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**Controlling Toxic Harms: The Struggle Over Dioxin
Contamination in the Pulp and Paper Industry**

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Controlling Toxic Harms: The Struggle Over Dioxin Contamination in the Pulp and Paper Industry

William Boyd*

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I. INTRODUCTION

*The most alarming of all man's assaults upon the environment is the contamination of air, earth, rivers, and sea with dangerous and even lethal materials. This pollution is for the most part irrecoverable; the chain of evil it initiates not only in the world that must support life but in living tissues is for the most part irreversible. In this now universal contamination of the environment, chemicals are the sinister and little-recognized partners of radiation in changing the very nature of the world—the very nature of its life.*¹

Writing in the early 1960s, Rachel Carson concerned herself primarily with the impacts of DDT and other synthetic organic pesticides on human health and the environment. Perhaps more than any other person, she demonstrated the many interconnections between certain agro-industrial practices, such as pesticide use, and widespread environmental contamination. *Silent Spring* was a transformational book, warning of dangers that were largely invisible to most people. As such, it was both of the moment and ahead of its time. Indeed, many have suggested that *Silent Spring* provided much of the initial spark that ignited the modern environmental movement—a “cry in the wilderness . . . that changed the course of history,” according to then Vice President Al Gore.² Today, forty years later, much of what Rachel Carson wrote seems prescient, even prophetic. By forcing people to look anew at the *ecology* of certain industrial practices, she helped them (us) to see the new risks and vulnerabilities emerging out of the very way in which modern industrial society produced its food. Hers was a story about connections and unintended consequences.

Silent Spring thus had a relevance that went far beyond the issue of pesticides and the environmental effects of chemical-intensive agriculture. By pointing to the persistent nature of various toxic substances, their movement upward through the food chain to inhabit living tissues in ever greater concentrations, and their ability to cause significant and lasting damage to human health and the environment (even at very small concentrations), Carson raised a host of issues that challenged traditional views of pollution. As *Silent Spring* made clear, microtoxicity mattered as much if not more than gross insults to the environment. The challenges for regulation were immense. During the 1963 hearings on water pollution,

1. RACHEL CARSON, *SILENT SPRING* 6 (1962).

2. Al Gore, *Introduction to RACHEL CARSON, SILENT SPRING*, at xv (Houghton Mifflin 1994) (1962).

Senator Edmund Muskie, a leading proponent of stronger federal environmental laws, spoke of the difficulties posed by toxic substances: "The emerging problems involving chemical, pesticide, and radioactive wastes are filled with unknowns which need answers before adequate treatment methods can be developed. Every effort is needed, of course, to safeguard the public health and welfare through effective controls until research has found these answers."³ These sorts of problems were different from traditional pollution concerns such as high concentrations of organic matter in wastewater. Even minute quantities of toxic pollutants might have significant and persistent adverse effects on human health and the environment.⁴ Once such substances were released into the environment they would be very difficult, if not impossible, to clean up. Quantifying the precise risks they posed proved particularly elusive. As a result, toxic pollution raised significant new challenges for the existing regulatory regime.⁵

3. *Water Pollution Control: Hearing Before a Special Subcomm. on Air and Water Pollution of the Senate Comm. on Pub. Works*, 88th Cong. 1-2 (1963) (statement of Sen. Muskie, member Senate Comm. on Pub. Works).

4. There is no generally accepted definition of toxic pollutants or toxic substances, and individual statutes typically take a broad approach to defining such terms. The Clean Water Act, for example, defines toxic pollutants as:

"those pollutants or combinations of pollutants, including disease-causing agents, which after discharge and upon exposure, ingestion, inhalation or assimilation into any organism either directly from the environment or indirectly by ingestion through food chains, will . . . cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring."

33 U.S.C.A. § 1362(13). Such a definition could include almost any substance, given the fact that everything is "toxic" at some level. The basic maxim of toxicology—the dose makes the poison—suggests the difficulties of making any categorical distinction between "traditional" pollutants and "toxic" pollutants. That said, there does appear to be some utility in the working distinction, embedded in both the existing regulatory system and in tort law, that distinguishes between those substances that present a risk of serious harm to human health and/or the environment at low levels of exposure and the panoply of pollutants and substances that can be toxic at high levels of exposure. Many of these highly toxic chemicals also have unique environmental characteristics such as long residence times and bioaccumulative potential that further distinguish them from more ordinary forms of pollution and add to the difficulties of controlling them. See DONALD G. CROSBY, *ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY* (1998).

5. To date, efforts to regulate toxics (in air, water, land, and food) have followed a number of different trajectories, some of which have proceeded independently from and others of which have overlapped traditional air and water regulation. For overviews, see Michael Shapiro, *Toxic Substances Policy*, in *PUBLIC POLICIES FOR ENVIRONMENTAL PROTECTION* 195-241 (Paul R. Portney ed., 1990) and Robert Gottlieb et al., *By Air, Water and Land: The Media-Specific Approach to Toxics Policies*, in *REDUCING TOXICS: A NEW APPROACH TO POLICY AND INDUSTRY DECISIONMAKING* 25-57 (Robert Gottlieb ed., 1995).

One extremely toxic compound that would have been right at home in *Silent Spring* is dioxin. Made famous by the controversies over Agent Orange and various toxic disasters such as Love Canal, Times Beach, and Seveso, Italy, dioxin has come to symbolize the perils of living in a world plagued by the toxic byproducts of industrial society.⁶ Like DDT, dioxin, which is the name of a family of some seventy-five related compounds, is an organochlorine (also known as chlorinated hydrocarbons). The most toxic and well-known of the dioxin compounds is 2,3,7,8-tetrachlorodibenzo-*p*-dioxin or 2,3,7,8-TCDD. When most people speak of dioxin they are referring to 2,3,7,8-TCDD, a convention followed here.

Like other organochlorines, dioxins are extremely stable compounds under most environmental conditions, with environmental persistence measured in decades rather than years.⁷ These compounds are fat-soluble and they bio-accumulate, which means that their concentration in living tissues increases as one moves up the food chain from one trophic level to another.⁸ Today, dioxins are found in living systems all over the world, including body tissues of every person living in the United States.⁹ And although there is ongoing controversy about just how toxic dioxin is and what sort of risk it poses, many scientists believe it may pose a health risk at extremely small concentrations, i.e. there is no safe dose.¹⁰ During the 1970s, researchers labeled dioxin "the most potent animal carcinogen ever tested"—the "Darth Vader" of chemicals, as one observer put it.¹¹ Both the World Health Organization and the U.S. Department of Health and Human Services have classified dioxin as a known human carcinogen.¹² In its most recent draft reassess-

6. See discussion *infra* Part II.

7. See U.S. EPA, HEALTH ASSESSMENT DOCUMENT FOR 2,3,7,8-TETRACHLORODIBENZO-*p*-DIOXIN (TCDD) AND RELATED COMPOUNDS, External Review Draft, 9-6 to 9-7 (Aug. 1994) [hereinafter EPA HEALTH ASSESSMENT DOCUMENT FOR 2,3,7,8-TCDD].

8. For a general discussion of organochlorine pollution and the associated health and environmental effects, see JOE THORNTON, PANDORA'S POISON: CHLORINE, HEALTH, AND A NEW ENVIRONMENTAL STRATEGY (2000).

9. See EPA HEALTH ASSESSMENT DOCUMENT FOR 2,3,7,8-TCDD, *supra* note 7, at 9-13 to 9-18.

10. See THORNTON, *supra* note 8, at 57-103.

11. See MARK R. POWELL, SCIENCE AT EPA: INFORMATION IN THE REGULATORY PROCESS 329 (1999).

12. In 1997, the International Agency for Research on Cancer (IARC), a division of the World Health Organization, upgraded its cancer evaluation of 2,3,7,8-TCDD from a probable human carcinogen to the highest category—"carcinogenic to humans." See IARC MONOGRAPHS ON THE EVALUATION OF CARCINOGENIC RISKS TO HUMANS AND THEIR SUPPLEMENTS, VOL. 69: POLYCHLORINATED DIBENZO-*para*-Dioxins and Polychlorinated

ment of dioxin toxicity, issued in September 2000, the U.S. Environmental Protection Agency (EPA) re-classified dioxin from a "probable human carcinogen" to "carcinogenic to humans."¹³ Recently, attention has begun to focus on whether dioxin and dioxin-like substances mimic certain hormones and act as endocrine disruptors—leading to a variety of environmental and health effects that are only just beginning to be investigated (much less understood).¹⁴ Dioxin, quite simply, represents one of the more intractable environmental problems of the contemporary era.

Unlike DDT and other synthetic organic pesticides, however, dioxin has never had any known use or benefit, thus making it both harder to defend and, in some respects, harder to control. Indeed, because dioxin is produced as an unintentional and, some would argue, unavoidable byproduct of various industrial practices—waste incineration,¹⁵ various combustion processes,¹⁶ certain chemical manufacturing processes (including some pesticides and

Dibenzofurans (1997), available at <http://www.cie.iarc.fr/>. In January 2001, the U.S. Department of Health and Human Services' National Toxicology Program published an addendum to its Ninth Report on Carcinogens that upgraded 2,3,7,8-TCDD from the "reasonably anticipated to be a human carcinogen" to the "known to be a human carcinogen" category. See NAT'L TOXICOLOGY PROGRAM, U.S. DEP'T OF HEALTH AND HUMAN SERVS., NINTH REPORT ON CARCINOGENS (2001), available at <http://ehis.niehs.nih.gov/roc/toc9.html>. The new listing had been planned as part of the Ninth Report, which was issued in May 2000, but was delayed until the U.S. Court of Appeals for the District of Columbia dismissed a request for injunction to prevent the upgrade. In November 2001, the court rejected a challenge to the upgrade brought by manufacturing interests. See *Tozzi v. U.S. Dep't of Health and Human Services*, 271 F.3d 301 (D.C. Cir. 2001) (holding that the Secretary acted neither arbitrarily nor capriciously in upgrading dioxin to the "known to be a human carcinogen" category).

13. See U.S. EPA, EXPOSURE AND HUMAN HEALTH REASSESSMENT DOCUMENT OF 2,3,7,8-TETRACHLORDIBENZO-P-DIOXIN (TCDD) AND RELATED COMPOUNDS, PT. III: INTEGRATED SUMMARY AND RISK CHARACTERIZATION FOR 2,3,7,8-TETRACHLORDIBENZO-P-DIOXIN (TCDD) AND RELATED COMPOUNDS, 99-158 (2000) [hereinafter EPA EXPOSURE AND HUMAN HEALTH REASSESSMENT OF 2,3,7,8-TCDD, PT. III]. Polychlorinated dibenzodioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and polychlorinated biphenyls (PCBs) are chemically classified as halogenated aromatic hydrocarbons. Dioxin is the most widely studied of these compounds and represents the reference compound for the broader class of PCDDs, PCDFs, and PCBs. See EPA HEALTH ASSESSMENT DOCUMENT FOR 2,3,7,8-TCDD, *supra* note 7. See also John A. Moore, et al., *The Dioxin TCDD: A Selective Study of Science and Policy Interaction*, in *KEEPING PACE WITH SCIENCE AND ENGINEERING* 221-242 (M. Uman ed., 1993).

14. See EPA HEALTH ASSESSMENT DOCUMENT FOR 2,3,7,8-TCDD, *supra* note 7, at 9-43 to 9-51. On dioxin's potential as an endocrine disruptor, see THEO COLBURN ET AL., *OUR STOLEN FUTURE* 110-121 (1997) and THORNTON, *supra* note 8, at 85-93.

15. U.S. EPA, EXPOSURE AND HUMAN HEALTH REASSESSMENT DOCUMENT OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) AND RELATED COMPOUNDS, PT. I, VOL. 2: SOURCES OF DIOXIN-LIKE COMPOUNDS IN THE U.S., 3-1 to 3-44 (Sept. 2000).

16. *Id.* at 4-1 to 7-28.

herbicides),¹⁷ and chlorine bleaching of pulp and paper¹⁸—controlling or halting its release would effectively require abandoning (or radically altering) such practices. Given the money involved and the fact that these practices produce very small amounts of dioxin, some have argued that the costs of reducing dioxin outweigh the benefits.¹⁹ On the other hand, given the extreme toxicity of dioxin and the uncertainties associated with its effects, others have urged a precautionary approach. Dioxin, they argue, should be presumed guilty until proven innocent.²⁰

This essay focuses on efforts to regulate and remedy dioxin contamination in a specific industrial sector—the pulp and paper industry. Although the issue of dioxin contamination in the pulp and paper industry first arose in the mid-1980s, efforts to define the nature and scope of the problem, much less control it, continue to this day. As with so many other toxic substances, the uncertainties associated with dioxin science and the practice of risk assessment have created significant opportunities for politicization. Indeed, as the various parties affected by the dioxin issue—industry advocates, environmentalists, plaintiffs' lawyers, government scientists and regulators, and local communities—have pursued their various interests through Congressional hearings, the tort system, and the regulatory arena, they have created fertile ground for intense political conflict.

By focusing on the struggle to control a specific toxic harm in a specific industrial sector, this essay explores the politicized nature of toxic harms in the United States and, in the process, highlights the considerable shortcomings of existing legal regimes and institutions for dealing with problems of such scope and complexity. In doing so, the essay raises a host of normative issues regarding current institutional arrangements and the appropriate strategy for dealing with toxic harms. While both tort law and the existing regulatory system will undoubtedly have a place in efforts to deal with toxic harms, the following case study demonstrates that neither has proven particularly adept at achieving the respective goals of compensation, deterrence, and pollution control in a timely and cost-effective manner. Such a result simply provides one more argu-

17. *Id.* at 8-5 to 8-45.

18. *Id.* at 8-1 to 8-5.

19. See *infra* notes 213-15 and accompanying text.

20. For a recent argument in favor of a precautionary approach with respect to organochlorines, such as dioxin, see THORNTON, *supra* note 8.

ment for developing new approaches to toxic harms. While any such effort must contend with the realities of environmental politics in the United States, this essay discusses several recent innovations in environmental policy and regulation that provide a possible basis for developing a new approach.

The essay is organized as follows: Part II provides background information and context necessary to situate dioxin and the case study in the broader landscape of toxic harms. Part III, which accounts for the bulk of the essay, documents the story of dioxin contamination in the pulp and paper industry. Part IV then provides a discussion of major lessons from the case study and possible alternatives for the future.

Three main lessons emerge from the case study. First, both tort and regulation (whether viewed as alternative responses to toxic harms or as complementary approaches) appear to be deeply flawed in their capacity to deal quickly with toxics problems of similar scale and complexity as dioxin. Second, throughout the dioxin controversy, scientific uncertainty has emerged as a key site of political conflict and, consequently, a key source of inaction and delay. Third, given the flaws in existing tools and institutions, any effort to develop alternative approaches needs to focus primarily at the level of institutional design. Rather than start from scratch, this essay argues that there are a variety of new tools and strategies that have emerged in recent years that might provide the ingredients for a new information-based approach to the social control of toxic harms.²¹

II. SITUATING DIOXIN IN THE LANDSCAPE OF TOXIC HARMS

Generalizations about toxic harms do not come easy. Aside from the vague and general nature of the term itself,²² efforts to distinguish among the many potential toxic harms must contend with a multitude of different sources, pathways, exposures, human health effects, environmental consequences, and legal and regulatory responses. Compounding such complexities is the pervasive lack of even the most basic information about the vast majority of chemicals that have been and continue to be introduced into the

21. See *infra* Part IV.

22. As a working definition, one might characterize a toxic substance as one that presents a risk of serious harm to human health and/or the environment at low levels of exposure. Such a definition, of course, inevitably begs a number of questions. What counts as "serious" harm? What constitutes "low levels" of exposure? Who gets to decide? See *supra* note 4.

environment.²³ Out of the 70,000 commercially produced chemicals in circulation today (more than 11,000 of which are organochlorines), the vast majority has not been subjected to any sort of substantial toxicity assessment.²⁴ Basic information on the toxicity of pollutants is similarly lacking. Out of the approximately 650 chemicals covered by the Toxics Release Inventory—all of which must have some evidence of “toxicity” to be on the list in the first place—information necessary for safety assessments is lacking for 93% of the chemicals released to air and 66% of the chemicals released to water.²⁵ This striking lack of basic information points out the practical impossibility of developing a coherent assessment of the overall toxics problem. Indeed, no matter how sophisticated the science becomes, we will never “know” the actual extent of chemical contamination, much less the associated health and environmental effects. Toxic ignorance, it seems, is a basic fact of life.

In spite of such pervasive ignorance, however, scientists and regulators have compiled a substantial amount of information on certain compounds. Along with asbestos, dioxin is one of the most intensively studied compounds in the toxics area. Since the 1950s, when some of the health effects of dioxin were first reported, thousands of scientific articles have been published on its biological and toxicological properties.²⁶ Over the last fifteen years, moreover, EPA has conducted three major assessments of dioxin, the most recent of which was released in draft form in September

23. See David Roe & William S. Pease, *Toxic Ignorance*, THE ENVTL. FORUM, May/June 1998, at 24 (documenting the general lack of basic information necessary to assess chemical safety and arguing that the current regulatory regime exacerbates the problem by rewarding ignorance and penalizing knowledge).

24. See ROBERT V. PERCIVAL ET AL., ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY 458 (2d ed. 1996) (noting that “more than 70,000 chemicals now are used in pesticides, food additives, cosmetics, drugs, and other commercial products. More than 1,000 new chemicals are introduced every year.”) See also THORNTON, *supra* note 8, at 99-101 (noting that in addition to the 11,000 organochlorines in commerce, thousands more are “produced as accidental by-products. Basic toxicity data on acute and chronic effects are available for only a tiny fraction. For the vast majority of compounds there are no data at all.”); Roe & Pease, *supra* note 23, at 25-27 (noting that 71% of high-volume chemicals in commercial use in the United States lack the minimum data necessary for health hazard screening and that 97% of these chemicals lack the information necessary for safety assessment).

25. See Roe & Pease, *supra* note 23, at 26-27.

26. See, e.g., EPA EXPOSURE AND HUMAN HEALTH REASSESSMENT OF 2,3,7,8-TCDD, Pt. III, *supra* note 13, at 26 (2000) (noting that “[s]ince the identification of 2,3,7,8-TCDD as a chloracneagen in 1957, more than 5,000 publications have discussed its biological and toxicological properties”).

2000.²⁷ The more we learn, it seems, the worse it gets.²⁸ And yet, despite such efforts, substantial uncertainties continue to plague attempts to accurately characterize the risks from dioxin, creating enormous challenges for efforts to regulate and remedy the potential harms associated with dioxin exposure.

One thing we do know, however, is that dioxin has been identified as the primary culprit in a number of important controversies over toxic substances. In the early 1970s, for example, dioxin was implicated in the controversy over 2,4,5-T (Trichlorophenoxyacetic acid), the active ingredient in a number of herbicides used to control weeds in forests, range and pastureland, and along rights-of-way.²⁹ After an epidemiological study that linked 2,4,5-T spraying in Oregon forests to increases in the local miscarriage rate, EPA invoked its emergency powers under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and suspended the registration of 2,4,5-T for use on forests and rights of way.³⁰ Dow Chemical, the manufacturer, quickly challenged the decision in federal district court on the grounds that EPA's actions were arbitrary and capricious.³¹ The court ruled in favor of EPA.³²

Dioxin has also been implicated in the ongoing controversy over Agent Orange. Widely used as a defoliant during the Vietnam War, Agent Orange, which involved a roughly equal mixture of 2,4,5-T and another chemical known as 2,4-D, was heavily contaminated with dioxin and subsequently alleged to be the cause of substantial health problems among the Vietnamese population and many American veterans.³³ In the United States, a group of veter-

27. *Id.* Prior assessments were released in 1985 and 1994. The current assessment runs to more than 3,000 pages.

28. See *infra* Part III.D for a discussion of the results from EPA's dioxin reassessment.

29. During the production of 2,4,5-T, dioxin is produced as an impurity. In 1970, EPA banned the use of 2,4,5-T on all crops except rice. See RONALD BRICKMAN, ET AL., *CONTROLLING CHEMICALS: THE POLITICS OF REGULATION IN EUROPE AND THE UNITED STATES* 212-13 (1985).

30. See 44 Fed. Reg. 15,874 (Mar. 1, 1979) (announcing the ban). This was the first time that EPA invoked its emergency power under section 6(c)(3) of FIFRA. See 7 U.S.C. § 136(c)(3) (2001). The epidemiological study was known as the Alsea II study, named for the Alsea basin in Oregon. Details of EPA's actions are recounted in *Dow Chemical Co. v. Blum*, 469 F. Supp. 892, 895-98 (E.D. Mich. 1979).

31. 469 F. Supp. 892.

32. *Id.* (holding that EPA did not act in an arbitrary and capricious manner and denying Dow Chemical's motion to stay EPA's emergency suspension orders of two dioxin-contaminated herbicides under FIFRA).

33. For a discussion of the Agent Orange controversy and the lawsuit it spawned, see PETER H. SCHUCK, *AGENT ORANGE ON TRIAL: MASS TOXIC DISASTERS IN THE COURTS* (1986).

ans sued several of the manufacturers in 1978, initiating one of the first class-action based toxic tort cases in the country.³⁴

In addition to contaminated herbicides, dioxin has also been involved in a number of high profile toxic disasters during the last several decades. The famous Love Canal incident, which resulted in the permanent evacuation of more than 500 families, resulted in part from dioxin contamination of local soil and water.³⁵ At Times Beach, Missouri, after determining that local authorities had sprayed dioxin-contaminated oil onto unpaved roads to control dust during the early 1970s, the entire town was evacuated in 1982 and officially closed in 1985.³⁶ In 1976, after an explosion at a chemical plant in northern Italy released large quantities of dioxin and dioxin-contaminated herbicides into the local environment, 800 people were evacuated from the neighboring township of Seveso.³⁷

In all of these cases, however, efforts to regulate the release of dioxin into the environment and efforts to fashion legal remedies for the alleged harms caused by dioxin exposure have run up against the basic fact of scientific uncertainty. The fundamental problem, from the perspective of those who favor a more precautionary approach to toxic substances, is that both the tort system and the current regulatory framework for toxic substances and toxic pollutants presume the availability of adequate scientific information as a basis for action—a presumption that is not very realistic in a world of toxic ignorance. Moreover, because the current

34. *Id.*

35. Between 1942 and 1952, the Hooker Chemical Company dumped more than 20,000 tons of hazardous waste into Love Canal, in New York state. The company then covered the canal with one to four feet of soil and sold it to the local school board for one dollar. An elementary school was built on the property, and a neighborhood grew up around the edges. In 1976, after residents reported health effects from wastes seeping into their basements and successfully organized to demand investigation, the state found local soil and water to be heavily contaminated with a number of toxic substances including dioxin. In 1978, a state of emergency was declared and more than 500 families were permanently evacuated. For a discussion, see THORNTON, *supra* note 8, at 277 and Christopher R. Strauss & Janet L. Scott, *The Future Rewritten: The Chemical Industry and the Environment*, CHEMISTRY AND INDUSTRY, Oct. 1, 2001.

