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FORUM

Reinventing Environmental Regulation from the Grassroots Up: Explaining and Expanding the Success of the Toxics Release Inventory

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ABSTRACT / The success of the Toxics Release Inventory (TRI) stands in stark contrast to most other environmental regulations in the United States. Between its inception in 1988 and 1995, releases of chemicals listed on the TRI have declined by 45%. We argue the TRI has achieved this regulatory success by creating a mechanism of "populist maxi-min regulation." This style of regulation differs from traditional command-and-control in several ways. First, the major role of public agencies is not to set and enforce standards, but to establish an information-rich context for private citizens, interest groups, and firms to solve environmental problems. Second, environmental "standards" are not determined by expert analysis of acceptable risk, but are effectively set at the levels informed citizens will accept. Third, firms adopt pollution prevention and abatement measures in response to a dynamic range of public pressures rather than to formalized agency standards or governmental sanction. Finally, public pressure ruthlessly focuses on the worst polluters—maximum attention to minimum performers—to induce them to adopt more effective environmental practices. TRI has inadvertently set in motion this alternative style of regulation that has, in turn, dramatically reduced toxics emissions in the United States. By properly understanding the mechanisms that drive TRI's accomplishments, more intentional public policy designs can expand the system of populist maxi-min regulation and achieve even more rapid toxics reduction.

The US Environmental Protection Agency (EPA) is currently in the throes of reinventing itself through a process of "designing and testing fundamentally new systems and approaches to address the environmental and public health challenges that still confront our nation" (US Environmental Protection Agency 1997a). An Office of Reinvention has been established, and some 40 pilot programs are being tested as the agency steps up its search for improved strategies of environmental protection. The EPA claims reinvention is based on a desire to "promote innovation and flexibility, increase community participation and partnerships, improve compliance with environmental laws, and cut red tape and paperwork" (US Environmental Protection Agency 1997a).

An increasing number of policy institutes, think tanks, and environmental groups have joined in the reinvention debate, strengthening calls for new demonstration programs, new legislation, and alternative regulatory strategies (Anon. 1997). Demands that EPA reinvent itself are motivated by a widespread assessment—coming from industry managers as well as environmental groups—that EPA policies and programs are too costly, overly bureaucratic, and frankly not very effective.

While the EPA will most likely benefit from its experimentation, testing new programs and policies is much more time consuming and costly than learning from existing ones. Little evidence exists to indicate that new initiatives will be more successful than past programs. Furthermore, in the zeal to design and test new programs, the agency may actually be missing the most promising lessons of recent regulatory reform. A more economical, conservative, and promising approach to regulatory reinvention would involve analyzing existing innovations that have a track record of success, and then expanding and replicating new programs along those demonstrated principles. In that spirit, those in the agency and others concerned with environmental quality would do well to understand what may be the most successful environmental regulation of the last ten years—the Toxics Release Inventory (TRI).

Created in the wake of the Bhopal chemical disaster,

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the TRI is a relatively obscure section of the Superfund Amendments and Reauthorization Act of 1986 (USC 1994). Put simply, the TRI is an accidental success story of regulatory reform. Designed to do much less, the program has proven to be one of the most successful programs to reduce toxics in EPA history. In the past ten years, the small program has eclipsed its initial goals of providing information for community planners, igniting a right-to-know movement in the US, and supporting both industry and environmentalists' efforts to reduce toxics. Although data are difficult to compare and particular causes of reductions are highly contested among experts, it is arguable that the TRI has dramatically outperformed all other EPA regulations over the last ten years in terms of overall toxics reductions and that it has done so at a fraction of the cost of those other programs.

Despite mounting evidence for the success of the TRI compared to other programs and increasing numbers of individuals and organizations who use the database successfully, there has been very little analysis of how, or why, the program works so well. This paper seeks to explain the underlying mechanisms that drive the TRI's success by assessing uses of TRI data and the impacts of this information on toxics reduction. We conclude by proposing policies and programs that build upon this mechanism and thereby promise to be even more effective in achieving the environmental and social goals the TRI has begun to realize. As the paper makes clear, the lessons of the TRI are both timely and relevant to efforts to reinvent programs for environmental protection in the United States.

Success of TRI: Past as Potential Prologue

On its face, the TRI is simply a pollution accounting system that requires manufacturing firms of a certain size to report their annual emissions of 651 toxic chemicals to the EPA.[1] Emissions are self-reported and then compiled by the EPA and stored in a database that is publicly available in print form, through a dial-up computer modem, on CD-ROMs, and through the Internet.[2] The EPA does little to check the accuracy of emissions reports, inspecting approximately 3% of firms in a given year. Reported data do not even attempt to measure actual emissions, but are based on industry estimates of releases and transfers. Beyond this, up to one third of regulated facilities fail to comply with reporting requirements each year (Wolf 1996).

Despite this minimal regulation and lackadaisical compliance, parties on all sides of the toxics debate—from chemical manufacturers to regulators to environmentalists—have acknowledged the success of the TRI. Dow Chemical environmental manager Millard Etling asserts that the TRI's ''mandatory disclosure has done more than all other legislation put together in getting companies to voluntarily reduce emissions'' (Seabrook 1991). Vice President Al Gore has proclaimed that ''Putting information about local pollution into the hands of the public is the single most effective, commonsense tool available for protecting human health and the environment'' (Mansur and Reeves 1996). Carol Browner (1996), head of the EPA, argues that the TRI ''is quite simply one of the most effective means we have in this country for protecting the health of our people, the health of our environment.'' Environmentalists go further, calling the TRI ''one of the most successful environmental laws in US history,'' (Hearne 1996) noted for having done ''more to reduce toxic emissions than all of our regulations taken together'' (Lawrence and Morell 1995).

