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Commentary

Improving the Management of Environmental Health

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Environmental health regulation has been developed on the premise that both problems and solutions are obvious, requiring only attention and commitment. The result has been impossible legislative goals and frenetic, unfocused agency efforts to deal with too many issues. Preventing all environmental health problems is impossible and not the best approach; instead, attention ought to be shifted toward reacting quickly to problems before irreversible, severe health damage has occurred. Rather than having regulatory agencies attempt to manage all problems, they should be focused on exemplifying goals and productive approaches, and on handling a few major issues. Regulatory agencies should be managing the nonregulatory institutions to ensure that they are effective in dealing with the myriad issues that the agencies will never be able to handle. The inherent limitations of federal regulatory agencies must be recognized to restructure environmental health management to be more effective in lowering risks while being efficient, administratively simple, and more equitable.

The history of environmental health problems is grim. Workers labored in dust clouds of asbestos, cotton, coal, or silica so thick they could barely see a few feet. A large proportion of the Japanese living in a community died or suffered severe neural damage from eating fish containing mercury. Hundreds of thousands of London residents became ill and 4,000 died during the London fog episode in 1952.

I don't mean to suggest that severe environmental health problems were the norm. However, when they occurred they were obvious and devastating. Our thinking is colored by this history, and our legislation is designed to deal with these sorts of problems. To oversimplify a bit, these historical situations were characterized by a relatively small number of highly visible problems. Not only were the problems easy to recognize, but the solution was also easy to perceive. In general the environmental exposure caused an acute disease or reaction that was life-threatening, or at least incapacitating. In general the problem occurred because people were too short-sighted to foresee the consequences of their actions. In a few cases, such as some occupational exposures, employers argued that all but a few trouble makers accepted these "conditions of employment" and that it was impossible to continue production without high levels of exposure.

Clearly, society had to correct unfortunate situations that had not been anticipated and to head off disasters that were about to occur. The employers' arguments were shown to be self-serving. Imaginative control technologies could lower exposure, changes in process could cure the problem, or, failing all else, substitution of materials would solve it. For example, beehive coke ovens would be impossibly expensive to control, but modern coke ovens achieve control with little economic penalty. Controlling emissions from home coal fires is impossibly difficult and expensive; it is easier to substitute natural gas or oil to solve the environmental problems.

The Regulatory Approach to Environmental Problems

These assumptions about the nature of environmental health problems were the basis of federal legislation in the 1970s and of agency regulation. When Congress instructed EPA in the 1970 Clean Air Act Amendments, they wanted primary air quality standards that would protect the most sensitive group in the population with an ample margin of safety; these standards were to be achieved within seven years. Clearly, Congress did not think that protecting the health of Americans from air pollution was terribly difficult, expensive, or time-consuming.

Perhaps Congress assumed solving environmental health problems was simple. Perhaps Congress was misled by staff and the experts who testified. More likely,

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a group of Congressmen with no technical training or appreciation of the problem assumed that if we could get an American to the moon within nine years, we could solve environmental health problems within seven (*1*).

The agencies have been little better in approaching the problems. When was the last time you heard the Administrator of EPA announce that the most sensitive group in the population could not be protected with an ample margin of safety during this administration? When was the last time you heard the administrator of OSHA telling a new conference that it simply was not possible to "assure insofar as practicable that no employee will suffer diminished health, functional capacity, or life expectancy as a result of his work."

To be sure, agency officials have been more forthcoming at scientific meetings. I was on a program with an EPA scientist in 1973 who asserted that there were no thresholds for the effects of air pollutants and so everyone could not be protected. But, if you were a member of the general public, I can't think of a single preface to a bill or agency news conference that told you that it wasn't that simple and that we weren't going to stop all discharges into the nation's waterways by 1985. The more relevant audience is not the general public; it is federal judges; they have been the arbiters of environmental health goals. When have these federal judges been informed by Congress or agency administrators that this simple approach is not workable and that the implied goals cannot be achieved?

Reality bears little resemblance to the assumptions of Congress in passing this legislation. There are 60,000 chemicals in common use, with perhaps 1,000 new ones added each year (*2*). There are millions of workplaces and hundreds of thousands of processes. Instead of being able to regard each chemical as an independent challenge to health, it is clear that interactions among chemicals and between personal habits and genetic predispositions on the one hand and environmental agents on the other hand are of dominant importance (*3,4*). Taking account of the interactions among chemicals and with personal habits and genetic predisposition, one would say that literally every person in every setting presents a unique situation.

