Chapter 7

A Regulatory Thicket

Toxic and Hazardous Substances

> ***National Journal:*** *Dioxin, a chemical that EPA has recognized as a likely human carcinogen, has been in the assessment process for almost two decades. Why is it taking so long to assess dioxin?*
>
> ***Stephenson:*** *You've got to think the end result of these assessments is that someone's going to have to do something, going to clean it up, and it's going to cost a lot of money. So there's a lot of care and attention being given to just how risky is this chemical; what would we need if we put a chemical control designation on it; what would it cost to clean it up? The Department of Defense uses many of these chemicals, and so they would be tasked with cleaning up. Should there be a standard or regulation for a chemical? And there's a legitimate concern about the scientific research. There's generally research that's contradicting on both sides of the argument.*
>
> —John Stephenson, director, Natural Resources Division, U.S. GAO, 2009[1]

If legal historians should choose a top ten in toxic litigation, a place surely will be reserved for the small community of Glen Avon, California. There, in early 1993, a legal spectacle began that demanded superlatives. "It's got to be among the top five civil cases in the history of American jurisprudence," one defense lawyer burbled as the proceedings began. Indeed, everything seemed dramatically oversized, like a production from some Hollywood of hazardous waste.[2] After eight years of planning and the screening of two thousand jurors, the trial began with 3,700 plaintiffs (all Glen Avon residents); thirteen defendants, including the state of California and major corporations such as Rockwell International, Northrop, McDonnell Douglas, and Montrose Chemicals; and injury claims exceeding $800 million. At issue was liability for injuries alleged to have been inflicted on Glen Avon residents from exposure to more than two hundred chemicals in thirty-four million gallons of waste

dumped into the Stringfellow Canyon between 1956 and 1972. The legal battle over financial responsibility for the Stringfellow disaster ended—or seemed to end—in late 2012, almost two decades after litigation began.

At the time the trial began, Glen Avon residents had already received more than $50 million in damages from one hundred companies that had used the site for dumping, but $22 million had been spent to initiate the new trial. The thirty lawyers and twenty-four jurors would eventually review more than three hundred thousand pages of court documents and thirteen thousand defense and 3,600 plaintiff exhibits for the initial proceeding. By then, Stringfellow had graduated from top billing on the EPA National Priority List (NPL) of the nation's worst abandoned waste sites to "one of the most contaminated sites on the planet."[3]

The trial has been held in installments. The first trial, involving seventeen plaintiffs, ended on September 17, 1993, when the jury found the state of California responsible for allowing toxic releases from the Stringfellow site but awarded the plaintiffs only $159,000 of the $3.1 million they had claimed in damages. The second trial, which began in September 1994, involved plaintiffs claiming much more serious injuries. In 1994, most of the plaintiffs settled out of court and the number of plaintiffs was reduced to only 763. The next year, the federal court ruled that the state of California was liable for all the site cleanup costs. After three more years of litigation, California agreed to assume the cleanup costs if seventeen private plaintiffs dropped their demands for $90 million in reimbursement for their own cleanup costs.

In early 2000, another federal judge determined that only 135 of the 763 remaining plaintiffs still had standing-to-sue status (see Chapter 3). At that time, estimates suggested that the site may require four hundred years of remediation at a cost of $740 million. In 2000, California also initiated lawsuits against thirty-five of its own insurers for refusing to compensate the state for the Stringfellow cleanup costs. In early 2005, sixteen insurers finally settled with the state for $93 million in cleanup costs (which made the list of "The 100 Top Insurance Verdicts of 2005" in one legal publication).[4] Trials began in 2006 for the first of the remaining nineteen insurers who claimed that they were not compelled to pay the full amount of all the policies they had issued to California for the Stringfellow property; meanwhile, California was spending more than $10 million annually to clean up and monitor the waste site. Finally (perhaps), in August 2012, the California courts ruled that the state's insurers would have to pay the full amount on all the policies they had each issued for the waste site.[5] The box score: more than forty years from site closure to last litigation, $180 million spent on cleanup, $100 million in current settlement costs, seventeen acres of contaminated ground, and thirty-four million gallons of toxic waste for which to account.[6]

Considering the magnitude of the site contamination and the cleanup so far accomplished, the EPA in 2004 impetuously claimed Stringfellow a "success story."[7] But new pollution still appears. In 2002, plumes of the chemical perchlorate were discovered contaminating drinking water wells near the site. After an EPA investigation revealed perchlorate diffusion into the site itself, a remedial study was initiated in December 2008 and the EPA, collaborating with state environmental agencies, will be conducting pilot tests as part of the design of a new pretreatment plant to be constructed and operational by 2013.

It may also take decades to dissipate the emotional pain associated from Glen Avon's civic life. The local school board voted to name a new $60 million school Glen Avon High School only after months of bitter contention within the community. Opponents of the new name contended that it perpetuated the Stringfellow stigma. "Glen Avon," explained one civic activist, suggests to many people a community that is "nothing but white trash, toxic waste and toothless women."[8]

The Stringfellow Canyon site is considered among the worst toxic site cleanups ever attempted. Even so, many legal experts believe that the Stringfellow litigation is a signpost along a sprawling road of ever more expansive and expensive future litigation as hazardous waste regulations multiply and government seeks more aggressively to satisfy public apprehension about toxic and hazardous substances. An ironic counterpoint to this growing litigation with its burgeoning liability awards has been the mounting disagreement among scientific experts about the extent of public risk from exposure to manufactured, stored, and abandoned chemical substances. Indeed, in no other area of environmental regulation has scientific uncertainty about the extent of the risk and identity of hazardous substances been greater or more public. This chapter is about the ambitious and extraordinarily difficult task of regulating the creation, use, and disposal of the nation's hazardous and toxic wastes. Currently, more than twenty-four federal laws and a dozen federal agencies are concerned with regulating the manufacture, distribution, and disposal of carcinogenic substances and other toxic or hazardous chemicals. The chapter focuses upon the EPA's implementation of five of these laws concerned with chemical risks to public health. Congress once predicted that three of these laws—the TSCA (1976), the RCRA (1976), and the Comprehensive Environmental Response, Cleanup and Liability Act (known as Superfund; 1980)—would amount to "cradle-to-grave" regulation of toxic and hazardous substances. The fourth law, the Emergency Planning and Community Right-to-Know Act (EPCRA; 1988) created perhaps the most widely publicized of all toxic chemical laws, the TRI. The final law, the Food Quality Protection Act (1996), is an effort to improve regulation as a result of new concerns about public exposure to

hazardous and toxic substances arising since the earlier laws were enacted. Implementing these laws has proved enormously challenging, not only because the scope and expense of regulation were vastly underestimated but also because new scientific controversies arise concerning the extent to which existing hazardous and toxic substances—or others continually being created—constitute significant risks to humans or to the environment. To illustrate why these conflicts often defy satisfactory resolution, the chapter describes the ongoing scientific and political controversies associated with continuing efforts to clean up the most famous of all existing abandoned waste sites at Love Canal, New York, and the challenges involved in proving that a group of recently identified chemicals, called endocrine disruptors, are a public health menace requiring regulation and not, as critics claim, a political and scientific fiction . . . that should be regulated.

These and other federal regulatory programs have significantly reduced public exposures to numerous chemical hazards. Still, after many decades of massive public investment in a multitude of regulatory programs aimed at almost every aspect of toxic and hazardous substances, accomplishments seldom satisfy either program proponents or critics—even though (or maybe because) the EPA must enforce altogether thirteen major laws affecting hazardous substance use and disposal in the United States.

An Ambiguous Inheritance

The environmentalists' hell is a firmament of compacted pesticide awash in toxic sludge. Environmentalists are not alone in attributing to chemicals a special malevolence. Most Americans apparently believe that the air, water, and earth are suffused with real or potential toxic menaces. The Gallup Organization polled a sample of Americans in mid-2015 concerning environmental risks about which they "worried a great deal" and discovered that Americans worried most about (1) drinking water; (2) pollution of rivers, lakes, and reservoirs; and (3) air pollution—all more or less associated with chemical substances.[9] Americans are often misinformed about the extent of environmental risks and frequently exaggerate the danger from the environmental pollutants they most fear. But widespread media coverage of hazardous chemical spills, newly discovered abandoned toxic waste sites, and other real or alleged chemical crises have forced attention on toxic and hazardous substances and imparted a sense of urgency to resolving the problems. Toxic and hazardous substances have progressed rapidly from secondary importance in the environmental agenda in the early 1970s to a primary concern in the early years of the twenty-first century.

