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PRIORITY-SETTING AT THE ENVIRONMENTAL PROTECTION AGENCY, AND COMPARATIVE ANALYSIS OF ENVIRONMENTAL PROBLEMS TO SUPPORT IT

Richard Morgenstern*

ABSTRACT

Setting priorities objectively is difficult at EPA because of numerous explicit statutory prescriptions, political and public pressures, internal bureaucratic tendencies, and deficiencies in data and analytical methods. To bring more rationality to this process, EPA has recently completed a study comparing the magnitudes of the major environmental problems the agency might address. This paper describes the methods and findings of this study, and how it can be used at EPA to improve overall protection of the environment.

INTRODUCTION

I have been invited in this paper to discuss two particular aspects of environmental policy in the United States: planning for the future, and enforcement of environmental requirements. I have chosen to cover only one of these topics—planning—rather than both of them.

I regard effective planning as critical to the mission of the U.S. Environmental Protection Agency (EPA). The EPA is provided with a limited staff and budget to perform its function. EPA can also require private industry to spend some limited amount of money for environmental purposes. The challenge of planning is to determine how to spend these limited resources for greatest effect. EPA must decide which environmental problems to devote attention to, and how much effort to give to each.

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Once the critical planning decisions are made about which problems to address, EPA then turns to a next set of decisions about how to address each problem on the agenda. Whereas the strategic planning decisions must be made by the highest officials in the agency, who have an overview of all the potential areas of agency concern, the more tactical decisions about what to do for an individual problem area can be made by the manager of that program area. The program manager can decide what combination of steps—establishing new regulatory requirements, implementing requirements, or enforcing against companies or others not complying with them—is most appropriate for his program. Decisions about enforcement and other steps in implementing a program are made subsequent to the planning decisions and can be delegated.

The issue I most want to discuss is how to go about setting the agenda for an environmental agency. I suspect that the U.S. experience in planning and priority-setting may have much that is relevant for China. You, like us, must set priorities by carefully balancing the requirements of laws, the wishes of the public, and the views of technical experts in the environmental agency. On enforcement issues we may not have so much to learn from each other. In our system, enforcement policy is very dependent on the peculiarities of our laws governing each program area. I suspect that our laws and the resulting methods that are available for enforcement are very different from yours.

PRIORITY-SETTING AT EPA

When the U.S. Environmental Protection Agency (EPA) was established in 1970, the nation's most pressing environmental problems were obvious: soot and smoke from cars and smokestacks, and the raw sewage and chemicals from municipal and industrial wastewater.

Since 1970 the nation has done much to abate the most visible forms of pollution, but there is still much unfinished business. Moreover, new problems have also been "discovered" or have risen in importance, such as indoor radon, global climatic change from the buildup of carbon dioxide in the atmosphere, acid precipitation and hazardous waste. Many of these new problems are difficult to evaluate, as they involve slow, cumulative changes with very serious possible ultimate effects, amidst considerable scientific uncertainty. Many involve toxic chemicals that can cause cancer or birth defects at levels of exposure that are hard to detect. And many involve persistent contaminants that can move from one environmental medium to another, causing further damage even after controls have been applied for one medium.

The complexity and gravity of these issues make it particularly important that EPA apply its finite resources where they will have the greatest effect. Choosing which environmental programs to emphasize should be viewed as an attempt to maximize health and ecological benefits from the public and private resources the EPA can command. In theory, the environmental agency should analyze its set of investment opportunities and select projects proceeding down an ordered list until a sufficient number of projects have been chosen to exhaust the agency's budget.

Needless to say, priority-setting at EPA does not look much like this theoretical model. A wide variety of factors combine to make such priority-setting difficult at EPA.

One major difficulty stems from the multiple statutory goals governing the agency. EPA administers nine major statutes. They contain a multitude of goals and prescriptions. In recent legislation the goals have become extremely specific, detailing what EPA is to do by when, and what will happen if EPA does not do so. Occasionally, the goals conflict as when a statute governing one environmental medium mandates controls that transfer pollution to another medium.

