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Regulation by list has substantially distorted our efforts to reduce toxic and hazardous emissions. The result has been less environmental protection and greater cost

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For more than a quarter century, the most fundamental decision in environmental and public health regulation of manufacturing facilities has been which of their thousands of pollutants should be regulated. Everything else in these programs is secondary—standards, criteria, emission or effluent limitations, permit requirements, economic incentives, enforcement. If a pollutant is regulated, it is "inside" the regulatory program. Industry, government, consultants, and the public give it serious attention. If a pollutant is unregulated under a particular statute or, worse, not regulated at all, it is most often simply ignored.

The listing decision is the foundation for five federal laws that regulate routine releases of toxic and hazardous pollutants from and within industrial facilities: the Clean Water Act, Resource Conservation and Recovery Act, Clean Air Act, Occupational Safety and Health Act, and Emergency Planning and Community Right-to-Know Act. Each regulates toxic and hazardous pollutants based on a list. Regulation by list means that a program applies to a large number of pollutants. Regulation by list also hastens implementation of a program because the target pollutants are identified in a single action. This approach is more efficient for the government and less disruptive and costly for business than developing a regulatory program on a chemical-by-chemical basis.

But there is a problem, and it is mostly hidden from view. The names of the lists — toxic and nonconventional water pollutants, hazardous waste, hazardous air pollutants, toxic materials, and toxic chemicals — sound comparable. When nonspecialists discuss environmental pollutants, they tend to use the terms synonymously, as if they referred to the same pollutants. Although lawyers recognize that the terms have different legal meanings, they tend to see the actual composition of the lists as best left to specialists such as toxicologists, chemists, and engineers.

The lists are extraordinarily different from each other, however. The resulting lack of focus substantially weakens our ability to reduce toxic and hazardous pollutants and contributes to the economic inefficiency of the current regulatory structure. Inconsistent listing limits the overall effectiveness of these laws by encouraging the transfer of regulated pollutants into unregulated media. In addition, inconsistent listing prevents government officials, the public, and most facility managers from gaining an overall understanding of the types and amounts of pollutants being released from and within individual facilities. Last, important advances in environmental regulation, embodied in pollution prevention, ecosystem and multimedia approaches, emissions trading schemes, and intrafacility flexibility, depend at root on the first step of listing. Given the dimensions of its effects, the problem of "what to list" may be the single most important issue in the regulation of manufacturing.

To provide an initial understanding of the problem, a team at Widener University Law School set out to compile and compare the lists under these five statutes. The results are instructive. Of the 1,134 pollutants regulated as toxic or hazardous under at least one of the five, only 49 are regulated under all of them. Less than 11 percent of the toxic and hazardous pollutants regulated under at least one of the big pollution control laws—CAA, CWA, RCRA—are listed under all three.

The lists were developed independently by different experts using different criteria. And they show it. Some lists embrace ecological concern, and some ignore it. Human health commands varying amounts of attention. Differences in chemical effects, particularly in different media, can probably explain some of the differences. Because different lists are

based on different human health and environmental effects, however, and because four of the five lists are based on the effects of pollutants in only one medium, the inconsistencies cannot be explained as a coherent response to differing pollutant effects. (In fact, many pollutants that are toxic to humans and the environment were deliberately excluded from the lists to keep management and compliance costs to government and industry within bounds.) Unfortunately, the chemical-by-chemical justification required for changing the lists and differences among the list modification criteria impede any substantial effort to make the lists more coherent and more protective.

After outlining the problem, this article puts forth a legislative proposal to address it. The proposal builds on the congressionally endorsed premise that it is cheaper and more protective to prevent pollutants from being created in the first place than to subsequently control their release into specific media. The proposal requires development of a list of pollutants that are known to have the most substantial environmental and human health effects in multiple media. Facilities emitting these pollutants would be obliged to deeply reduce their generation and release into all media. By setting goals and by providing flexibility about the means, this approach should better protect human health and the environment at less cost than the media-specific controls now existing under these laws. The proposal would also expand EPCRA reporting to include all toxic or potentially toxic pollutants released from a facility. Finally, the multimedia list would be expanded periodically, with a goal of reducing the generation of all significant pollutants to zero.