Foundations of the Regulatory Approach

The twin foundations of the current regulatory approach are (1) prevention rather than reacting after initial loss and (2) a command and control system for managing risk that leaves little or nothing to the analysis, motivation, and judgment of those controlling the risks. Both of these premises are subject to challenge. There are so many possible risks that it is far from obvious that important risks can be distinguished from trivial ones before there is an untoward occurrence. Problems plague the premanufacturing notice to EPA for chemicals, the registration of pesticides, and determining the proper standards for exposure to carcinogens. Given the difficulty and cost of screening all possible

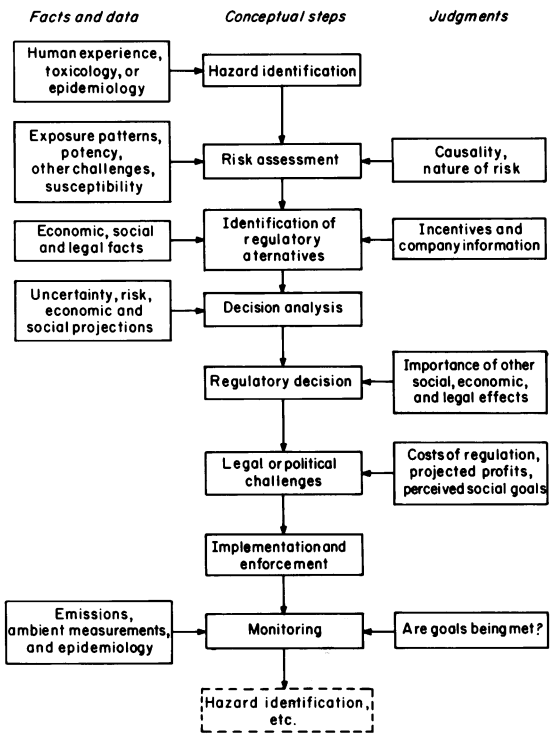

FIGURE 1. Hazard management.

risks and then regulating those that might induce loss, it is far from obvious that an ounce of prevention is worth a pound of cure. Indeed, the cost-effectiveness ratio of prevention might be 16/1 rather than the 1/16 of the nostrum.

The second foundation is subject to even greater challenge. Virtually all compliance with regulation is "voluntary," in the sense that no one compels the individual acts of compliance. For environmental emissions, the failure to comply is unlikely to be detected and the violator identified. For example, who would know if workers in a particular plant were being exposed to more than 10 ppm of benzene? How long, if ever, would it take to find this violation? If the violation were found, what is the chance that a significant penalty would be levied on these responsible?

There has been progress, as evidenced by the few serious acute diseases currently caused by environmental emissions. Instead, attention has shifted to chronic disease: cancers, chronic obstructive pulmonary disease, and subtle effects on learning and development. I don't mean to suggest these chronic diseases and conditions are not of concern, only that it is more difficult to find their cause and to prevent them.

However, it should be made clear that the progress in cleaning the workplace and environment more generally is not due solely to federal regulation. With only a few exceptions, the standards for toxic substances enforced by OSHA were not developed by OSHA. Instead, they are taken from voluntary industry standards

developed by ANSI and ACGIH. Studies of OSHA's effect on occupational safety revealed little or no improvement that could be ascribed to federal standards and their enforcement (*5*). Studies of air quality show that federal standards have not been achieved and that relatively modest improvements occurred in ambient air quality for sulfur oxides, nitrogen oxides, and ozone (*6*).

The current reality is that OSHA has no hope of setting standards and enforcing them for all environmental agents in all workplaces. EPA has no hope of examining each new chemical to determine which are safe and which should be excluded from the market. EPA has no hope of examining each pesticide in each use to set individual rules.

The current process works by selecting the bad actors for agency attention and then setting a standard that will protect health. The selection process has been arbitrary and capricious, with priorities dictated by the media rather than any objective analysis of which chemicals are most toxic and which involve the greatest exposures. Thus, some problems such as vinyl chloride monomer received no attention until disaster had occurred (*7*), while immense attention is given to routine emissions from nuclear reactors. Although this point has been made many times in the past and agencies have begun to structure priority setting, one would be hard put to describe the efforts as successful.

Standard Setting

Standard setting is a problem (*8*). The general rule is that standards should be set to prevent disease, subject only to the constraint that the standard be practicable (*9*). In *Benzene* (*10*), the Supreme Court added the condition that an agency had to find that there was a significant risk initially and that the standard would reduce that risk. However, for carcinogens, where the general assumption is that even a single molecule could produce cancer, there is always a risk and there is no risk level that is generally accepted to be insignificant. For example, the risks associated with ambient levels of EDB are on the order of one cancer per 100,000,000 lifetimes; yet EDB risks prompted immediate action by EPA and several states.

