

Confronting Chronic Pollution: A Socio-Legal Analysis of Risk and Precaution

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Abstract

The central aim of this article is to demonstrate a socio-legal approach to risk and precaution using the example of chronic pollution. Drawing on ongoing empirical work with the Aamjiwnaang First Nation, which is tucked into Sarnia's "Chemical Valley," a secondary aim is to influence and shape how we understand the problem and confront the risks of chronic pollution. This article forwards the argument that the prevailing regulatory approach is incapable of capturing the essence of contemporary pollution harms, because those harms are increasingly linked to continuous, routine, low-dose exposures to contaminants that are within legally sanctioned limits. Community residents and advocates struggling against chronic pollution are increasingly identifying with the environmental justice movement and adopting its strategies of resistance, including its mantra of "precaution." These strategies of resistance have the potential to dramatically expose the impotence of the prevailing regulatory approach to chronic pollution.

Keywords

Pollution--Law and legislation; Pollution--Environmental aspects; Environmental risk assessment--Law and legislation; Liability for environmental damages--Social aspects; Ontario

Confronting Chronic Pollution: A Socio-Legal Analysis of Risk and Precaution

DAYNA NADINE SCOTT *

The central aim of this article is to demonstrate a socio-legal approach to risk and precaution using the example of chronic pollution. Drawing on ongoing empirical work with the Aamjiwnaang First Nation, which is tucked into Sarnia's "Chemical Valley," a secondary aim is to influence and shape how we understand the problem and confront the risks of chronic pollution. This article forwards the argument that the prevailing regulatory approach is incapable of capturing the essence of contemporary pollution harms, because those harms are increasingly linked to continuous, routine, low-dose exposures to contaminants that are within legally sanctioned limits. Community residents and advocates struggling against chronic pollution are increasingly identifying with the environmental justice movement and adopting its strategies of resistance, including its mantra of "precaution." These strategies of resistance have the potential to dramatically expose the impotence of the prevailing regulatory approach to chronic pollution.

Cet article vise à démontrer une méthode socio-juridique en matière de risque et de précaution en s'appuyant sur l'exemple de la pollution chronique. En tirant parti des travaux empiriques en cours auprès de la Première nation Aamjiwnaang, cachée au cœur de la « vallée chimique » de Sarnia, un objectif secondaire est de façonner et d'influencer la manière dont nous envisageons le problème, puis de confronter les risques de la pollution chronique. Cet article présente l'argument selon lequel la méthode réglementaire qui prédomine est incapable de saisir l'essence des méfaits de la pollution contemporaine, car ces derniers sont de plus en plus liés à l'exposition continue, routinière

* Assistant Professor, Osgoode Hall Law School and the Faculty of Environmental Studies, York University. The author wishes to acknowledge the brave resolve and dedication demonstrated by the members of the Aamjiwnaang First Nation in confronting the chronic pollution they experience. She would also like to acknowledge the important research contributions of Judy Bang, Sidra Sabzwari, and Alexandra Stiver. This article has benefited tremendously from their skills and careful attention. My colleague Stepan Wood has also provided very thorough and insightful feedback. Finally, there have been a number of students over the past year who have contributed to my thinking about chronic pollution and environmental justice, and I thank them for their passion, curiosity, and commitment to change.

et à faible dose aux contaminants qui sont au-delà des limites sanctionnées par la loi. Dans la collectivité, les résidents et les défenseurs en lutte contre la pollution chronique s'identifient sans cesse davantage au mouvement de justice environnementale, dont ils adoptent les stratégies de résistance et le mantra de « précaution ». Ces stratégies de résistance pourraient radicalement mettre en évidence l'impuissance de la méthode réglementaire qui domine en matière de pollution chronique.

I.	THE RISE OF RISK.....	298
A.	The Causal Inquiry	301
II.	CHRONIC CONTAMINATION OF THE AAMJIWNAANG FIRST NATION	303
III.	ELEMENTS OF A SOCIO-LEGAL ANALYSIS OF RISK.....	307
A.	What is a Socio-Legal Analysis of Risk?	310
IV.	SUBJECTIVE ACCOUNTS OF CHRONIC POLLUTION.....	312
A.	The Dominant Account: Environmental Health Harms are Incidental and Accidental.....	313
B.	An Alternative Account: Environmental Health Harm is Inherent to Industrial Production	317
V.	LAW'S TREATMENT OF CHRONIC POLLUTION.....	320
A.	The Dominant Account Leads to a Strategy of "Risk Management".....	321
B.	The Emerging Account Leads to a Strategy of Precaution	328
C.	Strategies of Resistance: Body Burdens and Bucket Brigades.....	334
VI.	CONCLUSION.....	338

ONE OF THE MOST INTRACTABLE PROBLEMS facing modern environmental law is the issue of chronic pollution. By "chronic," I refer to the continuous or continuously recurring exposures to low doses of pollutants and contaminants that characterize the experience of living in the industrialized world. Traditional toxicology is based on high-dose tests and linear dose-response relationships reflecting "the prevailing paradigm of *dosis facit veninum*: the dose makes the poison."¹ But evidence to the contrary is accumulating. Epidemiological studies now routinely forward claims of irreversible developmental effects at low levels of exposure to certain key chemicals.² In this way, the "risks" of long-term low-

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1. Nicolas van Larebeke *et al.*, "Sex Ratio Changes as Sentinel Health Events of Endocrine Disruption" (2008) 14 *Int'l J. Occup. Envtl. Health* 138 at 138.
 2. *Ibid.* at 140. Abraham Brouwer *et al.*, "Characterization of Potential Endocrine-Related Health Effects at Low-Dose Levels of Exposure to PCBs" (1999) 107 *Envtl. Health Perspectives Supplements* 639; European Environment Agency (EEA), *Chemicals in the European Environment: Low Doses, High Stakes?* by David Gee *et al.* (Copenhagen:

dose exposures to pollution are becoming increasingly contested as a result of pressure from emerging social movements, such as the environmental justice movement. This movement has been a key impetus behind the precautionary principle or “precaution,” especially as it applies to toxic chemical pollution.

This article employs a socio-legal analysis of risk and precaution and undertakes two branches of inquiry. The first branch examines the multiple subjective understandings or accounts of risk, while the second branch demonstrates how particular understandings or accounts influence the form of the law’s response to the risk. This approach to studying risk and precaution is part theory, part practice. It is engaged theoretical work that contributes to social transformation: the aim is to influence and shape how we understand the problem and confront the risks of chronic pollution.

The argument is that the prevailing regulatory approach to the problem of chronic exposures is incapable of capturing the essence of contemporary pollution. The difficulties become apparent on a socio-legal analysis which reveals the basis upon which our regulatory regime rests. The basic deal we have struck as a society is that most pollution is in fact state-sanctioned—it is permitted according to certain specified limits or standards set down in regulations, and in the rare case where this legally sanctioned pollution results in proven harm, the state relies on tort law to step in and provide compensation.³ For this approach to be sustained, the incidence of harm

EEA, 1998) at 4, online: <http://reports.eea.europa.eu/NYM2/en/chemicals_eea_unep.pdf>; Matthew Hogg, “Chemicals Harmful to Health in Low As Well As High Doses” *The Environmental Illness Resource* (23 January 2007), online: <<http://www.ei-resource.org/news/general-environmental-health-news>>; Sergio Kuriyama *et al.*, “Developmental Exposure to Low-Dose PBDE-99 Effects on Male Fertility and Neurobehavior in Rat Offspring” (2005) 113 *Envtl. Health Perspectives* 149; Stefano Parmigiani *et al.*, “Exposure To Very Low Doses of Endocrine Disrupting Chemicals (EDCs) During Fetal Life Permanently Alters Brain Development and Behavior in Animals and Humans” in Richard C. Ragaini, ed., *International Seminar on Nuclear War and Planetary Emergencies: 27th Session* (River Edge, NJ: World Scientific, 2003) 293; Frederick S. Vom Saal & Claude Hughes, “An Extensive New Literature Concerning Low-Dose Effects of Bisphenol A Shows the Need for a New Risk Assessment” (2005) 113 *Envtl. Health Perspectives* 926; and Wade V. Welshons, Susan C. Nagel & Frederick S. vom Saal, “Large Effects from Small Exposures. III. Endocrine Mechanisms Mediating Effects of Bisphenol A at Levels of Human Exposure” (2006) 147 *Endocrinology* 556.

3. This is admittedly an oversimplification. Regulatory regimes may also provide compensation in some limited circumstances, and criminal or regulatory enforcement proceedings are also

associated with pollution must continue to be understood as unusual—insignificant and peripheral to the routine processes of modern industrial production. But the environmental justice movement has been persistently chipping away at this understanding. The new and emerging account of risk would construe the incidence of harm tied to pollution as not only significant, intentional, and expected, but also as inherent to our practices of production and consumption.

Advocates railing against chronic pollution and contamination are increasingly identifying with and being inspired by the environmental justice movement. A central focus is the notion of “disproportionate burdens”—the claim that while pollution is everywhere, it is most readily found in a few choice places, particularly those inhabited by the poor, the racialized, and the marginalized.⁴ Thus, the environmental justice movement seeks explicitly to

available in situations of harm resulting from authorized releases (although they tend to be infrequently invoked and do not necessarily address the environmental harm to individuals or communities). At the same time, tort law provides an inadequate answer. For example, in negligence claims, plaintiffs routinely fail to establish causation. For a consideration of the applicability of property torts, such as nuisance and trespass, as instruments for protecting “Aboriginal environments,” see Lynda Collins, “Protecting Aboriginal Environments: A Tort Law Approach” in Louise Belanger-Hardy *et al.*, eds., *Critical Torts* [forthcoming in 2008 as a special issue of the *Sup. Ct. L. Rev.*].

4. Timothy W. Luke, “Rethinking Technoscience in Risk Society: Toxicity as Textuality” in Richard Hofrichter, ed., *Reclaiming the Environmental Debate: The Politics of Health in a Toxic Culture* (Cambridge, MA: MIT Press, 2000) 239 at 249. The environmental justice framework was developed in the US context, and, to date, it has largely been focused on the distribution of the benefits and burdens of environmental management. When authors describe “sacrifice communities,” they are referring to the generally rural and poor Black or Hispanic communities disproportionately chosen to house toxic waste, coal-fired utility plants, and nuclear reactors. See Robert D. Bullard, *Dumping in Dixie: race, class, and environmental quality* (Boulder: Westview Press, 1990); Robert D. Bullard, *Confronting Environmental Racism: Voices from the Grassroots* (Boston: South End Press, 1993); Luke W. Cole & Sheila R. Foster, *From the Ground Up: Environmental Racism and the Rise of the Environmental Justice Movement* (New York: NYU Press, 2001); and Clifford Rechtschaffen & Eileen Gauna, *Environmental Justice: Law, Policy and Regulation* (Durham: Carolina Academic Press, 2002). See also Virginia A. Sharpe, “Environmental Justice and the Social Determinants of Health” in Gerald Visgilio & Diana Whitelaw, eds., *Our Backyard: The Quest for Environmental Justice* (Lanham: Rowman & Littlefield, 2003) at 25-38; David Harvey, “The Environment of Justice” in Frank Fischer & Maarten A. Hajer, eds., *Living with Nature: Environmental Politics as Cultural Discourse* (Oxford: Oxford University Press, 1999) at 153; Stella M. Capek, “The ‘Environmental Justice’ Frame: A Conceptual

“confront[] the *polluters* with the *polluted*.”⁵ That the polluted are powerless is thought to be evident in the very fact of their pollution.

On the Aamjiwnaang First Nation reserve, in the shadow of Sarnia’s “Chemical Valley,” a recent study confirmed what residents had suspected for years—the community’s sex ratio (the number of boys born relative to the number of girls) is declining at an alarming rate.⁶ It is speculated that chronic exposures to toxic chemical pollution, and, specifically, a group of endocrine-disrupting chemicals provocatively nicknamed the “gender-benders,” are responsible. While the skewed sex ratio may be a potent symbol of the complexity of contemporary pollution harms, it is by no means the only manifestation of the pervasive, diffuse, and body-altering pollution that the residents report. Ongoing empirical work is uncovering, from an Aamjiwnaang perspective, just how oppressive chronic pollution can be. Preliminary results illustrate quite clearly how, on a socio-legal approach, multiple subjective understandings of the risk of chronic pollution exist, and how dramatically different strategies of risk governance flow directly from them, depending on which account is adopted.

In the course of their ongoing struggles against chronic pollution, the Aanishnaabek of Aamjiwnaang have employed several strategies for community empowerment which demonstrate the growing influence of the environmental justice movement. Two of the most exciting new strategies employed by activists and communities inspired by the movement are biomonitoring (or “body burden” testing) and community environmental monitoring, such as the deployment of so-called “bucket brigades.” Biomonitoring is a “new science that derives from critical epidemiology and citizen-science alliance”—it generates a measure of a person’s “body burden,” which is thought to give direct information about total exposures to pollutants across time and from all sources.⁷ The “bucket brigades” are motivated groups of “residents who live in industrial zones and are recruited to monitor air near oil refineries, chemical factories, and power plants, using low-

Discussion and an Application” (1993) 40 *Social Problems* 5; and Susanne Antonnetta, *Body Toxic: An Environmental Memoir* (Washington: Counterpoint, 2001).

5. Robert D. Bullard, ed., *The Quest for Environmental Justice: Human Rights and the Politics of Pollution* (San Francisco: Sierra Club Books, 2005) at 6 [emphasis in original].
6. Constanze A. Mackenzie, Ada Lockridge & Margaret Keith, “Declining Sex Ratio in a First Nation Community” (2005) 113 *Envtl. Health Perspectives* 1295.
7. Phil Brown, *Toxic Exposures: Contested Illnesses and the Environmental Health Movement* (New York: Columbia University Press, 2007) at 265 [Brown, *Toxic Exposures*].

cost grab samplers. They are deployed on the frontlines of efforts to improve environmental monitoring and reinvigorate environmental enforcement.”⁸

These strategies are deployed by environmental justice activists in the attempt to expose the impotence of the prevailing regulatory approach to pollution. Specifically, they seek to marshal the evidence that is needed to demonstrate that chronic exposures to pollution are causing environmental health harms, even at the “safe doses” permitted by existing regulations. Precaution, in contrast, would demand that governance strategies take account of the cumulative effects of exposures from all sources across time. Thus, I draw on the Aamjiwnaang case not only to articulate what a socio-legal approach to issues of risk and precaution might produce on the question of chronic pollution, but also to demonstrate how the community’s resistance exposes inadequacies in the law’s treatment of chronic pollution.

