

# SCIENCE, DEMOCRACY, AND WATER POLICY

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The fundamental point to our argument is that public policy performs multiple roles in a democracy, only one of which relates to the utilitarian purposes of effectiveness and efficiency that science and technology address. Ideally, the various roles of policy are appropriately balanced, given the context within which the policy operates, and are all served. In the case of water resources, however, contending interests that justify themselves with scientific and technical rationales have come to dominate the policy arena, to the detriment of deliberative democracy. To restore balance, enlightened scientists and other experts need to be more appreciative of the importance of broad public discussion of issues and more willing to forgo exclusive reliance on technical answers. In water policy we need less rather than more science.

## **POLICY HAS MULTIPLE ROLES**

The argument begins with a consideration of the roles public policy performs in a democracy. First, public policy should solve problems efficiently and effectively. This is the role hydrologists, engineers, and systems analysts find most familiar, and is the one also considered central to the policy sciences, which is comprised of a number of social science disciplines focusing on public policy. Policy is seen as instrumental in the achievement of goals or the alleviation of problems. Sufficient water at a reasonable price must be delivered to serve human needs. Flood losses should be reduced. Environmental

quality must be protected. A quality drinking water supply must be assured.

In its role of problem solving, policy is expected to involve a logical sequential process that begins with the identification of a problem or goal, the identification of alternatives for reaching it, selection of the optimal alternative, implementation, evaluation, and redesign or adjustment as needed. Water science and technology sees itself as playing a critical part at *each* of these stages. It provides a systematic way of setting priorities and action agendas through monitoring of important indicators. For instance, water science can tell us the salinity levels where salts in the Colorado River become a significant problem. Causal analysis and systems monitoring can help identify the priorities or the critical forces that must be modified to reduce salinity levels. Another example: scientific data gathering and analysis can tell us whether the salts in the Colorado River are from natural or human sources and what strategies would reduce each of these salts to specific levels at what cost. Further analysis can determine whether goals are reached and if not, what might be done about it. The test of a good policy is that it achieves goals effectively and efficiently.

The primary actors in the utilitarian view of policy are specialists and experts who have knowledge about the subject matter. Such specialists are located in bureaucracies, universities, think tanks, and engineering firms. Often there is a professional network or community that speaks the same jargon and has a

common perception of the nature of problems (Smith 1993). This is very much the case in water resources. Those who have been involved in water resources for a number of years know the extent to which we are a community of people who know one another by their work if not face to face. A person can move from the United States Geological Survey to a university where the person may also serve as a consultant to an engineering firm.

The utilitarian or science perspective greatly contributes to the success of policy. Policies must work to solve problems or the legitimacy of the political regime is threatened. Consider the example of the Soviet Union where mounting practical problems of poor economy and degraded environment did much to undercut support for the political system. Dams must hold water; water from water projects must be delivered to the designated places or agencies that build and run projects are not likely to survive. Even so, the scientific perspective is at best a partial view of what public policy in a democracy must do.

The second role of policy relates to the policy process. This perspective focuses on policy as a reflection of the exercise of political power involving negotiation between contending coalitions of interests. Policies emerge from contests in which people and interests have something to gain or lose. The history of the Central Arizona Project, for example, can be portrayed as a geopolitical struggle between people in the upper and lower basins, each group desiring to secure sufficient cheap water for development (Ingram 1992). Economic and environmental interests are also contenders, and much of the history of water policy since 1970 can be written as the struggle between those who profit from economic progress and those associated with the environmental movement. From this perspective the business of policymaking is never finished. Each statute, executive order or regulation marks a temporary balance among contending powers. Good policies are those that enjoy widespread general acceptance. For instance, the 1972 Clean Water Act would be viewed as very successful from this perspective because the regulatory framework it set up (of standards and pollution permits) has been generally accepted, even though it may be terribly flawed from a scientific point of view (Mann and Ingram 1984). Certainly the experts on the National Water Commission were highly critical in their report which questioned whether water safe enough to swim in everywhere was a reasonable goal and whether across-the-board standards were wise given the enormous

variations in quality and uses of water. Such criticisms were completely ignored by the legislation's chief sponsor, Senator Edmund Muskie. Along with interest group leaders, elected officials are the primary actors in the process of negotiation and bargaining. Elected leaders seek not just resolution of conflict but credit for popular policy decisions. Many analysts believe that the 1972 Clean Water Act would not be as strong as it is except for Senator Muskie's presidential ambitions.