The fact that benzene won't disappear as a policy issue is indicative of the impossibility of the current standard setting process. There is good evidence that benzene is a leukemogen, but there are only rough guesses concerning the dose–response relationship (*11–13*). Enormous amounts of time at OSHA, EPA, and CPSC have been spent on preventing what would surely be only a dozen or so cases of leukemia each year in the USA. Without even counting the cost of reducing the benzene exposures, the cost of preventing a case of leukemia runs to millions of dollars in terms of squabbling expenses alone.

If the Supreme Court had given the quantitative characterization of significant risk (that was then accepted by the agencies, unions, consumer groups and Congress), *Benzene* would have been an important precedent. Without that, there is no hope of getting a sensible solution to setting standards; the process will inherently be arbitrary and capricious.

Enforcement

Enforcement is perhaps even a greater problem than standard setting (*5,14,15*). So few resources go into enforcement, and courts are so reluctant to impose fines or criminal penalties that it is not unfair to characterize compliance as voluntary. The principal pressures for enforcement are public opinion and the desire of executives to lead a quiet life and obey the law. The various estimates of compliance show that voluntarism is not very strong.

Regulatory Reform?

The usual solution to these problems is to call for appointing better people to the agencies, simplifying procedures, increasing or cutting the agency budgets, educating the public, subjecting regulations to OMB review to see that net benefits are positive, or to Congressional review to veto stupid decisions (*16,17*). These have all been tried, with some administrators so squeaky clean that even the media felt it could not criticize the agencies—for a few weeks. Neither increasing nor cutting agency budgets has had much effect on the problems, however much of it affected the lives of the staff. Educating the public is an enterprise with a time constant of decades, not weeks, as EDB, Love Canal, and Times Beach have shown. After four years of experience with Executive Order 12291, I hope I don't astound you with the opinion that all major regulations under the Reagan administration have not been paragons of thoughtful, nonpolitical reasoning.

Clearly there is a huge problem that has proven intractable despite the best efforts of some very smart people. The reforms proposed have been too little, too misguided. None offers hope of a solution, although some might help improve agency decision making. I believe that a more radical solution is required.

Nonregulatory Approaches

A more accurate characterization of the world is represented by the following propositions: (1) there are so many risks and risk situations that regulation (or centralized risk management more generally) cannot hope to deal explicitly with more than a tiny proportion; (2) it follows that enforcement is so large a task that even when some aspect of risk is subject to regulation, compliance will be largely voluntary; and (3) in our complicated world, there is no real hope of preventing first cases of loss; instead one can hope only to react quickly to such cases and prevent future losses.

Given these three propositions, regulation has an important role in managing risk, but the role is quite dif-

ferent from what it currently does. Since regulation can hope to address only a tiny proportion of risk situations, it is important that the ones to be addressed are chosen carefully. Two criteria should be used for selection: (1) the situations to be addressed ought to be precedent-setting in terms of identifying situations, setting goals, and otherwise helping to structure the situation. If the regulatory agencies take care, their actions will have vast leverage in influencing situations that they don't have the time or resources to consider explicitly. (2) The situations to be addressed should include genuine national crises where much would be lost by failing to act quickly.

But an even more important role of federal regulatory agencies should be to monitor risk management more generally and determine how nonregulatory institutions can be helped to handle the vast majority of risk situations more satisfactorily and expeditiously. The regulatory agencies will contain the experts on risk, have the goal of managing risks better, and have the resources to monitor and analyze risk management. They should have the role of determining when nonregulatory institutions are not working well and how they might be modified (or new ones created) to manage risk more efficiently. Again, this role seeks to leverage the limited efforts of regulatory agencies to have much greater effects on society wide risk management.

Prior to the 1970s, virtually all environmental risks were managed without regulation (*18,19*). While many were neglected, there was some management for most risks. For example, working in thick dust that made you cough and become sick was not viewed as a desirable attribute of a job. If a worker had a choice among jobs, he would choose the one without the apparent health risks, unless that job offered a wage premium to compensate for the working conditions. Similarly, people did not care to live in areas with noxious air pollutants, if they could find comparable housing in a nearby area without the noxious pollutants. Thus employers learned that they would have to pay higher wages to attract quality workers if the working conditions were relatively dangerous (*5*). Landlords learned that their property values were hurt by pollution (*20*). Remember that environmental cleanup in Pittsburgh was brought about by business leaders who believed that the "smoky city" image was costly, despite the evident costs of abating emissions.