36. For a brief discussion of Times Beach, see THORNTON, *supra* note 8, at 23 and Strauss & Scott, *supra* note 35.

37. Within a month after the explosion, about 250 cases of the skin disease chloracne, a sign of potentially high dioxin exposure, were reported. Fifteen years later, mortality rates from leukemia, Hodgkin's disease, and multiple myeloma were three to five times higher in the contaminated zone compared to the general population. For discussion of Seveso and the follow-up health studies, see THORNTON, *supra* note 8, at 183-84 and Strauss & Scott, *supra* note 35.

institutional framework places the burden of producing the scientific evidence necessary to characterize and quantify the harms associated with toxics largely on the plaintiff or the administrative agency, industrial firms have few incentives to develop the kind of information necessary to perform adequate risk assessments. In fact, the very presence of ignorance and uncertainty often serves to bolster claims by these firms that both tort law and the regulatory system are over-compensating and over-regulating in the toxics area.

Nowhere is this more evident than in the effort to prove causation in so-called toxic tort cases. Not only must the plaintiff show that exposure to dioxin is capable of causing a certain illness or class of illnesses (general causation), he must also show that he was exposed to dioxin from a particular manufacturer or facility and that the exposure was of sufficient magnitude to cause his particular illness (specific causation). Unlike asbestos or DES, dioxin does not appear to have a signature disease associated with it, making it very difficult to establish general causation. Consequently, even though dioxin exposure might be linked to a wider variety of health effects than either asbestos or DES, proving causation appears to be far more difficult.

Moreover, to the extent that exposure to dioxin stems from pollution rather than product defect, the theories of tort liability available to dioxin plaintiffs create further difficulties.³⁸ Assuming that they can get past the causation problems that are endemic to any toxics case, negligence and strict liability provide the two alternatives for establishing liability for actual harm to a person, but both have significant limits in the toxic pollution context.³⁹ Absent a

38. Tort liability for toxic harms is far more developed in the area of products liability than in the pollution context. Although considerable difficulties confront toxic tort plaintiffs in a products liability action (notably causation), the underlying theory of liability offers a more robust and direct cause of action than the alternatives available in the pollution context. This derives in part from the significant changes in products liability doctrine over the last several decades and the concomitant experience with massive products liability actions involving asbestos and, to a lesser extent, products such as DES, Dalkon Shield, breast implants, etc. See discussion *infra* Part IV.A. Personal injury resulting from exposure to dioxin was itself the subject of significant toxic tort litigation based on modern theories of products liability in the Agent Orange litigation. See SCHUCK, *supra* note 33, at 26-34 (1986) (noting that the expansion of manufacturers' duty under modern products liability doctrine provided the substantive basis for the veterans' claims in the Agent Orange litigation).

39. Strict liability, of course, will only apply in cases where the polluting activity can be shown to be "abnormally dangerous." THE RESTATEMENT (SECOND) OF TORTS § 519 (1977) provides that "one who carries on an abnormally dangerous activity is subject to

showing of any actual illness, plaintiffs seeking compensation for toxic harms from pollution can also employ emotional distress arguments—claiming that the fear of future illness resulting from exposure to the toxic pollutants constitutes a compensable injury—but courts have shown little enthusiasm for this cause of action.⁴⁰ Finally, trespass and nuisance, which provide the dominant theories for dealing with pollution-based harms outside of the personal injury context, have not proven particularly robust as vehicles for dealing with the vast and complex world of toxic pollution.⁴¹ In short, as discussed further in Part IV below, the tort system is simply not suited to deal with the many challenges involved in efforts to control potential harms associated with toxic substances such as dioxin.

In contrast, regulation appears to hold more promise as a tool for controlling toxic harms, but there are limits here as well. While dioxin emissions from pulp and paper mills (to water, air, and land) are subject to a number of potential regulations, there are still considerable gaps and little overall coordination among programs. In theory, section 6 of the Toxic Substances Control Act (TSCA) gives EPA the authority to regulate almost any process that produces dioxin upon a finding of unreasonable risk and as long as that process is not regulated adequately under other statutes.⁴² In

liability for harm . . . resulting from the activity, although he has exercised the utmost care to prevent the harm.” In determining whether an activity is abnormally dangerous, section 520 lists six factors for consideration: (1) existence of a high degree of risk of some harm to the person, land or chattels of others; (2) likelihood that the harm that results from it will be great; (3) inability to eliminate the risk by the exercise of reasonable care; (4) extent to which the activity is not a matter of common usage; (5) inappropriateness of the activity to the place where it is carried on; and (6) extent to which its value to the community is outweighed by its dangerous activities.

40. Much of the existing case law requires some form of physical manifestation of disease before allowing recovery for emotional distress. *See, e.g.,* Metro-North Commuter R.R. Co. v. Buckley, 521 U.S. 424 (1997) (summarizing much of the common law in the area and holding that a railroad worker negligently exposed to asbestos could not recover under the Federal Employers’ Liability Act for negligently inflicted emotional distress unless and until he manifests symptoms of a disease). *But cf. Potter v. Firestone Tire & Rubber Co.*, 863 P. 2d 795 (Cal. 1993) (allowing for recovery of damages for fear of cancer absent a physical manifestation, if the plaintiff can show exposure due to defendant’s negligence and that plaintiff is more likely than not to develop cancer as a result of the exposure).

41. For an overview of trespass and nuisance, see MARC A. FRANKLIN & ROBERT L. RABIN, *TORT LAW AND ALTERNATIVES: CASES AND MATERIALS* 652-78 (7th ed. 2001). *See also* Jeff L. Lewin, *Boomer and the American Law of Nuisance: Past, Present, and Future*, 54 ALA. L. REV. 189 (1990); Andrew Jackson Heimert, *Keeping Pigs Out of Parlors: Using Nuisance Law to Affect the Location of Pollution*, 27 ENVTL. L. 403 (1997).

42. *See* 15 U.S.C.A. § 2605 (2001). Although TSCA is generally presumed to apply only to substances produced for commercial purposes, the scope of section 6 is quite

practice, TSCA has proven to be severely limited as a tool to regulate toxic substances.⁴³ The Clean Air Act's National Emission Standards for Hazardous Air Pollutants (NESHAP) program explicitly lists dioxin as a hazardous air pollutant and, consequently, imposes mandatory technology-based standards.⁴⁴ Similarly, the Clean Water Act lists dioxin as a toxic pollutant subject to best available technology effluent standards for point sources.⁴⁵ Dioxin is also subject to regulation under the impaired waters listing process and total maximum daily load (TMDL) program embodied in § 303 and § 304 of the Clean Water Act.⁴⁶ Dioxin and wastes containing dioxin (such as dioxin-laced sludges from pulp and paper mills) are listed as hazardous wastes under § 3001 of the Resource Conservation and Recovery Act (RCRA), and thus subject to the full panoply of RCRA regulations regarding the generation (§ 3002); transport (§ 3003); and treatment, storage, and disposal (§§ 3004-05) of hazardous wastes.⁴⁷ Given its listing as a hazardous waste under RCRA, a toxic pollutant under the Clean Water Act, and a toxic air emission under the Clean Air Act, any "release" or "threatened release" of dioxin from a "facility" is potentially subject to liability under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).⁴⁸ Since October 1999, dioxin and dioxin-like compounds have also been subject to the reporting requirements under the Toxics Release Inventory (TRI).⁴⁹ Finally, the EPA has recently consolidated several new air and water rules for dioxin and a handful of other toxic pollutants

broad, referring to "the manufacture, processing, distribution in commerce, use, or disposal of a chemical substance or mixture." 15 U.S.C.A. § 2605(a) (2001).

43. The *Corrosion Proof Fittings* case, which overturned EPA's asbestos ban under TSCA, had a chilling effect on EPA's use of TSCA to regulate broadly in the toxics area. See *Corrosion Proof Fittings v. EPA*, 947 F.2d 1201 (5th Cir. 1991). As of 1998, EPA had taken regulatory action under TSCA § 6 against only five chemicals or chemical classes. See Roe & Pease, *supra* note 23, at 29.

44. These technology-based standards focus on reducing listed emissions from major sources in designated industrial categories. The NESHAP program is codified as § 112 of the Clean Air Act, 42 U.S.C.A. § 7412 (1999).

45. See § 307 of the Clean Water Act, 33 U.S.C.A. § 1317 (1999).

46. Briefly, these regulations require that states develop lists of waters that do not meet the water quality standards under § 303 in spite of point source control measures; identify major point sources of water quality impairment; establish TMDLs of specific pollutants for the impaired waters; and allocate the TMDL among the various contributing sources. See 33 U.S.C.A. §§ 1313-14 (2001).

47. See 42 U.S.C.A. §§ 6921-25 (1999).

48. See 42 U.S.C.A. §§ 9601 et. seq. (1999).

49. See Persistent Bioaccumulative Toxic Chemicals, 64 Fed. Reg. 58,665 (Oct. 29, 1999) (to be codified at 40 C.F.R. pt. 372). TRI is codified formally as §313 of the Emer-

from pulp and paper production into the so-called “cluster rule”—the agency’s first attempt at sector-based multimedia regulation.⁵⁰

There appears to be no shortage, then, of statutory law covering dioxin emissions from pulp and paper production. And although these various statutes are founded upon a number of different design principles—balancing risks and benefits, economic and technological feasibility, protection of public health, and information disclosure—the actual content of the rules and regulations promulgated to implement these statutory directives are often based on principles of cost-benefit balancing. As Cass Sunstein has recently argued, the basic cost-benefit calculus has come to provide a set of default principles for federal environmental regulations.⁵¹ Whereas the first generation of debate over environmental regulation focused largely on the desirability of using cost-benefit principles as the basis for regulation, the second generation, having accepted cost-benefit balancing as the default principle, is now focused on the

difficult questions about how (not whether) to engage in cost-benefit analysis—how to value life and health, how to deal with the interests of future generations, how to generate rules of thumbs to simplify complex inquiries, how to ensure that agencies do what they are supposed to do, how and when to diverge from the conclusion reached by cost-benefit analysis, how to determine the roles of agencies and courts.⁵²

agency Planning and Community Right-to-Know Act of 1986. See 42 U.S.C.A. § 11023 (1999).

50. For a discussion of the cluster rule, see discussion *infra* Part III.D.

51. Cass Sunstein, *Cost-Benefit Default Principles*, 99 MICH. L. REV. 1651 (2001). Sunstein speaks of an evolving federal common law of regulatory policy and cost-benefit analysis emerging out of the interactions between regulatory agencies and the courts (primarily the DC Circuit). *Id.* at 1655. In effect, as agencies labor to interpret statutory ambiguities, they often import cost-benefit principles—a move that is heavily encouraged by the courts. Sunstein thus interprets the recent *Whitman v. American Trucking*, 531 U.S. 457 (2001), as a case where the statutory directive clearly and unambiguously required that national ambient air quality standards be set without regard to cost. *Id.* at 1682-85. In his view, this represents an endorsement of the general use of cost-benefit balancing in cases of statutory ambiguity: “American Trucking is best taken not to question the cost-benefit default principles, and indeed the most reasonable reading of the opinion is that the Court has explicitly embraced that principle.” *Id.* at 1685.

52. *Id.* at 1655-56. Sunstein notes, however, that these cost-benefit principles are quite abstract and general, and that the courts and the agencies have done little to make them more concrete. He suggests that the best practices being developed by the Office of Management and Budget in this area represent an important step toward a more operational approach and concludes that it is precisely in this area “that a great deal of law will be made in the next decades.” *Id.* at 1698. In his view, these principles are crucial to sensible and effective regulation: “Suitably specified and understood, the cost-benefit default

The basic problem confronting cost-benefit balancing in the toxics area, of course, is the lack of even minimal information necessary to perform the balancing in the first place—a fact that translates directly into a need for improved risk assessment. In other words, to the extent that the cost-benefit calculus does provide a set of default principles for designing regulatory initiatives for toxic substances, risk assessment emerges as the central focus of attention and contestation. In the context of dioxin regulations, as the following case study demonstrates, this has been abundantly clear in the conflict over EPA's extensive, decade-long assessment of the health and environmental risks associated with dioxin. Although not part of any formal regulatory program, the dioxin risk assessment has played a decisive role in shaping the debate over dioxin regulations in the pulp and paper industry. In the process, the irreducible scientific uncertainties associated with any effort to quantify the risks posed by toxic substances have come to provide fertile ground for intense political conflict.

III. DIOXIN CONTAMINATION IN THE PULP AND PAPER INDUSTRY

The following case study traces the story of dioxin contamination in the pulp and paper industry. As one of the most visible and contentious pollution-based toxics issues that has arisen in the last several decades, the dioxin story provides considerable insight into how the current system deals (or fails to deal) with toxic pollutants and how it might be improved going forward. The case study proceeds in more or less chronological fashion, focusing on efforts to define the nature and scope of the problem, the concomitant struggle over dioxin science, the failed attempt by tort lawyers to turn dioxin contamination from the pulp and paper industry into a toxic tort bonanza, and the ongoing efforts by federal regulators to develop a coherent risk-based regulatory response to the problem.

A. *Defining the Problem*

The issue of dioxin contamination from pulp and paper manufacturing arose rather unexpectedly in the mid-1980s during EPA's National Dioxin Study.⁵³ This study, undertaken in the wake of the

principles should be regarded not as a technique for stalling desirable regulation, but as a pragmatic effort to ensure that regulations respond to serious problems rather than to trivial or imaginary ones." *Id.* at 1716.

53. The study was formally released in 1987. See U.S. EPA, NATIONAL DIOXIN STUDY—REPORT TO CONGRESS (1987) [hereinafter NAT'L DIOXIN STUDY].

chemical disaster at Times Beach, Missouri, detected surprisingly high levels of dioxin concentrations in fish living in several streams that were supposed to serve as reference or background (*i.e.*, uncontaminated) streams for the study.⁵⁴ Upon closer inspection, researchers determined that all of these contaminated reference streams were receiving wastewater effluent from bleaching pulp and paper mills.⁵⁵ In the words of one EPA official, "[a] major unanticipated finding of the National Dioxin Study was the presence of dioxin in fish that were not downstream of already known dioxin sources. A review of the data indicated a close association between the elevated fish dioxin levels and wood pulping facilities."⁵⁶

In a follow-up study of twenty-two pulp and paper mills in Wisconsin, Minnesota and Maine during late 1985, EPA detected dioxin in wastewater sludge samples.⁵⁷ Agency scientists hypothesized that dioxin was being formed as a by-product during the bleaching of wood pulp with chlorine and chlorine derivatives.⁵⁸ To test this hypothesis, EPA, in cooperation with the American Paper Institute and the National Council for Air and Stream Improvement (an organization sponsored by the paper industry), performed a study of five bleaching pulp mills (the "five mill study") during the second half of 1986.⁵⁹ The findings were not encouraging. According to one EPA official, "dioxins and/or furans"⁶⁰ were found in the effluents of four of the five mills, the pulps of all five mills, and the

54. *Id.*

55. *Id.*

56. *Dioxin Contamination of Food and Water: Hearing Before the Subcomm. on Health and Env't of the House Comm. on Energy and Commerce*, 100th Cong. 159 (1988) [hereinafter *Dioxin Contamination Hearing*] (Statement of Charles L. Elkins, Director of EPA's Office of Toxic Substances). Measured background levels of dioxin in fish were 0.2 parts per trillion (ppt). Dioxin concentrations of more than 50 ppt were found in fish in a Wisconsin reservoir and concentrations of up to 85 ppt were found in samples from Maine and Minnesota. See POWELL, *supra* note 11, at 367 n.3. According to the Toxicological Profile for Chlorinated Dibenzo-p-Dioxins (CDDs) from the Agency for Toxic Substances and Diseases Registry, the FDA recommends against eating fish and shellfish with levels of 2,3,7,8-TCDD greater than 50 ppt. See AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY, TOXICOLOGICAL PROFILE FOR CHLORINATED DIBENZO-P-DIOXINS (1998), available at <http://www.atsdr.cdc.gov/toxprofiles/tp104.html>.

57. *Dioxin Contamination Hearing*, *supra* note 56, at 159.

58. *Id.*

59. *Id.* at 160.

60. Furans or polychlorinated dibenzofurans (PCDFs) are a set of related compounds that have a similar structure to dioxin. See EPA EXPOSURE AND HUMAN HEALTH DIOXIN REASSESSMENT FOR 2,3,7,8-TCDD, Pt. III, *supra* note 13, at 3-4.

wastewater treatment plant sludges of all five mills."⁶¹ This provided compelling evidence in support of the conclusion that the chlorine bleaching process used in certain pulp and paper mills did, in fact, produce dioxins and dioxin-like compounds.⁶²

Word of EPA's findings soon reached members of the environmental community. They were not pleased, and some suspected that the agency was not disclosing all that it knew about the issue. In August 1986, Greenpeace activist Carol Van Strum filed a Freedom of Information Act (FOIA) request for EPA documents relating to the National Dioxin Study.⁶³ The following January a letter written by an EPA official to the American Paper Institute (API) was leaked to the press. It suggested that EPA would notify the industry in the event of any FOIA requests and would not release any results until publication of the five-mill study.⁶⁴ Van Strum and others began to suspect collusion between the agency and the industry. In August 1987, Van Strum, along with Greenpeace colleague Paul Merrell, released a report on the issue that pointed to the suspected connection between dioxin and pulp and paper production and, among other things, accused EPA of attempting a cover-up.⁶⁵ One month later EPA officially released its two-year National Dioxin Study, confirming publicly that dioxin contamination from chlorine bleaching at pulp and paper mills was a potential problem.⁶⁶ The study suggested that small levels of dioxin might turn up not only in wastewater discharges from bleaching mills (and the fish downstream) but also in the residual sludges left over from wastewater treatment (which were sometimes used to fertilize nearby croplands), in air emissions, and in the actual product it-

61. *Dioxin Contamination Hearing*, *supra* note 56, at 161 (Statement of Charles L. Elkins).

62. *Id.* Part of the reason for the "unexpected" nature of this discovery stemmed from the fact that dioxin formation was (and is) only partially understood. Moreover, the technology capable of measuring concentrations at the ppt level was not widely available until this time. Information on EPA's efforts to develop analytic techniques for detecting dioxins in waterways during this time is contained in Water Programs, Guidelines Establishing Test Procedures for the Analysis of Pollutants, 56 Fed. Reg. 5,090 (Feb. 7, 1991). EPA adopted an updated set of techniques for dioxins in 1997 that lowered the measurable range of minimum levels of dioxins into the low parts per quadrillion (ppq) range for aqueous samples. *See id.*; EPA Method 1613, Final Rule, 62 Fed. Reg. 48,394 (Sept. 15, 1997).

63. *See* Van Strum v. U.S. EPA, 680 F. Supp. 349, 350 (D. Or. 1987) (discussing Van Strum's efforts to secure access to EPA documents related to the National Dioxin Study).

64. POWELL, *supra* note 11, at 353.

65. *See* PETER MERRELL & CAROL VAN STRUM, NO MARGIN OF SAFETY: THE NEED FOR EMERGENCY ACTION TO REDUCE DIOXIN FROM THE PULP AND PAPER INDUSTRY (1987). *See also* POWELL, *supra* note 11, at 353.

66. *See* NAT'L DIOXIN STUDY, *supra* note 53.

self. Indeed, one of the implications of the five-mill study, which found traces of dioxin in the pulps produced at all five mills, was that dioxin might also end up in the consumer products made from these pulps.⁶⁷

Already aware of the possibility of widespread dioxin contamination and seeking to prevent a full-scale public relations disaster, the industry came out with its own findings that did, in fact, indicate trace amounts of dioxin in certain consumer products.⁶⁸ Not surprisingly, the prospect of dioxin-laced diapers and milk cartons created a media frenzy. In September 1987, the New York Times broke the story with a front-page article headlined: "Traces of Dioxin Found in Range of Paper Goods."⁶⁹ Here was a possible pathway for dioxin to migrate into the human body—part of the reason, perhaps, why virtually all Americans had detectable levels of dioxin in their bodies.⁷⁰ As Dr. Ellen Silbergeld, a toxicologist from the Environmental Defense Fund, noted: "people clearly are getting exposed to and absorbing dioxin I think we are facing a national health problem."⁷¹

Red Cavaney, President of the API, responded that although there was no evidence to support the claim that these "trace levels" of dioxin in paper products posed a threat to human health, the industry would continue to study the problem.⁷² He also pointed out, however, that "there [was] no readily apparent solution to the problem."⁷³ EPA effectively agreed with API, ruling out public health risks from using paper products. According to the agency, however, dioxin contamination in pulp mill effluent and wastewater sludge did represent a potentially serious problem that would require more study and might entail significant regulatory action.⁷⁴

The whole issue clearly had ominous implications for the industry and, more importantly, for the communities in which they operated.⁷⁵ Pulp and paper industry representatives, of course, had

67. U.S. EPA, U.S. EPA COOPERATIVE DIOXIN SCREENING STUDY (1988).

68. Philip Shabecoff, *Traces of Dioxin Found in Range of Paper Goods*, N.Y. TIMES, Sept. 24, 1987, at A1.

69. *Id.*

70. *Id.*

71. *Id.*

72. *Id.*

73. *Id.*

74. *Id.*

75. During the late 1980s and early 1990s, when the dioxin controversy was at its peak, there were 104 bleaching mills throughout the country. See U.S. EPA, SUMMARY RE-

long maintained that the air and water pollution generated by their mills was not toxic and did not pose health hazards. As William H. Chisholm of the American Pulp and Paper Association put it during the 1963 hearings on water pollution: "I want to point out here that pulp and paper mill wastes are organic in nature and completely nontoxic. They present no threat to human health."⁷⁶

By the mid 1980s, things had changed. Once industry leaders realized they had a potential dioxin problem, they mounted a swift and vigorous campaign to shape the public's perception of the issue. According to a series of internal documents from the API that Greenpeace made public in 1987,⁷⁷ the API developed an elaborate "Dioxin Public Affairs Plan" upon learning of EPA's findings regarding dioxin contamination in pulp mill effluent.⁷⁸ "That was not an issue we wanted to leave to chance," noted Carol Raulston, vice president for government affairs at API, when asked about the industry plan.⁷⁹ In pursuing its strategy, API hired a Washington public relations firm, trained corporate executives in how to address the issue, and conducted consumer surveys.⁸⁰ The trade association also targeted the EPA for "intelligence gathering" and developed a set of objectives whose overall goal was to convince EPA to "rethink" its dioxin risk assessment and to decouple pulp mill dioxin contamination from any sort of threat to public health and the environment.⁸¹ Red Cavaney, the president of API, noted in one memo to his executive committee that the organization's reason for getting involved in the joint five-mill study with EPA was, in part, to "forestall major regulatory and public relations difficul-

PORT ON U.S. EPA/PAPER INDUSTRY COOPERATIVE DIOXIN STUDY: THE 104 MILL STUDY (1990).

76. *Water Pollution Control and Abatement (Part 1A-Nat'l Survey): Hearing Before a Subcomm. of the House Comm. on Gov't Operations*, 88th Cong. 682 (1963). (Mr. Chisholm was half right—dioxin is an organic (i.e. carbon-based) compound, but like DDT and many other organic compounds, it also happens to be extremely toxic.)

77. These documents were allegedly sent to Carol Van Strum from an anonymous source with access to API records. See *Van Strum v. U.S. EPA*, 680 F. Supp. 349, 351 (D. Or. 1987).