Achieving all of the statutory mandates is impossible with the available resources. No escape is provided for—there is no recognition that some of the goals are unlikely to be achieved, and there is no guidance as to how to choose among goals when all of them can not be met. EPA is held accountable for each missed goal, and an argument that the goal was not achieved because the agency was working on something of higher priority is not regarded as a valid excuse. In recent years, in fact, the Congress seems to have distrusted EPA's performance in setting priorities sufficiently so as to limit it drastically.

This lack of appreciation in environmental statutes for the need to set priorities is also mirrored by the diverse public and political pressures brought to bear on the agency. Each is aimed at a particular program—"Clean up the abandoned hazardous waste site in my neighborhood quickly", or "My company can't afford to comply with your proposed air pollution control regulations", for example. Petitioners who want such actions from EPA are not satisfied when EPA does not do what they want because "other things are higher priority". The homeowner worried about a nearby hazardous waste site is not impressed when EPA responds that other sites scoring higher on a hazard Ranking System will be cleaned up first. The industrial plant manager is not satisfied when told that the proposed regulation abates health effects at an acceptable cost per case avoided. There is little external appreciation for EPA's

need, however, it is to be done, to set priorities across programs.

Internal pressures also make rational priority-setting difficult. As in all typical bureaucracies, long-established programs build an internal constituency of employees as well as an external one. And, in an area such as environmental protection with a substantial technical component, existing programs will build a critical knowledge base that can be used to justify spending more on them: monitoring data, engineering data on relevant control technologies, toxicological data on relevant pollutants, etc. By contrast, a new program to deal with an emerging environmental problem will have difficulty making its case due to uncertainty and lack of good data.

Even if the bureaucratic and institutional obstacles to rational priority-setting did not exist, environmental priority-setting would still be extremely difficult methodologically. A critical element in setting priorities is being able accurately to predict and then compare the likely results of alternative actions. Impediments to doing this well in the environmental field include:

1. A severe lack of knowledge about environmental processes. There are thousands of potentially toxic chemicals in commerce, and we have a toxicological understanding of only several hundred. We know virtually nothing about their synergistic or antagonistic effects. We know little about complex chemical transformations involving pollutants in the atmosphere or in groundwater. We know little about the reactions of entire ecosystems, as opposed to single species, to environmental pollution. Our data bases on emissions, ambient levels, exposure and uptake of pollutants are quite limited.

2. Methodological difficulties in specifying what environmental "results" are. We can measure quantities such as emissions or ambient concentrations, but these are not the ultimate terms in which environmental changes should be evaluated. We pursue environmental improvements because we care fundamentally about human health, ecological quality and economic values. In the area of economic values, there is consensus over measuring results in dollar terms—in dollar costs of compliance and in dollar losses stemming from environmental damages. But in the other two areas—human health and ecological quality—there is no agreement on the ultimate units we care about. Do we care more about a low risk of birth defects in future generations, or about a higher incidence of gastroenteritis among the current population? Do we care more about episodic fish kills from pollution in rivers, or about reproductive difficulties in birds exposed to certain pesticides? We don't know the answers to these questions. Even if

we could assess the risks inherent in these events accurately, we still would not know how to value them.

3. Evaluation of environmental results is further complicated when we try to compare across fundamental values. We cannot specify exactly what we mean by ecological quality, nor how we should trade it off against human health or economic values. It is extremely difficult, often impossible, to find a common denominator with which to compare disparate environmental programs.

4. Finally, projecting the results of environmental programs is difficult because EPA does not ultimately implement them. Typically, the private sector and state and local governments do. In assessing programs, EPA must judge the likely slippage between its regulatory proclamations and actions by other governments and the private sector.

