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# From Smoke-Filled Skies to Smoke-Filled Rooms

## *Louisville's Political Battles Over the "Smoke Evil"*

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Writing about his exploratory ride through town in 1842, Charles Dickens described Louisville, Kentucky, as "regular and cheerful: streets laid out at right angles, and planted with young trees." Yet Dickens also observed that Louisville's buildings were "smoky and blackened, from the use of bituminous coal," adding that, "an Englishman is well used to that appearance, and indisposed to quarrel with it."[1] Louisvillians have fought long-running battles over smoke. The city's concentration of heavy industries and its role as a transportation hub—spawned by its location on the Ohio River and between two coalfields—fouled its atmosphere. As residents came to understand the health and economic costs of the worsening palls and called for reform, they sparked decades of debate and political maneuvering. The conflicts initially arose over coal smoke, were greatly exacerbated by World War II-era chemical plants, and continued through the still unfolding implementation of the federal Clean Air Act. The outcomes of these battles were driven less by technological innovation than by the economic, political, and persuasive powers of the competing participants: coal dealers, industrial leaders, engineers, and trade associations on the one side, and merchants, doctors, and housewives who demanded cleaner air on the other. Standing between the interest groups were politicians, civil servants, and newspaper editors. Special interests nearly always trumped public interests—at least until the federal government imposed superior legal authority.

Smoke over downtown Louisville, November 1943. THE FILSON HISTORICAL SOCIETY

**LEFT:** View of Fourth Street, downtown Louisville, November 1943. THE FILSON HISTORICAL SOCIETY

The nation's first factories were water-powered mills that could be located at only a limited number of riverside sites that met certain requirements. The river had to offer both sufficient fall and reliable year-round flow to warrant the sizeable investment, yet be small enough to be dammed. But such locations were not always close to pools of untapped labor or markets. With the


Monon locomotive and train, south of Louisville's Union Station, 1920. UNIVERSITY OF LOUISVILLE PHOTO ARCHIVES

advent of the steam engine, factories could be situated closer to fuel supplies, labor, and markets—and to steam-powered boats and trains that transported goods to market in much less time. Manufacturing in Louisville followed the advent of the steamboat in the early-nineteenth century, and the construction of a canal around the Falls of the Ohio in 1830. New factories included foundries that made steamboat boilers and engines, stoves, and architectural iron, as well as brick kilns, slaughterhouses, soap and candle factories, distilleries, tobacco processors, lumber and flour mills, and even a sugar refinery.[2]

The steam engines of the industrial revolution consumed fuel voraciously. As forests were depleted, factories, trains, steamboats, and homes shifted from wood to coal. The town's proximity to two major bituminous, or soft, coalfields—the Appalachian or eastern, running south from western Pennsylvania through eastern Kentucky, and the western, running south from central Illinois through western Kentucky—aided the transition to coal in Louisville. Eastern bituminous coal burns hotter and emits less sulfur than does western bituminous, although neither can compete with the superior caloric and lower sulfur content of anthracite coal from eastern Pennsylvania coalfields. However, anthracite was significantly more expensive than even the highest grades of bituminous, and the more coal used the more significant were price differentials. As a result, energy-intensive

industries located near coalfields to limit fuel shipping costs. The ease of transporting coal up the Ohio River enabled Louisville to rely most heavily on lower-cost soft coal from western Kentucky's coalfields, despite its poorer quality. Of the resulting pollution, a visiting Pennsylvanian wrote in 1839, "Louisville is a city of some note and a place of considerable business—but one of the dirtiest and filthiest places I have yet met with—and if its citizens are unhealthy and often swept into a premature grave they are themselves to blame for it."[3]

By 1850, Louisville was the nation's tenth largest city and a booming center for manufacturing, water and rail transportation, and related industries. Yet its reputation for grim skies grew with the city. The coal that fueled fifteen foundries and increasingly heated homes and commercial establishments fouled the air. Adding to the pall, the railroads began to take their place in Louisville's economy, stealing away river-based commerce, providing passenger service and stimulating more industrial growth. Following the end the Civil War, the railroads expanded from Louisville to other commercial centers in all directions, further boosting the economy, particularly with iron works, manufacturing, breweries, distilleries, tanneries, and tobacco processing. Fuel-intensive cement mills followed. Except for a few water-powered mills, wood and coal drove these enterprises. In 1870, convenience and lower costs pushed the Louisville & Nashville (L&N) railroad, the city's largest, to feed its locomotive fireboxes with the bituminous coal that it hauled to market for mine operators. This shift meshed with L&N's plans to tap the growth potential of the coalfields, both by extending lines and buying smaller railroads.[4]

Municipal efforts to control smoke from the combustion of bituminous coal started around the nation in the mid-nineteenth century with limited results. Historian Joel Tarr argues that smoke control got a later start than did the regulation of potable water supply, wastewater disposal, and water pollution for several reasons. Unlike illnesses from water-borne contaminants that presented quickly and could be traced to their sources as a result of the era's growing understanding of bacterial science, smoke's harm to health and property was slower, more subtle, and more likely to be misperceived as a mere nuisance. Many medical doctors suspected, but could not prove, smoke's ill effects. The science and technology of providing municipal drinking water and wastewater collection developed earlier, and the public understood more easily the efficacy and benefits of installing both utilities. Lacking a technological fix for coal smoke, the only immediate alternative was to switch to cleaner fuels, a solution few adopted because of higher costs. Worse, while no one welcomed polluted water, the public widely saw smoke as a symbol of a flourishing economy.[5]

As coal smoke increasingly fouled city air, opinions on its acceptability varied widely. Prior to the widespread acceptance of germ theory in the

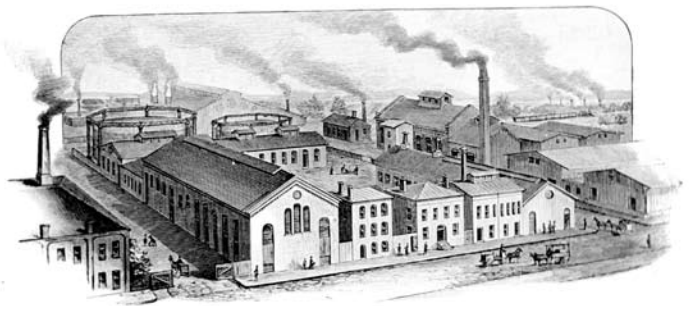
late-nineteenth century, most people, including medical doctors, believed that dirt and miasmas—vapors and foul odors from filth and decaying matter—caused sickness. Such theories rendered the later warnings of anti-smoke reformers intuitively appealing to the public. As their understanding of etiologies improved, doctors associated smoke with respiratory and heart diseases, and with worsened symptoms of consumption, or tuberculosis (TB). Industrialists on the other hand accepted smoke as the price of prosperity. Before the advent of environmental regulations, the only option for resolving disputes was litigation, though such lawsuits usually offered little relief. American courts had long applied English common-law doctrine against familiar nuisances such as slaughterhouse odors—often ordering the offending operation to close or relocate away from residential areas—but most judges treated suits against pollution from the industrial revolution's manufacturers and railroads much differently. Judges instead applied a new paradoxical doctrine known as "reasonable use," which held plaintiffs to dauntingly higher standards for proving injury and which assumed that what was good for industry was good for society. City folk, most judges ruled, could not expect the air quality that their rural cousins enjoyed.[6]