The analysis consists of five parts. Part I provides a theoretical grounding in contemporary risk and regulation debates. Part II details the ongoing struggles of the Aamjiwnaang First Nation with chronic pollution and its effects on their community. Part III introduces the elements of a socio-legal analysis of risk and precaution, drawing on a framework put forward by Jonathan Simon. Part IV describes two contrasting accounts of the risks of chronic pollution that exist in Sarnia’s Chemical Valley. This is followed by Part V, which demonstrates how each account of risk leads to a different regulatory approach and details the strategies of resistance that the Aamjiwnaang have deployed in order to expose inadequacies in the law’s treatment of chronic pollution. I conclude with some comments on future directions for the socio-legal study of risk and precaution.

I. THE RISE OF RISK

The concept of risk has become central to modern environmental law.⁹ In fact, many contemporary problems, such as genetic engineering, climate change, and

8. Dara O’Rourke & Gregg Macey, “Community Environmental Policing: Assessing New Strategies of Public Participation in Environmental Regulation” (2003) 22 J. of Pol’y Analysis & Mgmt. 383 at 385.

9. Nicolas de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules*, trans. by Susan Leubusher (Oxford: Oxford University Press, 2002) at 3. The phrase “rise of risk” is drawn from the title of David Garland’s chapter in Richard V. Ericson & Aaron Doyle, eds., *Risk and Morality* (Toronto: University of Toronto Press, 2003) 48. In this chapter, Garland details the centrality of the idea of risk for understanding modern times (at 49).

the detection of latent environmental and health hazards, have come to symbolize the preoccupation with “post-industrial risks” described by Ulrich Beck in his ground-breaking theory of the “risk society.”¹⁰ Beck’s central claim is that risk is now such an integral element of contemporary industrial society that we have become preoccupied with its understanding and control.¹¹ Further, Beck argues that the placement of legal responsibility for demonstrating liability is fuelling the crisis. Because people need to be exposed to hazards before it is possible to demonstrate that they are harmful (the idea of “society as laboratory”), the public’s response tends to be a form of “industrial fatalism.”¹² Beck says that the public must live with obvious threats of uncontrolled industrial development, but is unable to account for the nature of the risks and unable to identify the culprits. He goes on to argue that the political and legal systems that should be managing these hazards tend—both intentionally and unintentionally—to deny the social origins of the risks. Thus the public’s fatalistic response—to ignore and deny the risk because of a lack of control over it—is, in Beck’s view, to be expected.

An important characteristic of modern pollution is that these risks are virtually undetectable without scientific investigation. In many cases they must be actively brought into public awareness to be identified as a social threat. As Frank Fischer notes, “the highly technical and invisible nature of these risks [means that] the politics of risk intrinsically emerge as a politics of knowledge, typically contested through expertise and counter-expertise.”¹³ In Beck’s theory, risks exist in the social world only so far as there is scientific translation. “This elevates the expertise and status of the knowledge professions to a prime political position in the discourse of risk, leaving little or no room for the layperson.”¹⁴ The result is a growing tension between those who have ‘knowledge’ and those who do not.¹⁵

10. Ulrich Beck, *Risk Society: Towards a New Modernity* (London: Sage, 1992) [Beck, *Risk Society*].

11. *Ibid.*

12. Ulrich Beck, *Ecological Politics in an Age of Risk* (Cambridge: Polity Press, 1995) at 56-57.

13. Frank Fischer, *Citizens, Experts, and the Environment: The Politics of Local Knowledge* (Durham: Duke University Press, 2000) at 51.

14. *Ibid.*

15. See Maarten Hajer, *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process* (New York: Clarendon Press, 1995); Harvey, *supra* note 4.

Beck argues that while science is essential to the awareness of modern risks, its failure as an institution to speak authoritatively about risks has been a main driver of the current crisis.¹⁶ Beck's solution lies with "ecological democracy"—a public and "polyvocal" conversation about technologies that is based on a more reflexive or self-critical practice of science. But, as Beck's critics have pointed out, this is where he leaves the topic. He does not extend his analysis to include a challenge to the conventional understandings of science. As Fischer says, "we are left with ... the need to look for new ways to further democratize the processes of counter-expertise."¹⁷ In fact, Brian Wynne argues that the "risk society" thesis fails to really question the meaning of expertise and knowledge, especially what Wynne would call the social and cultural bases of their indeterminacies.¹⁸ He suggests that citizens' responses to expert knowledge should be seen as *conditioned* by social dependency on expert institutions.¹⁹ He is essentially arguing that Beck's idea of industrial fatalism is flawed. In Wynne's view, the risk society thesis underappreciates the sense of dependency and lack of agency that pervade citizens' experiences with expert institutions.²⁰

Overcoming this sense of dependency and lack of agency is a key goal of the environmental justice movement and the driving force behind the rise of "popular epidemiology."²¹ Popular epidemiology is a form of political struggle through which community members themselves engage in the collection of data and the marshalling of knowledge and evidence needed to explain their experience of contamination.²² To varying extents, residents involved in this

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16. It should be noted that Beck's work has been criticized for employing "sweeping generalizations" in its questioning of "science" and for lacking specific illustrations. See *e.g.* William Leiss, Book Review of *Risk Society: Towards a New Modernity* by Ulrich Beck, online: The Canadian Journal of Sociology Online <<http://www.ualberta.ca/~cjscopy/articles/leiss.html>>. Most adherents to the environmental justice movement would also explicitly reject Beck's notion that class consciousness and identity struggles are somehow erased by risk consciousness.
 17. Fischer, *supra* note 13 at 59.
 18. Brian Wynne, "May the Sheep Safely Graze? A Reflexive View of The Expert-Lay Knowledge Divide" in Scott Lash, Bronislaw Szerszynski & Brian Wynne, eds., *Risk, Environment & Modernity: Towards a New Ecology of Risk* (London: Sage, 1996) 44 at 45-46.
 19. *Ibid.* [emphasis added].
 20. *Ibid.*
 21. Fischer, *supra* note 13 at 121.
 22. Phil Brown & Edwin J. Mikkelsen, *No Safe Place: Toxic Waste, Leukemia, and Community Action* (Berkeley: University of California Press, 1990).

type of struggle will also draw on and enlist the knowledge and resources of experts. But popular epidemiology is more than just lay persons participating in traditional epidemiological practice, it tends to include social and structural factors as part of the causal disease chain, thus challenging the basic assumptions of and conventional approaches to risk.²³

A. THE CAUSAL INQUIRY

The risks associated with chronic pollution illustrate Beck's thesis perfectly. They are virtually undetectable without scientific investigation. They manifest, in Carl Cranor's words, as "harms caused by molecules."²⁴ To understand the mechanics of endocrine disruption—for example, the way that certain chemicals mimic hormones in the body by binding with available receptors and influencing gene expression—we are forced to rely on scientific and technical ways of knowing.²⁵ Kai Erikson calls these contemporary risks a "new species of trouble."²⁶ They are insidious in that the consequences of exposure tend to eventually manifest themselves in ways that start with toxins moving "stealthily into the tissues of the human body" and then working their way out.²⁷ Further, as Erikson argues, the latency period associated with many contemporary environmental health risks underscores their psychological impact in that it renders the experience of risk unbounded; "an 'all clear' is never sounded."²⁸

Pollution generates powerful anxieties in people. It works involuntarily on human bodies, and, in most cases, we have no way of being aware of its

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23. Phil Brown, "Popular Epidemiology and Toxic Waste Contamination: Lay and Professional Ways of Knowing" (1992) 33 *J. Health & Soc. Behav.* 267. Phil Brown's concept of "contested illnesses" also relies on a form of popular epidemiology in which laypeople combine with progressive professionals to challenge the dominant epidemiological paradigms.
 24. Carl F. Cranor, *Toxic Torts: Science, Law, and the Possibility of Justice* (New York: Cambridge University Press, 2006) at 12.
 25. Beck, *Risk Society*, *supra* note 10 at 63.
 26. Kai Erikson, "A New Species of Trouble" in Stephen R. Couch & J. Stephen Kroll-Smith, eds., *Communities At Risk: Collective Responses to Technological Hazards* (New York: Peter Lang, 1991) 11 at 11.
 27. Kai Erikson, *A New Species of Trouble: Explorations in Disaster, Trauma, and Community* (New York: W.W. Norton, 1994) at 20.
 28. *Supra* note 26 at 19.

intrusion despite the prospect of irreversible and cataclysmic harms.²⁹ The “injurious encounter” in chronic pollution cases takes place at the molecular level.³⁰ This, and the environmental dispersal of multiple injurious agents by multiple polluters, “renders the project of causal tracing difficult, if not impossible in many cases.”³¹ As Cranor notes,

[c]arcinogens, reproductive toxicants, and neurotoxicants are invisible, undetectable intruders that can have long latency periods (*e.g.*, from a few months to more than forty years for cancer), rarely leave signature diseases, often operate by means of unknown, complex, subtle molecular mechanisms and, when they materialize into harm, injure humans in ways that researchers might not discover for years.³²

Long latency periods between exposure and effect enable those seeking to resist the linking of environmental health harms with pollution to point to any number of possible intervening causal events.

To overcome these difficulties, many communities organizing around environmental health harms turn to the science of epidemiology for assistance. Epidemiology is the study of disease in the population as a whole, as distinguished from the study of disease in individuals.³³ It is the study of the distribution of a disease or physiological condition in human populations, and of the factors that influence that distribution.³⁴ Most toxic substances in the environment, however, have simply not been subjected to systematic epidemiological study.³⁵ Where there are studies to draw on, the scientific evidence typically provides that the toxic chemical in question might be hazardous, but not that it is hazardous. In order to show that exposure to a

29. Mary Douglas & Aaron Wildavsky, *Risk and culture: an essay on the selection of technological and environmental dangers* (Berkeley: University of California Press, 1982) at 26.

30. Lynda Collins, “Material Contribution to Risk and Causation in Toxic Torts” (2001) 11 J. Envtl. L. & Prac. 105 at 107.

31. *Ibid.*

32. Cranor, *supra* note 24 at 11.

33. *Rothwell v. Raes* (1988), 66 O.R. (2d) 449 at para. 51 (Ont. H.C.J.).

34. Cranor, *supra* note 24 at 9.

35. See Brown, *Toxic Exposures*, *supra* note 7; *ibid.* Regarding endocrine disruptors, Mary Wolff states: “basic knowledge about fate and transport in the body is very sketchy for many chemicals: where do they come from and how long do they last in the body?” Mary S. Wolff, “Endocrine Disruptors: Challenges for Environmental Research in the 21st Century” (2006) 1076 Ann. N.Y. Acad. Sci. 228 at 234.

toxic substance caused or contributed to human harm, substantial, lengthy, and expensive studies are needed.³⁶ Thus, epidemiological evidence is generally treated as useful for demonstrating links or associations between particular illnesses and potential toxins, but not for providing definitive causal pronouncements in particular instances.

The critique of conventional epidemiology from an environmental health perspective is that “[s]ubjective claims about the body are subordinated to statistical correlations between exposure and [populations].”³⁷ The focus is neither on individual suffering, nor on community-wide illness or harm, but on aggregated and probabilistic harm across disembodied populations. The result blurs the details of individual lives and community struggle in the hopes of creating a pattern or revealing a “cluster.” Thus, epidemiology’s “statistical vision” tends to turn individuals suffering from the effects of chronic contamination into mere “victims of chance,” denying the social origins of pollution and the blameworthiness of those who perpetuate it.³⁸ The social aspects of risk and its consequences can be brought into focus, however, through close empirical study. For this reason, I turn now to the struggles of the Aanishnaabek of Aamjiwnaang.

II. CHRONIC CONTAMINATION OF THE AAMJIWNAANG FIRST NATION

The Aamjiwnaang First Nation is a community of approximately nine hundred Aanishnaabek people living on a reserve located immediately adjacent to Sarnia’s notorious “Chemical Valley.” This area of southwestern Ontario, located at the southern tip of Lake Huron and bordering Michigan, houses one of Canada’s largest concentrations of industry, comprising several large petrochemical, polymer, and chemical industrial plants. In recent years, residents began to wonder why they needed two softball teams to accommodate the girls on reserve when they could barely field one team of boys.³⁹ Soon they had documented a marked decrease in the number of males born into their

36. Brown, *Toxic Exposures*, *ibid.*

37. Sheila Jasanoff, “Science and the Statistical Victim: Modernizing Knowledge in Breast Implant Litigation” (2002) 32 Soc. Stud. Sci. 37 at 37.

38. *Ibid.*

39. Personal communication with Ada Lockridge, Health and Environment Committee Chair, Aamjiwnaang First Nation (26 March 2008).

community. So, with the assistance of researchers affiliated with the University of Ottawa and the Occupational Health Clinic for Ontario Workers, an investigation was launched to explain this phenomenon, and the Aamjiwnaang First Nation now has the unwelcome distinction of the world's lowest documented birth ratio.⁴⁰

Using data reported to the Department of Indian and Northern Affairs, the researchers assessed trends in the ratio of male to female births for the years from 1984 to 2003.⁴¹ The results of linear regression analyses showed that while the proportion of male births was relatively stable from 1984 to 1993, it declined sharply from 1994 to 2003. Globally, the percentage of male births typically hovers at just about 50 per cent and in Canada this figure sits at 51.2 per cent. The study authors found, however, that the proportion of male births in the Aamjiwnaang community during the ten-year period from 1994 to 2003 steadily declined, accounting for only 41.2 per cent of births. In the five years from 1999 to 2003, the decline was even more pronounced, with males totalling only 34.8 per cent of births. Although sex ratios may fluctuate over time, the deviation identified in the Aamjiwnaang community, according to the study, was "outside the range of normal."⁴²

The study recommended further research to determine whether the noted decline in sex ratio was correlated with the community members' exposure to industrial pollutants. Other studies conducted in this region have found changes in the sex ratios and reproductive abilities of fish, bird, and turtle populations, which are also thought to be due to exposures to endocrine-disrupting chemicals.⁴³ Endocrine disruptors are said to have a "hormone-mimicking" effect.⁴⁴ They may induce long-term effects upon low-dose

40. Mary Ann Colihan, "Chemical Valley: Aamjiwnaang First Nation in Sarnia Sounds Alarm Over Toxins" *CBC News In Depth* (1 April 2008), online: <<http://www.cbc.ca/news/background/aboriginals/health.html>>.

41. Mackenzie, Lockridge & Keith, *supra* note 6 at 1296.

42. *Ibid.*

43. Endocrine disrupting chemicals include a diverse set of compounds that includes persistent organic pollutants (like dioxins and polychlorinated biphenols (PCBs)), several insecticides and fungicides, and a number of widespread industrial chemicals (such as brominated fire retardants). Alberto Mantovani, "Risk Assessment of Endocrine Disruptors: The Role of Toxicological Studies" (2006) 1076 *Ann. N.Y. Acad. Sci.* 239 at 240.

