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THE DRIVE FOR A SAFER CHEMICALS POLICY IN THE UNITED STATES

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ABSTRACT

This article analyzes the history, policies and politics of the modern era of safer chemical policy reform in the United States. In the last decade, state laws have modeled a chemical policy framework to phase out unnecessary dangerous chemicals in favor of safer alternatives. These state drivers, along with market campaigns to reduce downstream business use of hazardous chemicals, have weakened the chemical industry's resistance to fixing the broken federal chemical safety system. The obsolete Toxic Substances Control Act of 1976 (TSCA) has failed to protect public health and the environment and has stifled innovation toward greener chemistry. Health advocates with a progressive policy vision tempered by legislative pragmatism have launched a TSCA reform campaign to challenge chemical industry power in a weak Congress. The opportunity and limits to winning meaningful TSCA reform are characterized and marked as a critical milestone on the path to a truly comprehensive safer chemical policy for the United States.

Keywords: toxic chemicals, policy, TSCA, safer alternatives

Nearly 50 years ago, Rachel Carson called for a federal chemical policy based on public data, the best science, and a search for safer alternatives: "The choice, after all, is ours to make. If, having endured much, we have at last asserted our 'right to know,' and if knowing, we have concluded that we are being asked

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to take senseless and frightening risks, then we should no longer accept the counsel of those who tell us that we must fill our worlds with poisonous chemicals; we should look about and see what other course is open to us" [1, pp. 277-278].

Yet in 1976, the federal Toxic Substances Control Act (TSCA) grandfathered 62,000 existing industrial chemicals in commerce without any restrictions on known hazards or mandatory health and safety testing to fill data gaps [2]. The statute handcuffs the U.S. Environmental Protection Agency (EPA) with an onerous burden of proof that prevents ready action. In 35 years, EPA has restricted some uses of only five of those chemicals and ordered testing for only about 200 more [3]. EPA's 10-year TSCA effort to ban most uses of asbestos, a known human carcinogen, was rejected by a federal court [4]. About 20,000 new chemicals have been introduced into commerce since 1976 without complete data on health and safety and only a rushed risk screening [3]. After years of critical review by government auditors and environmental health advocates, virtually everyone acknowledges that TSCA remains ineffectual and obsolete.

This article traces the development of two related drivers for modernizing U.S. chemical policy—the rise of state-based chemical regulation and the emergence of a national health-based campaign to overhaul the federal chemical law. It chronicles state and national policy efforts to fix our broken chemical safety system over the last decade, illustrating how the safer chemicals movement challenges the dominant risk assessment regime and chemical industry power.

This analysis examines safer chemicals reform primarily through a policy development lens, which necessarily limits its scope. Many essential elements to effecting change are touched on only in passing, including organizing for grassroots power, creative messaging around health, and leveraging the new science. While the critical importance of building a diverse unified coalition is emphasized, this article barely discusses the perennial challenge and success in incorporating environmental justice, workers' concerns, and women's voices. Market-based campaigns and corporate chemical policies, while not analyzed, are also crucial drivers for safer chemical policy reform [5]. Within these limits, the history of the reform movement unfolds.

THE VIRTUAL ELIMINATION OF TARGETED CHEMICALS (1998-2009)

Modern chemical policy reform in the United States developed at the state level, informed by parallel actions by the Scandinavian countries, the European Union (EU), and Canada. The state actions harkened back to effective national strategies of the 1970s, such as the phase-out of DDT, PCBs, and lead, before the U.S. lost its global leadership role in environmental policy [6]. Some recent examples help illustrate the development of state policy leadership on chemicals.

Mercury in Products—Common Sense Trumps Risk Assessment

In an ornate legislative committee room on the fourth floor of the State House in Augusta, Maine, a pivotal moment in chemical policy reform quietly unfolded one spring afternoon in 2001. The policy question was profoundly simple: do the inherent hazards of mercury justify a phase out of mercury-containing thermometers in favor of safer alternatives or should a quantitative risk assessment be conducted first to determine whether any restrictions are needed?

The self-appointed expert on the Natural Resources Committee was a State Representative who lectured his colleagues for 45 minutes on how to quantitatively assess the risks of mercury thermometers. With a mathematical flourish, he firmly concluded that mercury thermometers did not pose a significant risk to human health and should remain unregulated. Rather than question his assumptions, the Chair cited evidence that mercury was long-lived, built up to high levels in the food web, and was highly toxic to fetal brain development. Human exposure was too high and safer mercury-free thermometers were equally effective and available at comparable cost.

By an overwhelming vote margin, Maine became one of the first states to prohibit the sale of mercury-added thermometers. Within a few years, most mercury products were phased out in Maine [7]. By 2009, similar laws to phase out mercury in consumer products had been enacted or proposed in 32 states, 21, cities and four counties in the United States [8, p. 9].

PBDE Flame Retardants—When Do We Know Enough to Act?

In 1998, Swedish scientists puzzled over the mysterious spikes on the chromatogram. They labored to develop a new method to identify the unknown chemicals. They had discovered polybrominated diphenylethers (PBDEs), chemicals added to plastics to slow the spread of flames. When they looked at archived breast milk samples, shock waves resounded throughout the scientific community. PBDE levels in humans had increased exponentially in 25 years [9].

A European risk assessment characterized the penta mixture of PBDEs as persistent and bioaccumulative, but lacked enough toxicity data to establish safe levels of exposure [10]. Nonetheless, by 2003 the EU took precautionary action to ban penta and octa blends of PBDEs and phase out all PBDEs in electrical and electronic equipment, including the deca mixture.

In the United States, a California furniture fire safety standard had triggered massive use of penta in foam couch cushions, resulting in North American PBDE body burdens much higher than those in Europe [11]. The California legislature passed a measure in 2003 to ban penta and octa, which was followed closely by a similar measure in Maine. Chemical makers halted penta production by the end of 2004, but strongly defended their lucrative market

in deca. By 2007, Maine and Washington had banned deca in electronics, mattresses, and textiles. By 2010, nine more states had restricted PBDEs, and a federal bill proposed to extend the phase-out nationwide. Chemical makers finally struck a voluntary deal with EPA to halt deca production by 2013, some 15 years after the first alarm.

Not once during the decade of debate over PBDEs was enough information available to confidently establish a safety standard and show that it wasn't met. EPA's initial risk assessment of decaBDE was controversial and not completed until 2008 [12]. Yet a begrudging consensus emerged to phase out PBDEs without relying strictly on risk assessment, because of the chemicals' inherent hazardous properties and the availability of safer alternatives [13].

EARLY LESSONS FROM STATE-BASED CHEMICAL ACTIONS

Risk assessment proved of little value in deciding whether or to what extent to restrict products containing mercury or PBDEs. The states chose to phase out these chemicals whenever safer alternatives were demonstrably available, effective, and affordable. Mercury hazards and aggregate exposure were well known, but data gaps plagued mercury use in products. Although PBDE exposure was documented early, few data were available to characterize risk to health.

From this early state experience, four lessons emerged:

1. Risk assessment has limited value for safely managing chemicals of high concern
2. Such chemicals should be virtually eliminated through an expedited, orderly transition
3. Data gaps on chemicals are rampant and must be filled to inform policy action
4. Alternatives assessment enables effective decision-making on solutions and exemptions

Risk Assessment—A Helpful Driver, but a Poor Decider

Applying risk-based health standards still dominates chemical management decision-making. In 2000, the National Research Council confirmed the safety standard for protecting the fetus from neurodevelopmental toxicity that results when pregnant women are exposed to methylmercury. Assessing mercury risks was easy since data are relatively robust on the hazards, dose-response relationship, and exposures, unlike for PBDEs and most other chemicals. Due to the buildup of methylmercury in certain fish, about 8 percent of all American women consume mercury above the safety standard. About 300,000 American babies are born every year at risk of

subtle brain damage resulting from elevated methylmercury exposure in the womb [14].

The "risk cup" filled by aggregate exposure from all sources of mercury "overflows." Since less than 10 percent of the vulnerable group is exposed above the safety standard, wouldn't a modest pollution control strategy enable the standard to be met without phasing out mercury use?