78. See Michael Weiskopf, *Paper Industry Campaign Defused Reaction to Dioxin Contamination*, WASH. POST, Oct. 25, 1987. See also *Dioxin Pollution in the Pigeon River, N.C. and Tenn.: Hearing Before the Subcomm. on Water Resources of the House Comm. on Public Works and Transp.* 137-40, 228-327, 100th Cong. (1988) [hereinafter *Pigeon River Hearing*] (statement of Greenpeace representative Carol Van Strum and various EPA, API, and court documents (including depositions) included with her statement supporting her claims of collusion between EPA and the API).

79. See Weiskopf, *supra* note 78.

80. *Id.*

81. *Id.*

ties."⁸² By developing relationships with people in the agency, working through "selective" congressional contacts, and marshaling a small army of outside experts, API hoped to shape EPA's approach to the dioxin issue, particularly in the area of risk assessment.⁸³

For a major consumer products industry facing a potential public relations disaster of massive proportions, API's strategy made perfect sense. Whether the strategy actually significantly shaped EPA's approach to the dioxin issue is difficult to know. The federal judge who heard Carol Van Strum's Freedom of Information Act suit against the EPA in 1987 seemed to think so. In reviewing some of the EPA and API documents submitted to the court by Van Strum, the judge concluded that "[t]he documents appear to support the existence of an agreement between EPA and the industry to suppress, modify or delay the results of the joint EPA/industry study or the manner in which they are publicly presented."⁸⁴ At the very least, the whole episode worked to further politicize the issue, creating even more distrust among certain environmental groups and the public for the industry and EPA.

In the midst of the ongoing media frenzy and legal battles surrounding the revelations, EPA began coordinating with the API and the National Council for Air and Stream Improvement to conduct a larger study of all bleaching pulp mills in the country. The "104 mill study," as it was known, began in the summer of 1988 and was funded entirely by the industry.⁸⁵ The study would, it was hoped, provide a definitive picture of the extent of the dioxin problem.

As the study was getting underway, however, it also became wrapped up in a consent decree that EPA was negotiating with the Environmental Defense Fund (EDF) and the National Wildlife Federation (NWF). Seeking to end a five-year lawsuit brought by these environmental groups, the agency agreed in July 1988 to carry out a comprehensive assessment of dioxins and furans in wastewater effluent, residual sludges, and pulp and paper products from all bleaching pulp mills in the country.⁸⁶ The 104-mill study

82. *Id.*

83. *Id.*

84. Van Strum v. U.S. EPA, 680 F. Supp. 349, 351 (D. Or. 1987).

85. The study was to be completed by spring 1989. See *Dioxin Contamination Hearing*, *supra* note 56, at 162-63 (statement of Charles L. Elkins).

86. The 1988 consent decree that EPA signed came out of a lawsuit filed by EDF and NWF against EPA in 1985 after EPA denied a citizens petition filed under the Toxic Sub-

was now part of a court-imposed agreement.⁸⁷ More importantly, EPA also agreed to propose dioxin regulations by April 1991. This specific regulatory proposal eventually became part of a larger set of rules regarding water effluent standards and national emissions standards for hazardous air pollutants from pulp and paper mills that has subsequently come to be known as the "cluster rule."⁸⁸ Thus, the consent decree not only increased the pressure on EPA (and the industry) to conduct a comprehensive study of dioxin contamination from pulp and paper mills, it also set a timeline for developing appropriate regulations. The regulatory wheels were starting to turn.

And then the hearings began. Just as EPA was working out its consent decree and launching the 104 mill study, the House Subcommittee on Water Resources convened hearings at the request of Tennessee representative James Quillen on dioxin contamination in the Pigeon River, which runs through western North Carolina and eastern Tennessee.⁸⁹ But instead of focusing on the source of the dioxin contamination in the Pigeon—the Champion International mill at Canton, North Carolina—Quillen and others directed the bulk of their attention (and anger) to EPA and the agency's supposed mishandling of the situation. Although Champion was almost certainly the source of dioxin contamination, representatives in Congress and from the community felt that EPA bore primary responsibility for failing to protect public health and the environment. This animosity toward EPA stemmed both from the years of frustration among Tennessee residents and politicians regarding the pollution of the Pigeon River and from the allegations then coming to light regarding EPA's relationship with the

stances and Control Act (TSCA) requesting that EPA regulate dioxins and furans from all known sources. See *EDF v. Thomas*, 657 F. Supp. 302 (D.D.C. 1987). At the time, bleaching pulp mills were not recognized as a source of these substances. By the time of the consent decree, of course, bleaching mills had been identified as a source of dioxins and furans, hence the requirement that EPA conduct the 104 mill study. The consent decree also required that EPA propose regulations under TSCA to control the disposal of pulp mill residual sludges and under the Clean Water Act to deal with discharges of dioxins and furans into surface waters. See POWELL, *supra* note 11, at 330.

87. See POWELL, *supra* note 11, at 330-31

88. For discussion of the cluster rule, see *infra* Part III.D.

89. Allegedly caused by the Champion International mill at Canton, N.C. and primarily affecting downstream residents in Tennessee, the dioxin issue in the Pigeon emerged out of a larger dispute concerning water pollution between the states of North Carolina and Tennessee, Champion International, and the EPA. For a detailed history, see RICHARD A. BARTLETT, *TROUBLED WATERS: CHAMPION INTERNATIONAL AND THE PIGEON RIVER CONTROVERSY* (1995).

paper industry and its stance on the dioxin issue. With such feelings of distrust permeating the hearings, there was little hope for balanced discussion.

In his opening remarks at the hearings, Representative Quillen, whose district included the Pigeon, charged that

the Environmental Protection Agency, has failed to discharge its duty. It has failed in its responsibility to protect our citizens and our river. This is why I asked for today's hearing, to get some answers to serious questions which have been raised, and which continue to be raised, about EPA's handling of this distressing situation.⁹⁰

Don Sundquist, another Congressman from Tennessee, weighed in with equal vehemence:

I want to know . . . why EPA has allowed [this] tragic environmental problem to escalate to obscenely hazardous proportions. It seems to me that EPA should have long ago been monitoring the water quality of the Pigeon River. It could have prevented the excessive, lethal, toxic pollution found in the Pigeon River today.⁹¹

EPA, of course, had only been aware of the *potential* for such a problem since 1985, and had only confirmed the presence of dioxin in the Pigeon in April 1988, three months prior to the hearings.⁹² To suggest that it could have acted to *prevent* the problem smacked of political posturing.

Still, given the revelations of the agency's cooperation with the paper industry on the dioxin issue, suspicions of agency foot-dragging and a certain pro-industry bias may have been justified. Others who testified at the hearing, such as Carol Van Strum of Greenpeace, provided damaging testimony regarding EPA's relationship with the API, bolstering earlier claims of agency misconduct. In her view:

EPA's handling of the pulp mill dioxin problem should be viewed in light of its traditional behavior: Leaked American Paper Institute documents . . . show that collusion remains the norm between EPA dioxin regulators and regulated industries . . . EPA's dioxin regulatory program is paralyzed and has been from the very beginning . . . More lives are at stake than just the lives of those who live near the Pigeon River.⁹³

90. *Pigeon River Hearing*, *supra* note 78, at 4.

91. *Id.* at 3.

92. See discussion of National Dioxin Study, *supra* notes 53-62 and accompanying text.

93. *Pigeon River Hearing*, *supra* note 78, at 139-40. See also the various EPA, API, and court documents included with Van Strum's statement supporting her claims of collusion between EPA and the API. *Id.* at 228-327.

For their part, EPA officials attempted to remind participants at the hearing that EPA had only recently become aware of dioxin contamination from pulp and paper mills, that North Carolina and Tennessee still retained primary responsibility for issuing discharge permits to mills such as Champion's, and that the so-called "collusion" between the agency and the API was little more than cooperation aimed at reducing the costs and time delays that would have burdened EPA if it had pushed ahead without such cooperation.⁹⁴ Representatives from the area were not persuaded. Jerry Clevenger, chairman of Tennessee's Cocke County Commission, left little doubt about his own feelings:

We are beginning to have serious doubts about the integrity of the Environmental Protection Agency. . . . The EPA has a mandate to protect the environment, not to compromise the beauty and cleanliness of any waterway, including the Pigeon River Several experts contend, and we believe, that allowing the continuous dumping of dioxin into the Pigeon River will constitute a death sentence for people who live along or nearby the river.⁹⁵

Jerry Wilde, president of the local Dead Pigeon River Council, charged that EPA's compromise with Champion represented more proof of the company's eighty-year license to pollute:

Over 80 years ago, the Pigeon River was sold to the highest bidder. Are people's health and welfare now being sold to the highest bidder? I call on you, members of Congress and of this committee, to ensure that the EPA does, in fact, protect our environment for us and our children and to see to it that the truth can no longer be hidden from the people.⁹⁶

While the bulk of the criticism at the hearing was directed at EPA, Champion also received some harsh words. As Tennessee representative Quillen pointed out,

it needs to be understood that the pollution of the Pigeon River began when the Champion Paper Co. started up its mill operations in Canton, NC, along the river 80 years ago. Since that time down to the present, this once lovely and sparkling clean mountain river has been transformed into a foul-smelling, foaming, sludge-filled mixture that looks like oily coffee and stinks like rotten eggs. This is how Champion makes its money What we in Tennessee are . . . demanding is that the Champion Paper Co. begin at long last to operate its Canton mill in a manner which does not continue to grossly pollute the Pigeon River and in a

94. See generally the testimony, statements, and questioning of EPA officials Bruce Barrett and Martha Prothro in *Pigeon River Hearing*, *supra* note 78, at 9-77.

95. *Id.* at 81.

96. *Id.* at 329.

manner which does not dump dioxin and other dangerous toxic compounds and chemicals into the river. We simply do not accept the destruction of the river and the present public health crisis as a routine part of the mill's operation.⁹⁷

Bob Seay of the Newport/Cocke County Chamber of Commerce expressed similar outrage:

Champion International Corp. has long ignored Appalachia. Mr. Andrew C. Ziegler, president of Champion International Corp., your day has come. The people have spoken. No longer will Cocke county tolerate your corporate behavior Don't attempt to hide behind the American Paper Institute or the EPA Cocke County says be a credible corporate citizen. Let the Pigeon live.⁹⁸

Representatives from Champion and from the API claimed in response that they were surprised by the high levels of dioxin found in the Pigeon River, emphasizing that their "industry [had] always been mindful of its environmental and health responsibilities."⁹⁹ In addition, they pledged to continue cooperating with EPA on the dioxin issue.¹⁰⁰ Soon they would be facing a massive class-action lawsuit.¹⁰¹ In the meantime, dioxin became a full-blown national obsession.

Indeed, less than six months after the Pigeon River hearings, Representative Henry Waxman of California convened his own set of hearings on the dioxin issue.¹⁰² Referring to dioxin as "one of the most toxic chemicals ever created,"¹⁰³ Waxman spoke of the fear spreading among the American public regarding the unseen dangers in consumer products: "Every day, it seems, we learn that something else causes cancer or is detrimental to our health. Now we learn that the dread chemical of Agent Orange and the chemical that forced the abandonment of Times beach, MO, is in baby diapers and milk cartons."¹⁰⁴ Waxman pointed to other pathways of contamination as well:

Valuable farm lands and the crops grown on them are contaminated with dioxin from the use of pulp mill sludge as a soil supplement. Fish downstream from pulp and paper mills are

97. *Id.* at 5.

98. *Id.* at 353. See also other statements from local citizens. *Id.* at 328-71.

99. *Id.* at 371-72.

100. See generally the testimony and statements of Red Cavaney, President of API and Richard Diforio, vice president at Champion. *Id.* at 371-98.

101. See *infra* Part III.C.

102. See *Dioxin Contamination Hearing*, *supra* note 56.

103. *Id.* at 1.

104. *Id.*

contaminated with dioxin flushed from mills during the manufacturing process. Concern is raised for those working in pulp and paper mills. While I understand there is continuing scientific disagreement over some characteristics of the dioxin risk, I do not believe anyone would argue that avoidable exposure to dioxin is acceptable So the question is being asked: Can we avoid exposure to the dioxins formed in pulp making and paper bleaching? Can the process be changed?¹⁰⁵

Members of the environmental community argued that the process could in fact be changed, that alternative bleaching procedures existed which could greatly reduce or even eliminate dioxin formation during pulp and paper making. The problem, in their view, rested largely with EPA's approach to the issue. Dr. Ellen Silbergeld from the Environmental Defense Fund, who was also a member of an expert panel convened by EPA's own Scientific Advisory Board to re-evaluate the carcinogenic risks of dioxins, noted that: "Fundamentally, we remain concerned that the reactive posture of regulatory agencies in this country perpetuate a situation which condemns us to catching up to situations of environmental, food and product contamination instead of preventing these and other ongoing sources of dioxins and related compounds."¹⁰⁶ In her view, moreover, it was not sufficient "to respond to [the] problem by developing a strategy that merely transfer[ed] risks from one vector to another."¹⁰⁷ New processes needed to be adopted that eliminated the problem altogether.¹⁰⁸

In principle, EPA seemed to agree with the goal of eliminating dioxin discharges from the industry. To that effect, the agency issued an interim strategy in September 1988 calling for aggressive action on dioxin discharges from pulp and paper mills.¹⁰⁹ By requiring states to adopt and enforce stringent water quality standards for dioxin, EPA sought to induce substantial reductions of

105. *Id.* at 2.

106. *Id.* at 3.

107. *Id.* at 5.

108. *Id.* at 5, 14-15. Janet Heiber of Greenpeace offered testimony on alternatives to chlorine bleaching then being used in Scandinavia. *See id.* at 143-144. *See also* U.S. OFFICE OF TECH. ASSESSMENT, TECHNOLOGIES FOR REDUCING DIOXIN IN THE MANUFACTURE OF BLEACHED WOOD PULP, OTA-BP-0-54 (1989).

109. *See* U.S. EPA, *Interim Strategy for the Regulation of Pulp and Paper Mill Dioxin Discharges to Waters of the United States*, Memorandum from Rebecca W. Hammer, EPA Acting Administrator for Water, to Water Management Division Directors and NPDES States Directors, Aug. 9, 1988. *Cited in* Kimberly M. Thompson & John D. Graham, *Producing Paper without Dioxin Pollution*, in *THE GREENING OF INDUSTRY: A RISK MANAGEMENT APPROACH* 229, 229-30 (John D. Graham & Jennifer Kassalow Hartwell eds., 1997).

dioxin discharges from existing point sources. For those states that failed to act, EPA threatened to apply its own standards. But EPA also noted that it was considering a reassessment of dioxin's cancer risk, effectively opening the door for states to develop their own risk estimates as a basis for establishing water quality standards. As a result, the dioxin standards adopted by those states with chlorine bleaching pulp mills varied by some three orders of magnitude.¹¹⁰

Of those states with the most permissive standards, nine out of eleven were in the South—the region which has dominated national pulp and paper production throughout the post World War II period.¹¹¹ In late 1989, Georgia became the first state to relax its dioxin standard, proposing a new standard—7.2 parts per quadrillion (ppq)—that was more than 500 times less stringent than EPA's suggested standard of 0.013 ppq.¹¹² Members of the environmental community expressed outrage and local newspapers suggested that the state was bowing to industry pressure.¹¹³ In March of 1990, the EPA notified Georgia that it would not approve the new standard and would impose its own criteria if Georgia did not revise the standard.¹¹⁴ Meanwhile, Maryland and Virginia began revising their standards, settling on a level of 1.2 ppq, which they arrived at by using the less stringent cancer potency estimates of the Food and Drug Administration and an "acceptable risk level" of 1 in 100,000 as opposed to 1 in 1,000,000 excess cancer deaths.¹¹⁵ Recognizing the uncertainty involved in such risk assessments and ignoring protests from environmentalists, EPA approved the Maryland and Vir-

110. See Thompson & Graham, *supra* note 109, at 230-33.

111. See Thompson & Graham, *supra* note 109, at tbl. 7.2 (identifying the states as Ala., Ark., Ga., La., Md., Miss., Tenn., Tex., and Va.). On the growth of the pulp and paper industry in the American South during the post World War II period, see William Boyd, *New South, New Nature: Regional Industrialization and Environmental Change in the Post-New Deal American South* (2002) (unpublished Ph.D. dissertation, University of California, Berkeley).

112. EPA's guidance criterion of 0.013 ppq came from the Agency's 1984 dioxin criteria document, *Ambient Water Quality Criteria for 2,3,7,8-Tetrachlorodibenzo-p-dioxin*. In that document, which summarized the science on dioxin toxicity up to that point, EPA recommended the water quality standard of 0.013 ppq for waters used as a source of drinking water and edible fish. See *NRDC v. U.S. EPA*, 16 F.3d 1395, 1399 n.3 (4th Cir. 1993). See also *Board of Natural Resources Adopts Dioxin Standard*, PR NEWswire, Mar. 29, 1990.

113. See Charles Seabrook, *Georgia Board of Natural Resources Tightens Dioxin Standard*, ATLANTA J. & CONST., Jan. 24, 1991, at D-6 (recounting the controversy over the Georgia dioxin standard).

114. *Id.*

115. Background information on the development of the Maryland and Virginia dioxin standards can be found in *NRDC*, 16 F.3d at 1398-99, in which the court rejected NRDC's challenge to EPA's approval of the Maryland and Virginia dioxin standards.

ginia standard as within the range of "scientific defensibility," even though it was some 90 times less stringent than EPA's recommended standard.¹¹⁶ Georgia and six other southern states (Ala., S.C., Miss., Tex., Ark., Tenn.) then adopted the new, "EPA approved" standard of 1.2 ppq.¹¹⁷ New Hampshire and New York were the only other states with similarly permissive standards.¹¹⁸ At the other end of the spectrum, Minnesota adopted a standard that was 100 times stricter than EPA's criteria.¹¹⁹ Most other states simply adopted EPA's criteria as their own standards.¹²⁰

As the controversy over state standards raged on, EPA also began releasing preliminary results from both the 104-mill study and from another study of dioxin concentrations in fish and wildlife.¹²¹ They were not encouraging, particularly for a number of paper mill towns in the South. In the fish study, which was part of a broader study on bio-accumulation of toxics in fish, EPA researchers found that dioxin concentrations in fish downstream from several southern pulp and paper mills greatly exceeded the FDA threshold of 25 parts per trillion (ppt).¹²² The highest level of contamination in the country, 180 ppt, was found in a particular species of fish—the creek chubsucker—downstream from Weyerhaeuser's mill at Plymouth, North Carolina.¹²³ The second highest concentration, 150 ppt, was found in carp living downstream from International Paper's Bastrop, Louisiana mill.¹²⁴ As

116. *Id.* at 1399.

117. See Thompson & Graham, *supra* note 109, at 230-33.

118. *Id.* at 231.

119. *Id.* at 233.

120. *Id.* at 231.

121. The final summary report was released in July 1990. See OFFICE OF WATER REGULATIONS & STANDARDS, U.S. EPA, SUMMARY REPORT ON U.S. EPA/PAPER INDUSTRY COOPERATIVE DIOXIN STUDY: THE 104 MILL STUDY (1990). The draft "fish study" was released in 1989. See OFFICE OF WATER REGULATIONS & STANDARDS, U.S. EPA, BIOACCUMULATIVE POLLUTANTS IN FISH - A NAT'L STUDY, Draft Report (1989). The final report was released in 1992. See OFFICE OF SCI. AND TECH., EPA, NAT'L STUDY OF CHEMICAL RESIDUES IN FISH, EPA 823-R-92-008a (1992). The overall conclusion that emerged from the 104-mill study and the broader study of chemical residues in fish was that dioxins in pulp and paper mill wastewater effluent represented the greatest public health concern. Pulp mill sludge, which was sometimes used as fertilizer on croplands, was identified not only as a secondary source of health concern, but also as a primary route of ecological concern. EPA did not consider dioxin in pulp and paper products to be a major risk, but rather "on the borderline of concern" and referred the issue to the FDA. See POWELL, *supra* note 8, at 355.

122. See 2 EPA Studies Confirm Threat to Fish of Dioxin From Paper Plants, N.Y. TIMES, Mar. 14, 1989, at C4.

123. *Id.*

124. *Id.*

TABLE 1. EPA LIST OF TWENTY PAPER MILLS ASSOCIATED WITH
ELEVATED CANCER RISKS FROM FISH CONSUMPTION
IN RECEIVING WATERS, 1990

<i>Company/Location</i>	<i>Cancer Risk</i>	<i>Fish Consumption Advisory</i>
International Paper Co., Georgetown, SC	2 in 100	Yes
Union Camp Corp., Franklin, VA	2 in 1000	No
Buckeye Cellulose, Perry, FL	2 in 1000	No
Weyerhaeuser Co., Plymouth, NC	2 in 1000	Yes
Westvaco Corp., Covington, VA	1 in 1000	Yes
Georgia-Pacific Corp., Palatka, FL	6 in 10000	No
International Paper Co., Moss Point, MS	3 in 10000	Yes
Temple-Eastex Inc., Evandale, TX	3 in 10000	No
Champion International, Canton, NC	2 in 10000	Yes
Georgia-Pacific Corp., Crossett, AR	2 in 10000	No
International Paper Co., Texarkana, TX	2 in 10000	No
International Paper Co., Jay, ME	1 in 10000	Yes
Boise Cascade Co., Rumford, ME	1 in 10000	Yes
St. Joe Paper Co., Port St. Joe, FL	1 in 10000	No
Boise Cascade Co., Derridar, LA	1 in 10000	No
Simpson Paper Co, Anderson, CA and Louisiana-Pacific Co., Samoa, CA	1 in 10000	Yes
Simpson Paper Co., Fairhaven, CA	1 in 10000	No
Weyerhaeuser Co., Cosmopolis, WA	1 in 10000	No
Weyerhaeuser Co., Everett, WA	1 in 10000	No
Leaf River Forest, New Augusta, MS	1 in 10000	Yes

Source: Press Release R-158, U.S. EPA, EPA Releases Risk Assessments for Eating Dioxin Contaminated Fish (Sept. 24, 1990).

for the 104-mill study, which measured dioxin concentrations in pulp mill effluent, the top eleven mills were all located in southern states.¹²⁵ International Paper's mill at Georgetown, South Carolina had the highest concentration of dioxin in its effluent, almost three times higher than the median for all mills where dioxin was found.¹²⁶

Based on these preliminary results, EPA developed a list of twenty mills throughout the country (sixteen of which were in the South) that presented significant cancer risks (more than 1 in 10,000) to those who regularly consumed fish from waters that re-

125. *Id.*

126. Dioxin concentration in the effluent at the Georgetown mill was 0.64 ppt. The median concentration for the mills where dioxin was measurable was 0.024 ppt. *See id.* *See also* Peter Applebome, *Town Agonizes Over Dioxin Levels*, N. Y. TIMES, Sept. 19, 1989, at A20.

ceived dioxins from the mills. In a 1990 press release summarizing the results, EPA ranked the mills by cancer risks (see Table 1).¹²⁷

For those who ate fish from the Sampit River and Winyah Bay downstream from International Paper's Georgetown mill, the health risks were hardly trivial. Indeed, according to the EPA, people who subsisted on a daily catch of fish from the Sampit faced an additional cancer risk of one in fifty over a seventy-year lifetime (EPA's "acceptable" cancer risk from food was one in one million).¹²⁸ Since fish and shellfish from the Sampit and Winyah Bay had long been a major source of protein for many of Georgetown's poorer and predominantly black population, the implications were quite serious. As Dr. Carl Schulz, a toxicologist from the University of South Carolina put it, "I'm not a rabid environmentalist . . . but I felt for this particular group of people in Georgetown, it's a very serious situation."¹²⁹

Most residents were confused and angry, particularly in light of the conflicting messages they were receiving regarding the health risks they faced. "I don't know which group of scientists is right," said Carol Winans, president of the local League of Women Voters, "but why should I take the risk?"¹³⁰ James Chandler, an environmental lawyer in the state, put the issue in somewhat broader context: "We've won some cases lately, and you think you're making some progress, then something like this comes along and you realize you didn't even know what the problem really was."¹³¹

In response, the industry mounted a systematic and very public challenge to EPA's findings, charging that the information released by the agency was misleading and confusing. Dr. Richard Phillips, staff vice president and director of process technology for International Paper, argued that

[t]he EPA risk assessment needlessly alarms local communities by issuing recommendations based upon old data and faulty assump-

127. Press Release R-158, U.S. Environmental Protection Agency, EPA Releases Risk Assessments for Eating Dioxin Contaminated Fish (Sept. 24, 1990).

