

The United States has no national policies or institutions in place to deal with the major water challenges that lie ahead.

A Plea for a Coordinated National Water Policy



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U.S. scientists chartered by Congress through the National Academies have affirmed that climate change is occurring, identified its potential impacts, and concluded that it is very likely related to human activity (NRC, 2011a). As Working Group II of the Intergovernmental Panel on Climate Change (IPCC) has reported, the direct impacts of climate change on world water resources will be to reduce available water supplies in some regions, raise sea level, and increase the probability of significant water-related disasters such as floods and hurricanes (Bates et al., 2008).

The world is enmeshed in climate-related change, and the United States is in the thick of it. The U.S. population is growing faster than in most other developed countries, and the U.S. Census Bureau expects it will increase by as many as 150 million by 2050; this will also increase the demand for water as well as for food and fiber. This rapid growth, coupled with a continuing shift in population to areas near water and/or with warm climates, is also likely to result in unplanned growth in areas subject to natural disasters.

All of these changes are occurring amidst volatile, complex, and ambiguous changes in many nations around the world. Until recently, when planners looked to the future, they envisioned a world very much like the present. Future climate could be judged by past climate, and societal needs and demands could be expected to remain within a narrow range (Figure 1a). However, a bounded future can no longer be expected.

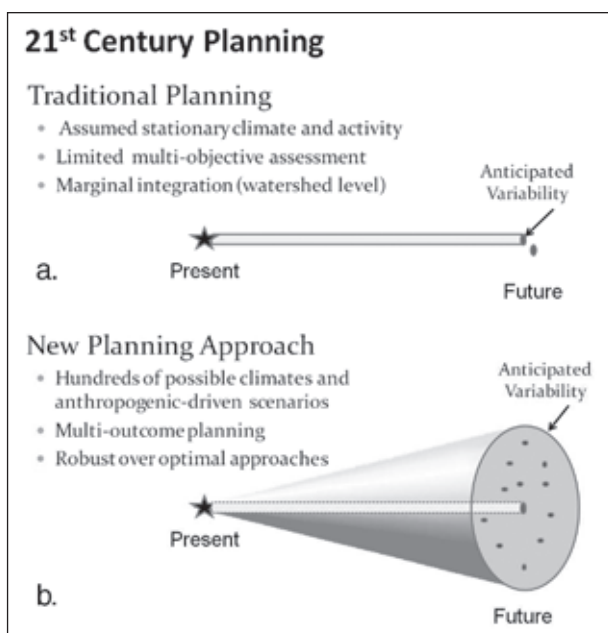


FIGURE 1 (a) Planning under current paradigms, which have undergone limited change over time. (b) New paradigm with a broad range of potential futures. Source: Adapted from Mark Waage, Denver Water (2010) with permission.

Planners and decision makers must now consider numerous alternative scenarios characterized by a high degree of variability and uncertainty (Figure 1b).

The hydroclimatic changes underway have been held responsible for the end of “stationarity”—“the idea that natural systems fluctuate within an unchanging envelope of variability” (Milly et al., 2008). Previously predictable hydrologic futures have become considerably more uncertain, making water-related planning and decision making much more difficult.

Like other countries, the United States faces a long list of water challenges:

