

CAN COMPARATIVE RISK BE USED TO DEVELOP BETTER ENVIRONMENTAL DECISIONS?

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I. INTRODUCTION

For at least the past ten years, a great deal of paper and time have been sacrificed to promote the idea of using more risk in developing environmental decisions.¹ In addition, thousands of people have actually attempted to apply these ideas through the use of risk assessment information in comparative risk projects. It is now time to determine whether the discussions promoting the use of more risk are consistent with the findings of those that have tried to use risk. As such, I hope to clarify in this paper the use of comparative risk as a tool for environmental management. This article is based on a set of experiences gained in EPA-sponsored state and local comparative risk projects.

II. WHY COMPARE RISKS?

The ultimate question that we must address regarding comparative risk is the following: Can comparative risk be used to develop better environmental decisions? This question contains terms that still need to be defined. Therefore, in an attempt to focus upon these issues, I would like to identify some specific “decisions” within the realm of the “environment” which will prove to be helpful in exploring the role of “comparative risk.”

1. *The decision to impose a certain regulatory limit on the level of atrazine in drinking water.* A comparison of the atrazine risk with other environmental risks provides a perspective with which to make regulatory decisions. From this perspective, for example, we perceive that the resolution of such a regulatory issue requires an answer to two questions: (1) what is the nature of the risk, in terms of the probability of a negative health outcome, that results from exposure to a

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1. OFFICE OF POLICY ANALYSIS, U.S. ENVTL. PROTECTION AGENCY, UNFINISHED BUSINESS: A COMPARATIVE ASSESSMENT OF ENVIRONMENTAL PROBLEMS (1987); RESOURCES FOR THE FUTURE, WORST THINGS FIRST: THE DEBATE OVER RISK-BASED NATIONAL ENVIRONMENTAL PRIORITIES (Adam M. Finkel & Dominic Golding eds., 1994).

certain level of the contaminant; and (2) how much will it cost to reduce the contaminant to a lower level. Risk assessment and cost-benefit analysis, the merits of which have recently been debated in Congress, respectively comprise our current analytical devices to grapple with these questions.²

2. *The decision to clean up a Superfund site.* Superfund sites raise a wide array of issues regarding the measurement of risk. In addition to such concerns as harm or potential harm to ecosystems and property values, the related matter of liability broadens the parameters for determining remediation.

3. *The decision to focus budgetary resources upon a high risk area.* Habitat loss or chemical contamination as a target? Air or water as a medium? A problem generally held to be within the government's responsibility or a problem many consider to be a personal lifestyle choice? Clearly the process of prioritizing risks expands the range of issues to be confronted.

4. *The decision to disseminate the results of risk assessment comparisons to the public.* It is important to recognize that many people consider the exercise of comparing risks to be an opportunity to inform the public so that political pressures can be focused on "the right risks."

5. *The decision to inform leaders and stakeholders of the magnitude of the problems and the range of the solutions that might be implemented.* Such an arrangement removes specific decisions as an endpoint to the process, which decreases the potential for polarized argument but also raises the possibility of disintegrating the focus of the analysis.

While the above-listed decisions are possible arenas for comparative risk, our experience suggests that only a subset of these decisions have so far been entertained within comparative risk projects. In the first example, the specific risks of atrazine in drinking water can be characterized and compared with other risks, such as the risks from cigarette smoking or driving without a seatbelt, but the actual decision of regulating the contaminant is not linked to these other issues. The regulations come from both statutory language and the precedent of the last three decades of implementation of the Safe Drinking Water Act.³ This Act does not allow for a comparing of

2. S. 110, 103d Cong. (1993); H.R. 4306, 103d Cong. (1994); H.R. 3425, 103d Cong. (1993); H.R. 3111, 103d Cong. (1993); H.R. 2910, 103d Cong., (1993).

3. The Safe Drinking Water Act of 1974, 42 U.S.C. §§ 300f - 300j-26 (1994).

risks, but rather requires that standards be set to protect human health without clarifying the degree of protection. Superfund site clean-up is also directed to some extent by the statutes which provide for federal authority but which also allow for the consideration of local conditions, costs of clean-up, and the laws of local jurisdictions. However, the clean-up of a site is dependant upon the liability of responsible parties so that the comparison of risks between a particular site and an environmental hazard unassociated with the liable parties is outside the guidelines and intent of the law. While these legal circumstances do not necessarily preclude the use of comparative risk, experience to date gives no examples from which to inform this discussion.