A risk-based approach fails when used to decide where to draw the finish line in reducing exposure. Mercury, PBDEs, and other persistent, bioaccumulative, and toxic chemicals (PBTs) defy traditional risk assessment [15]. Since small amounts build up to higher and higher levels in the food web over time, continued low-level pollution remains dangerous. PBTs are long-lived in the environment and are global pollutants that travel long distances from their original sources. Like many chemicals, PBTs undergo complex changes that multiply the rampant uncertainty inherent in risk assessment, rendering firm safety conclusions ever-elusive [16, pp. 59-74].

Second, a risk-based approach tends to promote environmental injustice by averaging risks across populations and underestimating risks to various subgroups. In actuality, "hot spots" of disproportionate exposure routinely occur in a patchy distribution [17]. Risk assessment fails to consider cumulative risks resulting from concurrent exposure to other pollutants; to psychosocial stressors such as racism, poverty and violence; and to other risk factors such as poor nutrition, limited health care access, and pre-existing medical conditions [18, pp. 213-239; 19].

Risk assessment also creates a false sense of security, since no safe level of exposure can be assumed for lead [20], fine particulate matter [18, pp. 151-154], carcinogens [21], or endocrine disruptors [22]. The best science now supports rejection of a safety threshold for *all* noncancer effects, given the enormous human variability in susceptibility and exposure [18, pp. 127-187].

Over-reliance on risk assessment for decision-making also misses commonsense pollution prevention opportunities. Glass thermometers filled with mercury or plastic TV cases full of PBDEs are unneeded when safer alternatives are readily available.

In 2009, the National Academy of Sciences (NAS) cited the failure of risk assessment to support timely decisions or best solutions to environmental health threats [18]. NAS said that rather than determining an acceptable level of risk for a given exposure scenario, EPA should use risk assessment to characterize which solution is preferable among risk management options identified in advance [18, pp. 240-257]. This would align EPA science policy with similar methods such as technology options analysis, alternatives assessment, and substitution planning.

The fate of risk assessment reform remains controversial. The chemical industry has mounted a vigorous attack on the NAS report [23], and EPA has responded too slowly [24].

Virtual Elimination—Continuous Improvement through an Orderly Transition

A virtual elimination policy seeks to replace chemicals of high concern with safer alternatives over a reasonably achievable time period. Unlike a risk-based approach, virtual elimination embodies both continuous improvement and promotion of best practices. A virtual elimination policy translates voluntary approaches such as pollution prevention and toxics use reduction into mandates, overcoming the problem of motivating laggards to make changes.

For example, the New England Governors and Eastern Canadian Premiers opted for "the virtual elimination of the discharge of anthropogenic mercury into the environment" [25]. The bi-national International Joint Commission agreed that "the discharge of any or all persistent toxic substances be virtually eliminated" in the Great Lakes [26].

Three policy elements adopted for mercury, PBDEs, and other chemicals have informed federal chemical policy development. First, a *presumptive ban* on specific chemical uses was imposed where effective alternatives were available, usually through a prohibition on the sale of certain products containing the chemical. Second, *categorical exemptions* excluded certain critical uses upfront from the presumptive ban. Lastly, manufacturers were provided the option of *case-by-case exemptions*, which if granted allow for temporary relief from the ban.

With proper design and periodic updating, virtual elimination ensures an orderly transition to safer alternatives, striking a balance between a thoughtlessly disruptive ban and continued unnecessary use of a dangerous substance. The exceptions to the presumptive ban provide for a smooth transition and offer a pressure-relief valve that allows for flexible extensions of deadlines if effective, safer alternatives are not yet readily available for specific applications.

Categorical exemptions can be passive or explicit. For example, mercury-containing lighting was omitted from the presumptive phase-out because more energy-efficient alternatives were not then available. Certain uses of PBDEs, such as in industrial wire and cable, were explicitly exempted from the presumptive deca ban because safer alternatives were not available yet.

A case-by-case policy typically allows a manufacturer to petition for an exemption for up to five years based on a finding that for a specific use, technically feasible alternatives are not available at a comparable cost, or that continued use of the chemical provides a net benefit to the environment, public health or public safety when compared to available alternatives.

In federal policy, a virtual elimination strategy should be applied to PBTs and other high-hazard chemicals to which humans are likely to be exposed. To implement such a chemical policy requires information on chemical use, exposure potential, and availability of safer alternatives.

Chemical Use Data—A Critical Missing Link

A landmark law passed by nine states requires any person who intentionally adds mercury to a product to report the amount used and the number of units sold. The resulting public database provided the first detailed data on mercury use in the United States [27]. The use data directly informed the search for mercury-free alternatives and policy actions to reduce use in products.

Serious data gaps exist on the use of most chemicals in commerce (as well as on chemical hazards and exposures). Chemical manufacturers often do not understand the end use of their chemicals far down the supply chain [28, p. 12]. Product makers often cannot identify all the chemicals in the raw materials and components that they use [29]. Since no single entity knows all chemical uses, a comprehensive system for disclosing chemical use will be necessary to inform policy and market decisions on chemical management. Chemical use data are essential for characterizing both the potential for exposure and the availability of safer alternatives.

Alternatives Assessment—The Search for Effective Solutions

Banning mercury thermometers was politically easy, unlike driving other mercury products and PBDEs out of commerce. When Maine advanced sweeping legislation in 2002 to phase out mercury products, lighting manufacturers mounted a fervent opposition campaign and killed the bill. A year later, the state identified specific mercury-free alternatives that were functionally equivalent and commercially available at a comparable cost [30]. With the solutions identified, a new law to phase out mercury use in dozens of products sailed through without opposition. A proposed ban on deca met a similar fate until an alternative assessment showed the solutions.

An evolving alternatives assessment methodology guides the search for available, effective, and affordable alternatives to hazardous chemicals [31]. The Green Screen was adapted from EPA's Design for the Environment program to help identify inherently safer alternatives [32]. Properly motivating the search for inherently safer chemicals remains a central challenge.

THE RIPENING OF FEDERAL REFORM (2001–2008)

In 2001, seasoned anti-toxics activists launched a nationally coordinated media campaign to promote Bill Moyers' exposé of the chemical industry, *Trade Secrets*. The resulting Coming Clean collaborative provided an ongoing forum for sharing information and strategy among a diverse network of non-governmental organizations (NGOs) working for environmental and occupational health and justice at the local, state, and national levels. Its Policy

Workgroup adopted a progressive policy vision, the *Louisville Charter for Safer Chemicals: A Platform for Creating a Safe and Healthy Environment through Innovation*, in May 2004. The *Charter* detailed six needed reforms: 1) require safer substitutes and solutions; 2) phase out persistent, bioaccumulative, or highly toxic chemicals; 3) give the public and workers the full right-to-know and participate; 4) act on early warnings; 5) require comprehensive safety data on all chemicals; and 6) take immediate action to protect communities and workers [33].

At a national gathering in December 2004, advocates gave birth to the national campaign for chemical policy reform by adopting a bold 10-year goal to achieve progressive TSCA reform by January 1, 2015. Unfazed by the recent reelection of President George W. Bush, they celebrated safer chemical reforms underway in Europe, at the state level, and in the marketplace.

They also resolved to build a state-based alliance to advance model chemical policies at the state level as a strategy for driving federal reform. Within a few months, state advocates representing health-based coalitions in Maine, Massachusetts, New York, and Washington formed the State Alliance for Federal Reform of chemical policy (SAFER).

Lastly, after heated debate, conferees agreed to pursue TSCA reform legislation. Given the unfavorable political conditions, some argued that immediate federal action would undermine efforts to establish state-level policy precedents. Others asserted that a federal "message bill" would show solidarity with the campaign-in-progress to pass REACH, the landmark legislation to register, evaluate, authorize, and restrict some 30,000 chemicals in the European Union [34].

The Kid-Safe Chemicals Act Sends a Message?

The development of the TSCA message bill provoked a sharp policy disagreement. The Environmental Working Group (EWG) argued for a risk-based approach based on the 1996 Food Quality Protection Act, which relies on risk assessment to set pesticide exposure levels that pose a reasonable certainty of no harm [35]. Clean Production Action and the Ecology Center argued for a data-rich, hazard-based, and substitution-driven approach that followed the Louisville Charter, state and European chemical policies, and the new international Stockholm Convention on Persistent Organic Pollutants (POPs). Such an approach would require comprehensive data on all chemicals and systematically replace inherently hazardous chemicals with safer substitutes.

