Climate Information and Western Water Institutions: Round Pegs in Square Holes?

Doug Kenney, Ph.D.

Discussion paper prepared for:
"Insights and Tools for Adaptation: Learning from Climate Variability"
November 18-20, 2003
Washington, D.C.

The intent of this paper is not to present new research or even to review the existing literature. Rather, this paper is simply a set of related observations from my work that, when taken together, describe a policy/decision making perspective that is sometimes lacking in the field of climate research. Thus, this is a "thought piece" designed merely to stimulate and enrich discussion, rather than a description of, or reference to, specific works or subjects.

To understand the origins of these thoughts, it is important to understand my background. I am not a climate scientist, but rather am a policy scholar based in a law school and employed by an interdisciplinary center that provides applied research on western natural resource issues primarily to lawyers, policy-makers, resource managers, academics, and the general public. My primary research interest is the laws, policies, administrative arrangements, and other "institutional" factors that guide the allocation and management of water resources in the American West. In recent years, I have contributed my expertise in this area to the work of the Western Water Assessment, a NOAA RISA (Regional Integrated Science Assessments) program based in Colorado. While my comments below reflect my experience in the Western Water Assessment, it would be inappropriate to conclude that these observations are reflective of the overall group effort. I am only one participant in a complex project and, arguably, am one of the most atypical representatives.

This paper starts with a few general observations (perhaps unnecessary for this audience) about the nature of the science/decision-making connection, or lack thereof, as that is an important part of the context of this workshop's more focused discussion. This is followed by a few observations associated specifically with western water institutions, particularly in the context of adapting to climate variability and climate change. I conclude with a few general observations potentially relevant to NOAA and its network of researchers and partners.

General Thoughts About the Science/Decision-Making Disconnect

My relatively brief experience in the field of climate research repeatedly leads me back to two general and closely related observations, mentioned below, about the frequent disconnect between science/scientists and the community of decision-makers and

resource managers. These observations are not particularly novel or sophisticated, but are nonetheless useful and relevant in describing the larger context within which to consider the more specific issues of this workshop.

(1) *It is Never Safe to Assume That Better Information Will Lead to Better Decision-Making and Management.* While practitioners of applied research have long recognized the truth of this statement, many (perhaps most) of us nonetheless continue to be surprised by the failure of improved information to lead to improved decision-making. The reason for this repeated mistake, I suspect, is that we often fail to appreciate the mechanisms at work behind this truth. A partial explanation is that most decision-makers operate within systems where choices are constrained, and where strong incentives exist to perpetuate the status quo. By ignoring new and improved information, these decision-makers are acting in a perfectly reasonable and predictable manner; the problem is rarely disinterested or incompetent decision-makers. Rather, the problem is two-fold: (1) researchers often do not understand the relevant "decision space"—i.e., the laws, policies, administrative arrangements, and related contextual factors associated with decision-making in a given subject matter—and therefore unintentionally produce research that is irrelevant and/or unusable in practice, and (2) the structure of the decision space is fundamentally flawed and is in need of reform. These are very different problems requiring very different solutions.

(2) *Specific Data and Technical Products are Poor Substitutes for General Knowledge and Insights, Especially if the Goal is to Reach New Audiences*. A great deal of climate research has produced a great deal of data, and increasingly, funding emphasis has encouraged the translation of this information into applied "products." Data and products, however, are useful only for those audiences that already have a general understanding of how the pieces fit together, much like words and books are only accessable to those who understand language. In many of the decision environments where climate information is potentially useful, the most pressing need is not more sophisticated or updated information, but rather is conveying to non-scientists general guidance about the nature of issues and relationships. In applied work, a good primer is often much more valuable than cutting-edge research, and a scientist who can communicate effectively with non-scientists is much more influential than a more distinguished scientist lacking these interpersonal skills. Despite this reality, the culture of professional research favors the specialist over the generalist, and exploration of details over articulation of general knowledge. The problem is not incompetent or disinterested researchers; the problem is a research environment that encourages and perpetuates irrelevance.

These observations are largely universal in that they speak to many types of science/decision-making endeavors (not merely those involving climate), and in the context of climate issues, are equally relevant to climate change as they are climate variability.

