennsylvania to the shores of the Great Lakes. By 1890, this mode of exploiting a bounteous natural endowment enabled the United States to outstrip British production and claim industrial leadership of the world. While "the old nations of the world creep on at a snail's pace," exulted steel magnate Andrew Carnegie, "the Republic thunders past with the speed of the express."¹

As the age of coal and iron culminated at the end of the nineteenth century, two new forms of energy — petroleum and electricity — promised even

greater productivity in the twentieth. A cleaner, nonrenewable fossil fuel became available when Samuel Drake struck oil at western Pennsylvania's Oil Creek in 1859. Petroleum was used initially for oil lamps and stoves in homes, for street lamps, and to lubricate machinery. After new oil strikes in Texas, Oklahoma, and California at the turn of the century, production increased dramatically, and fuel oil, which needed little refining, began to compete for coal's major uses. In California, the leading oil-producing state between 1900 and 1926, fuel oil supplemented the Sierra's hydropower to fuel furnaces, factories, ships, and locomotives. By mid-century, pipelines radiated from the oil fields, carrying crude oil to tidewater refineries, and natural gas for home heating and factories to cities.

The growing popularity of automobiles in the early twentieth century enormously expanded the demand for petroleum, both as gasoline for fuel and as asphalt for paved roads. The automobile itself was a revolutionary economic force, spawning new industries to mass-produce cars, trucks, rubber tires, and road building machinery, and multiplying demand for steel, glass, and cement. Its environmental effects were also profound, fouling the air with noxious emissions from vehicles and refineries and paving over much of the landscape with highways and shopping malls.

Meanwhile, energy's portability and versatility had been greatly enhanced by its conversion to electricity. Whereas coal and petroleum had to be transported laboriously from mine or wellhead to user, electrical energy whizzed effortlessly, instantly, and far less expensively through transmission lines to both industrial producers and individual consumers. The remarkable Thomas A. Edison (1847–1931) developed an array of ingenious electrical applications, most notably a practical incandescent lamp that dispelled “night and its darkness . . . from the arena of civilization” by lighting streets and homes. The “wizard of Menlo Park” became a popular hero by also inventing the multiplex telegraph, an improved telephone transmitter, the mimeograph machine, the phonograph, the microphone, and the motion picture.²

New industries arose to transform urban life by mass-producing these and countless other electrical applications for home, office, transport, and factory. Electric power propelled elevators and trolleys. Electrical smelting of aluminum, developed by Oberlin undergraduate Thomas Hall in 1888, became a major factor after 1930 in making modern aviation possible. Americans increasingly experienced the world through the electrically transmitted sounds and images of radio, motion pictures, and television. As the twentieth century ended, a digital computer revolution opened vistas of

instant, universal access to electronically transmitted information and to unlimited production by electronically programmed robots.

Hydroelectricity was hailed as “clean” energy because it resuscitated renewable and nonpolluting water power to drive its generators. This marked a shift, according to historian of technology Lewis Mumford (1895–1990), from the paleotechnic age of coal to the neotechnic age of electricity. The shift came at the cost of constricting great rivers by serial dams, from the Chattahoochee, Catawba-Santee, and Tennessee in the East to the Columbia and Colorado in the West. With hydroelectric sites fully exploited by the late twentieth century, an insatiable appetite for electricity was increasingly supplied by coal-fired generating plants that spewed contaminants into the atmosphere across many states, degrading Appalachian forests, dangerously depleting the earth’s ozone layer, and threatening global warming.

At the dawn of a new millennium, the environmental costs of existing sources of energy were becoming all too apparent, and prospects for new and cleaner sources were clouded. The extravagant hopes held out for nuclear power were dying under repeated assaults — near disaster at Three Mile Island, Pennsylvania; total disaster at Chernobyl, Russia; leaking or abandoned generating plants; and inability to dispose of nuclear wastes safely. Nor had nonpolluting and renewable forms of energy, such as solar power and wind power, been able as yet to compete substantially in the market. Meanwhile the citizenry, who would ultimately determine American society’s relation to its natural base, had been experiencing the environmental stresses that impinged most directly on urban-industrial life.

Industrial Cities and Labor

During the nineteenth century, industrialization transformed the urban landscape. Originally the urban system had been devoted mainly to trade, from the wharves and warehouses of the great Atlantic ports, to the wholesale merchandising houses of interior towns along major transportation routes, to the country stores around which rural villages straggled. Interspersed among these commercial facilities were skilled and independent “mechanics” or artisans, who owned their small home workshops and specialized in producing by hand the various commodities in demand. The introduction of large, mechanized factories gradually forced mechanics into unskilled wage labor, created great disparities of wealth, and segregated urban geography into separate sectors — offices for business, mansions for the

affluent, factories and tenements for workers, and slums for a new urban underclass of the dispossessed.

