Reducing Risk: Setting Priorities and Strategies for Environmental Protection

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Attached is the executive summary of *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*, a new report prepared by EPA's Science Advisory Board and the subject of EPA Administrator Reilly's speech to the National Press Club today.

Chapter One--Executive Summary

The Concept of Risk

Over the past 20 years this country has put in place extensive and detailed government policies to control a number of environmental problems. Smog in heavily populated areas, the eutrophication of lakes, elevated levels of lead in the blood of millions of children, the threat of cancer from exposure to pesticide residues in food, and abandoned drums of hazardous wastes are a few of the problems that have driven the enactment of more than a dozen major Federal laws and the current public and private expenditure of about $100 billion a year to protect the environment.

Those efforts have led to very real national benefits. The staggering human health and ecological problems apparent throughout eastern Europe suggest the price this country would be paying now had it not invested heavily in pollution controls.

Yet despite the demonstrable success of past national efforts to protect the environment, many national environmental goals still have not been attained. Factors like the growth in automobile use and common agricultural practices have caused national efforts to protect the environment to be less effective than intended.

Furthermore, with hindsight it is clear that in many cases those efforts have been inconsistent, uncoordinated, and thus less effective than they could have been. The fragmentary nature of U.S. environmental policy has been evident in three ways:

- **In Laws.** As different environmental problems were identified, usually because the adverse effects--smog in major cities, lack of aquatic life in stream segments, declining numbers of bald eagles--were readily apparent, new laws were passed to address each new problem. However, the tactics and goals of the different laws were neither consistent nor coordinated, even if the pollutants to be

controlled were the same. Many laws not passed primarily for environmental purposes also had major effects on the environment.

- **In Programs.** The Environmental Protection Agency (EPA) was established as the primary Federal agency responsible for implementing the nation's environmental laws. EPA then evolved an administrative structure wherein each program was primarily responsible for implementing specific laws. Consequently, the efforts of the different programs rarely were coordinated, even if they were attempting to control different aspects of the same environmental problem. This problem is compounded by the fact that EPA is not the only agency whose activities affect the environment.

- **In Tools.** The primary tools used to protect the environment have been controls designed to capture pollutants before they escape from smokestacks, tailpipes, or sewer outfalls, and technologies designed to clean up or destroy pollutants after they have been discharged into the environment. These so-called "end-of-pipe" controls and remediation technologies almost always have been applied because of Federal, State, or local legal requirements.

For a number of reasons, this kind of fragmented approach to protecting the environment will not be as successful in the future as it has been in the past. In this country the most obvious controls already have been applied to the most obvious problems. Yet complex and less obvious environmental problems remain, and the aggregate cost of controlling those problems one-by-one is rising.

Moreover, this country--and the rest of the world--are facing emerging environmental problems of unprecedented scope. Population growth and industrial expansion worldwide are straining global ecosystems. Never before in history have human activities threatened to change atmospheric chemistry to such an extent that global climate patterns were altered.

Given the diversity, complexity, and scope of the environmental problems of concern today, it is critically important that U.S. environmental policy evolves in several fundamental ways. Essentially, national policy affecting the environment must become more integrated and more focused on opportunities for environmental improvement than it has been in the past.

The environment is an interrelated whole, and society's environmental protection efforts should be integrated as well. Integration in this case means that government agencies should assess the range of environmental problems of concern and then target protective efforts at the problems that seem to be the most serious. It means that society should use all the tools--regulatory and non-regulatory

alike--that are available to protect the environment. It means that controlling the end of the pipe where pollutants enter the environment, or remediating problems caused by pollutants after they have entered the environment, is not sufficient. Rather, waste-generating activities have to be modified to minimize the waste or to prevent the waste from being generated at all. Most of all, integration is critically important because significant sources of environmental degradation are embedded in typical day-to-day personal and professional activities, the cumulative effects of which can become serious problems. Thus protecting the environment effectively in the future will require a more broadly conceived strategic approach, one that involves the cooperative efforts of all segments of society.

One tool that can help foster the evolution of an integrated and targeted national environmental policy is the concept of environmental risk. Each environmental problem poses some possibility of harm to human health, the ecology, the economic system, or the quality of human life. That is, each problem poses some environmental risk. Risk assessment is the process by which the form, dimension, and characteristics of that risk are estimated, and risk management is the process by which the risk is reduced.

The concept of environmental risk, together with its related terminology and analytical methodologies, helps people discuss disparate environmental problems with a common language. It allows many environmental problems to be measured and compared in common terms, and it allows different risk reduction options to be evaluated from a common basis. Thus the concept of environmental risk can help the nation develop environmental policies in a consistent and systematic way.

Scientists have made some progress in developing quantitative measures for use in comparing different risks to human health. Given sufficient data, such comparisons are now possible within limits. Although current ability to assess and quantify ecological risks is not as well developed, an increased capacity for comparing different kinds of risks more systematically would help determine which problems are most serious and deserving of the most urgent attention. That capacity would be even more valuable as the number and seriousness of environmental problems competing for attention and resources increase.