Unlike the atrazine and Superfund matters, the latter three decisions fall within the realistic potential for comparative risk projects as they are being carried out currently at the state and local level. However, while these examples provide a flavor for the wide range of decisions or activities to which comparative risk can be developed, no single project can accomplish multiple primary objectives. Therefore, it is essential that project goals are carefully chosen and clearly articulated by comparative risk projects' participants and sponsors.

The remainder of the article will link process questions and project results back to the specific objectives that particular projects are directed towards.

III. COMPARATIVE RISK FOR PRIORITY SETTING

The primary objective most often linked to comparative risk projects is the ability to set priorities. Comparative risk discussions in Congress, in the upper levels of environmental agencies, and in the private sector are often based on the premise that resource allocation should be prioritized according to the aggregate level of risk.⁴ Many people feel that this type of prioritization will influence agency decision-makers to allocate their budgetary and staff resources in the most efficient manner. It is this objective that draws so many participants into the process.

In developing the process for using comparative risk to set priorities, two significant challenges arise: (1) developing a comprehensive set of criteria for prioritization; and (2) overcoming the momentum established by pre-existing priority-setting activities. Most

4. RESOURCES FOR THE FUTURE, COMPARING ENVIRONMENTAL RISKS: TOOLS FOR SETTING GOVERNMENT PRIORITIES (J. Clarence Davies ed., 1996).

comparative risk projects recognize the need to expand the analysis beyond the considerations of risk. The standard refrain is that priority-setting requires more than just the comparison of risks. For example, the Summary Report of the California Comparative Risk Project includes a statement from the Statewide Community Advisory Committee which emphasizes that "Risk-based rankings of environmental topic areas are valuable and should be used for priority-setting in conjunction with other factors. Factors in addition to risk that need to be incorporated into decision-making include, but are not limited to, economics, public input, potential for pollution prevention, need to address the existence of disparate impacts on different populations, and emergence of future risks."⁵ The letter from Natural Resources Secretary Jan Eastman introducing Vermont's comparative risk report carries a similar message: "As the Advisory Committee recommends, risk reduction should be one of several criteria used for setting policy."⁶ The consideration of the feasibility of response and associated costs, however, is not included in the risk ranking phase of a comparative risk project (as described below). The typical comparative risk project plans to consider these criteria in a second phase of analysis. However, these second analytic processes have not been as rigorous as the initial risk analysis. Therefore, the completion of the priority-setting exercise is usually abandoned because information from the second phase of the project is necessary but lacking in the risk ranking.

The abandonment of the analysis of the feasibility and costs of managing risks could be a function of the second challenge facing priority-setting, that other efforts are continuously underway which result in the setting of the actual priorities for an environmental agency. For example, the legislative budgeting process often leads to the effective prioritization of agency activities. Furthermore, internal processes within each agency can lead to different levels of activity between solid waste, air, water, hazardous waste, habitat protection, endangered species, and other agency programs. These agency programs are the direct result of historical decisions regarding both program scope and design. Since the scope and design analyses were largely made independent from one another, there is no mechanism in place to encourage the shifting of resources between them. Com-

5. CALIFORNIA COMPARATIVE RISK PROJECT, TOWARD THE 21ST CENTURY: PLANNING FOR THE PROTECTION OF CALIFORNIA'S ENVIRONMENT, FINAL REPORT 50 (1994).

6. PUBLIC ADVISORY COMMITTEE, VERMONT AGENCY OF NATURAL RESOURCES, ENVIRONMENT 1991: RISKS TO VERMONT AND VERMONTERS (1991).

parative risk projects typically cannot bring together enough political power to overcome all of that historical baggage. Nonetheless, in a few rare cases, such as the State of Washington⁷ and the City of Seattle⁸, agency leadership used their political capital to adjust agency priorities in the wake of comparative risk projects. Even in these cases, however, the shifting of resources from an issue posing low risks to one posing high risks did not occur.

