

SCIENCE AND POLICY: THE VIEW FROM THE WORLD OF SCIENTISTS

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ABSTRACT

Given the fundamentally different aims of science and politics, questions continue to swirl around the ability of scientists to connect to the policy world. Scientists are accused of being reticent about participating in the political process for fear of compromising their scientific integrity. Scientists are also accused of failing to consider broad societal and ethical concerns when conducting their research. This study uses a survey of United States and Canadian natural scientists to explore these charges from the point of view of scientists. The survey results show that scientists do not have confidence that either scientists or policy makers have the ability (or desire) to understand each other's way of thinking. Still, it appears that scientists do appreciate the importance of societal and ethical concerns to the development of environmental policy, and are willing to address the question of how values are applied to the scientific process.

INTRODUCTION

Conventional wisdom posits that environmental questions are fundamentally questions of science [1], and that most environmental issues on the current policy agenda would not even exist were it not for scientific research [2]. As Norman Miller puts it, "every environmental problem has, at its foundation, a scientific reality" [3]. More to the point, Karen Litfin argues that the language of environmental policy debates is scientific in nature "because science is a primary source of legitimation and because scientists help to define environmental problems" [4]. At the same time, there exists recognition that it is not easy to translate the findings of science into reasonable public policies [5].

Along these lines, Walter Rosenbaum characterizes the science-policy nexus as a treacherous place to be because environmental issues compel public officials to make scientific judgments and scientists to resolve policy issues, and neither group is trained to make such judgments [6]. This tension between scientists and policy makers appears to be emblematic of all environmental policy making. As Rosenbaum observes: “The almost inevitable need to resolve scientific questions through the political process and the problems that arise in making scientific and political judgments compatible are two of the most troublesome characteristics of environmental politics” [6].

Much has been written about the tension between science and politics. Most agree with Arild Underdal and his assessment that “the relationship between science and politics is a complex and precarious one, vulnerable to various kinds of observations and perversions on either side . . .” [2]. There exists a general belief that science and politics constitute two distinct systems of behavior, characterized by “an imminent tension between impartiality and objectivity on the one hand, and strategic reasoning and tactical maneuvers to promote particular interests on the other” [7]. Seen in another light, the difference between science and politics is based on the idea that each has fundamentally different aims—science aims at truth, while politics aims at making the right decision [8].

No matter how you look at it, scientists find themselves trying to bridge the gap between their world and the world of policymakers. This is no easy task. There are those who argue that scientists should avoid politics, policy, and value discussions at all costs because such involvement tends to corrupt objective science [9]. Research has shown that scientists have a long-standing aversion to politics and are reluctant to become politically active for fear of compromising their reputation for scientific objectivity [10]. Scientists who fall into this way of thinking see themselves as standing apart from the world of politics—reticent to participate in the political process for fear of having their credibility compromised by policymakers who are not only scientifically illiterate, but intolerant of uncertainty and unappreciative of the concept of probability [3]. In this regard, scientists are even criticized for publicly discussing issues with high degrees of uncertainty, because most citizens (including policymakers) are not competent to assess scientific complexities [11].

Still others argue that the ideal of objectivity as portrayed by many scientists is fiction: that all scientists simply believe what they want to believe based on what their view of good or beautiful happens to be [12]. The argument is made that scientists must take a “pro-active” approach—coming out of their laboratories to take an active and personal involvement in public decision-making [13, 14]. The burden is put on scientists to learn the politician’s language and to see the world from the politician’s point of view [15]. From this perspective, scientists are expected to give up the unrealistic view that science is not connected to the social and physical environments [16] and accept science as a “profoundly human endeavor, a product not of disembodied minds but of actual people in social

interaction” [17]. In other words, scientists can no longer “simply do their science and not worry about . . . ethical concerns” [18].

RESEARCH PURPOSE

The purpose of this study was to provide a description and analysis of the science-policy linkage (as described above) from the point of view of natural scientists—a point of view that is often ignored in the mainstream environmental social science literature. This study was completed with the full intent of allowing natural scientists a chance to express their views of the way the environmental policy-making process works.

Furthermore, this study distinguishes and highlights differences and similarities between United States and Canadian scientists. The United States–Canada division permits testing whether different social and political contexts affect the views of scientists in each country in regard to the canons of the scientific process. Scientists in the United States and Canada function under two distinct types of environmental policymaking. The Canadian approach relies on scientific judgment and limits public debate about the scientific basis of policy decisions, while the United States approach is characterized by open conflict over regulatory science, including public debate over the interpretation of scientific evidence. Furthermore, Canadian officials tend to place a greater emphasis on the truth-seeking character of science, whereas in the United States, the environmental process places greater emphasis on the value-laden policy components of science [19].

