Decision Making at the State and Local Level: Does Science Matter?

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ABSTRACT Science is believed to be an important part of public policy decision making because of its inherent characteristics of measurability, rigor, objectivity, replication, and peer review. The purpose of this research was to explore the linkage of science to public policy decision making. The research explores what state and local public officials know about science and how much they actually use science in their decision making. Interview results with public officials in the State of Idaho demonstrate that policy makers ultimately see science as only one element in the mix. Findings suggest that equal attention and debate should be given to how science interacts with all of the other factors that affect the public policy making process.

Science plays a profound and formidable role in American public policy making. Science increasingly has been called on to provide information to improve decision making in public affairs (Karl et al. 2012, vii; Van Beek and Isaacs 2008, 211). Science is designed to inform social policy; it serves as a language and reference point that allows for informed discourse about the nature and seriousness of societal risks (Schmandt 1984, 26). Whether it involves the current focus on energy independence, nuclear-waste disposal, or enduring questions about climate change, science mixes extensively with the everyday decisions of citizens and policy makers in our democratic society. Science is viewed as a process that is transparent, replicable, and objective—and even as a means to sort out the uncertainty or to gain more knowledge about a subject matter.

The call to science is especially pertinent at the state and local level of policy making. Governors must decide whether to advance the cause of nuclear power, wind power, or solar power. Mayors struggle with decisions to advocate for expanding public transportation or existing roadways. Agency heads are conflicted over allowing the burning of fields to promote crop production or restricting burning to protect human health. It is not only the large and widely publicized national and international problems such as climate change and energy independence that call for the intervention of science. Reliance on science also affects decision making at all levels of government.

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This research explores the linkage of science to public policy making as viewed from the perspective of state and local public officials—policy makers who are in a position to use science in formulating and implementing public policy on a daily basis, attempting to solve some of America's most enduring problems. If science truly plays a formidable role in American public policy making, then we should see its influence in the views of our state, regional, and local policy makers. Moreover, by systematically reviewing the thoughts and ideas of public officials who work at the state, regional, and local level of government, this article sheds light on the science–policy linkage as it plays out at our most basic level of governance. In summary, it explores what state, regional, and local public officials know about science and how much they actually use science in their decision making.

This article provides a definition of science as it is characterized in the United States today by both scholars and the National Academy of Sciences (NAS). If we are to understand the linkage of science to policy at the state, regional, and local level of governance, we must begin with an understanding of the meaning of science and the process that defines the scientific method. First, the article provides an overview of science as it pertains to American public policy making. Thereafter, it describes the use of science and delineates how uncertainty poses special problems for policy makers. Ultimately, it examines how much science is part of the mix in decision making for policy makers in a democratic society.

THE DEFINITION AND CHARACTERIZATIONS OF SCIENCE

Over time, science has proven to be a difficult concept to explain or describe straightforwardly. Sabatier (2007, 5) spoke

doi:10.1017/S1049096515001183 © American Political Science Association, 2016

https://doi.org/10.1017/S1049096515001183 Published online by Cambridge University Press

of "the bewildering complexity" of the phenomena surrounding the concept of science, and Litfin (1994, 24) stated the difficulty of defining science in the following perspective:

> "Science" covers too much ground to be defined concisely. It is a product of research, employing characteristic methods; it is a body of knowledge and means of solving problems; it is a social institution and a source of social legitimacy.

That being said, we must start somewhere in understanding exactly what we mean when we talk about science. Hoover and Donovon (2008, 3–4) provided an excellent starting point, as follows:

> Science as a way of thought and investigation is best conceived of as existing not in books, machinery, or reports containing numbers but rather in that invisible world of the mind. Science has to do with the way questions are formulated and answered; it is a set of rules and forms for inquiry and observation created by people who want verifiable answers….Science is a process of thinking and asking questions, not a body of knowledge. It is one of several ways of claiming that we know something. In one sense, the scientific method is a set of criteria for deciding how conflicts about differing views of reality can be resolved. It offers a strategy that researchers can use when approaching a question. It offers consumers of research the ability to critically assess how evidence has been developed and used in reaching a conclusion.

Note that Hoover and Donovon (2008) specifically defined science as a process. More to the point, scientific knowledge can be obtained only by following the scientific process and the assumptions that underlie its foundation: determinism, empiricism, objectivity, and replication (Issak 1985).