Two recent comparative risk projects show a closer fit to the ideal priority-setting exercise. These projects are taking place in Northeast Ohio⁹ and in the Elizabeth River area of Virginia¹⁰. In the Northeast Ohio project, the risk ranking was followed by a discussion about which issues presented an opportunity for realigning the priorities, which were identified as those issues that did not have any existing government agencies taking the lead. Such an approach is quite unlike actions proposed by projects hosted by environmental agencies whose responsibilities for action are dictated by legislative bodies. In the Elizabeth River project, the clean-up of the river was the focus and sole objective throughout the project duration.¹¹ Therefore, the choice of strategies to accomplish the clean-up was focused upon a narrow range of possibilities. It is important to note that in both cases the projects were not hosted by environmental agencies with pre-existing priorities. These two projects suggest that comparative risk can be a part of a priority setting exercise. However, they do not provide much guidance to environmental agencies that have a wide range of responsibilities and are searching for a way to strengthen environmental programs by shifting resources from programs addressing lower risk problems.¹²

7. WASHINGTON ENVIRONMENT 2010, TOWARD 2010: AN ENVIRONMENTAL ACTION AGENDA 2-3, 8 (July 1990).

8. THE CITY OF SEATTLE'S ENVIRONMENTAL ACTION AGENDA, ENVIRONMENTAL STEWARDSHIP IN SEATTLE (October 1992).

9. CASE WESTERN RESERVE UNIV. CENTER FOR THE ENVIRONMENT, THE REGIONAL ENVIRONMENT PRIORITIES PROJECT, IN OHIO STATE OF THE ENVIRONMENT REPORT 407 (1995).

10. THE ELIZABETH RIVER PROJECT, ELIZABETH RIVER RESTORATION, EXECUTIVE SUMMARY (1996).

11. *See id.* at 1.

12. At a recent meeting of comparative risk project managers, the issue of priority setting was discussed. This group agreed that priorities as described by shifting resources from one program to another is not the objective of most comparative risk projects. However, this group did identify that comparative risk has been used to focus attention on particular issues - another way of thinking about priorities. JOANNE DEA & SUSAN THOMAS, GREEN MOUNTAIN INSTITUTE FOR ENVIRONMENTAL DEMOCRACY, BUILDING A FOUNDATION FOR CHANGE: OPPORTUNITIES AND CHALLENGES IN STATE COMPARATIVE RISK PROJECTS (1997).

IV. BEYOND PRIORITIZATION

Though comparative risk projects may not be directly successful at setting priorities for environmental agencies, they accomplish other important objectives. One such objective is assisting in the long-term efforts to shift resources to higher risk problems. Another possible objective is informing the public about the project results to enhance their understanding of relative risks. However, actual change in the public sector will normally only occur among those who are active in the development and discussion of the risk analysis. This issue will be addressed in more detail in a subsequent section of this article. Probably the most significant results from comparative risk projects include the education of, and the formation of a dialogue between, stakeholders concerning the subject of environmental harm. Such change provides a foundation for enhanced discussions in a wide variety of decision-making arenas (e.g., legislative budget discussions or internal agency planning processes). Beyond priority setting, the development of informed dialogue has led to more easily observable short term results.

V. HOW TO COMPARE RISKS

There is a four-step fundamental “how to” for comparing risks: (1) sharply defining the problem or problems that pose the risks; (2) articulating the values that should serve as criteria for analysis; (3) using technical expertise to evaluate each problem against those criteria; and (4) combining the results for each criteria into a single metric so that two problems or outcomes can be ranked or “compared.” The value of the outcome of any comparison of risks rests on the strength of these four steps. The process used to develop each of these four steps varies with each comparative risk project, but those variations can be categorized based on answers to a series of questions. These questions relate to the overall structure of the project.

- Who designs and implements each of the four steps?
- Who carries out the analysis?
- What is the role of science, scientists, and the public in the process?

After these questions are addressed, questions related to the four steps of the risk comparison process fine tune the project.

- How is the problem list designed and who is involved?
- How are the criteria developed and translated for the analysts?
- How are the criteria translated in the analysis to yield the technical reports?
- How is the technical information processed to yield a ranking?

There is discussion in academic circles regarding the answers to each of these questions.¹³ However, it is my experience in observing comparative risk projects that the utility of any comparative risk process is more dependent on the inclusiveness of participants than on the technical validity of the ranking scheme. For this reason, comparative risk projects should rely on extensive process in defining a problem list, identifying criteria for evaluation, instructing technical experts as to how to carry out the analysis, and actually carrying out a risk ranking. If the objective is to introduce scientific information into the decision-making process, those who are charged with making the decisions must first be willing to consider the information. As such, it is important to recognize that if a highly technical process is the mechanism for communicating the risk information, and the decision-makers were not involved with the development of this process, there is a possibility that the information will not be used.