Natural scientists from Canada and the United States were chosen as a point of interest for this study. Specifically, acid rain scientists were chosen because acid rain continues to be one of the most serious environmental and bilateral problems facing Canada and the United States today [20–24]. As Rosenbaum makes clear, “a long-term solution to acid precipitation domestically and internationally is not yet assured” [6]. In the case of acid rain, scientists were deemed especially important to the environmental policy process because they were the first to define acid rain as an environmental problem, thus setting the context in which the policy debate took place [25]. In fact, the acid rain issue came into prominence only because scientists kept telling the world of the potential devastating effects of acid rain [26].

Seen in this light, the importance of scientists to the establishment of environmental policy should not be underestimated. Previous research has shown that policy makers believe that scientists play a prominent role in developing alternative solutions to policy problems and in generating a long-term climate of ideas which directly affects policy makers’ thinking [27, 28]. Scientists’ perceptions were especially important in the development of North American acid rain policy because from the very beginning of the debate, scientists were called upon to communicate objectively the scientific facts and uncertainties and to

describe the expected outcomes following the best scientific practices [29, 30]. Essentially, the scientific community was expected to provide “the best available science to figure out the causes and effects of acid rain and how to control it” [31].

Yet, the scientific community did not speak with one voice. Scientists engaged in contentious and bitter debates about the seriousness of the acid rain problem, the causes and effects of acid rain, the effectiveness of proposed solutions, and who was to blame [32-34]. The debate over transborder air pollution has been marked by considerable mistrust between United States and Canadian scientists due to the politicization of the acid rain issue and its different significance for the two countries [35]. Scholars have provided evidence that, despite extensive collaboration between Canadian and United States scientists, each country responded differently to its cross-border air pollution problems and the political controversy created by these different views was not only a handicap to joint Canadian–United States scientific research, but it defined a clear and drastic mismatch between what politics needs and science can offer [36].

If this research finds the social and political contexts of scientists affect the way they perceive the scientific world, it would support the view that the values and institutions of science are already highly penetrated by national and social values and government institutions. If the outcome of this research were that no substantial difference exists between United States and Canadian scientists’ views of the science-policy linkage, it would offer further evidence of the separation of the worlds of science and politics. Moreover, it would suggest that the institutions of science might be stronger than they are generally given credit for in today’s world.

METHODS

For this research project, natural scientists from Canada and the United States were surveyed in January and February of 2003. Scientists were selected to participate in this study based on a single criterion: publication in the last four years of an article in a scientific Journal (e.g., *Canadian Journal of Fisheries and Aquatic Sciences*, *Biogeochemistry*, *Freshwater Biology*, *Water, Air and Soil Pollution*, and *Atmospheric Environment*) on a subject directly related to acid rain. Library and Internet searches were conducted to obtain the listing of all natural scientists who published an article on acid rain since 1999. From this list of scientists, respondents were randomly chosen from Canada ($n = 56$) and from the United States ($n = 56$). The return rate was 73% (82/112), with 39 of 56 Canadian scientists and 43 of 56 United States scientists returning questionnaires.

Questions on the survey focused on two primary areas of concern: 1) the relationship between scientists and policy makers, and 2) the intersection of values and science. Along these lines, respondents were asked to agree or disagree with the following statements:

1. In general, policy makers are ignorant with respect to how the scientific process works;
2. In general, scientists are ignorant with respect to how the policy-making process works;
3. Because scientists have a unique understanding of the natural world, they should have a greater influence than ordinary citizens in developing environmental policies;
4. Students in the natural sciences should be encouraged to AVOID politics, policy, or value discussion because these “corrupt” objective science;
5. Scientists must take into account broad societal and ethical concerns when conducting their research.

RESULTS

Table 1 summarizes the results of the five questions asked of scientists in the United States and Canada. The results show that a vast majority of respondents believe that:

- policy makers are ignorant with respect to how the scientific process works (71.6%);
- scientists are ignorant with respect to how the policy-making process works (66.2%);
- scientists should have a greater influence than ordinary citizens in developing environmental policies (75.0%);
- students in the natural sciences should NOT be encouraged to avoid politics, policy, or value discussions (97.5%);
- scientists must take into account broad social and ethical concerns when conducting their research (79.7%).