Efforts to address the unfocused regulation of toxic and hazardous pollutants are particularly timely because of the national debate on reinventing environmental regulation. The dominant issues in this debate are administrative efficiency and the economic cost of regulation. The pollution itself has received relatively little attention. But inconsistencies among the lists are an underlying reason this debate is necessary in the first place.

To see how the lists were formed, let's take these statutes one by one:

Clean Water Act. The CWA defines pollutants to include virtually anything that humans discharge into water, and establishes a regulatory program for three types of pollutants. Conventional pollutants include chemicals that suffocate fish and other organisms by absorbing oxygen from water. Toxic pollutants are those that will, alone or in combination with others, cause death, disease, behavioral abnormalities, genetic mutations, or similar problems in organisms or their offspring. Nonconventional pollutants are those that do not fit the other two categories.

In the years immediately following the act's adoption in 1972, EPA and the states concentrated on conventional pollutants. Although the agency had the statutory authority to regulate toxic emissions on a pollutant-by-pollutant basis, it was burdensome to demonstrate that a pollutant was toxic enough to deserve regulation, and EPA also feared the disruptive effects that a "pollutant of the month" approach might have on industry. In 1976, EPA settled several lawsuits filed by the Natural Resources Defense Council, the Environmental Defense Fund, and others by agreeing to regulate a list of toxic pollutants. The list in the consent degree was ratified by Congress when it reauthorized the act in 1977. It now contains 126 chemicals. A list of 22 nonconventional pollutants, which are regulated in much the same manner as toxic pollutants, was developed at approximately the same time.

Resource Conservation and Recovery Act. RCRA recognizes three different kinds of solid waste—municipal waste, hazardous waste, and industrial waste. Most of RCRA's regulatory apparatus is directed toward hazardous waste—waste that may cause or contribute to an increase in mortality or serious illness, or may pose a substantial threat to human health or the environment.

A solid waste is legally hazardous if it is listed as such or if it has one or more specific characteristics. There are four lists of hazardous wastes under RCRA. In two of the lists, specified pollutants are hazardous if they are commercial chemical products, off-specification commercial chemical products, or manufacturing chemical intermediates of such products, and they are discarded, intended to be discarded, or disposed of in other ways. The other two lists are not pollutant-specific; they are based on pollutant mixtures or combinations from particular types of sources. Wastes are also hazardous under RCRA if they meet technical tests or descriptive standards for at least one of four characteristics—ignitability, corrosivity, toxicity, and reactivity.

Because wastes can be hazardous in different ways, and because some of these ways do

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not lend themselves to pollutant-specific identification, it is harder to describe authoritatively the RCRA pollutants. To support a recent rule making, however, EPA developed a master list of 506 chemicals and chemical classes regulated under the law.

Clean Air Act. The CAA defines air pollutants broadly to include any physical, chemical, biological, or radioactive substance or matter that has entered the ambient air, including any precursor. The act regulates two types of air pollutants: criteria pollutants and hazardous air pollutants. The act relies on a three-step process for regulation of criteria pollutants. The steps are the publication of criteria describing identifiable effects of various concentrations of that pollutant in the ambient air, the adoption of national standards based on the criteria to protect human health and welfare, and the adoption and implementation of state plans to ensure compliance with these standards. Only six pollutants are directly regulated under this system—sulfur dioxide, particulate matter, carbon monoxide, ozone, nitrogen dioxide, and lead.

Before 1990, EPA was obliged to regulate hazardous air pollutants one at a time by developing standards based on the level of protection needed for public health. This part of the act proved ineffective; only seven pollutants were covered in 1990. The agency's inability to establish a broader program for regulating hazardous air pollutants led Congress in the 1990 amendments to direct the development of such a program for 189 hazardous air pollutants.