128. U.S. EPA, RISK ASSESSMENTS FOR EATING DIOXIN-CONTAMINATED FISH (1990). See also Michael Weisskopf, *EPA Seeking to Reduce Dioxin in White Paper; Cancer Risk Said to Justify Mill Restrictions*, WASH. POST, May 1, 1990, at A8; Philip Shabecoff, *Government Says Dioxin Poses No Major Danger*, N.Y. TIMES, May 1, 1990, at A17. Shabecoff noted that EPA and FDA officials had concluded that dioxin levels in bleached pulp and paper products were so low as to present a "negligible" health risk, but that individuals who ate significant quantities of fish downstream from certain pulp and paper mills did have an elevated cancer risk. *Id.*

129. Applebome, *supra* note 126, at A20.

130. *Id.*

131. *Id.*

tions derived from incorrect and obsolete information. The suggestion that eating fish caught downstream from certain paper mills poses an increased cancer risk is not supported by what we consider to be the best available science and the most recent fish test data.¹³²

Phillips then pointed to research done by Dr. John Squire, a research scientist at Johns Hopkins University whose earlier work had served as the basis for EPA's estimates of the carcinogenic risks associated with dioxins. Based on more recent research, Squire had concluded that "dioxin poses no cancer risk to humans at any anticipated levels of exposure."¹³³ The science wars had begun.

B. *Science Wars*

Much of the controversy over dioxin science emerged from the 1990 Banbury Conference, where a new "consensus" was reached on the biological action of dioxins and dioxin-like compounds at the molecular level.¹³⁴ Drawing on research conducted since the mid-1980s, participants at the Banbury conference agreed that dioxin-like compounds gain entry into cells by binding to a particular protein on cells known as the "Ah receptor."¹³⁵ Some participants hypothesized that there might be a threshold level of dioxin exposure necessary to initiate the cascade of effects leading to cancer, concluding from this that low-level exposure to dioxin (such as that existing at background levels in the environment) posed a negligible cancer risk.¹³⁶ Others contested the notion that such biologically based models could be used to predict the cancer risks associated with dioxin.¹³⁷ There was no agreement, in other words, on what the new understanding of the receptor-based mechanism of action meant in terms of human health risks.¹³⁸ Yet, the Banbury

132. *International Paper Challenges EPA's Dioxin Risk Assessments*, BUS. WIRE, Sept. 25, 1990. Phillips also expressed frustration at the fact that EPA did not acknowledge the progress it had made at its Georgetown plant in reducing the dioxin levels in the mill's effluent. See George Lobsenz, *Paper Companies Dispute EPA Dioxin Risk Study*, UNITED PRESS INT'L, Sept. 27, 1990.

133. *International Paper Challenges*, *supra* note 132.

134. For a discussion of the Banbury Conference, see Leslie Roberts, *Dioxin Risks Revisited*, 251 SCI. 624, 624-26 (1991). See also Eliot Marshall, *Toxicology Goes Molecular*, 259 SCI. 1394, 1394-96 (noting that dioxin had become a test case for those interested in using molecular analysis to understand the biological mechanisms of carcinogenesis and to provide a basis for adjusting risk standards).

135. See Roberts, *supra* note 134. See also CROSBY, *supra* note 3, at 170-71.

136. See Roberts, *supra* note 134.

137. *Id.* See also Leslie Roberts, *More Pieces in the Dioxin Puzzle*, 254 SCI. 377 (1991).

138. See Roberts, *supra* note 134. The Banbury Conference stimulated controversy not simply because of the science. Shortly after the meeting, it was revealed that the Chlorine

conference did lend credibility to those inside and outside of EPA who had been calling for a reassessment of the dioxin cancer potency criteria used by the agency.¹³⁹

In January 1991, arguments in favor of a reassessment received additional support from a study of more than five thousand American chemical workers who had been exposed to dioxin on the job. This study suggested that, at low levels of exposure, dioxin might be a less potent carcinogen among humans than previously thought.¹⁴⁰ Here, it seemed, was the epidemiological data necessary to bolster the Banbury findings regarding the biological action of dioxin and the possibility that there might be a safe "threshold" dose.

Paper industry representatives seized on the results, demanding that EPA re-evaluate its dioxin risk assessment.¹⁴¹ Meanwhile, scientists within EPA also reiterated their concerns with the existing risk assessment for dioxin.¹⁴² In response, EPA Administrator William Reilly initiated a formal reassessment of dioxin risk in April 1991. Citing the new studies as an impetus for the reassessment, Reilly noted that "[t]here has been much speculation about the effect of these new developments on our revised dioxin risk assessment Some factors may decrease the level of concern. Others may result in estimates of increased risk."¹⁴³ Red Cavaney, president of the

Institute had sponsored the meeting and had hired a public relations firm to circulate a summary of the results claiming that a "consensus" had been reached on the biological basis for dioxin risk assessment. A number of participants, including Dr. Ellen Silbergeld of the University of Maryland, suggested that they had been "manipulated and misused" by the conference organizers. See *Flap Erupts Over Dioxin Meeting*, 251 Sci. 866 (1991).

139. In 1988, for example, a group of senior EPA scientists concluded that "reliance on the linearized model [of dose-response] may be less appropriate for TCDD than for many other chemicals, . . . and the model may overestimate the upper-bound on the risk by some unknown amount." John A. Moore et al., *The Dioxin TCDD: A Selective Study of Sci. and Policy Interaction*, in *KEEPING PACE WITH SCI. AND ENG'G* 229 (M. Uman ed., 1993).

140. The study was published in the *New England Journal of Medicine* and was directed by Marilyn Fingerhut of the National Institute for Occupational Safety and Health. It included virtually all chemical workers in the U.S. who were exposed to dioxin between 1942 and 1984, and was one of the largest such studies ever undertaken. For those men with high levels of exposure for more than one year (and whose exposure occurred at least twenty years prior to 1987), the death rate from cancer was 46% higher than would have been expected. For those with lower levels of exposure, however, the report found a cancer mortality rate that was equivalent to the general population. See M.A. Fingerhut et al., *Cancer mortality in workers exposed to 2,3,7,8-tetrachlorodibenzo-p-dioxin*, 324 NEW ENG. J. MED. 212, 212-18 (1991). For press reaction, see Karen Klinger, *Dioxin Does Not Appear Potent Cancer Agent*, UNITED PRESS INT'L, Jan. 24, 1991. See also Roberts, *supra* note 134, at 625.

141. *U.S. to Review Dioxin Risk Given New Studies*, N.Y. TIMES, Apr. 16, 1991, at C5.

142. See Roberts, *supra* note 134.

143. *U.S. to Review Dioxin Risk Given New Studies*, *supra* note 141.

API, applauded EPA's decision, charging that the existing assessment of dioxin risk was "too stringent, in light of all the evolving science that has come out."¹⁴⁴ Adding fuel to the fire, Dr. Vernon Houk, the assistant Surgeon General and Director of the Center for Environmental Health and Injury Control at the Centers for Disease Control in Atlanta, concluded that "[i]f it's a carcinogen, it's a very weak carcinogen and Federal policy needs to reflect that."¹⁴⁵ Houk, the government scientist who made the original decision to evacuate Times Beach, Missouri in the early 1980s, also suggested that, in hindsight, that decision was an error: "Given what we know now about this chemical's toxicity and its effects on human health, it looks as though the evacuation was unnecessary."¹⁴⁶

Members of the environmental community responded by arguing that the new studies supported the claim that dioxin was as dangerous as ever and suggested that the reassessment was politically motivated. Environmental Defense Fund scientist Dr. Ellen Silbergeld, who was also a professor of pathology at the University of Maryland School of Medicine in Baltimore, stated that "[n]othing that has been learned about dioxin since 1985 when EPA first published its risk assessment finding on dioxin in the environment supports a revision of science-based policy or action."¹⁴⁷ Speaking somewhat more directly to the issue of politics, Dr. Mary O'Brien, director of an Oregon non-profit research group focusing on dioxin, claimed: "What's being protected here is not people or the environment but industries favored by the Government. The Government begins with the assumption that these industrial activities have to go on and they adjust the data to make the existing pollution practices acceptable."¹⁴⁸

EPA Administrator Reilly, however, brushed off the criticisms and urged that all parties wait for the reassessment. Still, he more or less admitted to opening up a can of worms:

I don't want to prejudge the issue, but we are seeing new information on dioxin that suggests a lower risk assessment for dioxin should be applied. I know the stakes and [I know] that I'm unraveling something here. There is not much precedence in the Fed-

144. *Id.*

145. See Keith Schneider, *U.S. Backing Away from Saying Dioxin is a Deadly Peril*, N.Y. TIMES, Aug. 15, 1991, at A1.

146. *Id.*

147. *Id.*

148. *Id.*

eral establishment for pulling back from a judgment of toxicity. But we need to be prepared to adjust, to raise or lower standards, as new science becomes available.¹⁴⁹

Scheduled to take only a year, it took more than three to produce a draft.¹⁵⁰ Meanwhile, the dioxin debate raged on.

C. *Toxic Torts*

Well before EPA released the results of its reassessment, the dioxin controversy spilled over into the courtroom. During the early 1990s, plaintiffs' lawyers in several southern states rushed to file lawsuits against various pulp and paper firms for polluting waterways with dioxin which, the attorneys argued, endangered the health and diminished the property values of downstream residents.¹⁵¹ The action began in southern Mississippi with a 1991 case involving a mill at New August, Mississippi run by a Georgia Pacific subsidiary, Leaf River Forest Products, which Georgia Pacific had acquired as part of its 1990 takeover of Great Northern Nekoosa Corp (Leaf River's parent company).¹⁵² Previously, EPA had listed the Leaf River mill as having the fifth highest dioxin level in its effluent in the country and had included it as one of the top twenty mills posing "significant" cancer risks to people who regularly ate fish downstream from the mill.¹⁵³ As a result, the state of Mississippi had banned commercial fishing and catfish consumption along the river for some forty miles below the mill.¹⁵⁴ Wesley M. Simmons, a retired commercial fisherman who owned a recreational camp on the Leaf River thirty-seven miles below the mill, decided to sue Georgia Pacific for failing to warn him of the dioxin pollution in the river, diminishing the value of his property, and

149. *Id.*

150. *See infra* Part III.D.

151. For a discussion of some of the early lawsuits, particularly in Mississippi, see Nicholas Varchavar, *Muddy Waters*, AM. LAWYER, July-Aug. 1993, at 52. *See also* Paul Kemezis, *Lawsuits Could Mount for Papermakers*, CHEM. WEEK, Feb. 13, 1991, at 24.

152. Procedural history of the initial lawsuit by Wesley Simmons is discussed in *Leaf River Forest Products, Inc. v. Simmons*, 697 So. 2d 1083 (Miss. 1996).

153. *See* Varchavar, *supra* note 151, at 57.

154. Upon discovering dioxin in the effluent and sludge produced by the Leaf River mill, the Mississippi Department of Wildlife and Fisheries closed the Leaf, Pascagoula, and Escatawpa Rivers (all of which received waste water from the Leaf River Mill) to commercial fishing from October 1991 to January 1991, and issued consumption advisories for fish caught from the Leaf and Pascagoula Rivers. The state subsequently lifted the consumption advisory for the Pascagoula River in December 1990, but not for the Leaf River. Background information can be found in *Leaf River Forest Products, Inc. v. Ferguson*, 662 So. 2d 648, 650-51 (Miss. 1995).

causing him emotional distress because of the *fear* of future disease that came from years of eating contaminated fish.¹⁵⁵

Simmons' lawyer, John Deakle of Hattiesburg, Mississippi, a man so tenacious "he'd fight a circle saw" according to one acquaintance, effectively turned the case into a moral crusade against Georgia Pacific.¹⁵⁶ Playing off local populist sentiments, Deakle used company and industry documents, including the API documents recovered by Greenpeace, to paint a picture of a greedy corporation willing to trade pollution for profits. "Take the profit out of what they have done to the river," Deakle pleaded with the jury, "your vote can make a difference."¹⁵⁷ He then asked the jury to award his plaintiff compensatory damages for nuisance and trespass and some \$70 million in punitive damages.¹⁵⁸ In reaching its verdict, the jury rejected Deakle's emotional distress argument, but did award Simmons more than \$40,000 in compensatory damages for nuisance, trespass, and loss of property value and some \$1 million in punitive damages.¹⁵⁹ Although Georgia Pacific immediately appealed, the verdict sent shock waves through the industry as major firms began to fear a potential avalanche of asbestos-style lawsuits seeking massive damages.¹⁶⁰ The highly uncertain, emotionally charged world of toxic torts was not a place where these firms wanted to be.

By February 1991, such fears seemed to be materializing. More than 7,000 individual cases had been filed in four Mississippi counties alone.¹⁶¹ Deakle himself, who had started with only a handful of clients, was suddenly representing some 6,000 plaintiffs, including more than a thousand who had filed claims against a nearby International Paper mill.¹⁶² Plaintiffs from other states soon began to file similar lawsuits. The floodgates had opened.

Up in Tennessee, J.A. and Joan Shults, who lived on the Pigeon River, filed a class-action lawsuit on behalf of several thousand local property owners against Champion International.¹⁶³ They asked

155. Simmons' claims are discussed in *Simmons*, 697 So. 2d at 1083-86. See also Varchavar, *supra* note 151, at 57-59.

156. See Varchavar, *supra* note 151, at 55.

157. *Id.* at 57.

158. *Id.* at 58.

159. Figures are reported in *Simmons*, 697 So. 2d at 1083.

160. See Kemezis, *supra* note 151, at 24.

161. *Id.*

162. Varchavar, *supra* note 151, at 59.

163. J.A. Shults & Joan Shults v. Champion Int'l Corp., 821 F. Supp. 517 (E.D. Tenn. 1992). For a discussion of the case, see BARTLETT, *supra* note 89, at 265.

for \$5 billion, alleging that Champion's pollution had diminished the value of their property, disrupted their lives, and threatened them with cancer. Coming on the heels of the 1988 Pigeon River hearings, this was a power play that had the potential to propel dioxin litigation into the big leagues.¹⁶⁴ The plaintiffs' attorneys pulled out all the stops—charging, for example, that Champion's conduct was “so outrageous in character and so extreme in degree as to go beyond all possible bounds of decency and must be regarded as atrocious and utterly intolerable in a civilized society.”¹⁶⁵ It would take another twenty-one months before the case would go to trial.¹⁶⁶

Meanwhile, John Deakle took his second Leaf River case against Georgia Pacific to trial.¹⁶⁷ Initially, he was joined by another group of plaintiffs, though Georgia Pacific quickly and quietly settled with this group for an undisclosed sum.¹⁶⁸ On his own, Deakle pursued the same basic strategy he used in the Simmons case. But this time he wanted to make the emotional distress argument stick. To that effect, one of his plaintiffs, Thomas Ferguson, offered some rather emotional testimony. Georgia Pacific, Ferguson claimed,

took my rights away from me. I can't swim where I want to swim no more. I can't fish. I can't do lots of things. And got me worried about cancer. They've got a sign out there from the Mississippi Wildlife that says don't eat fish out of these waters, it's contaminated with dioxin and causes cancer. But I've ate hundreds of pounds of fish unbeknowing that it had dioxin . . . It gets you worried and shakes you up and makes you break down.¹⁶⁹

Despite the fact that Ferguson admitted under cross-examination that he was not sick and had never been tested for dioxin, the jury awarded him and his wife \$90,000 each for emotional distress, \$10,000 for nuisance and \$3 million in punitive damages.¹⁷⁰ This was the second favorable plaintiffs' judgment in a dioxin case against a pulp and paper mill in little more than a year. Again, Georgia Pacific appealed.¹⁷¹ The message seemed clear, however.

164. See BARTLETT, *supra* note 89, at 265.

165. *Id.* at 266.

166. *Id.*

167. Lead plaintiffs were Thomas and Bonnie Jane Ferguson. For background, see *Leaf River Forest Products, Inc. v. Ferguson*, 662 So. 2d 648, 650-51 (Miss. 1995).

168. Varchavar, *supra* note 151, at 69.

169. *Id.* at 61.

170. *Id.* at 63.

171. *Id.* at 64.

There was money, perhaps a great deal, in these toxic tort cases.

The following March, less than three months after Deakle won his second trial, a group of lawyers filed a \$100 billion class-action lawsuit in Texas seeking damages from thirty-three pulp and paper firms and the API for "dioxin poisoning."¹⁷² This was such an excessive claim that the suit was withdrawn the following month. Yet it suggested the extremes to which plaintiffs' attorneys might push the issue.¹⁷³ From the perspective of industry executives, the situation was threatening to spin out of control.

The swelling tide of litigation gave added urgency to the Pigeon River lawsuit slowly working its way to trial in east Tennessee. In contrast to Deakle's cases, the Pigeon River case would be tried in federal district court, giving it greater visibility and added weight. The financial stakes were also considerably higher, with some 2,600 plaintiffs seeking \$5 billion in damages.¹⁷⁴ The paper industry did not want to lose this one, and they worked hard during pretrial maneuvers to limit the scope of the trial.¹⁷⁵

Their efforts paid off. By the time the case went to trial in September 1992, the damage claims had been reduced to \$2.9 million in compensatory damages and \$365 million in punitive damages.¹⁷⁶ More important, Champion's attorneys also succeeded in getting the judge to throw out all emotional distress claims and, by invoking the statute of limitations, to restrict any damages to the period after January 1988 (three years before the case was filed).¹⁷⁷ Finally, they restricted the issues before the court to charges of trespass (by pollution rather than people) and nuisance.¹⁷⁸

Referring to the company as "an arrogant power run amok," Don Barrett, the lead plaintiffs' attorney, opened the trial by arguing that "[t]his whole case can be summed up in a few words—pollution for profit."¹⁷⁹ Champion's attorneys responded by arguing that pollution *per se* was not the issue.¹⁸⁰ Rather, they steadfastly maintained that the question was whether or not the plaintiffs had

172. See *\$100 Billion Suit Accuses Paper Firms of Dioxin Poisonings*, L.A. TIMES, Mar. 6, 1992, at D4.

173. *Id.* See also *Class-Action Lawsuit Dropped*, HOUSTON CHRON., Apr. 3, 1992, at C13.

174. BARTLETT, *supra* note 89, at 265-66.

175. *Id.* at 266-68.

176. *Id.* at 268.

177. *Id.*

178. *Id.*

179. *Id.* at 269.

180. *Id.*

suffered any diminution of property values because of Champion's actions.¹⁸¹ Champion attorneys also emphasized all of the scientific uncertainties associated with dioxin and the disagreements among scientists about its toxicity and cancer potency.¹⁸² Finally, Champion vice president Richard DiFlorio testified that the mill had complied with all rules and regulations, that, in his view at least, "the problem [was] aesthetic,"¹⁸³ and that the mill was in the midst of switching to a bleaching process that used less chlorine and therefore reduced the dioxin load in the mill's effluent.¹⁸⁴

In closing arguments, Champion attorney Louis Woolf claimed that the charges against Champion consisted of "[r]umors, gossip, and hearsay" and implied that the plaintiffs were simply after money they did not really deserve.¹⁸⁵ Plaintiffs' attorneys responded with an equally predictable argument—invoking the story of David and Goliath and asking the jury to "render a verdict that will cause Champion and all other Champions of this country to shudder in their boardrooms."¹⁸⁶ After three and a half days of deliberation, the jury could not reach a verdict, and the judge declared a mistrial.¹⁸⁷ For the time being, Champion had dodged a bullet. Rather than face another trial, the company decided to settle. In March 1993, Champion agreed to pay \$6.5 million to the plaintiffs.¹⁸⁸ In exchange, the court barred all further trespass, nuisance, and personal injury claims against Champion pertaining to any actions of the company prior to the date of the settlement.¹⁸⁹ This case was closed.

In the months and years that followed, there were other dioxin lawsuits and settlements. In June 1993, Kimberly-Clark Corporation agreed to pay \$6.5 million to settle a class-action lawsuit involving dioxin contamination from its pulp and paper mill in Coosa Pines, Alabama.¹⁹⁰ Three years later, Champion was back in the news, paying out \$5 million to settle with a class of Alabama plaintiffs for property damage resulting from dioxin-contaminated effluent

181. *Id.*

182. *Id.* at 272-73.

183. *Id.* at 272.

184. *Id.*

185. *Id.* at 273

186. *Id.*

187. *Id.*

188. *Id.* at 274.

189. *Id.* at 274-75.

190. See *\$6.5 Million Settlement Announced in Dioxin Case*, MEALEY'S LITIG. REPORTS: TOXIC TORTS 2, No. 7, July 1, 1993.

from one of its mills.¹⁹¹ As in Tennessee, under the terms of the Alabama settlement, Champion admitted no wrongdoing or liability and was released from all further liability for property damages stemming from the mill's discharge prior to the date of the settlement.¹⁹² These settlements, while not insubstantial, were a far cry from the massive damages that plaintiffs had sought in the early nineties.

Meanwhile, back in Mississippi, things were not going so well for John Deakle. In 1995, the Mississippi Supreme Court reversed the \$3.2 million judgment in the *Ferguson* case, refusing to recognize the emotional distress claims as compensable torts under Mississippi law and rejecting the nuisance claims for lack of proof.¹⁹³ Then, in June 1996, a Mississippi circuit court judge dismissed four dioxin suits brought by Deakle and others against International Paper on behalf of more than 1,800 plaintiffs.¹⁹⁴ The following month the same judge dismissed 206 suits brought by Deakle and others against Georgia Pacific's Leaf River mill on behalf of some 5,400 plaintiffs.¹⁹⁵ In December 1996, the Mississippi Supreme Court reversed the \$1.047 million judgment that Deakle had won for his original plaintiff, Wesley Simmons, in 1990.¹⁹⁶ Based on the court's holdings in these cases, the defendant pulp and paper companies won summary judgment in several other dioxin cases.¹⁹⁷

In the end, the great toxic tort bonanza that John Deakle and

191. See *\$5 Million Settlement Approved in Dioxin Property Damage Action*, MEALEY'S LITIG. REPORTS: EMERGING TOXIC TORTS 5, No. 4, May 31, 1996.