There is much confusion about the assertion that pollution lowers property values; after all, property is much more expensive in the midst of a polluted city than in the clean mountains. For an industrial area like Pittsburgh, more houses were rented and the rents were higher when the air pollution was worst. This is because when the air pollution was worst, the mills were running all three shifts and more people were employed and earning more money. However, at any particular time houses in clean neighborhoods rented for more than houses in dirty neighborhoods (that were the same distance from the mills). Smoke does smell like jobs, but some people have polluted air without jobs and the lucky people have jobs without polluted air.

The Market

The market acts to control environmental pollution by giving employers an incentive to clean the workplace and landlords an incentive to get the polluters to control their emissions. The market doesn't work perfectly and it won't do the whole job, but it did and can help.

Tort Law

Tort law is also a device for reducing environmental pollution. Under English common law, one could sue for nuisance. While there are contradictory outcomes, there were cases which allowed individuals to collect payment for their damages from polluters or to force them to desist from polluting (*21*).

Voluntary Industry Standards

A third device is voluntary industry standards. While standardization was initially concerned with issues like screw threads, ANSI and ACGIH got around to recommending standards for levels of dust and chemicals in the workplace. While no company was required to adhere to these standards, they were a force toward lowering environmental emissions.

Insurance

A fourth device was insurance. If an insurance company had to pay for employee disease, at the very least, premiums would rise with awards. More generally, risk averse insurance companies would tend to push an employer to curtail actions that might lead to litigation and awards, since outcomes are uncertain and the insurance company cannot be sure it will be able to pass the costs of all awards back to the offending company.

Other Approaches

Other approaches include collective bargaining, licensing, and public pressure. It is difficult to ascertain how well these nonregulating institutions managed to curtail environmental emissions. On the one hand it is evident that they did not stop all emissions. Toxic waste dumps, air pollution, workplace hazards, and many unfortunately occurrences are evidence of problems. On the other hand, environmental emissions were curtailed and there was a limited number of disasters, such as London and Denora, rather than an endless list of failures.

Clearly, there were problems that the new environmental regulations sought to solve. However, Congress and the new agencies treated the other institutions managing the environment with contempt and either ignored them or shoved them aside to make room for

regulatory control. In 1984 it is evident that regulation is not a sufficient answer any more than the nonregulatory institutions. Now it is necessary to reevaluate these nonregulatory institutions and determine what role they can play and which ones should be used.

Criteria for Choosing Among Approaches

Before doing that, it is necessary to discuss the criteria for selecting one approach over another. The first criterion is the environmental quality (or disease level) that results. If the environmental quality that results is unsatisfactory, some other approach must be tried. However, the resulting environmental quality is not the only criterion. A second criterion is economic efficiency. This criterion would judge an approach superior if the amount of resources required to achieve the environmental quality were less than that of other approaches. A third criterion is administrative simplicity. Even apart from the total resources used, this criterion rewards approaches that are simple and transparent, not requiring an elaborate bureaucracy to administer. A fourth criterion is equity. People want the right people to pay and the right people to get the benefits.

To date, environmental policy has tended to focus on environmental quality and equity, with little or no thought to economic efficiency or administrative simplicity. As might be expected, the result has been programs that are expensive, being both inefficient and ineffective. The result has also been a byzantine system requiring an elaborate bureaucracy, almost inevitably leading to litigation, and requiring a burdensome process of announcement, hearings, submissions and building up a record. Focusing on environmental quality with a small amount of attention to equity has left the administrative approach needlessly expensive and complicated.

Conclusion

A first recommendation would be to make changes in the administrative approach that would make it both more efficient and more effective. A more radical approach would be to change the regulatory process to emphasize its leverage in using nonregulatory approaches to do most of the work. If so, there are two principal roles that regulatory agencies might assume. The first is to select a small number of topics for scrutiny. These topics should be selected both to serve as precedents for nonregulatory institutions and to handle the really major catastrophes.

The second major role is to oversee the nonregulatory institutions. Since it is clear that these institutions will be responsible for most risk management, it is important that they be supervised to ensure that they are effective and remain so. Thus, the regulatory agency would attempt to see that the entire job gets done and that each nonregulatory institution played its assigned role effectively in managing environmental risks.

The key concept for regulatory reform is leverage. The principal federal agencies have a total of perhaps 10,000 employees to determine the goals and enforce standards for literally millions of risk situations. Detailed standards setting and enforcement for each risk is impossible, even if agency budgets and staff were ten to one hundred times larger. The question is how current resources can be levered by using nonregulatory institutions.

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