Occupational Safety and Health Act. When the OSH Act was enacted in 1970, Congress authorized the Occupational Safety and Health Administration to adopt any national consensus standard as an occupational safety or health standard. Congress intended that such standards be adopted on an interim basis to expedite implementation of the act, and then be revised later. Based on that authority, the agency in 1971 adopted standards establishing maximum permissible exposure limitations for about 425 pollutants that occur in occupational settings. The act also gives OSHA authority to establish occupational safety and health standards concerning "toxic materials or other harmful agents" in the work place. OSHA has adopted such standards for 28 additional pollutants. It is reasonable to combine both lists to obtain a definitive list of the 453 pollutants regulated under the act.

Emergency Planning and Community Right-to-Know Act. Section 313 of EPCRA requires large manufacturers of specified toxic chemicals to submit an annual report of their releases and transfers. EPA then compiles these reports and publishes them as the Toxics Release Inventory. At the end of 1995, the list contained approximately 588 toxic chemicals and 27 chemical categories.

When the lists have different lengths, inconsistencies are inevitable.

When the lists have different lengths, inconsistencies are inevitable. Unfortunately, the number of pollutants on each list varies considerably. EPCRA's list of 615 pollutants is four times the size of the shortest list, the CWA's at 148. The CWA and CAA lists contain fewer than 200 pollutants, while the other three contain 450 or more.

The varying length of the lists provides only part of the explanation, however. Only 49 of the 1,134 pollutants that are on at least one of those lists are on all five, and only 70 more are regulated in four of five. More than two-thirds of these pollutants (768) are on only one list. Each list includes pollutants not on the others, and each excludes pollutants that are on all four others.

Of the five programs, the CWA, CAA, and RCRA are based on the most similar regulatory goals and structures. Each contains technology-based standards, requires permits, and is backed with considerable enforcement machinery. Still, the inconsistencies under these three programs are impressive. Most of the 579 total pollutants (382) are regulated under only one of the three programs, the great majority under RCRA. Only 63 are regulated under all three.

Sadly, these data actually understate gaps in the regulation of toxic and hazardous pollutants. First, many programs regulate facilities based on their size, number of employees, or amount of emissions or waste. Because these regulatory thresholds are not consistent from program to program, pollutants from

many facilities are regulated under some programs but totally unregulated under others. Second, regulation of particular pollutants under a program does not mean that the program regulates those pollutants uniformly. In fact, several programs contain built-in mechanisms that magnify the inconsistencies in their lists. In RCRA, for example, the definition of solid waste contains two exceptions that together exclude the majority of hazardous waste. Third, the lists suggest that the pollutants they include are actually being regulated. But that is not necessarily so. The regulatory program for hazardous air pollutants, for example, is in a relatively early stage of implementation. Fourth, although these five lists are derived from regulatory programs that most directly affect releases from manufacturing facilities, they are not the only lists applicable to industry. There are, in fact, many such lists. These lists—each of which is different from the others, as might be guessed—greatly broaden the inconsistencies suggested by the five primary lists.

The statutory programs do have several backstop mechanisms that reduce gaps. The clean air and clean water programs use umbrella parameters based on certain physical, chemical, or toxicological characteristics to limit releases of pollutants that are not specifically regulated. Several statutes attempt to fill regulatory gaps by providing an opportunity for the regulation at particular facilities of individual pollutants. Control technologies for regulated pollutants sometimes limit the release of physically, chemically, or biologically similar pollutants that are not regulated. Finally, and perhaps most importantly, state and local regulation of industry often fills holes created by inconsistent lists.

Unfortunately, the Toxic Substances Control Act doesn't provide much of a backstop. TSCA has limited the number of new chemicals released from or within new industrial facilities, and subjected the new use of existing chemicals to specific restrictions, but has had little overall effect on existing chemicals. Although the act authorizes EPA, on a substance-by-substance basis, to generally regulate chemicals that are already in commerce, the agency has had little success generally regulating any substances other than PCBs.

Many pollutants are unregulated in media where they may have substantial adverse effects.

The regulatory effect of these lists varies substantially from program to program. The CWA, CAA, and RCRA require permits, but the other two do not. The air, water, waste, and occupational health programs work by limiting the concentration of pollutants in specific media; EPCRA works by providing information. Four of the five programs are administered by EPA and one is administered by OSHA; the two agencies have different missions and constituencies. The detailed "cradle to grave" controls adopted under RCRA probably make compliance with that program more complex and difficult than any other. Different types of regulation occur even with pollutants that all five statutes recognize as hazardous or toxic.