Dealing with Climate Variability and Change in Western Water Institutions

Like most fields, the field of western water management is shaped by a variety of laws, policies, and equally important, a set of unwritten assumptions and norms that collectively guide behavior. Many of these "tenets" of western water management deal with the phenomenon of climate variability. The impact of climate variability and change on water *supplies*, in particular, is addressed in many ways, including in the design of dams, reservoirs and spillways; the development of operational regimes (e.g., when to store and release water); planning decisions about water system scale and expansion; and in the structure of legal arrangements, such as the prior appropriation doctrine that allocates supplies (and thus imposes shortages) on users based on first-come, first-served principle of seniority. In contrast, the potential impact of climate events and trends on *demand* is largely unrecognized, and *demand management* is a minor element in most adaptation and coping strategies, considered too unreliable to be considered by the managers—primarily engineers trained to operate systems, not manipulate customer behavior—and not required under legal regimes. The only way demand is "managed" is by shutting off junior users when supplies are exhausted, something reluctantly tolerated in agricultural regimes, but viewed as management failure in municipal settings.

Since water management is viewed, institutionally, in such a one-dimensional way, adaptation to climatic flucuations is viewed quite narrowly in terms of drought-proofing water supply systems—i.e., overbuilding water systems so that the same level of deliveries (supplies) can be maintained during dry periods. This largely closes the door to different means of adaptation, such as systems that explicitly and dynamically link allowable use to annual supply, or risk management approaches that accept shortages and the resulting damages as more cost-effective than overbuilding supply systems. Of course, the reality is not so black-and-white; elements of demand management and economically-based risk management exist in western water regimes, and new innovations are constantly occurring.[1] But the point is one of emphasis—namely, the dominant focus on the relationship between climate and water *supply*. The climate research community has much to say about this relationship, and is therefore well positioned to contribute to questions and decisions of interest to water managers. That is good news.

Also good news is the fact that this focus on isolating supplies from climate flucuations is equally applicable to long-term climate change as it is to extreme events. True, the implications for coping regimes are somewhat different. Dealing with extreme events requires knowledge about the return intervals of events of specific sizes, and using this knowledge to design reservoirs so that storage from the wet years is sufficient to last through the dry years. For climate change, this strategy might need to be augmented by

[1] A great deal of research and application needs to be done regarding the use of risk management tools in water management. Examples of these tools include various types of non-permanent agricultural-to-urban water transfers used in dry years. Whether or not this type of work should be funded through organizations such as NOAA is a legitimate question. I think it should, but one could argue that the linkages to forecasts and/or basic climate research are too tenuous to be the focus of NOAA funding. As is evident from the rest of this paper, my preference is to expand (conceptually) the scope of what is considered a climate issue and whom is considered a legitimate audience to be served by the climate research community.

the development of entirely new rivers or aquifer systems.[2] But the philosophy holds: use climate research to define the amount of precipitation likely available, and then design the engineering systems needed to capture and deliver a specified "firm yield" exceeding (or at least equaling) levels of expected demand.

The story could (and perhaps should) end here, with climate researchers and water managers building increasingly close partnerships over time as researchers learn what information can be used by managers, and managers learning how best to capitalize on the skills in the research community. This type of partnership building is difficult, but is something that the Western Water Assessment (and other western RISA's) are actively engaged in. In our efforts, we have come to appreciate the value in inviting the management community to articulate the types and timing of decisions that they face, and to be very strategic in identifying the types of climate information that can and cannot be applied in these real-world applications.