In the second edition of *Theories of the Policy Process*, Sabatier (2007, 5) provided another way to view the meaning of science. He summarized these characteristics in the statement that science should be "clear enough to be proven wrong" and designed to be "self-consciously error seeking, and thus self-correcting." This self-correcting aspect of science goes to the heart of what makes the scientific process such a profound and valuable way of knowing, according to Silver (1998, xiii): science "frequently stumbles, but it gets up and carries on." In less colloquial terminology, science is perhaps the only human activity in which errors are systematically criticized and, in time, corrected (Silver 1998, 25).

A more recent definition of science is provided by the NAS, as follows:

> Science is a particular way of knowing about the world. In science, explanations are limited to those based on observations and experiments that can be sustained by other scientists. Explanations that cannot be based on empirical evidence are not a part of science (Buck, Corn, and Baldwin 2007, 7).

Accordingly, following the scientific method is a dynamic process that "does not reveal 'truth' so much as produce the best available or most likely explanation of natural phenomena" (Buck, Corn, and Baldwin 2007, 8). The scientific method is described as possessing two crucial characteristics: (1) a transparent approach in which both new and old data are available to all parties; and (2) a continuing effort to update data and, therefore, modify and even reject previously accepted hypotheses in light of new information (Buck, Corn, and Baldwin 2007, 10).

Others follow the lead of the NAS by emphasizing the importance of transparency in a democracy dependent on the active participation of citizens in the production of knowledge (Foray and Kazancigil 1999, 12). In fact, some perceive transparency as the key to science's ability to improve the human condition, with scientists having the independence to confirm, refute, or improve on findings of a specific course of inquiry (Burnett 1999, 7B).

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Joy (2000, 254) also promoted the value of openness to the scientific process, as did the US General Accounting Office (2007, 2) when it called for scientific research to be made available with "open and timely access." Science is supposed to be a fair process in which there is "adequate opportunity for presentation and discussion of the data, their relevance for society, and the underlying values and preferences of the participants regarding the use of the data or findings" (Ashford 1994, 201).

THE SEARCH FOR GOOD SCIENCE

The search for "good" or "sound" science is now a regular part of most public policy debates (Miller 2009, 132). Some scholars argue that linking good science to societal goals is a necessary condition if there is to be democratic accountability (Byerly and Pielke, Jr. 1995, 1532). Others proclaim that the phrases "sound science" and "peer review" are words that are used only by those in the political arena as a means to justify predetermined political conclusions (Mooney 2004, 23). Still others suggest that policy makers do not want to know the truths that science can provide, and they often abuse science by using it to legitimize set ideological positions rather than to meaningfully inform policy (Underdal 2000, 6). At times, uncertainty around science has been magnified because both the public and policy makers alike are often confused about what is good science and are easily misled (Skolnikoff 1999, 19).

Frequently, science and scientific advice lead to political controversy rather than political accord (Kraft 2011, 7–9; Sarewitz 1996, 92). By excluding pertinent scientific information related to particular policy disputes over method and interpretation, scientists can inadvertently become involved in a censorship that threatens good public policy making (Skodvin and Underdal 2000, 31). Conversely, the existence of uncertainty is sometimes "managed" by both scientists and politicians in ways that allow them to justify action (or inaction) and build authority, thereby

https://doi.org/10.1017/S1049096515001183 Published online by Cambridge University Press

reinforcing the dominance of science in a debate such that both scientists and politicians benefit (Meyer 2006, 87).

Science has often proven to be ambiguous and capable of posing more questions than providing answers (Graham, Green, and Roberts 1998, 218). It is understood that science-based analysis does not necessarily determine a policy choice nor reduce political conflict (Jasanoff 1994, 7–8). It is for this reason exploring how science is used in state and local decision making is valuable.

METHODS

The purpose of this research project was to discern how state and local public officials use science in their everyday decision making processes so that we may better understand what part science plays in the mix of factors in the policy making process. As noted previously, we know what scholars believe about the importance of science in policy making. What this study explores is what state and local policy makers know about science and how they use this knowledge. Hence, I interviewed public officials, local and regional directors of agencies located in the State of Idaho, particularly in the Boise–Nampa metropolitan statistical area, as well as federal officials with oversight for the state or region. The City of Boise and the surrounding areas serve as the home of the state legislature and is the location of most federal and state agencies, as well as the largest population base in the state. Additionally, Idaho in general—and certainly in governing—is a rather monolithic state regarding political affiliation and ideology. I make no claim that this region is representative of all regions in the United States. However, I believe it provides an excellent place to complete a case study of the science–policy linkage to state and local governance, and it is sufficiently representative of state and local governments in the State of Idaho.