In July 2005, Senator Frank Lautenberg (D-New Jersey) introduced the Kid-Safe Chemicals Act (KSCA), which was also introduced by Representative Henry Waxman (D-California) in the House [36]. Siding with EWG, Congressional staff drafted a completely risk-based bill, although at least one staffer questioned the wisdom of establishing toxic chemical tolerances for babies.

KSCA would replace the TSCA standard of "unreasonable risk," which embodies cost-benefit analysis, with the strictly health-based "reasonable certainty of no harm." It would flip the burden of proof, from government having to prove harm, to the chemical industry having to prove safety. It would no longer require the least burdensome restrictions. KSCA called for widespread biomonitoring, and for risk-based safety determinations and use exemptions on priority chemicals.

Although KSCA awakened pent-up demand, the bills attracted few co-sponsors. EWG announced strong support while the chemical industry declared KSCA unworkable, dismissing the need for TSCA reform [37]. Many public health advocates lamented KSCA's failure to fill data gaps, phase out PBTs, or require safer alternatives. Congress held its first TSCA oversight hearing in 10 years, airing the case for closing gaps in data, safety, and technology [38].

KSCA died without fanfare as the Republican-controlled 109th Congress came to a close. Attempting federal legislation during the deepest depths of the Bush Administration was not a totally fruitless exercise. Virtually every policy difference and political tension within the environmental health movement surfaced, with time aplenty to organize and navigate forward.

Building the Chemical Action Pyramid

In September 2005, advocates gathered again on the shores of Lake Michigan to strive for a unified vision for federal chemical policy reform. Although no consensus was reached during the sometimes acrimonious debate, a possible hybrid approach sparked consideration. Using the old federal food pyramid and the Greenpeace plastics pyramid as a model, the Environmental Health Strategy Center (EHSC) sketched a chemical action pyramid.

At the red top of the chemical pyramid were the PBTs and other high hazard chemicals that would be phased out in favor of safer alternatives. A cautionary yellow middle tier was filled with other chemicals subject to risk-based safety determinations. The green foundation of the pyramid was the home for preferred chemicals. EWG reluctantly pledged to evaluate the concept of a "red top" phase-out of PBTs. But other advocates warned that relying on risk assessment for *any* hazardous chemicals would fail to provide full health and environmental protection.

Under the auspices of SAFER, design was begun on a hazard-based, substitution-driven chemical management system to inform model chemical policy development at the state level. In 2006, this policy research and analysis was published as an internal movement report, *A Framework for Chemicals Policy Reform* [39]. The chemical pyramid concept was fleshed out and a process flow addressed all chemicals in commerce in a systematic manner. Figure 1 illustrates the four tiers of the chemical action pyramid and the policy actions to be triggered.

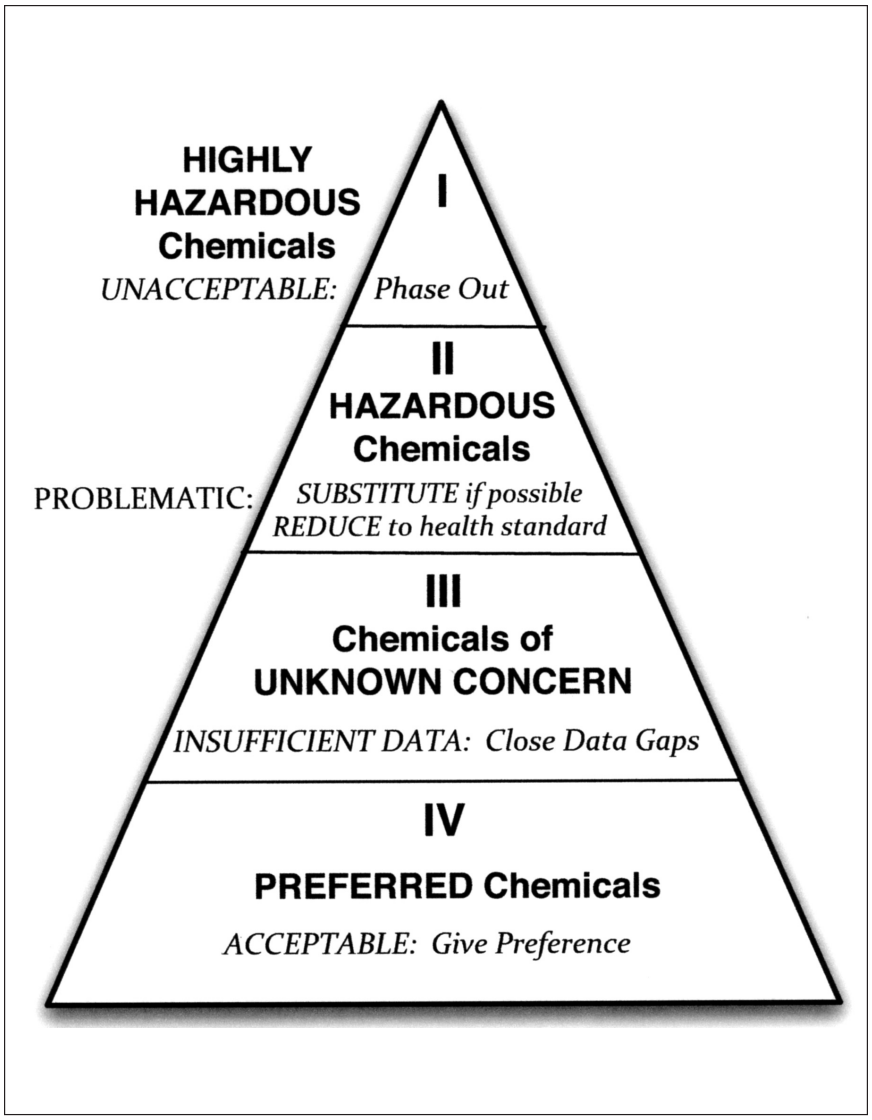

Figure 1. The chemical action pyramid.
Source: Mike Belliveau, Mark Rossi, and Laurie Valeriano, *A Framework for Chemicals Policy Reform: Issues in Model Policy Development,* July 2006, http://www.preventharm.org/Images/134/FrameworkChemPolicyRfrm.pdf (accessed February 20, 2011).

In Tier I, highly hazardous chemicals such as PBTs would be phased out unless safer alternatives were not available. Tier II hazardous chemicals would be safely substituted when possible or else exposure would be reduced to meet health-based safety standards. Chemicals of unknown concern would be temporarily assigned to Tier III until data gaps were closed through further safety testing and data gathering. Lastly, Tier IV identifies favored chemicals that are inherently low-hazard.

The *Framework* approach envisions an active role by government and industry in assessing the availability of safer alternatives and planning for substitution of hazardous chemicals. Time-limited exemptions would be provided if an alternatives assessment demonstrated that safer alternatives are not technically feasible and commercially available. The report cited policy precedents, including the federal Clean Air Act phase-out of ozone-depleting chemicals [40].

The *Framework* report focused on reducing inherent hazards rather than estimated risks, while acknowledging tension between a hazard-based system and the dominant risk-based regime for chemical management. While not specifically resolved, the authors "believe that developing a hazard-based chemicals policy that operates in addition to, rather than replaces, our existing risk-based system will move toward the safest chemicals more effectively" [39, p. 40].

Kid-Safe Chemicals Redux

In 2007, another major effort was made to unify NGOs in anticipation of action by the 110th Congress, which Democrats controlled for the first time since 1995. EWG and Coming Clean invited advocates to Washington, DC, to recommend specific improvements to the Kid-Safe Chemicals Act. EWG presented the case for continued reliance on KSCA without substantive changes as the most politically expedient and media-friendly path to success.

SAFER argued for a more health-protective yet politically feasible "dual track" approach in which high-hazard chemicals would be phased out in favor of safer alternatives, while other chemicals would be subject to a risk-based safety determination. The dual track mirrored the technology-based approach of past federal environmental laws, which requires best available solutions to reduce air and water pollution, backstopped by health-based safety standards.

Despite EWG protest, the dual-track approach captured the hearts and minds of attendees, including worker health and safety advocates and health groups. A delegation of policy experts representing diverse viewpoints was tasked with developing proposed consensus amendments to KSCA. Three strands of policy emphasis informed the NGO negotiations that followed.

The Environmental Defense Fund (EDF) argued for an information-rich TSCA that required a minimum dataset on hazards, exposures, and uses for all chemicals in commerce to inform both market and government decisions. EDF

had strong reservations about requiring safer alternatives without regard to chemical exposure, and burdening government with assessing alternatives.