44. Theo Colborn, Dianne Dumanoski & John Peterson Myers, *Our Stolen Future: Are We*

exposures in susceptible developmental phases.⁴⁵ It is hypothesized that these environmental contaminants disrupt the human endocrine system, influencing the sex ratio by changing parents' hormonal milieu or by inducing sex-specific mortality in miscarriage.⁴⁶

To the legacy of colonialism, the Aamjiwnaang First Nation adds the legacy of a century of petrochemical production. Talfourd Creek gathers its waters in an industrial corridor which is home to 40 per cent of Canada's chemical production before it meanders through the Aamjiwnaang reserve and empties into the St. Clair River.⁴⁷ The mantra of the environmental justice movement that "some live more downstream than others"⁴⁸ is an obvious reality in this community. There are sixty-two large emitting industrial facilities within twenty-five kilometres of the reserve.⁴⁹ In 2005 there were 5.7 million kilograms of toxic air pollutants released from the facilities on the Canadian side of the border alone.⁵⁰

While the Aamjiwnaang community experiences anxiety and fear related to the frequent pollution "incidents" or accidents that are part of life in Chemical Valley, it is the "slow poisoning" and the accumulation of toxins over time that

Threatening Our Fertility, Intelligence, and Survival? – A Scientific Detective Story (New York: Dutton, 1996).

45. In particular, the "continuum from gamete production and fertilization through to intrauterine and post-natal development of progeny, is recognized as especially vulnerable to endocrine disruption." Mantovani, *supra* note 43 at 240.
46. Dr. William Foster, Medical Director at the Center for Reproductive Care at Hamilton Health Sciences Center, "Panel Discussion on Sex Ratio Changes" (Panel discussion held at the Aamjiwnaang Environmental Health Symposium, Sarnia, 26 March 2008) [unpublished]. Foster stated that the driving mechanism is still very much contested. Some studies point toward a paternally-mediated effect, while others indicate a maternally-mediated effect.
47. Elaine MacDonald & Sarah Rang, "Exposing Canada's Chemical Valley: An Investigation of Cumulative Air Pollution Emissions in the Sarnia, Ontario Area" (Toronto: Ecojustice, 2007), online: <<http://www.ecojustice.ca/publications/reports/report-exposing-canadas-chemical-valley/attachment>>.
48. Jim Tarter, "Some Live More Downstream than Others: Cancer, Gender, and Environmental Justice" in Joni Adamson, Mei Mei Evans & Rachel Stein, eds., *The Environmental Justice Reader: Politics, Poetics & Pedagogy* (Tucson: University of Arizona Press, 2002) 213.
49. MacDonald & Rang, *supra* note 47.
50. *Ibid.*

they have come to dread most. Contamination of their bodies and their traditional territory has had an enormous emotional effect.⁵¹ And, as they have come to discover, the skewed sex ratio may just be the tip of the iceberg. Residents of the Aamjiwnaang First Nation have expressed a building anger and lingering sadness upon learning the extent of their health problems and the mounting evidence linking those problems to the actions of their industrial neighbours.⁵² The knowledge itself is upsetting, but the unknowns can have an equally corrosive effect. For example, in part because it is widely accepted among epidemiologists that exposures to toxic chemicals in one generation may produce effects in the next, no one can tell the Aamjiwnaang community whether they face a present danger or are experiencing the latent manifestation of exposures long past: “was it me, was it my dad, my mom? ... we don’t know who’s been exposed.”⁵³ But it is clear that the Aamjiwnaang First Nation is a deeply injured community.

“Implicit in the term ‘injury,’” according to Christopher Williams, “is a relationship between two events (cause and effect) that culminate in a tangible harm.”⁵⁴ Cultural anthropologist Sarah Jain uses the term “wound” to capture the sense that harms exist out there in the world that are not captured by the legal notion of “injury.”⁵⁵ And, as she reminds us, “wellness and wounding will always be at play within various cross-cutting hierarchies” pre-existing in our society.⁵⁶ “[W]ounding itself,” she states, “brings a mode of attention to objects into being. ... [O]bjects only emerge as separate from the [agent] when

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51. See e.g. Dean Jacobs, “Environmental Health Status of First Nations” (Lecture presented at the Aamjiwnaang Environmental Health Symposium, Sarnia, 26 March 2008) [unpublished; notes on file with author]. Jacobs—of Walpole Island First Nation, located on the St. Clair river—has underlined the “psychosocial and cultural dimensions” of the chronic pollution and contamination, describing a form of “chemophobia” in which “everyone blames everything on the pollution.”
 52. Community member comments (presented at the Aamjiwnaang Environmental Health Symposium, Sarnia, 27 March 2008) [notes on file with author].
 53. Ron Plain, “The Costs of Chronic Pollution: Stories from the Aamjiwnaang First Nation” (Lecture delivered at the “Exposing Canada’s Toxic Shame” event, Faculty of Environmental Studies, York University, 12 March 2008) [notes on file with author].
 54. Christopher Williams, “An Environmental Victimology” (1996) 23 *Social Justice* 16 at 20.
 55. Sarah S. Lochlann Jain, *Injury: The Politics of Product Design and Safety Law in the United States* (Princeton: Princeton University Press, 2006) at 6.
 56. *Ibid.* at 5.

something goes wrong.”⁵⁷ It is as if the chronic chemical pollution in the streams, rivers, air, and soil of the Aamjiwnaang reserve is suddenly rendered visible by the duly documented epidemiological study of the plummeting sex ratio.

In reality, the Aamjiwnaang story is one of the individual trauma of repeated miscarriage and the collective loss of a viable future. What is striking about this case, and the issue of chronic pollution more generally, is that the ‘risk’ is

defined not privately, but interpersonally, a kind of threat that individuals do not take on consciously or accept, but gradually find themselves enduring; it is risk identified not with individual persons or actions, but emergent at the level of social life and collective choice.⁵⁸

The risk is neither one for which the people of Aamjiwnaang have made trade-offs, nor one that they have accepted in exchange for some benefit accruing to them or even to society as a whole. It is a risk that they now actively resist. Their strategies, taken in concert with environmental justice activists, are the focus of attention worldwide and, as I will argue, have the potential to expose the impotence of current environmental law as an answer to contemporary pollution problems.

III. ELEMENTS OF A SOCIO-LEGAL ANALYSIS OF RISK

Conventionally, as environmental lawyers and legal academics, we have been concerned with environmental “problems.” But more recently, we are concerned with environmental “risks,” and, in essence, what the environmental justice movement seeks to mobilize us around are more accurately described as “environmental health risks,” that is, threats to humans that derive from or are transmitted through air, soil, water, and/or food chains.⁵⁹ The target of pollution that is a concern for environmental lawyers can no longer be just ecosystems, it must include human bodies. It is less about protecting the environment from humans and more about protecting humans from the environment. At the same time, we must also recognize that threats to both

57. *Ibid.*

58. Richard P. Hiskes, “Hazardous Liaisons: Risk, Power, and Politics in the Liberal State” (1998) 26 *Pol’y Stud. J.* 257 at 258.

59. I draw here on the distinctions made by Harris Ali. See Harris Ali, “Dealing with Toxicity in the Risk Society: The Case of the Hamilton, Ontario Plastics Recycling Fire” (2002) 39 *CRSA/RCSA* 29 at 30.

humans and ecosystems are not “caused” by the environment, but are “environmentally *mediated* hazards”—the harmful effects of which are “first and foremost injuries and justice problems” as opposed to “diseases and health problems.”⁶⁰

In the rationalist tradition, “risk is a quantity that can be measured precisely by means of a formula.”⁶¹ It is a simple function of the magnitude of the loss and the probability of occurrence. In other words, something is considered “risky” if the consequence of the risk materializing is serious and/or likely to happen. Studies of risk from this perspective tend to rely on experts to determine both what these formulas say about particular human activities and prescriptions for what a rational regulatory response to the risk should be on that basis.⁶²

But how ordinary people judge whether a particular activity is risky depends on several other factors outside of just the consequences (the magnitude of the loss) and the probability of occurrence.⁶³ Importantly, those factors most often include whether the risk is seen as voluntary and whether it is seen as fair.⁶⁴ Making judgments on both of these factors involves an assessment of the distribution of the costs and benefits associated with taking the risk. Expert risk management institutions calculate the costs and benefits of

60. Christopher Williams, “Environmental Victims: An Introduction” (1996) 23 *Social Justice* 1 at 2.

61. Piet Strydom, *Risk, Environment, and Society: Ongoing debates, current issues, and future prospects* (Buckingham: Open University Press, 2002) at 76.

62. See e.g. Cass R. Sunstein, *Laws of Fear: Beyond the Precautionary Principle* (Cambridge: Cambridge University Press, 2005); Cass R. Sunstein, *Risk and Reason: Safety, Law and the Environment* (Cambridge: Cambridge University Press, 2002).

63. Much work has been devoted to the question of why citizen perceptions of a risk may differ from ‘expert assessments’ of the same risk. At bottom, the answer seems to be that public perception of risk tends to include elements that are excluded from expert assessments. As Sunstein and Pildes note: “There is one strikingly consistent finding in risk studies: laypeople assess risk through different value frameworks from those implicitly embedded in expert approaches. Laypeople do not look only or even primarily to expected annual mortality; they look as well at a number of factors determining the acceptability of different risks in different contexts.” Richard H. Pildes & Cass R. Sunstein, “Reinventing the Regulatory State” (1995) 62 *U. Chi. L. Rev.* 1 at 56. Specifically, study after study has found that citizens often take account of the ‘catastrophic’ nature of the risk; the ‘controllability’ of the risk; the permanence of the potential loss; the equitable distribution of the danger and benefits associated with the risk; and the characteristics of the likely victims.

64. See e.g. *ibid.* at 66.

the risky action for society as a whole—they rarely attach much significance to the distributional questions of who bears the costs and who reaps the benefits. Yet residents of contaminated communities often find this, quite rationally, to be a highly relevant criterion.

Once a particular risk has manifested, or, more problematically, when an effect is present that could potentially (but might not) be attributable to the risk, the next question is one of cause and effect. In law, a causal link is a prerequisite to the assignment of responsibility and blame.⁶⁵ Social scientists and interdisciplinary legal scholars have long contended that “people’s perceptions and descriptions of cause-and-effect relationships vary according to their time, place, culture, and interest.”⁶⁶ In other words, however committed an expert or a resident is to practices for causal attribution that are objective and natural, those practices are inescapably contingent. Judgments about fairness in the allocation of risks and burdens in society inevitably seep into the purportedly objective determinations of cause and effect. And, as Arthur McEvoy has demonstrated, these “struggles over [the] causal definitions of problems ... are contests over basic structures of social organization”⁶⁷ with striking political and distributional consequences.⁶⁸

As will become clear, the conceptualization of risk inherent in the socio-legal approach recognizes that risk is as much the product of “a dynamic social process of definition, negotiation and legitimation,”⁶⁹ as it is the product of biophysical realities. Risk describes both subjective and objective elements.⁷⁰

65. Ernest Weinrib, *Tort Law: Cases and Materials*, 2d ed. (Toronto: Emond Montgomery, 2003).

66. Arthur F. McEvoy, “The Triangle Shirtwaist Factory Fire of 1911: Social Change, Industrial Accidents, and the Evolution of Common-Sense Causality” (1995) 20 *Law & Soc. Inquiry* 621 at 623 [footnotes omitted]; Sally Lloyd-Bostock, “The Ordinary Man and the Psychology of Attributing Causes and Responsibility” (1979) 42 *Mod. L. Rev.* 143 at 143-168; and Kelly G. Shaver, *The Attribution of Blame: Causality, Responsibility, and Blameworthiness* (New York: Springer Verlag, 1985).

67. Deborah Stone, *Policy Paradox and Political Reason* (New York: Harper Collins, 1988) at 162.

68. McEvoy, *supra* note 66.

69. John A. Hannigan, *Environmental Sociology: A Social Constructionist Perspective* (New York: Routledge, 1995) at 31.

70. As Levenstein and Wooding note, “science reveals real hazards.” Charles Levenstein & John Wooding, “Deconstructing Standards, Reconstructing Worker Health” in Hofrichter, *supra* note 4, 39 at 47 [emphasis added].

Harm exists. Communities suffer. That said, the focus of this analysis is on the claims made about risk.⁷¹ Specifically, the task is to define how socio-legal factors participate in and influence the definition of what is risky. Its purpose is to take account of the critical influence of “power, institutionalized interests, organizations, and the State in the social construction, creation, and allocation of risk.”⁷²

A. WHAT IS A SOCIO-LEGAL ANALYSIS OF RISK?

To understand the rise of risk in contemporary environmental discourse, the most useful studies, in my view, are focused at a level where the social construction of risk actually takes place, and where scientific claims-making about risk is consequential. We need to look more carefully at particular communities and their struggles. This article is therefore a modest attempt to set out a framework for socio-legal studies of risk and precaution, and apply it in the context of chronic pollution.

Jonathan Simon has outlined two primary branches of inquiry for socio-legal studies of risk.⁷³ Under the first branch, scholars should aim to understand the various ways in which subjects apprehend risk: how it becomes problematized at particular moments in particular places. In recognizing multiple understandings of risk, this approach identifies the historically-specific privileging of particular accounts or narratives of risk. It aims to generate richer, thicker descriptions of risk:

[A] socio-legal account of risk and the law, however, insists on the inclusion of these narratives and their evidence as to how risks actually arise and confront people, not in the abstract, but in specific ways rooted in racial, ethnic, class and gender characteristics. This evidence provides essential material for understanding the ways in which differently situated subjects interpret the *stakes of addressing* certain risks.⁷⁴

In other words, subjects who confront risks are not “generic human beings.”⁷⁵ In Sarnia, they are wage workers in petrochemical facilities, oil

71. Ali, *supra* note 59.

72. Kathleen Tierney, “Toward a Critical Sociology of Risk” (1999) 14 *Sociological Forum* 215 at 217.

73. Jonathan Simon, “Risk and Reflexivity: What Socio-Legal Studies Add to the Study of Risk and the Law” (2005) 57 *Ala. L. Rev.* 119 (conclusion to the Meador Lecture Series on Risk and the Law, delivered at the University of Alabama School of Law, 17 October 2005).

74. *Ibid.* at 122 [emphasis added].