- More frequent and more severe droughts and increased water demand. In 2002, 49 percent of the country was experiencing moderate to severe drought. Since then, drought has become commonplace in many more places across the country. At the same time, population growth, especially in urban areas of the West, is increasing pressures on limited water supplies (NDMC, 2011).
- Degraded water quality. The 1970s goal of providing fishable, swimmable, and drinkable water throughout the nation has not been realized. Control over point-source pollution has resulted in significant improvement in water quality. However, we have yet to effectively address nonpoint-source pollution and its impact on our nation’s rivers and groundwater (EPA, 2011a).
- Increasing flood damage. Over the last five decades, average annual flood damage has increased in spite of significant federal investment in structural and non-structural programs to reduce flood risks and lessen the impact of flooding when it occurs. Flood damage connected with Hurricane Katrina and major floods in 2008 and 2011 resulted in losses higher than the annual average of \$6 billion. Stormwater flooding is also a growing problem in urban areas (NWS, 2011).
- Aging and inadequate maritime infrastructure. Although ports, harbors, and inland waterways are critical to the success of national and international commerce, much of the U.S. inland waterway infrastructure is outdated and appreciably slows barge traffic. In addition, many ports, harbors, and channels are not competitive in today’s deep-draft shipping environment (ASCE, 2009a; USACE, 2011).
- Inadequate protection of the environment. Riverine and coastal ecosystems remain at risk as floodplains and wetlands are subject to increasing pressure by developers or are disappearing as a result of anthropogenic activities that have undermined their stability. More than 1,300 species of animals and plants are on the federal threatened or endangered species lists (USFWS, 2011).
- Legacy environmental damage. Human activities over the last century have severely damaged ecosystems in many places in the United States, including the Everglades, coastal Louisiana, the Chesapeake Bay, the upper Mississippi and Missouri Rivers, and the California Bay Delta. Only in the last two decades have efforts begun to restore the natural functions of these areas. The resources needed for restorations far exceed the amount that has been, or is likely to be, committed to those efforts (EPA, 2011b).
- Lack of understanding of the water-energy nexus. The availability of water is critical to the extraction of a variety of energy resources, the safe operation of nuclear and conventional power plants, and the production of renewable energy resources. The deep pumping of groundwater resources and the diversion of ground and surface waters for irrigation has placed heavy demands on energy supplies. Trade-offs are being made on a daily basis among water uses in an essentially zero-sum game.

- Inadequate protection of groundwater. Groundwater provides 18 percent of the nation's urban water supply, yet we are a long way from fully understanding the locations and conditions of groundwater resources. Contamination is a continuing challenge, and only a few communities have taken steps to protect the source areas of their groundwater (Kenny et al., 2009; USGS, 2011).
- Inadequate or nonexistent watershed planning. At the federal level, authorization and appropriation of funds for water resources are linked to specific projects rather than to needs identified on a watershed or basin level. Management by earmark rather than by national priorities and watershed needs inhibits comprehensive planning and ignores upstream-downstream interrelationships (AWRA, 2007).
- Dealing with interstate conflicts. States are responsible for managing waters entirely within their boundaries. However, management of interstate waters is problematic, and decisions on the use of shared waters are frequently made by courts or the federal government instead of by collective action of the states involved. For example, the states in the Missouri River basin have been arguing for more than two decades about the operation of the six large federal dams on the main stem of the Missouri. In another example, Florida, Alabama, and Georgia, to which Congress delegated authority to develop an accord on the use of the waters of the Apalachicola, Chattahoochee, and Flint Rivers, have been unable to come to an agreement in spite of more than two decades of negotiating. In both cases, the courts have been called upon to adjudicate specific issues that should have been addressed by multistate agreements (NRC, 2009, 2011b).
- Crumbling, outdated water infrastructure. The American Society of Civil Engineers (ASCE), in its biennial report on the condition of the nation's built environment, continues to give the five water infrastructure sectors grades of D or D- and has identified multibillion dollar funding shortages and deficient conditions in water and wastewater systems, dams, navigation, and levees (ASCE, 2009a).
- Lack of knowledge of current conditions. The United States has not undertaken a comprehensive water assessment since 1976. Although the U.S. Geological Survey (USGS) produces periodic reports on aspects of water availability and use, no effort has

been made to fully understand 21st century challenges. On the contrary, resources for monitoring current conditions are being reduced every year (Schiffries and Gropp, 2009).

Managing Our Water Resources

So what are the guidelines for U.S. water policy as we enter the second decade of the 21st century? Good water management, any management for that matter, is predicated on a vision based on goals and objectives for realizing that vision. Together the vision, goals, and objectives shape the policies that define responsibilities and authorities of organizations and individuals and describe how they will bring us closer to achieving the vision and how they will be coordinated with activities in other sectors.

