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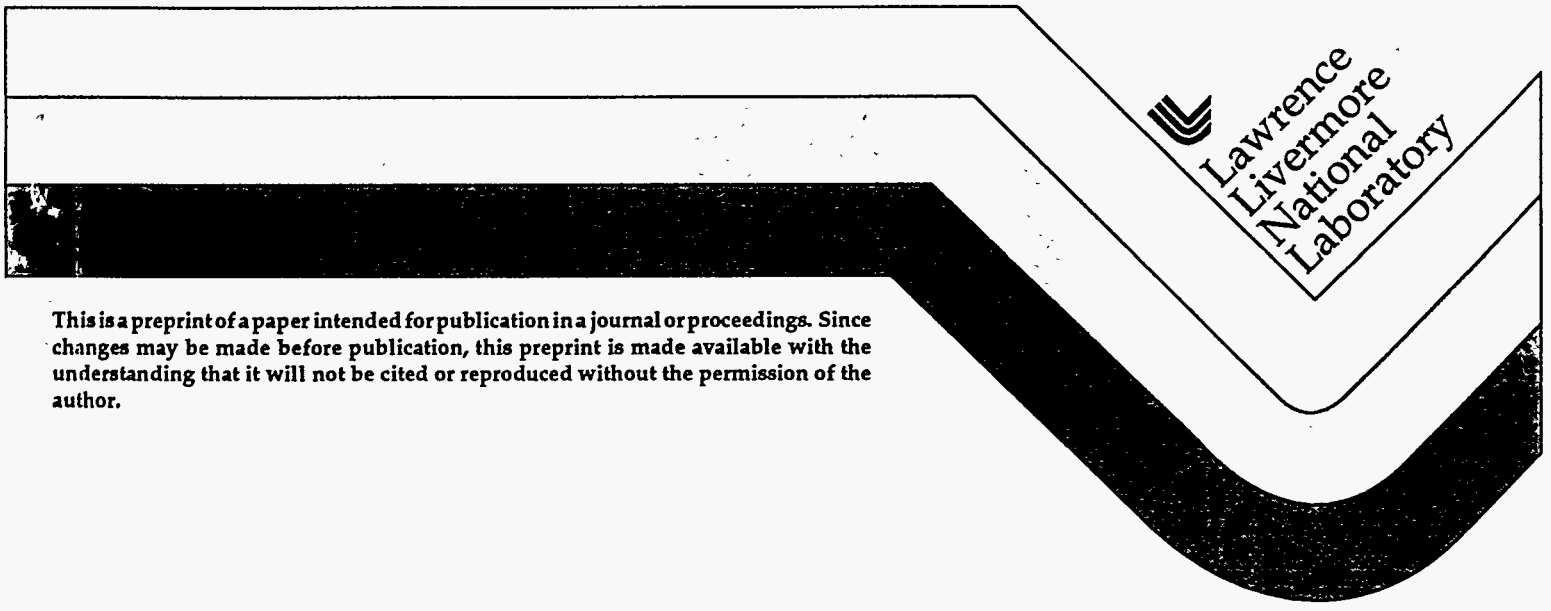

DISCLAIMER

Risk Management Considerations for Cost-Effective Environmental Decisionmaking*

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Background

Scientific publications and media reports continually remind us about the environmental hazards that surround us. We are appraised of the environmental legacies left by chemical industries, the defense complex, and even our local dry cleaning establishments. Governmental regulations have dictated that industry provide detailed listings of their input materials, wastes, and emissions to the public and perform risk assessments to demonstrate compliance with standards. These regulations were designed to make industry more accountable and to give the public information that would allow them to understand risks and either work for change or accept their living conditions. This process would appear to be rational, fair, and acceptable to both industry and the public. However, our inability to reach agreement on questions such as "How Clean is Clean?" or "Is it Safe?" after more than ten years of scientific and public discussions, coupled with the frequency of environmental demonstrations throughout the world, serves as evidence that "acceptable risk" has not yet been defined.

Risk Assessment Defined

Risk assessment is a risk management tool that scientists and government officials use to estimate the increased risk of health problems in people who are exposed to varying amounts of harmful substances. According to the U.S. Environmental Protection Agency, risk assessment is a four step process involving (1) hazard identification, (2) exposure assessment, (3) dose-response assessment, and (4) risk characterization.[1] Hazard identification involves reviewing and analyzing health effects data and studies to determine

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what health problems are caused by a substance. An exposure assessment estimates the magnitude, frequency, duration, and route of exposure, and a dose-response assessment estimates the incidence of health problems at different exposures. The risk characterization uses the dose-response and exposure assessments to describe the type and size of any increased risk expected as a result of exposure to a harmful substance.