75. *Ibid.* This is captured by the rationalists’ behavioural cost-benefit models.

company executives, municipal government planners, environmental advocates, and widows of the “Victims of Chemical Valley.” On the Aamjiwnaang reserve, they are young Aboriginal mothers, parents who routinely receive “emergency alerts” over the radio indicating that they should “Shelter in Place” as a result of an incident or a “fugitive release” from neighbouring industry, daycare workers responding to the sirens by shuffling toddlers inside and closing the vents, health clinic staff staring down bewildering statistics, teenagers struggling with asthma, as well as developmental and attention-deficit disorders, and young children prevented from swimming in the contaminated creek that passes through their traditional powwow grounds.⁷⁶ Without these narratives, our understandings of the risks of chronic pollution are diminished and our judgments about when precaution is warranted are impoverished.

Under the second branch of the inquiry, Simon suggests that the goal is to explore how particular techniques or strategies of risk governance become accepted as workable solutions or responses to the risk.⁷⁷ The analysis under this second branch is concerned with the contest of ideas. It exposes the interests at play in the battle to characterize the risk—the outcome of which is critical to the determination of the appropriate solution. Thus, a socio-legal approach tries to uncover not just the “plurality of different ways that risk choices are ordered by actual institutions, belief systems, and identities,” but also the way in which that ordering results in the allocation and distribution of risks in the world.⁷⁸

While rationalist approaches often seek to manage the risks we face in the present by predicting the future, a socio-legal analysis of risk is “historical and reflexive.”⁷⁹ Work in the behavioural law and economics mode, for example, often takes as a given that risk is calculable and expressible as a probability. The

76. These hypothetical risk “subjects” are drawn from encounters with real people in the context of my ongoing empirical work with the Aamjiwnaang First Nation. For example, Barb Millet runs a non-profit group called the “Victims of Chemical Valley,” which is largely a collection of Sarnia area widows. A “Shelter in Place” order was issued by Sarnia police as recently as 14 March 2008, following a benzene vapor leak at Imperial Oil. Residents were told by emergency TV and radio broadcasts that they should stay indoors and close all windows and air intakes. Jack Poirier, “Sarnia issues warning after benzene vapour leak at plant” *The Times Herald* (15 March 2008) [Poirier, “Sarnia issues warning”].

77. Simon, *supra* note 73.

78. *Ibid.*

79. *Ibid.* at 123.

task for socio-legal scholars, Simon argues, is instead to strive to uncover “real historical risk practices, struggles, and ideologies.”⁸⁰ Real subjects rarely confront risks as products of precisely specified costs/consequences and their probabilities of manifesting. Instead, “their situations vis-à-vis institutions, practices, and beliefs have already marked them with particular social associations and positioned them in proximity to particular technologies of risk management and strategies of governance.”⁸¹ As McEvoy states, “how people put events together depends a great deal on who they are and what they are trying to explain.”⁸²

The socio-legal approach validates multiple accounts of risk and exposes how regulatory approaches necessarily depend, in their logic, on a particular account. “Differently situated subjects,” notes Simon, not only experience risks differently, but also “interpret the stakes of addressing” risks differently as well.⁸³ In this study, the socio-legal approach allows us to clearly see the basis of our regulatory regime with respect to chronic pollution, and the vulnerability of the assumptions upon which it rests.

IV. SUBJECTIVE ACCOUNTS OF CHRONIC POLLUTION

The first branch of the inquiry asks how various subjects or actors understand the risks of chronic pollution, how they would describe the “harms” associated with it, and how they would construct the “causes” of those harms. For each subject, the answer will be informed by personal experience, distinct cultural traditions, local knowledges, and identities.⁸⁴ Drawing on Haraway’s conception of “situated knowledges,”⁸⁵ this should not serve to diminish the authority of those understandings, but to cement it. According to this view,

80. *Ibid.* at 137.

81. *Ibid.* at 123.

82. McEvoy, *supra* note 66 at 624-25.

83. Simon, *supra* note 73 at 127.

84. See e.g. Sheila Jasanoff, “Restoring Reason: Causal Narratives and Political Culture” in Bridget Hutter & Michael Power, eds., *Organizational Encounters with Risk* (New York: Cambridge University Press, 2005) 209 at 230.

85. Donna J. Haraway, “Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective” in Donna J. Haraway, ed., *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991) 183.

communally accepted knowledge derives its “robustness” from its roots in a particular “way of knowing,” and not from a claim to universalism. In other words, it is the “situatedness” of knowledge about risk that makes it compelling, whether the knowledge is scientific or not. Valverde, Levi, and Moore show that knowledges of risk are often a hybrid mix of expert and everyday knowledges.⁸⁶ For some, they are the experiential knowledges derived from literally living and breathing contamination; they are the knowledges of those whose depth of familiarity with exposures and effects is grounded in years of observation and reflection.

For the purposes of this article, my main goals are to set out a framework for a socio-legal analysis of risk and precaution, and to illustrate the approach by drawing on the preliminary results of empirical work that is ongoing on the Aamjiwnaang reserve. This analysis shows how a materially constituted and situated subjectivity about risk generates multiple accounts of the risk, and how those distinct accounts translate into distinct regulatory responses or solutions to the risk. Neither of the two subjective accounts presented here, particularly the alternative account, should be interpreted as being internally hegemonic or monolithic. The intention is to identify some broad, shared, or unifying characteristics for heuristic purposes.

A. THE DOMINANT ACCOUNT: ENVIRONMENTAL HEALTH HARMS ARE INCIDENTAL AND ACCIDENTAL

The dominant narrative for explaining the relationship between pollution and environmental health harms would construe those harms as both incidental and accidental. The harms are “incidental” to the processes of industrial production and consumption that continually produce them, because they are so minor or insignificant when seen in the context of the tremendous social benefit we derive from the modern petrochemical economy. It is a bargain of sorts, which permits pollution with the caveat that tort law is available to compensate victims in the unusual case where legally sanctioned pollution results in proven harm.⁸⁷

86. Mariana Valverde, Ron Levi & Dawn Moore, “Legal Knowledges of Risk” in Law Commission of Canada, ed., *Law and Risk* (Vancouver: UBC Press, 2005) 86.

87. In cases where a fine is levied, a Victim Fee Surcharge is also collected by the courts under O. Reg. 161/00 (enabling statute: *Provincial Offences Act of Ontario*, R.S.O. 1990, c. P.33, s. 60.1). Normally, the surcharge is paid into a “victims’ justice fund account,” managed by the

The Sarnia-Lambton Environmental Association is a “voluntary environmental co-operative of twenty industrial facilities” in the Sarnia area.⁸⁸ It owns a network of seven air and water quality monitoring stations (to the Ministry of the Environment’s (MOE) two monitoring stations). Its goal is to “share knowledge and resources to understand the effects of [industrial] operations and to develop better ways to eliminate spills and cut emissions to air, water, and land.”⁸⁹ Further, it aims to “remain well below the allowable limits set by Ontario’s clean air regulations, which protect public health and the environment.”⁹⁰ The effect of its efforts is to “identify and manage the quality of each emission source.”⁹¹

On this account, environmental health harms are also “accidental,” in the sense of random, unexpected, and unpredictable events without any culpable cause. The Sarnia-Lambton Environmental Association, for example, reports that, with respect to the Lambton Industry Meteorological Alert (LIMA) Regulation for sulphur dioxide emissions, there were “seven LIMA events” in 2006 in which the daily criterion was exceeded.⁹² According to the organization, “[t]he exceedances were the result of weather conditions that prohibited normal emission dispersion.”⁹³ With respect to ethylene, a volatile organic compound (VOC), the organization reports that the Ontario daily ambient air quality criterion was “exceeded on a total of [twenty] days at the various monitoring locations during the year.”⁹⁴ This time, no excuse was offered, but the report indicated that the annual sum averages of VOCs have been on a “downward trend” over the past seventeen years.⁹⁵

municipality in which the offence occurred. There is not, as yet, an established practice for redistributing these funds to compensate individuals or communities harmed by pollution.

88. Sarnia-Lambton Environmental Association, *2006 Progress Review Technical Summary* (Sarnia: SLEA, 2006) at i, online: <<http://www.sarniaenvironment.com/pdf/SLEA-2006-Technical-Program-Summary.pdf>>.

89. *Ibid.*

90. *Ibid.* at 1.

91. *Ibid.*

92. *Ibid.* at 2.

93. *Ibid.*

94. *Ibid.* at 5.

95. *Ibid.*

Despite the fact that the Aamjiwnaang residents are most concerned about the ongoing day-to-day exposures from substances that are constantly released into the air,⁹⁶ high profile spills and accidents continue to occupy the bulk of the Ministry's attention. For example, in January 2008, Nova Chemicals was fined \$550,000 when it pleaded guilty to "discharging or causing or permitting the discharge of a contaminant, namely benzene, into the natural environment, that caused or was likely to have caused an adverse effect."⁹⁷ The hydrocarbon leak, which could not be contained by the company until approximately sixteen hours later, caused roadblocks to be set up in the area, led to the evacuation of all non-essential personnel at neighbouring facilities (with everyone else being issued respirators), and caused several individuals to experience "headaches, sore throats and other symptoms consistent with benzene exposure."⁹⁸ The Ministry reported that "the neighbouring Aamjiwnaang First Nations chose to evacuate their buildings when benzene was detected in air monitoring in the building."⁹⁹

In another incident, a "Shelter in Place" order was issued by Sarnia police as recently as 14 March 2008 following a benzene vapor leak at Imperial Oil. Residents were told by emergency TV and radio broadcasts that they should stay indoors and close all windows and air intakes.¹⁰⁰ The accident occurred when the roof on a storage tank collapsed. An "emergency CVECO [Chemical Valley Emergency Coordinating Organization] Code 8 was issued, which notifies of a potential problem in Chemical Valley. A Code 6 followed, which calls for full traffic control in response to a toxic vapor release."¹⁰¹ CVECO and a related organization called CAER (Community Awareness and Emergency

96. Personal communication with Ron Plain, during the author's "Toxic Tour" of the First Nation (14 September 2007) [notes on file with author]. For example, Ada Lockridge, resident and chairwoman of the Aamjiwnaang Health and Environment Committee stated on 26 March 2008 that "we are all afraid ... the kids are afraid" [notes on file with author]. See also Ada Lockridge's remarks as quoted in Michael Oliveira, "Community in Canada's so-called Chemical Valley calls for limits on emissions" *Canadian Press* (19 February 2008).

97. Prosecution Disposition Report (Trial) for *R. v. Nova Chemicals* (Ont. C.J.), Sarnia IEB file # 4602-6H3R67 (16 January 2008) at 1 [copy on file with author]. This is in violation of *Air Pollution – Local Air Quality*, O. Reg. 419/05, thereby committing an offence under s. 186(1) of the Ontario *Environmental Protection Act*, R.S.O. 1990, c. E.19 [OEPA].

98. *R. v. Nova Chemicals*, *ibid.*

99. *Ibid.*

100. Poirier, "Sarnia issues warning," *supra* note 76.

101. *Ibid.*

Response), which is part of the chemical industry's "Responsible Care" program, operate a network of sirens that alert community members when evacuation is required due to chemical release.¹⁰² Those sirens are tested every Monday at 12:30 p.m., with an actual alert occurring by a continuous three-minute cycle of a one-minute high tone interval followed by one minute of silence. Residents are to tune into a local radio station for further instructions.¹⁰³ The rationale for the organization is stated as follows: "[t]his thriving, modern community is located close to large chemical manufacturing, industrial, and oil refining industries, presenting a unique public safety challenge."¹⁰⁴

This narrative explains the relationship between pollution and environmental health harms as deriving from accident, occurring rarely, and in discrete, isolated events. At the same time, it construes pollution as, consequently, incidental to the central contribution that industry makes to the well-being and vitality of Sarnia and southwestern Ontario. The City of Sarnia's website describes the presence of the petrochemical industry as follows:

Extending from Sarnia for some 32 kilometers (20 miles) southward is an impressive series of multi-million dollar petrochemical plants which make up the greatest concentration of this type of industry in Canada. For the newcomer to the area, the industries appear as a vast collection of pipes, tubes, towers and tanks—all creating a fascinating display that is unique to this part of Ontario. At night, the display takes on an even more impressive, almost beautiful appearance, with its thousands of twinkling lights.¹⁰⁵

In 2005, about half of the facilities in the Sarnia area failed to implement any new pollution prevention measures.¹⁰⁶ In fact, it is expected from surveys conducted with the facilities that 90 per cent of the chemical releases over the next few years will either increase or show no decrease.¹⁰⁷

This account of the risk of chronic pollution is supported by the dominant epidemiological paradigm, which is a set of practices and beliefs embedded

102. Community Awareness and Emergency Response (CAER), "Emergency," online: <<http://www.caer.ca/emergency.html>>.

103. *Ibid.*

104. Community Awareness and Emergency Response (CAER), online: <<http://www.caer.ca/>>.

105. The City of Sarnia, "Economic Development," online: <<http://www.city.sarnia.on.ca/visit.asp?sectionid=431>>.

106. MacDonald & Rang, *supra* note 47 at 23.

107. *Ibid.* at 24.

within scientific, governmental, and official understandings that emphasize individual behavioural factors, rather than environmental or social factors, as keys to disease prevention. These so-called “lifestyle” factors are considered primarily responsible for the risks,¹⁰⁸ and individual behaviour, if not personal characteristics, consequently come under the microscope. This paradigm is under heavy fire from the social determinants of health model, which would instead understand health to be dependent on social gradient: the higher the family income, the better the housing, and importantly, the better the environment in early life, the better the individual’s health.¹⁰⁹

B. AN ALTERNATIVE ACCOUNT: ENVIRONMENTAL HEALTH HARM IS INHERENT TO INDUSTRIAL PRODUCTION

An alternative, emerging narrative of the relationship between pollution and environmental health harms portrays those harms as both chronic and intentional. It sees pollution as one of the “inherent by-products of ordinary, everyday life,”¹¹⁰ and recognizes that devastating injury, disease, and “wounding” are similarly embedded. On this account, the production of harm in the “ever-expanding mosh pit of toxic chemicals” is inextricable from the production of commodities.¹¹¹

Most residents of the Aamjiwnaang First Nation accept that there is a causal relationship between chronic exposures to chemicals and injuries to human health. They acknowledge that the evidence is only now starting to come in, and that there is still much to be learned.¹¹² But those who subscribe to this alternative account would include a much broader cast of characters than

108. See e.g. Deborah Lupton, *Risk* (New York: Routledge, 1999); Deborah Lupton, ed., *Risk and socio-cultural theory: new directions and perspectives* (New York: Cambridge University Press, 1999); and Deborah Lupton, *The Imperative of Health: Public Health and the Regulated Body* (London: Sage, 1995).

