

Science and Policy—Uneasy Partners

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The misuse of science in the creation and advocacy of environmental policy is often decried within the scientific community, and it is facilitated by low public awareness of the state of the science for important environmental issues. Recently, some fellow Stanford graduate students and I decided to publicize what we contend is the current US administration's misuse of science in environmental policymaking. This misuse can be seen in policies ranging from forestry and fisheries to oil extraction and responses to climate change, all of which have potential for causing serious environmental harm. Our original goal was to publish a statement in an advertisement in the *New York Times*, but we left the logistics of publicity for further down the road and started by trying to articulate our concerns. The months that followed were a lesson in the difficulties of bridging the gap between science and policy.

Our first version was a strongly worded and scientifically accurate condemnation that we could defend:

The best available science indicates that President Bush's environmental policies will cause irreversible damage to the natural systems on which we all depend. His positions on climate change, pollution, forest and fisheries management, and resource extraction ignore widely accepted scientific information. To justify its policies, the administration exaggerates scientific uncertainty and relies on research at odds with the majority of scientific evidence. As a result, the public and the media often wrongly believe that administration policy reflects the state of scientific understanding. We appeal to President Bush to rely on credible science when creating environmental policies. Until that happens, we ask the

public to regard skeptically any administration claims of scientific support for its positions.

Getting consensus on this statement was difficult, and we have subsequently modified it slightly. Almost every sentence engendered heated debate, but the most vehement was over the phrase "will cause irreversible damage." Several members of the group pointed out that "will" implied a certainty that does not exist in science, and that "irreversible" was, with the exception of extinctions, potentially inaccurate over the longest time scales. In the end, we agreed that the statement satisfied our three main requirements: It was scientifically supported and objective, it was a strong condemnation of the misuse of science, and it called attention to the harm that the administration's policies would do. Our next step was to bring the statement to the 2003 meeting of the Ecological Society of America to see if we could gather support in the form of signatures and donations to help with publicity efforts.

Almost everyone I talked to at the meeting agreed with the statement, and no one presented a compelling counterargument to our contention that the administration was misusing science. Interestingly, most graduate students and postdocs signed willingly, but many senior scientists offered financial support without publicly endorsing the statement. However, even among this latter group there were many willing signatories, and we made some headway with pledges of financial support. We were encouraged enough to set up our Web site (www.scienceinpolicy.org) and press forward. We began to think more about how best to publicize the statement.

Having little experience in communicating information to the general public, we asked various people associ-

ated with advocacy, as well as scientists who had been engaged in broader public debates, for advice on how to publicize our efforts. Both groups were almost unanimous that the statement was too weak and not sufficiently targeted. The director of a local nonprofit organization wondered what good one more voice would do in an already rancorous debate. It seemed that, despite our best effort to craft a scientifically defensible and nonpartisan critique, we were destined to be swept onto the "environmentalist" side of the broader political debate. This, we were told, would make it easy for about half of the country to dismiss us. Another common criticism was that the statement needed a "hook," such as highlighting that the statement came from graduate and postdoctoral students—the "future scientists of America."

So, what appeared to us as a strongly worded condemnation was seen by those with experience in communicating with the public as weak and probably ineffectual. How then should scientists address the science behind policy, in language that is careful enough for science but strong enough for policy? We found this question even more problematic as we analyzed specific policies. Take an example drawn from the debate over drilling for oil in the Arctic National Wildlife Refuge (ANWR), specifically in the "1002 area," which was left open to the possibility of oil exploration when Congress created the refuge. The administration claims that drilling may greatly increase domestic oil production with little environmental damage. According to the national energy policy report authored by Vice President Cheney and others, "in May 1998, the USGS issued revised estimates of oil and gas resources in the 1002 Area.... The estimate reaffirms the 1002 Area's potential as the single most promising prospect in the United States. The total quantity of

recoverable oil within the entire assessment area is estimated to be between 5.7 and 16 billion barrels (95 percent and 5 percent probability range) with a mean value of 10.4 billion barrels” (NEPDG 2001, p. 77, sec. 5-9).

Taken separately, these sentences are true, according to the most recent assessment done by the US Geological Survey (USGS 1998). However, “the entire assessment area” is not “the 1002 Area,” which, according to USGS, contains significantly less oil (4.3 billion to 11.8 billion barrels, mean 7.7). In addition, all of the figures mentioned above represent estimates of technically recoverable oil. That is less than is actually present, but more than is economically recoverable at current oil prices. Is this deliberate distortion? Interpreting the intent of the authors is critical if we are to judge whether science is being deliberately misused, but interpretation of intent is more the purview of lawyers and historians than of scientists. I contend that the misrepresentation was probably deliberate, but it is difficult to explain the issue in a compelling sound bite.

A final obstacle that we encountered in trying to communicate our concerns is the problem of making predictions on the basis of imperfect knowledge of how the world works. In our statement and on our Web site, we call attention to clear misuses of science, but there are many important environmental issues for which science has provided less than definitive conclusions. It is difficult to criticize vague, nonscientific claims in scientific terms, and even harder to draw attention to such criticisms. It is more problematic still when the science is not definitive. Many of my colleagues believe that if there is no scientific answer to a question, scientists should not

express an opinion. Unfortunately, this preempts scientists’ ability to inform public debate. For some of the major environmental issues facing society today, studies that might be conclusive have not been and should not be done. Scientists have not drilled in ANWR, nor doubled global atmospheric carbon dioxide, nor logged the entire Amazon Basin. Even if we had, each experiment would have no controls, no replication, and no statistical power. Clearly, *p*-values and hypothesis testing, although crucial for building the knowledge on which predictions are based, are not directly applicable to the predictions themselves (Schneider 2001).

Are scientists forced, then, to rely on educated guesses and so undermine our status as guardians of objective truth? Why should anyone listen to a scientist’s best guess, if what gives science its weight is rigorous analysis and skepticism of unproven statements? Yet what scientists know about environmental issues, and the possible outcomes of different policies, has great potential benefits to society. Is it not our obligation to seek to influence policy for the better?

The problem of applying sound, but incomplete, information to important questions is not unique to environmental science. Physicians are faced daily with situations for which rigorous, double-blind studies on people of the appropriate age, gender, and lifestyle have not been done. Yet they routinely make their best guess, and they are often right. They have helped to greatly increase the human life span, and society respects their judgment. Physicians use medical science as much as possible and fill in the gaps with medical art. When it comes to the major environmental issues of the day, scientists would do well to

think about the analogy to medicine. Like the best guesses of physicians, our best guesses are more likely to be right than those of other people. Of course, we must acknowledge how we arrived at our conclusions and not give our educated guesses more value than they deserve. It is equally important, however, not to give them less value than they deserve. Otherwise, we will have to live with the misuse of science and the resulting environmental harm.

My colleagues and I continue, therefore, to publicize abuses of environmental science, and we still hope to raise funds to place ads in the *Times* and elsewhere. We have started an online petition drive (www.scienceinpolicy.org) and hope that scientists from all 50 states, and around the world, will endorse our statement.

Acknowledgments

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