The data on TRI, while problematic in number of ways, support these glowing assessments. Between 1988 and 1995 total releases and transfers (as wastes) of the roughly 330 chemicals on the TRI list decreased by over 45% (US Environmental Protection Agency 1995a). In raw terms, this meant 1.3 billion pounds less toxic chemicals were emitted into the nation's air, water, and land in 1995 than in 1988. We recognize that the quantitative effectiveness of various environmental regulations cannot be disaggregated easily—different regulations often cover the same chemicals, some categories of chemicals are more easily reduced than others, and technological and process advances can reduce chemical emissions even in the absence of governmental regulation. Still, reductions of releases of chemicals on the TRI list sparkle in comparison to the lackluster performance of other EPA programs.

Compare for example, the recent success of the Clean Air Act (CAA). Although major improvements were achieved in the early years of the program, an analysis of recent industrial emissions shows very minor reductions, and in some cases increased emissions of priority pollutants. Figure 1 compares changes in TRI chemicals with industrial emissions of CAA priority pollutants [carbon monoxide, lead, nitrogen oxides, particulates, sulfur oxides, and volatile organic com-

[1]Currently approximately 23,000 firms operating in SIC codes 20–39, which employ ten or more full-time workers, and which produce or use toxic chemicals above threshold levels report to the TRI.

[2]The most recent TRI data can be accessed on the World Wide Web at http://www.epa.gov/opptintr/tri/. From this web site interested parties can download data on a specific factory, on emissions in a county, on national trends in releases of a specific chemical, or can compare emissions between factories in the same sector.

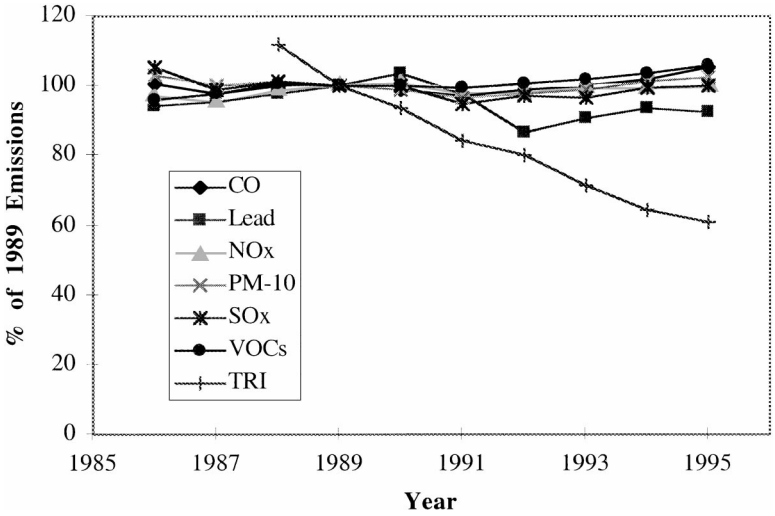

Figure 1. TRI versus CAA industrial emissions.

pounds (VOCs)] from 1988 to 1995. Industrial sources of priority pollutants showed very minor reductions during this period, with industrial sources of carbon monoxide and VOCs actually increasing by around 5% (US Environmental Protection Agency 1995b).

The Clean Water Act's (CWA) success in reducing toxics is similarly spotty. While water-quality data are much more difficult to access and analyze than air emissions, a recent US Government Accounting Office (1994) report found that the CWA permit process ''does not limit the vast majority of toxics being discharged from the nation's facilities'' and ''rarely controlled nonpriority toxic pollutants (with the exception of acids, ammonia, and chlorine) and priority pollutants only partially.'' One of the conclusions of the GAO report was actually to ''expand the use of the Toxic Release Inventory database to identify nonpriority pollutants being discharged to water that should be considered for control through the permit process.''

A number of analysts have also argued that the CWA's single-media focus has resulted in industry simply shifting emissions of the CWA's ''priority pollutants'' from water to air and land (Gottlieb 1995). As an example, Dernbach (1997) points out that ''process engineers can often select the medium into which waste or residue will be discharged,'' resulting in a situation where ''air emissions of Clean Water Act pollutants are higher than air emissions of other pollutants.'' Summing up the CWA achievements, two prominent analysts assert that, ''With some notable exceptions, the nation's water quality does not appear to have improved significantly since 1972 despite cumulative expenditures by government and the private sector of some $540 billion'' (Kraft and Vig 1994).

These rough comparisons make a prima facia case that the TRI more effectively reduces toxics than these other command-and-control regulations. These data give us good reason to believe that the regulatory strategy of the TRI has been more successful than traditional regulations aimed at toxics reductions. It is surprising that the TRI, which has no permitting, no standard setting, a weak monitoring and enforcement component, very little litigation, and no economic instruments, seems to have achieved so much. Combine this success with the minimal costs of the program—the TRI costs the EPA only approximately $23 million per year—and TRI emerges as a striking model of regulatory innovation. Several limitations in the data, however, prevent us from decisively favoring TRI's regulatory approach.

Accidental and intentional underreporting may exaggerate the large reductions reported in TRI public data releases. The methods EPA allows for estimating emissions still appear to permit abuses. Some of the reductions reported in the TRI have been ''phantom'' reductions, or as Natan and Miller (1998) explain, simply ''paper changes.'' For instance, the redefinition of on-site recycling as ''in-process recovery'' has resulted in significant paper reductions that have not actually involved a physical reduction in emissions. Some of the reductions reported in the TRI are also of uncertain benefit. Some reductions do not result in overall decreases in chemicals used or ultimately emitted, and the health and environmental implications of reducing emissions of some TRI-listed chemicals remains unclear.