109. Michael Marmot, “Introduction” in Marmot & Wilkinson, eds., *Social Determinants of Health*, 2d ed. (Oxford: Oxford University Press, 2006) 1.

110. Luke, *supra* note 4 at 242.

111. Sandra Steingraber, *Living Downstream: An Ecologist Looks at Cancer and the Environment* (Reading, MA: Addison-Wesley, 1997) at 100.

112. This was the basis for the recent Environmental Health Symposium, which was hosted by the Aamjiwnaang First Nation [Aamjiwnaang Environmental Health Symposium]. “Letter of Invitation,” Aamjiwnaang Environmental Health Symposium (Sarnia, 26 March 2008) [on file with author].

just the Aamjiwnaang First Nation. In fact, this account is an umbrella under which a wide variety of diverse risk subjects with partly overlapping and partly conflicting agendas seem to be converging.¹¹³ For example, long-time Sarnia mayor Mike Bradley now agrees with the Aamjiwnaang Health and Environment Committee that there are urgent health issues facing Sarnia residents and that they are attributable to pollution. As he recently stated, “[t]here is a price to pay.”¹¹⁴

Further, activists from the Aamjiwnaang First Nation have teamed up with progressive environmental epidemiologists that are working on compiling the growing evidence around chronic exposures, or what is sometimes called “sub-clinical chemical injury.”¹¹⁵ Ted Schettler, a physician with the Science and Environmental Health Network, stated at a recent Environmental Health Symposium in Sarnia that “children, from fetus onward, are disproportionately susceptible to contaminants. Early exposure for children, even in the womb, can be linked to diseases that show up later in life, and failure to conceive is part of this continuum.”¹¹⁶ Schettler sees the Aamjiwnaang community’s skewed birth ratio as a “clear signal that something is very wrong in Sarnia.”¹¹⁷

On this account, profound human wounding through chronic low-dose exposures to toxic chemicals is understood as a central, foreseeable consequence of the production process. “The release of massive amounts of air pollutants into the airshed” is seen as an “obvious burden on the health of local residents as well as on the environment.”¹¹⁸ It is in this context that environmental justice activists talk about “sacrifice zones”—those communities located in close

113. For example, many risk subjects rejecting the dominant account of the relationship between environmental health harms and pollution might agree that exposures are chronic and the harm is foreseeable; they might not, however, go so far as to characterize it as *intentional*, except in egregious cases. Instead, they may characterize it as advertent (rather than inadvertent), in the sense that it falls short of intent while remaining a form of subjective knowledge. Similarly, although they may agree that industry actors often *pollute* with intent, they might not agree that these actors *harm* with intent—even where the actors simply do not want to know, measure, or understand what harm the pollution may cause.

114. Colihan, *supra* note 40.

115. P. Grandjean & P.J. Landrigan, “Developmental Neurotoxicity of Industrial Chemicals” (2006) 368 *The Lancet* 2167 at 2167.

116. Colihan, *supra* note 40.

117. *Ibid.*

118. MacDonald & Rang, *supra* note 47 at 8.

proximity to industry that are seen as powerless and expendable.¹¹⁹ In Louisiana, these activists have re-dubbed their chemical valley as “Cancer Alley.”¹²⁰ To a certain extent, this understanding of the “risk” of air pollution is almost mainstream. Health Canada researchers, for example, authored a study in 1998 which found, from a review of eleven Canadian cities, that mortality increased as ambient air quality declined.¹²¹ The Canadian Medical Association also attributes annually an extra 100 deaths, 270 hospital admissions, 920 emergency visits, and 471,000 minor illness days to the air pollution in Sarnia-Lambton as a whole.¹²²

In 2006, the Aamjiwnaang Health and Environment Committee interviewed members on their experiences living with pollution and conducted a “body mapping” exercise.¹²³ Body mapping is a way of pooling the collective health complaints of people so that patterns can be identified. Residents were asked to place colour-coded sticky dots on maps of a human body to represent their symptoms. The result, when all of the maps were laid on top of each other, was a stark and alarming visual representation: 17 per cent of adults and 22 per cent of children surveyed had asthma; about 25 per cent of adults experienced high blood pressure and/or chronic headaches; about 25 per cent of children suffered from learning and behavioural problems; and about 40 per cent of women had experienced miscarriage or stillbirth.¹²⁴

In light of all this “accumulating trouble,” residents of affected communities find it increasingly difficult to characterize the incidence of “harm” from pollution as deriving from a few discrete, isolated events.¹²⁵ The once

119. See *e.g.* Bullard, *supra* note 5 at 85.

120. Beverly Wright, “Living and Dying in Louisiana’s ‘Cancer Alley’” in Bullard, *ibid.*, 87 at 87.

121. Richard T. Burnett, Sabit Cakmak & Jeffrey R. Brook, “The Effect of Urban Ambient Pollution Mix and Daily Mortality Rates in 11 Canadian Cities” (1998) 89 *Can. J. Pub. Health* 152.

122. Ontario Medical Association, “Illness Costs of Air Pollution (ICAP) – Regional Data for 2005 (with projections to 2026),” online: <<http://www.oma.org/phealth/ICAP2005regional.pdf>>.

123. Sharilyn Jonston & Ron Plain, “Environmental Health Status of First Nations: Aamjiwnaang First Nation Health Studies” (Presented to the Aamjiwnaang Environmental Health Symposium, *supra* note 112) [unpublished; notes on file with author].

124. *Ibid.*

125. Thomas D. Beamish, “Accumulating Trouble: Complex Organization, a Culture of Silence, and a Secret Spill” (2000) 47 *Social Problems* 473 at 477.

unremarkable daily pollutant loads are now seen as incrementally and gradually amounting to devastating consequences. In this respect, the concept of “total loadings” has become salient. It derives from the application of ecological principles to contemporary pollution problems. It aims to employ a systems lens, incorporating all inputs that might combine to act on ecological function. In its application to human communities, it serves to emphasize the accumulation of stresses that together could constitute a “disproportionate burden.”

On this account, the old denials—embedded in the turn to lifestyle factors as possible explanations for increased rates of disease—represent a failure to face the mounting evidence of disease from chronic pollution.¹²⁶ A common thread linking environmental justice struggles across Canada and the United States has been the shared experience of residents having to answer government claims that their illnesses or health impacts were more likely related to their rates of smoking, addiction, or obesity than to their exposures to environmental contaminants.¹²⁷ The degree to which a subject assigns relevance to lifestyle factors in explaining the incidence of illness and its disproportionate impact on particular communities maps well onto the divergent accounts of risk presented here. In the next section, I explore how those distinct accounts translate into regulatory solutions.

V. LAW'S TREATMENT OF CHRONIC POLLUTION

Under this second branch of the inquiry, the task is to demonstrate how particular accounts of risk shape the ‘solutions’ that can be considered. A fundamental justification for the socio-legal approach is that differently situated subjects interpret the *stakes of addressing* any given risk differently.¹²⁸ In other words, how a subject, or a collective of subjects, understands the relationship between pollution and environmental health harms is largely

126. For example, Jim Brophy of the Occupational Health Clinics for Ontario Workers in Sarnia notes the similarities to a time when government officials blamed the high mortality rates of asbestos workers on their own personal choices, like smoking. See Colihan, *supra* note 40.

An unidentified commentator at the Aamjiwnaang Environmental Health Symposium, *supra* note 112, commented that “we’ve heard these old denials before” [notes on file with author].

127. For an account of the struggles of the workers and residents of Sydney, Nova Scotia, see *e.g.* Elizabeth May & Maude Barlow, *Frederick Street: Life and Death on Canada's Love Canal* (Toronto: Harper Collins, 2001).

128. Simon, *supra* note 73 at 122.

determinative of what she or they might think is an appropriate way to manage or respond to that risk.

A. THE DOMINANT ACCOUNT LEADS TO A STRATEGY OF "RISK MANAGEMENT"

It is significant that environmental "problems" are now being re-inscribed as environmental "risks." As Jenny Steele has noted, "to name undesired potential outcomes in terms of risk is to begin to structure an approach to action."¹²⁹ Specifically, to call a problem a risk leads directly to a solution of risk management. Eliminating risk is not an option—conventional approaches simply seek to manage, regulate, and distribute risks.¹³⁰ And, as the environmental justice movement makes obvious, the way those risks are distributed is starkly gendered and even more starkly racialized, even in Canada.¹³¹

Some of the earliest environmental laws were pollution control laws.¹³² Civil remedies between individuals were dismissed as being ineffective legal tools for the general systemic control of pollution (despite continued reliance on them to "pick up the slack" when things went wrong). Instead, a regulatory approach was judged to be more effective. It was administered by technical agencies staffed with scientific and engineering experts who were focused on determining the safe levels of various pollutants in the environment. The job was one of identifying pollution sources, bringing them under permit, and then controlling the quality and quantity of emissions discharged through the terms and conditions of the permit.¹³³ The "underlying assumption was that the natural environment, with its air, water, and land components, could, through careful management, be used to dispose of, dilute, and cleanse the waste produced by human activity."¹³⁴ This is largely still the basis for the

129. Jenny Steele, *Risks and Legal Theory* (Portland, OR: Hart, 2004) at 203.

130. Bullard, *supra* note 5.

131. Andil Gosine & Cheryl Teelucksingh, *Environmental Justice and Racism in Canada: An Introduction* (Toronto: Emond Montgomery, 2008) at 33-62; Maureen G. Reed & Bruce Mitchell, "Gendering Environmental Geography" (2003) 47 *The Canadian Geographer/Le Géographe Canadien* 318.

132. Alastair R. Lucas, "The New Environmental Law" in Elaine L. Hughes, Alastair R. Lucas & William A. Tilleman, eds., *Environmental Law and Policy*, 3d ed. (Toronto: Emond Montgomery, 2003) 163 at 163-64.

133. *Ibid.*

134. *Ibid.*

contemporary regulatory regime. It is only a “matter of measuring, then carefully and fairly allocating this environmental assimilative capacity.”¹³⁵

The Ontario *Environmental Protection Act* (OEPA) is the principal law governing air quality in the province.¹³⁶ It contains a general discharge prohibition on “contaminants” in combination with the issuance of “permits” for emissions in accordance with a Certificate of Approval (CofA) issued by the Minister of the Environment.¹³⁷ A CofA is a legally binding license that sets out the conditions under which a facility can operate, including the “maximum permissible contaminant emission levels.” The entire approach is predicated on the development and implementation of standards, many of which were established more than twenty years ago. Recently, some progress has been made on updating the standards and incorporating more sophisticated “air dispersion models” in Ontario.¹³⁸ The models and the procedures for how they inform the granting of individual CofAs are contained in *Ontario Regulation 419/05, Air Pollution - Local Air Quality*.¹³⁹ The MOE calls this regulation the “cornerstone of [their] efforts to protect local air quality.”¹⁴⁰

The scheme essentially works like this: the Ministry sets Ambient Air Quality Criteria (AAQC) to limit “total atmospheric contaminant levels.”¹⁴¹ These place upper limits on the average contaminant concentrations

135. *Ibid.*

136. *OEPA*, *supra* note 97. For a summary of the new standards added in 2005, see Standards Development Branch, Ministry of the Environment, *Summary of O. Reg. 419/05 Standards and Point of Impingement Guidelines & Ambient Air Quality Criteria (AAQCs)* (Ontario Ministry of the Environment, December 2005) [MOE], online: <<http://www.ene.gov.on.ca/envision/gp/2424e04.pdf>>.

137. *Ibid.*, ss. 6(1), 9(1).

138. Ministry of the Environment, “Setting Environmental Quality Standards in Ontario: The Ministry of the Environment's Standards Plan,” online: <http://www.ene.gov.on.ca/envision/env_reg/er/documents/2000/pa9e0004.htm>; MOE, *supra* note 136. The new air dispersion models are gradually being phased in. Existing facilities of most industrial sectors will not be affected until sometime between 2010 and 2020. Until then, most facilities will continue to use the outdated models and the old air standards.

139. O. Reg 419/05, *supra* note 97.

140. Ministry of the Environment, “Setting Air Quality Standards in Ontario,” online: <<http://www.ene.gov.on.ca/en/air/ministry/standards.php>>.

141. There are more than three hundred.

permissible during set time periods at a particular point or “receptor.”¹⁴² They are based on either human health or environmental endpoints, whichever is the most sensitive. The Ministry then uses the AAQC to guide the setting of individual CofA limits.¹⁴³

Also crucial in the setting of individual CofA limits are the legally binding “Point of Impingement” (POI) standards for the contaminant content of emissions produced by individual facilities. In practice, the point of impingement is the location at which a contaminant first leaves the “property” of the source emitter.¹⁴⁴ Maximum average contaminant concentrations (over a half-hour period) at the POI may not be exceeded unless the source is specifically exempted by regulation.¹⁴⁵ The concentrations of contaminants at the POI are, however, not measured, but modelled based on formulae which purport to incorporate variable environmental conditions. In order to determine compliance, the facility calculates its POI concentrations using these formulae and compares its highest POI concentration with the standard.¹⁴⁶

The glaring failure of this approach is that it does not consider the environment being dumped into; it does not take into account the background contaminant levels in the ambient air. In fact, it takes these background levels to be zero, even though they are not required to be zero at the POI. They are

142. Ambient standards are limits on the concentration of specific pollutants in outdoor air.

Another regulatory option would be an effluent standard. A typical standard based on ambient air quality would state: “The average concentration of pollutant X in the air shall not exceed Y micrograms per cubic metre during any 24 hour period,” whereas a typical effluent standard would state: “The maximum daily discharge of pollutant A from point source B shall not exceed 2 kg.”

143. Where national standards exist, they also inform this process. The AAQC are used by the MOE to set the POI standards, via a set of established mathematical relationships.

144. O. Reg. 419/05, *supra* note 97, s. 2(1) states that “...a point of impingement with respect to the discharge of a contaminant does not include any point that is located on the same property as the source of contaminant”; however, s. 2(2) provides an exception where there may be a sensitive receptor located on the source’s property, such as a child care facility, a senior citizens’ residence, or a school.

145. *Ibid.*, s. 18(1).

146. *Ibid.* Under s. 22, a person who applies for a CofA must prepare an “Emission Summary and Dispersion Modeling (ESDM)” report; under s. 28, however, the applicant must notify the Ministry if either the modeling or the measurements indicate contraventions or the possibility of an “adverse effect.” If this is the case, s. 29 further requires the polluter to submit an abatement plan within thirty days of giving notice.

merely required to be “less than the POI concentration” as they cross boundaries onto neighbouring facilities. In other words, as advocates have noted, while the system might work for an individual facility, it does nothing to take into account the emissions produced by other facilities.¹⁴⁷ “[I]t does not guarantee, therefore, that if the POI limits ... were met by all contaminant sources, that the AAQ Criterion for total atmospheric contaminant levels would also be satisfied.”¹⁴⁸ The regulation seems to be based on the unlikely assumption that pollution never leaves industrial property.

