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A revolution is occurring in the way science is used in environmental regulation. Like most revolutions, this one is causing some pain and some disruption, and of course it is being opposed viciously by those who profit from the present system. But the revolution is occurring nevertheless, and the ultimate outcome seems assured. When the revolution is complete, it will be a great day for public health and for the environment.

Scientists often define "scientific certainty" as "being 95% sure that cause and effect have been correctly identified." It is exceedingly rare for a large group of scientists to be 95% certain about anything, especially about anything as complex as an environmental problem. When you're talking about living systems, great scientific uncertainty is the norm. Even in the case of an ultra-well-studied chemical like dioxin, scientific uncertainty far outweighs firm knowledge of cause and effect.

How is scientific uncertainty currently treated in environmental protection? For 50 years it has been used permissively. It has been used to postpone actions that would protect public health. The classic case is the introduction of tetraethyl lead into gasoline. (See REHW #539, #540.) When chemical and automobile corporations announced they were starting to put highly-toxic tetraethyl lead into gasoline in 1922, numerous public health officials thought it was a dangerous idea and they urged delay and careful study. But the corporations argued that there was no scientific agreement about the threat; in the absence of convincing evidence of widespread harm (which had not yet occurred, so couldn't be documented), they insisted they had the right to proceed. Basically, they argued, "Until you can line up the dead bodies, we can do whatever we want." On that basis, the corporations pressed ahead heedlessly with the new toxic technology, thus setting the standard for corporate behavior over the next 50 years. The consequences of that particular decision are now a matter of record -- tens of millions of Americans suffered brain damage, their IQs permanently diminished by exposure to lead dust.

Because we have allowed scientific uncertainty to postpone controls on dangerous activities, we now have hazardous levels of mercury in most of the nation's fresh-water fish; the Earth's ozone shield has been dangerously depleted; global warming is upon us, with attendant droughts, fires, floods, hurricanes, tornadoes and typhoons; the ocean's major fisheries are in serious decline; the normal sex ratio of male-to-female babies has been changed in numerous industrialized countries, and human sperm counts have declined 50% in 50 years; immune system disorders like asthma and diabetes are steeply rising; many of the world's coral reefs are dying; cancers of the brain, the lymph system, the blood system and the testicles are increasing; cancer in children is escalating; many species have gone extinct.... This list of contemporary calamities could be readily extended.

But now people are waking up. They are waking up to the fact that scientific uncertainty should be cause for caution, not for plunging ahead recklessly. When flying blind, if you are not sure whether that shape looming just ahead is a cloud or a mountain, slow down. A stitch in time saves nine. If you aren't sure what you're doing, you should proceed slowly and carefully, or perhaps not at all. Better safe than sorry. That is the philosophy of precaution.

In truth, the principle of precautionary action has seemed a bit abstract, until now. It has seemed like a fine philosophy, but how would it work in actual practice? Now a new handbook from the Science and Environmental Health Network (SEHN) fleshes out this important philosophy of environmental protection, describing how it can work at the local level.[1]

The United States is already under obligation to operate by the precautionary principle. The federal government signed and ratified the Rio Declaration from the 1992 United Nations Conference on Environment and Development. The Rio Declaration says, "In order to protect the environment, the precautionary approach shall be widely applied by States [meaning nations--P.M.] according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." Therefore, it is not a matter of WHETHER the U.S. will abide by the precautionary principle, but HOW.

The precautionary principle is now embedded in numerous international treaties and conventions: the Second North Sea Declaration; the Bergen Declaration on Sustainable Development; the Ministerial Declaration of the Second World Climate Conference; the Maastricht Treaty on the European Union; the Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes; and others.

Thus the stage is set. All that remains is for organizers and activists to press the precautionary principle into service at the local and state levels. The new guidebook from SEHN shows us how.

The precautionary principle says that decision-makers have a general duty to take preventive action to avoid harm before scientific certainty has been established.

The test for knowing when to apply the precautionary principle is the combination of threat of harm and scientific uncertainty. Some people would say that the threatened harm must be serious or irreversible, but others point out that this does not allow for the cumulative effects of relatively small insults.

Instead of asking how much damage or harm we will tolerate (which is the approach taken by risk assessment), the precautionary principle asks how to reduce or eliminate hazards, and it considers all possible means for achieving that goal, including scrapping the proposed activity. (Of course, alternatives to a hazardous activity must be scrutinized as carefully as the hazardous activity itself.)