Beyond this, the universe of toxics regulated by the TRI is certainly not comprehensive, is not strictly comparable to those targeted by the CAA and CWA, and bears only a loose relationship to health risks. Chemicals under the latter may be more fundamental to

combustion and other industrial processes or less easily replaced by unregulated chemicals, and therefore more difficult to reduce. Furthermore, many of the chemicals regulated by the TRI are also regulated by the command-and-control regulations of state and local governments, and so some portion of the emissions reductions of TRI-listed chemicals may have resulted from other, more conventional, environmental regulations. Further research will be required to sort out these difficult obstacles that confound attempts to quantitatively assess the effectiveness of such distinct policy approaches. Finally, the significance of TRI reductions is itself thrown into question because TRI reports the amounts of particular chemicals emitted and transferred, from various facilities, but not the toxicity of, or likelihood of human exposure to those chemicals. Therefore, there is no obvious way to gauge the human health benefit, if any, that has resulted from reductions in TRI-listed chemicals.

Despite these potential objections to the effectiveness of TRI and recognizing the need for further research to settle these objections, we are nevertheless impressed by the initial, admittedly tentative, evidence. We do not argue that the TRI has no problems; clearly it has many. However, we do argue that the TRI has, almost accidentally, combined a mix of elements that includes data collection, the comparability of that data, publicity, and ease of accessibility that set into motion a distinctive and effective method of environmental protection that combines the energy of both professional regulators and ordinary citizens. In the pages below, we lay out this mechanism of how the TRI works to reduce toxics emissions in order to extrapolate from this understanding a vision of how future policy revisions might address the weaknesses that critics have rightly exposed and thereby make it work even more effectively.

TRI Uses

How can a simple pollution accounting program outperform much more expansive and expensive regulatory programs? The most obvious answer is that the TRI has been used for purposes far beyond those imagined by its legislative authors. TRI data are now used regularly by individuals, community-based organizations, environmental groups, industry managers, state and federal agencies, lawyers, investment advisors, and the media. Uses vary from educating and mobilizing affected communities to assisting corporate environmental planning, from supporting efforts to strengthen regulations to promoting voluntaristic environmental initiatives.

A survey of TRI users in 1994 (Lynn and Kartez 1997) indicated a wide range of uses for TRI data, including:

- checking a facility's emissions against permit records;
- comparing the emissions of similar facilities;
- exerting public pressure on facilities;
- assessing the adequacy of existing laws;
- preparing recommendations for legislation or regulation;
- lobbying for legislative or regulatory changes;
- emergency planning;
- educating affected communities;
- identifying needs and opportunities for source reduction;
- supporting direct negotiations between industry and citizens;
- preparing company profiles; and
- supporting litigation.

Different groups obviously use the data for different purposes. Environmental and community groups primarily use TRI data to write reports about (and attract media coverage to) toxic issues in order to promote legislative action or pollution reduction. State agencies use the data to generate media attention with an eye towards promoting source reduction and pollution prevention planning, as well as to evaluate existing environmental programs. Industry groups appear to use the data to support direct negotiations with community groups as well as for internal identification of source reduction opportunities.

Past Assessments of TRI

Listing past uses of the TRI does little to help glean its underlying mechanisms of toxics reduction. Even the most sophisticated assessments provide little insight into how the provision of pollution data results in such significant changes in industrial practices. Existing assessments of the TRI fall into three broad categories: ''populism,'' ''voluntarism,'' and ''leveling.''

The populist view of the TRI was summed up by a reporter who explained that, ''If people know the details about chemical contaminants in their community, they'll put the heat on polluting industries, which in turn will clean up their act. Public exposure, instead of bureaucratic red tape, will do the job'' (Knickerbocker 1995). The Working Group on Community Right-to-Know goes further by explaining that the TRI ''broadens public participation in environmental decision making by transferring information from previously inaccessible corporate files to ordinary citizens. . . . As people become more knowledgeable and

better organized, they tend to become more proactive'' (MacLean and Orum 1992). In this analysis, information serves to educate and mobilize citizens, and as Carol Browner asserts, ''An informed local community will always do a better job of environmental protection than some distant bureaucracy'' (Browner 1996). In the populist view, communities simply need information (provided by the TRI) to make them more effective protectors of the environment.

We agree with much of the populist analysis of TRI and fully endorse its basic recognition of the role that ordinary people deserve in environmental regulation. Much of the TRI's success is attributable to a single fundamental difference between it and command-and-control regulatory strategies. The TRI catalyzes the involvement of ordinary people in the determination of toxics emissions standards by changing the effective limit that is publicly acceptable rather than legally allowable, whereas command-and-control policies leave discussions of toxics to ''experts'' in environmental agencies, industry, and sometimes environmental groups. Ordinary people, it seems, demand lower levels of toxics than government regulators. Beyond this, the worst industrial polluters seem to fear popular disapproval more than sanctions imposed by environmental regulators.

Nevertheless, citizen campaigns against polluters cannot account for the sheer quantity of reductions in TRI-listed toxics emissions. In particular, many firms that have not been targeted by environmentalists have nevertheless reduced toxics use. Therefore, many firms are cleaning up their facilities for reasons other than community-organized pressure. We cannot understand why TRI works without understanding why these firms become better environmental actors.

The voluntarist view argues that TRI data support voluntary pollution reduction efforts by revealing to them opportunities for operational changes that reduce both releases of toxics and the cost of doing business. One variant of this view asserts that the TRI provides data that corporate managers previously did not have (or did not realize they had), which supports internal initiatives on pollution prevention. TRI data help managers identify and eliminate sources of waste, compare themselves to other similar facilities, and honestly confront the measured performance of their facility. TRI information-forcing requirements have also motivated facilities to install chemical emissions monitoring and accounting systems that have in turn proven more valuable to managers than they themselves had anticipated (Seabrook 1991). More substantially, the TRI provides the core data for industry-wide voluntary pollution abatement efforts such as the Chemical Manufacturing Association's ''Responsible Care'' initiative and EPA's ''33/50'' program—so called because it invited participant companies to reduce emissions of 17 high-priority, TRI-listed chemicals by 33% by 1992 and by 50% by 1995.