A third aspect of policy is to provide an arena and subject matter for democratic deliberation through which citizens are enlightened, informed, and participate in the search for the public interest. While articulated today by some fairly abstract critical democratic theorists, this vision of policy was strongly espoused at our nations founding by statesmen like Thomas Jefferson who firmly believed that the people themselves were capable of making decisions that affected them (Ingram and Wallace 1996). This vision is also articulated in much of water policy, particularly the history of irrigation. Arthur Maas (1978) has written that the community legislature and water court in Valencia, Spain, are among the oldest democratic institutions in the world, existing even before the British parliament. These institutions allow ordinary people to make and enforce rules to ensure that water will serve community interests (Mann and Anderson 1978). Water played a critical role in formulating community consciousness and community self determination in the building of the American west. As the work of Michael Meyer has demonstrated, white settlers copied much of earlier Hispanic water law that allocated water above all to serve human welfare, not just to satisfy individual rights (Meyer 1984). Moreover, the process of collectively developing sources for water and distribution systems, cleaning ditches and honoring rotation of water use, reinforced the practice of democratic behavior. Individuals learned that individual livelihood depended on everyone restoring irrigation systems after storms. They also deferred self-interest in favor of the collective good by closing the gates to their irrigation canals when their turn was up (Brown and Ingram 1987).

It is obvious to any reasonable observer that policy is failing in its role as an enhancer of democratic deliberation. In recent surveys most people have said that they distrust their governments more than any other institution. While many see government as an active threat to their rights, others simply view the acts of government as irrelevant to their lives. Water policy, like many other policies, is greeted with alienation, cynicism,

and disinterest. Water users doubt that utilities can be depended upon to deliver clean, safe water and to protect the public interest over bureaucratic and special interests. Consider the public's vote on proposition 200 in Tucson, Arizona, which requires that Tucson domestic water users stay on ground water for five more years even though this proposition was opposed by most experts, Tucson Water, and the Mayor. Yet the initiative was approved by voters after an acrimonious campaign in which the public utility was accused of manipulating the public with false information.

The fourth role of policy in a democracy is to serve justice. The relevant questions here pertain to fairness in decision processes and allocation decisions and extend to issues of generational impacts on the natural environment. Policies that appear to be effective and efficient may have highly differential impacts on various social groups, or may destroy the natural environment at the cost of future generations. Some groups are disproportionately represented in favorable allocation decisions and others are disproportionately underrepresented. Issues about justice have become so prominent in environmental policy, for example, that an entire field of study called "environmental justice" has emerged. Cost benefit studies often do not examine differential impacts of policies in terms of race or socioeconomic class. Even the case studies of contending coalitions often focus mainly on who won from among those in contention, without recognition that some interests may not even have been considered. The history of water rights and water allocation in the west shows the systematic disadvantage of Indian tribes.

Balancing these partially conflicting roles is essential to good public policy. Finding the correct balance requires careful tradeoffs within the context of particular policies at particular times. When public policy in any area is single minded in its purpose and pursues instrumental rationality, political balance, democratic participation, or equality to the exclusion of all else, policy undermines rather than supports democracy. Where imbalance occurs, action needs to be taken to bring roles into better balance.

## **WATER POLICY LACKS BALANCE**

It is not difficult to find examples in water resources where several roles have not been fulfilled, to the detriment of good public policy. Sol Resnick, the former Director of the Arizona Water Resource Center, used to

tell a story about his experiences as a hydrologic advisor in some developing country where the state of deliberative democracy and sense of justice were quite advanced but which was technologically backward. Villagers, including almost all who were residents, met to decide where to put a new well (Resnick, 1984). They debated the advantages of placement close to this house or that and finally settled upon a site that everyone accepted. Once the decision was made, villagers were completely committed to it despite Sol's efforts to explain that the depth to ground water was far too great at that particular place. Eventually digging began and as Sol predicted workers could reach only sand. According to Sol the villagers blamed him for the failure and not their decisionmaking process that included a balancing of interests and democratic deliberation but excluded consideration of the utilitarian logic necessary to connect users to dependable water supplies. Later, accepting reality, the well was successfully dug at the site proposed by Sol!

The 1922 Colorado River Basin Compact represents a political context in which interests were satisfied, but which lacked important scientific information, was inattentive to issues of justice, and did not provide for democratic deliberation. The delegates to each of the basin states who met at Bishops Lodge outside Santa Fe represented all of the powerful interests, but were certainly not democratic decisionmakers. They met behind closed doors and carved up the Colorado River; parceling it out among the states as if they both had the power of mother nature and were omnipotent about the public interest. Their elite meetings were far from democratic deliberations, and the interests of Native Americans were poorly represented. Further, their science was flawed, and their assumption that the Colorado River would dependably flow at more than 15 million acre feet a year was significantly off the mark. The flawed policy that emerged has led to a sense of injustice and prolonged conflict over who would bear shortages (Weatherford and Brown 1986).