EWG continued its unflagging support for a risk-based KSCA with significantly expanded biomonitoring. It opposed a minimum dataset and any safer alternatives mandates. EWG conceded its own analysis supported a PBT phase-out, but would not agree to such a policy.

EHSC, representing the SAFER perspective, advocated for a PBT phase-out and EPA authority to require demonstrably safer and effective alternatives. EHSC also argued for closing the KSCA loophole that would allow the industry to secure risk-based exemptions for individual chemical uses without considering the aggregate risks from all exposures to the chemical.

Internal negotiations resulted in near-unanimity, with policy recommendations supported by more than 20 organizations—not including EWG, which maintained an anti-coalitional posture that better served its self-interest. The so-called Integrated Proposal of 2007 was presented privately to Congressional majority staff as proposed amendments to KSCA of 2005. The changes would require an upfront minimum data set and a hazard-based categorization of all chemicals in commerce. A dual track was created to add hazard-based substitution in two ways.

First, PBTs and very persistent, very bioaccumulative chemicals detected in human umbilical cord blood would automatically fail the safety standard and be phased out. Exemptions were allowed for critical uses if safer alternatives were not yet available. Second, EPA would be authorized to require safer alternatives, if demonstrably available, for specific uses of priority chemicals. Aggregate exposure would include all sources, research on legacy chemicals would be funded, and safety standards would be applied to permitting and the workplace to ensure environmental justice. The amendments eliminated loopholes, reduced ambiguity, and improved workability.

Nearly a year of discussions and delay ensued before Senator Frank Lautenberg and Representatives Hilda Solis (D-California) and Waxman finally introduced the new Kid-Safe Chemicals Act of 2008 [41]. Although improved, the 2008 bill disappointed many. Table 1 summarizes the major policy differences between KSCA 2005, the NGOs' Integrated Proposal of 2007, and the new KSCA 2008. The new bill proposed a vague minimum dataset with no deadline for submission. Rather than triggering a phase-out, PBTs found in newborn babies would simply be prioritized for an earlier risk-based safety determination. No safer alternatives authority would be created or environmental justice concerns addressed, although biomonitoring was improved.

Although several NGOs endorsed the 2008 legislation, some SAFER state advocates withheld their support, asking instead that their Congressional delegations help strengthen the bill. The chemical industry joined the symbolic fray with its continued relentless opposition. No hearings were held or co-sponsorship drive mounted, and the legislation died with a thud.

Table 1. Comparative Analysis of Proposed TSCA Reforms (2005-2008)

Policy elements	KSCA of 2005	Integrated proposal 2007	KSCA of 2008
Categorizes all chemicals by hazard within 5 years	No	Yes	Yes
Requires submission of minimum data set	No	Yes—within 5 years	Yes—but no deadline
Names up to 300 priority chemicals by 18 months	Yes—and add some annually	Yes—and add 300 annually	Yes—and add 200 annually
Phases out PBTs & vPvBs if detected in cord blood	No	Yes	No—but PBTs prioritized
Consider low doses, timing of exposure & nano	No	Yes	Yes
Applies health-based risk standard to decide safety	Yes	Yes	Yes
Decides safety based on all uses and new information	No	Yes	Yes—but with less specificity
Requires compliance plan	No	Yes	No
Risk-based exemption for restricted chemical uses	Yes—and could be abused	Yes—tightens exemption	Yes—in between others
Authorizes EPA to require safer alternatives	No	Yes—when found available	No
Requires biomonitoring	Yes—by industry	Yes—by federal CDC	Yes—by CDC at industry cost
Include legacy chemicals in aggregate exposure?	No	Yes—and funds research	No
Applies safety standard to permits and workers?	No	Yes	No

vPvBs = very persistent, very bioaccumulative chemicals (without regard to toxicity).

Source: See proposed TSCA reform legislation: *Child, Worker, and Consumer-Safe Chemicals Act of 2005,* S. 1391, H.R. 4308, 109th Congress, 1st sess. (known as the *Kid-Safe Chemicals Act*); and *Kid-Safe Chemicals Act of 2008,* S. 3040, H. R. 6100, 110th Congress, 2nd sess.

The 110th Congress witnessed the power of alliance-building, along with isolating self-promoting contrarians, to shape a unified policy agenda, while rooting professional lobbying by national NGOs more strongly in the real-world experiences of constituencies directly affected by toxic chemicals. Yet, progressive Congressional Democrats failed to prioritize a winning wedge issue, displaying limited policy vision tempered by excessive political caution in challenging the chemical industry. With the November election of President Barack Obama and an expanded Democratic majority, the plate seemed set for real TSCA reform in the new 111th Congress.

THE STATES AS LABORATORIES FOR REFORM (2003–2010)

Meanwhile, parallel development of state chemical policy during the KSCA debates proved the political viability of substitution-driven comprehensive reform. In the last eight years, 71 chemical safety laws were passed in 18 states by overwhelming bipartisan margins. The pace and breadth of state restrictions on toxic chemicals has more than tripled during this period. The coordinated SAFER states strategy used the lack of a functioning federal program to drive state legislative phase-outs of chemicals such as PBDEs in consumer products, building toward broader state laws that established new state-based chemical management programs [42].

Comprehensive state chemical policies have been enacted in four states and are pending elsewhere. The Maine legislature passed the most comprehensive state chemical policy in the country, popularly known as the Kid Safe Products Act, in 2008, based on a model policy developed by SAFER [39] and recommendations by a Governor's Task Force [43]. Similar laws were enacted in the states of Washington and Minnesota, with California passing companion bills. Table 2 summarizes the major elements of comprehensive chemical policy in state law to date.

Maine's Kid Safe Products Act uses an elegant policy design to authorize state regulation of chemicals in consumer products within limited state fiscal resources [44]. First, the state must adopt a hazard-based list of chemicals of high concern, based on credible science and other government actions. Second, the state applies exposure-related factors to identify priority chemicals from the longer list. Third, the burden shifts onto manufacturers to disclose which products these priority chemicals are used in. The state can require manufacturers to formally assess the availability of safer alternatives or contract for an alternatives assessment at the product makers' expense. Finally, the state may prohibit the sale of a product that exposes children to a priority chemical if a safer alternative is available, effective, and affordable [45].

Despite a conservative Republican take-over of the Governor's office and Maine Legislature in the November 2010 election, the chemical industry coalition

Table 2. Summary of Comprehensive State Chemical Laws

Policy element	CA	ME	MN	WA
Type of products subject to regulation	Consumer	Consumer	Children's	Children's
Lists chemicals of concern based on hazard characteristics	No	Yes	Yes	Yes
Designates priority chemicals based on exposure potential	Yes	Yes	Yes	Yes
Requires reporting on priority chemical use	No	Yes	No	Yes
May require assessment of safer alternatives	Yes	Yes	No	No
May prohibit sale if alternatives available and exposure occurs	Yes	Yes	No	No
Applies health-based risk standard to decide on use restrictions	No	No	No	No
Manufacturers pay fees to offset program costs	No	Yes	No	No
Other policy provisions	Requires chemical data collection	May require additional chem. info	Limited to HPV chemicals	Requires report on policy options

HPV = High Production Volume chemicals, as identified by U.S. EPA.

Source: Environmental Health Strategy Center, "Fact Sheet—Maine as a Laboratory for Safer Chemicals Reform," http://www.preventharm.org/Content/135.php (accessed June 17, 2011).

failed miserably in its attempt to gut the Kid Safe Products Act in 2011. In fact, the law was upheld and even strengthened [46].

These comprehensive state chemical policies generate multiple outcomes. They authorize regulatory action to prevent exposure to dangerous chemicals in specific products, avoiding chemical-by-chemical legislative fights. By formally listing chemicals of high concern and priority chemicals, they incentivize voluntary actions in the marketplace to move toward safer alternatives. Through chemical use reporting requirements, they begin to fill critical data gaps.

The success of state chemical policy campaigns can be credited to several factors, including:

- a health frame—the campaigns were sharply framed around children's health, not the environment, as well as the health of key constituencies (e.g., women and workers);
- strong coalitions—diverse health-based coalitions were organized with capacity to apply targeted grassroots power, direct legislative advocacy, and strategic communications;
- a product focus—parents and policymakers easily related to chemical threats in the home from consumer products, which were less politically threatening to in-state industries;
- a split-the-opposition strategy—the out-of-state chemical companies and their allied national trade groups remained villains, not local businesses and green chemistry entrepreneurs; and
- bipartisan wins—a series of winning campaigns built confidence and a bipartisan consensus that protecting children's health from the chemical industry was good politics.