Chemicals

Most toxic and hazardous substances are an inheritance of the worldwide chemical revolution following World War II. The creation of synthetic chemicals continued at such a prolific pace after 1945 that, by the mid-1960s, the American Chemical Society had registered more than four million chemicals, an increasing proportion of which were synthetics created by U.S. chemists since 1945. Today, more than eighty-four thousand chemicals are used daily in U.S. industry; between five hundred and one thousand new chemicals are created annually. Currently, the EPA has more than ten thousand new chemicals pending review, as required by TSCA.[10]

About 98 percent of chemical substances used commercially in the United States are considered harmless to humans and the ecosystem. However, more than one hundred twenty thousand establishments in the United States create and distribute chemicals, and the industry's capacity to produce and distribute still more new substances is growing. TSCA does not require chemical companies to test the approximately seven hundred new chemicals now annually introduced into commerce for toxicity, and companies generally do not voluntarily perform such testing.[11]

Toxic and Hazardous Chemicals

Many chemicals have been tested to determine their hazardousness—it is often relatively easy to decide if a chemical is corrosive, ignitable, or otherwise clearly dangerous when handled or abandoned in the environment—but few have been tested rigorously to determine their toxicity or risk to human or environmental health. Testing is particularly difficult and expensive when the long-term effects of a chemical are being investigated. Studies may require decades. The EPA has struggled diligently to reduce the time and complexity involved in its chemical risk assessments, but the agency's evaluation of potentially dangerous chemicals can consume many years and sometimes more than a decade.[12]

Cancer is the gravest and most widely feared of all toxic impacts from chemical exposures. By 2015, perhaps 1,500 to two thousand of all chemical substances, a small proportion of all suspected carcinogenic chemicals produced in the United States, had been tested sufficiently by federal agencies to determine their carcinogenicity. In 2014, for instance, the federal government's annual *Report on Carcinogens* contained profiles of only 243 substances that federal agencies had identified as "known to be human carcinogens" or "reasonably anticipated to be human carcinogens."[13]

In recent years, the EPA has improved the speed and efficiency of its own risk assessments. But the EPA's risk assessing is hobbled by an inadequate budget, limited staff, a huge burden of different regulatory programs, and

the constant tide of newly manufactured chemicals added to a catalog of many thousand existing and newly manufactured chemicals. Thus, TSCA requires the EPA to demonstrate that certain chemicals may constitute a potential health risk before it can require industrial manufacturers or users to test such chemicals, but the EPA examines only a very small portion of chemicals currently used or newly manufactured for their possible health risks.[14] Persuasive scientific evidence that environmental chemicals, such as pesticides and toxic industrial air emissions, are causing widespread cancer is quite often insufficient or nonexistent. Such environmental chemicals have frequently been suspected of creating cancer epidemics, but the National Cancer Institute and the U.S. Centers for Disease Control and Prevention have usually reported a lack of confirmed evidence to support these accusations.

Pesticides are a substantial component of proven or suspected toxic chemicals and chemical wastes. Pesticides are so widely and routinely used in U.S. agriculture that many farmers believe productivity cannot be sustained without them. Common foods, such as vegetables and fruits, are treated with dozens of possible carcinogens among the 20,700 pesticides currently available in the United States. Annual pesticide use in the United States has declined slightly since 2010 but still exceeds eight hundred million pounds annually.[15] These products contain more than 890 active ingredients.[16] Most of the pesticide products used in the United States since 1947 were registered before their long-term effects were understood. Federal legislation in 1972 required the EPA to reevaluate all existing pesticides in light of new information about their effects on humans and the environment. The EPA has prohibited or limited severely the use of many pesticides, including DDT, aldrin, dieldrin, toxaphene, and ethylene dibromide, and as a result, the levels of persistent pesticides in human fatty tissue had declined from about eight parts per million in 1970 to slightly more than two parts per million today.

Even if a chemical product is restricted or prohibited, the EPA often lacks the resources to implement controls quickly. One striking example is that the EPA estimated before 1980 that more than half a million office buildings, apartment houses, stores, and other public or commercial buildings contained potentially dangerous loose asbestos, but the agency decided by 1988 to take no action because the federal government, the states, and the private sector lacked the money and personnel to remove safely the deteriorating asbestos.[17]

Toxic Chemicals and Risk Assessment

Because most federal regulations restricting the use or manufacture of toxic chemicals will involve testing for their risk to human health or the

environment, the regulatory risk assessment discussed in Chapter 4 arises continually with toxics management. Chemical testing of any sort is time-consuming and costly, but when the long-term effects of a chemical are involved, studies may require decades. Moreover, substances currently suspected of having toxic effects often have not existed long enough for long-term impacts to be apparent. If testing deals with chronic effects of exposure to small quantities of chemicals—doses as small as parts per billion or trillion—difficulties in identifying the presence of the substance and the rate of exposure among affected populations may be formidable. Even repeated testing and retesting of human exposures to potentially toxic chemicals to establish their magnitudes of risk or the effectiveness of their existing regulation often may not produce conclusive evidence concerning the human health and environmental impact, as exemplified by two continuing toxic chemical controversies. The first, concerning Love Canal, the signature site that dramatized the nation's dangerous abandoned toxic waste problem, illustrates some of the practical challenges in determining when toxic waste is sufficiently regulated. The second matter, the controversy over endocrine disruptors, reveals some common difficulties in proving that a chemical should be a regulated toxic.

Love Canal. Love Canal is now infamous, the chemical dump that produced the Superfund legislation and achieved fame sufficient to have its own webpage on Google Sightseeing. It is also an excellent showcase for some practical challenges involved in deciding how and when to control known toxic wastes in an imperfect regulatory world of limited data, inevitable political controversy, and potentially dangerous public health hazards.[18]

In 1975, federal and state government officials determined that the huge, abandoned industrial chemical dump known as Love Canal, near Niagara Falls, New York, appeared to constitute such a health menace to the surrounding residential communities that hundreds of nearby residents were urged to sell their homes to the federal government and leave the neighborhood. In 1978, President Jimmy Carter ordered 259 families living nearest the site to be evacuated and, subsequently, between 1978 and 1980, a total of more than 950 families were ordered to leave by federal and state agencies. The deserted homes were bordered up and abandoned at a public cost of more than $17 million. Later in 1982, the EPA and the U.S. Public Health Service released the results of their massive investigation concerning the health effects of the Love Canal site upon the families in the nearby residential community. Contrary to earlier studies by New York State, the EPA asserted that it had found the neighborhood near Love Canal no less safe for residents than any other part of nearby Niagara Falls.

The evidence seemed formidable. More than six thousand samples of human and environmental materials near the site were collected and subjected to one hundred fifty thousand analytical measurements to determine what contaminants they contained. This data suggested that only a ring of houses a block from the waste site or closer had been affected significantly. But the study was challenged immediately because 90 percent of the samples were free of any chemicals. This result, asserted experts, could mean either an absence of chemicals or insufficient sensitivity in the measuring procedures. Other critics charged that the massive evacuation had been politically motivated.[19]

Although New York health officials later testified to congressional committees that they were confident the undetected chemicals could not be present in more than minute quantities, the Environmental Defense Fund's own scientific expert asserted that so much variance existed in the competence of the many laboratories conducting the tests and that so many sources of error could exist in some tests that chemicals could indeed have been present. Officials at the National Bureau of Standards also questioned the sensitivity of the test procedures. That same year, the federal Centers for Disease Control released its own study of former Love Canal area residents, indicating that they were no more likely to suffer chromosomal damage than residents elsewhere in Niagara Falls. Even if such damage were present, noted the study, it was impossible to know if it was linked to the later occurrence of illnesses.[20]

In mid-2004, the EPA appeared to write the last chapter in the Love Canal saga by declaring that the dump, now a Superfund project, was "clean" and thus no longer menacing for nearby residents.[21] However, in mid-2012, numerous former students who attended public school near Love Canal when it was discovered claimed they had experienced serious health problems in later years from exposure to the dump's toxics, asserted that uncontrolled toxic chemical wastes were seeping again from the site, and pledged to revive investigation into the Canal's long-term health impacts.[22] A year later, six families who purchased houses on the Love Canal restoration site, after assurance that the area was safe, sued EPA and New York state, charging that the site continued to leak hazardous chemicals and they had experienced illness linked to these uncontrolled chemical exposures. "We're stuck here. We want to get out," said one home owner, adding that he'd been plagued by mysterious rashes and other ailments since he moved into the four-bedroom home purchased a decade ago for $39,900."[23]

Endocrine Disruptors. The list of worrisome chemicals lengthened in the latter 1990s when scientific and governmental attention turned suddenly to a potentially huge inventory of chemicals called endocrine disruptors.