192. *Id.*

193. *Leaf River Forest Prods., Inc. v. Ferguson*, 662 So. 2d 648 (Miss. 1995). In rejecting claims for both negligently and intentionally inflicted emotional distress, the court stated emphatically that it had "never allowed or affirmed a claim of emotional distress based on a fear of contracting a disease or illness in the future, however reasonable." *Id.* at 658. Pointing to the failure of the plaintiffs to offer any proof that they had actually been exposed to dioxin from the Leaf River mill, the court refused to create such a tort out of the facts of the *Ferguson* case. *Id.* at 657-60. See also *Emotional Distress Claims Rejected in Mississippi Exposure Action*, MEALEY'S LITIG. REPORTS: TOXIC TORTS 4, No. 15, Nov. 3, 1995.

194. See *Mississippi Judge Dismisses Last of Dioxin Suits Against International Paper Co.*, TOXIC CHEMS. LITIG. REP., Aug. 6, 1996 at 23,489.

195. *Id.*

196. *Leaf River Forest Prods., Inc. v. Simmons*, 697 So. 2d 1083 (Miss. 1996). Here the court relied on its holding in the *Ferguson* case to dismiss plaintiff's emotional distress and nuisance claims. In rejecting Simmons' trespass claims, the court found that Simmons had failed to meet the burden of proving an actual physical invasion of his property by dioxin discharged from a mill located forty miles upstream. *Id.* at 1085-86.

197. See, e.g., *Prescott v. Leaf River Forest Prods., Inc.*, 740 So. 2d 301 (Miss. 1999) (affirming summary judgment for the defendants); *Herrington v. Leaf River Forest Prods., Inc.*, 733 So. 2d 774 (Miss. 1999) (same); *Angaldo v. Leaf River Forest Prods., Inc.*, 716 So. 2d 543 (Miss. 1998) (same).

others had hoped for turned out to be somewhat of a bust. Scientific uncertainty over the nature of the harm associated with dioxin exposure and the concomitant difficulties in proving causation in the absence of any illness severely limited the viability of personal injury claims under theories of negligence and strict liability. Given the absence of a clearly established causal link between dioxin exposure and serious illness, plaintiffs pursued their personal injury claims in the tenuous world of emotional distress for fear of future illness. At the same time, while the trespass and nuisance claims for damages from dioxin contamination of property proved more viable, these legal doctrines had inherent limits as vehicles for the kind of massive self-sustaining tort litigation that has characterized the asbestos area. As a result of these various legal and factual limitations, dioxin pollution from pulp and paper mills failed to ripen into the kind of toxic harm that can find significant purchase in the tort system. Not surprisingly, paper company executives who once feared a litigation explosion that might threaten the solvency of their firms moved on to other concerns.

Still, the *potential* of substantial asbestos-like liability in the wake of the initial victories of the early 1990s had two important effects on pulp and paper firms. First, it reinforced incentives to implement new procedures that used less chlorine in the bleaching process in order to demonstrate "progress" in dealing with the problem. If corporations could show that they were not only meeting state and/or federal standards for dioxin, but also modernizing their mills to reduce their dioxin loads, they might have a stronger case.¹⁹⁸ For the most part, this involved substituting chlorine dioxide for elemental chlorine in the bleaching process.¹⁹⁹ Beginning in the late 1980s and accelerating during the early 1990s, pulp and paper firms began voluntarily adopting chlorine dioxide as their prin-

198. For example, in *Ferguson*, Georgia-Pacific personnel testified that the company had made a concerted effort to reduce dioxin pollution from the Leaf River mill during the early 1990s largely through substitution of chlorine dioxide for chlorine as the principal bleaching agent used at the mill. See 662 So. 2d at 654 (recounting the testimony of Warren Richardson and Acker Smith). For a discussion of the difficulties involved in using the regulatory compliance defense in the products liability area, see Robert L. Rabin, *Reassessing Regulatory Compliance*, 88 GEO. L.J. 2049 (2000).

199. For a discussion of bleaching technologies and the benefits of substituting chlorine dioxide for elemental chlorine as a bleaching agent, see U.S. EPA, PROFILE OF THE PULP AND PAPER INDUSTRY 30-35 (1995); U.S. EPA, SUMMARY OF TECHNOLOGIES FOR THE CONTROL AND REDUCTION OF CHLORINATED ORGANICS FROM THE BLEACHED CHEMICAL PULPING SUBCATEGORIES OF THE PULP AND PAPER INDUSTRY (1990).

cipal bleaching agent.²⁰⁰ As a result, dioxin levels in their effluent began to decline. Between 1988 and 1993, for example, the discharge of 2,3,7,8, TCDD (dioxin) in effluent from bleached pulp and paper mills declined from 201 grams per year to 71 grams per year.²⁰¹ By 1995, bleaching mills had further reduced the dioxin discharges in their effluent to 16 grams per year.²⁰² Firms involved in dioxin litigation were quick to use this as evidence of how promptly they had responded to the problem.²⁰³

The potential liability associated with dioxin litigation also impacted the politics surrounding dioxin science. At the same time that they were making process improvements to reduce their chlorine use, pulp and paper firms involved in dioxin litigation also sought to emphasize the scientific uncertainty surrounding dioxin.²⁰⁴ During the major court battles, industry advocates constantly pointed to the disagreements among reputable scientists about dioxin's cancer potency.²⁰⁵ Likewise, industry experts also testified to the lack of any significant evidence of increased cancer risk in people exposed to dioxin downstream from pulp and paper mills.²⁰⁶ By emphasizing such uncertainty, the industry hoped to cast doubt on some of the arguments being made by the opposition, particularly in the area of causation. Scientific uncertainty, in

200. By 1994, chlorine dioxide usage (in tons) exceeded elemental chlorine usage in the bleaching process. U.S. EPA, PROFILE OF THE PULP AND PAPER INDUSTRY, *supra* note 199, at 33.

201. See U.S. EPA, SOURCES OF DIOXIN-LIKE COMPOUNDS IN THE UNITED STATES, tbl. 8-3 (2000).

202. *Id.* According to the American Forest & Paper Association, the new industry trade association created through the merger of the American Paper Institute and the American Pulp and Paper Association, the industry spent some \$1 billion on dioxin reduction measures between 1988 and 1992. See Cindy Skrzycki, *Pulp Friction: The EPA's Tussle Over Paper Pollutant Rules*, WASH. POST, Apr. 11, 1997, at G1.

203. See, e.g., the discussion of the testimony by Georgia Pacific personnel in *Ferguson*, 662 So. 2d at 654 (Miss. 1995).

204. See, e.g., BARTLETT, *supra* note 89, at 271-72 (discussing efforts by defendants to emphasize the uncertainties endemic to dioxin science).

205. *Id.*

206. In *Ferguson*, former EPA Administrator Lee M. Thomas testified for the defense that there were no data showing dioxin to be a human carcinogen. Dr. John Doull, professor of toxicology and pharmacy at the University of Kansas, also testified that there was no evidence suggesting the people living downstream from bleaching pulp and paper mills had any reason to fear contracting cancer from dioxin exposure. See 662 So. 2d at 656. Finally, Dr. Renate Kimbrough, an expert in public health and epidemiology who had worked for the CDC, the FDA, and the EPA, testified to the lack of any convincing evidence showing excess cancer rates in people exposed to dioxin at concentrations several times higher than that alleged to be present in the Leaf and Pascagoula Rivers. See *id.*

short, could be exploited as effectively in the courtroom as in the regulatory arena.

D. *Dioxin Science and the Regulatory Process*

By the mid-1990s, with dioxin litigation waning, attention shifted back to the regulatory arena. In September 1993, the Natural Resources Defense Council and fifty-five other environmental groups filed a petition under the Clean Water Act demanding that EPA ban all dioxin discharges by the pulp and paper industry by prohibiting the use chlorine in the bleaching process.²⁰⁷ Three months later, EPA proposed effluent rules for dioxin discharges from pulp and paper mills as part of a larger "cluster rule" containing air and water standards for the industry—the Agency's first attempt at "multi-media" regulation.²⁰⁸ The proposed dioxin rules called for total chlorine free (TCF) bleaching only at sulfite mills,²⁰⁹ a small subset of the industry. For the other mills, the proposed rules called for substitution of chlorine dioxide for chlorine combined with oxygen delignification—a process that further reduced chlorine use in the bleaching process.²¹⁰ According to EPA estimates, compliance with the proposed rules (including those for air emissions) would cost the industry \$3.84 billion, result in closure of eleven to thirteen mills, and lead to a loss of between 2,880

207. POWELL, *supra* note 11, at 343.

208. The proposed rules were announced in December 1993, formally satisfying one of EPA's major obligations under the 1988 consent decree that resolved the Agency's litigation with the Environmental Defense Fund and the National Wildlife Federation over the regulation of dioxin from pulp and paper mills. Pursuant to its authority under the Clean Water Act and the Clean Air Act, EPA proposed the new regulations with the express purpose of "reduc[ing] the discharge of water pollutants and emissions of hazardous air pollutants from the pulp, paper, and paperboard industry, not just with end-of-pipe and add-on controls, but also by eliminating or reducing the formation of these pollutants." See Effluent Limitations Guidelines, 58 Fed. Reg. 66,078, 66,078 (Dec. 17, 1993) (codified at 40 C.F.R. pts. 63, 430).

209. Sulfite mills, which accounted for approximately four percent of U.S. pulping capacity in the mid-1990s, rely on an acid solution of sulfurous acid and bisulfate ions in the pulping process. In contrast, Kraft or sulfate mills, which use a sodium-based alkaline pulping solution, accounted for roughly 80% of US pulping capacity during this time. Sulfite pulps generally have less color than kraft pulps and thus can be more easily bleached. See U.S. EPA, PROFILE OF THE PULP AND PAPER INDUSTRY, *supra* note 199, at 22-23. See Effluent Limitations Guidelines, *supra* note 208, tbl. IV.A-2 (summarizing proposed regulations regarding bleaching technology for the various segments of the pulp and paper industry).

210. See Effluent Limitations Guidelines, 58 Fed. Reg. 66,085, tbl. IV.A-2.

and 10,700 jobs.²¹¹ Dioxins and related compounds generated by the industry would subsequently be reduced by more than three hundred grams per year in wastewater effluent, a reduction of ninety percent from existing levels.²¹²

The industry quickly responded with its own estimates of compliance costs that were much higher than those of EPA. According to the American Forest & Paper Association, the successor to the API, compliance with the new rules would shut down thirty mills, cost \$10 billion in capital expenditures, and eliminate 27,500 jobs, including 19,000 at the mill level.²¹³ Luke Popovich, a spokesman for the American Forest & Paper Association, claimed that the new cluster rule was "likely to be the costliest regulatory program ever imposed on a single industry by the EPA."²¹⁴ Not surprisingly, during the comment period on the proposed rules, pulp and paper industry advocates flooded the EPA with data supporting their contention that any move to eliminate chlorine altogether from the bleaching process could not be justified on an economic basis.²¹⁵ Environmental groups, on the other hand, criticized the proposed rules as too lenient and urged that the government require total chlorine-free bleaching.²¹⁶ EPA went back to the drawing board, and the debate raged on for the better part of four years.

1. EPA's dioxin risk assessment.

Meanwhile, in 1994, EPA released the first external draft of its highly anticipated dioxin risk reassessment.²¹⁷ Based on three years of work by more than a hundred scientists from inside and outside of EPA, several public meetings, and an extensive peer-review process, the 2,400-page report was widely considered to be the most thorough assessment of dioxin risks to date (and one of the most thorough assessments ever made of any toxic compound).²¹⁸ The

211. See Kelly H. Ferguson & Kirk J. Finchem, *The 'Cluster Rule' Continues: Industry Asks, What Now?* PULP & PAPER, Nov. 1997, at 39-41.

212. See Effluent Limitations Guidelines, 58 Fed. Reg. 66,130-31.

213. See Ferguson & Finchem, *supra* note 211, at 39-41; Bill Nichols, *EPA's Proposed Cluster Rules Shape U.S. Paper Industry's Near Future*, PULP & PAPER, Sept. 1994, at 75-85.

214. See *Paper Industry Braces for Costly Anti-Pollution Rules*, ATLANTA J. & CONST., Oct. 29, 1993.

215. Ferguson & Finchem, *supra* note 211, at 40.

216. *Id.*

217. EPA HEALTH ASSESSMENT DOCUMENT FOR 2,3,7,8-TCDD, *supra* note 7.

218. For background information on the reassessment process, see Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD, dioxin), 59 Fed. Reg. 46,980 (Sept. 13, 1994). See also Jeff Johnson, *Dioxin Risk: Are We Sure Yet?*, 29 ENVTL. SCI. & TECH. 24 (1995)

report's major findings were not encouraging, particularly for those who had previously advocated the reassessment on the presumption that dioxin's risks had been overstated. Indeed, not only did the draft report reaffirm dioxin's status as a "probable" human carcinogen, but it also pointed to a variety of other non-cancer health effects that were far greater than previously expected.²¹⁹ These included various reproductive and developmental effects, disruption of the endocrine system, immunotoxicity, and several other potential metabolic and hormonal disturbances.²²⁰ Some of these effects were thought to happen at or close to background exposure levels.²²¹

In a departure from previous assessments, EPA also included other "dioxin-like" compounds in the reassessment. The argument for doing so stemmed from the fact that these chemically related compounds (such as furans and polychlorinated bi-phenyls or PCBs) operated in a similar manner to dioxin at the molecular level (primarily by binding to the Ah receptor). Scientists from EPA and elsewhere thus argued that all of these compounds should be evaluated together for their cumulative effects. Doing this required that the potency of each compound be measured or estimated and given a toxic equivalency factor or TEF ranking relative to 2,3,7,8-TCDD, which would have a TEF of one.²²² On this basis, the agency then developed an overall index of public health risks associated with aggregate exposure to these compounds. Although somewhat controversial, this represented an important step towards a more complete risk assessment and one that better reflected "real-world" conditions.

The report noted that hazardous and municipal waste incinerators accounted for the majority of releases to the environment.²²³

(noting that the 1994 reassessment represented the most comprehensive examination of dioxin and dioxin-like compounds undertaken by the EPA up to that point).

219. On the issue of dioxin's carcinogenicity, the draft report concluded that "[i]n summary, publication of additional studies of human populations exposed to dioxin and related compounds since the last EPA assessment has strengthened the inference, based on all the evidence from mechanistic, animal, and epidemiologic studies, that these compounds are appropriately characterized as probable human carcinogens." See EPA HEALTH ASSESSMENT DOCUMENT FOR 2,3,7,8-TCDD, *supra* note 7, at 9-42.

220. *Id.* at 9-43 to 9-51.

221. *Id.*

222. Potency was determined largely by the number and position of chlorine or bromine atoms on the dioxin-like molecule, which correlated with the relative ability of the compound to bind to the Ah receptor, the critical step in mediating the "toxic end points" of this class of compounds. *Id.* at 9-68.

223. *Id.* at 9-10 to 9-11.

Pulp and paper bleaching was listed as a source, though not of the same magnitude as incinerators.²²⁴ Given the importance of incineration as a source, atmospheric deposition was considered to be the major vector of environmental transport, while food intake (particularly fish, beef, pork, and chicken) appeared to be the most important pathway for human exposure.²²⁵ Background levels in the general population were estimated to be between forty and sixty ppt when all dioxins, furans, and PCBs were included.²²⁶ High-end estimates of the body burdens for the top ten percent of the general population were possibly three times higher than the average.²²⁷ Overall, EPA estimated that the average "body burden" of dioxins and dioxin-like compounds in the general population resulted in an additional cancer risk of one in ten thousand to one in one thousand per year.²²⁸ In other words, based on these estimates current "background" levels of exposure were already posing additional cancer risks that were substantially higher than the one in one million threshold that EPA considered "acceptable."²²⁹ Moreover, a variety of non-cancer effects were also thought to occur at background levels of exposure.²³⁰

Although the draft report did not point to any significant differences in exposure rates due to ethnicity, socio-economic status or geographic location, it did identify several potential "highly exposed populations."²³¹ Breast-feeding infants constituted one such group.²³² Due to the levels of dioxins and dioxin-like compounds in mother's milk, nursing infants received between four and twelve percent of their total lifetime intake during the first year of life.²³³ This finding was particularly disturbing in light of the fact that developing infants are considered to be far more sensitive to dioxins and dioxin-like chemicals than older people.²³⁴ Given the cumula-

224. *Id.* at 9-9.

225. *Id.* at 9-12.

226. This was the equivalent of 40-60 picograms of dioxin Toxic Equivalence per gram of lipid. *Id.* at 9-76.

227. *Id.*

228. *Id.* at 9-85.

229. *Id.*

230. *Id.* at 9-86. As noted previously, major non-cancer effects included various reproductive and developmental effects, disruption of the endocrine system, immunotoxicity, and several other potential metabolic and hormonal disturbances. *Id.* at 9-43 to 9-51.

231. *Id.* at 9-18.

232. *Id.* at 9-18 to 9-20.

233. *Id.* at 9-19.

234. *Id.* at 9-19 to 9-20. See also COLBURN ET. AL., *supra* note 14, at 118-20 (citing animal studies documenting heightened sensitivity to dioxin exposure at prenatal and

tive effects of these substances, early exposure might also influence later susceptibility to dioxin toxicity.²³⁵ Other highly exposed subpopulations identified by the report included workers exposed in occupational settings and industrial accidents, people who lived near discrete local sources, and subsistence fishermen who consumed large amounts of fish from areas where dioxin concentrations in the fish were high.²³⁶ Although the data were spotty, several studies of subsistence fishermen around the world reported levels of dioxins and dioxin-like compounds in their blood that were three to twenty times higher than the average background levels for the general population.²³⁷

On the whole, then, the reassessment confirmed dioxin's status as one of the most potent toxicants ever studied and suggested that current levels of exposure created a human health hazard. This was obviously not what industry representatives had hoped for when they asked for the reassessment in 1991. Predictably, industry advocates, along with non-EPA scientists, criticized the findings. One group of scientists assembled by the American Forest & Paper Association argued that EPA did not have "sufficient scientific evidence" to reach its "alarming conclusion" regarding the existence of adverse health effects at or near current background body burden levels.²³⁸ Along somewhat similar lines, a report issued by the French Academy of Sciences seemed to directly contradict the EPA report, concluding that "[c]ontrary to popular opinion, there is no evidence to suggest that dioxins and their related compounds constitute a major risk to public health."²³⁹ Citing the French work as well as a draft review of EPA's reassessment conducted by the agency's own Scientific Advisory Board, one toxicologist suggested in a Wall Street Journal op-ed piece that EPA's reassessment had been compromised by politics from the start.²⁴⁰ "Like asking a fox to design the building specifications for the chicken coop," she

postnatal stages of development). This suggests that the timing of the dose might turn out to be as important as the dose itself in determining the risks of adverse health effects over an average lifetime.

235. EPA HEALTH ASSESSMENT DOCUMENT FOR 2,3,7,8-TCDD, *supra* note 7, at 9-67.

236. *Id.* at 9-18 to 9-22.

237. *Id.* at 9-20 to 9-22.

238. Env'tl. Dioxin Risk Characterization Expert Panel, *EPA Assessment Not Justified*, 29 ENVTL. SCI. & TECH. 31 (1995).

239. Cited in Allison Lucas et al., *Health Studies Raise More Questions in Chlorine Debate*, CHEM. WEEK, Dec. 21-28, 1994, at 26.

240. Kathryn E. Kelly, *Cleaning Up EPA's Dioxin Mess*, WALL ST. J., June 29, 1995, at A16.

noted, "asking EPA to conduct scientific research and then regulate objectively on the basis of those results creates a hopeless conflict of interest."²⁴¹ She then charged that "[m]uch of EPA's flawed position on dioxins has been based on internal research, much of which has not met international standards for scientific review."²⁴² In response, EPA Assistant Administrator Dr. Robert Huggett noted that much of the science incorporated in the report was not performed by EPA but instead came from peer-reviewed literature from around the world and that EPA's own science had in fact been subjected to rigorous external peer-review, involving hundreds of scientists from outside the agency.²⁴³

Members of the environmental community generally praised the reassessment. Some also clearly relished the fact that the results had not turned out as the original advocates of the reassessment had hoped. Peter deFur, a toxicologist with the Environmental Defense Fund, suggested that "[i]ndustry [was] about to be bitten by the snake it loosed."²⁴⁴ Others pointed to research contained within the report that reinforced earlier arguments claiming that there was no "safe" level of exposure to dioxin and that even if there were, background exposure levels were already high enough to generate "unacceptable" risks by EPA's own standards.²⁴⁵ Consequently, they argued, "EPA must rigorously eliminate sources as well as exposures, recognizing that each exposure threatens human health and the environment."²⁴⁶

The review conducted by EPA's own Scientific Advisory Board (SAB), recommended only minor changes to sections of the report devoted to reviewing the scientific literature on dioxin.²⁴⁷ The SAB specifically commended EPA for including a broader class of dioxin-like compounds and for focusing on non-cancer effects in addition to carcinogenic effects.²⁴⁸ It also praised the way in which EPA had conducted the process.²⁴⁹

However, the SAB review did note three major weaknesses asso-

241. *Id.*

242. *Id.*

243. Robert J. Huggett, *EPA's Dioxin Review is Science, Not Policy*, WALL ST. J., July 19, 1995, at A11 (Letters to the Editor).

244. See Sharon Begley & Mary Hager, *Don't Drink the Dioxin*, NEWSWEEK, Sept. 19, 1994.

245. Richard Clapp et al., *EPA on the Right Track*, 29 ENVTL. SCI. & TECH. 29 (1995).

246. *Id.*

247. U.S. EPA SCIENCE ADVISORY BOARD, DIOXIN REASSESSMENT REVIEW (1995).

248. *Id.* at 3-5.

249. *Id.*

ciated with the way in which EPA had characterized dioxin risks. First, most, though not all, members of the SAB review committee concluded that the report exhibited "a tendency to overstate the possibility for danger" associated with dioxin exposure.²⁵⁰ Second, SAB concluded that EPA had not been as thorough as it could have been in identifying and analyzing some of the "important uncertainties associated with the Agency's conclusions."²⁵¹ Finally, SAB suggested that the characterization of non-cancer risks had not been performed in a way that could "facilitate meaningful analysis of the incremental benefits of risk management alternatives."²⁵² On the basis of these suggestions, SAB asked EPA to rework the sections of the report dealing with dose-response modeling and overall risk assessment before submitting it to them for a final review.²⁵³

In September 2000, EPA formally submitted the re-worked portions of its draft dioxin reassessment and the results of the peer review process to the SAB.²⁵⁴ In addition to confirming the conclusions found in the 1994 reassessment, the most recent draft re-classified mixtures of dioxins and related compounds as "likely human carcinogens," while characterizing 2,3,7,8-TCDD (the most potent and thoroughly studied of the dioxin compounds) as "carcinogenic to humans."²⁵⁵ The SAB formally endorsed the report in June 2001, clearing the way for EPA to release it in final form.²⁵⁶

250. *Id.* at 5.

251. *Id.*

252. *Id.*

253. *Id.* at 4.

254. See EPA EXPOSURE AND HUMAN HEALTH REASSESSMENT OF 2,3,7,8-TCDD, Pt. III, *supra* note 13.

255. *Id.* at 104.