Differences in chemical releases and properties are the most basic justifications that may be provided for inconsistent lists. For instance, it may not be necessary to regulate discharges of a particular pollutant into surface water if it is rarely discharged into water. In addition, the toxicity of many regulated pollutants varies with the route of exposure. It may thus be appropriate to regulate a pollutant when it is airborne because it has toxic effects when inhaled but not to regulate the same pollutant in the water.

Unfortunately, the processes used to develop and amend these lists do not support the conclusion that pollutants are regulated in media where they are toxic and unregulated in media where they are not. To the contrary, they indicate that many pollutants are unregulated in media where they may have substantial adverse effects. Although the list development processes are unevenly documented, it is possible to reconstruct their basic contours. There exists a reasonable explanation for each list, by itself, but no explanation of how the decisions for the different lists fit together.

The list makers faced a daunting task. The basic reality in which all pollutant regulation occurs is the scarcity of information about the effects of chemicals. No toxicity information is available for 78 percent of the 12,860 chemi-

cals that are used in commerce in quantities of more than one million pounds per year, and only minimal toxicity information is available concerning the rest. Data gaps exist even for regulated pollutants; the National Research Council concluded in 1994 that there were significant gaps in our understanding of the human health effects of many of the hazardous air pollutants listed under the CAA. For chemicals that have been tested for human health effects, there is considerable information concerning carcinogenicity and acute toxicity, but much less information concerning chronic toxicity. Only 10 percent of chemicals in commerce other than pharmaceuticals have been tested for neurotoxicity. Very little information is available concerning the synergistic effects of pollutants on human health. Even less information exists concerning the effect of various pollutants on other living things. The fate of pollutants as they move through the environment is not well understood.

There exists an explanation for each list, but no explanation of how they fit together.

In completing this task, separate organizations or groups of people developed each list independently, and in different contexts. Those developing later lists, including the multimedia TRI, generally did not have the willingness or ability to revisit earlier lists. The overwhelming majority of the occupational health standards were developed by the American Conference of Governmental Industrial Hygienists as recommended exposure limits, and made mandatory when OSHA adopted them by reference. A much smaller number were developed directly by the agency itself. The toxic water pollutant list was developed by an EPA work group based on substantial input from the environmental organizations that had sued EPA. The initial hazardous waste lists were prepared by EPA's Office of Solid Waste in response to a statutory deadline for developing such regulations. The initial EPCRA and hazardous air pollutant lists were developed as part of legislation. The EPCRA list was prepared largely from two state lists, and the air list was prepared mostly by EPA experts.

This independent development under diverse circumstances contributed to many of the differences among the lists. If a pollutant is toxic in outdoor air, it is surely just as toxic in workplace air. Yet 67 of the 189 hazardous air pollutants under the CAA are not regulated under the OSH Act.

Four of the five lists were based on information about pollutants that were known to occur in the particular medium being regulated; the presence of the same pollutants in other media was viewed as irrelevant. In addition, the likelihood that these pollutants would travel to other media after their release, and their toxicity in these secondary media, received relatively little attention. The ACGIH list that OSHA drew on was developed in response to the presence of those particular substances in the workplace. The 28 additional toxic chemicals that OSHA has listed were also based on their presence in the workplace. In addition, no pollutants or pollutant families were included in the CWA priority pollutant consent decree unless they were known to be present, or were likely to be present, in point source effluent discharges. When EPA trimmed that list to individual pollutants, it based its decision on the occurrence of these pollutants in water and on their commercial availability, among other factors. Similarly, the regulatory definition of hazardous waste under RCRA was based on constituents or characteristics known to exist or occur in industrial wastes that were disposed of improperly. The hazardous air pollutant list under the CAA drew heavily from the TRI, and pollutants were not included unless they were also regulated by at least one state. Of the five, only the TRI list is not limited by the likelihood that pollutants are present in a particular medium.