Scientific research has suggested that certain externally produced chemicals, especially many human-made synthetic compounds, may sometimes mimic naturally produced hormones in humans and animals and may interfere, perhaps disastrously, with the normal functioning of the endocrine system. Many of these disruptors, according to some scientific theories, gain their potency from the bioaccumulation of extremely small doses in human and animal tissue over long periods of time. The possible human health effects could include cancers of the reproductive system, reduced sperm counts in males, abnormalities of fetal development leading to learning and behavioral disorders, and many other pathologies associated with hormonal malfunctions. Some scientists believe that disruptors have been responsible for sexual abnormalities and deformities in gulls, terns, eagles, and fish.[24]

If endocrine disruptors exist, apprehension seems prudent. "The number of substances which have been suggested as possibly contributing to perturbation of the endocrine system . . . is vast," explained one careful study of the issue:

> Man-made or generated substances include broad classes of chlorinated and non-chlorinated compounds and heavy metals widely used in industrial and household products such as paints, detergents, lubricants, cosmetics, textiles, pesticides, and plastics, as well as byproducts of sewage treatment and waste incineration and other forms of combustion. Many pharmaceutical products, including contraceptives, have hormonal activity. There are also large amounts of plant hormones (mainly phytoestrogens) commonly ingested in human (and animal) diets—especially vegetarian products. . . . [25]

In short, here is something to unnerve everybody. Yet the disruptor issue emerges from a fog of uncertainty and scientific controversy. The effect of disruptors on humans and animals, the identity of truly dangerous substances, the results of long- and short-term exposures, the relative dangers to adults and fetuses, and much more are largely unknown. Scientists themselves disagree about the danger. "Even though sound scientific evidence can be found on both sides . . . simple cause and effect data are not available," explained one expert review of the evidence. "But even without certain scientific evidence, the potential health, social and economic effects are forcing government, organizations and the general public to take notice."[26]

The public history of endocrine disruptors is the very model of how environmental issues acquire political clout. Expert meetings held in the United States in 1991 and 1993 first called major scientific attention to the possible danger of endocrine disruptors. However, the issue's political momentum mounted when, in 1993, the BBC broadcast the documentary

Assault on the Male, which suggested that human and animal reproductive problems might arise from endocrine disruptors. The issue rose to national attention with the publication in 1996 of *Our Stolen Future,* written by a team of U.S. scientific interpreters, who vividly described the menace presumably posed by disruptors:

> Hormone-disrupting chemicals are not classical poisons or typical carcinogens. They play by different rules. They defy the linear logic of current testing protocols built on the assumption that higher doses do more damage. For this reason, contrary to our long-held assumptions, screening chemicals for cancer risk has not always protected us from other kinds of harm. Some hormonally active chemicals appear to pose little if any risk of cancer. . . . [S]uch chemicals are typically not poisons in the normal sense. Until we recognize this, we will be looking in the wrong places, asking the wrong questions.[27]

This aura of mystery, dread, and imminence proved to be a powerful political catalyst, creating additional media attention, provoking public concern, and compelling a response from government officials. In 1996, Congress passed the Food Quality Protection Act, which amended several major federal environmental and public health laws to require that the EPA create and then implement within three years an endocrine disruptor screening program for chemicals, and—as if to prove beyond refutation its environmental vigilance—Congress further mandated the EPA to add an additional tenfold safety factor to protect infants and children when setting standards for allowable pesticide residues in food, unless reliable data showed that a different factor would be safe. The EPA appointed a scientific advisory committee on endocrine disruptors in 1996, and two years later, it reported that, although the available data were insufficient to verify the magnitude of risk or the variety of chemicals associated with endocrine disruption, enough evidence existed to justify more intensive research and more public information about the potential problems arising from suspected endocrine disruption.

Although Congress mandated that the EPA craft an endocrine disruptor screening program and implement it by 1999, administrative and scientific difficulties have frustrated both objectives—additional testimony to the impotence of congressional micromanagement. Also, preliminary estimates suggested that the necessary testing protocols would probably be extremely expensive, perhaps approaching $1 million for each chemical tested and that tests would be required for many hundreds of chemicals and their compounds. The chemical industry believes that insufficient evidence exists to justify the imposition of such an expensive

testing regimen, and scientists themselves disagree about the magnitude of the endocrine disruptor problem. "Every policy paper, every study gets embroiled in scientific disputes over the EPA's assumptions on everything from children's dietary habits to the amount of roach killer an average family is likely to use," observed one progress report.[28] The Consumer Product Safety Commission, however, using its own authority and based on available evidence, has banned six types of phthalates in children's toys and some child care products, including rubber ducks whose flexible plastic may contain phthalates.[29] The new, improved rubber duck, however, may contain phthalate replacements which themselves pose health risks.[30]

Costs and Controversy

It is doubtful that either friend or foe of the federal regulatory programs enacted between 1970 and 1986 realistically understood the enormous expense that would be involved in the new legislation. New regulatory agencies had to be created or existing ones expanded. A small sample of the direct and indirect costs associated with recent hazardous substance legislation can only suggest the scale on which such regulatory programs must operate:

> The average priority abandoned waste site cleaned up by the EPA under Superfund legislation has cost $2.1 million and will cost far more in the future; the aggregate expense for eliminating all the nation's worst abandoned waste sites is expected to be many times the initial Superfund authorization of $1.6 billion.[31]
>
> The EPA's regulations for disposal of hazardous waste on land sites exceeded 500 pages in the Federal Register. EPA officials say the costs of compliance for the affected industries will exceed $1 billion yearly.[32]

When the massive costs are projected against the fragmentary scientific data on the effects of many chemicals and the often tenuous evidence relating chronic impacts to extremely low levels of exposure, arguments over the acceptability of the costs in light of the benefits inevitably arise. Critics of federal environmental programs have asserted that most impose not only unacceptable costs for the regulation of acknowledged hazards but also staggering costs for the stringent control of substances with unproven effects. Numerous critics, including presidents Reagan, George Bush, and George W. Bush, have argued that benefit–cost calculations should become a major consideration, if not a required criteria, when determining whether a substance should be regulated.

Criticism of regulatory costs often feeds on the disparity between the timing and character of the costs and the timing and character of the benefits from regulation. The costs tend to be tangible, immediate, and massive: Dollars must be spent, agencies created, rules promulgated, and other expensive actions initiated. In contrast, years or decades may pass before any apparent benefits accrue. The benefits may be intangibles—deaths and illnesses prevented, public costs of future regulation avoided, or public safety enhanced—that tend to be discounted by those who must pay for regulation in the present. Examples exist, however, that show the future benefits of regulation can be enormous. The number of U.S. deaths from exposure to asbestos as much as forty years ago will grow to between eight thousand and ten thousand annually. More than two hundred thousand claims outstanding against major asbestos manufacturers at the beginning of the twenty-first century must be settled. The current value of these future claims has been estimated conservatively at $40 billion.[33]

Federal Law: Regulation From the Cradle to the Grave?