256. See U.S. EPA, SCIENCE ADVISORY BOARD, DIOXIN REASSESSMENT - AN SAB REVIEW OF THE OFFICE OF RESEARCH AND DEVELOPMENT'S REASSESSMENT OF DIOXIN (2001). The SAB review noted that almost half of the Panel's members did not support EPA's designation of TCDD as a human carcinogen, while roughly a third of the Panel did support the classification, with the remainder unwilling to take a position. *Id.* at 4. The SAB review, however, acknowledged the profound (and perhaps irreducible) uncertainties confronting dioxin science and the concomitant limits that this placed on EPA's ability to inform the public of the magnitude of the health risks associated with dioxin and related compounds. In light of this, the Panel concluded that "[s]ince neither knowledge breakthroughs nor fully developed and widely accepted techniques for producing improved risk assessment procedures can be expected to be available in the near future, . . . the Agency [should] proceed expeditiously to complete and release its Dioxin Risk Reassessment." *Id.* Employing language that echoed the precautionary principle, the Panel recommended further that "[c]onsistent with sound environmental and public health policy, . . . EPA [should] continue to limit emissions and human exposure to this class of chemicals in view of the very long biological and environmental persistence of these chemicals." *Id.*

Yet, although the final version was scheduled for release in the fall of 2001 (a full ten years after the process had begun), the Agency still had not released it as of spring 2002.

2. *The Cluster Rule.*

During the latter half of the 1990s, at the same time that the agency was working on the dioxin reassessment, EPA was also reviewing the so-called "cluster" rule for the pulp and paper industry. In 1996, EPA announced that it was considering two options for its bleaching requirements as part of the final rule.²⁵⁷ The first, supported by industry, called for complete substitution of chlorine dioxide for elemental chlorine.²⁵⁸ The second, based on EPA's original 1993 proposal, called for oxygen delignification followed by complete substitution of chlorine dioxide for elemental chlorine.²⁵⁹ Based on data collected from various mills employing these two processes, the agency noted that once the new rule went into effect, dioxin levels in pulp mill effluent would be reduced by ninety-five and ninety-nine percent respectively (depending on which option was chosen).²⁶⁰ In a departure from previous regulatory models, EPA also suggested that its final rule would contain a voluntary incentives program aimed at rewarding those mills that exceeded regulatory requirements in reducing discharges.²⁶¹ This was a particularly welcome development for those mills that had already installed oxygen delignification processes and were thus worried that they might end up at a competitive disadvantage if this particular process was not part of the new rule.²⁶²

257. See Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards: Pulp, Paper, and Paperboard Category, 61 Fed. Reg. 36,835 (July 15, 1996).

258. *Id.* at 36,838-39.

259. *Id.* The oxygen delignification process uses oxygen to reduce the lignin content of unbleached pulp beyond that typically provided through conventional pulping processes, thereby reducing the amount of chlorine (or other bleaching agent) necessary to achieve "full market brightness" bleached pulp.

260. *Id.* at 36,841.

261. *Id.* at 36,849-58.

262. These incentives provisions appeared to result in part from the considerable "stakeholder" input that EPA received on the development of the cluster rule as well as from EPA's new thinking about "regulatory flexibility" as embodied in programs such as Project XL. See *id.* Project XL is described at Regulatory Reinvention (XL) Pilot Projects, 60 Fed. Reg. 27,282-04 (May 23, 1995). In essence, projects approved under the Project XL program would involve the exercise of "regulatory flexibility" by EPA in exchange for a commitment on the part of the regulated entity to achieve better environmental results than would have been attained through full compliance with all applicable regulations. One bleached papergrade kraft mill was already participating in Project XL as of 1996.

Environmental groups continued to press their call for a total ban on chlorine in the bleaching process.²⁶³ In their view, no amount of dioxin was permissive, particularly in light of the reassessment.²⁶⁴ They saw the original 1993 proposal as a minimum requirement that would provide a stepping stone to total chlorine-free bleaching.²⁶⁵ With EPA's 1996 announcement, some feared that the agency was buckling under industry pressure.²⁶⁶ EPA, they argued, had a mandate to require the "best available technology" to achieve environmental protection and total chlorine-free bleaching was certainly available; a point that was hard to argue with since a number of mills in Scandinavia and Europe had converted to total chlorine-free (TCF) bleaching.²⁶⁷ Indeed, even in

Many of the voluntary incentives discussed in EPA's 1996 proposals for the cluster rule fit nicely with the overall thrust of Project XL.

263. This had been the basic position of a number of environmental groups since the early 1990s. In 1993, for example, NRDC and fifty-five other environmental groups had petitioned the EPA under the Clean Water Act to eliminate dioxin discharges from pulp and paper production by prohibiting the use of chlorine as a bleaching agent. See POWELL, *supra* note 11, at 343. Likewise, Greenpeace, which had been involved in the issue since the late 1980s, launched a major chlorine-free campaign in the mid-1990s to eliminate dioxin from the waste streams of various industrial processes, including pulp and paper production. See MICHELLE ALLSOPP, *ACHIEVING ZERO DIOXIN: AN EMERGENCY STRATEGY FOR DIOXIN ELIMINATION* (1994).

264. In March 1997, environmental activists succeeded in getting Representative Jerold Nadler of New York to introduce legislation that would require pulp and paper firms to achieve zero discharge of dioxin and dioxin-like compounds through the use of chlorine-free bleaching within five years in order to be permitted for operation. See Glenn Hess, *Drawing the Curtain on the Cluster Rules and Moving to ECF Bleaching*, 252 CHEM. MKTG. REP., Oct. 27, 1997, at 14. Admitting that his bill, the Chlorine Zero Discharge Act, faced an uphill battle, representative Nadler contended that "the paper industry will tell you that they should only be required to lower the amount of chlorine they use to undetectable levels instead of a zero use level. . . . But until there is zero output of dioxin, we will be risking our health and the health of our children. Quoted in *id.* See also Cindy Skrzycki, *Pulp Friction: The EPA's Tussle Over Paper Pollutant Rules*, WASH. POST, Apr. 11, 1997, at G1.

265. Reflecting the general disapproval in the environmental community over EPA's unwillingness to push total chlorine free bleaching, Jessica Landman of the Natural Resources Defense Council argued that "EPA is choosing between the first half and the second half of the twentieth century in writing its pollution control rules for the pulp and paper industry. We want twenty-first century technology." Quoted in Hess, *supra* note 264, at 14..

266. See Skrzycki, *supra* note 264.

267. See Skrzycki, *supra* note 264. TCF bleaching uses a combination of oxygen, hydrogen peroxide, and ozone as bleaching agents. Roughly one-third of Scandinavian and Western European mills used TCF bleaching in the mid 1990s (with Scandinavia accounting for roughly sixty percent of global TCF production), in part because the underlying pulping technology (sulfite) made adoption of such bleaching processes easier. See Patrick Fitzgerald, *ECF Riding High*, 248 CHEM. MKTG. REP., Nov. 6, 1995, at 15. In its 1996 Federal Register notice announcing the two options for the cluster rule, the EPA stated that "[t]he limited range of papergrade TCF products currently produced and sold in the U.S. market

the United States, Louisiana-Pacific's Samoa, California mill had recently switched to TCF bleaching as part of a settlement with the local Surfrider Foundation.²⁶⁸ Given the right incentives, there was no technical reason why pulp and paper production in the United States could not be chlorine free.²⁶⁹

For its part, the industry continued to issue dire predictions of the economic impact associated with the more restrictive approach.²⁷⁰ Labor unions also joined in fighting the more expensive regulations. Here, in their view at least, was a classic example of the so-called jobs-versus-environment tradeoff.²⁷¹ EPA, they argued, should consider the cost-effectiveness and economic impacts in promulgating the new standards.²⁷² As usual, EPA was caught in the middle. Given the visibility of dioxin and the fact that the cluster rule represented the agency's first attempt at "multi-media" regulation, the stakes were high.

In November 1997, EPA issued the final version of the cluster rule.²⁷³ The industry got what it wanted—total substitution of chlorine dioxide for chlorine with no additional requirement for oxygen delignification.²⁷⁴ To reward those mills that had already installed such processes as well as those that might do so in the future, the new rule also included the voluntary incentives program.²⁷⁵ In total, EPA estimated that the new rule would require

indicates that TCF technology is not yet available to make the full range of products produced by ECF [elemental chlorine free] or similar chlorine-based processes. Nonetheless, EPA continues to strongly encourage further development and implementation of TCF technologies and products. It is also probable that all TCF mills would qualify for the advanced technology incentives program. . . . [T]his should provide an opportunity to stimulate production and U.S. market share for TCF products." 61 Fed. Reg. 36,839 (Jul. 15, 1996). In effect, EPA did not consider TCF to be a sufficiently "available" technology to be used as a basis for BAT regulations.

268. The settlement was part of a consent decree worked out with the U.S. Department of Justice. See Brad Knickerbocker, *A Pulp Mill Comes Clean with Chlorine-Free Processing*, CHRISTIAN SCI. MONITOR, Mar. 7, 1995, at 10.

269. See generally MAUREEN SMITH, THE U.S. PAPER INDUSTRY AND SUSTAINABLE PRODUCTION: AN ARGUMENT FOR RESTRUCTURING 120-32 (1997).

270. See Skrzycki, *supra* note 264; John H. Cushman, Jr., *EPA Seeks Cut in Paper-Mill Pollution, but Not Elimination*, N.Y. TIMES, May 21, 1997, at A21.

271. See Skrzycki, *supra* note 264.

272. See *id.*; Cushman, *supra* note 270.

273. The final air rules are at 63 Fed. Reg. 18,504 (Apr. 15, 1998) (codified at 40 C.F.R. pts. 63, 261). The final water rules are at 63 Fed. Reg. 42,238 (Aug. 7, 1998) (codified at 40 C.F.R. pt. 430).

274. See 40 C.F.R. pt. 430.

275. *Id.* The program is formally known as the Voluntary Advanced Technology Incentives Program (VATIP). Mills that voluntarily enroll in the VATIP must comply with more stringent wastewater regulations, and in exchange, have extra time to comply.

\$1.8 billion in capital expenditures.²⁷⁶ Dioxin levels in pulp mill effluent would be reduced by ninety-six percent, which would eventually eliminate all dioxin-based fish advisories attributed to pulp and paper mills.²⁷⁷ In announcing the new rule, EPA Administrator Carol Browner stated that the agency was "taking significant steps to protect the health of millions of American families from contaminated air and water from pulp and paper mills," adding that the action "puts us well on our way to cleaning up more than seventy rivers and streams throughout the nation."²⁷⁸

Environmental advocates expressed considerable dismay. Jessica Landman, an attorney with the Natural Resources Defense Fund, charged that the new "standards will allow the pulp and paper industry to continue their routine contamination of our waterways," noting, ironically, that "[w]e have cost-effective technologies readily available, but you would never know it from these standards."²⁷⁹ Rick Hind of Greenpeace referred to the new rule as "low-lead instead of no-lead gas."²⁸⁰ In May 1998, the National Wildlife Federation (NWF) and the Natural Resources Defense Council (NRDC), along with several local environmental groups, filed a lawsuit against EPA in Maine, claiming that the new regulations violated the Clean Water Act by not requiring Best Available Technology (BAT) and demanding that EPA enact the more restrictive option reflected in the original 1993 proposal.²⁸¹ In announcing the lawsuit, NWF President Mark Van Putten stated that "EPA has the legal and moral obligation to protect people and the environment from the dangers of these chemicals [It] does not have the option of staying with the status quo simply because the industry prefers it."²⁸² EPA staff defended the new rule, noting that the original 1993 plan would have cost an extra \$1.2 billion in order to achieve an additional one percent reduction in dioxin dis-

276. See U.S. ENVTL. PROT. AGENCY, EPA's FINAL PULP, PAPER AND PAPERBOARD 'CLUSTER RULE'—OVERVIEW, EPA-821-F-97-010 (1997).

277. *Id.*

278. Press Release, U.S. EPA, EPA Eliminates Dioxin, Reduces Air and Water Pollutants From Nation's Pulp and Paper Mills (Nov. 14, 1997). While the title of the press release suggested that the new rule would eliminate dioxin, the text stated more accurately that it would "virtually eliminate dioxin discharges into waterways." *Id.* See also EPA's FINAL PULP, PAPER AND PAPERBOARD 'CLUSTER RULE'—OVERVIEW, *supra* note 276.

279. See EPA Orders \$1.8 Billion Plan to Clean Up Mill's Discharges, WASH. POST, Nov. 15, 1997, at A13.

280. *Id.*

281. See Press Release, Nat'l Wildlife Fed'n, Lawsuit to Challenge EPA Chlorine Rules, (May 12, 1998), available at <http://www.nwf.org/watersheds/lawsuit.html>.

282. *Id.*

charges.²⁸³ Clearly the agency did not consider this extra margin of protection economically justified.

Pulp and paper firms were generally pleased with the final rule. By the time it was issued, many companies were well on their way towards compliance.²⁸⁴ Most firms expressed relief that they would not be required to meet the more stringent standards. Industry giant Georgia Pacific, for example, referred to EPA's rule as a "reasonable" and "right" choice for protecting the environment.²⁸⁵ The American Forest & Paper Association applauded EPA's conclusion "that a totally chlorine-free alternative was not a viable option."²⁸⁶ Meanwhile, the United Paperworkers International Union praised the new rule for "protect[ing] the environment while minimizing job loss in the pulp and paper industry."²⁸⁷ In short, the industry and its allies succeeded in convincing the EPA that the more stringent requirements contained in the original 1993 cluster rule proposal constituted regulatory overkill. By taking voluntary steps to reduce their dioxin discharges, they effectively got out in front of the "regulatory curve," demonstrating to EPA and others that they were willing and able to make changes.²⁸⁸

3. *Environmental politics.*

Such actions may in fact mark a new, more proactive approach by pulp and paper firms to environmental issues. To be sure, some pulp and paper firms along with industry trade associations have gone to great lengths during the last decade to emphasize their newfound concern for "environmental stewardship."²⁸⁹ Corporate environmentalism, it seems, has become standard rhetoric in the industry. Some firms have even suggested the possibility of moving to zero-discharge mills in the future as way of avoiding problems

283. *Id.*

284. By 1995, more than sixty percent of the industry had already made the transition to chlorine dioxide (or elemental chlorine-free) bleaching technology. See Fitzgerald, *supra* note 267, at 15. See also Hess, *supra* note 264, at 14.

285. Quoted in Cathy Cooper, *For Pulp and Paper Mills, Reasonable Cluster Rules*, 105 CHEM. ENG'G 45, 45 (1998).

286. Quoted in *id.*

287. Quoted in *EPA Orders \$1.8 Billion Plan*, *supra* note 279.

288. POWELL, *supra* note 11, at 366.

289. Through their industry trade association, pulp and paper firms agreed on a number of new environmental initiatives in the late 1990s, including the Sustainable Forestry Initiative (SFI) and an "Environmental Health & Safety Principles" program that requires adherence to eight principles on environmental performance. For an overview, see American Forest & Paper Assoc., *Environmental Health & Safety Principles Progress Report* (2000), available at <http://www.afandpa.org/iinfo/iinfo.html>.

like the dioxin issue.²⁹⁰ Technological innovation aimed at preventing pollution rather than simply controlling it has now become an important point of discussion among managers and executives. Jerry Ballangee, an executive from Union Camp, recently predicted that "a no-discharge plant is a very attractive proposition and at some point we will get there."²⁹¹ R.L. Erickson, vice president for manufacturing and technology at Weyerhaeuser made a similar point: "We had dioxin in 1987. What will it be in 2005? By closing the loop, you can prevent future issues."²⁹² Members of the environmental community, however, are somewhat skeptical of the industry's recent "greening," suggesting that until there are tangible results the whole effort is little more than a sophisticated public relations ploy—"greenwashing" they call it.²⁹³

Still, the dioxin issue clearly has affected the industry's approach to environmental regulation and it may mark a significant departure from the industry's more recalcitrant approach to other environmental issues in the past. Whether or not this will result in more or better environmental protection in the future is not clear. There can be little doubt, though, that the industry's initial "cooperative" approach to the dioxin issue gave it considerable input into the regulatory process.²⁹⁴ By working with EPA rather than fighting the agency at every turn, the industry gained a certain access to regulators that it had never enjoyed in the past. Such access allowed the industry to constantly challenge dioxin science and the costs and benefits associated with various regulatory options, thereby shaping the outcome.

This is not to suggest, however, that the industry succeeded in getting everything it wanted or that EPA was somehow co-opted. Indeed, environmental groups, though perhaps unhappy with the final results, were also quite successful in shaping the process from the very beginning. By making dioxin a major public issue in the late 1980s, they effectively put the industry on the defensive. By forcing EPA to accept a legally-imposed timeline for developing dioxin regulations for pulp and paper discharges, they set the regulatory train in motion. Throughout it all, moreover, these environmental groups, like the industry, pushed for a particular

290. See John Holusha, *Pulp Mills Turn Over a New Leaf*, N.Y. TIMES, Mar. 9, 1996, at A35.

291. Quoted in *id.*

292. Quoted in *id.*

293. See Kenny Bruno, *Greenwash Inc.*, SIERRA 86, No. 3, 2001, at 82.

294. See Thompson & Graham, *supra* note 109, at 254-59.

interpretation of dioxin science that bolstered their own regulatory agenda.

This is quite simply the nature of contemporary environmental politics, where interest groups of various persuasions cultivate access and push their cause with regulatory officials. Given the high stakes and immediacy of the questions being asked combined with the considerable scientific uncertainty associated with efforts to quantify toxic harms, the policy discourse almost inevitably devolves into intractable disputes between basic principles. On one side are those seeking to ground regulation on the precautionary principle, which effectively presumes harm until proven otherwise. On the other side are those pushing for "complete" certainty, effectively assuming no harm until proven otherwise. The overall result of this conflict in the dioxin case has been a significant reduction, though not elimination, of dioxin discharges from pulp and paper mills.²⁹⁵ Is it enough or too much? That depends, of course, on whom you ask.

IV. CONTROLLING TOXIC HARMS

The social control of toxic harms represents one of the more difficult challenges facing modern industrial society. Aside from the scientific and technical complexities endemic to toxics issues, the diversity of parties involved combined with the financial interests at stake create a deeply politicized situation. To date, tort and regulation have provided the primary tools for responding to toxics issues. As the preceding study of dioxin contamination in the pulp and paper industry suggests, however, these existing tools fail to deal adequately with the unique problems posed by toxic harms. Two obvious questions emerge from this conclusion: (1) Why are existing tools inadequate? and (2) What sorts of alternative institutional arrangements are necessary to develop a more effective approach to toxic harms? This section addresses these questions.

A. *Tort-Based Approaches*

The chief advantage of tort law as a remedial approach to toxic harms lies in the precision that it supposedly offers in redressing harms to individual plaintiffs—something that regulation simply cannot provide. In the case of toxic pollutants resulting in poten-

295. See *supra* note 267 (discussing reduced discharges from the adoption of new bleaching technologies).

tial mass exposure, however, the tort system does not seem to be particularly well equipped to provide such remedies. Common criticisms of mass tort litigation include the arbitrary nature of the results; the failure to deliver compensation to real victims when they need it; misallocation of risk among consumers, corporations, and government; massive waste; and failure to achieve anything remotely resembling corrective justice.²⁹⁶ As the proliferation of mass torts has grown to the point of threatening the carrying capacity of the federal docket, the most common refrain appears to be how ineffective and wasteful the system has become. As one scholar put it: "the field known as 'mass torts' comprises a melange of discrete disputes with little in common besides their prodigious procedural complexity, stratospheric transaction costs, and abject dependence on uncertain science."²⁹⁷ Such shortcomings derive principally from three major areas of difficulty: (1) proving causation in the face of scientific uncertainty; (2) utilizing theories of liability developed for very different sorts of injuries; and (3) scaling up from two party disputes to multi-party actions dealing with mass exposure. While none of these areas of difficulty is necessarily insurmountable in its own right, when taken together they pose a formidable barrier to anyone seeking to use the tort system to deal with a problem as complex as dioxin.

Proving that a particular toxic substance such as dioxin caused an actual injury requires that a plaintiff establish both general and specific causation—that is, it requires that the plaintiff show that the substance in question is capable of causing the kind of injury

296. See Peter H. Shuck, *Mass Torts: An Institutional Evolutionist Perspective*, 80 CORNELL L. REV. 941, 942 (1995); see also Robert L. Rabin, *Environmental Liability and the Tort System*, 24 HOUS. L. REV. 27 (1987). Rabin's article focuses specifically on the distinctive problems associated with pursuing tort actions in the context of harm deriving from toxic pollutants. In addition to problems of identifying the precise source of harm and establishing manageable boundaries to the litigation, Rabin points to the seemingly intractable problems of causation (what he refers to as identification) in the toxic pollution context, noting that

[t]oxics of all sorts—impure water, hazardous chemicals, defective synthetics—often breed disease rather than cause immediate injury. As a consequence, the tort system is severely tested. Since diseases do not occur instantaneously, there are serious time-lag issues. And because diseases are frequently a product of the background risks of living (or at least intertwined with those risks), technical information is essential to establish attribution. Thus, *identification*, ordinarily a routine issue of cause in fact at common law, is a costly enterprise that relies on types of evidence and probability judgments which can be regarded as ill-suited to traditional resolution through the adversary process.

Id. at 29.

297. SCHUCK, *supra* note 296, at 942.

that he allegedly suffered (general causation) and that his exposure to the substance from a particular source was of sufficient duration and amount to cause his injury (specific causation).²⁹⁸ Establishing general causation in toxic torts generally involves producing scientific evidence sufficient to draw a probabilistic inference that the product or substance was capable of causing the health effects in question.²⁹⁹ This is essentially a risk assessment, and it is one of the most contested (if not the most contested) features of toxic tort litigation. Ideally, general causation should be expressed as the probability of harm resulting from a given exposure expressed in the form of a "dose-response" curve.³⁰⁰ This is difficult, however, because it invariably relies on proxies and default assumptions to get from available data to actual conditions.³⁰¹ A very rough hierarchy of methods includes human epidemiological studies, animal studies, and structure-activity relationship analyses.³⁰² Each of these has its own problems, and the issues are addressed widely in the risk assessment literature. Briefly, epidemiological studies are usually unavailable, especially in cases involving serious time lags between exposure and disease. In the case of toxic substances, moreover, the combination of underlying study-design biases, confounding factors, and uneven data quality can generate causal associations that may not actually exist.³⁰³ Animal testing data, which provide the most common empirical basis for most risk assessments, must be extrapolated from higher to lower doses (due to time and statistical limitations of controlled studies), and translated to humans.³⁰⁴ Structure-activity relationship analyses and

298. See *In re Joint E. & S. Dists. Asbestos Litig.*, 52 F.3d 1124, 1131 (2d Cir. 1995) ("Causation in toxic torts normally comprises two separate inquiries: whether the epidemiological or other scientific evidence establishes a causal link between *c* (asbestos exposure) and *d* (colon cancer), and whether plaintiff is within the class of persons to which inferences from the general causation evidence should be applied.")

299. For a discussion of general causation, see Margaret A. Berger, *Eliminating General Causation: Notes Toward a New Theory of Justice and Toxic Torts*, 97 COLUM. L. REV. 2117 (1997).