The lists are not based on a consistent assessment of risks. The EPCRA list did not even begin with a risk assessment; many chemicals were chosen simply for their production volume. Only one—the CWA toxic pollutant list—is based on serious consideration of environmental effects. Pollutants were placed on the other lists primarily or exclusively because of their human health effects. The lists reflect differing levels of attention to various potential human health effects, but tend to concentrate on carcinogenicity and

related concerns. The OSH Act list is the exception; it is based on carcinogenicity as well as a great variety of noncarcinogenic effects.

Even when the risk assessment methodologies were similar, the same scientific information about the same pollutants was not necessarily used in the development of these lists. None is based on a comprehensive analysis of all pollutants in a particular medium. No two are based on an analysis of the same subset of pollutants. Each was drawn from particular groups of pollutants that were identified by technical analysts, state regulatory programs, or combinations of various lists. Although the lists were based on the best information then available to those who were preparing them, new scientific information about the effects of particular pollutants became available during the two decades over which the lists were developed. Finally, the listing decisions appear to give insufficient weight to ecological effects. Although EPA's Science Advisory Board has stated that environmental and human health risks should be given equal weight, three of the four EPA lists fail to do so.

None of the lists is based solely on a risk assessment of the pollutants; they were also based on the regulatory consequences of listing. As a result, the lists do not necessarily contain all the substances that pose substantial risks to health and the environment. In fact, they contain only a portion.

The lists do not necessarily contain all the substances that pose substantial risks.

The lists were influenced in at least three ways by concern for manageability and cost of the subsequent regulatory program. First, the number of regulated pollutants was limited to prevent overloading the government's regulatory resources, particularly for the CWA and CAA, which require the development of technology-based limits for every class of industry that emits a regulated pollutant. Second, many pollutants were excluded from lists because tests to measure their concentration in a particular medium were unavailable or too burdensome. This is particularly true of RCRA, where, for example, EPA said there was no technical measure for the carcinogenicity of a waste. Third, the lists were influenced by concerns over costs to industry. Because four of the five lists were developed or modified as part of a legislative process that also determined what listing would mean, the number and type of pollutants on a list were necessarily influenced by potential compliance costs. Potential costs to industry have also limited expanding the OSH Act list.

The discrepancies among the underlying analyses for each list are highly unlikely to be resolved by incremental changes. Each of the lists is accompanied by criteria for adding or deleting pollutants. These criteria all require the implementing agency to make findings concerning the risks presented by an individual pollutant. These findings must be made on a pollutant-by-pollutant basis. EPA's authority to add a pollutant to the hazardous air pollutants list, for example, or to delete one, must be based on the effects of that particular pollutant. Except for the TRI, the agency must also find that the particular pollutant presents a risk in the medium being regulated. The human health and environmental protection criteria also differ from list to list. The duty to justify list changes on a pollutant-by-pollutant basis, and differences in the criteria, impede any effort to coordinate list changes among the five programs.

The obligation to justify list changes on a pollutant-by-pollutant basis essentially reenacts the situation that existed prior to the development of the lists, particularly in the air and water programs, when EPA was unable to regulate a meaningful number of pollutants as toxic or hazardous. Despite impressive improvements over the past several decades, the release of toxic or hazardous pollutants from or within manufacturing facilities continues to pose threats. A great many pollutants are still produced in manufacturing. There is increasing scientific evidence about the effect of chronic exposure to low levels of toxic chemicals on, among other things, the sexual development, reproductive ability, and immune systems of birds, fish, and mammals, and on the development and function of the human nervous system. Such evidence suggests that we may be approaching the limits of the environment's ability to continue absorbing pollutants from human activity—even in small amounts.

The volume and quality of scientific information about pollutants continues to increase, as does the ability of toxicologists to differentiate among different kinds of effects. There is a growing scientific understanding, for example, concerning the ecological effects of chronic low-level exposures to toxic or hazardous pollutants. The ability of scientists to measure pollutants at smaller and smaller concentrations enables detection and analysis of increasingly subtle environmental and human health effects. As this evidence grows, there will likely be continuing pressure to add pollutants to the lists.