Contemporary water policy is imbalanced in a different way. The kind of imbalance among policy roles can best be described as *dominance of political power, technically legitimated*. That is, policy choices reflect political competition among powerful interests that are legitimized by appeals to scientific and technical arguments. Interests, including bureaucratic interests, contend with one another in a context where participants disguise their concerns with scientific and technical arguments that appear credible but which actually are chosen not on

scientific grounds but instead because they serve specific interests. Elected leaders fear appearing at cross purposes with experts on water. They take positions depending upon whether they can find experts who will give them convincing technical rationales. This kind of imbalance leads to policies that are destructive to justice and to deliberative democracy. Further, such politics and policy ultimately discredit science.

In water policy the roots of the impulse to disguise water policy in technical terms can be traced to the progressive era during which the power of expertise to fashion policies was elevated above the politics of powerful interests. John Wesley Powell, for instance, contended that the federal government and the Department of Interior should create scientifically based water and land policy for the West. Earlier reclamation policy promised to make the deserts and agrarian democracy bloom through projects which were planned and constructed by centralized, bureaucratic expertise. As Samuel Hays' 1959 book about the progressive movement in natural resources makes clear, local interest groups challenged and often prevailed against centralized experts. However, the notion that there was a scientifically right way to handle water resources became firmly imbedded in the collective mind. The prestige of scientific approaches to water policy got a boost when the great dams constructed in the Pacific Northwest and Boulder Canyon were able to deliver flood control and cheap hydropower. These projects symbolized the ability of water science to solve practical problems.

The linkage of science to government is reinforced by the technically oriented missions provided to federal natural resources agencies. There is a natural affinity of science, technology, and bureaucracy because of shared values, such as a belief in hiring based on merit and specialization rather than kinship, friendship, or patronage. Management specialists gradually are being replaced by disciplinary specialists who have advanced degrees in one or another scientific field. Many scientists have gained management skills that make them comfortable in bureaucratic hierarchies. Scientific rationalizations provide a powerful legitimation to policy proposals and actions emerging from agencies. Scientists and professionals have much stronger credentials than generalist managers when it comes to knowing the right answers. Modern life tends to favor bureaucratic organizations, and armed with scientific legitimacy, the power of professionalized bureaucracy is truly formidable.

The clout of expertise has not been lost on interest groups, including the environmental movement. Scholars have documented the trend toward environmental interest groups hiring their own in-house scientists to provide the best possible rationales for positions that they take, even though those positions are taken mainly on grounds other than science. The tobacco companies hired their own in-house researchers to counter the arguments of university and government scientists and smoking causes lung cancer. Business and trade associations engage their own science experts to help them put the best scientific face possible upon their activities. This has spawned a debate about which side can claim mainstream science and which is junk science, as illustrated by the advertisements in the New York Times sponsored by the Union of Concerned Scientists in which they claim they have brought sound science to the table while their opponents have commissioned junk science (Union of Concerned Scientists 1996). While the two sets of scientists in this debate are squarely at odds, they share common scientific allegiance to policy as a utilitarian tool as well as common background and credentials. Similarly in the area of water resources, while there are enormous differences of opinion about the particulars of water policy within the community, there is general agreement about what passes for acceptable knowledge and evidence in the policy debate. However much these experts may differ on particulars, they are united on the notion that water is a technical subject that requires special study before anyone should venture to express an opinion or form a conclusion.

Despite the veneer of science and scientific rationality, the politics of interest, including professional, bureaucratic, geographic, economic, and environmental interests is clearly the driving force here. Utilitarian reasoning and science are brought in as very junior partners in the combination. In this context science is more used than listened to. That is, only those scientific and technical arguments that support policy options favorable to interests are made. The unfettered consideration of all possibilities does not take place. Before we consider further the impacts on science, however, let us first consider the consequences to policy processes and content.

In interest dominated, technically justified water policy, issues are socially constructed as technical questions that only technicians can answer. There is an old axiom in politics that declares that whoever defines the issues wins

the contest. Most issues are subject to a variety of constructions. For instance, take the issue of crime. It can be constructed as a matter of the effectiveness and efficiency of delivering safety to the public. Under this guise whether or not to patrol a neighborhood, strengthen sanctions for crimes, or alter penal systems depend upon whether crime is reduced and at what cost. Alternatively, crime can be constructed as a political issue in which public officials who are soft on crime let criminals off and coddle them while they are in jail. The political issues are whether one or another candidate or party has a better record for effectively fighting crime. Or, crime can be constructed as a justice issue in which some social and ethnic classes are treated differently by policy, are over represented in the criminal justice system, and are more likely to have practices in which their members engage criminalized.