A variant of this view (Lynn and Kartez 1997) argues that the TRI ''creates conditions under which experts, managers, and affected lay people can engage in direct discussions about how best to control toxic emissions.'' Voluntary reductions thus come from internal and external pressures for innovation. The information in the TRI is in essence ''the minimum condition necessary to initiate self-determinative processes that may lead to voluntaristic problem solving.''

While TRI data have certainly revealed such ''win–win'' situations in which firms can both reduce toxics releases and operational costs simultaneously, the voluntarist interpretation of TRI suffers several severe limitations. Foremost, the optimal level of allowable toxics releases as determined by risk assessment or public debate may require firms to engage in pollution reducing activities that move beyond the space of ''win–win'' operational improvements. Firms will not likely take such moves voluntarily—without the kind of compulsion that the populist and leveling perspectives offer. Related to this, members of the regulated community and their representatives know that publicly available toxics information inevitably generates public and political pressure that moves beyond these profitable environmental opportunities. Perhaps because of this, the Chemical Manufacturers' Association (CMA) has opposed TRI legislation at almost every turn: the CMA sued the EPA in 1994 when the agency expanded the TRI list to include some 300 additional chemicals, and it has opposed a recent structural expansion of TRI called the Sector Facility Indexing Project (SFIP) (Fairley 1997). It seems overly charitable to imagine that firms who will not voluntarily disclose data on discharges into the environment will voluntarily embark upon even moderately costly toxic reduction programs.

The leveling view argues that TRI data help level the playing field in pitched interest-group battles over environmental quality. TRI provides government-legitimated information that activists can then repackage into forms to help educate and inform community members and stir action. When environmental activists participate in corporate negotiation or legislative lobbying, data from the TRI helps bolster their proposals for production changes or regulatory measures. TRI, in short, strengthens the positions of environmental groups against industry in existing battles.

Like populism, the leveling view accounts for only a small portion of the users of TRI information and

eventual toxics reduction. A fundamental weakness of this view is that it presents the TRI principally as a weapon in an environmentalists' arsenal to win stricter command-and-control regulations necessary for environmental protection. The data above, however, suggest that the stringent Clean Air and Clean Water standards have largely failed where TRI has succeeded. We therefore conclude that TRI's main mechanisms of regulatory success do not depend upon the command-and-control measures that environmental interest groups often seek.

How the TRI Works: Environmental Blacklisting (Populist Maxi-Min Regulation)

While the populist, voluntarist, and leveling views each touch upon important aspects of why the TRI works, none understands the fundamental mechanism that accounts for its success. We call this distinctive mechanism ''populist maxi-min regulation,'' which can be thought of simply as a kind of environmental blacklisting. The TRI database offers easy access to a wide variety of users in mass media, community groups, environmental organizations, government, and industry. Many of these users—especially journalists and environmentalists—use this information to identify and target the most egregious polluters. TRI data are then publicized through easy to understand ''blacklists'' or ''top ten'' lists that compare the relative pollution performance of facilities on a local, statewide, or national basis. Public pressure—sometimes in the form of community mobilization and sometimes not—often induces these firms to reduce their toxics releases. Others who are not specifically blacklisted improve their environmental performance to avoid the potential negative consequences of being identified as worst in their class. In the next round of TRI data releases, another set of firms get blacklisted, which motivates many of these firms to implement environmental improvements. The mechanism thus induces continual reduction of toxic releases by pressuring whoever happens to fall at the bottom of the list.

We call the scheme populist because the pressure comes from ordinary people rather than government officials. ''Maxi-min'' means that people spend maximum energy targeting the minimum, or worst, environmental performers. Focusing regulatory effort on the worst offenders makes sense from both moral and environmental perspectives. The worst polluters do the most damage to human health and environment and so deserve greatest public pressure and scrutiny. The worst polluters, furthermore, frequently incorporate the dirtiest production processes and most inefficient materials use and so offer the greatest potential gains to cleaner and safer air, land, and water.

A number of people have criticized the blacklisting effect of the TRI as inappropriate for reasoned environmental policy. One common objection is that ordinary people are unable to interpret complex chemical information; for instance, they have neither the training nor the time to make determinations about health risks upon which even experts disagree. This technocratic view, however, misunderstands the fundamental sentiments that drive street-level hostility to toxic polluters. Someone who lives next to a particularly noxious facility is concerned about relative, not absolute risk. What they know is all they need to know; they suffer higher health risks—from living next to one of the worst polluters—than others who live elsewhere. Even if that level of additional risk is low, it is considered unjust and inequitable.

The question of whether environmental policy should aim to distribute the health risks of pollution equitably and to continually reduce toxics levels, or whether it should aim to reduce toxics to some technocratically determined level of risk lies beyond our present investigation. This brief sketch of how the distinction between the two choices separates TRI from many other environmental policies illustrates, however, that the logic and morality of environmental blacklisting is not as objectionable as it may seem at first glance.

Like other varieties of blacklisting, populist maxi-min toxics regulation exploits a wide range of institutional channels. Unlike command-and-control legislation, whose sole method of enforcement is administrative action, TRI-generated lists specify the targets of enforcement, but leave the degree and method of sanction open to citizens themselves. Mobilized citizens have responded by attacking egregious polluters both through direct action and negotiations. TRI-based blacklisting has also led to public agency actions, mass media focus, stock market reactions, development of new environmental legislation and regulations, and corporate public relations campaigns.