Industrialization also gave rise to different types of cities. In the old Atlantic ports, various new industries mixed with established commercial activities. New York City became a center for shipbuilding, steam printing, publishing, and clothing manufacture; Philadelphia turned out machinery and locomotives; and Richmond supplemented tobacco processing with a major ironworks, which proved an indispensable linchpin of the Confederate war effort. Although most cities and towns spawned several industries, others specialized in some newly mass-produced commodity. In Massachusetts, Lowell and Lawrence sprang up as cotton-mill cities, while rural Lynn evolved into a center of mechanized shoemaking. Elsewhere, Rochester milled flour, Louisville distilled whiskey, and Cincinnati became the “Porkopolis” of the West. In areas devoted to resource extraction, towns and villages were variously dominated by mines and smelters, by lumbering and sawmills, or by mechanized fishing and canneries. The growth of some large cities was propelled by particular industries: stockyards and meatpacking in Chicago, steel in Pittsburgh, automobiles in Detroit, and tires in Akron.

Demand for industrial labor attracted a mass migration of ethnically diverse peoples, both from the rural countryside and from overseas. Throughout the nineteenth century, sons and daughters deserted foundering subsistence farms in droves to seek jobs in rising industrial centers. At mid-century, large influxes of Irish immigrants provided much of the labor for canals and railroads while establishing their largest enclave in Boston. Germans settled heavily in Cincinnati, St. Louis, and Milwaukee. Later in the century, southern and eastern European peoples arrived in New York City and other northeastern communities. Although many boarded railroads to claim homesteads on the Great Plains, 80 percent of the “new immigrants” settled in the Northeast, primarily in urban mosaics of polyglot ethnic neighborhoods. The ethnic and racial diversity of urban America was rounded out in the twentieth century by Asian immigration to the West Coast, a massive flight of African Americans from southern oppression to northeastern cities, and an influx of Mexicans to the Southwest.

Working in cities posed living and laboring hazards for the urban poor. Immigrants to cities often lived in poorly constructed, drafty, unsanitary tenements and worked in unhealthy, hazardous environments. In Chicago, Jane Addams (1860–1935) spearheaded a middle-class movement to improve living conditions for poor tenants by living and working among them. She founded Hull House, documented in her *Twenty Years at Hull House*

(1910), where members instituted childcare, built playgrounds, and initiated cooperative housing arrangements for working women. She and others pressured the city to extend garbage and refuse collection to poor neighborhoods, to halt animal slaughtering in tenements, and to remove dead carcasses. Adams's colleague, bacteriologist Alice Hamilton (1869–1970) publicized the spread of infectious diseases resulting from piles of garbage and untreated sewage and lobbied to alleviate workplace hazards. She promoted the field of industrial medicine in America and worked with labor leaders to identify “industrial poisons,” such as carbon monoxide in steel mills, and work-related hazards, such as “phossy jaw” that disfigured match factory workers using white phosphorous. Her work extended to the effects of toxic chemicals found in petroleum, solvents, and heavy metals and resulted in her classic text *Industrial Poisons in the United States* (1925), opening up the field of occupational health.

The City as Wilderness

In reaction to all these changes, a new perception of the city as wilderness emerged. In 1898, writer Robert Woods described *The City Wilderness* as a dark, dismal, depressing place filled with squalid alleys and poverty-stricken inhabitants. Novelist Upton Sinclair's *The Jungle* (1905), written to expose the unsanitary conditions and working-class misery in Chicago's meatpacking industry, depicted the urban environment as dingy, smoky, and rancid with stockyard odors. Booth Tarkington's *The Turmoil* (1914) characterized the city as a locale dedicated to growth and the production of wealth at any cost to its inhabitants. Evil wilderness was embedded in the city, by contrast with the good wilderness of clean air and pristine, unblemished nature found in the Appalachian and Rocky Mountains.

In *American Hunger* (1944), novelist Richard Wright recalled vividly his impressions of the city wilderness on reaching Chicago in 1927 as an African-American refugee from southern racism: “My first glimpse of the flat black stretches of Chicago depressed and dismayed me.... Chicago seemed an unreal city whose mythical houses were built of slabs of black coal wreathed in palls of gray smoke.... The din of the city entered my consciousness.... I looked northward at towering buildings of steel and stone. There were no curves here, no trees, only angles, lines, squares, bricks and copper wires.... I was learning already ... the strain that the city imposed upon its people.”³

For many white urbanites, negative feelings about the city wilderness were fueled by racist reactions, not only to blacks like Wright, but also to dark-haired, dark-eyed immigrants from southern Europe. Newspapers and cartoonists portrayed impoverished refugees from Mediterranean farms and villages as living in pestilent squalor with the animals they brought. New-comers, who could have squatted on public lands and staked out a homestead farm in an earlier era, became urban squatters while they looked for housing and jobs. When they camped by necessity alongside their poultry and goats in city parks and on streets, they were stigmatized as uncivilized threats to the safety and health of the community.