I gathered evidence to create the case study from 30 interviews with federal, state, regional, and local policy experts who provided in-depth knowledge about the use of science and public policy making within their domain at the statewide or jurisdiction level in the State of Idaho. Of the 30 interviews that were conducted, 21 were with non-elected public officials and nine were with elected public officials. Six interviews were with federal officials, nine were state officials, and 15 were local or regional officials. Of the six federal officials, one was elected; of the nine state officials two were elected. At the local level, six of the 15 were elected officials. The interviews were conducted between May and June 2010. I chose public officials who either were elected or directors who had decision making authority on state or local governance, even if in a federal agency or office. In the letter of invitation to participate in an interview, I provided a definition of science highlighting that it is a process that is replicable, objective, and empirical. An example of this invitation letter and the interview questions are in Appendix A. Before commencing each interview, the definition of science noted in the letter and the purpose of the interview was reiterated. I promised anonymity but I do refer to responses by governance level or as either elected or non-elected public officials. It could be argued that in the American public policy process, only elected officials are in the position to create public policy. However, agency heads are often on the front line of the public policy debate, and they certainly inform and guide policy even though they do not specifically "create" the legislation.

ANALYSIS

The following list summarizes the results of the eight questions asked of federal, state, regional, and local public policy makers. The results reveal a vast majority of respondents indicated the following:

- Policy makers believe there are instances in which science provides answers to specific policy problems (83.3%).
- Policy makers view science as different from other ways of knowing because the processes are testable, empirical, replicable, peer-reviewed, and not intuitive (86.6%).
- Policy makers believe that it is important that their policies be supported by science (80%).
- Policy makers use science in all three stages of the policy making process (70%).
- Policy makers obtain their information from a variety of sources, and a majority stated government agencies as at least one source (60%).
- Policy makers believe that there are areas in which science is viewed to be more important to public policy because of the nature of the issue (80%).
- Policy makers stated that more than 17 factors influence public policy decision making. Of those factors, respondents indicated that 46% of the time politics was a factor and 53% of the time capacity to implement the decision, including the cost and funding, was a factor of influence.
- Policy makers stated that 75% to 100% of the time their decisions are founded on science (50%).

There were differences and similarities between elected and non-elected policy makers in their responses to interview questions. Elected officials indicated unanimously that there are instances when science provides answers to specific policy problems, whereas only 76% of non-elected officials thought this was the case. Elected officials more frequently indicated that what makes science different in terms of a way of knowing is that it is measurable, providing empirical data.[1] Conversely, non-elected officials reported the characteristic of the scientific process as testable and replicable as their most frequently noted defining characteristic of knowing through the use of science. A clear majority of both elected and non-elected officials indicated that it was important that their policy decisions be supported by science (i.e., 66% for elected officials and 86% for non-elected officials, respectively). Additionally, a majority of both elected and non-elected officials reported that science assisted in providing answers in all three stages of the policy-making process: beginning, middle, and end (i.e., 67% and 71%, respectively).

The two most frequently cited sources of information were (1) agencies (typically, data); and (2) staff or consultants for expertise. Literature, books, and conferences comprised the third most frequently noted category as a source of information. Non-elected officials also reported gathering their own primary data, whereas elected officials did not. When asked if there were areas in which science is viewed as more important to policy making, both groups overwhelmingly indicated that this was the case; both elected and non-elected officials indicated the environment followed by health.[2] When asked which factors other than science influenced public policy decision making, financial capacity was most frequently mentioned among elected officials, whereas non-elected officials most often cited politics. Finally, 55% of elected compared to 48% of non-elected officials indicated that 75% to 100% of their decisions are founded on science.

