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Lessons Learned: Bridging the Gap Between Science and Water Management

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ABSTRACT

Attempts to bridge the gap between those who generate scientific information and those who use it have not always been successful. This is true in part because most research methodologies encourage a relatively narrow, disciplinary focus on questions, frequently avoiding the complexities and interdependencies of the "real" world. A true dialog between end users of climate information and those who generate data is rarely achieved.

Improved scientific information is important to managing water supplies in the context of increasing competition for water. However, scientists may not fully understand the context within which water management decisions are made, or have the appropriate training to

ensure that the information that they produce is useful. There are major limitations to the applicability of current scientific products, in part because they are generated without a full understanding of institutional and political limitations to using the products in implementing new management techniques. Scientific training generally does not encourage sensitivity towards the needs of the users of the information that is generated, nor does it provide the tools needed for translation of knowledge to application by decision-makers.

Water managers also are trained to function in specific types of environments. Most water managers learn a substantial proportion of their skills on the job, within the particular context of the organizations they represent. Some water managers may be concerned about using new technology, because behaving as others have is a proven or acceptable strategy. This perspective is not unique to water managers; it has been observed in other professions (see Pulwarty and Redmond, 1997). New information sources and technology represent risk, and the repercussions of management error can be substantial. Perception of risk, as opposed to risk as described by objective observers, is likely to control decisions.

The common expectation among researchers is that new information can help managers anticipate a range of possible outcomes and assist in designing and implementing flexible responses. There is currently a major focus within federal agencies on "usable science," providing new opportunities to develop research products that have direct applications in the "real world." In the context of NOAA, the focus is on climate services, translating new understanding of the behavior of the ocean and atmosphere into the capacity to predict climate conditions in the months, years, and even decades ahead. Knowing that there is a high probability of a severe, sustained drought, for example, or an increased risk of flooding, can be of great use to water managers. However, a new form of scientific training is needed to improve the "usability" of scientific products like these. For example, much of the predictive capacity is in the context of probabilities of particular outcomes, quite unlike the current weather predictions that are deterministic in nature. Enabling the use of this new kind of information as an input to decision-making will require pilot testing and training of potential users. Understanding the context of decision-making needs to be established as a legitimate part of developing usable science. Funding agencies and current review processes tend to perpetuate the view that science should not be "contaminated" with social concerns. However, failure to appreciate the social context of decision-making has resulted in generations of scientific products that are rarely used.

This new approach will require different modes of communication between scientists and users of information, and possibly new types of professionals. The type of communication we have in mind moves beyond the current approach that is prevalent in federal agencies, providing information without assessing its utility, towards developing a framework and infrastructure for ongoing relationships between scientists and practitioners. This has been labeled "co-production of knowledge," and the implications of this approach are substantial because of the institutional changes required to facilitate it. To the extent that there is a need for improved predictive capacity to make better water management decisions, there are significant communication hurdles that need to be overcome. This paper focuses on some of those hurdles, including the information needs of both decision-makers and scientists, and makes suggestions for narrowing the gap between science and its intended applications.