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Risk in Perspective

Risk-Based Environmental Advocacy

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"EDF's recent reports, Toxic Ignorance and The Chemical Scorecard, lay the groundwork for future risk-based reforms of the Toxic Substances Control Act, the Clean Air Act, and the EPA's Toxic Release Inventory."

As environmental policy becomes more risk-oriented, it will become crucial for stakeholders to become knowledgeable about the processes of risk assessment, management, and communication. Yet one of the most important stakeholder groups, environmental advocacy organizations, have resisted the use of risk analysis for moral, technical, and/or tactical reasons. An exception within the advocacy community is the Environmental Defense Fund (EDF), which has an aggressive, forward-looking approach to the use of risk analysis in favor of environmental protection. In this issue of RISK IN PERSPECTIVE, we review two of EDF's most recent risk-oriented projects: *Toxic Ignorance* and *The Chemical Scorecard.*

TOXIC IGNORANCE

Effective implementation of chemical risk management requires scientific information on the risks of chemical exposures to human health and ecosystems that is publicly available. In its 1997 report *Toxic Ignorance*, EDF revealed some serious gaps in public information about whether widely used chemicals can produce particular types of toxicity.

Based on a random sample of selected high-use chemicals (N = 100) and a review of publicly-accessible databases, EDF concluded that 70+% of compounds lack a toxicity database that is necessary for even a preliminary risk assessment. A basic database, as defined by an international consensus standard, includes rudimentary information on acute toxicity, repeated dose toxicity, genetic toxicity (in vitro), genetic toxicity (in vivo), reproductive toxicity, and developmental toxicity (teratogenicity). Although more than 90% of the sampled chemicals had been tested for acute toxicity (usually death), more than 50% of the chemicals had not been tested for any form of chronic toxicity.

The EDF report is useful for a variety of reasons. It is being used in the public arena to encourage chemical manufacturers to make larger investments in toxicity testing. It is

also being used to stimulate reconsideration of the Toxic Substances Control Act of 1976, a law that was intended to stimulate testing and protect the public from unreasonable risks arising from chemical exposure.

The *Toxic Ignorance* report has some important limitations that are worth noting. They are discussed here to provide a broader context for the policy significance of the report's findings.

First, the report may cause lay readers to form a misimpression about the scientific value of basic toxicity information. Some of these "basic" toxicity tests (e.g., in vitro toxicity tests) have never been fully validated as to their relevance to human health. Although it is certainly appropriate to encourage toxicity testing, it is often unclear how to interpret the results of such tests. Some chemicals that appear innocuous based on the results of basic toxicity tests may in fact be associated with significant health risks that are not detected in these tests. Moreover, a chemical that displays numerous toxic effects in basic tests may pose little or no risk to people, depending upon which species and strains of animals were tested, and how these effects in animals respond to reductions in dose. We know from toxicology that "the dose makes the poison": risk depends upon how people are exposed to the chemical, and how large the effective doses to people are. Informing the public that a chemical has (or has not) been subjected to basic toxicity testing is not very informative; expert interpretation is required and, even when such information is available, residual uncertainties always remain. Nevertheless, more data are generally better than less data.

Second, if a chemical lacks certain test results, it may not be efficient to require that the missing tests be performed. In some situations, the results of one test, for instance an acute toxicity test, can act as a fairly good predictor of the results of another test, say a long-term chronic test. In other situations, tests performed on one chemical or class of chemicals may serve as a realistic surrogate for the test results that would occur if similar yet untested chemicals were subjected to testing. Instead of requiring numerous tests, a better idea may be to set "default" chronic toxicity values based on the results of acute toxicity tests, where the default distribution of possible values is based on experience with other tested chemicals. Manufacturers would then judge whether it is worthwhile to spend the additional resources on chronic toxicity testing.

The resources saved from conducting fewer tests should not be ignored. These resources may be better expended reducing human exposures to the chemical or developing new chemical products that are less toxic and more effective in their intended applications or testing other chemicals with fewer test results. It is important to recognize that the EDF report assumes (based on previous "consensus" judgments) but does not establish that it is efficient to require "basic" toxicity information on all widely used chemicals.

Finally, it is important to recognize that there is no clear end to what can be credibly characterized as "basic" toxicity information. Why are chemicals tested one at a time, when real-world exposures involve mixtures of chemicals? Why are chemicals tested on genetically homogeneous, healthy rodents, when exposed people in the real world are genetically diverse and have illnesses ranging from asthma to AIDS? Embedded in the concept of a "basic" toxicity test are important value judgements as well as scientific judgements. When scientists and stakeholders come to a consensus about what is "basic" toxicity testing, they may not realize the resource-allocation effects of the value judgements they are

making. Recent efforts to require tests for "endocrine disruption" need to be scrutinized from a cost-effectiveness perspective. Nevertheless, we should expect that the definition of "basic" in toxicity testing will gradually be expanded as we become a wealthier and more environmentally sensitive society. The EDF report makes a significant contribution by stimulating concern about why many widely used chemicals are not minimally tested for toxicity.

