Disciplinary Frameworks for Water:
Preconceptions and Perceptions

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There is an old adage: "Seeing is believing." It is also true that "Believing is seeing." In a sense, each water professional is trapped (or limited) by our personal experiences and our technical training.

Different fields of study shed light on water issues; the lenses of specialized disciplines allow scientists and scholars to delve into subjects in a consistent manner that reflects associated paradigms. In addition, the choice of a professional career reflects personal values, which magnifies the role we assign to those who are trained in the same set of paradigms. The disciplinary composition of the International Water Association has evolved over time to include management scientists, legal specialists, economists and other social scientists. The organization's Special Interest Groups reflect a wider range of expertise than a decade ago, partly because water leaders recognize that engineering skills are necessary, but not sufficient, for developing and implementing water policy and for implementing cost-effective programs. Similarly, government ministries, international organizations, university research teams, water agencies, and water and sanitation utilities need to draw upon a wider skill-set than in the past if they are to be effective in addressing emerging issues.

To some extent, disciplines become associated with particular advocacy groups. Specialization also means that scholars in particular disciplines are often not fully aware of key interconnections. However, disciplines also shape the framing and analysis of issues: technical training, in effect, puts blinders on researchers. Just as the IWA has expanded its range of activities, universities and water research institutes need to create multi-disciplinary initiatives to improve our understanding of the complex relationships underpinning water issues. Similarly, water utility operators need to hire professionals with a wide range of backgrounds, if performance is to improve. Thus, we need to bring together specialists from a number of disciplines in order to create the building blocks for "seeing" water issues more clearly. The following list is meant to illustrate the unique contributions made by different groups:

Engineers look to technologies for solutions to water scarcity, energy issues, and environmental problems. If funding is available, they are able to develop and integrate new (often expensive) approaches to promoting sustainable systems. Also, they are capable of devising optimization models that incorporate innovative approaches to water supply.

Hydrologists investigate (among other things) pollution transport in water systems. They are involved in resource management and have a deep understanding of the impacts of water usage and wetlands on water levels and flows within watersheds. This understanding often determines policy decisions on water permit regimes and water trading regimes. In addition, these scientists model the impacts of discharges under different conditions and the implications of alternative nutrient reduction plans. *Meteorologists* help us understand other facets of the water cycle.

Demographers forecast migration patterns and the implications of changing age-distributions of the population. *Epidemiologists* estimate the doses received by different population groups in the context of environmental problems. Then *medical scientists* and *toxicologists* analyze the dose-response relationships for citizen health outcomes, as they conduct exposure and risk assessments.

Ecologists study the impacts of water patterns on the local and global environment, assess the value of ecosystem services, and track invasive species and biodiversity. Thus, they provide impact analyses for natural systems. For man-made structures, *materials scientists* examine damages caused by water pollution and other forms of environmental degradation.

Political scientists focus on interest conflicts, as they consider issues of power, legitimacy, social cohesion, and the roles of different stakeholder groups in influencing policies that might promote sustainability. Jurisdictional issues include those associated with authority conflicts: centralized vs. decentralized decision-making, local vs. regional authority, and environmental mandates vs. incentives. Consensus is critical because ultimately, in a democratic system, there needs to be widespread agreement on desired outcomes to avoid instability and excessive cycling.

Geographers help us understand the interactions between topology and land use. Sophisticated global positioning technologies enable specialists to track vegetation trends and identify water use patterns to assist researchers in other disciplines in making forecasts about water scarcity.

Historians document how groups have confronted water issues in the past. Through detailed research on past conditions, citizen attitudes, and political leaders, they shed light on ways we have dealt with problems in specific regions during different time periods. The patterns they uncover and the lessons they identify can help us appreciate the roles of different groups in influencing public policy.

Economists emphasize the importance of efficiency in resource allocation. They generally apply cost-benefit analysis to water and environmental policies. Analysts tend to advocate price signals to provide incentives for water conservation and for the adoption of appropriate control technologies. From this perspective, renewable and non-renewable resources are commodities with values in alternative uses, including future consumption and environmental restoration/remediation.

Planners deal with land use and zoning issues, given population growth projections. Planners integrate legal constraints with historical experience, bringing topological, aesthetic, and geographical elements to the analysis. They attempt to translate citizen values into policies that promote sustainability.

Archeologists and *anthropologists* provide insights on the impacts of industries, transportation systems, dams, mines, and related economic activities on unique historical sites, local populations, and indigenous groups. Such impacts create difficult issues, from determining the social costs associated with particular policies to social priorities regarding the use of water resources.