The responses to the first two questions listed above are quite informative. First, it is noteworthy that respondents, as a whole, see a clear break between what scientists and policy makers know about each other’s professional disciplines. As might be expected, a slightly larger percentage of scientists (5.4%) viewed policy makers as ignorant of the scientific process than viewed scientists as ignorant of the policy process. More important than this difference, however, is the fact that scientists perceive an unmistakable distinction between the world of the scientist and the world of the policy maker. There does not appear to be much (if any) convergence between the everyday professional activities of scientists and the everyday professional activities of policy makers. As far as the scientists surveyed for this research project are concerned, science and politics clearly constitute two distinct and separate systems of behavior, with little in common.

Second, substantial and statistically significant differences exist between the perceptions of Canadian and United States scientists on the intersection of the

Table 1. Scientists' Perceptions of the Science-Policy Linkage

In general, policy makers are ignorant with respect to how the scientific process works.

	United States <i>n</i> = 39	Canada <i>n</i> = 35	Total <i>n</i> = 74
Agree	56.4%***	88.6%***	71.6%

In general, scientists are ignorant with respect to how the policy-making process works.

	United States <i>n</i> = 41	Canada <i>n</i> = 36	Total <i>n</i> = 77
Agree	53.7%**	80.6%**	66.2%

Because scientists have a unique understanding of the natural world, they should have a greater influence than ordinary citizens in developing environmental policies.

	United States <i>n</i> = 42	Canada <i>n</i> = 38	Total <i>n</i> = 80
Agree	69.0%	81.6%	75.0%

Students in the natural sciences should be encouraged to AVOID politics, policy, or value discussion because these "corrupt" objective science.

	United States <i>n</i> = 42	Canada <i>n</i> = 39	Total <i>n</i> = 81
Disagree	95.2%	100%	97.5%

Scientists must take into account broad societal and ethical concerns when conducting their research.

	United States <i>n</i> = 41	Canada <i>n</i> = 38	Total <i>n</i> = 79
Agree	80.5%	78.9%	79.7%

**Indicates difference between Canadian and United States responses are statistically significant to the .05 level (using chi square).

***Indicates different between Canadian and United States responses are statistically significant to the .01 level (using chi square)

Source: Author's computation.

scientific world and the policy world. A much larger portion of Canadian scientists than United States scientists felt that policy makers are ignorant with respect to how the scientific process works (88.6% to 56.4%) and that scientists are ignorant with respect to how the policy-making process works (80.6% to 53.7%). A larger proportion of Canadian scientists than United States scientists (81.6% to 69.0%) also indicated that scientists should have a greater influence than ordinary citizens in developing environmental policies, but this difference was not statistically significant. On the other hand, there were no substantial or statistically significant differences between United States and Canadian scientists on the two questions concerning the part that values play (or should play) in connecting science to policy. The vast majority of both countries' respondents felt that scientists must take into account societal and ethical concerns when conducting their research and should confront discussions of values as they are linked to scientific research.

It is also important to note that many of the respondents argued for a greater influence for scientists in the environmental policy-making process. One respondent put it this way: "If policies are a mix of facts, values, and possibilities, scientists just know some facts better than other folks." Comments from other respondents suggested that scientists' knowledge should be made available in such a way as to make it easier for non-scientists to understand how science is connected to the environment. As one respondent commented, "Scientists should not have more influence, but should make their results known so that citizens can make the final judgment." Along these lines, another respondent observed that scientists' influence comes "not through individuals, but through their work."

The surveyed scientists overwhelmingly rejected the idea that scientists should avoid politics. This viewpoint was summed up with the following statement: "Scientists should be aware of the political issues so they can design research that is relevant to answering questions asked by society." Another respondent noted that politics is substantially different from both policy and science: "Sound policies are derived from sound science and both are based on value discussions. Politics on the other hand is purely arbitrary in nature."

There was also no doubt among those interviewed that scientists must account for broad social and ethical concerns when conducting their research. Contrary to those who claim that scientists often act apart from the social world within which they actually live, the survey results offer evidence that scientists are quite aware of their real-world surroundings. Large majorities of scientists from both Canada and the United States insisted that broad societal and ethical concerns were accounted for in the conduct of the research process.

At the same time, those who did not agree with such a linkage (between societal concerns and scientific research) were adamant that scientists maintain their distance from the social world. In this regard, several of the respondents argued for the separation of values from science. They spoke of societal values

being used to determine what issues scientists address and in choosing the objectives of research. However, they also asserted that social values should not be used in terms of how scientists interpret their results or actually conduct their research.

ANALYSIS AND CONCLUSION

The survey results show that the tension between science and policy, as seen through the eyes of scientists, is real and pervasive in the world of environmental policy making. Respondents viewed scientists and policy makers as being ignorant of the way each comes to their collective wisdom, revealing support for the often-cited proposition that science and policy constitute two different systems of behavior. At the same time, it appears that most scientists do not—as some have suggested—harbor an unrealistic belief that science is not connected to the social world, with its human endeavors and value-laden decision-making. On the contrary, scientists overwhelmingly accept the idea that science and politics are inevitably linked, and that scientists, in the course of completing their research, must take into account broad societal and ethical concerns. The survey results suggest that, following the counsel of Bill Joy [18], most scientists are no longer satisfied with simply conducting their scientific research without concern for their ethical surroundings.