Regulation by list necessarily puts human health and the environment at risk because its primary response to pollutants occurs *after* they have been released from or within an industrial facility, *after* considerable information has been gathered showing the risks they create, and *after* Congress, EPA, or OSHA has decided to regulate. Humans and the environment are already adversely affected by toxic and hazardous pollutants by the time the listing process comes into play.

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The gap between the 12,860 chemicals in commerce in significant amounts and those listed is unlikely to be appreciably changed, however. Three of the lists have changed relatively little, if at all, since they were first developed. OSHA has been able to add only 28 chemicals to the occupational health standards it adopted by reference in 1971, and has deleted none. EPA has deleted three pollutants from the list of toxic water pollutants since 1976, and has added none. It is probably too soon to expect changes in the 1990 list of hazardous air pollutants, and there have been none. When major changes have occurred, they have been directed by Congress, as in the case of RCRA, or made easier by their relatively small regulatory consequences, as in EPCRA.

Apart from providing less human health and environmental protection than we may have thought, inconsistent lists have two other adverse effects. First, they encourage transfers of pollutants into unregulated media. If a pollutant is not regulated in a particular medium, the cost of releasing it there is likely to be minimal. Inconsistent lists encourage industrial process engineers to design and operate manufacturing and pollution control systems so that toxic and hazardous pollutants are discharged into media where they are not regulated. Such cross-media transfers reduce the overall improvement that could be expected from pollution control expenditures because they increase releases in another medium.

The control of toxic and nonconventional water pollutants under the CWA provides a concrete example of cross media transfers. At the author's request, Hampshire Research Institute (which analyzes TRI data for EPA) compared releases and transfers of toxic and nonconventional pollutants under the CWA with all other pollutants. The comparison showed that direct surface water discharges and discharges to publicly owned treatment works are indeed much lower for CWA pollutants than they are for other pollutants. However, the CWA appears to have reduced regulated water pollutants in part by driving them into the air. Total air emissions represented 28 percent of all releases and transfers of CWA pollutants in 1993, but they represented only 15 percent of the releases and transfers of all other pollutants.

Second, inconsistent lists impede a complete understanding by facility operators, government agencies, and the public of the toxic and hazardous pollutants released within and from those facilities. Other than the OSH Act, each program requires public reporting of releases of regulated pollutants on an ongoing basis and, when applicable, as part of a permit application. For these four programs, only releases or concentrations of regulated pollutants must be reported. Because of inconsistent lists, no one (except perhaps the facility's managers) knows its total overall releases or its total releases of toxic or hazardous pollutants.

The difficulty in assembling an overall picture of releases from existing data is well illustrated by the famous joint study by EPA and Amoco Corporation of the company's refinery in Yorktown, Virginia. Although the TRI is known as the nation's best source of

multimedia release information, the TRI report for that facility accounted for only 2.4 percent of the facility's total releases to air, water, and land. The study found that the TRI report was based on estimates that were substantially lower than actual releases in some cases, did not include many chemicals that the refinery released, including criteria air pollutants, and excluded some activities that account for significant releases. Reporting requirements under other laws were similarly inadequate. Effluent reporting under the plant's National Pollutant Discharge Elimination System permit and internal solid waste reporting showed only 11 percent of its total releases, and this data did not adequately characterize the chemicals in these waste streams.

Without such information, industry, regulators, and the public cannot properly assess the actual or potential environmental or human health effects of individual facilities. In a system that is based primarily on risk in the choice of regulated pollutants, ironically, regulatory agencies routinely approve permits for industrial facilities even though they generally are not fully aware of the risks those facilities could create.

Unfocused control demonstrates the need for greater pollution prevention.

Inconsistent lists mean that the information being provided confuses the public and damages the credibility of the overall program. The nation's environmental laws have a wide range of opportunities for public participation, and depend on that participation for their effectiveness. Effective participation cannot occur, however, unless the public has access to reliable and accurate information. Chemicals not on one list—or not on any of them—can easily be perceived as nontoxic or nonhazardous. For chemicals on one list but not on another, the probability of public confusion is high, particularly when they are on the TRI.