Policy makers were very clear that there are occasions when science provides answers and that there are specific issues that

https://doi.org/10.1017/S1049096515001183 Published online by Cambridge University Press

lend themselves more to the use of science. However, despite the enormous support for science's positive characteristics, the state and local policy makers interviewed for this study also qualified their support for science's unique ability to provide answers to complex policy questions. In fact, results of the interviews indicate that although science provides valuable information toward finding policy solutions, it also can confuse the issue because it often is used to support both sides of an argument. Three responses from the interviews illustrate a common perception among policy makers. A federal-level official commented: "It depends on whether you count economics and engineering as science as well as the natural sciences. If you do, then yes, science plays a role in providing answers to specific policy questions." A locally elected official stated it this way: "Overwhelmingly, the peer-reviewed science tells us what steps to take, but whether we can get there is both socially and politically a different story." Finally, a state-level respondent made the following argument:

> Yes, what I see most often is science being used in discussion and debates over policy. The problem with it is the different studies and statistics are used to make different points. The answer is yes, it can be very helpful, but the conflicting data make it difficult.

The aggregated interview data reveal that policy makers recognize that science is different from other ways of knowing, that science's basic characteristics (e.g., replication, peer review, and transparency) make it a valuable resource in defending specific policy ideas. However, that defense is part of the uncertainty of what makes it less valuable. Specifically, policy makers think that:

> It depends on the credibility of the science and the motivation. I've seen people pull parts of a study so it depends on how [science] gets used, reused, or recast. Another thing is that science changes. We once believed the world was flat. The state of the art of science improves and, over time, science changes. Science has a role. It seems like you can buy a lot of science.

The interviews clearly establish that science is not the only source of information informing the public policy process. A majority of federal, state, regional, and local, policy makers also use information garnered from in-house experts, academic universities, non-profit organizations, trade organizations, the Internet, professional journals, and public hearings. The use of a variety of sources of information is certainly related to the vast number of factors that influence decision making, ranging from politically driven values to the values of safety and need.

It is worth noting that only half of the policy makers indicated that they based their decision making on science a clear majority of the time (i.e., 75% to 100%). What does this mean for the 50% that are not using science in an overwhelming majority of the time for decision making? If this indeed is true, we must ask what these decision makers are using in lieu of science. The interviews shed light on the answer. One respondent indicated:

> [Science is used] a minority of the time, but not for the reason you might think. [It is used] a minority [of the time] because the questions put to me are both strategic and political and require people to go along.

Another respondent in this category clarified his position, indicating that "the challenge is some questions have better information and science than others." Another policy maker noted the following:

However, despite the enormous support for science's positive characteristics, the state and local policy makers interviewed for this study also qualified their support for science's unique ability to provide answers to complex policy questions.

> The data informs the process but things like legal systems [get in the way]. A planner can tell you based on the data, but only if politics didn't get in the way. I don't mean that negatively, but the political system will be a major deterring factor in what we do.

Finally, a local level official stated the following:

> I rely on a science foundation to better outcomes while I look at my charge to protect the public interest. Science helps me to do that.....There are a number of things that come to my head as I try to persuade. I will use science and every other tool in the toolbox to persuade a commission. Some days it will be things other than science [such as] showing disrespect or portraying them as the bad guys. I think in any policy determination, the goal is to win in the policy. Science might get you there one day and not the next.

One interesting finding from the interviews is that there exist few differences in the perceptions about science between elected and non-elected policy makers. Elected public policy makers were only slightly less likely than those non-elected to indicate that it is very important for their policies to be supported by science. Elected officials were also more likely to indicate that policies supported by science are at least somewhat important as compared to non-elected policy makers, who reported that science was neither more important nor unimportant for particular policy issues.

At the aggregate level, 80% of policy makers indicated that there were areas or issues in which science was considered more important than other factors. Those areas include times when answers are not obvious or when life, safety, and public danger (e.g., health, energy, environment, bridge design, or scientific engineering) are involved. The interviews revealed that 25% of the federal and state level respondents think that science is important for all issues and not necessarily more important for some than others. Yet, 100% of local public policy makers believe that the issue does influence the importance of science for the public policy making process. This difference suggests that at the federal and state level, policy makers are more likely to recognize that politics and other factors pervade all types of public policy decision making, resulting in science being only one of the tools

https://doi.org/10.1017/S1049096515001183 Published online by Cambridge University Press

in the decision making mix. Even when little is known or much is at stake, science may not have as great an influence as has been suggested.