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The Policy Framework

The National Environmental Policy Act of 1969 clearly stated the goals, objectives, and policies that have guided our treatment of the environment. The Water Pollution Control Act Amendments of 1972 provided a vision for the future condition of water—fishable, swimmable, and drinkable—and established policies and procedures that have led to improvements in water quality. The Endangered Species Act of 1974 defined the treatment of flora and fauna and the habitats on which they rely. However, since the 1970s we have made little progress and have become increasingly confused about fundamental management of the nation's water resources.

Following the great Mississippi flood of 1993, a White House study committee reported that the nation's approach to dealing with floods was uncoordinated and lacked clear direction. In its report, *Sharing the Challenge: Floodplain Management into the 21st Century*, the committee recommended enactment of legislation based on a vision for management of floodplains and a

description of the responsibilities of federal, state, and local governments (IFRMC, 1994). Although legislation was considered in 1994, political changes in Congress that year tabled all action.¹

Wrangling over Flood Management in the Missouri River Basin

Use and control of the waters in the Missouri River basin have long been of interest to the federal government. Early in the 20th century, dams in support of power and reclamation were built, and in 1933, construction began on Fort Peck Dam in Montana to support downstream flood control and navigation.

In the 1940s, concern about the water resources of the Missouri River basin led to congressional approval of the Pick-Sloan Plan in the 1944 Flood Control Act. The plan was developed by the U.S. Army Corps of Engineers (USACE) and the Bureau of Reclamation (Bureau) to address the need for flood control, navigation, fish and wildlife protection, hydroelectric power, public water, recreation, irrigation, and water quality.

An NRC report concluded that the ecosystem in the Missouri River basin was in danger of collapse.

In the 1950s and 1960s, five additional large dams were built on the main stem of the Missouri River, and numerous others were built by USACE and the Bureau on tributaries to carry out this mandate. Subsequent environmental legislation, such as the Endangered Species Act, added additional purposes to the use of the Missouri River basin, and congressional committee guidance “informed” decisions on operating matters.

When a major drought hit the Midwest in 1988 and drew down water in the Mississippi River, concerns arose that Missouri River water might be used to “help out” the Mississippi at the expense of Missouri River

navigation and several threatened and endangered species. Following the drought, USACE began a detailed review of its operation of the main stem dams.

In spite of efforts by all parties, no resolution had been reached as the 21st century began. The 10 states in the basin have not agreed among themselves even about what would constitute appropriate operation. In 1999, USACE and EPA asked the National Research Council (NRC) to examine threats to the Missouri River ecosystem. The NRC report concluded that unless immediate actions were taken to address the needs of endangered and other species, the ecosystem was in danger of collapse (NRC, 2002):

Current management protocols for operating the Missouri River system represent an accretion of federal laws, congressional committee language, appropriations instructions, and organizational interpretations that have been enacted or developed over the past century. This guidance has generally not been updated to reflect changing economic and social conditions, scientific knowledge, economies, and social preferences which have clearly changed across the Missouri River basin since the mainstem dams were planned and constructed. However, the institutional and policymaking framework for Missouri River management has not changed accordingly. The decision-making context for the Missouri and its tributaries is characterized by prolonged disputes, disaffected stakeholders, and degrading ecological conditions. Barriers to resolving this policy gridlock on the Missouri River include a lack of clearly stated, consensus-based, measurable management objectives, powerful stakeholders’ expectations of a steady delivery of entitlements, and sharply differing opinions and perspectives among some Missouri River basin states.

Even as the NRC study was under way, various basin states were bringing suit in federal court against USACE to force modifications of its operating rules. The states came down on all sides of the disputes, but the U.S. Department of Justice consolidated them into one case that was heard by a federal judge in Minnesota. His ruling, in 2004, acknowledged the conflicting guidelines under which USACE was operating and, in essence, seconded the comments of the NRC committee. In 2006, USACE made the decision to implement new operating procedures. In the FY 2009 Omnibus Appropriations Act, Congress finally acted, directing that a study be initiated to determine if changes to the authorized purposes of the project and existing federal water resources infrastructure might be warranted (MoRAST, 2009).