In political terms, state advocates transformed safer chemicals reform into a progressive wedge issue. Divisions within the business community were exploited to reduce political opposition. But more importantly, the Republican coalition was divided, weakening its alliance with big business. Republican legislators voted 73 percent of the time in favor of state chemical bills in the last eight years, out of the more than 9,000 roll call votes cast, despite unyielding chemical industry opposition [42]. This represents true bipartisan support from moderate Republicans as well as electoral fear of being tarred as voting to poison children with industrial chemicals.

By leveraging the failure of federal leadership to secure passage, state chemical policies also ripened the moment for federal reform, an original aim of the SAFER strategy. In fact, a senior Dow Chemical official lamented that "A patchwork of 50 different chemical management laws is not necessarily a good thing for the global competitiveness of this industry . . . the public lacks confidence in the federal chemical regulation statute, so we still need to do something" [47].

TRACTION NOT ACTION ON TSCA REFORM (2009-2010)

At the outset of the 111th Congress, TSCA reform advocates felt emboldened by the success of state chemical policy reforms and market campaigns and the election of Barack Obama as President. Two former state environmental agency directors were appointed to lead federal chemical management programs, EPA Administrator Lisa Jackson and her Assistant Administrator Steve Owens. Congressman Henry Waxman seized the reins of the House Energy and Commerce Committee. And the informal advocacy alliance that wrestled to overcome internal differences from 2005 to 2008 was beginning to congeal into a unified coalition.

That this reform opportunity was squandered ultimately speaks to the chemical industry's political power, the centrist timidity of the Obama Administration, and a weak Congress isolated from the common-sense wishes of American consumers for safer products. Yet this same Congress generated serious traction for TSCA reform and aired the first debate on workable legislation in 34 years. An effective national reform coalition and campaign was also launched, with new voices in health care, businesses, and the states helping to continue to drive reform.

In February 2009, the first oversight hearing on TSCA struck themes that dominated the chemical policy debate in the 111th Congress. Public health advocates eviscerated the broken chemical safety system [48]. The United Steelworkers union declared that: "Made in USA should be a guarantee, not a warning." The chemical industry tacked to the center, supporting TSCA "modernization" for the first time, but cautioning against quick, substantive action [49].

Environmental and public health advocates recommended a comprehensive set of proposed amendments to the Kid-Safe Chemicals Act of 2008 to majority staff in the spring of 2009. Adding political strength to the coalition and platform, environmental justice reforms were proposed for the first time to require EPA to address toxic hot spots, which are localized geographic areas of disproportionately higher exposure to toxic chemicals from many diverse sources. Labor unions pursued parallel recommendations, seeking "just transition" guarantees.

The safer alternatives agenda was narrowed to detailed, practical policy recommendations to phase out PBTs to which people are exposed, except for critical uses for which safer alternatives are not available. Expedited action was also called for to significantly reduce human exposure to other high-hazard chemicals prior to any risk-based safety determination. These two pathways reflected internal compromise in the face of Congressional staff resistance to safer alternatives.

In the summer, NGOs formally launched the Safer Chemicals, Healthy Families coalition, representing a united public front among national environmental groups, state-based environmental health advocates, the environmental

justice community, health-affected constituencies, health-care professionals, independent scientists, and sustainable businesses. Organized labor established a separate allied presence through the Blue-Green Alliance.

In August, the NGO coalition and the leading trade association of chemical manufacturers, the American Chemistry Council, issued competing principles for TSCA reform. Soon thereafter, EPA Administrator Lisa Jackson announced the Obama Administration's TSCA reform principles. These all showed alignment around the need for an effective law that led to timely government decisions on safer chemical management supported by adequate data [50-52]. However, their superficial similarity belied substantive differences. A false sense of agreement on the shape of needed reforms was carried into a House oversight hearing on prioritizing chemicals [53] and the first Senate TSCA oversight hearing in December [54].

Another House oversight hearing on TSCA and persistent, bioaccumulative, and toxic chemicals sharply illustrated one key policy difference [55]. The Natural Resources Defense Council called for an orderly phase-out of PBTs, since they defy traditional risk assessment and management approaches [15]. The chemical industry sought more delay. The EPA, while publicly conceding the serious threats posed by PBTs, privately reported that an internal White House deal prevented them from supporting a PBT phase-out even when human exposure was demonstrable. In exchange for dropping upfront cost-benefit analyses from TSCA, the Administration's principles were interpreted as strict adherence to risk-based standards [56].

Frustrated by the failure of Congress to act—and by the impression, fanned by industry, that all parties agreed in concept to limited TSCA reforms—Safer Chemicals, Healthy Families launched a "Don't be Duped" media campaign to distinguish real reform from phony reform (see Table 3) [57]. With a presence both inside and outside the chemical industry's premier conference on chemical regulation, GlobalChem 2010, advocates issued a banner message: "Chemical Industry—You Can't DUCK Real Reform" attached to a 20-foot tall inflatable rubber ducky, which symbolized the common products that expose children to toxic chemicals every day [58].

Senator Lautenberg finally introduced the Safe Chemicals Act of 2010 [59]. It never left the starting gate, mortally wounded by failed legislative strategy. The chemical industry scored a relatively weak bill, but never delivered a Republican co-sponsor as promised. The Senate majority decided not to move the bill without one, relieving Republican moderates such as the Maine Senators from engaging, even though a similar state law had already passed back home.

The House majority made two process concessions to the chemical industry, but all for naught. Representatives Bobby Rush (D-Illinois) and Henry Waxman issued their bill as a discussion draft rather than as formal legislation and conducted an intensive stakeholder process. The Toxic Chemicals Safety Act of 2010 was then introduced [60], followed by the only legislative hearing ever held

Table 3. Some Sharp Differences in TSCA Reform Platforms

Policy element	Protecting public health demands:	Yet the chemical industry wants:
Data	Public disclosure of safety information for all chemicals in commerce	Limited testing of a handful of chemicals, leaving us in the dark about most hazards
Restrictions	Expedited action to phase out or reduce the most dangerous chemicals	More lengthy and costly studies of chemicals already proven to be dangerous
Safety	Deciding safety based on real-world exposure to all sources of toxic chemicals	An assumption that we are exposed to only one chemical at a time, and from one source at a time

Source: Safer Chemicals, Healthy Families, "don't be duped," http://saferchemicals.org/dont-be-duped/index.html (accessed February 20, 2011).

on TSCA reform. The chemical industry aggressively opposed the House bill to such an extreme that it contradicted its own principles for TSCA reform [61].

Public health advocates strongly supported the Rush/Waxman bill, which substantially if imperfectly responded to the entire policy platform of Safer Chemicals, Healthy Families [62]. Unlike the 2008 KSCA, the House bill would require the greatest practicable reductions in exposure to PBTs, a provision added by majority staff at the eleventh hour only after a credible threat by NGOs to oppose the bill. The bill required EPA to develop action plans on toxic hot spots and to follow the NAS on risk assessment. New chemicals were treated like existing chemicals, and incentives were created to introduce inherently low-hazard chemicals and safer alternatives to chemical uses [63].

Downstream companies that use chemicals played an increasingly important role in advocating for their own interests apart from the chemical industry [64]. As a result, the bill required chemical manufacturers to disclose the identity of chemicals and other chemical information down the supply chain [65]. A mid-sized construction materials company executive testified in support of the legislation, undermining the chemical industry's efforts to paint the bill as anti-business [66]. Even the chemical formulators, such as Proctor & Gamble, broke ranks with the chemical manufacturers to support reporting on their own chemical use [67, 68].

Despite serious traction and policy development during the 111th Congress, the House and Senate failed to act on TSCA reform, or even to mark up a bill for a Committee vote. Congress let slip the best opportunity to overhaul the

chemicals law since 1976. Certainly the chemical industry flexed its muscles to finally kill TSCA reform [69]. But the reform effort also fell victim to other factors, including a legislative calendar dominated by contentious debates over climate change, health care, and later the BP oil disaster, inadequate Congressional staff resources dedicated to the task, a lack of institutional knowledge about TSCA, broken promises by the chemical industry, and failed legislative strategies by the bill's sponsors and the Administration.