Among the two dozen federal laws relating to toxic and hazardous substances, five of them, three passed in the 1970s, define the fundamental framework for regulating the disposal of these substances: the TSCA (1976), the RCRA (1976), the Superfund legislation (1980), the EPCRA (1986), and the Food Quality Protection Act (1996). These laws represent a congressional effort to create a comprehensive regulatory program for all chemical substances from their initial development to final disposal—the cradle-to-grave control that seemed essential to achieving, for the first time, the responsible public management of chemical products. Few laws, even by the standard of recent environmental legislation, mandate a more complex and technically formidable administrative process than do these programs. A brief review of their major provisions suggests the immense regulatory tasks involved.

Regulating Chemical Manufacture and Distribution: The Toxic Substances Control Act

The major purpose of TSCA and its 1986 amendments (the Asbestos Hazard Emergency Response Act) is to regulate the creation, manufacture, and distribution of chemical substances so that substances hazardous to humans and the environment can be identified early and then controlled properly before they become fugitive throughout the ecosystem. TSCA and its amendments require the EPA to achieve five broad objectives:

1. *Information gathering*. The EPA is required to issue rules asking chemical manufacturers and processors to submit to the administrator information about their newly developed chemicals. The information is to include the chemical's name, formula, and uses; estimates of production levels; a description of by-products; data on adverse health and environmental effects; and the number of workers exposed to the chemical. In achieving these goals the administrator also is to do the following:
   a. publish a list of all existing chemicals
   b. see that all people manufacturing, processing, or distributing chemicals in commerce keep records on adverse health reactions, submit to the EPA-required health and safety studies, and report to the EPA information suggesting that a chemical represents a previously undetected significant risk to health or the environment
2. *Screening of new chemicals*. Manufacturers of new chemicals are to notify the EPA at least ninety days before producing the new chemical commercially. Information similar to that required for existing chemicals is also required for new chemicals. The EPA is allowed to suspend temporarily the manufacture of any new chemical in the absence of adequate information as required under the law and to suspend production of a new chemical permanently if it finds a "reasonable basis to conclude that the chemical presents or will present an unreasonable risk of injury to health or the environment."[34]
3. *Chemical testing*. The EPA is given the authority to require manufacturers or processors of potentially harmful chemicals to test them. The Interagency Testing Committee, composed of representatives from eight federal agencies, was created to recommend to the EPA priorities for chemical testing. As many as fifty chemicals can be recommended for testing within one year.
4. *Control of chemicals*. The EPA is required to take action against chemical substances or mixtures for which a reasonable basis exists to conclude that their manufacture, processing, distribution, use, or disposal presents an unreasonable risk of injury to health or the environment. Permitted actions range from a labeling requirement to a complete ban. The control requirements are not to "place an undue burden on industry," yet at the same time they are to provide an adequate margin of protection against unreasonable risk. TSCA specifically requires the regulation and eventual elimination of PCBs.
5. *Control of asbestos*. The EPA is required to develop a strategy for implementing the congressional mandate that all schools be inspected for asbestos-containing material and to develop and implement plans to control the threat of any asbestos discovered.

How TSCA Regulates. EPA follows a procedure known as IRIS when assessing any chemical that may qualify for its evaluation. While the EPA has considerably improved the speed and efficiency of its IRIS procedure, Figure 7.1 illustrates why IRIS's extensive data and review requirements often move assessments at a glacial pace frustrating for advocates of prompt, economically efficient, effective toxics regulation.

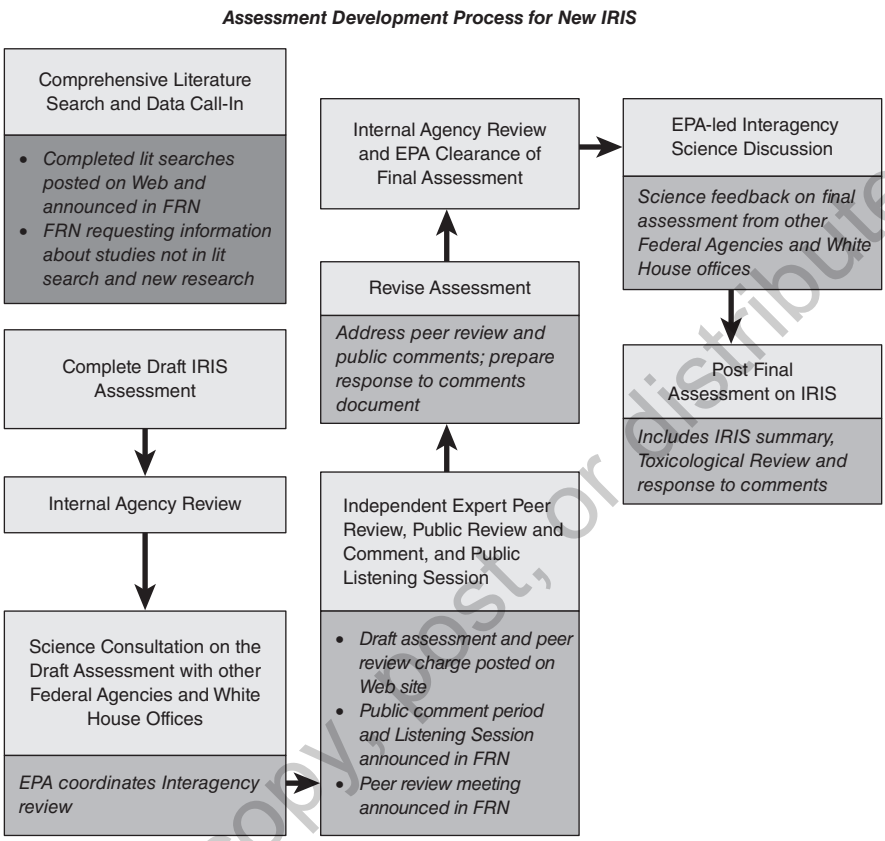
Considering the cumbersome IRIS process, the EPA's record for having so far identified more than 550 chemicals as human health risks (not all related to cancer) among more than eighty-four thousand commercial chemicals now used in the United States should be considered at least an important achievement in light of the public health risks it has reduced or eliminated.[35]

The Regulatory Thicket. One formidable problem posed with TSCA is that it loads upon EPA a regulatory task for which the agency has never been provided with adequate resources in professional staff, budget, or congressional support.[36] TSCA requires the EPA to assume the initiative for creating and interpreting a vast volume of integrated technical information. Obtaining the data often requires that chemical manufacturers, processors, consumers, and waste depositors provide timely, accurate information—information they previously guarded jealously. With this heavy burden of initiative, the agency would have been hard-pressed to meet all its program obligations under TSCA with even the most benevolent funding and generous personnel levels—neither of which it has enjoyed.

By 2009, the EPA had been able to test fewer than two hundred of more than sixty-two thousand commercial chemicals on its original TSCA agenda. In an effort to lighten its testing overload, the EPA resorted to an alternative strategy of encouraging chemical companies to voluntarily provide test data on about 2,800 chemicals produced or imported in amounts of one million pounds or more. The chemical industry would not agree to provide data on several hundred of these chemicals. Moreover, TSCA requires that the EPA determine whether a chemical about which it has received data will pose an "unreasonable risk" before the EPA can regulate its production or use—a virtual regulatory dead end. "EPA officials say that the act's legal standards for demonstrating unreasonable risk are so high that they have generally discouraged EPA from using its authorities to ban or restrict the manufacture or use of existing chemicals," concluded GAO's investigators.[37]

In 2014, the GAO found EPA still overwhelmed with TSCA's chemical assessment workload. "EPA has found much of TSCA difficult to implement, hampering the agency's ability to obtain certain chemical data or place limits on chemicals," it concluded.[38] Given the formidable obstacles,

Figure 7.1 The Integrated Risk Information System (IRIS)



Source: U.S. EPA, *Integrated Risk Information System: IRISTrack,* available at http://cfpub.epa.gov/ncea/iristrac/.