¹ The 1994 report was a subject of discussion during Senate hearings in 2008 and 2011 following major Midwest floods in those years. In both cases, the administration was directed to report on actions taken in response to the 1994 report.

Confusion and Failed Efforts

In 1992, in response to concerns about future challenges to water use in the western United States, Congress directed the formation of a federal-state-public commission to “review present and anticipated water resource problems affecting the nineteen Western States.” Members of Congress were concerned about overlapping and conflicting jurisdictions and the large number of cabinet departments, independent agencies, and White House offices dealing with national water policy. The situation, according to then-Senator Mark Hatfield, “created considerable confusion among the ranks of water policy makers and water policy implementers” (WWPRAC, 1998).

In 1998, the commission issued its report, *Water in the West: Challenge for the Next Century*, in which it concluded that addressing water challenges would require “fundamental changes in institutional structure and government process.” It confirmed the congressional belief that “federal water policy suffers from unclear and conflicting goals implemented by a maze of agencies and programs.” Although the report received considerable notice, little action resulted. Other NRC studies during those same years also highlighted the absence of a national approach to water resources development and the need for coordinated water-related legislation.

Even in the absence of legislation on a watershed level, effective management could be facilitated by a clear definition of the objectives of water projects. In 1965, Congress passed the Water Resources Planning Act, which, among other things, directed the administration to develop principles and standards for water resources project development.

The first Principles and Standards, produced by the Water Resources Council in 1973 and revised in 1977, called for projects to be judged on the basis of their contributions to a combination of national economic development, regional economic development, environmental quality, and other social effects (WRC, 1973a,b).

In 1983, the Reagan administration replaced the Principles and Standards with Principles and Guidelines, which established national economic development as the sole objective of development and paid lip service to the other objectives (WRC, 1983). Criticism of this revision was consistent over the next two decades, and several NRC reports pointed out its shortcomings. (NRC, 1999, 2004a,b).

The Beat Goes On

Given the absence of a unifying national approach, many have expressed concerns about conflicts among sectors (agriculture, navigation, hydropower, recreation, etc.) over uses of water and continuing interstate discord. In 2001, several federal agencies asked the American Water Resources Association (AWRA) to bring together water experts from around the nation to discuss policies for guiding water resources activities of the United States. By the time the first dialogue was held in Washington in 2002, 10 federal sponsors were fiscally supporting the dialogue.

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More than 20 nongovernmental organizations agreed to cosponsor the dialogue, which brought together more than 250 people for two-and-one-half days. The result was a letter to the president and congressional leaders highlighting the general consensus of the participants. Unfortunately, little attention was paid to the letter either on Capitol Hill or in the White House.

A year after the first dialogue and the submission of the letter, the same federal agencies asked AWRA to conduct a second dialogue in 2005 in Tucson, Arizona, to ensure that western views were incorporated into the conversation. The issues raised in the second dialogue paralleled those in the first, and a letter similar in content to the first was sent to the president. Unfortunately, the reaction from leaders was also similar.

In 2006, the same federal agencies, in hopes of transforming the results of the first two dialogues into action, asked AWRA to bring together experts in Washington, this time with the goal of identifying actions to be taken. Following this meeting, letters were sent to the president, senior congressional leaders, and all state governors, noting that “Stewardship of the Nation’s water resources is being neglected and the manner in which we deal with water issues is dysfunctional.” All three letters stressed the same general needs (AWRA, 2007):

- The Administration and Congress should work with governors and tribal leaders to establish broad principles for water management—in essence, a national vision. In turn the vision must be translated into water policies that clearly define the roles and responsibilities of federal, state and local governments and the public with respect to water and the goals and objectives that would establish a blueprint for future actions.

The House Transportation and Infrastructure Committee is responsible for preparing a biennial Water Resources Development Act.