THE TORTUOUS PATH TO VICTORY

In November 2010, a red tide swept the nation. Republicans regained control of the House and narrowed their margin in the Senate, reflecting a rise in conservative power and Tea Party influence. The chemical industry invested heavily in the 2010 election. They reported $3 million in direct campaign contributions [70], and spent untold millions more anonymously, thanks to the *Citizens United* decision by the U.S. Supreme Court. In 2010 alone, the chemical industry fielded 531 lobbyists and spent $50 million to advance its federal legislative agenda [71].

Despite these poor conditions, a smart campaign could win passage of compromise TSCA reform legislation in the 112th Congress. Legislation often follows the path of least resistance. The status quo must become even more painful to the chemical industry. And continued inaction must incur a political price for members of Congress. Reform then becomes the preferred option.

Significant elements within the chemical industry want TSCA reform. The public does not trust the industry or its products [72, pp. 5, 9]. The industry abhors the patchwork quilt of state chemical policies [47]. They decry "retail regulation" by downstream companies whose corporate chemical policies result in "de-selection" of chemicals [73]. Significantly ramped up state policy and market-based campaigns will help drive major chemical companies to the table.

As the 2012 general election approaches, the political advantage of legislative action on TSCA reform will become more apparent. The White House and Democratic leaders must finally recognize safer chemical reform as a wedge issue. Increasing media attention will highlight concerned moms as consumers and voters, and the unfolding new science on chemical health hazards. Republicans must come to fear losing their jobs in 2012 if they vote against protecting children's health from toxic chemicals. A savvy campaign will enhance these political factors.

Direct negotiations with the chemical industry are desirable and necessary. Public health advocates and the chemical industry each hold enough power to block reforms perceived as favorable to the other side. Leaders of both the chemical industry and the NGO coalition have met many times to discuss chemical policy reform. Ramped up state, market and political drivers

will transform this dialogue into serious negotiations that can lead to a compromise agreement.

A possible grand bargain to resolve the legislative debate over TSCA reform could require:

- A minimum dataset for *all* chemicals, but tiered to production levels and other factors;
- A sorting of existing chemicals into three groups for 1) expedited action to reduce use of high-hazard chemicals with widespread exposure such as PBTs, 2) an EPA safety determination on priority chemicals with the burden of proof on industry, and 3) no immediate action on other inherently low-hazard, low-exposure chemicals;
- A compromise health-based safety standard based on aggregate exposure that triggers restrictions on specific chemical uses, taking alternatives and costs into account.

Such a legislative outcome may be possible. In 2011, an early Senate oversight hearing examined TSCA with renewed vigor, and Senator Lautenberg introduced a substantially improved bill that includes the chemical action pyramid concept crafted five years earlier [74]. A Senate floor vote seems likely by the end of the year. The House Energy and Commerce Committee now chaired by Fred Upton (R-Michigan) will consider at least piecemeal TSCA reform later in the year. Such action could lead to a conference committee compromise and final votes before the 2012 election, or at least set the stage for completion in the next Congress.

REFLECTIONS ON THE STRUGGLE FOR SAFER CHEMICALS REFORM

Federal chemical policy reform is inevitable. All the drivers will continue to build unabated until Congress acts. How quickly and how well Congress does that job will be the ultimate measure of success of the national campaign for safe chemicals reform. Although still a work in progress, some lessons learned are worth examining now. A legislative advocacy truism provides a useful analytical framework: relationships trump the frame of reference and politics trumps them both.

The Frame

The campaign has used mastery of the policy merits of TSCA reform and the growing body of science on health threats of toxic chemicals to appeal effectively to a broad spectrum of the public. The health case for chemical policy reform has been so clearly framed that everyone supports reform. The campaign was forced to distinguish between real reform and phony reform, which will remain an ongoing challenge. The campaign illustrated how our broken federal

safety system hurts consumers clamoring for protective state-level policies and downstream businesses hungry for more information on chemicals in the supply chain.

Effectively rebutting chemical industry claims that TSCA reform will kill jobs and stifle innovation presents perhaps the greatest challenge in reaching those with a personal point of view that prioritizes economic growth. A helpful response recently exposed the chemical industry for shedding U.S. jobs, underinvesting in research and development, and overspending on pollution controls [75]. More work will be needed to sharpen communication of the business case for TSCA reform, including how innovation in green chemistry solutions will be unleashed by federal regulation of toxic chemicals.

The campaign must continue to strike a balance between its reasonable face, open to negotiated compromise, and a harder-edged truth-telling about meaningful reform.

The Relationships

The health of the growing NGO coalition, a foundation for successful campaigning, requires building trust and overcoming differences to present a powerful, sustainable united front. That necessarily requires isolating dysfunctional dissenters, sharing credit with strategic partners, and matching member capacity to campaign needs.

Although the coalition can't retain ex-Congressmen as lobbyists as the chemical industry does, much can be made of direct relationships that coalition members have established with Members of Congress and their staff. Because the coalition taps partners in more than 30 states in addition to Hill-centric national advocates, there are many personal constituent relationships to leverage. These must grow in breadth and depth to outpace the inside access of the chemical industry.

The Politics

This is winning terrain for the coalition, once it succeeds in breaking through the competitive noise and diminished sense of what's possible that plagues the Beltway bubble. Savvy polling, celebrity lobbying, and a growing media drumbeat have begun to receive political attention. Next up should be grassroots mobilization and media action in states and districts where key Senators and Representatives are up for re-election in 2012, with special attention to battleground states in the presidential contest. Should the campaign credibly threaten to make safer chemicals for healthy families an election issue, the reform agenda should be unstoppable.

No single Congress can deliver what American society truly needs—a just transition to safe chemicals and sustainable materials, an economy at peace with the planet, good jobs for healthy people, livable communities, and justice for

all. Yet, 10 years of strategic organizing has placed an effective, progressive Toxic Substances Control Act within reach for the first time in 35 years.

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NOTES

1. Rachel Carson, *Silent Spring* (New York: Houghton Mifflin, 1962).
2. Toxic Substances Control Act, 15 U.S.C. §2601 et seq. (1976), http://www.law.cornell.edu/uscode/html/uscode15/usc_sup_01_15_10_53.html (accessed February 15, 2011).
3. U.S. Government Accountability Office, *Chemical Regulation: Options Exist to Improve EPA's Ability to Assess Health Risks and Manage Its Chemical Review Program* (GAO-05-458), June 2005, http://www.gao.gov/new.items/d05458.pdf (accessed February 15, 2011).
4. *Corrosion Proof Fittings v. EPA*, 947 F.2d 1201 (5th Cir. 1991).
5. Lowell Center for Sustainable Production, University of Massachusetts Lowell, "Corporate Chemicals Policy," http://www.chemicalspolicy.org/chemicalspolicy.corporate.php (accessed February 15, 2011).
6. R. Daniel Kelemen and David Vogel, "Trading Places: The Role of the United States and European Union in International Environmental Politics," *Comparative Political Studies* 43(4) (2010): 427-456, http://dx.doi.org/10.1177/0010414009355265.
7. Environmental Health Strategy Center, "Fact Sheet—The Virtual Elimination of Mercury Products in Maine," http://www.preventharm.org/Content/438.php (accessed June 17, 2011).
8. Jessica Schifano, Joel Tickner, and Yve Torrie, Lowell Center for Sustainable Production, *State Leadership in Formulating and Reforming Chemical Policy: Actions Taken and Lessons Learned*, July 2009, http://www.chemicalspolicy.org/downloads/StateLeadership.pdf (accessed February 16, 2011).
9. K. Norén and D. Mieronyté, "Contaminants in Swedish human milk. Decreasing levels of organochlorine and increasing levels of organobromine compounds," *Organohalogen Compounds* 38 (1998): 1–4, http://www.dioxin20xx.org/pdfs/1998/98-348.pdf (accessed June 29, 2011).