In sum, numerous factors combine to make rational priority-setting very difficult at EPA. Statutory mandates and public, political, and bureaucratic pressures discourage it. Even absent these influences, it is difficult to manage well without clear values and good information.

In most respects, EPA has fallen prey to these difficulties in priority-setting. Perhaps like many other agencies, EPA's procedures for priority-setting:

- Are driven largely by statutes. EPA spends much of its effort in programming resources to meet goals established by Congress. In general it is appropriate for the Congress to set EPA's agenda. But the agency has several important advantages relative to the Congress that it should contribute to the process of setting environmental priorities: greater technical expertise, and greater appreciation of the opportunities and difficulties in program implementation. Based on this knowledge EPA should, but does not, assert more authority in priority-setting. EPA should choose explicitly among competing congressional goals when this is authorized by statute or necessitated by budget constraints. EPA should seek actively to have Congress change environmental statutes where necessary. Instead, though, EPA seems to look harder for more guidance from the Congress. EPA now commonly researches the legislative history of statutes to divine "Congressional intent", and tests in advance the reaction of key congressional personnel to possible agency regulatory actions.

- Are incremental. Priority-setting processes at EPA focus on marginal decisions rather than on base programs. A typical issue is whether a program should be given a small increase in resources, stay the same or suffer a small cut. Marginal projects comprising each increment will be evaluated, but the much larger base program is not examined.

- Seldom involve explicit cross-program comparisons. EPA's priorities tend to be an aggregation of within-program decisions. It is rare that anyone pits one program against another and asks which offers the best return for invested resources.

- Make insufficient use of technical expertise. EPA has substantial in-house technical expertise that is brought to bear on specific program issues such as individual regulations. But EPA's experts have typically not been asked for judgments beyond those within the province of their technical specialty, be it toxicology, engineering, or ecology. These experts are asked to play little role in priority-setting, where judgments and opinions become critical in filling the gaps between areas of technical knowledge.

In recent years some improvements have occurred in EPA's priority-setting. Perhaps most important are advances in risk assessment techniques for human health impacts of environmental pollutants. For cancer impacts in particular, there is now a common denominator for comparing different programs, and quantitative procedures for estimating this common denominator. These methods are generally used in priority-setting at the margin, in helping to decide which potential new regulation to adopt and which to reject. Using risk assessment and other techniques, EPA will typically calculate the cost per cancer case avoided for each new proposed regulation. Applying a similar cost-effectiveness cut-off level across all regulations provides some consistency to EPA decision-making at the margin in the human health area. (Some observers argue also, though, that EPA's increasing ability to analyze human health effects quantitatively has caused the agency to pay too little attention to non-quantifiable concerns such as ecological quality.)

Also important are recent EPA emphases on "environmental results" and on strategic planning. The agency has been revamping its internal management systems to encourage managers to pursue ultimate environmental results (health or ecological or economic improvements) rather than intermediate administrative goals (e.g., issuing permits, conducting inspections, taking enforcement actions). For key program areas, the agency has also been improving its process for strategic planning to achieve environmental results, and integrating the results of the strategic planning more forcefully into the processes for budgeting and setting the agency's regulatory agenda.

A final important step in improving EPA's ability to set priorities effectively has been a study entitled "Unfinished Business: A Comparative Assessment of Environmental Prob-

lems" (CAEP).^{*} The remainder of this paper will focus on the CAEP.

METHODOLOGY OF THE COMPARATIVE ASSESSMENT PROJECT

The CAEP was an ambitious year-long project to determine the comparative magnitude of the various environmental problems that EPA might address. We aimed to develop a broad picture of environmental problems in terms of the relative risks to human health and the environment posed by each. Which are the largest problems EPA might tackle; which are smaller? In a world of limited resources, we thought this profile of relative risks would be a good starting point for agency priority-setting. Other things being equal, EPA should devote more effort to solving larger problems.