In 1880, L. L. Warren brought suit against the Louisville Coffin Company, whose steam-powered factory sat in the middle of the downtown block bounded by Chestnut, Walnut (now Muhammad Ali Boulevard), Third, and Fourth Streets, a block "almost entirely occupied by building for residences and light fancy stores." The factory smokestack was only fifty-five feet tall and two hundred feet from the back doors of Warren's home and restaurant. He sued because "frequently the smoke, soot and cinders . . . [were] rendering the atmosphere unwholesome for respiration" and he and his neighbors found their "buildings in danger from burning embers." A lower court ruled in Warren's favor, but the firm appealed to the Kentucky Supreme Court. Chief Justice William S. Pryor acknowledged that the location was a poor choice for such a manufacturer and that the stack emissions were "unpleasant" when they blew toward Warren and his neighbors. Nonetheless, applying the reasonable-use doctrine, he found for the manufacturer. He ruled that Warren's evidence failed to prove that he and his family had "sustained any substantial injury" or that they suffered worse than their neighbors. Pryor declared that "one living in the city must necessarily submit to the annoyances which are incidental to city life." "Manufacturing establishments," he noted, were "necessary and indispensable to the growth and prosperity of every city," and "individual comfort must yield to the public good." Ruling in favor of Warren, the judge concluded, would establish a precedent that "would destroy the manufacturing interest in the city of Louisville."[7]

In the late-nineteenth century, Louisville's manufacturing and mercantile sectors continued to expand. The city became the world's largest

tobacco market, the nation's largest producer of cast-iron pipe, plows, and cotton denim, and a leading cement producer. Skies blackened further from the growing use of coal for fuel and gasified coal for lighting. In the new century Louisville's "midday smoke palls limited visibility to less than a city block." Like their peers throughout the country, Louisville's Progressive-era reformers saw smoke as a chronic nuisance and eventually as a threat to public health. Perhaps most loudly, women's groups and shopkeepers complained about soiled laundry, furnishings, and merchandise, and higher light bills. Yet manufacturers and railroads employed 38 percent of Louisville's workers and wielded almost insurmountable political influence, despite the attempt at Kentucky's 1890 Constitutional Convention to prohibit the long-standing corporate practice of providing cash, railroad passes and other favors to public officials.[8]

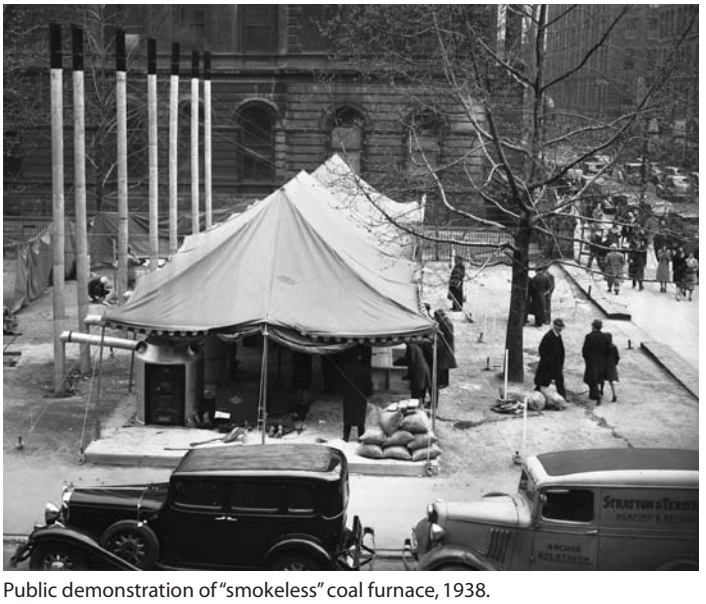
Industrialists turned a deaf ear, portraying smoke as a symbol of good times and employing the tactic of declaring a need for more study and then questioning the validity of the results. The engineers of the era's Efficiency Movement equated smoke with inefficiency and wasted coal—bad design, low-quality fuel, and improper equipment operation—that could be solved through science. Some of those engineers, like Benjamin Franklin before them, claimed that stoves could be "smokeless" if well designed and properly operated. Inventors, manufacturers and soft coal dealers placed great stock in so-called "smoke consumers": boiler and furnace devices and design modifications such as "automatic" stokers, steam jets, down-draft furnaces, and brick arches. Peddled as yielding "smokeless combustion" without requiring the more expensive anthracite coal, each "smoke consumer" nonetheless had its limits. Automatic stokers, for example, actually required conscientious operation by trained "firemen." While they lessened smoke plumes when diligently operated, none were wholly smokeless and all were far from the silver bullet promised by advertisements, salesmen, and coal dealers eager to snuff out calls for banning bituminous coal.[9]



Conversion of coal to gas for lighting, Louisville Gas Company, 1888. UNIVERSITY OF LOUISVILLE PHOTO ARCHIVES

Adopting local ordinances in response to demands to arrest what pollution opponents commonly labeled the "Smoke Evil" and "Smoke Nuisance" proved to be a tricky proposition, politically and practically. The doomsday claims of coal dealers and the third-way assurances of engineers and smoke-consumer salesmen drowned out proposals for banning soft coal. Not atypically, Louisville's three ordinances adopted over four decades always came after protracted debate, and always with disappointing results. The

administrative impetus for the first ordinance came not from the city's board of health. In 1905 and 1906 pneumonia was the second biggest local killer, responsible for more than one in seven deaths, and consumption, the largest killer, was exacerbated by polluted air. Yet the annual reports of the city health officer, a medical doctor, called for new regulations to control only "avoidable noises," hog pens, and dairy stables. The lengthy discussion under the heading of "Pure Air" in the medical officer's 1907 annual report called pure air "a matter second to none as a municipal necessity," accompanied by a call for sewers and an end to privies. He then urged the building director to widen the space between buildings so that "nature's most potent disinfectors—sunshine and air—could destroy the pathogens that caused anthrax, typhoid, cholera, tuberculosis, diphtheria and other diseases, and protect the human body's natural resistance to them." After stressing the importance of factories to the community's "commercial welfare," the doctor urged manufacturers and others to employ "smoke consumers" voluntarily without waiting for mandates.[10]



Public demonstration of "smokeless" coal furnace, 1938.



Noting that his 1895 call for a smoke ordinance failed because of a lack of "true smoke consumers" and the heavy volumes of complaints lodged with his office, the building inspector's 1905 and 1906 annual reports contained renewed pleas for legislation to end property damage from excessive smoke by requiring the then available "perfect smoke consumers" on all "manufactories using furnace and smoke stack." Changes in building construction techniques led to taller buildings—six to twelve stories high, on par with many smoke stacks—and smoke blowing directly into windows. The building inspector argued that there was "scarcely a tall building in the city whose occupants [did] not suffer great inconvenience at times from smoke emanating from the stacks of small factories and laundries that [were] exempt from molestation by law." He added that conditions were at least as bad in office buildings, retail stores, and some residential areas of the city, and called for lawmakers to adopt an ordinance that would remove one of greatest impediments to Louisville becoming "a great city."[11]