An improved ability to compare risks in common terms would have another value as well: it would help society choose more wisely among the range of policy options available for reducing risks. There are a number of ways to reduce the automobile emissions that contribute to urban smog; there are a number of ways to decrease human exposure to lead. The evaluation of relative risks can help identify the relative efficiency and effectiveness of different risk reduction options.

There are heavy costs involved if society fails to set environmental priorities based on risk. If finite resources are expended on lower-priority problems at the expense of higher-priority risks, then society will face needlessly high risks. If priorities are established based on the greatest opportunities to reduce risk, total risk will be reduced in a more efficient way, lessening threats to both public health and local and global ecosystems.

The Traditional Role of the Environmental Protection Agency

For the past 20 years, EPA has been basically a "reactive" agency. As environmental problems were identified, the public conveyed its concern to Congress, and Congress passed laws to try to solve the problems within some, often well-defined, timeframe. EPA then implemented the laws using the resources--budget and staff-- allocated by Congress.

Consequently, EPA has seen its missions largely as managing the reduction of pollution and, in particular, only that pollution that is defined in the laws that it administers. EPA's internal programmatic structure mirrors the environmental legislation that is required to implement. Moreover, the tools EPA traditionally has used to reduce pollution have been limited, in general, to the emissions controls it could force polluters to apply through regulatory action.

This reactive mode, although understandable when seen in its historical context, has limited the efficiency and effectiveness of EPA's environmental protection efforts. Because of EPA's tendency to react to environmental problems defined in specific environmental laws, the Agency has made little effort to compare the relative seriousness of different problems. Moreover, the Agency has made very little effort to anticipate environmental problems or to take preemptive actions that reduce the likelihood of an environmental problem occurring.

Because most of EPA's program offices have been responsible for implementing specific laws, they have tended to view environmental problems separately; each program office has been concerned primarily with those problems that it has been mandated to remediate, and questions of relative seriousness or urgency generally have remained unasked. Consequently, at EPA there has been little correlation between the relative resources dedicated to different environmental problems and the relative risks posed by those problems.

Unfinished Business

The Environmental Protection Agency squarely faced the question of relative risk for the first time when it established an Agency task force to assess and compare the risks associated with a range of environmental problems. In 1986 and 1987, about 75 senior career managers and staff compared the relative risks posed by 31 environmental problems within four broad categories of risk: 1) human cancer risk, 2) human non-cancer health risk, 3) ecological risk, and 4) welfare risk. The task force limited its comparison to those risks that remain after currently-required controls have been applied (i.e., residual risks). The results of this effort were presented in *Unfinished Business: A Comparative Assessment of Environmental Problems*.

Unfinished Business was a landmark study. For the first time, the many environmental problems of concern to EPA were compared to each other in a non-programmatic context. Moreover, the report explicitly pointed out the disparity between residual risk and resource allocation at EPA. The problems

that the authors judged to pose the most serious risks were not necessarily the problems that Congress and EPA had targeted for the most aggressive action.

However, the report did find a correlation between EPA's programmatic priorities and the apparent public perceptions of risk. That is, Congress and the Agency were paying the most attention to environmental problems that the general public believed posed the greatest risks.

The authors of *Unfinished Business* recognized that their risk rankings, while based on the judgments of experienced professionals, were limited, since they were based on incomplete data and novel risk comparison techniques. But the value of the report, then and now, rests not so much on the accuracy of the rankings but on the fact that EPA had begun to see the long-term public policy importance of understanding relative risks. In short, *Unfinished Business* was yet another sign that the nation as a whole, and EPA in particular, could not continue "business-as-usual" in the face of the environmental risks of the 1990s and beyond.

The Relative Risk Reduction Strategies Committee

Shortly after he took early in 1989, EPA Administrator William K. Reilly asked the Science Advisory Board (SAB) to review EPA's 1987 report on relative environmental risk, *Unfinished Business*, evaluate its findings, and develop strategic options for reducing risk. In response to that request, the SAB formed a special committee, the Relative Risk Reduction Strategies Committee (RRRSC), which in turn was divided into three Subcommittees: the Ecology and Welfare Subcommittee, the Human Health Subcommittee, and the Strategic Options Subcommittee.

The Relative Risk Reduction Strategies Committee was co-chaired by Dr. Raymond C. Loehr, Chairman of the SAB and professor at the University of Texas, and Mr. Jonathan Lash, Secretary of the State of Vermont's Agency of Natural Resources. The Ecology and Welfare Subcommittee was chaired by Dr. William Cooper of Michigan State University; the Human Health Subcommittee was chaired by Dr. Arthur Upton of the Institute of Environmental Medicine, New York University Medical Center; and the Strategic Options Subcommittee was chaired by Mr. Alvin Alm of Science Applications International Corporation.

The 39 members of the RRRSC and its Subcommittees were nationally-recognized scientists, engineers, and managers with broad experience in addressing environmental and health issues. Their names and professional affiliations are listed at the front of this overview report.