10. European Commission, Joint Research Center, *European Risk Assessment Report: Diphenyl Ether, Pentabromo Derivative (Pentabromodiphenylether)*, August 2000, http://esis.jrc.ec.europa.eu/doc/existing_chemicals/risk_assessment/REPORT/penta_bdpereport015.pdf (accessed September 12, 2011).
11. L. S. Birnbaum and D. F. Staskal, "Brominated Flame Retardants: Cause for Concern?" *Environmental Health Perspectives* 112(1) (2004): 9-17, http://dx.doi.org/10.1289/ ehp.6559.
12. Environmental Working Group, "EPA Axes Panel Chair at Request of Chemical Industry Lobbyists: Review Panel Timeline," http://www.ewg.org/node/26033 (accessed February 16, 2011).
13. Mark Rossi and Lauren Heine, Clean Production Action, *The Green Screen for Safer Chemicals: Evaluating Flame Retardants for TV Enclosures*, March 2007, http://www.cleanproduction.org/library/Green_Screen_Report.pdf (accessed February 20, 2011).
14. U.S. Environmental Protection Agency, "Mercury: Human Exposure," http://www.epa.gov/hg/exposure.htm (accessed February 16, 2011).
15. Linda Greer, Natural Resources Defense Council, "TSCA and Persistent, Bioaccumulative, and Toxic Chemicals: Examining Domestic and International Actions," Testimony, Subcommittee on Trade, Commerce and Consumer Protection of the Energy and Commerce Committee, U.S. House of Representatives, March 4, 2010, http://democrats.energycommerce.house.gov/Press_111/20100304/Greer.Testimony.pdf (accessed February 16, 2011).
16. Mary O'Brien, *Making Better Decisions: Alternatives to Risk Assessment* (Cambridge, MA: MIT Press, 2000).
17. T. J. Woodruff et al., "Public health implications of 1990 air toxics concentrations across the United States," *Environmental Health Perspectives* 106(5) (1998): 245-251, http://dx.doi.org/10.1289/ehp.98106245.
18. National Research Council, *Science and Decisions: Advancing Risk Assessment*, (Washington DC: National Academy Press, 2009), http://www.nap.edu/catalog.php?record_id=12209#toc (accessed February 16, 2011).
19. R. Morello-Frosch and E.D. Shenassa, "The Environmental "Riskscape" and Social Inequality: Implications for Explaining Maternal and Child Health," *Environmental Health Perspectives* 114(8) (2006): 1150-1153, http://dx.doi.org/10.1289/ehp.8930.
20. T. A. Jusko et al., "Blood Lead Concentrations < 10 ug/dL and Child Intelligence at 6 Years," *Environmental Health Perspectives* 116(2) (2008): 243-248, http://dx.doi.org/10.1289/ehp.10424.
21. U.S. Environmental Protection Agency, Risk Assessment Forum, *Guidelines for Carcinogen Risk Assessment* (EPA/630/P-03/001F), March 2005, http://www.epa.gov/raf/publications/pdfs/CANCER_GUIDELINES_FINAL_3-25-05.PDF (accessed February 16, 2011).
22. W. V. Welshons et al., "Large Effects from Small Exposures. I. Mechanisms for Endocrine-Disrupting Chemicals with Estrogenic Activity," *Environmental Health Perspectives* 111(8) (2003): 994-1006, http://dx.doi.org/10.1289/ehp.5494.
23. Julie Goodman and Lorenz Rhomberg, Gradient Corporation, "Current Controversies in Non-Cancer Dose Response," *Trends*, Fall 2010, http://www.gradientcorp.com/pdf/trends/Trends49.pdf (accessed February 16, 2011).

24. Pamela Shubat, Children's Environmental Health Advisory Council, "Re: Upcoming EPA staff discussions of NRC report Science and Decisions: Advancing Risk Assessment," Letter to EPA Administrator Lisa Jackson, October 21, 2010, http://yosemite.epa.gov/ochp/ochpweb.nsf/content/CHPAC_NRC_Report.htm (accessed February 16, 2011).
25. New England Governors/Eastern Canadian Premiers, *Mercury Action Plan 1998*, June 1998, http://www.epa.gov/ne/eco/mercury/pdfs/Mercury_Action_Plan.pdf (accessed February 16, 2011).
26. International Joint Commission, United States and Canada, *Revised Great Lakes Water Quality Agreement of 1978*, as amended November 18, 1987, http://www.ijc.org/en/activities/consultations/glwqa/GLWQA_e.pdf (accessed February 16, 2011).
27. Environmental Health Strategy Center, "Fact Sheet—Mercury Use was Widespread in Consumer Products," http://www.preventharm.org/Content/438.php (accessed June 17, 2011).
28. U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics, *2006 Inventory Update Reporting: Data Summary*, (EPA 740S08001), December 2008, http://www.epa.gov/iur/pubs/2006_data_summary.pdf (accessed February 20, 2011).
29. Richard Denison, Environmental Defense Fund, "Improving Information Flows—In Supply Chains and Beyond," workshop background paper, Framing a Future Chemicals Policy, Boston, MA, April 28-29, 2005, http://www.chemicalspolicy.org/archives.pastmeetings.futurepolicy.workshops.php (accessed February 20, 2011).
30. Catherine Galligan, Gregory Morose and Jim Giordani, Lowell Center for Sustainable Production, *An Investigation of Alternatives to Mercury Containing Products*, January 22, 2003, http://www.sustainableproduction.org/downloads/An%20Investigation%20Hg.pdf (accessed February 20, 2011)
31. U.S. Environmental Protection Agency, Design for the Environment, "Alternatives Assessments," http://epa.gov/dfe/alternative_assessments.html (accessed February 16, 2011).
32. Clean Production Action, "Green Screen for Safer Chemicals," http://www.cleanproduction.org/Greenscreen.php (accessed February 20, 2011).
33. Louisville Charter for Safer Chemicals, "Louisville Charter for Safer Chemicals: A Platform for Creating a Safe and Healthy Environment through Innovation," http://www.louisvillecharter.org/thecharter.shtml (accessed February 20, 2011).
34. European Parliament and Council of the European Union, "Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, …", *Official Journal of the European Union*, L 396:1-849, December 30, 2006, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:396:0001:0849:EN:PDF (accessed February 20, 2011).
35. U.S. Environmental Protection Agency, National Agricultural Compliance Assistance Center, "Agrichemicals: Food Quality Protection Act—Children and Consumers," http://www.epa.gov/oecaagct/factsheets/epa-305-f-00-005ag.html (accessed February 20, 2011).
36. *Child, Worker, and Consumer-Safe Chemicals Act of 2005*, S. 1391, H.R. 4308, 109th Congress, 1st sess. (known as the *Kid-Safe Chemicals Act*).
37. Michael P. Walls, American Chemistry Council, "On the Toxic Substances Control Act," testimony, U.S. Senate Committee on Environment and Public Works, August 2, 2006, http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=548028dd-cb31-4def-8ced-5d93516c8771 (accessed February 20, 2011).

38. Michael P. Wilson, University of California Berkeley, "Oversight on the Toxic Substances Control Act and the Chemicals Management Program at EPA," testimony, U.S. Senate Committee on Environment and Public Works, August 2, 2006, http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=713310df-1b84-4375-bac8-7dd8d9a7a7a8 (accessed February 20, 2011).
39. Mike Belliveau, Mark Rossi, and Laurie Valeriano, *A Framework for Chemicals Policy Reform: Issues in Model Policy Development*, July 2006,http://www.preventharm.org/Images/134/FrameworkChemPolicyRfrm.pdf (accessed February 20, 2011).
40. Clean Air Act Amendments, Title VI—Stratospheric Ozone Depletion, U.S.C. §7671 et seq. (1990), http://epa.gov/oar/caa/title6.html (accessed February 20, 2011).
41. *Kid-Safe Chemicals Act of 2008*, S. 3040, H.R. 6100, 110th Congress, 2nd sess.
42. Michael Belliveau, Environmental Health Strategy Center, *Healthy States: Protecting Families from Toxic Chemicals While Congress Lags Behind*, November 2010, http://www.preventharm.org/Images/271/HealthyStatesReportFINAL.pdf (accessed February 15, 2011).
43. Governor Baldacci's Task Force to Promote Safer Chemicals in Consumer Products, *Final Report*, December 2007, http://www.maine.gov/dep/oc/safechem/saferchemfinrpt.htm (accessed February 21, 2011).
44. Maine, Laws of 2007, Chapter 643, *An Act to Protect Children's Health and the Environment from Toxic Chemicals in Toys and Children's Products*, (2008), 38 Maine Rev. Stat. Ann. §1691 et seq. http://www.mainelegislature.org/legis/bills/bills_123rd/chappdfs/PUBLIC643.pdf (accessed February 20, 2011).
45. Environmental Health Strategy Center, "Fact Sheet—Maine as a Laboratory for Safer Chemicals Reform," http://www.preventharm.org/Content/135.php (accessed June 17, 2011).
46. Environmental Health Strategy Center, "STATEMENT—Maine strengthens safer chemicals law: Rejects bid to roll back children's health protection," http://www.preventharm.org/Content/427.php (accessed June 18, 2011).
47. Glenn Hess, "Loosening Gridlock: Chemical industry hopes Congressional Election will spur more bipartisan collaboration," *Chemical & Engineering News*, October 25, 2010, http://pubs.acs.org/isubscribe/journals/cen/88/i43/html/8843gov2.html (accessed February 21, 2011).
48. Richard A. Denison, Environmental Defense Fund, *Revisiting the Toxic Substances Control Act of 1976*, testimony, February 26, 2009, http://democrats.energycommerce.house.gov/Press_111/20090226/testimony_denison.pdf (accessed February 21, 2011).
49. Cal Dooley, American Chemistry Council, *Revisiting the Toxic Substances Control Act of 1976*, testimony, February 26, 2009, http://democrats.energycommerce.house.gov/Press_111/20090226/testimony_acc.pdf (accessed February 21, 2011).
50. Safer Chemicals Healthy Families, "A platform for the reform of the Toxic Substances Control Act," http://www.saferchemicals.org/about/platform-for-reform.html (accessed February 21, 2011).
51. American Chemistry Council, "10 Principles for Modernizing TSCA," http://www.americanchemistry.com/s_acc/sec_article_acc.asp?CID=2178&DID=9939 (accessed February 21, 2011).
52. U.S. Environmental Protection Agency, "Essential Principles for Reform of Chemicals Management Legislation," http://www.epa.gov/opptintr/existingchemicals/pubs/principles.html (accessed February 21, 2011).