300. See Arthur C. Upton, *Carcinogenic Risk Assessment in Proper Perspective*, 4 TOXICOLOGY & INDUS. HEALTH 443 (1988); Carole A. Kimmel, *Quantitative Approaches to Human Risk Assessment for Noncancer Health Effects*, 11 NEUROTOXICOLOGY 189 (1990). See also the discussion and references regarding risk assessment, *infra* Part III.B.

301. *Id.*

302. For a discussion of these various techniques in the context of EPA's carcinogen risk assessment, see U.S. EPA, GUIDELINES FOR CARCINOGEN RISK ASSESSMENT (1999).

303. See Gary Taubes, *Epidemiology Faces its Limits*, 269 SCI. 164, 164-69 (1995) (discussing the many uncertainties that plague epidemiological studies, particularly in the toxics area).

304. See Richard Wilson & E.A.C. Crouch, *Risk Assessment and Comparisons: An Intro-*

models can be suggestive, but they are usually considered inadequate in the absence of corroborating empirical evidence.³⁰⁵

Assuming that sufficient evidence exists to establish general causation, individual plaintiffs still have to establish that they were exposed to the substance in question, that their exposure resulted from the defendant's activity, and that the exposure caused their particular injury. This is often very difficult in cases involving toxic pollution, which often entail reliance on mathematical modeling of plumes and statistical techniques as a basis for inferring the probability that the plaintiff suffered exposure from the defendant's pollution. Indeed, absent a major chemical disaster resulting in immediate exposure of large numbers of individuals, plaintiffs commonly face great difficulties proving specific causation in cases where adverse health effects ostensibly arise from industrial pollution. This is especially true in the case of dioxin given existing "background" concentrations of dioxin in human tissues, the lack of any signature disease from dioxin, and the general difficulties involved in attributing common diseases to specific environmental risks.

In sum, establishing "causation" for toxic harm requires that the plaintiff show (a) that the toxic substance is capable of causing harm (and, ideally, mapping out exactly when and how much harm it causes as a function of exposure or dose), and (b) that the toxic substance did cause harm in this particular case, which requires showing exposure of sufficient magnitude to have caused the plaintiff's particular injury. As suggested, such difficulties are particularly burdensome in the case of dioxin because, unlike asbestos or DES, where causation can be bolstered by the presence of signature diseases, dioxin could be implicated in a whole host of health effects—none of which are exclusive to the compound. When one recognizes that dioxin is one of the most intensively studied of all known toxic compounds, the challenges of proving causation in other pollution-based toxic torts seem insurmountable.

duction, 236 Sci. 267, 268-69 (1987) (discussing the problems involved in extrapolating from animal studies to humans); see also Bruce N. Ames, et al., *Ranking Possible Carcinogenic Hazards*, 236 Sci. 271, 271-80 (1987) (discussing the utility of animal studies as a basis for ranking rather than predicting human risks); John H. Weisburger & Gary M. Williams, *Carcinogen Testing: Current Problems and New Approaches*, 214 Sci. 401, 401-7 (1981) (discussing the problems with animal studies and the emergence of new approaches focusing on the mechanisms of carcinogenesis).

305. See EPA GUIDELINES FOR CARCINOGEN RISK ASSESSMENT, *supra* note 302, at 2-18.

Such difficulties are compounded further by prevailing evidentiary standards. Indeed, given the Supreme Court's recent rulings on the admissibility of scientific evidence in the *Daubert* line of cases,³⁰⁶ and the fact that so little is known about so many toxic compounds, it is not at all clear that expert testimony would be admissible in many toxic tort cases.³⁰⁷ Although efforts to keep so-called "junk science" from being admitted into evidence should be encouraged, some scholars have argued that courts should relax the *Daubert* requirements in the toxics area and "recognize the wider range of reliable toxicological evidence that scientists utilize to conclude that substances are known or likely human toxicants or carcinogens."³⁰⁸ By raising the bar on the type of evidence needed to establish general causation, they argue, *Daubert* reinforces existing incentives on the part of defendants to emphasize

306. See *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579 (1993) (requiring the trial judge to perform a "gate-keeping" role to ensure that expert scientific testimony is not only relevant but also reliable, which the court defined as properly grounded in the "methods and procedures of science"); *Gen. Elec. Co. v. Joiner*, 522 U.S. 136 (1997) (establishing an abuse of discretion standard for reviewing trial judge determination of expert qualifications); *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999) (extending the *Daubert* principles and requirements to "technical" experts).

307. For a discussion of the emerging difficulties posed by *Daubert* and its progeny for toxic torts in the products area, see Carl F. Cranor & David A. Eastmond, *Scientific Ignorance and Reliable Patterns of Evidence in Toxic Tort Causation: Is There a Need for Liability Reform?*, 64 LAW & CONTEMP. PROBS. 5 (2001).

308. *Id.* at 45. Peter Huber has been the most persistent critic of what he calls "junk" science in mass toxic tort litigation. See PETER W. HUBER, GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM (1991). See also KENNETH R. FOSTER & PETER W. HUBER, JUDGING SCIENCE: SCIENTIFIC KNOWLEDGE AND THE FEDERAL COURTS (1997); DAVID L. FAIGMAN, LEGAL ALCHEMY: THE USE AND MISUSE OF SCIENCE IN THE LAW (1999). For a case study on the use and abuse of science in toxic tort litigation, see MARCIA ANGELL, SCIENCE ON TRIAL: THE CLASH OF MEDICAL EVIDENCE AND THE LAW IN THE BREAST IMPLANT LITIGATION (1996). Shelia Jasanoff criticizes the assumption that there exists an easily identifiable domain of knowledge known as "mainstream science." See SHELIA JASANOFF, SCIENCE AT THE BAR: LAW, SCIENCE, AND TECHNOLOGY IN AMERICA, 207 (1995). As she puts it,

[c]ontrary to the professed beliefs of many in science and industry, good science is not a commodity that courts can conveniently shop for in some extrasocietal marketplace of pure knowledge. There is no way for the law to access a domain of facts untouched by values or social interests. Scientific claims that are imported into the legal process are colored not only by the interests of the offering parties but also by the social, cultural, and political commitments of other actors in society: for example, the reluctance of experts to breach disciplinary solidarity, the law's desire to cloak morally difficult judgments with the 'objective' authority of experts and instruments, and the public's demand for decisions that seem both open and rational. Historically, sociologically, and politically, the proposal that courts should increase their reliance on value-neutral mainstream science is therefore extremely problematic.

Id.

ignorance and uncertainty in the face of claims that their activities have resulted in toxic harms.³⁰⁹

While proving causation in a world of toxic ignorance represents the greatest challenge facing toxic tort plaintiffs, existing liability rules also pose a number of constraints. This is particularly true in the case of toxic pollutants. Indeed, in contrast to the more conducive theories of liability developed in the products area—strict liability for manufacturing defects, responsibility to adopt reasonable alternative designs in the case of design defects, and a general duty to warn of foreseeable risks of harm³¹⁰—polluting firms generally need only show that their behavior was reasonable (and lawful) to avoid tort liability. More importantly, there is no general duty to warn in the pollution context.³¹¹ As suggested in Part II, to

309. See Cranor & Eastmond, *supra* note 307, at 14-16 (arguing that “[l]ack of scientific knowledge . . . invites a defendant whose substance is challenged as harmful to utilize ignorance as a means to avoid liability”); See also Margaret A. Berger, *Eliminating General Causation: Notes Toward a New Theory of Justice and Toxic Torts*, 97 COLUM. L. REV. 2117, 2119 (1997) (arguing that the general causation requirement in toxic tort litigation combined with the fact of toxic ignorance “creates incentives on the part of corporations not to know and not to disclose”).

310. See RESTATEMENT (THIRD) OF TORTS: PRODUCTS LIABILITY § 2 (1998):

A product is defective when, at the time of sale or distribution, it contains a manufacturing defect, is defective in design, or is defective because of inadequate instructions or warnings. A product: (a) contains a manufacturing defect when the product departs from its intended design even though all possible care was exercised in the preparation and marketing of the product; (b) is defective in design when the foreseeable risks of harm posed by the product could have been reduced or avoided by the adoption of a reasonable alternative design by the seller or other distributor, or a predecessor in the commercial chain of distribution, and the omission of the alternative design renders the product not reasonably safe; (c) is defective because of inadequate instructions or warnings when the foreseeable risks of harm posed by the product could have been reduced or avoided by the provision of reasonable instructions or warnings by the seller or other distributor, or a predecessor in the commercial chain of distribution, and the omission of the instructions or warnings renders the product not reasonably safe.

311. See RESTATEMENT (THIRD) OF TORTS: PRODUCTS LIABILITY §2, cmt. i (1998):

In addition to alerting users and consumers to the existence and nature of product risks so that they can, by appropriate conduct during use or consumption, reduce the risk of harm, warnings also may be needed to inform users and consumers of nonobvious and not generally known risks that unavoidably inhere in using or consuming the product. Such warnings allow the user or consumer to avoid the risk warned against by making an informed decision not to purchase or use the product at all and hence not to encounter the risk. In this context, warnings must be provided for inherent risks that reasonably foreseeable product users and consumers would reasonably deem material or significant in deciding whether to use or consume the product. Whether or not many persons would, when warned, nonetheless decide to use or consume the product, warnings are

the extent that the activity in question is considered "abnormally dangerous," plaintiffs can argue for strict liability, but such causes of action would be exceptional in a modern industrial economy.³¹² This leaves negligence as the basic liability rule for personal injury claims resulting from the vast majority of toxic pollutants. In contrast to products liability—where the plaintiff need only show a defective design and/or inadequate warning—the negligence regime applied in the pollution context requires the far more difficult showing of unreasonable behavior on the part of the defendant. In the case of dioxin contamination from pulp and paper production, this would presumably require a showing that a particular facility or company acted unreasonably relative to the practices of the sector or the business community as a whole. Given the standardized nature of the technology and the extensive automation in the pulp and paper sector, this appears to be a rather difficult case to make. Moreover, even if a plaintiff attempted to claim that the industry as a whole acted unreasonably with respect to dioxin contamination, the fact that the issue was not even known until the mid 1980s combined with the industry's considerable efforts to assess the actual extent of the problem and its efforts to shift to less chlorine-intensive bleaching processes suggests the difficulties involved in showing negligence.

Given their inability to demonstrate any actual physical injury associated with exposure, dioxin plaintiffs, like many others in the toxic tort area, also sought to establish liability for intentional and negligent infliction of emotional distress, arguing that fear of future illness constituted sufficient grounds for liability. As noted, however, courts have been less than enthusiastic about such causes of action, especially in the absence of any manifestation of physical injury. This left trespass and nuisance as the residual theories of

required to protect the interests of those reasonably foreseeable users or consumers who would, based on their own reasonable assessments of the risks and benefits, decline product use or consumption. When such warnings are necessary, their omission renders the product not reasonably safe at time of sale. Notwithstanding the defective condition of the product in the absence of adequate warnings, if a particular user or consumer would have decided to use or consume even if warned, the lack of warnings is not a legal cause of that plaintiff's harm. Judicial decisions supporting the duty to provide warnings for informed decisionmaking have arisen almost exclusively with regard to those toxic agents and pharmaceutical products with respect to which courts have recognized a distinctive need to provide risk information so that recipients of the information can decide whether they wish to purchase or utilize the product.

312. See *supra* notes 38-39 and accompanying text.

liability for many dioxin plaintiffs. Although trespass and nuisance claims for damages from dioxin contamination of property did indeed turn out to be more viable than the personal injury and emotional distress claims, they have inherent limits as tools for dealing with toxic harms. The site-specific nature of these claims limits their ability to deter the production of toxic substances on a large scale. More important, trespass and nuisance obviously have nothing at all to offer in the way of compensation for plaintiffs who have or will suffer health effects associated with exposure to toxic substances. As doctrines that emerged out of two-party disputes over property rights, such causes of action are ill equipped for the complex world of toxic harms.

Finally, efforts to scale the tort system from simple two-party disputes to mass toxic exposures raise a number of serious procedural concerns regarding treatment of individual plaintiffs (present and future). As several commentators have argued, the story of mass torts is in many ways a story about procedure.³¹³ Procedural questions and choices, in other words, have been fundamental in shaping the emergence of the mass tort in the toxics area. Aggregation of claims, in this view, derived largely from the desperate efforts of judges to develop standardized procedures that would lower the transactions costs associated with mass exposure cases. As these torts "matured," judges, defendants, and plaintiffs lawyers all came to see the advantages of settling these cases as a group. The class action became a vehicle both for resolving the federalism dilemmas embedded in mass exposure claims and for giving defendants and courts the repose that they desired.³¹⁴ Because of the procedural complexities inherent in the class action approach to toxic torts, however, opportunities for collusion and abuse abound. As John Coffee argues, "the mass tort class action is uniquely vulnerable to the danger of collusion."³¹⁵ During the 1990s, according

313. See DEBORAH HENSLEY ET AL., CLASS ACTION DILEMMAS: PURSUING PUBLIC GOALS FOR PRIVATE GAIN (2000); see also John C. Coffee, Jr., *Class Wars: The Dilemma of the Mass Tort Class Action*, 95 COLUM. L. REV. 1343 (1995).

314. See HENSLEY ET AL., *supra* note 313, at 11-25, 79-114.

315. See Coffee, *supra* note 313, at 1349. Coffee points to the perverse incentives that emerge in the class action context, noting that "[n]o opening generalization about the modern class action is sounder than the assertion that it has long been a context in which opportunistic behavior has been common and high agency costs have prevailed. If not actually collusive, non-adversarial settlements have all too frequently advanced only the interests of plaintiff's attorneys, not those of the class members." *Id.* at 1347-48. Coffee goes on to note that because "courts have little ability or incentive to resist the settlements that the parties in class action litigation reach," there is no real mechanism for accountability.

to Coffee, the class action evolved into a vehicle that provided defendants with a variety of procedures to minimize their tort liabilities.³¹⁶ Once a sword for plaintiffs, the modern class action (at least in the tort context) became a shield for defendants.³¹⁷ In Coffee's view, this "new legal technology"—manifest most prominently in the use of mandatory classes, settlement classes, and future claimant classes—worked to "create a new, even more protective form of limited liability for corporations."³¹⁸

In the cases involving dioxin contamination from pulp and paper production, the procedural inadequacies of the class action technique seemed readily apparent. After the initial successes in Mississippi, plaintiffs' lawyers in a number of states rushed to file ever-larger class action suits against pulp and paper firms, seeking to capitalize on the growing wave of anxiety associated with dioxin. Most of these suits settled relatively quickly for several million dollars apiece. In return, many of the defendant companies were released from future liability. Although the details of the individual settlements were not disclosed, one can presume that the thousands of plaintiffs saw relatively little in the way of compensation. More important, the whole question of future claimants seems to have been largely ignored in these settlements, raising serious questions about the ability of the tort system to deliver real compensation to victims of toxic harms if and when they actually suffer injury.

B. *Regulation and the Dilemmas of Risk Assessment*

Just as the tort system does not deal well with mass toxic exposure cases, so the regulatory system (at least as currently constituted) has proven limited in its capacity to respond quickly to the emergence of new toxic harms. The fact that it took more than ten years from the time dioxin was first identified in pulp mill effluent to the time that a final regulation was promulgated illustrates how slow and cumbersome the regulatory system can be in dealing with problems of this complexity. Obviously there are many factors that can delay the regulatory process. In the toxics area, however, such

Id. at 1348. In his view, these constraints on the court stem from (1) the threat of docket overload; (2) inability to control attorney's fees in the face of out-of-court settlements; and (3) client passivity. *Id.* at 1349.

316. According to Coffee, these procedures constituted "a new legal technology, the impact of which uniquely disadvantages future claimants." *Id.*

317. *Id.*

318. *Id.* at 1461.

problems often derive from the presence of scientific uncertainty and the contested role of risk assessment in setting regulatory priorities.

This is not intended to suggest that the practice of risk assessment is an inappropriate basis for toxics regulation. Rather, the point is simply to recognize the fact that risk assessment as practiced in the real world often reinforces a dynamic of politicization that can hinder efforts to control toxic harms. Thus, it is important to consider not only what risk assessment can and cannot do but also how it has evolved and what functions it performs in the context of the contemporary administrative state.

Given its obvious appeal as an administrative technique, the practice of quantitative risk assessment has, over the last two decades, come to occupy a very prominent place in EPA's approach to environmental protection. Beginning in the early 1980s and reaching a climax under William Reilly, top EPA officials expressed growing enthusiasm and support for the potential of risk assessment (and its sibling risk management) to reshape agency practices and environmental policy more generally.³¹⁹ In part, this stemmed from a broader effort in the federal bureaucracy to rationalize the practice of risk assessment across the various agencies.³²⁰ These officials wanted to introduce more systematic "risk-

319. Together, risk assessment and risk management make up risk analysis. As defined at EPA, risk assessment proceeds in four steps: (1) hazard assessment, which determines whether a particular agent is linked causally with a given health effect; (2) dose-response assessment, which seeks to determine the quantitative relation between exposure to a certain dose-level of the agent in question and the incidence and/or severity of a response in test animals; (3) exposure assessment, which seeks to determine the population(s) exposed to the agent in question and the routes, magnitudes, frequencies, and durations of exposure; and (4) risk characterization, which attempts to characterize or summarize the nature of the risk in light of uncertainties involved and major assumptions employed. See Milton Russell & Michael Gruber, *Risk Assessment in Environmental Policy-Making*, 236 SCI. 286-90 (1987). In principle, risk assessment is supposed to be separate from risk management, which is the process by which a regulatory agency such as EPA decides what to do with the results of a risk assessment. In practice, however, such a separation is not always possible. See Richard Andrews, *Risk-Based Decision Making in Environmental Policy in the 1990s*, 209-31 (Norman J. Vig & Michael E. Kraft eds., 2d ed. 1994).

320. In 1983, the National Research Council (NRC) published a report recommending that federal regulatory agencies adopt more consistent and uniform risk assessment practices, including "inference guidelines" to better ensure the technical quality of risk assessments and preserve its "scientific" basis. The NRC report also recommended a basic framework for risk assessment composed of four basic steps: hazard identification; dose-response assessment; exposure assessment; and risk characterization. See NAT'L RESEARCH COUNCIL, *RISK ASSESSMENT IN THE FEDERAL: MANAGING THE PROCESS* (1984). EPA responded to this recommendation with a set of risk assessment guidelines in 1986, *Guidelines for Carcinogen Risk Assessment*, 51 Fed. Reg. 33,992 (Sept. 24, 1986), which set forth

based" decision procedures throughout the agency, thereby moving EPA away from its former "patchwork" of responsibilities for implementing particular environmental statutes toward a more coherent mission that would be defined by risk priorities.³²¹ Scientific experts would assume unprecedented power and authority in identifying these priorities.³²² The whole effort promised to ground specific environmental policies, such as dioxin standards, in scientific analysis.³²³ "Good science" became a mantra for those who hoped to put EPA on more "rational foundations."³²⁴ Hazards would be reduced to some common calculus of expected harm or death, compared to one another, and ranked. Standard algorithms would be developed for particular sets of risks. Inference guidelines and default assumptions would be systematically applied. On the basis of such risk characterization, cost-benefit analysis would

principles and procedures to guide EPA scientists in assessing the cancer risks from chemicals and other agents in the environment. The NRC published another report in 1994, offering an updated set of guidelines for refining risk assessment practices. *See* NAT'L RESEARCH COUNCIL, SCIENCE AND JUDGMENT IN RISK ASSESSMENT (1994). In 1996, EPA published a revised set of cancer risk guidelines, *Proposed Guidelines for Carcinogen Risk Assessment*, 61 Fed. Reg. 17,960 (Apr. 23, 1996). These proposed guidelines have subsequently been subjected to extensive public comment and peer review, including three reviews by EPA's Science Advisory Board. Based on this input EPA issued draft revised guidelines in July 1999. U.S. EPA, GUIDELINES FOR CARCINOGEN RISK ASSESSMENT (July 1999). In November 2001, the agency announced its intent to issue final revised guidelines for Carcinogenic Risk Assessment in 2002. *See* 66 Fed. Reg. 59,593 (Nov. 29, 2001). These guidelines are intended to be used in conjunction with other risk assessment guidelines developed by the agency since the mid-1980s, including guidelines for exposure assessment, chemical mixtures, developmental toxicity, mutagenicity, reproductive toxicants, and neurotoxicity.

321. For important EPA statements on risk assessment and its relationship to the agency's mission, see U.S. EPA, UNFINISHED BUSINESS: A COMPARATIVE ASSESSMENT OF ENVIRONMENTAL PROBLEMS (1987), and U.S. EPA SCIENCE ADVISORY BOARD, REDUCING RISK: SETTING PRIORITIES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION (1990).

322. In many respects, this is the mandate envisioned for EPA's Science Advisory Board (SAB). *See* EPA SCIENCE ADVISORY BOARD, REDUCING RISK, *supra* note 321. For one of the more prominent articulations of this view, see STEPHEN BREYER, BREAKING THE VICIOUS CIRCLE: TOWARD EFFECTIVE RISK REGULATION (1992) (arguing for a new centralized administrative group charged with rationalizing the practice of risk assessment and the practice of ranking risk priorities across the federal bureaucracy). For a critical review of Breyer's proposal, see Sheila Jasanoff, *The Dilemmas of Risk Regulation*, ISSUES IN SCI. & TECH. 79, 80 (Spring 1994) (identifying "the book's greatest conceptual weakness [as] its unthinking embrace of a vision of rationality based on closely held and impartial technical expertise"). *See also* Sheila Jasanoff, *Science, Politics, and the Renegotiation of Expertise at EPA*, 7 OSIRIS, 2d Series, 195-217 (1992); RICHARD N. L. ANDREWS, MANAGING THE ENVIRONMENT, MANAGING OURSELVES: A HISTORY OF AMERICAN ENVIRONMENTAL POLICY 268-70 (1999).

323. *See* U.S. EPA, UNFINISHED BUSINESS; U.S. EPA SCIENCE ADVISORY BOARD, REDUCING RISK, *supra* note 321.

324. U.S. EPA SCIENCE ADVISORY BOARD, REDUCING RISK, *supra* note 321.

then be used to evaluate various regulatory options.³²⁵ From the perspective of pure administrative efficiency and in the context of limited resources, the goal seemed worthy enough.

Yet, there are a number of problems with such an approach. As suggested in the previous section, any attempt to assess the risks and calculate expected losses from some sort of environmental disturbance, such as dioxin contamination, entails assumptions about physiological, toxicological, and/or ecological processes (causal mechanisms) that are often not well understood.³²⁶ Tremendous uncertainties are also encountered in any effort to extrapolate from high-dose exposure to low-dose exposure and from responses in animals to responses in humans.³²⁷ Moreover, difficulties in understanding latent effects and latency periods, special sensitivities in exposed populations, synergistic effects with other substances, and temporal and spatial variability in exposure levels threaten to overwhelm any claims of being complete and accurate enough to be reliable.³²⁸ Reducing risks to a common calculus (e.g., excess cancer deaths) obviously leaves out or downplays other sorts of health risks (e.g., immune system impairment, neurotoxicity, etc.) that may not lend themselves as easily to quantification.³²⁹ The purely aggregate approach to risk, by focusing on averages or means, also tends to ignore the maximally exposed population.³³⁰ Finally, different agencies and even different divisions within the same agency often employ different models, assumptions, and approaches to risk assessment.³³¹

325. For a discussion of the rise of economic analyses at EPA, and their relation to risk assessment, see *ECONOMIC ANALYSES AT EPA: ASSESSING REGULATORY IMPACT* (Richard D. Morgenstern ed., 1997). For an argument in favor of comparative risk assessment, see the collection of essays in *RISK VS. RISK: TRADEOFFS IN PROTECTING HEALTH AND THE ENVIRONMENT* (John D. Graham & John B. Weiner eds., 1995).