Urban businesses also seemed threatening to much of the citizenry as they increased in size and economic power. Editorial cartoons portrayed corporations, monopolies, and trusts as gigantic octopuses with tentacles reaching out to envelop the entire world. The turn-of-the-century Progressive movement, which looked to efficiency in industry and government, tried to restrain corporations by laws enforcing competition. Congress passed the Sherman Antitrust Act outlawing monopolies and conspiracies in 1890, and a decade later President Theodore Roosevelt built a popular mandate against abuse of power by the American oil industry. In 1911, the Supreme Court found Standard Oil in violation of the Sherman Antitrust Act and ordered its dismantlement.

Yet the problems of the industrial city had deeper roots than corporate greed and ethnic prejudice. Its health was entwined, as few understood, with the health of the natural environment it was steadily despoiling and polluting. "The idea of the city as animate — if not 'natural' —" according to urban historian Martin Melosi, "is essential for an understanding of urban growth and development. Cities are not static backdrops for human action . . . : they are ever mutating systems." Cities both depend on and modify the physical environment, he continues: "Urbanization removes much of the filtering capacity of soil and rapidly channels precipitation into available watercourses, thus encouraging flooding. City building affects the atmosphere by increasing airborne pollutants and also creating 'heat islands' where temperatures are greater than the surrounding area. Various urban activities produce huge volumes of waste products that require complex disposal mechanisms."⁴ Unfortunately, as geographers Thomas R. Detwyler and Melvin G. Marcus note, the air and water extracted from the ecosphere by cities, "are not returned to the ecosphere in the same condition in which they were received."⁵

By the turn of the nineteenth century, the intertwined ecological effects of population growth, industrialization, urbanization, and their concomi-

tant pollution called forth new technologies, citizen movements, and legislation. According to environmental historian Joel Tarr, “The construction of technological networks in American cities for the transmission of water, wastewater, power, communications, freight, and people dramatically altered the context of city life and the effect that urban centers had upon their surrounding environments.”⁶ Beginning with the recognition of air pollution, the environmental problems of the industrial city soon extended to garbage, noise, and water pollution.

Air Pollution

Concern about quality of life issues originated, Melosi points out, not with the environmental movement of recent decades, but “with the more obscure antismoke campaign of the 1910s.”⁷ The history of air pollution moves from acceptance of smoke to campaigns against it. Early in the age of coal and iron, urban industrial centers often took pride in black smoke as symbolizing progress and the triumph of “civilization.” At worst, smoke was an inescapable nuisance that had to be endured, a necessary cost of the creation of jobs, the rise of the middle classes, the improvement of living standards.

The symbolic meaning of smoke turned negative by the late nineteenth century in areas where industries abounded and coal was used for domestic heating. Barrels of cinders and ashes lined streets and walkways, where they might remain for weeks owing to inadequate collection methods. People with rain barrels on their roofs found the water contaminated with soot; city trees began dying. Breathing polluted air had disastrous effects on the human respiratory system. Smoke and soot irritated the nose, throat, and lungs, giving rise to or exacerbating a multitude of ailments ranging from the common cold to asthma, bronchitis, pneumonia, black lung disease, tuberculosis, diphtheria, and typhoid fever. The poor, immigrants, and blacks who lived and worked in crowded inner cities were especially prone to diphtheria and pneumonia.

Smoke was most oppressive in towns dominated by coal-burning industries. Rebecca Harding Davis described life in the iron mill town of Wheeling, West Virginia, in 1861: “The idiosyncrasy of this town is smoke. It rolls sullenly in slow folds from the great chimneys of the iron-foundries, and settles in black, slimy pools on the muddy streets.... clinging in a coating of greasy soot to the house-front, the two faded poplars, the faces of the passers-by. Smoke everywhere! ... From the back-window I can see ... the slow

stream of human life creeping past, . . . breathing from infancy to death an air saturated with fog and grease and soot, vileness for soul and body.”⁸

Women expressed concern over air pollution because it affected their abilities to uphold standards of cleanliness. A Milwaukee woman reported, “It’s impossible for me to have my laundry work done at home because of the smut that falls on clothes while they’re drying,” while another noted, “It is bad for the furniture, for the clothing, for the health, and for the temper.”⁹ Psychological consequences of living in smoky areas were also noted. A doctor asserted that “women living in sunless rooming houses and attired in somber, dirty clothes are prone to be irritable. They scold and whip their children and greet their husbands with caustic speech.”¹⁰ Domestic deterioration led to excessive drinking, the doctor stated, a situation that caused men to flee to bars, seeking “the cup that cheered.” Physical dirt was considered to be moral dirt.