Inconsistent lists also undermine a pillar upon which any legal system must ultimately rest—its ability to be understood by those it affects. In many ways, the pollution control laws have grown in complexity beyond the ability of regulated parties, their attorneys, the public, and even the government to understand them. Although much of that complexity is due to the manner in which regulation is conducted, including differences in deadlines, permitting, and other requirements, differences in regulated pollutants greatly contribute to that complexity.

How should we respond? The evidence in this article points in two seemingly contradictory directions. On the one hand, strongly divergent lists have limited the ability of these programs to reduce toxic and hazardous pollutants and demonstrated that there is no bright line separating the risks of regulated and unregulated pollutants. On the other hand, inconsistencies among the lists have contributed to the economic inefficiency of these programs. The following provides a framework for addressing both problems.

Move from pollution control to pollution prevention. The unfocused control of toxic and hazardous pollutants, and the single-medium lens by which four of the five pollutant lists were developed, demonstrate the need for greater emphasis on pollution prevention—process changes and other measures that prevent the generation of toxic and hazardous chemicals. Pollution prevention is attractive for both environmental and economic reasons. The problem of unfocused control suggests that pollution prevention may provide a considerable opportunity for both risk and cost reduction. Because it involves changes in the manufacturing process, pollution prevention can limit releases into all media, whether regulated or not. As noted, almost 1,100 pollutants are regulated under at least one of the five statutes but not under one or more of the others. For those pollutants, pollution prevention could reduce their releases in media where they are not now regulated. In addition, pollution prevention addresses the problem of cross-media transfers to unregulated media.

The disparities among the lists also suggest significant economic benefits from pollution prevention. A facility that installed a waste water treatment system in 1979 to control CWA toxic water pollutants, for example, could now easily find releases from that system regulated as hazardous air pollutants

under the 1990 CAA. As the pollutants on individual lists change and grow over time, in other words, manufacturing facilities that use pollution controls may pay several times to control the same pollutants.

Establish a multimedia priority for the most toxic or hazardous pollutants. To focus the nation's effort to reduce toxic and hazardous pollutants, Congress should adopt or authorize the adoption of a list of the most toxic or hazardous pollutants in multiple media. The most obvious starting point for developing such a list is the existing multimedia list under EPCRA. Because the release and transfer of pollutants on this list must be publicly reported, the TRI provides a baseline from which to assess and measure reductions. Using an existing list is also less disruptive and confusing to business, the public, and government agencies than creating an entirely new list. In a manner similar to what it did in the 1990 CAA, Congress could adopt a list prepared jointly by EPA and OSHA that would identify a subset of those pollutants that present the greatest risks to both human health and the environment in multiple media. Such a process would likely result in the selection of many metals, persistent and bioaccumulative organic chemicals, carcinogens, and other pollutants that have serious adverse environmental and human health effects. It may be appropriate to allow additions to that list for pollutants important to particular ecosystems, such as the Great Lakes region or the Chesapeake Bay. It may also be appropriate to provide a process for developing modified lists for the most toxic or hazardous pollutants in particular industrial sectors. Congress should also include a mechanism for periodically expanding the list.

A multimedia list would reduce risks by encouraging the use of pollution prevention.

The multimedia list would provide a platform for a program to reduce risks from these pollutants through the use of pollution prevention. This program would demonstrate legal and technical means of using pollution prevention that could later be applied to a broader range of pollutants. Put differently, the program would give significantly greater emphasis to development and implementation of ecologically efficient solutions, encourage their use on a broader scale, and move pollution prevention from the margins to the center of the nation's environmental protection efforts.

Establish reduction goals. Environmental and occupational health programs for manufacturing succeed to the extent that they reduce pollutants. Paper measures, such as number of permits issued or denied, amount of civil penalties collected, or number of companies adopting environmental management systems, are all secondary to actual reduction. Congress should thus direct that pollutants on the list (or lists) be subject to steep reductions in their generation as well as their release into all media. The reductions should be great enough to seriously reduce the risks presented by these pollutants but over a long enough period of time (say five to ten years) to allow industry to meet the goals with minimal disruption. The reductions could also be expressed as reductions in the amount or toxicity of pollutants generated per unit of product produced. The percentage reductions could be uniform for all industries or could vary as necessary. Because we do not know how much loading of these pollutants the environment or human health can withstand without significant damage, a long-term goal of not generating or releasing any of these pollutants would also be wise.