This sort of study was new for EPA. The agency has a great deal of experience in assessing risks at stake in particular regulatory approaches to controlling a single pollutant from a single type of source. EPA also has some experience in program-wide risk assessment. EPA has, for example, completed a study of the health risks from hazardous air pollutants, developing several approaches for estimating the nationwide incidence of cancer from these pollutants.^{**} But a study of the scope of the CAEP, covering multiple sorts of risks and all environmental programs, was novel. In conducting the project, we organized and limited our work in four important ways.

First, we divided the universe of environmental problems into 31 pieces. Each of the pieces represents an environmental problem area defined along lines corresponding generally with existing programs or statutes. For example, some of our 31 problem areas are: criteria air pollutants, hazardous air pollutants, contaminants in drinking water, abandoned hazardous waste (e.g., Superfund) sites, pesticide residues on food, and worker exposures to toxic chemicals. Other ways of slicing the pie were possible; for example by pollutant, by route of exposure, by source category or by environmental medium. We thought it most important to define our units in terms corresponding roughly to program priority decisions.

Second, we considered four different types of risk for each problem area: cancer risks, non-cancer health risks, ecological effects, and welfare effects (visibility impairment, materi

^{*} U.S. Environmental Protection Agency, Office of Policy Analysis, *Unfinished Business: A Comparative Assessment of Environmental Problems*, Washington, D.C., February, 1987.

^{**} U.S. Environmental Protection Agency, *The Magnitude and Nature of the Air Toxics Problem in the United States*, Washington, D.C., September, 1984.

als damage, etc.). Each type of risk was analyzed separately. There were no decisions that one type was more important than another, and we made no attempt to "add" risks for a problem area across the four risk types.

Third, in view of the already massive scope of the project, we decided to limit it by *not* considering:

- the economic or technical controllability of the risks;
- the qualitative aspects of the risks that people find important, such as the degree to which the risks are voluntary, familiar, or equitable;
- the benefits to society of the activities that cause the risks; and
- the statutory and public mandate (or lack thereof) for EPA to deal with the risks.

These decisions about where to limit the scope of the study and where not to were carefully considered. In order to provide a broad guide to EPA priority-setting, we thought it critical to include within the study all issue areas that EPA might potentially address, and all types of risk that EPA generally seeks to abate. The study scope thus includes some areas that are primarily the province of other agencies (e.g., risks from exposure to consumer products addressed by the Consumer Product Safety Commission) and some areas for which EPA has no clear statutory authority (e.g., indoor air pollution). On the other hand, the decision to limit the project scope by not considering the controllability of the risks both made the project more manageable and, by making the results fall short of translating directly into recommended agency priorities, made the project less threatening to participants.

Finally, because the intent of the project was to indentify areas of unfinished business for EPA, we assessed risks as they exist now—given the levels of controls that are currently in place. We did not aim to assess risks that have been abated by EPA's programs or that will be abated by EPA's programs when full compliance with current regulatory requirements is achieved. This decision again had the effect of stopping the study results short of directly guiding agency priorities. By looking at existing or residual risks we gained an idea of what more the agency could aim to accomplish with additional efforts in various program areas, but we did not examine what would be lost if the agency reduced its efforts in these areas. To the extent that priority-setting involves both investments in some areas and disinvestments in others, the results of the CAEP directly inform only the investment decision portion of the process.

The method we used to compare environmental problem areas can best be described as systematically generating informed judgments among agency experts. About 75 career managers and experts representing all EPA programs participated in four work groups (one for each of the four types of risk) over a period of about nine months. The participants assembled and analyzed masses of existing data on pollutants, exposures and effects, but ultimately had to fill substantial gaps in available data by using their collective judgment. In this sense, the project represents expert opinion rather than objective and quantitative analysis.