The question that challenges me is whether or not this is enough. If those of us in the climate research community limit ourselves to better serving this traditional audience of water managers, complete with their traditional emphasis on supply management, then we may overlooking other opportunities and other potential audiences, and more troubling, may be inadvertently contributing to regimes of water management that, arguably, have several fundamental flaws. For example, if we acknowledge that water *demands* deserve greater consideration in overal water management planning and decision-making, then we should conceivably expand our audience to include people associated with decisions about growth, zoning, building codes, industrial development, and so on, or in the agricultural context, to decision processes about agricultural subsidies, soil conservation incentives, and so on. Similarly, water resources provide yet another reason for climate researchers to reach out to audiences concerned with environmental protection, public lands management, and energy development and use, to name just a few other sectors, and to people from fields such as law, policy (including elected officials), economics, sociology, and so on. Undoubtedly, we should try to better serve the traditional audience of reservoir managers, but it would be foolish to assume that these individuals comprise the full spectrum of individuals that have some role in shaping the risks associated with the relationship of climate events/trends and water resources. For our traditional audience, we need to be better listeners and more helpful collaborators; but for these potential new audiences—audiences that dwarf reservoir operators in their numbers and influence—we need to exercise true leadership, which requires understanding the full breath of the subjects we decide to cover.

In the Western Water Assessment, we have decided that part of our efforts will be to reach out to new audiences, and to seek opportunities to interject climate information into water-related decision processes where it is currently absent. This not merely requires understanding where and how a variety of decisions are made, but also requires

[2] In response to the recent drought in Colorado, voters in November will be asked to approve the selling of $2 billion in bonds to build new projects and rehabilitate and enlarge existing projects. A small fraction (I believe 5 percent) is to be reserved for conservation initiatives. Proponents of the ballot measure argue that it is needed to provide both drought protection and protection against potential climate changes.

identifying the gaps and flaws in those decision networks, and in some cases, exploring means to augment or reform those processes. While our efforts in this area are still relatively young, it is becoming clear that the subject of climate change may be more useful—more relevant—than drought in articulating the need for interjecting climate information into more discussions and decision processes, as the impacts of climate change figure to resonate more broadly than drought though society.[3] Focusing on climate change also allows us to enter into planning-oriented discussions rather than just the more operational discussions associated with drought coping.

Moving Forward

So what do these observations suggest regarding the future activities of NOAA partners, and specifically, about the goal of improving the ability of society to avoid negative impacts (and potentially capitalize on positive impacts) from climate change? This is a difficult question, so I will not attempt to provide a comprehensive answer. But a few conclusions seem clear.

First, activities such as the RISA's are essential, not merely for advancing the substantive goal of using climate information to better address societal issues, but more generally, to pioneer new mechanisms for better connecting scientists to other leaders in society. The historic disconnect between science and decision-making is troubling in many contexts, but is particularly ominus as we shift our attention to a scientific issue the scale of global climate change. Our ability to address this issue will not hinge on the quality of our science as much as it will on our ability to move this science out of the academic journals and into thousands of discrete decision processes at various scales.

Second, for that component of the NOAA agenda that is intended as applied research, virtually all strategic decisions about what issues are researched and how this information can potentially be used should, as a practical matter, begin in part by considering the potential audience for the information, and the societal need implicated by the research. While we should be responsive to those who knock on our doors with questions, and we should try to better serve our traditional users of climate expertise, we must also acknowledge that we have probably only scratched the surface of potential audiences, partners, and opportunities to contribute to society. Additionally, we need to critically review the logic of the questions asked, and perhaps more importantly, be cognizant of the important questions that nobody is yet raising. Thus, the goal should not merely be applied research, but proactive applied research, informed and guided by a detailed knowledge of how decisions are (and should be) made in society. This, obviously, is primarily social science.

[3] At least in the field of water management, *climate variability* is often seen as an isolated "technical" problem that should be anticipated and addressed by water managers, whereas *climate change* implicates long-term planning processes where roles exist for parties other than water managers, such as city planners and elected officials.

Third, if the two previous conclusions are accepted as having some merit, then there must be an acknowledgement that some additional "soil preparation" needs to take place before society can fully utilize the science emerging from NOAA. For climate science to take root in a variety of sectors and settings, potential audiences of climate information must have some introduction to the themes and language of climate science, and relationships must be actively cultivated. Ideally, the subjects of climate variability and climate change can be presented simultaneously, as it is the combined impact of both phenonmena that may have the greatest policy and management relevance. By the same token, scientists must develop at least a working knowledge of relevant decision environments, and the manner in which decision makers can and cannot make decisions. Only once a common baseline of understanding is established can scientists safely jump into the technical minutia and alphabet-soup of acronmyns that charaterize many of the stillborn partnerships between scientists and decision-makers.