Traditional risk assessments for regulatory purposes (such as the atrazine and Superfund decisions) are usually conducted by technical staff from environmental agencies who follow prescribed steps for determining the analytic variables of exposure and toxicity. While discussions focusing on the details of these steps receive a great deal of attention, they are not part of the focus in comparative risk projects. However, as an issue and/or audience becomes broader, both the range of expertise and the complexity of carrying out and reporting the analysis expands. For example, when considering issues such as solid waste management or criteria air pollutants, there is a broad range of exposures from the potential pollutants. With issues such as habitat alteration or global climate change, even broader questions of biodiversity, geographic extent, and reversibility of impact will lead to far different analyses than will an issue such as a simple increase in frequency of a single human health endpoint.

13. *See id.*

Though comparing risks so diverse as global climate change and solid waste management can be daunting to even the most learned technical experts, state and local comparative risk projects have successfully carried out the comparisons.¹⁴ The mechanism with which such complex issues have been successfully addressed includes a series of questions which help participants to contemplate the issues objectively while at the same time allowing for the incorporation of those participants' values. Some examples of the questions to consider for the analysis and ranking are included below:

- Do you consider risks to the general population?
- Do you consider risks to specific sub-populations? Which sub-populations?
- Do you report risk assessment calculations as traditionally done?
- Do you include a range of assessments dependent upon the assumptions?
- Do you differentiate different health endpoints? Skin cancer v. lung cancer; Glaucoma v. skin rash v. developmental problems; Effects to the older age populations v. the young
- Do impacts which cause a shift in species composition pose greater risk than impacts which affect the population of a single species?
- Do impacts which have intense local effects pose greater risk than those which have a greater geographic distribution but less severe impacts?
- Do impacts which cause a decrease in tourism dollars pose greater risk than those which displace resource dependent jobs?

In order to understand the range of project types, I will briefly outline four projects and their structures which provide different answers to the questions raised above.

14. See, e.g., TOWARD THE 21ST CENTURY: PLANNING FOR THE PROTECTION OF CALIFORNIA'S ENVIRONMENT, *supra* note 5; ELIZABETH RIVER RESTORATION, *supra* note 10; CONSENSUS RANKING OF ENVIRONMENTAL RISKS FACING MAINE, *infra* note 15; MICHIGAN'S ENVIRONMENT AND RELATIVE RISK, *infra* note 16; RECOMMENDATIONS TO REDUCE ENVIRONMENTAL RISK IN OHIO, *infra* note 17.

*Maine Environmental Priorities Project*¹⁵

In the case of the Maine Environmental Priorities Project, a group of representatives from industry, environmental groups, community groups, and government labored for three years to work out each of the steps of a comparative risk ranking. This Steering Committee selected the technical work group members, defined the problems to be analyzed, developed and carried out the risk ranking, and edited the wording in the final report. As an example of the effort involved in developing the risk ranking process, a subcommittee worked for six months, first testing a few approaches with the full Steering Committee and then designing the schedule for a two day retreat. Even with this extensive preparation, the ranking process was overhauled within three hours of the first day.

*Michigan*¹⁶

In contrast to Maine, the Michigan comparative risk project was a much quicker and less complex process. A consulting firm coordinated the activities of a Scientist Committee, a Citizens Committee, and an Agency Committee. The Scientist Committee members produced their White Papers without extensive public committee meetings and the subsequent risk ranking took place without extensive discussion regarding the process within the other committees. However, through the work of Task Forces more time has been invested in developing which strategies to pursue after the risk ranking.

*Ohio*¹⁷

As a mix of the Maine and Michigan processes, the management of the Ohio project used a Public Advisory Committee to provide some of the guidance for the analysis and ranking phase. Similarly, the technical analysis was carried out by a mix of agency staff and private sector experts. As the date of the ranking approached, the Advisory Committee focused greater effort on the plan for their ranking. It first established specific criteria for the ranking of the

15. MAINE ENVIRONMENT PRIORITIES PROJECT, CONSENSUS RANKING OF ENVIRONMENTAL RISKS FACING MAINE, REPORT FROM THE STEERING COMMITTEE (JANUARY 1996).