The directness and relative simplicity of this approach are attractive. Statutory goals for reductions would be clearer to the public than best available technology and related requirements. They would also be more understandable to industry than the current matrix of control laws, and would provide a stable basis for long-term planning. Because companies could achieve these goals in several different ways, and because pollution prevention offers the potential for returns on investment, companies are likely to see economic benefits or, at worst, relatively low costs. Such goals are also likely to foster better protection of human health and the environment because they are multimedia in nature and because they are not dependent on existing standards. Incentives as well as a means of ensuring the use of appropriate substitute chemicals would also be required to make this system work.

Require public reporting of all toxic or poten-

tially toxic pollutants. A basic way of including pollutants in a regulatory program—and a prerequisite for the success of a pollution prevention program—is to require public reporting of their generation and release. The TRI has already led to lower levels of releases and transfers for most reported chemicals, whether they are otherwise regulated or not. The TRI's ability to reduce environmental releases, its multimedia nature, and its relatively limited regulatory consequences make it a logical and attractive vehicle for implementing a more comprehensive approach. Further expansion of the TRI would likely help shift the emphasis of the other four programs toward pollution prevention.

Although some companies have developed information about all environmental releases from specific facilities—such as the Yorktown refinery—they are the exception. A major objection to developing a more complete inventory is cost, particularly at large and complex facilities. The program should thus focus initially on developing a cost-effective system for reporting releases. The consolidation of reporting requirements from various programs would be a major step in that direction.

An expanded TRI should include all toxic or potentially toxic pollutants used by a facility in quantities exceeding 10,000 pounds per year, the current TRI reporting threshold. An expanded inventory of toxic or potentially toxic pollutants would be helpful to facility operators because they would find inefficiencies in their processes and better understand where materials are being lost.

An expanded inventory would also provide the public and government agencies with a better opportunity to understand releases than is currently available. Public information about pollutants in permit applications would be consistent with the expanded TRI data, thus enabling easy comparison of releases among various media. When approving such applications, the regulatory agency would at least be fully aware of the releases that it is authorizing, and would have disclosed them to the public. Such an inventory would provide a more informed basis on which to make permitting and enforcement decisions, to recognize cross-media trade-offs, to reduce risk from the facility, and to measure progress in reducing pollutant generation and releases.

In addition, the TRI should be modified in ways that EPA is already discussing. The TRI should encourage pollution prevention by directly quantifying it. Facilities would be required to report information that would accurately show the extent to which they have reduced or eliminated pollution at the source. The TRI should also provide better information about exposure to pollutants in the workplace. Because the TRI data only capture releases or transfers of pollutants from a facility, they do not measure releases within a facility, which would affect those working there.

Reduce other pollutants. The environmental and economic opportunities inherent in pollution prevention are especially important because of the magnitude of unregulated releases. The human health and environmental risks of this pollution are not likely to be trivial. As the listing process indicates, many significant pollutants presenting significant risks were excluded to keep the lists at a manageable length, to reduce costs, or because of the absence of suitable technical tests. The actual or perceived costs to industry of pollution control have played, and continue to play, a significant role in limiting the size of the lists. A more cost-effective approach would make a much broader program possible.

A facility-wide approach appears to be the best way of protecting health and the environment.

Congress should thus, at a minimum, set a long term goal of using facility-wide pollution prevention to reduce generation of such pollutants as close to zero as possible. A facility-wide approach to toxic and hazardous pollutants appears to be the best way of protecting human health and the environment against releases from or within a facility, particularly as it moves from pollution control to incorporate pollution prevention.

The debate has traditionally been between those arguing for more protection and those arguing against higher costs. But we are unlikely to further reduce toxic and hazardous pollutants or decrease the costs of regulation unless we do both together. When we focus on the pollutants themselves, we have that opportunity.