There is a very large and well-respected body of scientific evidence that supports correlations between air pollution and health effects.¹⁴⁹ This is the same data used by governments to set ambient air quality standards. It is also well documented that the ambient concentration of an air pollutant in a particular location depends on many factors, including “emissions sources, weather (for example, temperature, wind speed and direction, and precipitation), and land patterns.”¹⁵⁰ Pollutant concentrations for a given area can vary on a seasonal or daily basis. According to critics, “[a]n important feature of ambient standards is that they cannot protect everyone because of the range of [human] susceptibility [to pollutants].”¹⁵¹ “Despite the intent to protect public health with a margin of safety, standard setting is a political process that involves compromises.”¹⁵²

147. Cooper *et al.*, *Environmental Standard Setting and Children's Health* (Toronto: Canadian Environmental Law Association and Ontario College of Family Physicians, Environmental Health Committee, 2000), online: <<http://www.cela.ca/publications/cardfile.shtml?x=1114>>.

148. *Ibid.* at 176. According to the MOE, this is only a concern for a few contaminants, like particulate matter, where background levels are significant; for all other contaminants, background levels of pollution in the ambient air are, as advocates have noted with disbelief, “apparently minimal.”

149. Phil Brown *et al.*, “The Health Politics of Asthma: Environmental Justice and Collective Illness Experience” in David Naguib Pellow & Robert J. Brulle, eds., *Power, Justice, and the Environment: A Critical Appraisal of the Environmental Justice Movement* (Cambridge, MA: MIT Press, 2005) 185 at 190.

150. Michelle L. Bell & Jonathan M. Samet, “Air Pollution” in Howard Frumkin, ed., *Environmental Health: from Global to Local* (San Francisco: Jossey-Bass, 2005) 331 at 334.

151. *Ibid.* at 353.

152. *Ibid.*; Liora Salter, “The Housework of Capitalism: Standardization in the Communication and Information Technology Sectors” (1993-1994) 23 *Int'l J. Political Econ.* 105; and Stepan Wood “Green Revolution or Greenwash? Voluntary Environmental Standards,

We might consider O. Reg. 419/05 as part of the larger statutory regime. For example, the OEPA contains a prohibition against causing adverse effects, which applies notwithstanding. O. Reg. 419/05 also contains a prohibition against causing discomfort to persons, notwithstanding compliance with the standards as set out in the regulation.¹⁵³ We might say that these general prohibitions can inform the exercise of discretion on the part of the Director of the Ontario Environmental Assessment and Approvals Branch and overcome any shortcomings with the actual regulation. But again, this falls short. The adverse effects we are concerned about are not likely to be attributable to any one specific polluter. It is the cumulative effects of the many CofAs granted for operations within any specific “airshed” that worry residents. On the dominant account of risk, then, the logic goes like this: if a permit or CofA is issued which meets the requirements as set out in provincial law to protect human health and the environment, it cannot be said to have an “adverse effect.” If there is no adverse effect, then there can be neither harm nor disproportionate burden.

This dominant narrative for explaining pollution’s harms—one that understands them to be incidental and accidental—depends on expert constructions of the risks. Not surprisingly, this account leads to the adoption of a decision-making process about pollution that seeks primarily to inform, rather than to actively involve, community members. In fact, one of the toxic by-products of a permitting system for pollution control is that many decisions are now made “underground,” in the “quiet and less visible regulation and license-negotiating process of government.”¹⁵⁴ The Director may always impose stricter standards in a CofA than are required by O. Reg. 419/05, but it is very difficult for community members to influence these decisions.¹⁵⁵ Further, it seems that the pattern, in Sarnia at least, is not for standards stricter than those

Public Law, and Private Authority in Canada” in Law Commission of Canada, ed., *New Perspectives on the Public/Private Divide* (Vancouver: UBC Press, 2003) 123.

153. *OEPA*, *supra* note 97, s.14; O. Reg. 419/05, *supra* note 97, s.33.

154. K. Webb, “Pollution Control in Canada: The Regulatory Approach in the 1980s” in Hughes, Lucas & Tilleman, *supra* note 132, 165 at 166.

155. This is not meant to detract from the significance of the public notice, comment, and appeal processes available in most Canadian jurisdictions since the 1980s. For a description of the Ontario *Environmental Bill of Rights* and its associated online registry, see Mark S. Winfield, “A Political and Legal Analysis of Ontario’s Environmental Bill of Rights” (1998) 47 *U.N.B.L.J.* 325.

required by the regulation, but rather for exemptions from those regulations. Royal Polymer, a company in Chemical Valley producing PVC in close proximity to the Aamjiwnaang reserve, has been so repeatedly found in non-compliance with its CofA that the company has now petitioned the Ministry for an exemption from that standard.¹⁵⁶ The regulatory process includes an invisible application of discretion in the granting of CofAs and the setting of their terms, and that discretion is a crucial factor in the allocation and distribution of risk to particular communities.

The dominant account also obscures the sustained, intentional, and profit-seeking dimensions of chronic pollution. It hides from view the exploitative way in which polluting industries perpetually occupy some communities.¹⁵⁷ As Caitlin Zaloom quips, “[r]isk reaps reward.”¹⁵⁸ Emitting pollution in the quantities spewed into the air around Sarnia, even when legally sanctioned, can still be conceived of as risk taking by the corporations. They are pushing the boundaries and betting on the fact that those harmed by their actions will not be able to make out a viable tort claim. The risk society, in other words, “is a society in which some take risks for the sake of possible benefits and others are compelled to face the dangerous consequences of such risk taking.”¹⁵⁹

Polluting is a complex practice that is at once morally reprehensible and yet also an exemplary act of contemporary productivity.¹⁶⁰ Depending on one’s perspective, we can name this business for what it is: turning risk into profit. As Zaloom argues, “aggressive risk taking” is established and sustained by the routinization and legitimation provided by the regulatory structure that permits pollution.¹⁶¹ Risk “off-loading” is a technology of generating wealth, and it is a

156. Ontario, Ministry of the Environment, “Instrument Proposal Notice: Royal Polymers Ltd.” (Toronto: Environmental Registry, 7 February 2007), online: <<http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MjkyNjI=&statusId=MjkyNjI=&language=en>>. The Ministry has not yet taken a decision with respect to this matter.

157. Ellen L. Omohundro, *Living in a Contaminated World: Community Structures, Environmental Risks, and Decision Frameworks* (Burlington: Ashgate, 2004); Bullard, *supra* note 5.

158. Caitlin Zaloom, “The Productive Life of Risk” (2004) 19 *Cultural Anthropology* 365 at 365.

159. Strydom, *supra* note 61 at 76.

160. Zaloom, *supra* note 158.

161. *Ibid.*

“critical component of satisfying needs in contemporary capitalism.”¹⁶² In the classic legal treatment, any harm from routine pollution is considered precisely incidental to our system of industrial production. We depend on tort law to step in when catastrophe strikes and to “salve injuries through the compensatory award.”¹⁶³ But as the Aamjiwnaang example demonstrates with devastating clarity, our habits of production create and sustain inequities that are not capable of being captured (let alone compensated) by the “moral and material logic of repairable harm” that forms the basic premise of tort law.¹⁶⁴ Worse, probabilities are not randomly distributed and the pervasiveness of risk in contemporary society is not uniformly experienced.

Environmental offences are rarely sanctioned or shamed.¹⁶⁵ The causes and costs of chronic contamination remain hidden, because the logic of industrial progress demands pollution. Thus, the roots of illness and wounding in toxic chemical pollution, and the possibility of prevention, also remain obscure. Risk fades into the social landscape: it is treated as a natural by-product of industrial production with neither legal nor political significance. Harm is predictable in the aggregate, but never in the individual case.¹⁶⁶

On the surface, of course, regulators claim to be taking action to prevent harm and reduce pollution.¹⁶⁷ But even as the government purports to crack down on air pollution, as the MOE recently has, the incentives on polluters (as evidenced in the regulations) are not structured so as to accomplish this goal.¹⁶⁸

162. *Ibid.* at 367.

163. Jain, *supra* note 55 at 33.

164. *Ibid.* at 31.

165. Steven Bittle & Laureen Snider, “From Manslaughter to Preventable Accident: Shaping Corporate Criminal Liability” (2006) 28 *Law & Pol’y* 470; Keith Hawkins, *Environment and Enforcement: Regulation and the Social Definition of Pollution* (Oxford: Clarendon Press, 1984).

166. In the case of chronic exposures to pollution, we cannot know with precise certainty how many or which particular individuals will be harmed by toxic chemical pollution in a given year; we can, however, predict with startling accuracy that many thousands will. See generally Cranor, *supra* note 24; Luke, *supra* note 4 at 248.

167. Ontario, Ministry of the Environment, Press Release, “Ontario’s New Air Standards Among the Toughest in the World: New Air Standards Will Better Protect Ontario Communities” (31 August 2007), online: <<http://www.ene.gov.on.ca/en/news/2007/083101.php>>.

168. Further, the enactment of “tougher standards” presumes and requires that governments will enforce them, and that they will enforce them equally. For a discussion of what one author calls Canada’s culture of “systemic non-enforcement,” see Lynda Collins, “Tort, democracy

It is in this respect that we might say that environmental law is ambivalent to chronic pollution. The ambivalence, I would argue, derives from the continued prominence of the account that understands environmental health harms as incidental to, and not central to, industrial production. This view treats harm caused by legally sanctioned, permitted pollution (as is the case for most pollution in Sarnia's chemical corridor) as a by-product or an accidental side effect of the economic activity. Pollution remains "unintended," and yet it is a "fixed feature" of modern economies.¹⁶⁹ The production of chemicals, the refining of oil, and the generation of electricity in the Sarnia corridor have harm and wounding embedded in them. These are equally the *production* of pollution.

A central issue with the alternative account, of course, is whether pollution—especially low-dose, chronic exposures—can be said to be the "cause" of environmental health harms. As Hart and Honore observe, McEvoy demonstrated that a "causal explanation is most often prompted by the occurrence of something unusual: we ask for the causes of accidents, catastrophes, deviations from the normal or accepted course of events."¹⁷⁰ This is why a transformative shift in thinking is required in order for environmental health harms to be attributed to polluters. The "normal" background conditions of industrial production cannot, in law, be held to be the "cause" of illness and suffering.¹⁷¹ In seeking this transformative shift in thinking, many turn back to the precautionary principle. Can precaution provide this transformative stimulus?

B. THE EMERGING ACCOUNT LEADS TO A STRATEGY OF PRECAUTION

The account of risk that construes environmental health harms as inherent to our industrial model often leads to policy solutions seeking "cumulative impact assessment." It is widely acknowledged that the problems of persistence and bioaccumulation in toxic chemical pollution make the "assimilative approach unsuitable."¹⁷² On this account, it is also now obvious that traditional pollution

and environmental governance: The case of non-enforcement" (2007) 15 Tort L. Rev. 107.

169. Luke, *supra* note 4 at 248.

170. Lloyd-Bostock, *supra* note 66 at 147, quoting H.L.A. Hart & A.M. Honore, "Causation in the Law," reprinted in Herbert Morris, ed., *Freedom and Responsibility: readings in philosophy and law* (Stanford: Stanford University Press, 1973) 325 at 334.

171. H.L.A. Hart & A.M. Honore, *Causation in the Law*, 2d ed. (Oxford: Clarendon Press, 1985).

172. Lucas, *supra* note 132 at 164.

control regimes are completely ineffective against chronic low-dose exposures to toxic chemicals, such as endocrine disruptors. Conventional practices of risk assessment are based on the premise that, while a serious hazard may exist, “there is no *risk*” without a path of exposure.¹⁷³ Thus, risk assessment enables the continued release of contaminants at levels that are scientifically sanctioned as “acceptable.”¹⁷⁴ But new evidence is starting to indicate that certain classes of chemicals in widespread use, such as endocrine disruptors, “are capable of exerting population-wide effects at current levels of exposure.”¹⁷⁵ The solution? Precaution.

“Precautionary activists contest traditional risk assessment with *cumulative* risk assessment.”¹⁷⁶ Advocates in the environmental justice movement now also routinely demand that regulators take an ecosystem approach. This would be grounded in an assessment of the overall consequence of all human activities on a living system, including human communities. It would focus on cumulative effects and not on individual facility emissions. Specifically, on this account, we would see the emissions from newly permitted facilities measured in combination with existing sources. “[C]onsiderable impetus for this cumulative risk assessment comes from environmental justice groups who argue that the multiple assaults on their communities cannot be understood if government and science focus on isolated, individual chemical risks.”¹⁷⁷ For example, Aamjiwnaang Chief Christopher Plain stated recently that the MOE should be working towards “diminishing the cumulative exposure of the public to chemicals.”¹⁷⁸ Chemicals work in concert with each other: “[i]n other words, even if every facility that affects a community ... has a legally adequate permit, the cumulative burden of these facilities nonetheless could create significant harm.”¹⁷⁹

173. Alice Tarbell & Mary Arquette, “Akwesasne: A Native American Community’s Resistance to Cultural and Environmental Damage” in Hofrichter, *supra* note 4, 93 at 102 [emphasis added].

174. National Wildlife Federation & Canadian Institute for Environmental Law and Policy, *A Prescription for Healthy Great Lakes: Report on the Program for Zero Discharge* (Washington: National Wildlife Federation, 1991).

175. *Ibid.*

176. Brown, *supra* note 7 at 209.

177. *Ibid.*

178. Personal communication (20 February 2008).

179. Holly D. Gordon & Keith I. Harley, “Environmental Justice and the Legal System” in Pellow & Brulle, *supra* note 149, 153 at 160.

The emerging, alternative account of the relationship between pollution and environmental health harms would judge the prevailing regulatory approach to be fundamentally flawed. It is seen as patently unable to address the risks from chronic air pollution. The thrust of the emerging account is reflected in a recent decision of the Environmental Review Tribunal for Ontario. The decision states:

POI standards are helpful guidelines or signposts, but they can only estimate acceptable levels because it is not possible to know the circumstances in which individual applications arise, such as whether the facility is in an isolated location or a heavy industrial area; in a pristine or polluted region; whether cumulative impacts are low or high; the type and nature of other contaminants in the area; the additive and/or synergistic effects of the proposed emissions with other materials in the environment; and so on.¹⁸⁰

The Environmental Commissioner for Ontario has also lamented that the “continued reliance on a POI approach ... is not directly controlling annual *loadings* of contaminants.”¹⁸¹ The Commissioner notes that the prevailing approach cannot offer protection for “[pollution] ‘hot spots’: industrial airsheds with significant background concentrations from pollutants from multiple facilities.”¹⁸² To actually tackle this issue, industry would be required to prove that ambient standards are not exceeded at critical locations (and for vulnerable “receptors”) when applying for (or renewing) a CofA. Instead of conferring a general right to pollute, CofAs would be subject to continuous supervision—and thought of as temporary concessions or revocable licenses.