The precautionary principle shifts the burden of proof. Proponents of an activity should prove that their activity will not cause undue harm to human health or the ecosystem. Those who have the power and resources to act to prevent harm have a responsibility to do so. That responsibility has 2 parts: financial liability for anything that goes wrong. [A performance bond posted up front (common in the construction industry) is the best way to handle this. See REHW #510.] The second part of responsibility is a duty to monitor, understand, investigate, inform and act. Ignorance and uncertainty are no longer excuses for postponing actions to prevent harm.

The steps in taking precautionary action are not complicated:

1. Describe and understand the problem or threat. How big is it? How far could it extend in space and time? Are there indirect impacts (for example, after the product is thrown away)? How serious could the effects be? Similar questions are raised whenever an environmental impact statement is written in response to the National Environmental Policy Act (NEPA), so there is not much new here.

2. Describe what is known and what is not known. There are many kinds of uncertainty (which the SEHN HANDBOOK does an excellent job of describing). Are we dealing with something that is unknowable, or about which we are totally ignorant? (If so, this is a good reason not to proceed.) What would it take to reduce the uncertainties? (Some uncertainties can be reduced and some cannot.) The SEHN HANDBOOK provides a good guide for understanding uncertainties: "Environmental and public health advocates have to ask difficult questions of industry and regulators to expose the depths of our ignorance. Once this lack of knowledge has been exposed, the notion of needlessly exposing humans and the environment to hazards without information on their effects seems irrational, and precaution seems logical."

3. Identify alternatives to the activity or product. First restate the

problem to describe the purpose of the activity. A development provides housing; a solvent provides degreasing; a pesticide provides pest management. Now examine all of the alternative ways of fulfilling the purpose, to find the one that minimizes damage to people and to the environment.

4. Determine a course of action. How much precaution seems called for? Stop the proposed activity? Demand alternatives? Demand modifications to reduce bad impacts? Demand that a performance bond be posted up front?

5. Monitor. Those undertaking the activity should bear the cost of monitoring, but it should be conducted by an independent party (when possible). The monitoring information might warrant additional actions, or different actions.

The HANDBOOK then compares precaution to the way decisions are made now -- by risk assessment. Risk assessment does not fare well in the comparison.

The HANDBOOK ends with a section called "Answering the critics." Critics of the precautionary approach say things like, "It is not based on sound science" and, "This is emotional and irrational" and, "This will halt development and send us back to the stone age," and, "We comply with regulations so we are already practicing precaution." The HANDBOOK patiently provides reasoned responses to each of these dumb statements and several others as well.

The precautionary principle has American industry scared to death. Precautionary action immediately makes sense to people. Everyone can understand the wisdom of, "Do unto others as you would have others do unto you" and, "Better safe than sorry." The precautionary principle combines scientific validity with ethical force. No wonder corporations (and their handmaidens in government) consider it a threat to business as usual. It IS a threat to business as usual.

Industry's best hope is to adopt the language of precaution with great fanfare, while pressing ahead with the same old risk-based projects and programs, hoping no one will notice. To this end, the Harvard Center for Risk Analysis, a chemical industry think tank, held a conference last month to develop strategies for countering the precautionary principle. Participants openly scoffed at precaution. One participant described how his mother used to make him wear a sweater whenever he went outside, even though he lived in southern California. That pathetic little anecdote drew a loud, nervous laugh from the assembled throng, as if it had scored big points against the wisdom of precaution.

Participants had paid good money to attend the Harvard seminar, hoping to learn how to shore up the sagging fortunes of risk assessment. But even Big Heads from Harvard cannot salvage a bad idea whose time has gone. All risk assessments are fiction, shot through with assumptions, guesstimates, judgments, and biases --all disguised disingenuously as "good science." The only thing that allows risk assessors to hold their heads up in public is that most people don't have the faintest idea what risk assessors do for a living or the consequences their work entails.

The principle of precautionary action, on the other hand, embodies all aspects of science -- including uncertainty -- in an ethical procedure aimed at ELIMINATING risks (something no risk assessment has ever aimed to do).

In the long run, the ethical way will prevail.

--Peter Montague (National Writers Union, UAW Local 1981/AFL-CIO)

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[1] Joel Tickner, Carolyn Raffensperger, and Nancy Myers, THE PRECAUTIONARY PRINCIPLE IN ACTION-- A HANDBOOK (Windsor, North Dakota: Science and Environmental Health Network, 1999). E-mail: craffensperger@compuserve.com; mail: SEHN, Rt. 1, Box 73, Windsor, ND 58424; telephone and fax: (701) 763-6286.

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