Direct Action

TRI data often spur community, environmental, and labor groups to take direct action against the worst polluters in their community, county, or state. This action has in many cases resulted in agreements from the offending firms to reduce toxics emissions by changing production processes or by adopting abatement technologies. In one survey of how citizen groups use TRI, 85% of respondents reported that they used it to exert public pressure on facilities and 58% reported that targeted facilities eventually pursued source reduc-

tion efforts (Lynn and Kartez 1997). The Massachusetts Public Interest Research Group (MassPIRG), for example, targeted the Raytheon company in a public accountability campaign in 1990 after TRI data revealed that Raytheon was the state's largest emitter of ozone-destroying chemicals such as chloroflourocarbons (CFCs) and methyl chloroform. In 1991, MassPIRG obtained a pledge from Raytheon to switch to water-based alternatives to CFCs (Anon. 1991).

The 1989 TRI data listed Syntex Chemicals Corporation as the largest emitter of air toxins in Boulder County, Colorado. Citizens and local officials mobilized to press for cleaner manufacturing. Initially resistant, the company signed a ''good neighbor'' agreement in 1991 to cut its toxic emissions levels by 50% by 1994 (Working Notes 1991). In another example of direct maxi-min popular action, community activists from Northfield, Minnesota, allied with union activists in Local 1481 of the Amalgamated Clothing and Textile Workers Union (ACTWU) in a campaign against Sheldahl Incorporated after a 1990 Natural Resources Defense Council (NRDC) report identified Sheldahl as the nation's 45th largest emitter of airborne carcinogens. After a public campaign, the alliance secured an agreement from Sheldahl to reduce use of those carcinogens by 64% over two years, and by 90% over three years (Anon. 1991).

Regulatory Agency Accountability

In addition to direct targeting, the TRI has also catalyzed popular campaigns that press environmental agencies to enforce regulations against egregious polluters. For example, the citizens' group Consumer Policy Institute of Brooklyn, New York, used TRI data to identify Ulano Corporation, an art supplies manufacturer, as the top industrial air toxic polluter in New York City. According to 1988 TRI data, Ulano released 17% of the city's air toxic pollution. After a media campaign, the State Department of Environmental Conservation forced Ulano to use a new incinerator that reduced toluene emissions by some 95% (Anon. 1991).

Mass Media

Mass media outlets such as newspapers, magazines, radio, and television constitute a major channel for the dissemination of TRI data. Since TRI information can be easily accessed and compiled with a computer and modem, it offers a ready source of material for local journalists. A quick search of the Lexis-Nexis database of national newspapers and magazines showed that journalists have indeed mined TRI data to write articles about local polluters and the state of the local environment. Each year since its initial release in 1989, hundreds of articles using TRI data have appeared in local newspapers and magazines.

These articles, furthermore, frequently take the form of blacklists that single out one or a small number of facilities as the ''worst'' environmental performers. A quick sampling of headlines conveys the flavor of mass media pressure: ''Potlatch Corp. Is Again Idaho's Top Polluter; Lewiston Operation Leads Federal Environmental Protection Agency's List'' (*Lewiston Morning Tribune* 1997), ''2 TVA Plants Among Top Polluters'' (Dean 1997), ''Quebecor Printing In Depew, 3M Plant in Tonawanda Make '95 List of Top 10 Polluters In State'' (Vogel 1997), ''Critics Say Asarco Lead Company Is Among State's Worst Polluters'' (Uhlenbrock 1997), ''Two County Firms Among Maryland's Biggest Polluters'' (Allen 1997), and ''Clearwater Mill is Idaho's Top Polluter; Feds Say Spots 2–4 Are Held By Sugar Processors'' (*Lewiston Morning Tribune* 1996).

More than 800 such TRI blacklist articles have appeared in local and national magazines and newspapers. While we cannot quantify the effect of this media pressure on the nation's worst polluters in terms of toxics reduction, we hypothesize that firms do respond to this negative publicity. Many firms value good relations with local communities, fear that bad publicity will bring enforcement action from regulatory agencies or lawsuits, and often seek a reputation as good, clean corporate citizens. When Great Lakes chemicals appeared on a list of Arkansas' top polluters, for example, its vice president responded that ''we won't be satisfied until our name doesn't appear on the list'' (Terrell 1995).

Stock Markets

Recent research has established that bad media publicity from TRI data has a negative impact on stock prices of polluting firms and that those firms subsequently reduce toxic emissions. The first such study, by James Hamilton (1995), found that firms releasing high levels of pollution were more likely to be reported in the news media and that publicly traded firms were likely to suffer a decline in stock price as a result of this negative publicity. Hamilton argues that ''Stockholders in firms reporting TRI pollution figures experienced negative, statistically significant abnormal returns upon the first release of the information. These abnormal returns translated into an average loss of $4.1 million in stock value for TRI firms on the day the pollution figures were first released.'' In a 1997 study that verifies and extends this analysis, Konar and Cohen find that those firms that pollute more suffer greater declines in stock value as TRI information is released, but that these same firms subsequently show greater improvements in environ-

mental performance. As they explain, ''the Top 40 [emitters of toxics] . . . became relatively 'lower' TRI emitters following the public announcement of TRI data, both in absolute and relative terms within their industries'' (Konar and Cohen 1997).

If these findings are correct, the complex institutional nexus that connects TRI information, the news media, stock market price reactions, and firm responses to those markets operates as another channel of populist maxi-min regulation. Press agents use the data set to identify the worst performers. For a variety of reasons—possibilities of ''stricter scrutiny by regulators, environmentalists, and facility neighbors [and] . . . loss of reputation and good will''—stock prices of these firms drop (Hamilton 1995). Anxious to avoid further punishment from stock holders, these firms attempt to remove themselves from toxics blacklists by reducing emissions. In the next round of TRI data releases, the cycle repeats itself. Another group of blacklisted firms suffers market punishment and responds by cleaning up its operations. This dynamic, nontechnocratic mechanism of populist regulation thus yields potentially unending continuous improvements in environmental performance, as long as stockholders continue to show preferences for cleaner firms.