Only on the final day in office in 1907 for most of the city's aldermen did all but one member of the board heed the building inspector's pleas, and then only after the chair of the board of public safety testified that the proposed rule would eliminate 80 percent of city's soot problem. As in other cities, Louisville's ordinance empowered its mayor to create a smoke department and to appoint an engineer as its smoke inspector, whose duties included certifying the design of proposed boilers and furnaces, issuing permits prior to installation, and inspecting finished jobs. To address operating problems, the smoke inspector had the right to enter a premise to determine the cause and resolution of excessive smoke. He also had the authority to order boiler and furnace operators to optimize their firing techniques, if not retrofit smoke abatement equipment. Last, he could cite and fine violators from ten to one hundred dollars. However, loopholes doomed its effectiveness: the law exempted railroad locomotives, and (as was the case in all but Los Angeles) private residences. The inspector, moreover, was appointed for only one year and could be relieved of his duties at any time by the board of public safety. Even if the mayor exercised the ordinance's option to hire an assistant smoke inspector, the two could not have managed all of their duties in a city with more than two hundred thousand residents and a large coal-burning industrial sector.[12]

The ordinance went into effect in November 1908. The building inspector's 1909 annual report claimed that compliance was better in Louisville than in any other city its size in the United States or Canada, and that "seldom [was] any objection raised against the ordinance when properly explained." However, he lamented in his 1910 annual report that despite the installation of 709 "smoke consumers" the ordinance's exemptions rendered it "extremely faulty," making the job of suppressing smoke "next to impossible." When the economy began to flag in the 1910s, city leaders pushed air quality to the back burner and initiated new economic development efforts, including the Louisville Convention and Publicity League, the Louisville Board of Trade, the Million Dollar Factory Fund, and the Louisville Industrial Fund. Several dozen new industries set up shop, including the Reynolds Metals Corporation and a new Ford Motor Company assembly plant. Predictably, the building inspector's 1913 annual report charged that efforts to enforce the ordinance foundered because of "resistance, legal and otherwise, offered by owners to the installation of smoke prevention apparatus." Even where "smoke consumers" existed, firemen failed to operate them properly. In his 1914 report, the building inspector complained that no success could be achieved without bringing "the greatest pressure to bear" upon recalcitrant boiler operators. He also reminded policymakers that the exemption of residential chimneys undermined the possibility of clearing the city's air.[13]

Engineers and manufacturers continued to invent new equipment and unrealistic claims. In 1913 and 1914 Murphy Iron Works advertised that

its "Automatic Smokeless Furnace" would not only automatically feed itself and remove its ash, but also have "at no time any perceptible discharge of smoke." The American Stoker Company guaranteed that its stokers would offer "smokeless operation" with "any kind of coal." While these inventions often improved performance, they hardly constituted the sweeping solutions promised. Largely serving vendors' bottom lines and coal dealers' rationales for inaction, the myth of an easy solution persisted. Sociologist and civic reformer Charles Zueblin proclaimed in his 1920 textbook, *American Municipal Progress*, that "scientific devices make smoke abatement entirely possible" and that "only intelligence and public spirit [were] needed to clear skies." He called smoke an "impressive indictment of . . . waste" and shamed Philadelphia, Providence, Rochester, and Louisville for "stultify[ing] themselves by exempting locomotives" rather then requiring the fruits of scientific invention.[14]

By 1914, local women's groups also concluded that the 1907 ordinance was inadequate. Believing that only further regulation could correct "irascible 'smoke nuisances,'" they formed a Smoke Abatement Committee and "declared an organized war against the 'smoke evil.'" The league's campaign included public-education sessions for firemen, janitors, and housewives on proper boiler firing techniques, and lectures by experts from Cincinnati and Chicago. Businessmen started their own organization, the Louisville Smoke Abatement League, that collaborated with the women's committee, the local Retail Merchants Association, and the Engineers and Architects Club. Most outside experts assured these groups that with proper equipment and disciplined operation, bituminous coal and clean air were not mutually exclusive.[15]

The "Smoke Evil" or "Smoke Nuisance" became a regular topic in local newspapers. A 1916 editorial in the *Louisville Herald* proclaimed that housekeeping was the country's biggest industry and that its female managers possessed the power, given the imminent passage of universal suffrage legislation, to motivate politicians to legislate the "abolishment of smoke." The *Louisville Times* ran lengthy articles every day for three weeks that year. The opening piece declared the 1907 law "ineffectual" for assessing only one fine in eight years. Another listed detailed estimates of the "heavy toll" exacted upon residents, property, and landscaping—totaling twelve dollars per person annually, including extra house painting, wallpaper cleaning, and lace curtain laundering—plus another million dollars yearly in extra costs incurred and passed on by merchants. Proponents of a stricter ordinance quoted Nashville's smoke inspector who disputed the widely held notion that "the principle complaint against the Smoke Nuisance comes from finicky housekeepers and 'sissy' men." Rather, businessmen and retail merchants who confronted damaged wares and shop fixtures, extra cleaning expenses, and "huge light bills" complained the loudest. The city tax assessor


Local air pollution-spawned business, 1925. UNIVERSITY OF LOUISVILLE PHOTO ARCHIVES

confirmed assertions that reductions in real estate assessments due to smoke were "especially true in the districts surrounding the railroad yards and manufacturing districts." Descriptions of the health impacts came largely from studies by the University of Pittsburgh, and reflected commonly held misperceptions. Besides irritating the eyes, nose, throat, lungs, and the gastro-intestinal tract, doctors linked smoke to "fatigue, irritability and malcontent." By blocking sunshine, smoke was thought to be "devitalizing," reducing productivity, and leading to drunkenness, restlessness in the insane, and "sallow-faced, cellar-grown, oxygen-starved weaklings." The articles explicitly blamed not just commercial, industrial, and institutional boilers, but also residential furnaces and railroad locomotives, and took every opportunity to call for "civic co-operation" to reduce smoke.[16]

Despite the public outcry for cleaner air, Louisville's General Counsel took until 1919 to adopt a revised smoke ordinance, the delay attributable in part to the war effort. The second attempt maintained the earlier ordinance's focus on soot and dense smoke, but added "cinders, acids and other fumes detrimental to health" to its definition of public nuisance. The new ordinance strengthened design and operating requirements for larger sources, but still exempted private homes, smaller apartment buildings, and locomotives. The combustion engineer and building department retained their oversight and enforcement duties, while a new appeals process allowed cited violators to object in writing to the Board of Public Safety. The General Counsel did not specify a minimum number of enforcement officers, and

perhaps tellingly forbade bribery. In the summer of 1922, city officials promised strict enforcement and predicted that the coming fall and winter would be "comparatively free from smoke and soot." The new ordinance, the city stressed, prompted dozens of the largest furnace operators, including city hall, to make repairs, if not install new stokers, and erect taller smokestacks, the largest of which was sixteen feet in diameter and two hundred feet high.[17]

One year later, however, the Retail Merchants' Association continued to decry smoke damages, and brought in its own expert to advise the city on possible solutions, including calls for addressing residential sources. A 1925 editorial in the *Courier-Journal* suggested that the task was greater than could be accomplished by the smoke inspector and his assistant. During the 1920s and 1930s, national professional organizations, such as the Smoke Control Association of America and the American Society of Mechanical Engineers, studied the smoke problem and reached two conclusions. Pressures to economize had led industries, utilities, and railroads to make significant progress toward eliminating the densest of their smoke, and domestic sources needed restrictions.[18]