A major clean air reform movement ensued. In the late nineteenth and early twentieth centuries, civic groups took up the issue. Chambers of Commerce in large cities such as Cleveland, Chicago, St. Louis, Toledo, and Pittsburgh began to study the problem. Pittsburgh industrialist Andrew Carnegie (1835–1919) urged the city and state to deal with smoke pollution. A Committee on Smoke Prevention recommended that legislation be passed. “The way to abate smoke is to abate it,” trumpeted an inspector in Toledo. “There are three remedies. Fine the violators, second fine them again, third, keep fining them until they are bankrupt or repentant.”¹¹ But even with the passage of new laws, the courts imposed only meager fines.

Women were especially motivated to clean up cities. According to historian Suellen Hoy, “Women were a significant force in the movement to improve living conditions in the industrial cities of the United States. Motivated by a desire to protect their homes and families, large numbers of women believed that they, the nation’s homemakers, could make a special contribution to the housekeeping practices of their communities.”¹² They turned their energies to abating air, water, noise, and garbage pollution. During the late nineteenth and early twentieth centuries, women’s groups were instrumental in passing abatement ordinances that regulated smoke outputs from factories. In St. Louis, the Women’s Organization for Smoke Abatement pressed for compliance with city smoke ordinances. In Cincinnati, women’s groups appealed to the mayor to act on smoke abatement. In Chicago, an antismoke league was formed that was chaired by women. The league worked with smoke inspectors, helping to coordinate efforts to locate and halt the worst polluters.

Along with increased pressure from civic reformers and women's groups, engineers sought technical solutions. Engineers and smoke inspectors were active in every major city by 1912, and engineers themselves frequently made rounds to inspect factories. They pushed for the use of better equipment, such as stokers and banked and down-draft furnaces, and urged that the height of chimneys be raised so that smoke was carried higher into the atmosphere. The results, however, were limited by the technological options available. While some success was achieved in smoke abatement, and while technological advances continued, the problem continued in most urban industrialized areas. During World War I, with the country's efforts focused on increasing industrial output, progress was especially limited.

Garbage

A second problem for urban areas was garbage disposal. On farms the practice was often to throw buckets of gray water or garbage out the door. But when that method of disposal was transferred to cities, garbage and rubbish rapidly piled up in alleys, where it caused odors and created health hazards. In large cities, such as New York and Los Angeles, garbage and refuse accumulated faster than it could be collected. Collection was haphazard and primitive. Street teams collected garbage, and large barges carried it out to sea. Or refuse collectors simply dumped it in fields or lots beyond city limits.

A major concern for cities was the removal of refuse from horse-drawn trolleys. Miles of rails laid through cities were polluted by horses whose equine wastes created health hazards and odors, as each horse discharged several gallons of urine and 20 pounds of manure per day. By the mid-1880s, 100,000 horses and mules were pulling 18,000 horse cars on 3,500 miles of track. By 1900, there were 3.5 million horses in cities. In Chicago alone 82,000 horses produced 600,000 tons of manure per year. At night horses had to be stabled or kept in fields and barns. During the day, when working the streets, they deposited piles of manure along the rails. Such sights and smells contributed to characterizations of urban areas as wilderness.

What was done to combat garbage? The American Public Health Association undertook a major study of refuse, looking to Europe for experience and guidance in dealing with waste. Women's groups formed health protective associations in New York and other cities. The General Federation of Women's Clubs (G.F.W.C.) advocated urban cleanup and promoted better

methods of street cleaning. In Chicago, Jane Addams's Hull House lobbied for clean streets and the excavation and removal of years of accumulated waste. Cities also created cleaner, healthier recreation spaces such as urban parks. Such efforts, combined with new laws regulating sanitary conditions, contributed to civic improvement. By 1900, ninety-four per cent of cities had refuse collections.

Street cleaning was initiated in major urban areas. Blacks and immigrants were employed to push refuse carts on wheels and clean up streets, but early attempts were sporadic. Some parts of the city remained laden with trash, owing to lack of coordination. Another method was to institute traveling garbage burners, a type of a steam engine on wheels with a long smokestack. Workers moved through the streets, shoveling garbage into the furnaces, burning it as they went. Horse-drawn water carts went through city streets flushing them of refuse even as the horses themselves added to the problem. Such systems were employed in New York, St. Louis, Cincinnati, and Los Angeles, among others.

A major effort in garbage and refuse reform was undertaken in New York City by George Waring, a cleaning commissioner known as "The Apostle of Cleanliness," who assumed office in 1895. He advocated source separation. Every household had containers in the kitchen and basement for garbage, paper, and ashes that were taken to the street on pickup days. Waring hired young engineers to design the collection system and employed urban workers to clean up neighborhoods. He created a cadre of "White Wings," 2,000 white-uniformed adult cleaners, who patrolled the streets with brooms, buckets, and can carriers. He raised their pay and improved their working conditions. He also formed a juvenile street-cleaning league, in which he enlisted 500 young people to disseminate information on sanitation to citizens.