Stricter Laws and Regulations

Just as individual facilities and firms can be environmentally blacklisted, so can entire states. TRI data has often been used by activists and legislators to support implementation of stricter environmental legislation and regulation in those states revealed to be poor environmental performers. Carol Dansereau, from the Washington Toxics Coalition, argues that the real goal of organizations like hers is to ''try to build more regulation, more implementation of existing regulations, and more enforcement.'' The TRI thus serves as evidence for the need for stricter regulations and better enforcement of existing laws. Dansereau goes on to explain that ''really fundamental changes need state pressure. For some low-hanging fruit, pressure on a company can do it, but community pressure has to be coupled with regulatory pressure'' (C. Dansereau personal communication 1997).

In 1989, for example, Louisiana was listed as the state having the third largest level of toxic emissions. Based partly on this ranking and ensuing criticism, the state legislature passed a sweeping air toxics law in 1989 (Orum and others 1989). The goal of the law was to reduce toxic emissions by 50% by 1994, and legislative strategies to reach this goal included lists of priority pollutants, ambient air and emissions standards, and technical control requirements. By 1995, Louisiana led the country in toxic emissions reductions, lowering its 1988 use levels by more than 50% (US Environmental Protection Agency 1995a). TRI data has also been used to support the passage of stricter environmental legislation in North Carolina (Orum and others 1989), New Jersey, Delaware, California, and at the federal level (MacLean and Orum 1992).

Preemptive Toxics Reduction

Varieties of populist maxi-min pressure discussed above operate on those firms that TRI reveals to be poor, and thereby blacklisted, environmental performers. Much of TRI's success can be attributed, however, to managers' fears of appearing on an environmental blacklist and suffering associated consequences. Those who anticipate the possibility of being blacklisted can avoid such publicity and its consequences through preemptive measures that reduce toxics emissions. While it would be difficult, if not impossible, to quantify the amount of TRI-listed toxics reductions attributable to these industry preemptive measures, testimony from managers suggests that this is a substantial source of success for populist maxi-min regulation.

Soon after the TRI became available in 1989, many major corporations, including 3M, AT&T, Dow Chemical, Dupont, and Merck pledged to voluntarily reduce toxics emissions (Cushman 1995). Anticipating a poor TRI ranking, Monsanto was the first to take this preemptive step. Its vice chairman stated ''[w]e knew the numbers were high, and we knew the public wasn't going to like it.'' Immediately prior to the first release of TRI data, Monsanto pledged to cut its releases of TRI chemicals by 90% over a three-year period (Wolf 1996).

More generally, industry is one of the largest users of TRI data, and many firms report using the information to aid in pollution abatement and source reduction efforts (Lynn and Kartez 1997). While some of this may be attributable to altruistic desires to preserve clean air and water, fear of blacklisting and its consequences no doubt largely motivate the ''volunteer'' measures. As Kansas City's Manager of Air Quality explains, ''Let's face it, companies, especially big corporations, don't want to be on the top of any toxic-release list. . . . We hear that all the time'' (Mansur and Reeves 1996).

How to Make TRI Work Better: A Regime of Populist Maxi-Min Regulation

If the TRI owes a large part of its success to its unintended construction of a system of populist maxi-min regulation, then intentional public policies that institutionalize this principal will reduce toxics use and emission even more effectively. The aim of such pollu-

tion policies would be to establish a public framework in which ordinary citizens, environmental interest groups, and government regulators compel firms to continuously improve their pollution performance by using pollution data to identify the worst polluters on one hand and showing them that comparable firms have done better. Returning to the understanding of populist maxi-min regulation as a kind of blacklisting, the policies that compose this framework fall into four categories: (1) development and imposition of regulatory reporting requirements and technical standards that make it easy for citizens and organizations to construct blacklists that accurately identify those polluters most threatening to human health and the environment; (2) facilitating the efforts of ordinary citizens and environmental organizations to sanction these worst environmental performers; (3) facilitating the ability of firms to respond to these challenges by aiding their toxics reduction efforts; and (4) rewarding firms that excel at toxics reduction.

Easy and Accurate Blacklisting

The source of TRI's success and the root of many complaints against it has been the ease with which a wide variety of users—ordinary citizens, public interest groups, state agencies, journalists, and those in industry—can use its data to quickly and easily rank industrial facilities along a rough dimension of environmental performance: toxic substance emission and transfer. The strengths of this populist mechanism were argued above: firms identified as worst performers through these data suffer public critiques, financial losses, regulatory pressure, and embarrassment. Critics of the TRI have noted that these blacklists may condemn the innocent because they fail to accurately assess sources of environmental harm and human health risk. The TRI, after all, disseminates data about the quantities of some 600 chemicals released in the course of production processes. These data are for the most part silent on the prime factors affecting human well being and environmental protection: exposure to these chemicals and their toxicity relative to other chemicals and in absolute terms. Because it counts quantities of releases but not these more direct determinants of risk, the TRI measures environmental performance very poorly and thus potentially directs its populist energy at the wrong targets.

The first task of intentional populist maxi-min reform, then, is to implement TRI-style toxics tracking with environmental performance indicators that better reflect risks to human health and the environment than the current raw release statistics. One promising initiative along these lines is an EPA pilot program called the Sector Facility Indexing Project (SFIP). The SFIP expands the use of TRI data and makes it more understandable in several important ways. Focusing initially on five industry sectors—automobile assembly, iron and steel, petroleum refining, primary nonferrous metals, and pulp mills—the SFIP creates a report card for each facility that lists not only the quantity of its emissions, but also weights those emissions according to toxicity, scales them according to the size of the facility, lists the site's previous regulatory citations, and supplies local demographic information. The SFIP reinforces populist maxi-min regulation by allowing interested users to more easily construct lists of comparable worst performing facilities and to better gauge the health dangers posed by various kinds of chemical releases. The SFIP is accessible through the Internet[3] and in hard copy formats. It should be noted that the agency has had to overcome ''a very concerted effort to stop the project'' by industry and some state governments (Pesticide and Toxic Chemical News 1997).