326. See Howard Latin, *Good Science, Bad Regulation, and Toxic Risk Assessment*, 5 YALE J. REG. 89, 91-92 (1988). See also Donald T. Hornstein, *Reclaiming Environmental Law: A Normative Critique of Comparative Risk Analysis*, 92 COLUM. L. REV. 562, at 571-72 (1992); Thornton, *supra* note 8, at 420-21.

327. See Wilson & Crouch, *supra* note 304; Ames et al., *supra* note 304; Weisburger & Williams, *supra* note 304.

328. See Taubes, *supra* note 303; see also Crosby, *supra* note 4, at 143-61.

329. The difficulties of assessing the variety of health risks associated with toxic substances such as dioxin are reflected in EPA's efforts to develop guidelines for neurotoxicity, mutagenicity, developmental toxicity, etc. as complements to its guidelines on carcinogenic risks. See discussion and references *supra* note 320.

330. See Latin, *supra* note 326. EPA has endeavored to account for highly-exposed populations in its dioxin risk assessment. See EPA EXPOSURE AND HUMAN HEALTH REASSESSMENT OF 2,3,7,8-TCDD, Pt. III, *supra* note 13, at 73-76.

331. See Latin, *supra* note 326; see also Hornstein, *supra* note 326; Andrews, *supra* note

Quantitative risk assessment, in short, has never been able to provide a simple protocol for translating "good science" into risk predictions. Even former administrator William Ruckelshaus, a major proponent of risk assessment, realized its inherent limitations. He knew that risk assessment would always be plagued with uncertainties that required all sorts of assumptions.³³² Not surprisingly, the practice of risk assessment has often elicited considerable controversy, sometimes degenerating into a highly politicized process, with various interests lining up their own experts, their own "science," to support a particular approach or conclusion. As in other areas of environmental policy, this has led to charges of over- and under-regulation, increasing distrust for regulatory agencies, and political balkanization.

Despite all of the political controversy, however, risk assessment continues to hold considerable attraction for many regulators. Indeed, when seen in a larger context, the appeal of risk assessment stems largely from its capacity to act as an "organizing technology" of immense reach. At the most basic level, risk assessment operates as a schema of rationality—a method of breaking down, re-arranging and ordering various elements of the world. Part of its attraction rests in the fact that it entails a distinctive political economy of knowledge; a new dependency on experts and expert systems. By

319. In his recent history of environmental policy, Richard Andrews criticized the risk assessment approach at EPA as an attempt to use "scientific language to mask fundamentally political decisions, and to allow policy to be controlled by an EPA subgovernment rather than by a broader political process." Andrews, *MANAGING THE ENVIRONMENT*, *supra* note 322, at 269.

332. See William D. Ruckelshaus, *Science, Risk, and Public Policy*, 221 *SCI.* 1026, 1026-28. Ruckelshaus noted that "the formal assessment of risk" represented one of the most "troublesome" examples of the "dissonance between science and the creation of public policy." *Id.*, at 1026. In his view, this stemmed largely from the inevitable conflict between irreducible scientific uncertainties and the demand for certainty reflected in many environmental laws. *Id.* Although he pushed for a more formal and coordinated approach to risk assessment in EPA and throughout the federal government, Ruckelshaus was quite realistic about the limits of risk assessment:

when we examine the premises on which . . . estimates of risk are based, we find a confusing picture. In assessing a suspected carcinogen, for example, there are uncertainties at every point where an assumption must be made: in calculating exposure; in extrapolating from high doses where we have seen an effect to the low doses typical of environmental pollution; in what we may expect when humans are subject to much lower doses of a substance that, when given in high doses, caused tumors in laboratory animals, and finally, in the very mechanisms by which we suppose the disease works. One thing we clearly need to do is ensure that our laws reflect these scientific uncertainties.

Id. at 1027.

putting a price on health, by making lives fungible, risk assessment and risk management are part of a broader "technology of power" in the modern administrative state. As such, they represent rationalized ways of coping with the hazards generated by industrial society.³³³ In the process, they can determine, quite literally, the difference between life and death.

Inevitably, though, no matter how rational or scientific such practices appear, the use of risk assessment in environmental policy becomes politicized. Arguments about the assumptions built into risk assessment and the procedures used often serve as surrogates for arguments about the real issues. Similarly, the disconnect between irreducible scientific uncertainties on the one hand, and the legal system's demand for certitude and precision on the other, creates ample opportunities for conflict between competing interest groups. This can lead to costly delays and politically compromised results.

In its dioxin reassessment, EPA hoped to circumvent some of these problems by opening up the process to a broad community of scientists—one of the reasons why the reassessment has taken so much longer than initially expected. This ultimately proved to be an important decision. Indeed, despite the delays, EPA's move to open up the process served to blunt the criticisms of those who charged the agency with running a closed process. More important, the resulting reassessment has been widely seen as a stronger document because of the process.

In sum, while risk assessment clearly has a central role to play in any effort to identify and control toxic harms, it is important to recognize the ways in which it gets mobilized in the political struggle over toxics regulation. The many scientific disciplines that inform toxic risk assessment will always be subject to uncertainty. While the scientific process should continue to play a major role in informing toxics policy, it should not be fetishized in a way that effectively trumps alternative efforts to control the toxic byproducts of industrial production systems.

C. *Alternative Information-Based Approaches*

What, then, might an alternative approach look like? If one ac-

333. For a broader, social-theoretic perspective on risk and risk assessment, see ULRICH BECK, *RISK SOCIETY: TOWARDS A NEW MODERNITY* (Sage ed., 1992) and Francois Ewald, *Insurance and Risk*, in *THE FOUCAULT EFFECT: STUDIES IN GOVERNMENTALITY* 197-210 (Graham Burchell et al. eds., 1991).

cepts the premise that the current system is deeply flawed and perhaps incapable of effectively controlling toxic harms, the appropriate place to focus is institutional design. In focusing on institutional design, moreover, attention should be directed to process rather than substance. While this essay hardly claims to offer a comprehensive alternative, this final section suggests three potential institutional design changes—each of which draws on existing innovations and ideas—that might bolster efforts to develop an alternative approach to the social control of toxic harms. These include mandatory disclosure; stronger facility-level monitoring of toxics releases; and a sector-based, tax-financed testing and screening program. The overall goal is to create new incentive structures that motivate firms to produce the information necessary for toxics assessment and make that information available to the public in an accessible manner.

1. *Mandatory disclosure.*

Any information-based approach to toxics policy must be built on a sophisticated and effective disclosure regime. Based on existing programs such as California's Proposition 65³³⁴ and the EPA's Toxics Release Inventory (TRI),³³⁵ such a regime needs to be mandatory and subject to stronger liability provisions—perhaps akin to the liability rules existing under duty-to-warn theories in tort or the disclosure obligations that support the modern regime of securities regulation. Indeed, some commentators have argued that the mandatory disclosure system underlying the federal securities laws and the regulatory authority vested in the SEC together provide the most logical institutional vehicle for requiring broader social and environmental disclosures by public companies.³³⁶ Ac-

334. Formally known as the Safe Drinking Water and Toxic Enforcement Act, Proposition 65 was approved overwhelmingly by California voters in 1986. Codified as amended at CAL. HEALTH & SAFETY CODE §§ 25,249.5-13 (West 1999 & Supp. 2001).

335. Modeled on New Jersey's 1983 Worker and Community Right to Know Act, TRI was passed in 1986 as part of the Superfund reauthorization amendments. The program is formally known as the Emergency Planning and Community Right-to-Know Act, codified at 42 U.S.C.A. §§ 11001-11050 (2001).

336. See Robert H. Feller, *Environmental Disclosure and the Securities Laws*, B.C. ENVTL. AFF. L. REV. 225 (1995) (arguing for expanded environmental disclosures under the federal securities laws); Cynthia Williams, *The Securities and Exchange Commission and Corporate Social Transparency*, 112 HARV. L. REV. 1197 (1999) (concluding that the SEC has the statutory authority to require expanded social and environmental disclosures and that it should use that authority to do so). In fact, as Williams points out, the SEC twice considered such an expansion in the 1970s and 1980s (partially as a response to rulemaking petitions brought by NRDC and other public interest groups) but "concluded that the information

cording to Cynthia Williams, the “celebrated” financial transparency of U.S. capital markets, which “derives primarily from the specific information about operating results, presented using rigorous accounting principles” as mandated by the federal securities laws, provides a model for a broader social and environmental transparency.³³⁷ Leaving aside the apparent shakiness of her premise regarding “rigorous” accounting practices in the wake of the Enron scandal, it is not clear that the SEC and the financial disclosure regime are the appropriate vehicles for a more formal approach to toxics disclosure. One would not expect lawyers and accountants to have a comparative advantage over engineers and environmental scientists regarding the presentation and release of toxics information. But the general notion of mandatory disclosure, backed up by strong liability rules for failure to disclose and misrepresentation, does provide an important model.

In some respects, California’s Proposition 65 comes closest to such a liability rule in the toxics area.³³⁸ Mandating that “[n]o person in the course of doing business shall knowingly and intentionally expose any individual to a chemical known to the state to cause cancer or reproductive toxicity without first giving a clear and reasonable warning to such individual,”³³⁹ the law creates a strong duty to warn. By providing for public and private enforcement, including a “bounty-hunter’s” provision that rewards successful plaintiffs with twenty-five percent of the penalties,³⁴⁰ the law also creates considerable incentives for individual firms to comply.

that an expanded disclosure mandate would require was not clearly significant (“material”) to investors.” *Id.* at 1206.

337. See Williams, *supra* note 336, at 1200.

338. Proposition 65 contains both a warning requirement and a discharge prohibition, but the centerpiece of the program has been the warning requirement. While much of the commentary on the program has focused on the efficacy of the warning requirement, the key innovation of Proposition 65 might actually lie in the background liability rule and the corresponding incentives it creates for firms to generate the information necessary for toxicity testing. See Clifford Rechtschaffen, *The Warning Game: Evaluating Warnings Under California’s Proposition 65*, 23 *ECOLOGICAL L.Q.* 303 (1996); Michael Barsa, *California’s Proposition 65 and the Limits of Information Economics*, 49 *STAN. L. REV.* 1223 (1997). For a discussion of the information-generating incentives embedded in proposition 65, see Roe & Pease, *supra* note 23.

339. CAL. HEALTH & SAFETY CODE § 25,249.6 (West 1999). Proposition 65 also prohibits the discharge or release of such chemicals “into water or onto or into land where such chemical passes or probably will pass into any source of drinking water.” *Id.* at § 25,249.5.

340. Public enforcement provisions are at CAL. HEALTH & SAFETY CODE § 25,249.7(c) (West 1999 and Supp. 2001). The citizen suit provision, which authorizes any person to bring an action “in the public interest,” is at § 25,249.7(d). The bounty hunter provision is at § 25,192(2).

In contrast to Proposition 65, TRI does not rely on the same sort of background liability rule to mandate disclosure. The chief advantage of this program lies instead in the incentives it creates for performance monitoring and benchmarking through standardization of toxics release data.³⁴¹ By providing a continuous stream of standardized data that can be aggregated and compared within and between sectors, TRI enriches the information base and allows for performance monitoring among firms as well as by third party actors.³⁴²

EPA's recent efforts to extend and enhance TRI through the Sector Facility Indexing Project (SFIP)—a web-based project that brings together TRI and other environmental information from a number of data systems to produce facility-level profiles for five industry sectors (petroleum refining, iron and steel production, primary nonferrous metal refining and smelting, pulp manufacturing, and automobile assembly) and a subset of major federal facilities—represents an important next step in this evolving toxics disclosure regime. As currently constituted, SFIP provides information on production, compliance and inspection history, chemical releases and spills, and demographics of the surrounding population.³⁴³ While the program is limited in scope and voluntary, it could provide the basis for a new regime of environmental disclosure that is linked to specific facilities. Making it mandatory and creating a liability regime for misrepresentations or omissions (failure to warn) would give it teeth.

2. *Monitoring.*

Monitoring and enforcement obviously provide essential complements to any mandatory disclosure regime. Without effective monitoring, the liability rules underlying mandatory disclosure

341. For a very favorable assessment of TRI and its potential to incentivize continuous improvement in environmental performance, see Bradley C. Karkkainen, *Information as Environmental Regulation*, 89 GEO. L.J. 257 (2001). According to Karkkainen, TRI represents a watershed in environmental regulation, "pioneering the systematic use of performance monitoring and benchmarking as regulatory tools." *Id.* at 260. Although he points out the current limits of the program, the incentive structure embedded in TRI holds considerable promise: "TRI-generated transparency thus unleashes, strengthens, and exploits multiple pressures, all tending to push in the direction of continuous improvement as facilities and firms endeavor to leapfrog over their peers to receive credit for larger improvements or superior performance" *Id.* at 262.

342. *Id.* at 261-62.

343. For information on the project and access to the data, see EPA's SFIP home page at <http://es.epa.gov/oeca/sfi/> (last visited Apr. 23, 2002).

would have little bite. Under the existing framework, administrative agencies, non-governmental organizations, and the plaintiff's bar serve as the primary monitors of environmental performance. As suggested above, TRI, SFIP, and other disclosure programs provide important sources of information that can be used to improve such efforts by allowing for easier sector- and facility-based monitoring of environmental performance. By lowering the costs of monitoring, such programs open up new opportunities for local communities and other third party actors to get involved in the process.³⁴⁴

Rather than simply using TRI and/or SFIP data to assess environmental performance, however, one of the major goals for improved monitoring in the toxics area should be to develop improved techniques and institutional capabilities that allow for better real-time monitoring of toxic releases from industrial facilities. By moving further "upstream" to monitor actual releases from industrial facilities, such monitoring provides a possible check on the reported releases mandated under the various disclosure regimes discussed above. The financial, technical, and institutional difficulties of such a monitoring program are considerable, very likely requiring significant government involvement.

Such efforts, however, could be complemented by a coordinated program that draws on third parties and local communities to do real-time environmental monitoring of individual facilities. The growing popularity of citizen-based monitoring programs, such as the "Bucket Brigades" pioneered in industrial communities in California and now spreading to states such as Louisiana, provides a possible model. Using low-cost air sampling devices built from plastic buckets, the bucket brigades suggest that local citizens can and will monitor the environmental quality of their communities if given the opportunity.³⁴⁵ Dara O'Rourke and Greg Macey

344. According to Karkkainen, one of the most important and far-reaching effects of TRI lies in its ability to lower the costs and barriers of accessing the information necessary to do environmental monitoring. In his view, "The underlying genius of TRI . . . is that by measuring and continuously tracking facility- and firm-level environmental performance by using objective and comparable metrics, it creates a transparent and information-rich environment, enabling monitoring and benchmarking by multiple actors—by managers and directors, as well as by markets, communities, and the regulatory apparatus at all levels of government." See Karkkainen, *supra* note 340, at 329.

345. See the "Bucket Brigade" webpage at <http://www.bucketbrigade.org/> (last visited Apr. 23, 2002). See also Mike Dunne, *Air Sampling Bucket Simple, Effective Tool For Environmental Activists*, STATE-TIMES MORNING ADVOCATE (Baton Rouge, La.), Jan. 29, 2000, at A10.

suggest that this sort of program marks the emergence of a new paradigm of “community environmental policing”—one that has the potential to democratize and empower local communities in their efforts to monitor and control the industrial landscapes that they inhabit.³⁴⁶ While there are limits to how far such a program can be extended as a basis for improved monitoring of industrial facilities, they clearly represent important efforts to develop what O’Rourke and Macey refer to as “new strategies for public participation in environmental regulation.”³⁴⁷ Stronger financial support from EPA and foundations could significantly expand such programs—enhancing stakeholder involvement and generating a significant force for greater accountability regarding environmental performance.

3. *Testing and screening.*

Any effective monitoring program presumes not only that actors will have both the necessary incentives and the capabilities to monitor, but also that they have something to monitor. This last presumption is somewhat problematic in the toxics area given the pervasive state of ignorance regarding the toxicity of the vast majority of chemical compounds that confront people in their daily lives. This suggests the need for more systematic testing and screening in order to develop a better knowledge base for the regulatory system. The crucial challenge lies in shifting the burden of generating this information to industrial actors in a manner that creates positive incentives for testing and screening. If accomplished, this would represent a significant step toward developing a new framework for controlling toxic harms—one which rewards knowledge rather than ignorance.

One possibility for effecting such a transition involves the imposition of tort liability for failure to develop and disclose the information needed to assess the risks associated with potentially toxic substances. Various commentators have argued in this context for special rules that shift the burden of factual uncertainty to the defendant manufacturer to prove that its products are not hazardous.³⁴⁸ By creating a new “duty to test,” such a rule would

346. See Dara O’Rourke & Greg Macey, *Community Environmental Policing: Assessing New Strategies of Public Participation in Environmental Regulation*, MIT Department of Urban Studies and Planning (2002) (unpublished manuscript, on file with author).

347. *Id.*

348. Margaret Berger, for example, argues for abolishing the general causation requirement as an element of the plaintiff’s *prima facie* case in toxic torts (the crucial factor

presumably incentivize firms to produce the information needed to assess the safety of their industrial releases.

In contrast to tort-based approaches, others have argued for the superiority of administrative approaches to the testing problem.³⁴⁹ One possible (and partial) solution in this context involves a tax-financed testing and screening program for industrial discharges. Designed on a sector-specific basis and financed through taxes on specific industrial inputs that are known precursors of toxic compounds (*e.g.*, chlorine, petroleum feedstocks, etc.), this would provide a fund for testing as well as incentives for firms to switch to cleaner processes. Such a program would also allow individual firms in sectors where the technology is fairly standardized to pool their efforts while avoiding free-rider problems. In contrast to a new liability rule, this would presumably allow for better coordination of efforts and better allocation of resources among priorities.

Of course, realizing any of these three design changes would require a significant shift in the current political climate regarding toxics regulation. Any discussion of the most effective institutional framework for controlling toxic harms that ignores politics is unlikely to be of much use. But the fact that each of these design changes draws on existing efforts and ideas and would operate as a complement to, rather than a substitute for, the existing system suggests some degree of political feasibility. At the very least, thinking about how to scale these innovations, particularly those emerg-

that controls liability in her view) and replacing it with a new tort that would impose liability in negligence for failure to develop and disclose the information that is needed to assess serious latent risks. In her view this would shift the burden to corporations, creating strong incentives for producing information rather than maintaining ignorance. *See* Berger, *supra* note 299, at 2140-52. Similarly, Wendy Wagner has proposed adopting a presumption that an insufficiently tested product caused the plaintiff's harm in the products liability context. *See* Wendy E. Wagner, *Choosing Ignorance in the Manufacture of Toxic Products*, 82 CORNELL L. REV. 773 (1997). For a critique of these proposals, see Mark Geistfeld, *Scientific Uncertainty and Causation in Tort Law*, 54 VAND. L. REV. 1011, 1014 (2001) (arguing that there is no need for new evidentiary rules in the products area because, "tort liability can be imposed on product sellers for not adequately warning about the scientific evidence suggesting that the product is carcinogenic [or harmful in some other way]"). In Geistfeld's view, the evidentiary hurdles inherent in proving causation in these sorts of cases are only relevant at the damages phase. *Id.* Geistfeld points out, however, that "[c]ases outside of the products liability context require different analysis, because the hazardousness of the substance determines the appropriateness of imposing any liability on the defendant." *Id.* In these kinds of cases, he argues, it might be appropriate to relax the evidentiary requirements in the face of scientific uncertainty. *Id.*

349. Geistfeld, for example, concludes that administrative regulations rather than new tort liability rules are needed to solve the problem of inadequate information. *See* Geistfeld, *supra* note 348, at 1036-37.

ing out of local communities, to provide key components of a new approach to toxic harms enhances the ongoing process of social learning that is ultimately the most important element of any policy reform effort.

V. CONCLUSION

This essay has explored the limits of the contemporary legal and institutional framework for regulating and remedying toxic harms through an intensive case study of dioxin contamination in the pulp and paper industry. If this case study demonstrates anything, it is that the incentive structures embedded in the current institutional system (both tort and regulation) need to be re-oriented in a manner that facilitates the generation of useful information regarding toxic harms without succumbing to the paralyzing effects of scientific uncertainty. As illustrated by the case study, a preoccupation with scientific uncertainty creates considerable opportunity for politicization and delay. In cases where there is a potential for significant harm to human health and the environment, such delay seems unwarranted, even irrational. As currently constituted, both the regulatory system (dominated as it is by a risk assessment calculus and a preference for technological solutions) and the tort system (which inevitably bogs down over the scientific complexities associated with proving causation in toxics cases) are only capable of a chemical-by-chemical approach to toxic harms. Such an approach will never be adequate to deal with the magnitude of the problem posed by toxic chemicals.

As a complement to the existing regime, this essay has proposed three institutional design changes, each of which draws on and extends existing innovations in the context of an emerging information-based approach to toxics regulation and control. A more sophisticated disclosure regime—drawing on EPA's Toxics Release Inventory, California's Proposition 65, tort theories regarding the duty to warn, and perhaps some of the liability provisions regarding disclosure obligations in the securities area—could provide the basis for a new toxics policy founded on the basic principle of "right to know." Complementing this, an improved monitoring regime focused on individual facilities that harnesses the energies of third parties and local communities could provide stronger accountability while enhancing stakeholder involvement. Finally, a sector-based testing and screening program financed by taxes on chlorine (or other inputs implicated in the generation of

toxic by-products) would not only create incentives for developing and operationalizing alternative production systems (and there are already a number of commercially viable alternatives in place) but would also provide a fund as well as a possible institutional mechanism for individual firms to cooperate in a program aimed at solving the fundamental problem of toxic ignorance. Of course, whether any of these design changes is adopted is ultimately a political question, and none of them deal with the enormously complicated issue of compensation. What they do offer, however, are the rudiments of a new framework that creates incentives for knowledge generation and collective learning.

Looking back, one wonders what Rachel Carson would have made of the whole issue. Certainly she would have recognized the centrality of politics. Doubtless, too, she would have been quick to condemn the bold pronouncements made by industry advocates to challenge regulation—"little tranquilizing pills of half truth" she called them.³⁵⁰ In her view, contamination of the environment with toxic substances was an issue beyond compromise. Precaution rather than risk management was the only sane response, especially in the face of uncertainty. Indeed, the very fact that there were and are uncertainties concerning the implications of toxic chemicals for human health and the environment provided one more reason why they should be eliminated altogether. There were and are always alternatives—other paths to follow. In Carson's own words:

The choice, after all, is ours to make. If, having endured much, we have at last asserted our 'right to know,' and if, knowing, we have concluded that we are being asked to take senseless and frightening risks, then we should no longer accept the counsel of those who tell us we must fill our world with poisonous chemicals; we should look about and see what other course is open to us.³⁵¹

350. CARSON, *supra* note 1, at 13.

351. CARSON, *supra* note 1, at 277-78.