There are several elements of a “cumulative approach.” On top of the focus on additive effects or total loadings, there is also the issue of interactions between chemicals. While our regulatory approach and its attendant risk assessments are based on the individual assessments of isolated chemicals, we are, in reality, exposed to complex mixtures. “Scientific studies make it clear that chemicals can interact or act together to produce an effect that none could

180. *Dawber v. Ontario (Director, Ministry of Environment)*, [2007] 28 C.E.L.R. (3d) 281 at para. 40.

181. Environmental Commissioner for Ontario (ECO), *Neglecting our Obligations: 2005-2006 Annual Report – Supplement* (Toronto: ECO, 2006) at 83, online: <<http://www.eco.on.ca/eng/index.php/eco-publications/eco-publications-2/2005-06-annual-report.php>> [emphasis added].

182. *Ibid.*

produce individually.”¹⁸³ The legal regime currently ignores both additive and synergistic effects:

Regulating as if chemicals act only individually is as unrealistic as assuming that a batter in a baseball game can only score a run for his team if he hits a home run. In real life and in baseball, the bases may already be loaded and a single could well be enough.¹⁸⁴

In particular, the potential for multiple exposures to chemicals with common targets or a common mechanism of toxicity (or “mode of action”) calls for attention to the interaction and effects of mixtures. In this respect, current knowledge is woefully incomplete.

Calls for cumulative impact assessment also demand a more “place-based,” or situated approach, returning the focus to the central spatial aspects of pollution. As Sandra Steingraber notes, “the distribution of illness in space reveals clues about its causes.”¹⁸⁵ In both the infamous Woburn and Love Canal environmental justice struggles, residents employed explicitly spatial analyses to solidify their claims about the sources and origins of the pollution. In the Woburn case, this involved tracing the movement of underground plumes of groundwater as a way of demonstrating a pathway of exposure.¹⁸⁶ In the Love Canal case, residents led by a group of self-proclaimed “housewives” faced the familiar challenge of proving that the toxic chemicals from the Canal were the cause of the noted health effects, including elevated rates of cancer, uterine infections, and birth anomalies.¹⁸⁷ Geologists eventually conducted a mapping of swales (*i.e.*, moist surface valleys or underground soil intersections), and the residents overlaid those maps on maps of the community’s disease profile.¹⁸⁸ This image ultimately proved persuasive in explaining the way that chemicals

183. Colborn *et al.*, *supra* note 44 at 220.

184. *Ibid.*

185. Steingraber, *supra* note 111.

186. Paula DiPerna, “Leukemia Strikes a Small Town” *The New York Times* (2 December 1984), online: Center for Environmental Health <<http://ceh.uconn.edu/example7.html>>.

187. New York State Department of Health, *Love Canal – Public Health Time Bomb: A Special Report to the Governor and Legislature, September 1978* (New York: State Department of Health, 1978), online: <http://www.health.state.ny.us/environmental/investigations/love_canal/lctimbmb.pdf>.

188. Phil Brown & Richard Clapp, “Looking Back on Love Canal” (2002) 117 *Public Health Reports* 95 at 96.

were picked up and transferred, showing exactly how residents were being exposed to the contamination from the Canal.¹⁸⁹

The attention to these pathways for chemical migration is critical. In Aamjiwnaang, the residents of the reserve have, for many years, been complaining about the prevailing winds and the way they disperse and distribute the pollution through the formation of plumes (streams of pollution that can remain distinct from ambient air over various distances because of differences in temperature and density). In fact, the notion of disproportionate burdens deployed by the environmental justice movement has a fundamentally spatial character. When communities sense that they are bearing more than their *fair share* of environmental burdens, this often leads directly to calls for an analysis of cumulative impacts. The idea of burden sharing inherently involves some form of counting—whether it is the number of facilities or the “total pollutant loading”—and a comparison. Residents of pollution hot spots intuitively know that living among sixty-two large polluting facilities is worse than living near two (even when the regulator insists that none of these sixty-two produce any offsite impacts).

In non-Aboriginal populations, the spatial aspects of pollution have exacerbated the difficulties of proving that harms are related to exposures. This is because “people shift their spatial location and visibility” over time.¹⁹⁰ People move. In fact, in several seminal environmental justice struggles involving chronic contamination of non-Aboriginal populations, such as the Love Canal or Frederick Street in the Sydney Tar Ponds, residents demanded a state-sponsored buy-out or relocation of their communities. In these instances, the effects of the contamination on the property values were more easily observed than those acting on their bodies. Residents that had not left the community of their own accord before the contamination controversy flared were trapped by the economics of the situation. In fact, members of the Aamjiwnaang First Nation, when they speak out against the chronic pollution that they experience, often face the question from outsiders: “why don’t you leave?” “Why should *we* leave?” is Ron Plain’s response. When a member of the community noted recently that “Aamjiwnaang is situated right next to industry,” Ada Lockridge, Chair of

189. *Ibid.*

190. David N. Pellow, “Environmental Inequality Formation: Toward a Theory of Environmental Injustice” (2000) 43 *The American Behavioral Scientist* 581 at 590.

Aamjiwnaang's Health and Environment Committee, interjected immediately to correct: "No," she stated, "industry is situated right next to us."¹⁹¹

Aboriginal peoples, "unlike most Americans and Canadians, are not a transient population and cannot abandon their homeland to find cleaner air, water, and land."¹⁹² Native people, "like resident ... plants and animals, will live adjacent to these [contaminated] sites forever and experience the effects of persistent contaminants for generations to come."¹⁹³ The connection to the land is tied to identity: as Tarbell and Arquette insist, "[t]he only place the people of Akwesasne can be Mohawk is on Mohawk land."¹⁹⁴ The same is true for the Aanishnaabek of Aamjiwnaang. The Aanishnaabek people have occupied their lands at the southernmost tip of Lake Huron for hundreds of years. As Ron Plain explains, on the Aamjiwnaang burial grounds, you will find the remains of four generations of his ancestors, all in one place, literally on the fence line of a large refinery: "we all lived *here*—all our lives."¹⁹⁵ The permanence of both the risk and the Aamjiwnaang First Nation on the landscape may explain why we might see a disproportionate effect of chronic pollution in this community: it is grounded both spatially and historically.¹⁹⁶ It also demonstrates clearly how toxic chemical pollution exists in social contexts that can exacerbate its effects.¹⁹⁷

191. Aamjiwnaang Environmental Health Symposium, *supra* note 112 [notes on file with author].

192. Tarbell & Arquette, *supra* note 173 at 99. This claim must be understood in the context of a history of forced displacement and sedentarization of First Nations peoples through state policies and legislation, such as the *Indian Act*, R.S.C. 1985, c. I-5. See e.g. John L. Tobias, "Protection, Civilization, Assimilation: An Outline History of Canada's Indian Policy" in Ian Getty & Antoine Lussier, eds., *As Long as the Sun Shines and the Water Flows: A Reader in Canadian Native Studies* (Vancouver: UBC Press, 1983) 39. Further, the understanding that Native people are "tied to the land" can be challenged empirically on the basis of recent census data that reveals a significant Aboriginal population that, in fact, does move freely on and off, and among traditional territories.

193. *Ibid.*

194. *Ibid.* at 103.

195. Jonston & Plain, *supra* note 123.

196. Dr. Devra Davis, "Keynote Address: New Social Movements" (Presented to the Aamjiwnaang Environmental Health Symposium, *supra* note 112) [unpublished]. Davis noted that, for many environmental justice struggles in the United States, entire communities (like Reveltown and Mossport, LA) were essentially evacuated after being contaminated by the chemical industry: people simply moved away *en masse*. "We lost the ability to document the problem," she states. Colihan, *supra* note 40.

197. Luke, *supra* note 4 at 248.

C. STRATEGIES OF RESISTANCE: BODY BURDENS AND BUCKET BRIGADES

Two strategies that increasingly constitute integral parts of the campaigns by environmental health and justice advocates, body burden testing and bucket brigades, flow directly from the characterization of the risk of harms from pollution as chronic and inherent. Advances in biomonitoring have enabled communities to obtain measures of a person's "body burden," which are thought to give direct information about total exposures across time and from all sources.¹⁹⁸ The testing is expensive and risky, but for a community under siege from pollution, the greatest fear is a study that returns the headline "Community Pollution Levels Within the 'Normal' Range." Nevertheless, communities are moving forward with this strategy, confident that they will generate evidence that cannot be ignored. Similarly, "bucket brigades" are teams of local residents in fenceline communities, who generate the data—or evidence—that can be used to force their governments into action.

Everywhere we go, it seems, we bring our bodies. Biomonitoring technologies have now advanced to the extent that they can detect minute concentrations of contaminants in nearly every living individual. A body burden is a measure of a person's chemical load; it is the sum total of exposures from all routes of entry (inhalation, ingestion, and skin absorption) and from all sources (food, air, and water) from all the places we work, live, and play. For a complete measure of the total burden, one would need samples from every fluid and compartment of tissue in the exposed body. More commonly, a sample of blood, urine, semen, umbilical cord fluid, or fingernails is extracted and subjected to expensive analysis.¹⁹⁹ The risk subject is then confronted with the task of making sense of the textual representation of her contamination. As Steingraber notes, it is "our bodies, inscribed."²⁰⁰ In the case of "fat soluble, persistent chemicals, body burdens provide a measure of cumulative exposures" that have built up over time; but for "chemicals quickly metabolized and

198. Brown, *Toxic Exposures*, *supra* note 7 at 265.

199. The testing of umbilical cord blood is highly controversial, as is the practice of breast milk monitoring for pollutants. These are socially significant mediums for announcing the presence of toxins. For example, on the breast milk issue, environmental health advocates want to be sure that alerting expecting mothers about the toxins in their breast milk will not cause them to give up breastfeeding in favour of formula.

200. Steingraber, *supra* note 111 at 236.

excreted, the body burden is an index akin to a press release rather than a biography.²⁰¹ It “reports on the status of immediate and ongoing exposures to particular contaminants at single points in time.”²⁰²

As it is often said in the environmental justice movement that the polluted are powerless is proven by the very fact of their *pollution*.²⁰³ But this is a campaign that, while widely embraced, exposes, in my view, a conceptual discontinuity.²⁰⁴ A coming challenge for this emerging social movement against chronic pollution is to wrestle with the underlying tension that has environmental justice activists wanting to put forward both of the following claims about pollution at the same time:

- 1) That “it’s in all of us,”²⁰⁵ or that “we all live downstream”;²⁰⁶ and
- 2) That “some of us live more downstream than others.”²⁰⁷

Can both of these claims have merit? It is clear that at some level, yes, we are all polluted, and yes, it is also clearly a matter of degree. But does it undermine the basis of the central environmental justice claim when groups demonstrate that the rich and powerful are also polluted?²⁰⁸ With respect to low-dose chronic exposures, while it may be true that “no one can fully escape,” some of us can and do avoid exposures to the most toxic local contaminants that others are unable to

201. *Ibid.*

202. *Ibid.*

203. Bullard seems to indicate that powerless communities are those forced to bear disproportionate environmental costs. Bullard, *supra* note 5 at 31.

204. There are a growing number of environmental groups engaged in biomonitoring. For example, the US-based Environmental Working Group (EWG) has a campaign entitled “Across Generations,” which involves the testing of mothers and daughters, a campaign entitled “Mother’s Milk,” and a campaign targeting pollution in newborns. See “Environmental Working Group,” online: <<http://www.ewg.org>>. Similarly, Environmental Defence (ED) has a biomonitoring campaign entitled “Toxic Nation.” See Environmental Defence, online: <<http://www.environmentaldefence.ca>>.

205. Environmental Defence, *ibid.*

206. See e.g. Dorothy E. Chunn, Susan C. Boyd & Robert J. Menzies, “We All Live in Bhopal” in Susan C. Boyd, Dorothy E. Chunn & Robert J. Menzies, eds., *Toxic Criminology: Environment, Law and the State of Canada* (Halifax: Fernwood, 2002) 7 at 11.

207. Tarter, *supra* note 48.

208. *Supra* note 204. For example, the EWG campaign included high profile public figures, and ED’s “Toxic Nation” campaign tested the body burdens of a variety of people—from federal politicians and celebrities to ordinary Canadians.

dodge.²⁰⁹ Radioactive waste disposal sites, incinerators, refineries, coal-fired utilities, and cement kilns are not located in wealthy neighbourhoods.

Still, forcing Canadians to confront the fact that our current laws and complex regulatory regimes are demonstrably failing to prevent the build up of a whole slew of known toxins in our own bodies is a worthy aim of these campaigns. They may also serve to promote an awareness of emerging research that now points to health effects at levels below the "safe doses" currently set by our regulatory agencies, and to demonstrate the ubiquity of certain substances in the environment. While work to date has not moved to correlate burdens with actual health status, this is a direction for future research. But, again, as a mobilizing strategy, biomonitoring, when combined with individual health data, is potentially individualizing and medicalizing, and thus working at cross-purposes with exercises in popular epidemiology.²¹⁰

Launching their own bucket brigades is a second new strategy which allows residents of contaminated fence-line communities to actively participate in environmental monitoring and regulation. In essence, those residents are equipped to sample the ambient air in their communities at times and locations of their own choosing. The team consists of "sniffers" and "samplers" in a coordinated network using low-cost grab samplers that are "explicitly designed to be inexpensive, easy to use, and made of materials that can be found at a local hardware store."²¹¹ At the same time, these buckets are capable of storing a sample of ambient air that can be subject to sophisticated analysis with proven credibility.

The strategy is motivated by the firm belief that the current monitoring systems in place are wholly inadequate and that they in fact "perpetuate an environment in which firms pollute beyond safe levels, and with little threat of punishment."²¹² It is also widely understood in the environmental justice movement that the "location, range, and focus of ambient monitors are determined through an inherently political process."²¹³ In Sarnia, there are no

209. *Ibid.*

210. Phil Brown's concept of "contested illnesses" also relies on a form of popular epidemiology in which laypeople combine with progressive professionals to challenge the dominant epidemiological paradigms. See Brown, *supra* note 7.

211. O'Rourke & Macey, *supra* note 8 at 389.

212. *Ibid.* at 384.