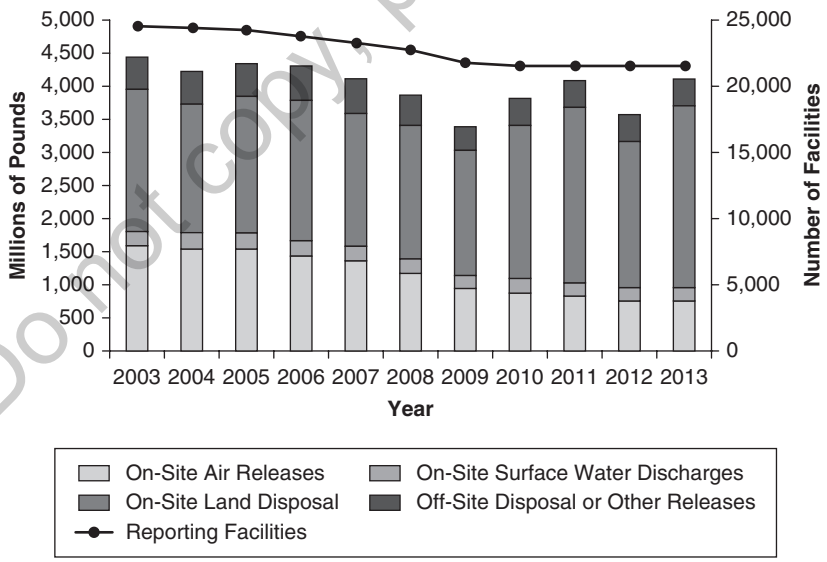
it is a small wonder that since 2012 EPA has been able to assess only four of eighty-three chemicals prioritized for TSCA review and that it may take at least a decade or longer to assess all eighty-three chemicals.[39]

Publicizing Chemical Releases: The Toxic Release Inventory. The EPCRA created the national Toxic Release Inventory (TRI), among the most publicized, effective, and publicly accessible of all current federal toxics regulations. The TRI takes chemical regulation a major step beyond TSCA by creating a database containing information collected since 1988 on the disposal or other releases of more than 650 toxic chemicals by thousands of U.S. facilities together with information about how these facilities

manage those chemicals through recycling, energy recovery, and treatment. One of TRI's primary purposes is to inform communities about toxic chemical releases to the environment. Since its creation, it has been directly and indirectly responsible for encouraging thousands of organized community and interest group initiatives to identify and regulate exposures to air toxics, many previously unknown.

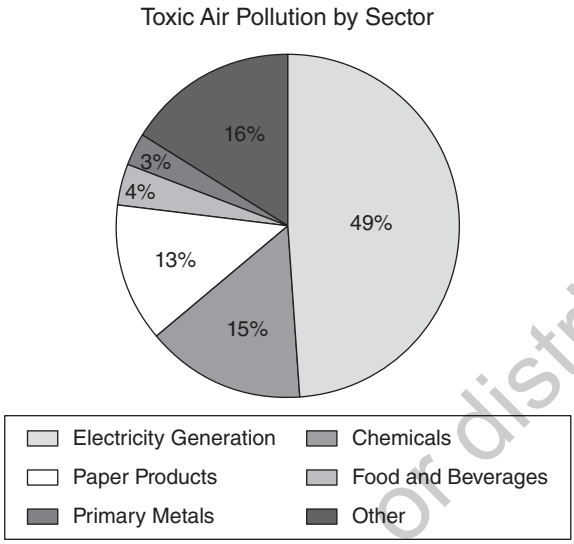
TRI records a steady decrease in chemical releases since 1988. As Figure 7.2 illustrates, in the decade between 2003 and 2013, total chemical releases decreased about 8 percent. However, embedded in this encouraging long-term trend are several major challenges still posed by toxic releases. First, the TRI throws into sharp relief the enormous importance of the electrical power industry as the source of almost half the total volume of toxic air releases in the United States (see Figure 7.3). As the industry is also the major source of domestic climate change chemicals, it is understandable that this industry's environmental performance, especially the extent to which these emissions require further regulation, has become a continuing source of scientific and political contention and a crucial issue for environmentalists and public health officials. The TRI also reveals a continuing, substantial, often unregulated discharge of toxic

Figure 7.2 Releases of Toxic Chemicals On- and Off-Site, Between 2003–2013



Source: U.S. EPA, EPA, *2013 TRI National Analysis: Introduction,* available at http://www.epa.gov/toxics-release-inventory-tri-program/2013-tri-national-analysis-introduction.

Figure 7.3 Sources of Industrial Air Pollution in the United States, 2011



Sector	*Toxic Air Pollution (lbs)*	*% of National Air Pollution*
Electricity Generation	381,740,601	49%
Chemicals	112,870,057	15%
Paper Products	103,249,010	13%
Food & Beverages	26,908,977	4%
Primary Metals	24,923,246	3%
Other	121,888,815	16%
Total	771,580,707	100%

Source: Reprinted with permission from the Natural Resources Defense Council. National Resources Defense Council (NRDC), "Curbing Pollution," NRDC Switchboard, available at http://switchboard.nrdc.org/blogs/paltman/the_toxic_20_states_with_the_h.html.

chemicals in the nation's waters. In 2013, the TRI reported that about 5 percent of all reported chemical discharges were released into water.[40] This amounted to approximately 206 million pounds of toxic chemicals; the five top states receiving these chemical discharges were Indiana, Texas, Louisiana, Alabama and Virginia.[41]

Regulating Solid Waste: The Resource Conservation and Recovery Act

The major purposes of RCRA and its 1980 and 1984 amendments are to control solid waste management practices that could endanger public health or the environment and to promote resource conservation and recovery. Solid wastes are defined in the act to include waste solids, sludges, liquids, and contained gases—all forms in which discarded toxic and hazardous substances might be found. In addition to providing federal assistance to state and local governments in developing comprehensive solid waste management programs, RCRA also mandates the following:

1. *Criteria for environmentally safe disposal sites.* The EPA is required to issue regulations defining the minimum criteria for solid waste disposal sites considered environmentally safe. It is also required to publish an inventory of all U.S. facilities failing to meet these criteria.
2. *Regulation of hazardous waste.* The EPA is required to develop criteria for identifying hazardous waste, to publish the characteristics of hazardous wastes and lists of particular hazardous wastes, and to create a manifest system that tracks hazardous wastes from their points of origin to their final disposal sites. The EPA also is to create a permit system that would require all individuals or industries generating hazardous waste to obtain a permit before managing such waste. Permits would be issued only to waste managers meeting the safe disposal criteria created by the EPA.
3. *Resource recovery and waste reduction.* The act requires the Commerce Department to promote the commercialization of waste recovery, to encourage markets for recovered wastes, and to promote waste recovery technologies and research into waste conservation.
4. *State implementation.* The act provides for state implementation of regulations affecting solid waste management and disposal if state programs meet federal standards. The EPA will enforce these provisions in states that do not or cannot comply with federal regulations for the program's enforcement.
5. *Mandated deadlines and waste-by-waste review.* The 1984 RCRA amendments create deadlines for the EPA to set standards for the disposal of specific wastes. If the EPA fails to do so, congressionally mandated standards will be applied. The EPA is also ordered to evaluate nineteen specific substances, and deadlines are established for the agency to regulate new kinds of waste disposal activity.

Congress was determined to drive the EPA hard. It instructed the EPA in exquisite detail concerning how to implement virtually every aspect of RCRA, from the allowable permeability of liners for surface impoundments to the concentrations at which many different chemical wastes must be banned from land disposal. Twenty-nine different deadlines for specific program activities were listed, for example, a ban on land disposal of bulk liquid in landfills within six months, new regulations for small-quantity waste generators within seventeen months, and interim construction standards for underground storage tanks within four months.[42]

It is also becoming evident that the number of potential waste storage and treatment facilities in the United States requiring corrective actions under RCRA is likely to exceed vastly the initial estimates. The EPA has estimated that perhaps 3,700 waste treatment and storage facilities will require cleanup under RCRA rules.[43] Moreover, the current list of twenty thousand facilities subject to RCRA inspections is likely to grow as more facilities are discovered. If the estimates are accurate, the size and scope of the cleanup program would be as large as the expected Superfund cleanup and may cost more than $22.7 billion. The cleanup of all sites may not be completed until the year 2025.