Additionally, Waring created municipal refuse-sorting plants staffed by immigrant workers, the poor, blacks, and other minorities. They removed salvageable materials, sorted paper, and picked over goods that could be sold or recycled. Workers experienced a mixed blessing, caught between the advantage of employment and the consequences of unsanitary working conditions. Exposed to smoke and dust while working in sorting plants, they were also condemned to living in substandard apartment buildings.

By the 1890s, engineers began to address problems of garbage with increasing effectiveness. A Society for Street Cleaning and Refuse Disposal was formed. Numerous books and professional pamphlets were written on the topic of pollution; analyses and inventories were compiled; and citizen groups were formed, all of them reflective of early responses to the problem

of polluted cities. Engineers constructed the first American garbage furnace in New York City on Governor's Island in 1885, and other cities, such as Montgomery, Alabama, followed suit in 1911. Carts loaded with refuse and garbage ascended a ramp and deposited their contents on an unloading deck at the top of the building. The refuse was then lowered and burned. Engineers also invented better garbage scows. Ashes and rubbish were loaded onto barges and taken outside New York Harbor, where they were dumped into the ocean, a method still used illegally to dispose of garbage and medical wastes. The rationale was, "dilution is the solution to pollution."

Noise Pollution

A third problem for urban development was noise from new forms of transportation. Industrial cities continually generated huffings, clankings, screechings, and smokings that went on for 12 to 14 hours a day and sometimes around the clock. Brakes, gears, motors, and bells mingled with the noise of street traffic and elevated railroads. Noise was a major issue for those in inner cities. Poor women in Philadelphia complained: "What we can't stand is the noise. It never stops. It is killing us. We work hard all day and need sleep and rest at night. No one can sleep till midnight and all the noise begins again at five. Many of us have husbands who work all night and must get their sleep during the day." They told wealthy Civic Club members, "You can get away from the noise during the summer, but we cannot. . . . Now what can your civic club do for us?"¹³

What was done about noise? Noise reform was already under way in the early twentieth century. Civic clubs formed committees to deal with unnecessary noise and worked to prepare legislation. Antinoise groups cooperated with local boards of health. They argued that sound endangered life and health, asserting that if people could be prevented from polluting water supplies, they could be prevented from congesting the air with noise. Police departments assisted in abating unnecessary noise. In Atlanta, the Chamber of Commerce's antinoise committee, appointed in 1918, received 140 letters of complaint and secured the cooperation of the police department. In Baltimore, the city's medical society formed an antinoise commission, which compiled a noise inventory and drew up legislation to abate the noise.

In New York City, a special concern was mounted about whistles from tugboats and barges on the rivers that outlined the five boroughs. Julia Bar-

nett Rice, after having raised six children, began a campaign against shrieking tugboat whistles and riverboat noise. She collected 3,000 signatures from rich and poor, from hospitals and boards of health, and persuaded her congressman, William Bennett, to push a law through Congress. Known as the Bennett Act of 1907, it regulated boat whistling in harbors and prohibited unnecessary whistling. But enforcement of laws regulating ephemeral, nuisance noises was almost prohibitive. Despite laws and police enforcement, compliance with antinoise regulations was virtually impossible, and noise continued to be a major urban problem.

Water Pollution

A fourth major problem faced by burgeoning urban areas was access to clean water. Historian Theodore Steinberg notes the strain put on rivers and streams by the polluting effects of industry: "Industrial transformation ... created a new ecology of its own with far-reaching effects on the water quality of [a] region's rivers.... Rivers were used to generate energy for production, to carry off human and factory waste, and ultimately to supply cities with water for domestic use."¹⁴ Contaminants such as sulphuric acid, soda ash, muriatic acid, lime, dyes, wood pulp, hair, flesh, and hides polluted the early mills of the Northeast. During the nineteenth century, prior to the construction of municipal water and sewer works, keeping water clean and disease-free for drinking was a major problem. Contaminated water flowed into rivers and oceans and raw sewage was pumped into waterways. "Years of abuse and neglect," states Steinberg, "had by the 1870s left a rather disturbing mark on the waterscape. In that decade, as concern emerged over public health ... some state officials began to wonder about the costs of water pollution."¹⁵ After 1880, many cities began to install sewer systems, but raw sewage continued to be dumped into bays and rivers.

Water-related infections occurred throughout the nineteenth century. Cholera outbreaks devastated the urban economies of cities such as New Orleans between 1846 and 1850. In Memphis, in the 1870s, epidemics led to improvements in sanitation and sewage systems. By 1873, it was discovered that the vibrio that caused cholera could be killed if sufficient sunlight was allowed to fall on the water supply. If reservoirs were opened and exposed to light, the vibrio was prevented from reproducing. Typhoid fever was another waterborne disease, spread by flies lighting on fecal contaminants, by impure, unpasteurized milk, and by contaminated raw fruits and

vegetables. A rate of typhoid above 15 to 20 per 100,000 indicated a polluted water source.