Indeed, seeking to reduce fuel costs, labor requirements, smoke complaints, and the risk of new regulations "when every lumber-pile contain[ed] an outpost of the local smoke abatement league," railroads everywhere challenged their engineers to enhance efficiency. Employing eight thousand workers in Louisville and enjoying prominent political influence might have given L&N confidence that its locomotives could avoid the aldermen's aim. However, the smoke abatement movement had broad support and L&N faced internal business pressures to burn soft coal. After decades of heavy investment, nearly one-third of its revenues came from hauling coal from mines to markets north, south, and west. In its peak year in 1927, its trains transported over forty-two million tons of coal, accounting for 60 percent of its total tonnage. Rather than risk its investment return or alienate its biggest customers, L&N pressured its engineers to improve operating practices and invent devices that could be retrofitted on to locomotives to "conserve fuel and eliminate smoke" while burning soft coal. L&N engineers employed improved stokers, blowers, and self-designed steam jets on its locomotives with some success. Yard engines, which stayed in town to queue smaller units of cars into the longer trains hauled out of town by road locomotives, constituted the most visible sources of smoke and received the most attention. Despite improving its efficiency by 31 percent between 1923 and 1940, the L&N spent six million dollars to buy nearly three million tons of coal in 1940.[19]

The ranks of manufacturers continued to grow, with 153 new plants established between 1923 and 1927 alone. Major new industries included two oil refineries, a second Ford plant, and perhaps not coincidentally a

fabricator of industrial dust control devices, American Air Filter. A new dam across the Ohio River produced hydroelectric power, but most power came from burning coal. Manufacturers' letterheads commonly boasted engraved images of plants with smoking stacks. Louisville was the sixth dirtiest city in the nation in 1931, behind only St. Louis, Cincinnati, Pittsburgh, Detroit, and Chicago. The revelation prompted another round of newspaper coverage, expert presentations, and calls for better regulation. Feeling threatened, coal dealers formed their own advocacy group, the Louisville Coal Institute. Its members and experts took the familiar position that with proper technique soft coal could be burned without smoke. More independent experts countered that anthracite's higher cost would be offset by its greater heating value and attributed up to 65 percent of the problem to residential furnaces. Indeed, though in 1936 the Louisville Gas & Electric Company (LG&E) installed one of the nation's earliest electrostatic precipitators to capture fly-ash on its Canal Station, visibility in the city dropped to as little as one hundred and fifty feet on the worst days.[20]

Louisville Gas and Electric Company, Waterside Plant, seen from Clark Memorial Bridge, 1938. UNIVERSITY OF LOUISVILLE PHOTO ARCHIVES

A series of articles published in the *Louisville Times* in January 1937 reflected more sophisticated thinking and expanded the definition of the problem. Writers spoke of "a blanket of carbonaceous and sulfurous smog," a term derived from smoke and fog that was coined in England in 1905, and slowly entered the American vocabulary. The medical director of Louisville's Waverly Hills tuberculosis clinic and other doctors spoke publicly, accusing smog of aggravating TB patients' symptoms and causing seemingly intractable pneumonia death rates. Reminding the public that smog harmed all residents, infirm or not, surgeons reported that lungs, pink at birth, were dark gray to black after a lifetime of breathing Louisville's sooty air. A doctor with the Kentucky State Board of Health cited British and American research that connected smog with heart disease, stomach disease, rickets, and higher infant mortality. The radio station WHAS aired a series of discussions with experts from the engineering and health fields.[21]

Louisville's acting mayor, Horace A. Taylor, responded by appointing a fourteen-person "citizens' smoke abatement committee" to study the problem. With at least half of its members coming from the coal industry, railroads, LG&E, and other large consumers of coal, the committee lacked interest in new rules and concluded that "the only practical method of attack on the smoke problem [was] through education." Its pamphlet on how best

to operate a coal-fired furnace, sent home with schoolchildren, was written by the Louisville Coal Institute. The mayor and smoke inspector accompanied the committee on a trip to Illinois to see the manufacture of "smokeless fuel," a coke-like product made from soft-coal dust that coal dealers repeatedly proposed as a way to keep their commodity burning locally. The coal institute received permission to erect temporary stokers and twenty-five-foot-tall stacks in downtown Lincoln Park the following winter to demonstrate optimal firing to passers-by.[22]

The Great Depression rippled through smoke-control efforts as municipal cutbacks crimped the number of smoke inspectors everywhere. Louisville's smoke inspector lost his assistant, leaving him to face an impossible task alone. Filling a research gap, the federal Works Progress Administration (WPA) hired twenty-eight engineers in 1938 to conduct a "Smoke Abatement Study in Industrial Plants and Railroads," partly by stationing them in towers, tall buildings, and rail yards, to estimate the duration and density of smoke emanating from various sources around the city.

Louisville Carbide plant, west Louisvillle, 1946.
UNIVERSITY OF LOUISVILLE PHOTO ARCHIVES

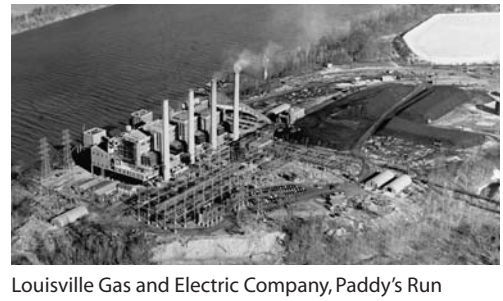
The study provided the first analytical definition of the problem, including estimates that residences generated half of the 16,900 tons of particulates dumped into the city's air that year. The data also showed that on average in only ten months lower fuel bills returned the costs of installing new stokers at local factories. The study's 1939 report recommended that the city employ a competent combustion engineer, manufacture a "smokeless fuel" from otherwise wasted screenings of Kentucky's soft coal, inspect high-pressure boilers annually, form an association to promote industrial smoke abatement, and "as a last resort" adopt a stronger ordinance with heavy penalties for noncompliance.[23]

Though Louisville's air by then ranked the third dirtiest in the country (the average resident inhaled an estimated cup and a half of soot annually), the mayor's smoke abatement committee, which had said it needed more data before it could fix the 1919 ordinance, neither approved nor forwarded the report's recommendations to then-Mayor Joseph D. Scholtz. Instead, it allowed the Louisville Coal Institute to rebut the report after the coal dealer on the committee objected to the smokeless-fuel proposal. While placing great emphasis on the impossibility of clean air in Louisville without reducing contributions from residential stoves, the committee also asserted that those reductions would occur only if an alternate fuel were cost competitive. Despite a *Louisville Times* editorial reminding them of the hidden costs of soot and smog, politicians still could not bring themselves to regulate

residential furnaces. Perhaps their timidity arose partly from the sentiments of C. Paul Downard, president of a local coal company, in a lengthy letter to the *Courier-Journal*. In it, he raised numerous doubts about the accuracy and significance of the study's data, suggesting that an unknown portion of particulate matter was dirt from the Great Plains's dust bowl and warning that "overzealousness" risked residents' livelihoods.[24]

Across the nation, only in St. Louis, Missouri, and Pittsburgh, Pennsylvania, located at opposite ends of the Ohio River, did politicians muster enough fortitude to regulate "home fires" prior to World War II. In 1934, the mayor of St. Louis appointed Raymond R. Tucker, a combustion engineer and former member of Washington University's mechanical engineering faculty, to develop a clean-air plan. Using the same approach that St. Louis and other cities used to treat water pollution—removing pollutants before consumption—Tucker proposed to control smoke before inhalation by requiring the use of so-called "smokeless fuel" and "smokeless combustion" equipment. Persuading decision-makers to adopt such legislation proved difficult until the spring of 1940, when especially heavy palls during the previous heating season heightened community awareness and support for change. The St. Louis ordinance included homeowners and used licensure of fuel dealers to limit coal sales to anthracite. When the following winter its skies were noticeably clearer, community leaders credited the ordinance. Pittsburgh's 1941 ordinance was then the nation's strongest, but the war effort postponed its enforcement until the winter of 1947-48.[25]