The impediments to the RCRA program are those common to most federal regulatory efforts: cost and complexity, foot-dragging by regulated waste managers, insufficient money for needed oversight, and wrangling about cleanup terms. "The agency, the states, and companies often disagree on how cleanup should be pursued," explained a GAO report. "These disagreements prolong the cleanup process because more time is needed [to define] the cleanup terms, and companies must sometimes meet the duplicate requirements of both federal and state regulators."[44]

Cleaning Up Abandoned Waste: Superfund

The discovery of Love Canal in 1978 escalated rapidly into a national media event dramatizing to Americans the danger of abandoned toxic wastes within the United States. In the crisis-driven style characteristic of the 1970s, Congress reacted by passing in 1980 the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly called Superfund. The Superfund legislation included an appropriation of $1.6 billion to clean up the nation's worst abandoned toxic and hazardous waste sites.

When the first Superfund legislation was enacted, the nation's abandoned and uncontrolled hazardous waste dumps were uncharted territory. Collaboration among the nation's governments seemed essential to identify abandoned sites, assess their health hazards, create standards for cleanup, and if possible, assign to site creators the financial liability for

the cleanup. Congress attempted to address these and other major abandoned waste problems through four major Superfund programs:

1. *Information gathering and analysis.* Owners of hazardous waste sites were required to notify the EPA by June 1981 about the character of buried wastes. Using this information, the EPA would create a list of national sites.
2. *Federal response to emergencies.* The act authorized the EPA to respond to hazardous substance emergencies and to clean up leaking chemical dump sites if the responsible parties failed to take appropriate action or could not be located.
3. *The Hazardous Substance Response Fund.* The act created an initial trust fund of $1.6 billion to finance the removal, cleanup, or remedy of hazardous waste sites. About 86 percent of the fund was to be financed from a tax on manufacturers of petrochemical feedstocks and organic chemicals and on crude oil importers. The remainder was to come from general federal revenues.
4. *Liability for cleanup.* The act placed liability for cleaning up waste sites and for other restitution on those responsible for release of the hazardous substances.

The National Priority List. One important result of this new legislation is that EPA is required to create an inventory of the nation's dangerous hazardous waste sites and to identify the most dangerous sites on a National Priority List (NPL). EPA is required to initiate action to clean up the NPL sites. In 2008, the NPL included 1,318 sites in U.S. states and territories (Table 7.1). By 2012, more than 1,300 of the NPL sites had been cleaned up substantially and removed from the NPL list, but new sites are added as these are removed.[45] Moreover, the EPA estimates that there are at least fifty thousand eligible sites, and many experts believe the actual number may exceed this estimate by at least twenty thousand.[46] Thus, the program still confronts a huge backlog of contaminated sites while contending with massive cost overruns, technical complexities, political squabbles, and endless litigation.

"The Largest, Most Complicated, and Most Disliked." The Superfund program has been a consensus choice as the most controversial, expensive, and problematic of all environmentalism's showcase legislation. By George W. Bush's second term, EPA officials, increasingly testy at the continued criticism of Superfund, were pointing to significant improvements in the speed and economy of site cleanups.

Table 7.1 *Hazardous Waste Sites on the National Priority List by State and Outlying Area, 2008*

State and outlying area	Total sites	Rank	Percentage distribution	Federal	Nonfederal
Alabama	15	26	1.2	3	12
Alaska	5	45	0.4	5	—
Arizona	9	39	0.7	2	7
Arkansas	9	40	0.7	—	9
California	97	2	7.8	24	73
Colorado	20	20	1.6	3	17
Connecticut	15	24	1.2	1	14
Delaware	14	27	1.1	1	13
District of Columbia	1	(X)	0.1	1	—
Florida	52	6	4.2	6	46
Georgia	16	23	1.3	2	14
Hawaii	3	46	0.2	2	1
Idaho	9	41	0.7	2	7
Illinois	49	7	3.9	5	44
Indiana	31	14	2.5	—	31
Iowa	12	33	1.0	1	11
Kansas	12	34	1.0	1	11
Kentucky	14	28	1.1	1	13
Louisiana	13	31	1.0	1	12
Maine	12	35	1.0	3	9
Maryland	19	21	1.5	10	9
Massachusetts	32	12	2.6	6	26
Michigan	67	5	5.4	1	66
Minnesota	25	18	2.0	2	23
Mississippi	6	44	0.5	—	6
Missouri	29	16	2.3	3	26
Montana	15	25	1.2	—	15
Nebraska	13	32	1.0	1	12
Nevada	1	49	0.1	—	1
New Hampshire	21	19	1.7	1	20
New Jersey	116	1	9.3	8	108
New Mexico	14	29	1.1	1	13
New York	86	4	6.9	4	82
North Carolina	32	13	2.6	2	30
North Dakota	—	50	0.0	—	—
Ohio	40	10	3.2	5	35
Oklahoma	9	42	0.7	1	8
Oregon	12	36	1.0	2	10
Pennsylvania	96	3	7.7	6	90
Rhode Island	12	37	1.0	2	10
South Carolina	26	17	2.1	2	24
South Dakota	2	47	0.2	1	1

(Continued)

Table 7.1 *(Continued)*

State and outlying area	*Total sites*	*Rank*	*Percentage distribution*	*Federal*	*Nonfederal*
Tennessee	14	30	1.1	4	10
Texas	49	8	3.9	4	45
Utah	19	22	1.5	4	15
Vermont	11	38	0.9	—	11
Virginia	30	15	2.4	11	19
Washington	48	9	3.8	13	35
West Virginia	9	43	0.7	2	7
Wisconsin	38	11	3.0	—	38
Wyoming	2	48	0.2	1	1
Guam	2	(X)	(X)	1	1
Puerto Rico	13	(X)	(X)	1	12
Virgin Islands	2	(X)	(X)	—	2
Total	1,318	(X)	(X)	163	1,155
Total United States	1,301	(X)	(X)	161	1,140

Source: U. S. Department of Commerce, *Statistical Abstract of the United States* (Washington, DC: U.S. Government Printing Office, 2009).

Notes: "—" indicates zero; (X) indicates not applicable. Data are as of December 31, 2008. They include both proposed and final sites listed on the National Priorities List for the Superfund program as authorized by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986.

The EPA's annual Superfund reports remain relentlessly optimistic, but the total Superfund costs cast a more pessimistic aspect. Superfund long ago exhausted its originally authorized funding of $15.4 billion and will greatly exceed the $26.4 billion that the EPA estimated in the early 1990s would be necessary to complete the entire program. Since 1981, Superfund appropriations have totaled more than $32 billion in nominal dollars or about $1.2 billion annually.[47] Superfund costs during the decade of 2000 to 2010 alone are estimated to have been approximately $14 billion to 16.4 billion.[48] Since the late 1990s, moreover, a diminishing congressional interest in Superfund has been evident in the gradual decline of annual funding for new projects and a decrease in the number of new project undertaken.[49] Superfund's unquestionable improvements have not pacified program critics, especially congressional Republicans, who seldom find much to like about Superfund.

Completed cleanups have averaged about $2.1 million each, but many troublesome sites create enormous cost escalations. One hundred fifty-four Superfund projects costing more than $50 million—such as California's Stringfellow dump—have achieved "megasite" status because

of the time, technical complexity, and legal difficulties they entail.[50] About 20 to 33 percent of each Superfund site expenditure has been absorbed in litigation and negotiation. One estimate suggests that approximately twenty thousand lawyers were engaged in Superfund litigation by 2000.[51]

The reasons for Superfund's plodding pace and high costs are clear. The enormous legal costs generated by Superfund are largely the result of the complexities involved in establishing liability for abandoned hazardous waste dumps and the difficulty in recovering damages from private parties. In 1984, for instance, the EPA placed the Helen Kramer Landfill in Mantua, New Jersey, high on the NPL and awarded $55.7 million for the cleanup contract. To recover these costs through liability claims, the federal government subsequently sued twenty-five private firms, and the state of New Jersey sued the same firms plus twenty-five additional ones. A few of these fifty defendants sued 239 other parties who they claimed were responsible for these wastes, including the city of Philadelphia and other municipalities. And most of these litigants then sued their insurance companies.[52] The litigation is still active. So far, the EPA has been able to recover only a small fraction of cleanup expenses from parties alleged to be liable for the costs. Another inducement to delay and expense has been disagreement between regulatory officials and communities affected by Superfund over the appropriate amount of cleanup required to make sites safe. Superfund officials endure intense community pressure to achieve the most stringent and costly standards at a site restoration. When officials and communities disagree about the matter, litigation often results even before cleanup begins.