In retrospect, the project involved more judgment and less objective analysis than was expected. The quantity and quality of available information were worse than was hoped; in effect the agency knows in a precise way much less about environmental problems than it should. An illustrative example of the interplay between data and judgment occurred when the health work groups tried to assess risks associated with the hazardous air pollutant problem area. Reasonably good data exists on emissions, exposures, and effects for some 30 hazardous air pollutants. Health risks from these chemicals could be assessed objectively as moderately high in comparison to other environmental problems. However, there are hundreds or even thousands of potential additional chemicals that could be classified as hazardous air pollutants, for which very limited or no data exist. If the roughly 30 well-understood chemicals constitute a moderately high health risk, how large is the entire hazardous air pollutant problem when the additional chemicals are considered also? Are the 30 chemicals only the tip of the hazardous air pollutant iceberg? Or are the 30 known chemicals far worse than the others (perhaps because EPA has chosen to generate data first on the worst of all the hazardous air pollutants)? The work groups had to use their judgment, informed by widely scattered data, to answer questions like this in assessing the risks due to the entire hazardous air pollutant problem.

In addition to data deficiencies, the work group also had to contend with methodological difficulties. Standard assessment methods existed for cancer health effects and for welfare effects, but new approaches had to be improvised for ecological risks and non-cancer health effects. Difficult questions of ground rules had to be resolved (e.g., should risks that occur far in the future be discounted relative to those occurring today?). Overlaps and inconsistencies were discovered in the list of 31 problem areas (e.g., should leachate from a hazardous waste site that contaminates groundwater used for drinking be

classed as a hazardous waste problem, a drinking water problem, or both?).

Despite the difficulties, participants in the project expressed confidence in their final relative rankings. They believe that there really are substantial differences in risk across major environmental problem areas, and that the relative rankings reflect the gist of these differences. Although the leaps of judgments and manipulation of limited data were initially very disturbing for many of the scientists on the work groups, by the end of the process the participants felt satisfied with the process they had created to rank the problem areas and with the results of the process.

FINDINGS OF THE COMPARATIVE ASSESSMENT PROJECT

The major findings of the project are rankings of the 31 problem areas for each of four types of risk. The rankings are based on risks existing today, assuming that current controls stay in place. We found the following:

- No problems rank relatively high in all four types of risk, or relatively low in all four. Whether an environmental problem appears large or not depends critically on the type of adverse effect with which one is concerned.
- Problems that rank relatively high in three of four risk types, or at least medium in all four include: criteria air pollutants; stratospheric ozone depletion; pesticide residues on food; and other pesticide risks (runoff and air deposition of pesticides).
- Problems that rank relatively high in cancer and non-cancer health risks but low in ecological and welfare risks include: hazardous air pollutants; indoor radon; indoor air pollution other than radon; pesticide application; exposure to consumer products; and worker exposures to chemicals.
- Problems that rank relatively high in ecological and welfare risks, but low in both health risks include: global warming; point and non-point sources of surface water pollution; and physical alteration of aquatic habitats (including estuaries and wetlands) and mining.
- Areas related to groundwater consistently rank medium or low. These include active hazardous waste (RCRA) sites, inactive hazardous waste (Superfund) sites, municipal and industrial non-hazardous waste sites, releases from storage tanks, and other groundwater contamination.

The rankings by risk do not correspond very well with EPA's current program priorities. Areas of relatively high risk but low EPA effort include: indoor radon; indoor air pollution; stratospheric ozone depletion; global warming; pesticides risks; accidental releases of toxics; consumer projects; and

worker exposures. Areas of high EPA effort but relatively medium or low risks include: RCRA sites; Superfund; underground storage tanks; and municipal non-hazardous waste sites.

This divergence between what we found in terms of relative risks and EPA's priorities is not necessarily inappropriate. Some problems appear to pose relatively low risks precisely because of high levels of program effort that have been devoted to controlling them, for example surface water pollution by industry and municipalities. These high levels of attention may remain necessary in order to hold risks to current levels. In other areas, notably those relating to hazardous or solid waste, current risks appear low even without large historical amounts of effort having been devoted to their control.