The buildup of defense industries during World War II distracted the entire nation from clean air concerns, and brought heavy industries and significantly more air pollution to Louisville. LG&E officials decided in 1939 to order equipment for a new coal-fired power plant, just before the federal government "halted utility-expansion projects and redirected manufacturing to munitions and other wartime equipment." After the new Paddy's Run plant was built on the Ohio River on Louisville's west side, the government named LG&E a "national defense utility" and tapped its new generating capacity. It chose Louisville for the site of three synthetic rubber plants—DuPont, B. F. Goodrich Company, and American Synthetic Rubber Company—and the National Carbide Company's plant producing acetylene, a rubber ingredient. The area along the Ohio River where these facilities were built soon became known as Rubbertown. In 1942, the federal government paid to expand the plants, using Louisville's distilleries to make industrial alcohol, another ingredient in rubber production. At its peak in 1944, Rubbertown produced



Louisville Gas and Electric Company, Paddy's Run plant, west Louisville, 1949. UNIVERSITY OF LOUISVILLE PHOTO ARCHIVES

195,000 ton of rubber, and employed eighty thousand Louisvillians in rubber and other defense-related jobs. Demand for electrical power from large industries more than quintupled between 1939 and 1944.[26]

By the early 1940s, soot and smoke regularly obscured the view of Louisville's downtown skyline from the Phoenix Hill end of Broadway. Real estate experts saw smoke and noise as the principle drivers of both "premature decay of 'close-in' urban property values" and the decline of suburban home sales. A 1941 article in the *Louisville Times* reported that the federal Public Health Service (PHS) calculated that air pollution cost the average Louisville resident thirty dollars annually, including doctor's bills, premature damage to metals and exterior painted surfaces, and laundering expenses. Shortly thereafter, the city's mayor Joseph D. Scholtz, a Democrat who campaigned on a promise to reduce the smoke problem, established a new Smoke Elimination Committee of seven people with "no ax to grind," including Mrs. F. H. Linkenberg, the first representative of women's clubs. In response to its mayoral charge to determine why the city's smoke problem worsened despite the 1919 ordinance, the committee reached familiar conclusions: enforcement was poor, and the ordinance partly missed its mark by omitting railroad locomotives and residential furnaces. Scholtz then authorized the committee to draft an effective ordinance.[27]

The mayor's committee met with Raymond Tucker of St. Louis and held separate hearings with various interest groups, including the Louisville Coal Institute, the Louisville Real Estate Board, the Board of Education, the Retail Merchants' Association, and the Hotel Men's Association. Stating he did not fear turning a profit if Louisville cleaned its air, David Stry, a textile chemist with the Louisville Cleaners and Dryers Association, testified about telltale damage from "sulfurous acid and other gases in the Louisville atmosphere." Rayon curtains rotted, and blue clothing and curtains reacted like litmus paper, "fad[ing] into a reddish color," he observed. Predicting that coal interests would renew boycott threats, Harry W. Schacter of the Retail Merchants' Association angrily declared that its members "lose tens of thousands of dollars because of smoke. We have a right to protest, and we do protest."[28]

Representing the coal institute, C. Paul Downard called the "sudden demand" for a Louisville ordinance "unwarranted." He asserted that the St. Louis law was not nearly as effective as believed, and accused the *Courier-Journal* of "reckless abandon." Downard claimed that the existing "all embracing" ordinance would suffice if fully enforced, and demanded that the proposed law be "discussed strictly on its merits." He denied the existence of such a thing as "smokeless fuel," and argued that the *Courier-Journal's* estimates of the costs of anthracite were too low. The *Courier-Journal* responded with a terse editorial, accusing Downard of "speak[ing] for a tiny group of men who fear *they might lose a little money* if Louisville

cleaned up its smoking chimneys." In contrast, Schacter of the merchants' association represented "a very large group who know that *they lose thousands* because Louisville has not cleaned up its smoking chimneys. We repeat: *Everyone pays the smoke bill.* And no one group has the right to inflict a general nuisance upon 320,000 people."[29]

The testimony and flattering coverage of the St. Louis ordinance in local newspapers directly challenged the premise that proper firing technique could be a stand-alone solution. It sparked an angry backlash from the coal institute, whose next pamphlet attacked clean air advocates as "selfish interests" whose advocacy was "far more dangerous and devastating than coal smoke." Exploiting the political risk that regulating "home fires" presented to elected officials, coal supporters flatly denied that a St. Louis-type ordinance could work in Louisville and labeled such a regulation premature and an "unjust burden." The institute's "plan" for clearing Louisville's smoggy skies was "simply" to enforce the twenty-two-year-old 1919 ordinance. Coal dealers asserted that "all fair and sincere groups . . . [would] recognize that this plan should at least be put into effect for a period of one or two years before attempting any other plan that would place a hardship on the home consumer."[30]

The next week, the *Courier-Journal* polled eleven members of the board of aldermen (the twelfth member was out of town). Only one alderman expressed support for the St. Louis approach. The other ten, including a coal broker, four L&N employees, and four men who worked for firms that burned large volumes of coal, claimed to be undecided, to need more time to study the problem, or to have not "given it any thought." In a debate broadcast by radio, J. J. McTighe, the coal institute's president, told listeners that switching from bituminous to anthracite coal would be like "swapping the Kentucky Derby for a mule race." The results of a League of Women's Voters poll of five hundred and sixty residents from all twelve city wards released the following week presumably increased pressure on those ten aldermen. Ninety-two percent of respondents said they would like to see clear skies and 70 percent said they would be willing to pay more for fuel. And for its first community project, the Louisville Movie Club began producing a film for the use of the mayor's committee in educating the public on the gravity of the smoke problem.[31]

Days later, the mayor's committee submitted its recommendations. The majority report called for an ordinance similar to St. Louis's that "would cause a minimum of inconvenience and costs," and ban all "[o]bjectionable smoke." Sellers could vend only anthracite, except to buyers who utilized approved mechanical equipment. Coal dealers would be required to get permits and pay a one cent per ton tax to pay for the program that would regulate what type of coal they sold. The proposal also authorized temporary suspensions if supplies became inadequate or prices excessive. The

report likened the proposed requirements to earlier municipal reforms, such as water filtration, sewer installation, compulsory vaccination, food inspection, milk pasteurization, and planning and zoning rules. Reflecting wartime patriotism, the report reminded readers of the great achievements possible to cooperative communities, enjoining that "any temporary or apparent sacrifices necessary to eliminate the smoke nuisance" would be "offset a hundred-fold by the economic advantages and the joys of living in a smoke-free community." The minority report expressed doubts that Kentucky coal could be rendered clean enough to meet requirements and that the ordinance could be burdensome to lower-income residents.[32]

Saying that it "was worth every sacrifice for civic betterment," St. Louis's mayor, Barney Dickmann, attributed his failed bid for re-election that month in part to the increase in the price of coal as a result of his city's smoke ordinance, especially in the precincts inhabited by lower-income black voters. Louisville's incumbent mayor opted against running for re-election and ordered his law director to draft a St. Louis-style ordinance, sending shudders through the local Democratic leaders who were keenly aware that voters would confront higher coal prices just before going to the polls that November. In aldermanic and party meetings, skittish politicians called for implementation delays and an exemption of the residential sector if the ordinance, combined with an ongoing coal strike and the resource demands of defense efforts, pushed prices too high. Wilson Wyatt, the Democratic candidate for mayor, claimed not to have followed the debate closely.[33]