- The Administration and Congress should better coordinate water resources activities. The efforts of federal agencies can overlap and at times conflict, and there is no body within the Administration to provide substantive coordination or adjudication of disagreements among agencies and to ensure needed collaboration. Furthermore, the Congress should work to eliminate the frequently uncoordinated actions of the numerous Congressional committees that deal with water.
- The Administration, Congress, and the governors must encourage policies that promote watershed planning and change policies that do not. Federal agency operations and programs need to be more watershed-oriented rather than tied to political boundaries and project-level authorizations and appropriations that often create more problems than they solve. Much should be learned from the successful efforts of some states and tribal organizations to operate in this manner.
- The Administration, Congress, and the governors must ensure that the Nation's vast scientific knowledge about water is available to all, clearly presented, and fully considered in making decisions on key water issues. Critical data about water resources must be collected.

The 2007 letter did receive some attention from both the administration and Congress. Senior staff members in both groups requested briefings on the results of the

dialogue, and later that year, in the 2007 Water Resource Development Act, Congress established a National Water Resources Planning Policy and directed the Secretary of the Army to revise the current Principles and Guidelines to reflect those policies within two years.

Since the Principles and Guidelines had resulted from a presidential directive and applied to four federal agencies, the administration assumed responsibility for the formulation of a new principles and guidelines document that would apply to all federal agencies. In 2010, the White House circulated an initial draft of the new document for comment by the public and the National Academies. In late 2010, an NRC committee submitted its comments (NRC, 2011a) to the White House indicating that, although the thrust of the document seemed responsive to the congressional direction, the document itself was confusing and in need of substantial revision. A new document has yet to be issued.

In 2009, Congressman James L. Oberstar, then chairman of the House of Representatives Transportation and Infrastructure Committee, which is responsible for preparing the biennial Water Resources Development Act, reported to a group of water experts assembled in Washington, D.C. (USACE, 2010):

Today, the diverse water resources challenges throughout the United States are often studied, planned and managed in individual silos, independently of other water areas and projects. Generally, this has resulted in local and narrowly focused project objectives with little consideration of the broader watersheds that surround the project. There are 24 Federal agencies with water responsibilities and this does not count the land management agencies with related responsibilities. Policy is ad hoc, implementation is decentralized, coordination is fragmented, and communication is non-existent or fails to connect. We need a national water policy and unifying vision and guiding principles.

Glimmers of Hope

In 2008 and 2009, USACE, in coordination with several other federal agencies, conducted listening sessions around the country to explore how collaborative efforts to deal with water resources challenges could be improved. The group concluded its efforts with a two-day National Conference in Washington that brought together “water actors” on the federal, state, and local levels.

Participants in the conference supported the development of “a national water vision, especially one that unifies the focus and policies regarding water resources across levels of government, and especially across the

federal agencies.” For some, the ongoing review of Principles and Guidelines would offer an opportunity to begin the development of the elements of a vision (USACE, 2010).

Following the disastrous 2008 floods in the Midwest, the president of the Mississippi River Commission brought together senior representatives of federal agencies operating in the flood-affected areas to develop a long-term vision that included the following goals for people living in the Mississippi River basin (MRC, 2011):

- They would enjoy a quality of life unmatched in the world.
- They would lead secure lives along any river or tributary in the basin.
- They would enjoy fresh air and the surrounding fauna, flora, and forests while hunting, fishing, and recreating along any river or tributary in the basin.
- They could travel easily, safely, and affordably to various destinations in the watershed.
- They could drink from and use the abundant waters of any river, stream, or aquifer in the basin.
- They could choose from an abundance of affordable basic goods and essential supplies grown, manufactured, and transported along the river to local and world markets.