53. U.S. House of Representatives, Committee on Energy & Commerce, Subcommittee on Trade, Commerce and Consumer Protection, *Prioritizing Chemicals for Safety Determination*," hearing, November 17, 2009, http://democrats.energycommerce.house.gov/index.php?q=hearing/prioritizing-chemicals-for-safety-determination (accessed February 21, 2011).
54. U.S. Senate, Committee on Environment and Public Works, Subcommittee on Superfund, Toxics and Environmental Health, *Oversight Hearing on the Toxic Substances Control Act*, joint hearing, December 2, 2009, http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&Hearing_ID=129f8be4-802a-23ad-4217-c8c5900bf3db (accessed February 21, 2011).
55. U.S. House of Representatives, Committee on Energy & Commerce, Subcommittee on Trade, Commerce and Consumer Protection, *TSCA and Persistent, Bioaccumulative and Toxic Chemicals: Examining Domestic and International Actions*, hearing, March 4, 2010, http://democrats.energycommerce.house.gov/index.php?q=hearing/tsca-and-persistent-bioaccumulative-and-toxic-chemicals-examining-domestic-and-international (accessed February 21, 2011).
56. Robert S. Sussman, (Senior Policy Counsel, U.S. Environmental Protection Agency), personal communication, January 2009.
57. Safer Chemicals, Healthy Families, "don't be duped," http://www.saferchemicals.org/dont-be-duped/index.html (accessed February 20, 2011).
58. Cheryl Hogue, "Rallying for Better Chemicals Regulation," *Chemical & Engineering News*, March 31, 2010, http://pubs.acs.org/cen/news/88/i14/8814news4.html (accessed February 21, 2011).
59. *The Safe Chemicals Act of 2010*, S. 3209, 111th Congress, 2nd sess., http://thomas.loc.gov/home/gpoxmlc111/s3209_is.xml (accessed February 21, 2011).
60. U.S. House of Representatives, Committee on Energy & Commerce, "Chairmen Rush, Waxman Release H.R. 5820, The Toxic Chemicals Safety Act," news release, July 22, 2010, http://democrats.energycommerce.house.gov/index.php?q=news/chairmen-rush-waxman-release-hr-5820-the-toxic-chemicals-safety-act (accessed February 21, 2011).
61. Richard Denison, Environmental Defense Fund, "Not playing nice: The American Chemistry Council solidifies its claim to being the 'industry of no,'" blog post, http://blogs.edf.org/nanotechnology/2010/07/30/not-playing-nice-the-american-chemistry-council-solidifies-its-claim-to-being-the-industry-of-no (accessed February 21, 2011).
62. Safer Chemicals, Healthy Families, "Landmark Legislation Introduced to Protect the Health of American Families," http://www.saferchemicals.org/safe-chemicals-act/index.html (accessed February 21, 2011).
63. Safer Chemicals, Healthy Families, "Support H.R. 5820, The Toxic Chemicals Safety Act," fact sheet, undated, http://www.saferchemicals.org/PDF/resources/factsheet-house-bill.pdf (accessed February 21, 2011).
64. Business-NGO Working Group for Safer Chemicals and Sustainable Materials, "The Need for Chemical Ingredient Disclosure across the Supply Chain," fact sheet, July 15, 2010, http://www.biznngo.org/pdf/BizNGO_Chem_Ingredient_Disclosure_Factsheet_FINAL_15Jul2010.pdf (accessed February 20, 2011).
65. The Dake Page, "Needs of Downstream Users Critical to Safe Chemicals Act Developments," blog post, June 10, 2010, http://thedakepage.blogspot.com/2010/06/needs-of-downstream-users-critical-to.html (accessed February 21, 2011).

66. Howard Williams, Construction Specialties, Inc., "Hearing on H.R. 5820, the Toxic Chemicals Safety Act of 2010," testimony, U.S. House of Representatives, Committee on Energy & Commerce, Subcommittee on Trade, Commerce and Consumer Protection, July 29, 2010, http://democrats.energycommerce.house.gov/documents/20100729/Williams.Testimony.07.29.2010.pdf (accessed February 21, 2011).
67. Consumer Specialty Products Association, "Industry Commends Chairmen Waxman and Rush on Stakeholder Process Resulting in Improved Chemical Regulatory Bill," news release, July 23, 2010, http://www.cspa.org/news-media-center/news-releases/2010/07/industry-commends-chairmen-rush-and-waxman-on-stakeholder-process-resulting-in-improved-chemical-regulatory-bill (accessed September 12, 2011).
68. Richard Denison, "A bright spot in industry-NGO dialogue on TSCA," blog post, December 9, 2010, http://blogs.edf.org/nanotechnology/2010/12/09/a-bright-spot-in-industry-ngo-dialogue-on-tsca/ (accessed February 21, 2011).
69. Sheila Kaplan, "Reform of Toxic Chemicals Law Collapses as Industry Flexes Its Muscles" *Politics Daily*, October 13, 2010, http://www.politicsdaily.com/2010/10/13/reform-of-toxic-chemicals-law-collapses-as-industry-flexes-its-m/ (accessed February 16, 2011).
70. Center for Responsive Politics, "PACs: Chemical and Related Manufacturing," http://www.opensecrets.org/pacs/industry.php?txt=N13&cycle=2010 (accessed February 21, 2011).
71. Center for Responsive Politics, "Lobbying: Chemical and Related Manufacturing," http://www.opensecrets.org/lobby/indusclient.php?lname=N13&year=2010 (accessed February 21, 2011).
72. Mark Mellman, The Mellman Group, "Presentation of Findings From A Survey of 825 Voters in 75 Swing Congressional Districts," July 29-August 1, 2010, http://www.saferchemicals.org/PDF/resources/schf-poll-final.pdf (accessed February 21, 2011).
73. Joe Kamalick, "Consumer regulation of chemical products expands," *ICIS News*, April 7, 2009, http://www.icis.com/Articles/2009/04/07/9206803/consumer-regulation-of-chemical-products-expands.html (accessed February 21, 2011).
74. The Safe Chemicals Act of 2011, S. 847, 112th Congress, 1st sess., http://thomas.loc.gov/home/gpoxmlc112/s847_is.xml (accessed June 14, 2011).
75. James Heintz and Robert Pollin, Political Economy Research Institute, *The Economic Benefits of a Green Chemical Industry in the United States: Renewing Manufacturing Jobs While Protecting Health and the Environment*, University of Massachusetts, Amherst, 2011, http://www.peri.umass.edu/236/hash/8c17bbe533cedf5c0874455cd34a215e/publication/463/ (accessed June 14, 2011).

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