While EPA continues to struggle with CERCLA's implementation, its accomplishments since 1980 are significant if often ignored or deprecated. "In many ways, CERCLA has been wildly successful," concluded one careful review of the CERCLA first thirty years. "The EPA has investigated over forty-seven thousand sites suspected of releasing hazardous substances into the environment. Many of these sites have been addressed by removal actions, state authorities, or by private parties. Just over 1,600 sites have been placed on the NPL, and cleanups have been fully implemented at more than two-thirds of these sites.[53] Additionally, the nation's hazardous waste exposures and resulting health risks would doubtless be more severe if CERCLA did not exist. At the same time, significant implementation issues remain. Can EPA improve the quality of Superfund site cleanup in light of diminishing funding? Equally important, once Superfund sites have been cleaned up, will the owners provide continuing high quality stewardship? Many observers believe EPA also needs to recover more of the cleanup cost from the parties responsible for waste sites on the NPL and to reduce the administrative costs created by prolonged litigation at many NPL sites.

A Continuing Challenge: Underground Disposal. More than half of the nation's liquid waste is flushed into deep underground cavities or water systems by many industries and municipalities, where it is presumed to disperse too deeply to contaminate water or soil used by humans. Much of this waste is known to contain toxic chemicals. However, such disposal is seldom carefully monitored or regulated. Experts suspect that many hazardous materials buried in this way will migrate through subsurface water flows until they contaminate drinking water wells and aquifers used for irrigation, lakes, rivers, or soil. For these reasons, the National Academy of Sciences has recommended that the federal government promote incineration, chemical processing, or other more modern procedures for waste disposal. Although federal and state water-quality regulators have succeeded in diminishing underground disposal, more than twelve million gallons of waste materials are still injected underground annually.[54]

Chemical Threat or Chemiphobia?

Although experts agree that the public should be concerned about the health risks associated with exposure to chemical substances and chemical wastes, they cannot easily determine which kinds of exposure and how much exposure are unacceptably risky. A related issue is that the elimination of all risk from exposure to toxic and hazardous substances is often impossible or unacceptably expensive, yet federal regulations such as the Superfund legislation do not clearly define how much cleanup is enough. The problem, as two informed critics observed, is "how clean is 'clean,'" and the solution is not apparent. According to political scientists Marc Landy and Mary Hague,

> In principle, one would want to clean until [an abandoned hazardous waste] site is called perfectly "safe." However . . . there is no scientifically identifiable point at which an "unsafe" site becomes "safe." No matter how much cleanup has been performed at a site, it can always be argued that more cleanup would reduce risk even further.[55]

A second issue involves political chemistry. When public fear about hazardous substances blends with official eagerness to appear tough on pollution, the resulting risk-averse political climate often spawns hasty, severe regulatory policies. A political synergy between public fear and governmental overreaction often results, as we have observed previously, in targeting for greatest attention those pollutants exciting the greatest public apprehension rather than those posing the most scientifically documented health risks.

Finally, regulatory costs have been especially controversial in toxic and hazardous substance regulation, because of the rapid and severe escalation in the number of regulations and the growing recognition that future regulations will cost enormously more. Federal regulations, for instance, require all municipal landfills to be built with plastic and clay liners, liquid collectors, and treatment systems to prevent leaking toxic waste. These regulations have drastically raised the cost of opening a new municipal landfill and forced most of the country's existing 6,500 landfills to close when retrofitting became too expensive. And future landfill costs may be far greater still as the variety of waste-dump toxics and their health risks are better documented.[56]

To many critics, all these problems have produced public chemiphobia, while impelling governmental regulators to appease public opinion through excessively harsh chemical controls at enormous economic, scientific, and political cost to the nation. To many conservative critics, these regulations are too often "animated by a quasi-religious mind-set that combines an aversion to even minimal risks with a strong preference for governmental intervention in markets and a fierce hostility toward corporations."[57] Even the many experts who disagree with these conclusions often recognize that toxic and hazardous substance regulation is the most difficult, least satisfactory, domain of contemporary environmental policymaking. With Superfund and SARA, Congress finished its attempt to craft, within less than a decade, the first truly comprehensive federal regulation of virtually all hazardous or toxic materials in the United States.

The Food Quality Protection Act: Improved Pesticide Regulation

The Food Quality Protection Act is a constructive congressional effort to eliminate the regulatory morass created by fifty years of different statutory standards for pesticide residues on food. The act simplified regulatory standards for an extremely widespread, diverse, and politically contentious group of chemicals. Equally important, it abolished the zero-tolerance provisions for pesticide residues required by the Delaney clause of the Federal Food, Drug and Cosmetic Act (1949), which were widely regarded as unreasonably stringent scientifically and economically. The most important provisions of the act include the following:

1. *A single, health-based standard.* All pesticide residues must demonstrate "a reasonable certainty of no harm" if they are to be permitted in food products.

2. *Tightened risk standards*. Risk calculations must consider all nonoccupational sources of exposure, including drinking water, and exposure to other pesticides with a common mechanism of toxicity when setting tolerances. This provision allows regulators to consider not only the effect of the residue itself but also the impact of other kinds of exposure to the same or similar pesticides outside a workplace.
3. *Provisions for children*. This provision requires an explicit determination of safe exposures for children and, if necessary, a tenfold increase in the adult safety standards to be used for children when the relevant children's data are uncertain.
4. *Endocrine testing*. The EPA is required to establish a comprehensive screening program for chemical endocrine effects on humans, to implement the program, and to report on its progress to Congress.
5. *Consumer right to know*. This provision requires distribution of brochures in grocery stores on the health effects of pesticides, how to avoid risks, and which foods have tolerances for pesticide residues based on benefit considerations.

Leading national environmental advocacy groups generally accepted the new legislation warily, recognizing reluctantly that zero tolerance for pesticide residues probably had become an indefensible cancer-exposure standard economically and even scientifically. Still, many environmental leaders feared the new legislation might have breached irreparably a high wall of resistance to cancer risk they had legally erected over fifty years, inviting a flood of other legislation eroding the zero-tolerance standard for other ingredients in food.

The NIMBY Problem

NIMBYs are a common presence at proposed toxic waste and hazardous facility sites. The NIMBYs (shorthand for Not In My Backyard) may be white-collar professionals, executives, or articulate, well-educated, and politically sophisticated individuals. They can be housewives, teachers, perhaps salespeople, or public officials. They personify members of a well-recognized, potent citizen resistance movement.[58] NIMBY is

> a reaction or attitude towards any project, such as the siting of a hazardous enterprise or affordable housing projects, that is perceived to pose a threat to health or safety, status or reputation of a neighborhood or geographical area. NIMBYism can take the form of a protest against authorities or industry by the formation of action groups comprised by local residents. This

> response by the local population derives from a variety of reasons, including: a sense that they are being overrun by the authorities or industry to a genuine concern for the health and safety of residents of the community.[59]

NIMBYism is all too familiar to federal, state, and local officials attempting to implement state programs for issuing permits for hazardous waste sites as required by RCRA or trying to plan for the designation or cleanup of a Superfund site. It poses a formidable obstacle to waste-site management under RCRA and Superfund. It is the environmental movement's problem, too. NIMBYism is a dissonance within the environmental ethic—a disturbing contradiction between the movement's commitment to participatory democracy and its insistence on rapid, effective environmental regulation.