To be sure, scientists still appear to be a bit cautious about crossing the often-confusing boundary between science and politics. Yet, large majorities of the scientists surveyed for this research project agreed that scientists should have a larger influence than ordinary citizens in developing environmental policies and that scientists should take more of an active role in policy discussions, even as these discussions touch on the murky intersection of politics, values, and science. As suggested by some (and opposed by others), the survey results speak to the fact that more and more scientists feel comfortable in bringing their views to the policy table. Some scientists believe this entry into the political arena should be carried out more along the lines of informing and educating citizens, as well as policy makers, to the finer points of the scientific world. However, no matter how you look at these survey results, there are clear signs that scientists are losing their long-standing aversion to thinking about (and participating in) public policy debates concerning environmental protection.

Still, before rushing to judgment about the delicate balance between science and politics, it is important to look at some cross-border issues. The United States–Canadian comparisons highlight the difficulty of sorting out the complex and precarious relationship between science and politics. On the one hand, major differences exist between United States and Canadian scientists in how they view the linkage of science and policy. In this regard, the survey results support the contention that different social and political contexts affect the views of scientists. As a whole, Canadian scientists—exposed to less open conflict and

public debate than their United States counterparts—have a much more pessimistic view of the science-policy linkage. Eight of 10 Canadian scientists see a world where scientists and policy makers have little in common, each working from distinct and conflicting sets of principles. While a majority of United States scientists also view the science-policy linkage in this manner, they do not, as a whole, come anywhere close to the overwhelming majority of Canadian scientists who maintain this view. This finding provides support for the claim that science is irrevocably entangled with the social and political contexts of scientists.

On the other hand, the survey results also provide evidence that (at least on the question of how societal and ethical values should be linked to the scientific process) United States and Canadian scientists have almost identical views. This is an interesting finding because of the asymmetry in the United States–Canadian environmental sphere, especially as it pertains to acid rain. There exists a clear imbalance with respect to the cross-border environmental relationships (with Canada often described as environmentally dependent on the United States) and with respect to acid rain (with Canada receiving the bulk of the pollution). However, the fact that scientists on both sides of the border share similar views about the part that values play in the science-policy linkage is quite noteworthy. Despite the immense differences in the way these two countries approached the acid rain issue and the very contentious nature of the acid rain debate between Canada and the United States, it appears that when it comes to the part that values play in the science-policy linkage, scientists remain more closely bound by their scientific and professional ethics than by their nationalities.

This finding is an important finding, for several reasons. First, it provides evidence that the different national contexts of these scientists may not be the driving force determining their outlook and assessments. In essence, the lack of substantial differences between the perceptions of United States and Canadian scientists offers evidence of the separation of the worlds of science and politics, and shows that the institutions of science may be stronger and more independent of social and political concerns than they are generally given credit for in today's world.

Furthermore, the fact that United States and Canadian scientists line up so closely on their perceptions of the part that values play in the science-policy linkage is a positive sign of things to come. This is important, because there remains much work to be accomplished with respect to the acid rain issue. In fact, the recent release of the 2002 Progress Report on the United States–Canada Air Quality Agreement makes it clear that transboundary pollution continues to threaten human health and natural resources and that its reduction is not possible without cross-border attention and cooperation [37]. The 2002 Progress Report also bemoans the state of cooperation between United States and Canadian scientists, arguing that to date “most work has been carried out in parallel rather than in a truly cooperative mode” [37].

I would argue that the fact that scientists in both countries share similar perceptions about the role of science and values in the environmental policy-making process bodes well for improving the cross-border policy linkages between the United States and Canada. The similarity in views among those on the front lines of scientific research gives hope that cross-border pollution can be reduced in a manner that would truly bring about the promised “new era of cooperation aimed at helping to guarantee cleaner air and a healthier environment for millions of Canadians and Americans” [38].

In the end, one can never quite get away from the idea presented in the opening paragraphs of this study—the solution to our environmental problems (including acid rain) will always be founded in a scientific reality. If this is the case, then the nexus between the scientific world and the policy (or political) world needs much more attention. Moreover, to effectively make their scientific findings relevant to the environmental policy-making process, natural scientists must become more in tune with the instruments of policy making. Surely, based on the results of this study, scientists are making substantial strides in that direction.

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