The League of Women Voters made plans to defend the ordinance at hearings scheduled before the aldermen voted. City staff set up a grate and coal stove on a flat-bed truck, and drove it around to every neighborhood to demonstrate how to use the slower-to-ignite anthracite. In Butchertown, a combustion engineer from St. Louis accompanied the truck, explaining that though the better coal cost one-third more it provided twice as much heat. Several young men attacked him and the driver and wrecked the equipment. Meanwhile, the coal institute circulated petitions asserting that the 1919 ordinance would suffice if only it were fully enforced and demanding more hearings. The Central Labor Union also argued against the proposed ordinance, arguing it would hurt the "low paid working class." While the ordinance's first draft included home fires and an appropriation to ease its economic impact on the poorest residents, after a week of vociferous dissent the mayor agreed to restore the residential exemption. Still, opposition remained strident. Calling the mayor's committee "fanatics" and the smoke inspector "biased," coal institute president McTighe raged that the ordinance was a "Hitler idea" and that coal dealers "might as well turn over all [their] books to the combustion engineer."[34]

The aldermen scheduled their first hearing for an evening when the mayor would be out of town. Mayoral staff reserved half the seats for

ordinance proponents and half for opponents, but hordes of angry foes arrived early. When representatives of the coal institute and the L&N protested about locked doors, one alderman, James Ross (an L&N employee), unlocked them. Nearly five hundred opponents quickly filled the chambers. The coal institute's McTighe presented petitions bearing thirty thousand signatures. Reminding the aldermen that his "great corporation" had eight thousand employees with "fifteen million in purchasing power," the president of L&N, James B. Hill, warned of dire economic consequences, including wartime shortages and a backlash from coalfield legislators in future sessions of the state general assembly. Other speakers echoed Hill's predictions. Coal operator R. K. Kelly said the proposed ordinance threatened a return to the Great Depression, and one African American in attendance, John Petrie, testified that "poor people, whites as well as Negroes" could little afford the more expensive coal. Supporters of the ordinance met with a hostile response from the partisan crowd, and its disruptive behavior soon prompted aldermen to summon police to restore order. After the hearing, board president and future mayor Andrew Broaddus announced that the aldermen would draft their own plan to address smog.[35]

A furious Mayor Scholtz accused the L&N and coal dealers of having "tried every trick in the book." "The L&N Railroad isn't going to run this town while I am Mayor," he fumed, and announced that he would take the issue to the people via a radio address. However, before arrangements could be made, and despite a promise to forego further action, the aldermen met in closed session and voted to kill their own anti-smoke bill. Nine aldermen voted against the ordinance, two, including Broaddus, abstained, and one was absent. The medical-doctor chair of the mayor's committee admitted defeat less than three weeks after the ordinance was drafted, and McTighe demanded that party officials not punish incumbent Democratic aldermen for voting against the ordinance.[36]

Between this fiasco and the end of the war in 1945, the smoke controversy barely simmered. The *Courier-Journal*, for example, reported on the issue 143 times during the first five months of 1941, yet only forty-seven times during the remaining fifty-two months of the war. Foreseeing renewed postwar battles over smoke, the Louisville Area Development Association, a business group that later merged with others to form the Louisville Area Chamber of Commerce, appointed its own committee in late 1944. Hoping the soft coal industry would "become . . . even bigger," its members "decided that the only solution . . . was for the City to hire a competent engineer as smoke commissioner [whose] main task would be a consultant." Meanwhile, C. Paul Downard made two successful runs for office, serving as a Republican member of the board of aldermen between 1943 and 1947. During his second term—won by a razor-thin margin—he served

as board president and supported his own revised version of Democratic mayor Wilson Wyatt's smoke ordinance.[37]

The Republican ordinance, which the aldermen adopted in 1945, differed somewhat from Wyatt's smoke ordinance. It stipulated that a new smoke commission answer to both the mayor and the aldermen, and consist of seven commissioners of "good reputation," not necessarily Louisville residents, including one "coal man," two "chief operating engineers in plants containing high-pressure boilers," one owner or operator of "apartment houses, hotels or office buildings," and one person "actively engaged in the practice of designing and installing heating and ventilation equipment." By design, then, most commissioners came from the regulated body. Far from the St. Louis approach, the ordinance allowed the railroads (not surprisingly Downard's coal company's biggest customers) to burn any fuel in its equipment if fitted with stokers or other smoke-reducing equipment. The ordinance exempted single-family homes and smaller apartment buildings and, in what would eventually prove its most problematic exemption, its focus on fuel combustion meant that it overlooked the chemical emissions of heavy industry, including Rubbertown's manufacturers. Plans for new combustion equipment required approval of the combustion engineer, but the commissioners served as an appeals board for permit holders dissatisfied with the combustion engineer's decisions. Fines for violations were a minuscule ten to one hundred dollars.[38]

The ordinance's exemptions, the commission's bias, and a policy of requiring staff to seek the commission's permission before filing enforcement actions in court ensured failure. Another round of citizen complaints, critical editorials, and political promises ensued with the next heating season. By 1948, the estimated annual costs of smoke rose to between ten to twenty million dollars, and auto headlights were at times required at midday. The combustion engineer complained publicly that the local ordinance court did not support his efforts to enforce what he declared to be an inadequate law against even the worst offenders. Remarkably, the employers of eight of the eleven men on the smoke commission and its engineering advisory committee faced a total of 225 unresolved violations.[39]

The 1948 air-pollution disaster in Donora, Pennsylvania, in which toxic smog killed twenty residents and sent seven thousand—half the steel mill town's population—to the hospital, changed the tenor of dirty air debates throughout the nation. In smoggy cities across the country, the perception of the "smoke nuisance" mushroomed into a politically volatile "public health threat." Confronted with vivid newspaper photographs of dense smoke pouring from Louisville residential and industrial chimneys and of dramatic aerial views of the inky smog hanging over Louisville, the public demanded protection. When the board of aldermen proposed amendments to strengthen the 1945 ordinance yet failed to adopt them, the

*Courier-Journal's* editors attacked. They chided the commission for their "theory that because Kentucky produces soft coal, Louisville may not admit the scientific truth that soft coal, fired by hand, is bound to produce objectionable smoke."[40]

Pleas for relief prompted the city to sue National Carbide in 1947. The suit alleged that carbide dust from the company's Rubbertown plant injured the health of nearby residents, forcing them to stay indoors and keep their windows shut, and depriving them of the full use of their homes and property. The suit boldly asked the court to shut down all plant furnaces lacking dust-control technology. The company denied all charges, disowned the dust in question, and argued that it had already invested one million dollars into dust-control equipment. Just three weeks after the disaster in Donora, Federal District Judge Roy M. Shelbourne dismissed the suit, citing the plant's earlier importance to the war effort, its location in an industrialized zone one and a half miles beyond city boundaries, and Justice Pryor's opinion in the 1880 Warren suit. Shelbourne dismissed concerns about industrial calcium carbonate dust, arguing it was no worse than schoolhouse chalk dust. Most damaging, he ruled that the city failed to prove that residents' health suffered, much less that a causal relationship existed between residents' ill health and National Carbide's dust.[41]