Water issues, particular those related to water quality, tend to become defined narrowly and technically. Contamination is described as parts per million of an alphabet soup list of chemicals that only chemists understand. Possible health effects are discussed in terms that communicate only with a toxicologist. While the debate sounds highly technical, most research scientists view it as superficial. Under such definition of issues, a broad, hydrologic focus is absent. The water is not seen in systemic terms and the larger picture of past and present development choices directly and indirectly related to water availability and quality are excluded from the debate. Further, the sustainability of water systems into the future is not usually part of the discussion.

Social construction of issues in narrow technical terms also leaves out important social justice concerns. There is little focus on who fairness or on who wins and who loses. What industries will receive subsidized water rates, how present users may have to pay for system expansion to accommodate growth, and what may happen to trees and other greenery as a result of water rate changes are just some of the questions seldom discussed. There is little explicit discussion of who holds the power of decision in issues that are presented in heavily technical terms, even though control clearly gravitates toward experts. Instead science is presented as if it were politically neutral. The technical nature of issue construction eliminates real participation on the part of the lay public. If the public becomes any part of the issue definition, it is to draw attention to how little the public knows and how much it needs to be educated.

When issues are constructed technically, the resulting legislation often contains policy designs that are damaging to democratic deliberation. While water policies are supposed to lead to action, policies devote many provisions to what experts like to do best; that is, study, gather data, employ additional researchers and technicians, plan, evaluate, and write reports. Little distinction is to be made between what is good for professionals and other experts and what is good for the public interest. Experts prosper whether or not projects are built and there seems to be endless calls for additional study.

While policy experts have great confidence that, given the proper support, they can find solutions to problems, they display little confidence in street level agency officials or ordinary people to take action. This bias is reflected in their choice of policy tools. They prefer policy tools that work automatically and do not depend upon modifying human behavior through education or incentives. Quantitative decision aids remove the need for administrative judgement. When population and pollution reach certain action levels, local agencies are supposed to invest in facilities to meet drinking water standards rather than balance competing needs which may include systems maintenance and public information. To solve pollution problems, the water policy designers opt for new waste treatment technologies. More attention and money are directed at technical solutions than to behavioral solutions that might induce people to change their buying habits or to pollute less. Because people receive implicit messages through their experience with policy, it is not surprising that most people view water as an arcane subject too complex for their involvement to be meaningful. The kinds of rules imbedded in policy are also significant. Long range planning rules require goals to be adopted and actions to be determined that will not take effect for many years. Only those who have a direct financial interest or a high level of expertise are likely to express interest far in advance. While planning documents are useful to professionals, they are often barriers to participation.

Advocacy science rather than normal science often occurs in water policy and science itself becomes politicized (Salter 1988). Controversial agency actions require the endorsement of scientific advisory committees which are asked to certify the technical soundness of positions that are often as much political as technical. All the serious contending interests, including government, have their

own science advisors. While these advisors hold real credentials and share scientific values, the kind of science they are asked to do is far from the idealized model. While scientific investigation may take place in standard laboratory or science settings, and scientists involved go to great length to protect their reputations as free from bias, the atmosphere is far from dispassionate. The usefulness of the conclusions of research to the sponsors who may be regulators, regulated, or interest groups is at the forefront. There is not the open ended exploration of natural phenomena characteristic of research science. This kind of science almost never results in innovative or surprising break through in understanding. Further, scientists are often pressured to provide conclusions they are not ready to provide to audiences that have little background to recognize good science.

Advocacy science has some pragmatic advantages to the scientific establishment that must be mentioned. The demand for people with technical expertise is very high and there are many jobs for graduates of university programs that provide technical training. There is a fairly free flow of money for studies that are performed by consultant groups and university professors. Such benefits come at a price which some believe is too great. Sociologist Chandra Mukerji (1989) has written:

The process of giving the voice of science to the state for its political ends is, in formal terms, the opposite of ventriloquism. Scientists do not send their voices out to speak through the mouths of mute government officials. Government officials extort the language of science and scientists' analytic skills to do their political jobs. Scientists are made mute, except when politicians find their voices useful.