Another water-related disease was yellow fever, caused by the mosquito *Aedes aegypti*. It was especially dangerous in warm, humid cities and rural areas, but reached into northern cities as well. The Massachusetts Bay Colony experienced an outbreak of yellow fever in 1647, while in Philadelphia in 1793, 10 percent of the population died from the disease. In New Orleans in 1853, some 8,000 people died, with another 4,000 fatalities in 1878. In Memphis, Tennessee, more than 5,000 people in a population of 38,000 died during the 1878 outbreak. By 1905, however, the virus was eradicated from the United States.

Municipalities began to build clean water supplies so that drinking water could be kept free of contamination. Large cities created gravity-flow reservoirs above the city so that water could flow into distribution systems. In 1801, Philadelphia built the Schuylkill Waterworks, the first large municipal system that used steam to push water through its pipes. In 1835, New York City constructed the Croton River Dam forty miles north of New York, a gravity aqueduct consisting of tunnels that conducted fresh water into the city. In California, water works supplying Los Angeles and San Francisco were constructed toward the end of the century, initially by leading water from coastal mountain ranges. In the early twentieth century, they were followed by larger projects, such as the Owens River Valley project to supply Los Angeles and the Hetch Hetchy Valley dam for San Francisco, both enormously controversial at the time. Water projects were thus a major part of the great era of publicly financed municipal water and power systems for large and growing cities in the name of the public good.

The Sanitary City

The links between clean water as an ecological input to the city and sewage and garbage as outputs became regional concerns after World War I as the economy moved from an industrial to a consumer base and populations burgeoned. “Sanitary services,” Melosi notes, “provide water for domestic and commercial uses, eliminate wastes, protect the public health and safety, and help to control many forms of pollution.”¹⁶ Public waterworks grew from more than 10,000 in 1932 to more than 14,000 in 1940, and regional water districts formed to deliver service to customers. The Public Works Administration (PWA) during the New Deal years financed some

2,500 water projects. Public health was of paramount concern. Water treatment facilities improved through better filtration, control of chlorination, and aeration. With better treatment, deaths from typhoid fever declined from 33.8 per 100,000 in 1920 to 3.7 by 1945. Water outputs also received more consideration, and regional water and sewage treatment facilities were increasingly linked under joint management and administration.

Sewer systems, like water systems, received government support during the New Deal era. Between 1933 and 1939, the PWA funded approximately 65 percent of the nation's new sewage disposal plants. Early methods of disposal by dilution moved toward a combination of bio-physico-chemical treatments. Sewage was treated by processes of clarification, oxidation, and disinfection. Technologies included filtration through sand and gravel beds, sludge digestion and drying, chemical precipitation, and the use of septic tanks and contact beds. By 1945, about 63 percent of the U.S. population lived in communities with sewage treatment plants.

During the interwar period, the concept of pollution expanded from sewage and domestic wastes to include industrial effluents. Untreated industrial wastes were discharged into sewers, which flowed into rivers, lakes, and oceans. Increasingly, public health officials raised doubts over whether dilution was sufficient to dissipate polluting chemicals. Pollutants included mineral matter in coal and iron industries; acids and salts from mines and oil wells; lead from slag; benzene, toluene, and naphtha from oil distilleries; sulphites from pulp mills; grease and oils from manufacturing plants; arsenic from paints; animal refuse from meatpacking plants; and hot liquids and inflammable wastes from chemical processing plants. Effects included waterfowl and fish kills, corroded sewer pipes, gas leaks, explosions in pumping and treatment plants, and reduction of dissolved oxygen in water. Questions arose over whether industries should be allowed to discharge such wastes into municipal sewer systems and how to assess costs and levy taxes.

After World War II, thousands of new chemicals entered the waste stream. Petroleum distillates, detergents, and pesticides produced burning rivers, foaming streams, and dying lakes. In 1959, the Cuyahoga River between Cleveland and Akron burned for eight days. In 1963, nationwide pollution from municipalities, industry, and agriculture killed 7.8 million fish. In 1965, Lake Erie was so polluted with coliform bacteria, phenols, iron, ammonia, chlorides, and phosphates from industrial processes and municipal sewage that it was ecologically dead.

In the postwar period, federal legislation began to address industrial effluents. The Water Pollution Control Act of 1948 provided loans to local in-

terstate agencies, municipalities, and states to reduce water pollution. The act was amended in 1956 and 1961 to provide grants for municipal sewage treatment plants for domestic and industrial wastes and to continue a cooperative approach between the federal government and the states. Post–World War I pollution problems, however, led to widespread unease over the nation’s ability to resolve the interconnected problems of inputs and outputs to urban water supplies, setting the stage for the emergence of the age of ecology in the 1960s through 1990s.