NIMBYism thrives because of numerous and still increasing state and federal laws that empower citizen activism in the implementation of many different environmental laws and regulations. Most states now have legislation in which citizens are given some role in the writing, implementation, and enforcement of environmental laws. Seventeen states require the appropriate agencies to prepare environmental impact statements for their activities and mandate public notice and involvement in the process.[60]

Federal law provides many opportunities for citizen participation in environmental regulation. Major environmental laws, such as the CAA, the Clean Water Act, RCRA, and Superfund grant citizens the standing to sue federal agencies to compel their enforcement of environmental regulations. The Surface Mining Control and Reclamation Act (1977), the 1984 RCRA amendments, and the 1972 Clean Water Act amendments, among many others, require the responsible federal and state agencies to involve the public in writing and implementing regulations. Several federal environmental laws also permit citizens or citizen organizations to sue private firms for failure to comply with the terms of their pollution-discharge permits and to recover the costs involved in the suits. Public notice and hearings are routinely required of environmental agencies before major regulations are promulgated or permits are issued for pollution discharges or hazardous waste sites. Behind these generous provisions for citizen participation, legal scholar Michael S. Greve notes, is congressional distrust, a "reflexive suspicion that the executive, if left to itself, would systematically under-enforce the law."[61]

These statutory provisions have set in motion political forces powerfully abetting NIMBYism. One such force is the rapid proliferation of national and state organizations specifically committed to educating Americans about hazardous waste and to helping local communities organize politically to deal with local hazardous waste problems. Among the earliest and most visible national organizations is the Citizen's Clearinghouse for

Hazardous Waste, created in 1981 by Lois Gibbs, a housewife whose experiences with the Love Canal waste crisis convinced her of a need to educate other communities about hazardous waste. There also has been an explosion of ad hoc state and local groups that have organized to deal with specific hazardous waste issues, ranging from the closing of city waste dumps to state policies for hazardous waste transportation.

Many existing state and national environmental organizations now give major attention to hazardous waste issues and provide technical assistance and education for concerned citizens. These groups believe they are ultimately contributing to better implementation of RCRA and Superfund by ensuring greater citizen understanding and acceptance of waste policy decisions made by government officials. Often, however, this activism arouses or emboldens citizen opposition to providing permits for local hazardous waste sites. Public officials and waste producers commonly complain that organized citizen groups too often agitate rather than educate in community waste issues.

Public resistance to hazardous waste site permits and management plans under RCRA or Superfund is a serious and unsolved political problem afflicting both programs. Coupled with litigation, the many political and administrative strategies available to citizen groups determined to prevent permits for local hazardous waste dumps can delay program implementation for years or decades.

State governments are not innocent of NIMBYism. Almost any hazardous waste proposal can arouse it. Public hearings on siting hazardous facilities, as political scientist Michael E. Kraft observed, can become "a perfect forum for elected officials and the general public to give vent to fears and concerns, and to denounce decision-making on the siting question. The public hearing procedure . . . facilitated the classic NIMBY response to siting unwanted facilities that impose localized costs and risks while offering diffuse national benefits."[62]

Many administrative strategies have been tried, but none seem to dispel NIMBYism. States that financially compensate local governments and citizens for the risks and other problems entailed in accepting a hazardous waste site are no more successful in gaining public approval for the siting than states using only scientific criteria for site selection. Evidence suggests that most citizens who oppose a hazardous waste site will not change their minds under any circumstances.[63] Opponents may occasionally be converted if they are convinced that the local community will have continuing, accurate information about the site status and continuing control over the site's management. But converts are few. Opponents to hazardous waste sites are numerous, vocal, and unyielding. Moreover, they are apt to win their fights.

NIMBYism will continue to be tough, stubborn, and durable, its ranks crowded with well-educated, socially active, organizationally experienced people. NIMBYism is rarely routed by better information, more-qualified experts, improved risk communication techniques, and other palliative actions premised on the assumption that the public will be more reasonable about a hazardous facility siting if it is better educated about the issues. All this belies the widespread belief among scientific experts and risk professionals that NIMBYism is rooted in the public's scientific illiteracy.[64]

Why is better risk communication not enough? Because NIMBYs usually distrust the source of governmental risk information: public officials and their scientific spokespeople. In addition, the critics of governmental hazardous waste management often have their own experts and information sources. The conflicting sides, notes Harvard physicist and science policy expert Harvey Brooks, tend to become "noncommunicating publics that each rely on different sources and talk to different experts. Thus, many public policy discussions become dialogues of the deaf. . . ."[65] Often, the true wellsprings of public anxiety about waste siting are not understood by technical experts; people worry about "potentially catastrophic effects, lack of familiarity and understanding, involuntariness, scientific uncertainty, lack of personal control by the individuals exposed, risks to future generations," and more.[66]

Critics often hold environmentalists responsible for NIMBYism. They assert that the environmentalist rhetoric favored by NIMBYs is little more than deceptive but respectable packaging for middle-class selfishness. In reality, argue the critics, most NIMBYs want somebody else to bear whatever risks are associated with hazardous waste sites, while they continue to benefit from the products and economic activities that produce the waste. Even if NIMBYism is well intentioned, critics also note, it fails to solve waste problems. Eventually, waste has to go someplace. It is unfortunate, the critics conclude, that the waste often ends up at whatever sites are the least well defended politically, not at the most appropriate places. Thus, many environmental justice problems (as observed in Chapter 4) and numerous controversies between the states over high-level nuclear waste disposal (see Chapter 8) are created or intensified by NIMBYism.

Whatever its merits, the certain continuation of NIMBYism poses difficult problems for environmental regulation. Is it possible to secure informed public consent to the siting and management of hazardous waste facilities? If no public involvement techniques or risk communication procedures can produce public consensus or acquiescence to hazardous waste site planning under RCRA and Superfund, must solutions be imposed by judicial, administrative, or political means? Is there danger that continuing the promotion of public involvement in making these

decisions will enshrine procedural democracy at the expense of social equity—in effect, will citizen participation gradually result in selectively exposing the least economically and politically advantaged sectors of the public to the most risks from hazardous waste? How much responsibility for the worst impacts of NIMBYism rests with the environmental movement? These questions can only grow in importance as the hazardous waste problem magnifies in the twenty-first century.

Conclusion

In no other major area of environmental policy is progress measured in such modest increments as the regulation of toxic and hazardous wastes. Hazardous waste in abandoned or deliberately uncontrolled landfills numbering in the thousands has yet to be controlled properly. Federal and state governments have yet to approve and implement on the appropriate scale the strategies required to ameliorate hazardous waste problems. The risks already associated with hazardous substances and the many others that will become apparent with continuing research in the twenty-first century are unlikely to diminish without a massive and continuing federal commitment of resources to implementing the programs as intended by Congress—a commitment of resources and will on a scale that has been lacking so far.

Implementation of TSCA, RCRA, and Superfund is likely to be slow, because these laws raise technical, legal, and political problems on an order seldom matched in other environmental policy domains. First, no other environmental programs attempt to regulate so many discrete, pervasive substances; we have observed that the hazardous substances that may lie within the scope of these laws number in the tens of thousands. Second, regulation is delayed by the need to acquire technical information never previously obtained by government, to conduct research on the hazardousness of new chemicals, or to secure from corporations highly guarded trade secrets. Third, almost every major regulatory action intended to limit the production, distribution, or disposal of chemical substances deemed toxic or hazardous by government is open to technical controversy, litigation, and other challenges concerning the degree of risk associated with such substances and their suitability for regulation under the laws. Fourth, opponents of regulatory actions under TSCA, RCRA, and Superfund have been able to use to good advantage all the opportunities provided by requirements for administrative due process and the federalized structure of regulation to challenge administrative acts politically and judicially. Fifth, in many instances, the states responsible for implementing the programs have been slow to provide from their own resources the means necessary to ensure proper implementation.

From a broader perspective, the enormous difficulties in controlling hazardous substances once they are released into the ecosystem, together with the problems of controlling their disposal, emphasize the crucial role that production controls must play in hazardous substance management. Indeed, it may be that the human and environmental risks from hazardous chemicals may never be constrained satisfactorily once these substances are let loose in the environment. U.S. technology development has proceeded largely with an implicit confidence that whatever human or environmental risks may be engendered in the process can be contained adequately by the same genius that inspired technology's development—a faith, in effect, that science always will cure whatever ills it creates. Toxic and hazardous substances pose for the nation a formidable technological challenge: how to reckon the human and environmental costs of technology development while technologies are yet evolving, and then, how to prudently control dangerous technologies without depriving the nation of their benefits.

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