Legal specialists spotlight the institutions of policy implementation, incorporating precedence into the process (based on past cases). For example, rules and regulations attempt to pay significant attention to procedural fairness. Due process contributes to the legitimacy of outcomes. If the different parties perceive there is no transparency nor opportunities for participation, water policy will be perceived as unreasonable; the laws will either be changed or they will be disobeyed in a variety of ways. In addition, they play a role in resolving authority conflicts through the drafting of new legislation and actions taken within the judicial system.

Environmentalists advocate sustainability and environmental equity. The by-products of economic activity affect public health and have environmental impacts. Water has economic value, but often the associated impacts of different uses are non-monetary or difficult to quantify. For example, wetlands and estuaries contribute to the health of the planet: in many jurisdictions, rules on levels and flows attempt to incorporate impacts on biodiversity and sustainability.

Ethicists help us understand our personal values and notions of stewardship. We have a clear responsibility to leave future generations with a legacy of sound institutions, healthy citizens, and a clean environment, though the best means to these ends are often not obvious. In fact, debates over the means and timing of initiatives can be quite contentious. Thus, this field identifies sources of value conflicts.

Physical, biological, and social scientists attempt to uncover patterns and identify lessons to help us improve policy. *Engineers* then apply those principles in designing water utility systems and water management procedures for achieving social objectives.

No discipline has all the answers. More importantly, each discipline asks essential questions. It is clear that sound public policy requires the contributions of specialists who bring a variety of perspectives to the table. For example, the IWA promotes improved water sector performance when it facilitates networking across disciplines and promotes interdisciplinary work that integrates the various frameworks into useful decision-tools.

Water problems are not solved: they are managed. If solutions were easy, concerned citizens and policy-makers would long ago have adopted those “solutions”. When they are doing their job, public policy-makers practice the art of the possible—drawing upon scientific

consensus (when that exists) and balancing risks (when those are identified). The frameworks utilized by specialists from different disciplines underscore the complexity (and seeming intractability) of water issues. The frameworks can constrain our perceptions, causing us to over-emphasize one approach over others. Nevertheless, without these disciplinary perspectives, we would lack foundations for resolving conflicts that arise around water resource management and water use.

According to Shabman (2005) there are at least four sources of conflict in policy development and implementation: *cognitive conflicts* (based on technical disagreements regarding how information might be interpreted), *interest conflicts* (where stakeholders obtain different benefits and costs under alternative policies), *values conflicts* (involving ideology or personal preferences regarding outcomes), and *authority conflicts* (stemming from jurisdictional disagreements). These potential sources of conflict characterize most politically-charged situations, with water supply management illustrating the interplay of these forces.

The disciplinary frameworks listed above address these four types of conflicts. The physical sciences focus on resolving cognitive conflicts: *what is* and *what would be the consequences of adopting specific policy options?* These questions can be answered with technical research, although the confidence intervals (and burden of proof issues) introduce further complexities into the process. Political scientists and economists help identify interest conflicts: *who benefits* and *who bears the burdens of different policy options?* Here, the Golden Rule often applies: "He who has the Gold rules." Yet democratic systems seek outcomes that benefit people, not just people (and entities) funding political campaigns. The challenges for our political systems are significant: technocrats do not make policy, they implement policy. So the role of special interests in determining public policy needs to be addressed frontally, not after the fact.

Turning to the third type of conflict, we note that Ethicists can help clarify our own values: *what ought to be?* Different concepts of social justice or weights to be given to environmental impacts of economic development suggest that unanimity on this score is unlikely—but the differences ought to be stated up front, so people are not talking past one another. Sometimes dialogues within a community can narrow the range of disagreements: almost everyone wants policies that leave the world better off than when we came on the scene—so perhaps the values conflicts are more apparent than real.

Finally, we must address the issue of appropriate government authorities for implementing policies: *who decides?* This issue is especially problematic when water basins cross local, state, or national boundaries. Here, access to water becomes a potential lightning rod for cross-border conflicts. Resolving such issues requires participants to understand that the results need not involve a zero-sum game (more for one means less for the other). Similarly, the jurisdiction issue arises in the choice between public ownership of water utilities and private participation in the funding and/or operation of water systems. Again, it seems that some of the disputes are designed to keep particular constituencies aroused: one could argue that the issue is not one of ownership, but of performance.

The purpose of this note has been to draw attention to how different disciplines contribute to resolving conflicts in the water arena. Each of us can benefit from the insights developed by "other" water professionals. Ultimately, our beliefs frame our perceptions and limit what we ask and what we see. More attention should be given to scientific observations that identify fundamental systems relationships and constraints. Although water is an extremely contentious field of study, more comprehensive frameworks must be developed in the years ahead if future generations are to evaluate current initiatives as building sound foundations for the future.

Reference

Shabman, Leonard (2005). "Water Supply Conflict and Government Response: The Challenge for Florida," *Askew Institute Report,* University of Florida, Spring: 10-11.