While scientific and technical rationalizations provide enormous power to the political interests that find them beneficial, Mukerji is correct to conclude that individual scientists and science as an intellectual enterprise are not really advantaged. The public gets the impression that science can be bought when opposing sides line up their advisers and expert witnesses. The wonderful reputation science once had for its ability to solve problems is badly damaged. Like everyone else, scientists are believed to be mainly out for themselves. Further, there is bound to be a conservative bias to science that is done in the service of legitimizing the advantage that the state or private interests have over others. Despite the vision scientists have of themselves as independent, critical, and

innovative, in their role of legitimating policy beneficial to powerful interests, they tend to be tools of the status quo.

## **A MORE APPROPRIATE ROLE FOR SCIENCE**

What suggestions do we have towards a more appropriate role for science in public policy? What can scientists do to change their role in the politics of interests, and be technically justified? Three possibilities that are different but not mutually exclusive emerge.

### Accept Their Political Role, and Improve Their Negotiating Skills

Many believe it is impossible to treat technical issues as if they are separate from those that involve interests and values. In her study of scientific advisory committees, Sheila Jasanoff, a sociologist who argues this point of view, found that successful advisory committees are intimately involved in negotiation and bargaining not just on what constitutes good science but many other political matters. When scientists are good at this job, they can mediate political conflicts. Jasanoff (1990) writes:

Protected by the umbrella of expertise, advisory committee members in fact are free to serve in widely divergent professional capacities: as technical consultants, educators, policy advocates, mediators, and even judges. Though the purpose is to address only technical issues, committee meetings therefore serve as forums where scientific as well as political conflicts can be simultaneously negotiated. When the process works, few incentives remain for adversaries to deconstruct the results or attack them as bad science (p. 124).

The implications for what kinds of credentials a scientist should have to perform this role well are interesting. Being just a good scientist is far from sufficient. The most valued expert is one who can transcend disciplinary boundaries, synthesize diverse perspective, and has a firm understanding of the political role of science in public policy. This means that universities do a disservice to science students and to the political process when they are led to believe that science can be separated from politics and that it is sufficient just to be technically proficient while ignoring questions related to fairness, justice, and other values.

### Perform Science for the Powerless and Under Represented

The issues of what interests are served by science in politics needs to be faced directly. Since scientists in water policy and similar areas that are technically constructed are in fact deeply involved in decisions that help some and hurt others, they have social obligations. The fact is that science is going to be used by the state and powerful interests. Science is likely even to be distorted by these interests in ways favorable to them.

At the same time, there is a considerable experience of science that challenges power by pointing out the omissions, gaps, and misstatements in science justifications. Dorothy Nelkin (1992) has chronicled the number of cases in which science has been used by community and environmental groups to challenge authority in such areas as nuclear safety, registration of pesticides, risks of food additives, and the like. There is a long tradition within water resources of the use of science to question bureaucratic plans and special interest schemes. Consider the ways in which hydrology and water science has been used to accomplish underdog victories such as the defeat of dams in the Grand Canyon and the passage of the Arizona Groundwater Act.

Other professionals regularly recognize that left to the market, many would not be able to get access to their skills. To avoid the resulting inequities they donate a portion of their time. Consider the pro-bono work done by lawyers or the charity clinics staffed by physicians. Socially responsible scientists might well follow this model.

Science in the service of justice, however, requires a political sense that is alien to many scientists who do not like to think they are in any way accountable for the ways in which their research is used. If scientists are to serve democracy, they need to be better trained to understand and question policymaking processes.

### Exercise Influence to Restore Balance by Engaging the Process of Democratic Deliberation

The most fundamental flaw in contemporary water policy is that many value questions in which ordinary citizens have a great interest, are being framed as technical questions. In consequence, the public discussion about values that needs to occur in a democratic society does

not take place. Water is a fundamental social resource, and collective decisionmaking about its distribution and protection is fundamental to building a sense of community. For every water resource question settled by an elite, an important opportunity to improve the deliberative process is foregone.

Technical issues need to be reinterpreted as human and social issues, and the boundary of what constitutes a technical question needs to be redrawn more narrowly. While it is the primary role of politicians to perform this function, in our present politics they often prefer to hide behind the testimony of experts rather than deal with conflicts. In any case scientists have greater credibility to more convincingly draw the boundaries between what experts need to address and what should be public issues. Unfortunately, it has been our experience that many water specialists, often including professionals in engineering consulting firms, are poor at drawing this distinction. They encourage the public and client to believe they can answer questions that are not subjects for experts. Knowing what aspects of policy must be addressed by deliberative processes, and not swept into the domain of specialists, should come as part of graduate training and continual practice of water resource scientists. In the long term only lively, meaningful discussion of human values related to water can improve water policy.

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