A number of other efforts currently seek to expand the scope and quality of readily accessible toxics information. The Environmental Defense Fund (EDF) has developed an extremely user-friendly web-based database[4] called the Chemical Scorecard, which combines information from 150 databases—including both TRI and SFIP—with access tools that allow users to generate just the kind of pollution rankings recommended in this article. Users of the Chemical Scorecard can quickly generate lists of firms that release toxics by industry, known and suspected health risk, location (state, county, city, zip code, etc.), and amount of chemical release, among other factors. Where data are available, users can generate toxicity or production-normalized rankings. Through the web site, users can send faxes directly to facility managers to express their concern about toxics emissions in their community. More recently, the EDF has added responses from firm managers to the web site and plans to incorporate industry self-evaluations in order to expand the toxics reduction dialogue between the public and industry.

In addition to improving interpretability of data, policy measures should also seek to improve the quality of underlying toxics reports. Presently, information enters the TRI system through forms completed and filed by industry personnel at reporting facilities. Due to limitations in EPA resources, the agency has limited abilities to verify the accuracy of the data and sanction

[3]The Internet Universal Resource Locator for this site is: http://www.epa.gov/oeca/sfi

[4]The Internet Universal Resource Locator for this site is: http://www.scorecard.org/

facilities that misfile. During the period from 1988 until 1995, the agency issued 1179 complaints for TRI violations and proposed penalties of some $70 million. Almost all of these complaints were issued for nonreporting (US Environmental Protection Agency 1994). For an eight-year period, this total fine figure is quite low in comparison with other federal environmental sanctions. Although the EPA issued an average of 150 fines per year during this period, one close observer estimates that fully one third of regulated firms—approximately 7000—fail to submit required TRI reports each year (Wolf 1996). In order to ensure the timely and accurate reporting of facility emissions information, public policies should impose more severe sanctions for non- and misreporting.

These reporting requirements and their administration by the EPA are themselves inevitably politicized, and traditionally opposed interests groups such as environmental and industry organizations can play the constructive role of watchdogs in maxi-min regulation. Both regulated firms and enforcing agencies want to see lower reported levels of toxics releases. Based upon decreasing releases, the former can claim that more stringent regulation is unnecessary, while regulators can point to a job well done. Both, therefore, may be tempted to choose more favorable methods of release estimation (resulting in ''paper reductions'') or to overlook reports that exaggerate reductions. Environmental activists, on the other hand, may be tempted to underplay or ignore the TRI's success in order to stimulate demand for ''stronger,'' less voluntary, policy measures. The argument of this paper, however, is that these parties ought, for their own sake, to abandon this usual pattern of back and forth rhetorical politics in favor of supporting the integrity of maxi-min toxics regulation by using their power and resources to ensure the accuracy of reports rather than undermining them. Those firms that manage to successfully reduce their toxics releases have an interest in accurate reporting in order to show that they, in comparison to their dirtier competitors, really are good environmental corporate citizens. Concomitantly, environmental organizations ought to hold both firms and government agencies accountable for producing accurate toxics release data. The veracity and accessibility of the data are the foundation of this promising style of environmental policy.

Relatedly, the current TRI program also lacks a sound process for revising the list of chemicals to be reported. TRI was created with an original list of some 329 toxic substances. Between 1988 and 1994, administrators made several additions and deletions, but the next major addition came in 1995. With the addition of 276 chemicals, the list now totals some 650 chemicals and compounds. Nonetheless, this list covers only 5% of total emissions of toxics in the United States (Office of Technology Assessment 1989), and it pales in comparison to the approximately 73,000 chemicals in commercial use in the United States. The original TRI list was simply the combination of toxics lists used in New Jersey and Maryland (Dernbach 1997). The TRI program also previously omitted chemical releases from a number of highly polluting sectors, such as hazardous waste treatment facilities, incinerators, and power plants, as well as from most small firms. Beginning in 1998, some of these facilities will be required to report.

Changing the TRI list to address these deficiencies has been an intensely political process, with industry groups combating all expansion efforts and environmental organizations favoring dramatic expansion based on the right-to-know. From some industry perspectives, TRI reporting imposes unreasonable costs on firms and frequently triggers misguided public responses. For reasons like these, the Chemical Manufacturers' Association (CMA) challenged the 1995 expansion through court action but was defeated in Federal Appeals Court in August of 1997. As of this writing, the CMA is deciding whether to petition the Supreme Court on the matter of list expansion (Fairley 1997). A right-to-know defense of TRI, on the other hand, favors listing thousands of chemicals. A community's right to know, after all, extends to chemicals whose risk is uncertain or minimal as well as ones that are quite noxious. The maxi-min perspective, however, cuts a swath between these two poles of debate. On this view, toxics reporting is based not upon an informational right but is rather a device to focus public and regulatory attention upon the most urgent threats to human health and the environment. Since that attention is necessarily limited, it is much better to have a short list of the right chemicals and toxicity factors rather than a very long, less differentiated list of confusing data. Therefore, federal legislation and EPA procedures should establish a sound, nonlitigious process for changing the TRI list to include those chemicals determined to pose a reasonable threat to public health and dropping those that demand less attention. Such matters will always be contentious, even among experts, and particularly when expansions impose administrative costs on industry. Nevertheless, regulatory officials should err on the side of expanding the list rather than prematurely contracting it. The direct costs of a long list are small compared to the potential loss of information relevant to public health decisions.