THE CHEMICAL SCORECARD

In 1998 EDF established a new Internet site that allows citizens to use personal computers to call up information about pollution in their community. Information is available on 17,000 individual industrial facilities and 650 chemicals reported to EPA's 1995 Toxic Release Inventory (TRI). In addition to being a masterful use of diverse databases and computer technology, the new EDF site contains information that is more risk-oriented than the information released each year by U.S. EPA.

Historically, the TRI has been used to convey the quantity of "toxic" pollutants emitted into the environment by stationary sources. From a risk analyst's perspective, this information is not very meaningful because the focus is on mass emissions instead of risk. The 650 chemicals are treated implicitly as if they are equally toxic or, more generally, of equal concern, an assumption that is dubious enough to cause any respectable toxicologist to have elevated blood pressure.

EDF has taken an important step forward by developing a scoring system that adjusts the amount of the chemical that is released by a weighting factor called the chemical's "toxic equivalency potential" (TEP). If the TEP of chemical A is 10 times the TEP of chemical B, the emissions of 1 pound of chemical A are considered to be as bad as the emissions of 10 pounds of chemical B. For all chemicals known to cause cancer, the EDF Scorecard converts releases into "benzene-equivalents". This concept means that releases of carcinogen A are expressed as the number of pounds of benzene that would have to be released into the air to pose the same approximate level of cancer risk as the emissions of carcinogen A. All chemicals posing non-cancer health effects are similarly converted to "toluene equivalents". Insofar as the TEPs have more validity than an assumption that risk is proportional to mass emissions, the EDF approach moves the entire "right-to-know" movement closer to a risk reporting system.

Accompanying the *Scorecard* is a candid discussion of the limits of the TEPs used by EDF as well as some conceptual limitations with the entire approach. Here we emphasize several limitations that are worthy of special consideration.

First, the EDF *Scorecard* cannot yet be used to compute risks of chemical emissions because information on the extent of human exposure to these chemicals is not provided. Although EDF has taken a major step forward by using the TEP method, risk will not be understood at a community level until exposures to these chemicals are characterized. The EDF contribution may be useful in stimulating community interest in acquiring information about exposure and risk.

Second, the EDF *Scorecard* counts only those 650 chemicals considered "toxic" by the 1995 EPA TRI. The most important pollutants, certainly the most important air pollutants, are not considered in TRI or EDF's *Scorecard*. From a public health perspective, the most important air pollutants are the ubiquitous "criteria" air pollutants: fine particles, ozone, carbon monoxide, nitrogen dioxide, sulphur dioxide, and lead. There is no scientific justification for the persistent practice of reporting "toxic"

information to community leaders, without including information about "criteria" air pollution. A recent statewide project in Tennessee did combine these two forms of pollution and concluded that community leaders should be far more concerned about "criteria" air pollutants than "toxic" air pollutants. As risk assessment procedures become more sophisticated and better understood, we may learn that the human health risks posed by so-called "toxic" air pollution are relatively trivial compared to "criteria" air pollution.

Third, the EDF *Scorecard* only considers chemical emissions from stationary industrial facilities that are reported to EPA's TRI in 1995. Toxic emissions from cars, vans, light trucks, buses, heavy trucks, lawn mowers, motorcycles, backyard grills, wood stoves and other non-industrial sources are not reported through TRI. Also ignored are indoor sources of pollution such as smoking and wood stoves. Thus, the EDF Scorecard is a potentially misleading portrait of the most important sources of pollution in communities throughout the United States. A more inclusive version of EDF's Scorecard would be more useful to community leaders.

Finally, after all of the information on toxic pollution is made available to a community leader, the *Scorecard* provides no comparative perspective about whether these pollution-related risks are significant compared to the ordinary risks that citizens face in daily life. Only when this information is provided will citizens be in a truly informed position to judge whether the risks of pollution justify significant public concern.

CONCLUSION

The Environmental Defense Fund is one of the few environmental advocacy organizations that has a forward-looking, risk-based agenda for the future of environmental protection. EDF's recent reports, *Toxic Ignorance* and *The Chemical Scorecard*, lay the groundwork for future risk-based reforms of the Toxic Substances Control Act, the Clean Air Act, and the EPA's Toxic Release Inventory. These reports are also likely to be used in the 50 states as well as in Brussels and foreign capitals to stimulate a more risk-oriented approach to environmental policy. Any serious student of environmental policy should take the time to consider the strengths and technical limitations of these projects as well as their implications for future policy reforms.

FURTHER READING

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