213. *Ibid.*

ambient air quality monitors belonging to the Ministry of the Environment located downwind of Chemical Valley. In fact, when faced with the recent publication of some test results from an air sample captured by the Aamjiwnaang bucket brigade, the MOE agreed to install an air quality monitoring station on the reserve.

Without the monitors or the capacity to do its own monitoring, the Aamjiwnaang First Nation faces this very typical scenario: “[i]ndustry has an accident that results in a chemical release; government officials arrive too late to inspect or evaluate the release; and industry announces that there is no risk to the community.”²¹⁴ Following a massive power failure a few years ago in Sarnia, “one company famously declared ‘no offsite impact’ even as clouds of black smoke billowed over the city.”²¹⁵ As Vicki Ware, an Aamjiwnaang band councillor states, “[b]y the time you get someone to come out to the community to test the air, you’re not going to get an accurate sample.”²¹⁶ The bucket brigades are intended to alter the essential power relations inherent in this scenario by providing the community with an indispensable tool to deploy: information that it controls. “With just a few air samples,” Denny Larson of Global Community Monitor explains, “the community can collapse the house of cards built by the government and industry that pollution doesn’t cross the industry’s fenceline.”²¹⁷ This expectation is reflected in the remarks by Ada Lockridge after the test results came in: “The Ministry of Environment has to move on this. We have the proof.”²¹⁸

A central concern for those worried about the cumulative effects of exposures is that government agencies “are not monitoring the full range of chemicals that [residents] are exposed to.”²¹⁹ For example, the recently released Aamjiwnaang bucket brigade results revealed unusually high levels of benzene, which is a chemical for which Ontario does not even have an ambient air

214. *Ibid.* at 391.

215. Editorial, “Do-it-yourself air monitoring” *The Sarnia Observer* (11 May 2007), online: <<http://www.gcmonitor.org/article.php?id=582>>.

216. Jack Poirier, “Band to Monitor Industry” *The Sarnia Observer* (10 May 2007), online: <<http://www.gcmonitor.org/article.php?id=582>>.

217. Global Community Monitor, “History of the Bucket Brigade” (2006), online: <<http://www.bucketbrigade.net/article.php?list=type&type=74>>.

218. “Localized study is complete; Aamjiwnaang test finds high levels of hazardous chemicals” *The Sarnia Observer* (15 March 2008) [copy on file with author].

219. O’Rourke & Macey, *supra* note 8 at 395.

quality standard.²²⁰ Benzene is a volatile organic compound, which can be hazardous to human health when inhaled. Because benzene has been noted as toxic and is a probable human carcinogen, the official provincial position is that its emissions should be prevented or limited to the greatest extent possible.²²¹ As a result of the bucket brigade results, John Steele, spokesperson from the MOE, stated that the province is looking into establishing a standard for benzene and that the government will also install an air monitoring station in the Aamjiwnaang community by spring 2008.²²² Thus, for communities under siege from toxic emissions, the mobilization of a bucket brigade can signal the “transition from victims to agents of change.”²²³

The account of risk that holds environmental health harms to be an inherent aspect of pollution and production is one that now invariably leads to a solution of precaution. That solution has usually focused on calls for attention to cumulative impacts. Thus, strategies of resistance employed in environmental justice struggles worldwide necessarily aim to force the recognition of cumulative effects. The body burden campaigns, while not without their difficulties, seek to demonstrate the burden in a cumulative, embodied sense of what we breathe and consume. The bucket brigades, in an entirely different way, address cumulative effects by showing that what we count in our official regulatory system is only a fraction of what we are forced to bear. Both strategies have the potential to expose the difficulties with law’s treatment of chronic pollution.

VI. CONCLUSION

According to Simon, empirically informed socio-legal studies of risk “can complement and complicate” other approaches.²²⁴ In this case, the analysis demonstrates that multiple competing accounts of the risks of chronic pollution

220. *Supra* note 218.

221. MOE, *supra* note 136; *Bogan v. Director, Ministry of the Environment*, [2007] 28 C.E.L.R. (3d) 21 [OERT].

222. Jack Poirier, “Aamjiwnaang test finds high levels of hazardous chemicals” *The Sarnia Observer* (20 February 2008), online: <<http://www.ecojustice.ca/media-centre/press-clips/localized-study-is-complete-aamjiwnaang-test-finds-high-levels-of-hazardous-chemicals/>>.

223. O’Rourke & Macey, *supra* note 8 at 398.

224. Simon, *supra* note 73 at 137.

exist, and that depending on which is adopted, distinct and very different regulatory approaches follow. Whoever defines the risk, as Tarbell and Arquette observe with respect to the Akwesasne's experience of chronic contamination, also "gets to define what is a rational course of action."²²⁵ The strategies put forward flow directly from the subjective accounts of risk. I have drawn on the ongoing empirical work with the Aamjiwnaang First Nation in order to articulate what a socio-legal approach to issues of risk and precaution might produce on the question of long-term, low-dose exposures to toxic chemicals, and also to demonstrate how the community's resistance exposes the inadequacies of the law's treatment of chronic pollution.

Environmental justice activists and their allies in environmental health are beginning to marshal the evidence that is needed to demonstrate that chronic exposures to pollution are causing environmental health harms, even at the 'safe doses' permitted by existing regulations. They are deploying this evidence to demand that regulators implement precaution—governance strategies for pollution that take account of the cumulative effects of exposures from all sources, across time. In other words, they are demanding that the regulatory solutions carried forward to address the risks of chronic pollution reflect the emerging understandings of those risks that challenge the dominant account.

As McEvoy vividly demonstrates in his memorable analysis of the Triangle Shirtwaist Fire and its influence on how law treats industrial accidents, "[l]aw is both an index for social thought and an agent for changing it."²²⁶ That is to say, law is at once a "mechanism for maintaining, reproducing, *and challenging* unequal social relations—continually setting and resetting the acceptable relations between markets and bodies..."²²⁷ Exposing the emerging accounts of the risks of chronic pollution and potential environmental health harms could potentially catalyze a process of social learning and lead to a transformation in our way of thinking.

On a socio-legal analysis, as Simon notes, "it is the particular context, characters, narratives, institutions, etc., within which a precautionary ... or any other risk governance strategy is deployed that makes all the difference."²²⁸ In

225. Tarbell & Arquette, *supra* note 173 at 99.

226. McEvoy, *supra* note 66 at 625.

227. Jain, *supra* note 55 at 5 [emphasis added].

228. Simon, *supra* note 73 at 138.

particular, some of the strategies employed by environmental justice activists embody very progressive constructions of precaution that are potentially transformative. In particular, the focus is shifting to the “availability of alternative, less harmful processes and products” championed by the toxics-use-reduction movement. This movement demands that industry work toward “accelerated elimination” of toxic chemicals and that governments implement “safe substitution” programs that would require facilities to switch to safer alternatives whenever they are available.²²⁹ These progressive constructions of precaution, with ties to industrial ecology and the “clean production approach,” are searching for the simplest, safest way to achieve our social goals, instead of

229. See *e.g.* *Toxics Use Reduction Act*, M.G.L. c. 21I (1989) [TURA]. The Act, which was passed in Massachusetts in 1989, “requires that manufacturing firms using specific quantities of some 900 industrial chemicals undergo a bi-yearly process to identify alternatives to reduce use of those chemicals.” See Joel Tickner, “The Precautionary Principle and Toxics Use Reduction” (1998) 3 *The Networker*, online: <http://www.sehn.org/Volume_3-1.html>. One of the goals is to achieve in-plant changes that would eliminate and avoid the use of hazardous chemicals or prevent their generation as by-products on a per-end-unit of product basis, in order to reduce the risk of exposure to workers, consumers, and the environment (without transferring risks among these groups). There is some indication that this movement is beginning to have influence over policy in Canada as well. For example, the Ontario government recently established a “Toxics Reduction Strategy,” which includes a mandate for an “expert panel” to consider “substitution” as a policy alternative. See Ontario, Ministry of the Environment, “Terms of Reference for the Toxics Reduction Scientific Expert Panel,” online: <<http://www.ene.gov.on.ca/en/toxics/terms.php>>. Further, while the *Canadian Environmental Protection Act*, S.C. 1999, c. 33 [CEPA] contains provisions, such as s. 77(4), for “virtual elimination” of substances that are persistent and bioaccumulative, these provisions have been, until very recently, largely ignored by the federal government. Recent moves by Health Canada and Environment Canada under the “Chemicals Management Plan” may indicate a new direction. See Government of Canada, “Chemicals Management Plan,” online: <http://www.chemicalsubstanceschimiques.gc.ca/plan/index_e.html>. The “Challenge” program, for example, institutes a “reverse onus” scheme for a group of two hundred high priority chemicals: in other words, the government indicated a “predisposition” towards listing these chemicals as toxic, and invited industry to submit information that would convince them otherwise. See Government of Canada, “The Government of Canada ‘Challenge’ for chemical substances that are a high priority for action,” online: <http://www.chemicalsubstanceschimiques.gc.ca/challenge-defi/index_e.html>. Under this program, for instance, the government recently announced its intention to add Bisphenol A (BPA) to its list of toxic substances under CEPA. See *e.g.* Government of Canada, “Toxic Substances: Reducing the Threat,” online: <<http://www.ene.gov.on.ca/en/toxics/index.php>>.

investing so much in determining whether particular chemicals pose “unacceptable risks.”²³⁰

The goal is to move away from the question of “how much exposure/risk can we absorb without harm?” to the question of “how much exposure can we avoid?” It is to move away from “protracted, unwinnable debates” over how to quantify the risks and where to set the legal maximum limits for their presence in our environment,²³¹ because these are debates in which “the chemical ‘enemy’ becomes the central concern, not the system that produces the chemical, or the social and political relations that enable it to be produced and used.”²³² Thus, precaution, in practice, is coming alive as it is being transformed by these activists into a flexible philosophy of action that grounds real, concrete demands for policy change. It is, as Phil Brown notes, “a powerful alternative vision.”²³³

What is made obvious through the Aamjiwnaang situation, as well as through the basic thrust of the environmental justice movement, which trades in communities and not in individual well-being, is the centrality of community level effects in the formation of accounts of risk.²³⁴ Brown’s concept of the collective illness experience postulates that “tying together [their] illness experience and awareness of local hazards can lead people to a *social discovery*.”²³⁵ This incorporates the notion of embodied health, through which

230. See e.g. SF Environment, “SF Precautionary Principle Ordinance,” online: <http://www.sfenvironment.org/our_policies/overview.html?ssi=14>; *City and County of San Francisco Environment Code*, Ordinance No. 75-08, File 071531, supp. 16 (approved 9 May 2008), c. 1, s. 101: “The San Francisco Precautionary Principle” [SFPPPO]. The SFPPPO requires all “officers, boards, commissions, and departments of the City and County” to implement the precautionary principle in conducting their affairs. This includes a duty of anticipatory action to prevent harm, the recognition of a ‘community right to know,’ an obligation to conduct an alternatives assessment (and to *select the alternative with the least potential impact on human health and the environment*), a requirement for full cost accounting, and a call for participatory decision making.

231. Steingraber, *supra* note 111 at 271.

232. Levenstein & Wooding, *supra* note 70 at 41.

233. Brown, *Toxic Exposures*, *supra* note 7 at 202-03.

234. Kai Erikson, *Everything in its Path: Destruction of Community in the Buffalo Creek Flood* (New York: Simon and Schuster, 1976); Michael R. Edelstein, *Contaminated Communities: Coping with Residential Toxic Exposure* (Boulder: Westview Press, 2004). See also Hiskes, *supra* note 58 at 257.

235. Brown, *Toxic Exposures*, *supra* note 7 at 24 [emphasis in original].

people begin “to see their bodies through the lens of social stigma and discrimination.”²³⁶ The body mapping exercise undertaken by the Aamjiwnaang Health and Environment Committee is part of this process: the relations between people and pollution, and knowledge and power, become tangible on paper. Residents begin to make connections between their experience and the social determinants of their health.²³⁷

Sociologists have long known that the experience of illness shapes identity.²³⁸ Ron Plain states that, “[o]ur daughters will have to look outside our community for their partners,”²³⁹ reflecting, in a sense, how the Aamjiwnaang residents have begun to forge a collective identity from their experiences of chronic pollution. As they search for the cause of their illnesses, they engage in a process to attribute responsibility for the harm.²⁴⁰ As Omohundro argues, understanding environmental risk is not just about understanding contaminants (individually or cumulatively), but is about understanding how people, collectively, interact with their landscapes, particularly in situations where toxic chemicals perpetually occupy the landscape.²⁴¹ Conventional environmental health research has focused on individual risk perceptions, expert opinions, and exposures, to the exclusion of questions about social group dynamics, collective risk perceptions, and the significance of shared histories and community identities.²⁴² But toxicity “is a communal construct—fearing it, seeing it, typing it, measuring it, judging it—all involve many complex, multi-layered acts of cultural, political, and social interpretation.”²⁴³ Perceiving risks, making determinations of cause, and putting forward strategies are “active, constructive process[es] ... influenced by the motives, values, experiences, and other characteristics of the judger, the specific context, and the anticipated consequences.”²⁴⁴

236. *Ibid.* at 28.

237. Brown *et al.*, *supra* note 149 at 186.

238. See *e.g.* Gareth Williams, “The genesis of chronic illness: narrative reconstruction” (1984) 6 *Sociology of Health and Illness* 175.

239. Plain, *supra* note 53.

240. Brown *et al.*, *supra* note 149.

241. Omohundro, *supra* note 157.

242. *Ibid.* at 4.

243. Luke, *supra* note 4 at 240.

244. Lloyd-Bostock, *supra* note 66 at 167.

It is time to recognize the disingenuousness in a reliance on tort law as a fall back for a failing regulatory system. Tort law governs “the field of *accidental* harms.”²⁴⁵ Profound human wounding, through chronic low-dose exposures to toxic chemicals, should not continue to be understood as accidental, but should be seen as a central and inherent consequence of the production process. Concrete material conditions link risks with the conditions of their perpetuation on the landscape, whereas accepted patterns and practices of production link pollution with profit. The new instinct in social thought must instead be to link sick bodies and wounded communities with known pollutants.²⁴⁶ The task is to re-imagine law’s treatment of low-dose, long-term exposures so as to better equip current environmental law to tackle contemporary pollution problems.

245. Pat O’Malley, “The Government of Risks” in Austin Sarat, ed., *The Blackwell Companion to Law and Society* (Malden, MA: Blackwell, 2004) 292 at 298 [emphasis added].

246. Steve Kroll-Smith & Sandra D. Westervelt, “People, Bodies and Biospheres: Nexus and the Toxic Tort” (2004) 26 *Law & Pol’y* 177 at 178.