CONCLUSION

Overall, the findings show that science is important to federal, state, regional, and local, policy makers because of its inherent characteristics—the same characteristics described in the previous discussion about "good science." Measurability, rigor, objectivity, replication, and peer review are all viewed as making science the best way of knowing. Furthermore, policy makers think that it is very important that their policies be supported by the science. At the same time, these same policy makers made it clear that multiple factors influence their decision making, with political and ideological values often cited as a driving force in public policy making. In fact, the reality of a political situation (depending on the specific issue) often overshadowed the work of scientists and trust in science. This finding may sound muddled; however, in reality, the state and local policy makers are describing the complexity of their decision-making and how they cannot rely solely on science to do what is perceived to be in the public interest.

Furthermore, policy makers think that it is very important that their policies be supported by the science. At the same time, these same policy makers made it clear that multiple factors influence their decision making, with political and ideological values often cited as a driving force in public policy making.

The interviews reveal agreement among federal, state, regional and local policy makers that many factors beyond science ultimately play a role in public policy making. Values, politics, and capacity to implement the decision are viewed as equally critical as science to the decision-making process. These findings distinctly support the idea that scientists (and science) cannot deliver solutions to public policy problems—it is simply too much to ask. Even the guidance or help that science provides seems dubious at times because the credibility of the science is often questioned or outright attacked. These findings support Graham, Green, and Roberts' (1998, 8) assertions that experience shows that scientists cannot solve both scientific and policy conflicts and that we should guard against giving such claims more worth than they deserve.

State and local policy makers also recognize that science can be used simultaneously to oppose or support specific policy issues. Whereas science is consistently viewed as one way of knowing, the fact that it can be manipulated so easily to fit a particular argument in the policy arena detracts from its overall effectiveness. In the end, the assessment of Steel, Clinton, and Lovrich (2003, 55)—which suggests that the public is left with the fact that scientific information "typically 'disappears' into the complex mix of diverse forms of reasoning and types of information considered simultaneously by decision makers responsible for formulating public policy,"—seems appropriate to the case presented here.

The findings also support the ideas put forth by Cozzens and Woodhouse (1995, 542), who argued that normative decision rules should be guiding public policy decisions. Certainly, the federal, state, regional, and local policy makers interviewed agreed with this belief. In addition, this study supports the notion put forth by other researchers (e.g., Robison 1994, 80) that scientific knowledge is insufficient to make public policy decisions. Politics, values, and capacity clearly play critical roles in the decision making process as well. It is worth noting that some research has presented the idea that scientists should be encouraged to promote and assume a more activist role in environmental policy making (Lach et al. 2003), for example. Other research suggests that groups actively engaged in issues are more receptive to the views of scientists (Steel et al. 2004, 11). Ironically, these scholars also noted that many of the scientists in their study are "more skeptical about their ability to find 'truth' and 'facts' than their attentive public...."

The evidence provided herein suggests that if we know science is only one element in the mix, equal attention and debate should be given to how science *interacts* with all of the other factors that affect the public policy making process. The study also points out the belief that the role or importance of science varies given the policy issue (e.g., environmental versus equity issues). Rather than continuing to "buy" or outright attack science, it may be more advantageous to understand its weight in the mix of factors in the policymaking process given a particular issue. Recent research corroborates the importance of the weight of science in the policy making mix. Since science is more often summarily questioned, the way science is communicated is being given greater attention (Dahlstrom 2014; Fischoff and Scheufele 2014). This new attention suggests that the weight or mix of science is clearly becoming a more evident piece in the science–policy linkage than previously considered. It is clear from this research that science is one more tool in the decision making and policy debate. An explicit consideration of the way that science is communicated—along with the social welfare or other normative criteria and factors such as capacity to implement projects—may advance the speed, reduce the cost, and add to the value of state and local public policy decision making.

SUPPLEMENTARY MATERIAL

To view supplementary material for this article, please visit http://dx.doi.org/S1049096515001183.

ACKNOWLEDGMENTS

The author thanks Leslie Alm; Brent Steel, chair and discussant at the 2011 Western Political Science Association meeting; and the anonymous reviewers for their helpful comments and contributions to this article. Any omissions or errors are the sole responsibility of the author. ■

https://doi.org/10.1017/S1049096515001183 Published online by Cambridge University Press

NOTES

1. Respondents could indicate more than one characteristic. The most common characteristics cited by all respondents were measurable, replicable, unbiased, and objective.
2. Respondents could indicate more than one policy area. The most common policy area responses by all respondents were environment, health, public safety, and important for all policy areas.

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https://doi.org/10.1017/S1049096515001183 Published online by Cambridge University Press