Risk Assessment Limitations

In recent years, risk estimates derived from risk assessments have been used to set regulatory requirements in the U.S. This has led to complaints from industry because such requirements are projected to cost them $185 billion by the year 2000.[2]

In theory, assessing the risks of activities to determine potential environmental consequences is a good one. However, there are limitations associated with basing decisions strictly on a risk assessment conclusions. These include:

- Absence of human effects data - data from studies of a substance's effect on animals may or may not accurately predict its effect on humans.

- Bias - without concrete scientific evidence, assumptions are created that can overestimate or underestimate risks. Industry representatives argue that regulators have a conservative bias which leads to expensive programs to protect insignificant threats to public health and the environment.

- Difficult comparisons - methods do not allow weighing different health and environmental effects against one another (e.g. dioxin exposure vs. ecosystem degradation vs. cancer death). Furthermore, there are natural (earthquake fatality) or societal (smoking a pack of cigarettes a day) vs. exposure (living next to a hazardous waste storage facility) comparisons that cannot be compared reliably.

- Value Judgments - In the U.S., we have seen many instances where the results of technical risk assessments were disregarded by affected public groups. Most people are able to accept the risks associated with decisions that they personally make. However,

they generally want zero risk if they believe another person's actions are creating a risk that they are uncertain about or that they do not welcome. The actions may not be harmful, but an individual's personal fears, may lead to non-acceptance of all risk assessment conclusions other than zero risk. Unfortunately, most of the population only understands two probabilities: *zero,* which means an event will not occur or *one*, which means an event will occur with certainty. They want results expressed simply - safe or unsafe. Coupled with the limitations described above, it is not surprising that the results of risk assessments are often subject to challenge.

Cost-Effective Environmental Decisionmaking

While technical risk assessments may not lead to conclusive results, they may be useful scientific tools in a broader risk management scheme. Such a scheme would acknowledge that absolute certainty with respect to risk is not a rational outcome and would be qualitative, allowing inclusion of a broader cross section of stakeholders in the decisionmaking process. For example, a value added approach[3] proposed by Vernon Grose, combines risk severity (negligible to catastrophic), risk probability (rare to very frequent), and risk countermeasures cost (exorbitant to inexpensive) with a methodology that collects disparate risks, ranks them for significance, and displays the risks in a format that can be understood by all the ranking process participants. Since people are generally able to accept the risks associated with decisions that they personally make, the costs associated with regulatory burden and court challenges could be averted by employing such approaches.

Middle Urals Pollution Prevention Priorities Assessment Project

In 1993, scientists from the Lawrence Livermore National Laboratory, the Russian Federal Nuclear Center Institute of Technical Physics, and the Institute of Industrial Ecology, Urals Branch established a collaboration to assess pollution priorities in the Middle Urals region of Russia. The project scientists are employing scientific risk assessment tools for evaluating existing data. However, because a broad spectrum of participants from the oblast government, nongovernmental organizations, and scientific institute will participate in the priority setting, a methodology is being developed to

allow ranking input by the participants. The urgency of the problems in this region and the limited resources available for remediation are driving priorities toward pollution prevention efforts, stabilization (not clean-up) of contaminated areas, and improvements in food and water supply systems. The risk management approach, which includes science based risk assessment as a tool, should minimize delays and be cost effective.

Conclusions

Progress in addressing environmental problems has been severely hampered by the inability of stakeholders - government agencies, nongovernmental groups, and industry - to agree on acceptable risk. Science based conclusions would be a desirable basis for determining acceptable risk, but unfortunately the complex linkage between low levels of harmful substances and cancer or other health effects is not fully understood. The costs involved with further research on the relationship and with examining the behavior and fate of thousands of chemicals is prohibitive. Clearly, we must employ new semi-quantitative or qualitative methodologies that allow us to use existing data and employ interested parties to prioritize actions in a way that maximizes environmental and health quality, but is also cost beneficial.

References

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2. Baker, Beth, "Risk Assessment Kills Bills," *Bioscience,* (January 1995), p. 15.

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