Overall, EPA's priorities appear more closely aligned with public opinion than with our estimated risks. Recent national polling data rank areas of concern about environmental issues as follows:

- High: chemical waste disposal, water pollution, chemical plant accidents, and air pollution;
- Medium: oil spills, worker exposure, pesticides, and drinking water;
- Low: indoor air pollution, consumer products, radiation (except nuclear power), and global warming.

A final item resulting from the project is the agenda it has given EPA for improving data and methods for performing environmental risk assessments. We have found it impossible to perform this project in a quantitatively rigorous fashion. The best information we have is on the environmental causes of cancer, but it is weak even here. There is a general lack of information on and attention to welfare and ecological effects. Members of both the ecological and the welfare work groups felt that EPA has paid too little attention to these sorts of concerns relative to human health. Exposure data are often poor in all four areas, even in problem areas where major regulatory efforts are under way. No generally accepted methods exist for assessing ecological or non-cancer health effects.

THE IMPACT OF THE STUDY AND THE NEXT STEPS

The CAEP was designed to avoid several of the shortcomings that typify priority-setting at EPA:

- The CRP aimed explicitly to compare environmental problem areas with each other. Problems were not addressed in isolation. Methods were developed and information was obtained specifically to allow relative comparisons of the different problem areas.

- The analysis was not limited to increments or margins. Entire problem areas were compared with each other.
- The analysis focused on the ultimate impacts of environmental problems. Where accepted methods of analysis did not already exist, new methods were developed that allowed participants to focus on these ultimate rather than intermediate impacts.
- The analysis was not constrained by statutory, public, or political pressure. It aimed objectively to assess risks, independently of whether or how those risks ought to be dealt with. It assessed a broad set of problem areas, including several outside of EPA's direct statutory mandates.
- The analysis made maximum use of the expertise and information within the agency. The participants were EPA's best and brightest.

But the project still falls well short of what is needed in theory for a full guide to priority-setting. The CAEP assessed only risks and not potential control actions. Allocation of resources among programs should depend on *both* the possibilities for risk reduction and the costs of achieving it in each area. Absent an investigation of controllability, we cannot be certain that more agency attention to high risk program areas would represent an improvement over the current agency allocation of resources.

Despite not having done an explicit analysis of controllability, we strongly suspect that resource reallocation is desirable toward program areas identified in the CAEP as high risk/low EPA effort. This depends on two propositions. First, we suspect that spending in each program area shows a pattern of declining marginal product; that the first actions undertaken in a program area are the most cost-effective and subsequent actions are progressively less so. Secondly, we suspect that the initial program actions in any high risk program area are in an absolute sense extremely cost-effective, whether or not the area is amenable to traditional regulatory controls. At a minimum, research and development, public education, and legislative development are probably very profitable initial steps. In sum, although we have not done the supporting analysis, we felt that additional (or perhaps even initial) spending in high risk/low effort areas is likely to be more worthwhile than additional spending in low risk/high effort program areas.

Finally, in a practical sense the CAEP does not provide a full guide to priority-setting. Priorities in an administrative agency cannot depend solely on the agency's expert judgment of the cost and benefits of different investment opportunities.

Statutory mandates, public perceptions and political pressures are also critical influences.

The major hope for the study outside of EPA was that it would be viewed as a credible attempt to enhance environmental priority-setting. The specific findings were of concern, but equally important was to prompt a broader and better informed debate (especially in the political arena) about environmental priorities. And, we hoped that the debate would focus heavily on risks and opportunities to reduce risks in different environmental areas.

We believe the process followed by the EPA in its CAEP provides a useful model for other government agencies also. It is desirable for all government agencies to focus their resources efficiently on achieving their fundamental missions. Objective analysis to compare the magnitudes of the problems an agency might deal with, public debate of these findings, and consequent reordering of priorities are important steps toward this goal.