16. MICHIGAN DEPARTMENT OF NATURAL RESOURCES, MICHIGAN'S ENVIRONMENT AND RELATIVE RISK, MICHIGAN RELATIVE RISK ANALYSIS PROJECT 5-8 (JULY 1992).

17. OHIO COMPARATIVE RISK PROJECT, RECOMMENDATIONS TO REDUCE ENVIRONMENTAL RISK IN OHIO, REPORT FROM PHASE 2 OF THE OHIO COMPARATIVE RISK PROJECT i-ii, 1 (DECEMBER 1995).

human health, ecosystem, and quality-of-life technical issues, then additional framework was established for integrating the individual rankings. A draft ranking resulted which was then open for public review. Comments from this review provided a basis for the Advisory Committee to re-evaluate some of its criteria for ranking, which resulted in an amended final ranking result.

*California*¹⁸

At the outset, some participants in the California Comparative Risk project were skeptical about the concept of comparative risk. Therefore, an extensive effort was undertaken to identify other elements of analysis that could enhance the comparison of risks. Thus, in addition to a risk ranking team, California established groups to look into Environmental Justice, Economic Analysis, and Environmental Education as alternatives to risk ranking. The technical analysis from the collaborative risk ranking phase of the project was one of the most extensive analytic processes carried out to date. Unfortunately, the Statewide Community Advisory Committee has not had the opportunity to fully review the efforts of the technical teams and no risk ranking or follow up to the analysis has taken place.

VI. SPECIFIC PROJECT RESULTS

As previously noted, a comparative risk ranking does not necessarily result in a noticeable shift in agency resources. However, there are numerous examples of risk rankings where such a shift occurred. For example, in the Maine Environmental Priorities Project ("MEPP"), several activities involving Steering Committee members are currently being conducted.¹⁹ In one such activity, MEPP is participating in the design of an alternative to a referendum banning clear cutting as a forestry practice. Governor King specifically requested that a collaborative process be employed to develop the proposal, and overall participation in the activity was further enhanced due to the experiences gained during the MEPP process. Similarly, Ohio Governor Voinovich decided to direct \$500,000 to Environmental Education in order to utilize the results of the comparative risk project.²⁰ In Colorado, the Department of Health continues to

18. See *generally* TOWARD THE 21ST CENTURY: PLANNING FOR THE PROTECTION OF CALIFORNIA'S ENVIRONMENT, *supra* note 5.

19. See CONSENSUS RANKING OF ENVIRONMENTAL RISKS FACING MAINE, *supra* note 15.

20. See *generally* RECOMMENDATIONS TO REDUCE ENVIRONMENTAL RISK IN OHIO, *supra* note 17.

use the results of its 1990 project to provide strategic guidance.²¹ In Virginia, the Elizabeth River Project (Norfolk, VA) used a comparative risk ranking process to develop and integrate information in pursuit of management strategies to enhance protection efforts.²² After the risk ranking was completed, many of the participants worked with project staff and government representatives to explore possible management strategies. Publicity from the project raised the visibility of the project and the community's interest in seeing action. As a result, products of the project include a study by the Army Corps of Engineers, a University of Virginia field test of a bioremediation process for sediments, a wetland restoration project coordinated through the City of Norfolk, and Virginia DEC enhanced monitoring capabilities. Finally, the Program for the Environment at Case Western Reserve University coordinated a comparative risk project for the 4-county area surrounding Cleveland, OH.²³ As with the Elizabeth River Project, the risk ranking followed a standard model of technical information which had been used as a basis for public discussions. The risk ranking then served as the starting point for the development of appropriate activities for the project to participate in. As discussed earlier, the chief criterion for selecting these activities was the absence of existing coordinating bodies. All of these examples, in the aggregate, demonstrate the wide range of responses that can be effected by the collaborative assessment process of comparative risk.

VII. GENERAL PROJECT RESULTS

A. *Rankings*

As priorities are not the impetus of comparative risk projects, rankings are not necessarily the most substantive result. In fact, rankings typically contain very strong caveats regarding their ultimate use and interpretation. In addition, a review of the rankings from different projects does not yield any dramatic trends. Therefore, it is probably inappropriate to draw conclusions from the collected rankings of the different projects.