The silencing effect of wartime patriotism on public tolerance of smoke, dust, and chemical fumes evaporated in the postwar era. Loud complaints emanated from West End residents about Rubbertown's tainted industrial plumes. Hoping to appease them, the smoke commission hired engineers from the University of Louisville's Institute for Industrial Research (IIR) to analyze the problem. Offering little clarity, the IIR's 1950 report concluded that indeed dust was a problem in the West End, but no more so in quality or quantity than in the downtown central business district, and called for more research to compare those findings to elsewhere in Jefferson County. As growing numbers of middle-class families fled to the suburbs, Rubbertown's remaining residents intensified their opposition, appealing in 1952 to the state assembly. They successfully persuaded legislators to pass a law that enabled the creation of special city-county districts for regulating pollution.[42]

When Rubbertown came within the jurisdiction of the newly formed Air Pollution Control District of Jefferson County (APCD), industrialists attempted to forestall imminent regulations. The Manufacturing Chemists' Association issued a booklet of advice to municipalities wrestling with demands for tougher controls on air pollution. The Rubbertown Industrial Group commissioned the Battelle Memorial Institute of Columbus, Ohio—deemed "a capable and reputable research group" by APCD—to critique the IIR study. West Enders questioned its objectivity, prompting Battelle's lead engineer to assert that the research institution "hardly would jeopardize its

reputation by selling out for $50,000" and the board soon avowed that it was "proceed[ing] as vigorously as possible with whatever means available." Because APCD received less than three-quarters of its requested budget, salaries were too low to keep inspection jobs filled. Hence the board "did not feel justified in purchasing the major portion of the sampling equipment," and agency activities "were somewhat curtailed for the last six months of 1952."[43]

Discontent came to a head later that year. An ad hoc group of determined residents, civic and women's clubs, parent-teaching associations, churches, and doctors hired attorney Henry I. Fox at their own expense. The Joint Committee on West End Air Pollution filed a formal appeal for relief—not to APCD but to the Louisville and Jefferson County Board of Health—from the "fumes, gases, dust and odors . . . discharged into the air over their homes by the industries at 'Rubbertown.'" Attached were 165 affidavits from "reputable citizens of the West End" and a joint statement from ten "highly reputable physicians living and practicing their profession in the West End," testifying to the impact of poor air on residents' health. Filled with strong language, medical references, and legal arguments, the complaint accused Rubbertown industries, especially National Carbide, of knowingly creating a "health menace" and of avoiding accountability, and accused elected officials of both nonfeasance and malfeasance. The group implored the board to declare air pollution in the area a health menace and to take action to stop it. They then published their complaint as a twelve-page pamphlet and encouraged recipients to read it and "pass it to [their] friends and neighbors."[44]

The health board and the Jefferson County Medical Society appointed a committee of doctors to investigate the problem. The following summer, after it concluded that dust in the West End was indeed "a probable health hazard," the board boldly ordered National Carbide to "show cause" within thirty days why it ought not be shut down. As in federal court four years earlier, company officials and their attorneys asserted in depositions that its dust did "not cause, or even contribute significantly to any health hazard in the West End." The plant doctor and union steward testified that if emissions constituted an actual problem workers would be sickened, yet they remained unaffected. The industrial health director for the state department of health testified that contaminants stayed below accepted safety standards for an eight-hour work day, yet acknowledged that limits for the twenty-four-hour exposure endured by residents did not exist. As the health board battled National Carbide, the APCD board held hearings on its chief engineer's proposal to adopt enforceable rules on factory dust. With the mayor, Andrew Broaddus, echoing the Chamber of Commerce's call for "careful and exhaustive study" of requirements that manufacturers bemoaned as prohibitively expensive and a technical impossibility and which would put them

at a competitive disadvantage, the politically appointed pollution board indefinitely tabled the proposed regulations. Four days later, the health board attorney persuaded his clients to delay legal action against National Carbide, pending the results of the Battelle study, lest the suit be dismissed for lack of evidence.[45]

Acrimonious debate filled the next APCD board meeting, held three days before "eye-smarting smog settled over a large portion of the city." Frank J. Wolking, a real estate agent and spokesman for the Shawnee Civic Club, accused APCD of doing "not one earthly thing to combat the problem." Board member E. R. Ronald, an engineer, insisted that APCD lacked adequate authority and declared that if Wolking could provide "the necessary evidence," the agency "would be glad . . . [to] stop the pollution." Wolking retorted that "you can taste it, smell it, and feel it"—obvious proof of the problem. Cane Run Road resident John Bindner added that if the pollution "existed in the East End it would be cleaned up immediately." Ronald and fellow board member Billy Smith indignantly offered to step down. West Enders turned their backs on the Democrats and Republicans who promised on the campaign trail that autumn to fight West End pollution and sought the help of the Commonwealth's attorney. The Western Electric Company, meanwhile, issued "smog goggles" to reduce stinging in workers' eyes.[46]


Poster for national smoke abatement week, 1950, locally funded by Louisville's coal dealers and promoted by the Louisville Smoke Commission. METRO LOUISVILLE AIR POLLUTION CONTROL DISTRICT ARCHIVES

Not surprisingly, with the plant owners paying for the study, the Battelle Institute's 1953 interim report "found little evidence linking the problem to plants in the Rubbertown area." Its full report the next year made sweeping criticisms of the data collected in the IIR study, including its focus on Rubbertown rather than the whole community, and of the methods used to analyze the data. Battelle further raised the ire of West Enders by claiming that dust was no worse in Rubbertown than elsewhere in the city. An article in *Business Week* noted that Rubbertown plants spewed an estimated six hundred tons of chemical emissions per day and concluded that "Quite possibly part of Louisville's problem . . . [is] more psychological than real, but the fact remains that it is a problem." Building custodian Edward Kalis wrote President Dwight D. Eisenhower, appealing for relief, and silently picketed outside city hall, wearing a suit, bow tie, and dress hat and holding a brief case labeled, "Rubbertown Chemical Smog Injures Public Health."[47]

Seeking a way to appease both voters and the "good citizens" of industry, Mayor Broaddus, the APCD board, and U.S. Representative John

H. Robinson petitioned the U.S. Public Health Service (PHS) in early 1955 to conduct a joint study of Louisville's air quality. With congressional approval for federal involvement, APCD, the local board of health, the Kentucky Department of Health, and PHS signed a Memorandum of Agreement (MOA) for collaborative study. Other federal agencies, academic researchers, the Manufacturing Chemists' Association, and the local Chamber of Commerce agreed to contribute technical expertise. The PHS study focused on Louisville's West End with the aim of developing a foundation for regulatory control. Its objectives included an inventory of emitted air pollutants, an analysis of their sources, a map of their contamination zone, and an assessment of their effects on West End residents and property. The study's backers also hoped it would yield recommendations for solving Louisville's air pollution problems and, reflecting persistent misunderstandings of disease etiology, a bacterial count of Louisville air. Local government provided most of the funding and thirteen full-time and seven part-time staff. The PHS contributed one hundred and fifty thousand dollars per year; the Chamber of Commerce made a one-time contribution of seventy thousand. At the same time, the APCD board tabled newly proposed rules on dust from industrial processes, after Chamber of Commerce members decried them as an unbearably expensive "calamity" that would have "forced entire industries to leave Louisville."[48]