Through its combined efforts the RRRSC attempted to achieve four objectives:

1. Critically review *Unfinished Business*, reflecting any significant new information that bears on the evaluation of risks associated with specific environmental problems.

2. To the extent possible, merge the evaluations of 1) cancer and non-cancer risks and 2) ecological and welfare risks.

3. Provide optional strategies for reducing the major environmental risks.

4. Develop a long-term strategy for improving the methodology for assessing and ranking environmental risks and for assessing the alternative strategies that can reduce risks.

In particular, the Ecology and Welfare Subcommittee and the Human Health Subcommittee were charged with reviewing and updating the risk findings from *Unfinished Business*. Those two Subcommittees were to provide, to the extent possible, a single aggregate ranking of the risks that each Subcommittee assessed, and recommend a long-term strategy for improving the methodology for assessing such risks. The Strategic Options Subcommittee was charged with 1) identifying strategy options for reducing residual environmental risks, and 2) developing and demonstrating analytical methodologies for identifying and selecting risk reduction options.

The RRRSC began planning its work in the spring of 1989, and it held its first meeting in September 1989. In all, the Committee and its three Subcommittees held twelve public meeings and three working sessions.

The RRRSC has conducted a lengthy review of the data and methodologies that support risk assessment, comparison, and reduction today. This review of environmental risk has led to several conclusions about the need for and value of comparative risk assessments and their implications for the national environmental agenda.

This overview report highlights the most important findings and recommendations from the three Subcommittee reports, along with insights derived from discussions among the Committee members after they reviewed the Subcommittee reports. The full reports of the three Subcommittees are included as appendices to this report (see inside back cover) and should be referred to for important additional information and detailed support for the contents of this overview report.

The RRRSC recognizes that this overview report and its appendices contain policy-oriented findings and recommendations that are outside the normal scope of SAB purview. But in this case the EPA Administrator explicitly asked the SAB to review, from a technical and scientific perspective, the optional strategies available for reducing risk. Thus this report includes recommendations on approaches to risk management and on the future direction of national environmental policy. However, nothing in this report or its appendices should be construed as an SAB recommendation for a specific policy option to be used to reduce a specific environmental risk.

The Ten Recommendations

1. **EPA should target its environmental protection efforts on the basis of opportunities for the greatest risk reduction.** Since this country already has taken the most obvious actions to address the most obvious environmental problems, EPA needs to set priorities for future actions so the Agency takes advantage of the best opportunities for reducing the most serious remaining risks.

2. **EPA should attach as much importance to reducing ecological risk as it does to reducing human health risk.** Because productive natural ecosystems are essential to human health and to sustainable, long-term economic growth, and because they are intrinsically valuable in their own right, EPA should be as concerned about protecting ecosystems as it is about protecting human health.

3. **EPA should improve the data and analytical methodologies that support the assessment, comparison, and reduction of different environmental risks.** Although setting priorities for national environmental protection efforts always will involve subjective judgments and uncertainty, EPA should work continually to improve the scientific data and analytical methodologies that underpin those judgments and help reduce their uncertainty.

4. **EPA should reflect risk-based priorities in its strategic planning processes.** The Agency's long-range plans should be driven not so much by past risk reduction efforts, or by existing programmatic structures, but by ongoing assessments of remaining environmental risks, the explicit comparison of those risks, and the analysis of opportunities available for reducing risks.

5. **EPA should reflect risk-based priorities in its budget process.** Although EPA's budget priorities are determined to a large extent by the different environmental laws that the Agency implements, it should use whatever discretion it has to focus budget resources at those environmental problems that pose the most serious risks.

6. **EPA--and the nation as a whole--should make greater use of all the tools available to reduce risk.** Although the nation has had substantial success in reducing environmental risks through the

use of government-mandated end-of-pipe controls, the extent and complexity of future risks will necessitate the use of a much broader array of tools, including market incentives and information.

7. **EPA should emphasize pollution prevention as the preferred option for reducing risk.** By encouraging actions that prevent pollution from being generated in the first place, EPA will help reduce the costs, intermedia transfers of pollution, and residual risks so often associated with end-of-pipe controls.

8. **EPA should increase its efforts to integrate environmental considerations into broader aspects of public policy in a s fundamental a manner as are economic concerns.** Other Federal agencies often affect the quality of the environment, e.g., through the implementation of tax, energy, agricultural, and international policy, and EPA should work to ensure that environmental considerations are integrated, where appropriate, into the policy deliberations of such agencies.

9. **EPA should work to improve public understanding of environmental risks and train a professional workforce to help reduce them.** The improved environmental literacy of the general public, together with an expanded and better-trained technical workforce, will be essential to the nation's success at reducing environmental risks in the future.

10. **EPA should develop improved analytical methods to value natural resources and to account for long-term environmental effects in its economic analyses.** Because traditional methods of economic analysis tend to undervalue ecological resources and fail to treat adequately questions of intergenerational equity, EPA should develop and implement innovative approaches to economic analysis that will address these shortcomings.