From City to Suburb

The sense of the city as a polluted arena helped push people into suburbs, beginning at the turn of the nineteenth century and accelerating in the post–World War II period. Mass transit made the suburbs a new option for the middle class. People could now work in city business districts but live outside of town. Horse-drawn omnibuses and commuter railroads in the 1830s had been followed by electric streetcars (1880s), elevated trains (1890s), and subways (1900s), creating tentacle-like suburban patterns in which people lived within a mile of a mass-transit station. After World War I, the automobile’s use for commuting diffused those early patterns, allowing workers to live anywhere that roads and later freeways reached, while trucks made possible the location of commercial distribution centers on urban edges. Suburbs created safe, sanitary environments for those who could afford the homes and travel costs, but condemned those who could not to crowded slums. The big boom in housing expansion occurred after World War II. Single-family housing starts ballooned from 114,000 in 1944 to post–World War II highs of 937,000 in 1946; 1,183,000 in 1948; and 1,692,000 in 1950. Both highways and automobiles supported the growth in suburban living. The interstate highway system enacted by President Dwight D. Eisenhower’s signing of the Federal-Aid Highway Act in 1956 created multilane highways accompanied by automobile-generated sprawl, traffic congestion, and environmental pollution.

The automobile suburb fostered privately owned, single-family homes built on larger lots, wider streets, and with greener lawns than in urban centers, giving rise to what Kenneth Jackson has called *The Crabgrass Frontier* (1985). “The dream of a detached house in a safe, quiet, and peaceful place,” he argues, “has been an important part of the Anglo-American past and a potent force in the development of the suburbs.”¹⁷ Suburban homes

followed the designs of architects such as Andrew Jackson Downing (1815–52), who stressed the need for affordable functional designs, and Frank Lloyd Wright (1867–1959), who focused on single-story ranch homes with street-accessible carports and garages.

In addition to affordable housing, private property, and the automobile, race was a decisive factor in the evolution of American cities and suburbs. Underlying prejudice, fear of urban crime, and crowded conditions, along with court-mandated school desegregation in 1954, resulted in a flight to the suburbs by white affluent families. Tract developments, single-story schools with large playing fields, and suburban shopping malls characterized post–World War II construction patterns. “Racial prejudice,” states Jackson, “and a pervasive fondness for grass and solitude, made private and detached houses affordable and desirable to the middle class, and they produced a spread-out environment of work, residence, and consumption.”¹⁸ Low-density housing and the internal-combustion engine, however, combined to foster waste in land and fuel and to increase air and water pollution. Racial prejudice, wage and housing discrimination, and the lack of mass-transit systems kept minority workers in inner cities, where pollution and hazardous wastes threatened both the natural environment and human health.

Minorities and Pollution

“The age of ecology,” according to environmental historian Andrew Hurley, “coincided with changing forms of environmental degradation that discriminated along racial and class lines.”¹⁹ In his study of environmental inequalities in Gary, Indiana, Hurley shows how patterns of waste disposal differentially affected black and white, rich and poor, white collar and blue collar, urban and suburban populations. The vast industrial output during World War II drastically increased inner city pollution. People in minority and poor communities, adjacent to industrial areas, were affected by pollution to a far greater extent than middle-class and well-to-do whites. The case of Gary’s Steel industry illustrates post-War pollution problems.

By the end of World War II, Gary had become one of the nation’s most polluted cities. Steel manufacturing was located along the southern shore of Lake Michigan. Here, U.S. Steel Corporation used the Grand Calumet River, which flowed through Gary and into Lake Michigan, for water in the production of coke and finished steel and for waste disposal. Most of the post–World War II population was centered in the area just south of the

plant, where the Grand Calumet flowed through the city and where most black steel workers lived.

U.S. Steel emitted 100,000 tons of particulate dust into the air every year, much of which settled over north Gary. Coke plants released small carbon particles, while open hearth furnaces, used for converting the iron into steel, emitted iron particles. The air was polluted with sulfur dioxide, nitrogen oxide, and hydrocarbons. Winds carried the particles southward into the areas where workers lived.

North Gary likewise bore the brunt of the factory's water pollution. U.S. Steel dumped toxic liquid wastes into the Grand Calumet River, including ammonia, cyanide, phenols, and oils that flowed into Lake Michigan. In northwestern Gary, children played in the river, while the water utility, located just east of the waste stream, supplied well water polluted by seepage to several thousand families in northwest Gary.