21. OFFICE OF HEALTH AND ENVIRONMENTAL PROTECTION, COLORADO DEPARTMENT OF HEALTH, ACTION PLAN (1991); MULTI-MEDIA FOCAL GROUP, COLORADO ENVIRONMENT 2000, PROGRESS REPORT (APRIL 1993).

22. See ELIZABETH RIVER RESTORATION, *supra* note 10.

23. See THE REGIONAL ENVIRONMENT PRIORITIES PROJECT, *supra* note 9.

B. *Partnerships/Cooperation*

Many participants are surprised with the level of cooperation that is developed through a comparative risk project. The specific project results described above demonstrate the range of efforts that can be effected by participation in the comparative risk process.

C. *Changing perceptions*

Evidence that information changes people's perceptions and/or opinions is not widely available for many policy issues. Very few comparative risk projects measure the change in opinion; however, in at least one case, the change in opinion about relative risk is well documented. Prior to carrying out a structured risk ranking process, this comparative risk project in Vermont, "Environment 1991," polled the public about the relative risk of a range of issues.²⁴ The results of the poll are noticeably different from the risk ranking results developed by the project's Public Advisory Committee. While this is an isolated example, staff members of the Green Mountain Institute interviewed project participants in numerous states and the results indicate that the shift may be typical for all or most comparative risk projects. However, it should be noted that a high level of participation in the projects is required to have observable shifts in perception. Thus, members of the public exposed to only the results of a ranking may not show any significant change in perception.

D. *Accessible information*

The development of technical reports that present information in a consistent framework results in more accessible information than is typically available from environmental agencies. Each project develops a series of technical reports, the sum of which often runs in the hundreds of pages. However, these technical reports are typically used for the risk ranking and therefore the information within them is more readily accessible to a non-technical audience. In addition, most projects summarize these results in a more readable publication.

24. See ENVIRONMENT 1991: RISKS TO VERMONT AND VERMONTERS, *supra* note 6.

VIII. CONCLUSIONS

The significance of comparative risk may have more clarity after considering the process and results of actual projects. I suggest the following working definition: *Comparative risk is a dialogue between those who have information about the environment and those who make decisions.* Note that this definition does not include a sharp delineation of the decisions that can be affected. This is intended to preclude the exclusive use of comparative risk as a priority setting exercise and to embrace the possibility that comparative risk may serve as a foundation for a wide range of decisions. Referring to the original five options for using comparative risk, this definition allows for a wide array of decisions, including regulations regarding pollutant levels, Superfund cleanups, priority setting, education, and building collaborative processes. However, existing bureaucratic systems appear to preclude the use of any new process in projects already underway. Therefore, most of the effort in comparative risk projects is intended to inform participants of environmental decisions and develop a collaborative assessment process to ensure broader participation in future decisions (if the bureaucracies are ready for that participation).

Additionally, the experience gained from comparative risk should prove useful when developing a cost-benefit analysis aimed at decision-making. Specifically, the fact that comparative risk relies heavily on a collaborative process for structuring the analysis and processing the information necessitates that the results from that analysis will be important to those who are considering how to structure the analysis for cost-benefit. Furthermore, detailing the structure of either comparative risk or cost-benefit in the absence of broad participation will probably yield an academic or advocates' analysis rather than an analysis that addresses the values of a broad audience.

Comparative risk could also be useful in broadening the values of strict analytical processes when those processes seem to yield results promoting a particular policy position. For example, a revision of risk assessment assumptions that reduces the calculated risk from exposure to a pollutant is often cited as a preferable analysis by those interested in relaxing regulations. The use of comparative risk to consider a wider range of issues, such as global climate change and pesticide use, precludes the identification of polarized positions and allows for dialogue about the different values at risk. Furthermore, it is my strong opinion, based on the observation of several compara-

tive risk projects, that strengthening comparative risk is better accomplished through enhancing the process of information exchange rather than utilizing a technical model for comparing quantitative information.

Finally, human nature dictates that people who invest a large amount of time and energy to a cause demand results. As such, my experience over the past seven years in comparative risk leads me to the conclusion that collaborative decision processes are the key to moving beyond the rigid structure of current bureaucratic decision processes.