Finally, several authors have suggested that the TRI should account not only for emissions and transfers of

toxic materials, but should also include a system of accounting for materials used by private facilities (Hearne 1996). Such a materials accounting system would enable public and private users not only to benchmark levels of emissions at regulated facilities, but more broadly to evaluate industrial progress in preventing pollution through source reduction. While a materials accounting inventory would create capacities to profile various industries, we question whether such a system would be as effective in the area of pollution prevention as TRI has been in reducing toxics. A materials accounting system would allow users to generate lists of chemical gluttons—those that use more chemicals to produce a particular quantity of product than their competitors in the same industry. While most Americans probably oppose such wastefulness and thus hold an ethic of pollution prevention, they probably feel less strongly about such waste than they do about toxic releases with potentially harmful consequences to public health. Those listed as chemical gluttons will probably draw less forceful public criticism than those on a list of toxic polluters, and the regulatory gains will be proportionately lower as well. Nevertheless, TRI surprised opponents and supporters alike in its regulatory success, and a materials accounting system might be equally successful. Because the costs of implementation are relatively low and the system would be useful to professional regulators and industry quite apart from its contribution to populist maxi-min regulation, we favor this extension to the TRI.

Increasing Sanctions Against the Worst Polluters: The Stick

Beyond improving the quality of information used to generate lists of polluters, public policies should increase the costs to the worst environmental performers. Federal and state regulatory agencies could expand the use of the TRI and other informational resources when compiling lists of worst polluters and then use these lists to target inspection, permitting, and enforcement efforts. Such procedures would allow EPA to more economically deploy its regulatory resources because firms on these lists would often stand in violation of existing emissions regulations. Such targeted inspections and enforcement would also add force to the mechanism of populist maxi-min regulation by forming a kind of alliance between community groups that often target these worst performing firms and government agencies.

In addition to increasing direct regulatory sanctions, public policies should also increase the ability of mobilized citizens and their organizations to protect themselves against the worst polluters and to effectively conduct campaigns that pressure such facilities to adopt best environmental practices. State environmental agencies or the EPA might, for instance, create offices of community assistance that supply technical support to citizen groups that must live with highly polluting facilities. In the same vein, public funds might support community-based organizations or other nongovernmental organizations (NGOs) to run community environmental assistance programs. Experts at such public or NGO offices might provide information about the potential public health consequences of toxics emitted by nearby facilities and methods of avoiding these poisons.[5] Lawyers who work out of such departments could educate citizens about legal remedies that might be taken against the owners of these polluting facilities. Finally, technical assistance might come in the form of a campaign clearinghouse that informs residents about the tactics used in successful ''good neighbor'' or direct action campaigns against similar facilities in other parts of the country.

Providing Support for the Worst Polluters: The Carrot

Public policies can also strengthen populist maxi-min regulation by enabling the worst environmental performers to reduce their toxics use, transfers, and emissions. A wide variety of such programs already operate at both the state and federal levels under the broad heading of pollution prevention, and maxi-min regulation recommends increasing the funding for such programs and targeting them to assist the worst environmental performers. Such programs include technical assistance to upgrade equipment and processes at the facility level, help with facility pollution prevention plans, tax benefits for firms that adopt cleaner production technologies, and increased public sponsorship of pollution prevention research.

Rewards to Best Environmental Performers

In addition to these popular and agency measures that focus on the worst environmental performers, populist maxi-min regulation would be strengthened by public policies that reward the best environmental performers. Just as TRI can be used to compile blacklists, an expanded version of it might be used to compile lists of firms that have successfully implemented practices that place them among the lowest toxic emitters in their class. These firms should be recognized for their accomplishments as good corporate citizens and envi-

[5]The Environmental Defense Fund offers such services to communities electronically through the Environmental Scorecard (www.scorecard.org) project discussed above.

ronmental leaders. Just as a firm's reputation should suffer from poor performance, it should gain from excellence.

More concretely, public policies might reward good environmental performance by making such firms eligible for participation in experimental programs that loosen regulatory oversight. Recent EPA programs such as the Common Sense Initiative and Project XL grant participating firms increased flexibility in compliance in exchange for commitments to make improvements that surpass existing environmental regulations. Several reasons favor conditioning eligibility for participation in such programs on a firm's ability to demonstrate environmental performance. First, conditional eligibility recognizes the accomplishments of a firm and rewards it with a tangible benefit. Second, such firms have earned the trust of the public at large on environmental issues, and reduced oversight reaps benefits from that trust—public trust essentially reduces the costs associated with intensive monitoring, inspections, paperwork, and overly burdensome regulation. Finally, those firms that have demonstrated that they are good environmental performers will be most capable of utilizing regulatory flexibility to reduce pollution even further. These firms have demonstrated their capacity to adopt best practices in toxics reductions and so will be more likely to develop more effective technologies and processes for pollution prevention. Well-designed public policies could then encourage these firms to disseminate the best practices they develop throughout industry.

Conclusions

Despite trenchant criticisms against it—that much of the toxics reduction is illusory, that real reductions are only loosely related to safeguarding health and the environment, and that the data suffer from many limitations—the inadvertent success of the TRI should serve as a model for innovation in the EPA. The underlying mechanisms that have made the TRI so successful, which we call populist maxi-min regulation, if applied intentionally, hold the potential for even more effective environmental regulation by correcting many of these deficiencies. From the lessons we have outlined, it should be possible both to strengthen the TRI itself and to apply its mechanisms to other EPA initiatives.

With rewards to the best and broadly applied punishment to the worst, populist maxi-min regulation is a system of continuous environmental improvement that reduces toxics emissions from above and from below. By encouraging the most advanced firms to develop ever more effective pollution prevention and reduction practices, and by pressuring the worst performers to adopt these demonstrated technologies, public policies based on the populist maxi-min principal can effectively deploy the resources of environmental agencies and utilize the energy and wisdom of ordinary people to improve the quality of our air, soil, and water and thereby to create safer communities for all of us.

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