Although the MOA called for the employment of "as many as possible of the known methods for continuous air analysis," the study included only samples taken on days empirically judged as especially polluted. Without the unanimous approval of the study's steering committee, the MOA prohibited sharing information with the media. Seeking cooperation, officials notified Rubbertown plant managers of the coming study, perhaps allowing them to institute temporary operational changes or production cutbacks to reduce emissions. The study analyzed the most significant industrial sources of air pollution in Rubbertown in 1956, including five gasoline storage depots; one wood preserving plant; one manufacturer each of neoprene, synthetic rubber and acetylene; one small oil refinery; two coal-fired power plants; and one chemical plant that used chlorine and propane to make carbon tetrachloride, hydrochloric acid, and other industrial products. Because the managers of the neoprene, rubber, and chemical plants cited confidentiality and withheld production data, study engineers could only estimate their emissions on the basis of those facilities' coal consumption.[49]

The study's findings affirmed the complaints of West End residents. Rubbertown industries annually dumped over one hundred and seventy thousand tons of pollutants into the air of West End neighborhoods and downtown, including most of the dust in western Louisville. Besides byproducts of coal combustion, the pollutants included numerous chemicals—several that are currently considered carcinogenic—some of which the study

attributed to specific facilities. Domestic and commercial-sector coal combustion together accounted for 6 percent, transportation another 6 percent, but the study found that more than 80 percent of the problem emanated from industry, principally by fossil fuel combustion. Sulfur dioxide from industrial coal combustion represented the biggest pollution problem, and exceeded the "taste threshold" on about one-half of measured winter days and about one-fifth of measured summer days. Large quantities of gasoline vapors leaked from storage and handling facilities. Lastly, backyard burning of rubbish and autumn leaves added irritating pollutants, odors, and haze to the air.[50]

The PHS's 1961 report advised APCD to take specific steps to reduce air pollution, starting with adopting more regulatory and administrative powers, hiring more staff, and procuring more field and laboratory equipment. It urged strict enforcement of an existing limit on the rate of particulate emissions from industrial fuel combustion, and proposed a new ceiling on the sulfur content of fuel and a new one-ton-per-day maximum on allowable daily emissions from any single industrial facility. The PHS recommended bans on off-site industrial odors and open burning of trash and leaves, and a requirement that firms that stored, processed, or handled petroleum products control fugitive emissions. To preclude "poor selections in the location of industries, and the creation of vexing air pollution problems which could and should be avoided," the report called for the coordination of "prevention and abatement activities for the entire metropolitan area including Louisville, Jeffersonville and New Albany . . . between air pollution control agencies and zoning and planning commissions." It further advised continuous education of "city and county officials, residents, industrial, commercial and institutional management" on the "purpose, objectives and activities of the air pollution control program," and on "their respective responsibilities in protecting their air resources." The PHS report also contained a familiar recommendation omitted from the summary report published by local officials: The city should ban the sale of the dirtiest coal for use in hand-fired residential furnaces.[51]

In the end, market forces and federal legislation, not local legislation, snuffed out visible smoke in Louisville. Superior economics, speed, and pulling capacity, plus lower labor requirements, forced the railroads to abandon coal-fired steam locomotives and shift to diesel-powered locomotives. L&N first employed diesel-powered yard engines in 1939 to try to stave off regulation, and only began buying diesel road locomotives in 1942 out of competitive necessity. By 1956, despite still earning 31 percent of its revenues by hauling coal, L&N had replaced all of its coal-fired steam locomotives. The Baltimore & Ohio, also with a sizeable presence in Louisville, did the same by 1958. Similar forces extinguished residential coal use. In 1940, 90 percent of Jefferson County homes were heated with coal, but lower

costs and concerns about cleanliness, practicality, and safety precipitated rapid change. By 1960, natural gas, oil, and propane warmed 89 percent of Louisville's homes, while coal was still burned in 10 percent. Since then, residential coal use has all but disappeared. Gas remains the principal home heating fuel, with electric heat making up nearly all the difference.[52]

During the 1960s, APCD attempted to correct the problems identified in the PHS study. But as was the norm throughout the nation, its regulations focused on visible plumes, such as smoke and dust from industrial boilers, combustion equipment, and storage tanks. Regulators had few hooks on invisible gaseous industrial and tailpipe pollutants. Indeed, some writers conclude that net emissions worsened as a result of continued growth in industrialization, population, suburban sprawl, private automobile use, and electricity consumption.[53]

Despite the decline of visible smoke, public concern over pollution and its health effects grew to record levels nationwide during the 1960s and 1970s, resulting in nine major pieces of federal environmental legislation. Congressional adoption of the earliest federal clean-air legislation increased awareness and concern, and air pollution in particular became a powerful issue in national politics. One pair of polls quantified public concern over air pollution in politically compelling terms. Although only 28 percent of respondents said air pollution was very serious or somewhat serious in 1966, that figure jumped to 69 percent by 1970. New citizen groups such as the Pittsburgh-based Group Against Smog and Pollution—with the appropriate acronym of GASP—used grass-roots techniques to increase awareness and political pressure for change. Consumer advocate Ralph Nader and his Nader's Raiders—a cadre of idealistic and highly motivated graduate students of law, science, engineering, and public health—conducted extensive research, published a key report, *Vanishing Air*, and helped to form a new lobbying group, Coalition for Clean Air. Widespread news coverage of the first Earth Day, April 22, 1970, focused attention in American living rooms on environmental concerns.[54]

In 1969 and 1970, the most likely presidential challenger to Richard Nixon, Maine senator Edmund Muskie, chaired the Senate Committee on Air and Water Pollution and was instrumental in the passage of the 1967 Air Quality Act. Hoping to steal the issue from Muskie, Nixon announced early in 1970 that legislation addressing air and water pollution would be the cornerstone of his administration's environmental advocacy. The landmark Clean Air Act (CAA) of 1970 was signed into law that December, and Nixon Administration created the Environmental Protection Agency (EPA) to administer it and other environmental laws and programs. The federal act mandated the attainment of health-based standards for allowable concentrations of certain "criteria" air pollutants in 247 air quality control regions, including the metropolitan Louisville area. With the CAA's

regulatory authority, the EPA's research footing, and engineer Robert T. Offutt's leadership, APCD made significant strides, often well ahead of peer cities. In 1973, LG&E pioneered technology that "scrubbed" stack emissions of sulfur dioxide—long Louisville's biggest air pollution problem—and allowed it to continue to burn less expensive, but dirtier, western Kentucky coal. The accomplishment earned numerous recognitions and a visit by the then-president, Jimmy Carter. In the early-1980s, Louisville was one of the first cities to institute a mandatory vehicle emissions inspection program. In 2005, in the absence of federal regulations to reduce most of the city's toxic air pollutants known to cause cancer, birth defects and other diseases, APCD garnered national attention when its staff, led by Arthur L. Williams and Jonathan Trout, persuaded its board to adopt the nation's first comprehensive municipal air-toxics reduction regulations.[55]

Louisville's battles over smoke followed patterns similar to those in most American communities and they persist in contemporary American environmental debates. Only when air pollution became severe enough to motivate a critical mass of citizens and opinion makers to question the status quo did elected officials act. Politicians and their appointees treated public and special interests with equal importance at best, and economic and political interest groups frequently stymied concerns about public health. Capitalists went to great lengths to avoid any loss of control over their operations and profitability. Even when motivated to evolve technologically or to reduce their emissions, they strove to do so on their terms. Parties resistant to change repeatedly sought time by calling for more study while decrying the costs of pollution abatement, overlooking the related savings, and seeking painless solutions. Outcomes were much less a function of available technology than the tenacity, political alliances, and pocketbooks of a relatively few critical players. Finally, in the absence of political leadership and risk-taking, local legislation could not solve the problem of air pollution, and instead required external forces such as the market and a higher level of governmental authority.

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