Hazardous waste was also a major pollutant. U.S. Steel used its own vacant land for disposal sites, and by the 1970s was burying 600,000 barrels a year of hazardous waste. After the 1960s and 1970s, private scavenger companies began to buy up vacant lots throughout the area, burying the waste in lots, marshes, and trenches left over from highway construction. Wastes were also disposed of within the city limits in fifteen private dumps. Chemicals, pesticides, and solvents were introduced into the waste stream — PCBs (polychlorinated biphenyls); insecticides such as DDT; and solvents, such as benzene and toluene — chemicals that were subsequently reclassified as carcinogens.

Waste sites were differentially located in poor areas. Wealthier people, some of whom managed the plants and industries, lived in Miller, located east of the downtown area, and in Aetna and Glen Park to the south. These areas were least affected by contaminants. Glen Park and Miller each had one hazardous site; Aetna had none. By contrast, many sites were located in the inner city and in West Gary, where wage workers and the poor made their homes.

By the 1950s, Miller and West Gary had become the two fastest-growing areas. Just after World War II, blacks had constituted less than 30 percent of the population, but by the 1980s they made up 71 percent. They began to move into white areas, initiating white flight and racial discrimination, such that western and central Gary became primarily black while other areas became white. By 1980, blacks comprised 90 percent of the population and Hispanics made up 8 percent. They earned good salaries from the steel works, and therefore most of them chose to remain and live close to their jobs.

The history of urban environmental problems going back to the turn of the century and their differential impact on minorities and the poor illustrates the increasing complexity of environmental problems as populations moved from rural to urban areas and from other countries into the United States during the era of industrialization.

Conclusion

As the United States became increasingly urbanized by the turn of the nineteenth century, problems of urban pollution became widespread. Smokestack industries polluted the atmosphere, garbage piled up on city streets, the noise from cars, trucks, trains, and boats rent the air, and domestic and industrial effluents caused odors and illnesses. Minority populations experienced these effects on a larger scale than did white communities, which were able to marshal legislators and technologists to create solutions. Efforts to stave off the worst effects of urban pollution met with marginal success at first, but increased over time. The greatest successes, however, would come during the era of environmentalism in the latter half of the twentieth century.

Notes

1. Andrew Carnegie, *Triumphant Democracy* (New York: Scribner's, 1886), 1, as quoted in *Civilizing the Machine: Technology and Republican Values in America, 1776–1900*, by John F. Kasson (1976), 183.
2. *Ibid.*, 183.
3. Richard Wright, *American Hunger* (New York: Harper and Row, 1944), 1–3.
4. Martin V. Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore: Johns Hopkins University Press, 2000), 3–4.
5. Thomas R. Detwyler and Melvin G. Marcus, eds., *Urbanization and Environment: The Physical Geography of the City* (Belmont, Calif.: Duxbury, 1972), 21, quoted in Melosi, *The Sanitary City*, 4.
6. Joel Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron, Ohio: University of Akron Press, 1996), xxx.
7. Martin Melosi, "Hazardous Waste and Environmental Liability: An Historical Perspective," *Houston Law Review* 25, no. 4 (July 1988): 741.
8. Rebecca Harding Davis, "Life in the Iron Mills," *Atlantic Monthly* (April 1861): 430–51, quotation at 430.

9. *Milwaukee Sentinel*, 10 November 1903, quoted in Dale Grinder, “The Battle for Clean Air: The Smoke Problem in Post–Civil War America,” by Dale Grinder, in *Pollution and Reform in American Cities, 1870–1930*, ed. Martin Melosi (Austin: University of Texas Press, 1980), 87.
10. J. B. Stoner, “The Ill Effects of Smoke on Health and Comfort,” *Military Surgeon* 32 (1913): 373, quoted in Grinder, “The Battle for Clean Air,” 86.
11. Frederick Upham Adams, in the *Toledo Blade*, 23 January 1906, quoted in Grinder, “The Battle for Clean Air,” 95.
12. Suellen M. Hoy, “‘Municipal Housekeeping’: The Role of Women in Improving Urban Sanitation Practices, 1880–1917,” in Melosi, ed., *Pollution and Reform*, 193–94.
13. Imogen B. Oakley, “The Protest Against Noise,” *Outlook* 90 (17 October 1908), 351–55, quoted in “Toward an Environmental Perspective: The Anti-Noise Campaign, 1893–1932,” by Raymond W. Smilor, in Melosi, ed., *Pollution and Reform*, 139.
14. Theodore Steinberg, *Nature Incorporated: Industrialization and the Waters of New England* (New York: Cambridge University Press, 1991), 206.
15. *Ibid.*, 211–22.
16. Melosi, *The Sanitary City*, 1.
17. Kenneth T. Jackson, *Crabgrass Frontier: The Suburbanization of the United States* (New York: Oxford University Press, 1985), 288.
18. *Ibid.*, 296.
19. Andrew Hurley, “The Social Biases of Environment in Gary, Indiana, 1945–1980,” *Environmental Review* (Winter 1988): 19.