In April 2011, the White House issued a water framework, *Clean Water: Foundation of Healthy Communities and a Healthy Environment*, which, although titled *Clean Water*, describes coordinated actions being taken by the Obama administration to deal with an array of pressing water issues and the overarching concepts that will guide the development of solutions to those issues. The framework focused on the following principles (EOP, 2011):

- Promoting Innovative Partnerships . . . to restore urban waters, promote sustainable water supplies, and develop new incentives for farmers to protect clean water.
- Enhancing Communities and Economies by Restoring Important Water Bodies...including restoring iconic places like the Chesapeake Bay, California Bay-Delta, Great Lakes, Gulf of Mexico and Everglades.²

² See the article in this issue by David Dzombak, “Nutrient Control in Large-Scale U.S. Watersheds,” which discusses some recent successes in the Chesapeake Bay and the challenges ahead.

- Innovating for More Water-Efficient Communities.
- Ensuring Clean Water to Protect Public Health.³
- Enhancing Use and Enjoyment of our Waters [by] . . . expanding access to waterways for recreation, protecting rural landscapes, and promoting public access to private lands for hunting, fishing and other recreational activities.
- Updating the Nation’s Water Policies includ[ing] action to modernize water resources guidelines, and update Federal guidance on where the Clean Water Act applies nationwide.
- Supporting Science to Solve Water Problems.

The European Union has put in place directives for standards for clean water, sustainable practices, marine environmental policy, and managing flood risks for all 27 member countries.

Example of a Successful Collaborative Approach

In light of the disappointing history of water policy described above, we might ask if it is even possible in this dynamic and politically focused world to develop a formal collaborative framework dealing with water issues that cross boundaries and include differing conditions.

The answer is yes! It is possible. In Europe, a Water Framework Directive was developed by the European Commission and approved by the European Parliament. The directive “governs” some water activities of the 27 countries that are part of the European Union (EU), and it “establishes a legal framework to protect and restore clean water across Europe and ensure its long-term and sustainable use.” Although the primary focus

³ The article by Rutherford Platt in this issue describes how New York City and Boston, working collaboratively with the federal government, have brought clean water to their residents by carefully managing the watersheds in which the water was collected and obviating the need for expensive water filtration.

is on cleaner EU waters and increasing citizen participation in water decisions, the directive does require the development of basin-level plans to address water use in each basin, as well as floods, hydropower, and navigation (European Commission, 2000).

The Framework Directive has been followed by directives on the quality of water intended for human consumption, the assessment and management of flood risks, and frameworks for community action in marine environmental policy. Under the flood directive, every country must make flood maps—flood-risk maps that include the boundaries of the largest floods that have occurred on each river—and other data. Each directive requires EU countries to pass implementing legislation or face economic sanctions.

So, yes, it is possible to face difficult problems in a collaborative way when the leadership understands the necessity of doing so.

The Need for Effective Communication

So why can't we adopt a similar approach in the United States and take action on key issues? Is this a problem of communication?

Leaders in the water sector... have long been aware that water is essential to sustainable development, but they do not make the decisions on development objectives and the allocation of human and financial resources to meet them. These decisions are made or influenced by leaders in government, the private sector and civil society, who must learn to recognize water's role in obtaining their objectives (WWAP, 2009).

Even if an agreement is reached in the water community on the need for policy, the challenge will be to communicate this need to those who must make it happen. This is the water box challenge (Figure 2). Every three years, the World Water Assessment Program (WWAP), a United Nations activity, publishes a report on the status of the world's water and the challenges to managing this precious resource.

In the *Third World Water Development Report* (WWAP, 2009), WWAP addressed issues in management of water resources, beginning with a description of the management structure for world water systems. According to WWAP, the governance mechanism for water is divided into two sections.

In the bottom section, the so-called "water box," are water-resources professionals who plan, operate, and maintain world water systems. This group deals with myriad problems of managing this fragile, scarce resource and the technical challenges in dealing with water infrastructure, droughts, floods, and other water issues. The people and groups in the water box focus on the specific issues of the day and meeting the needs of the sectors in which they operate. However, their ability to meet these challenges is heavily influenced by the actions of the actors outside the water box—the political and business sectors and the public at large, who may be, but most likely are not, educated in the specifics of water resource issues.

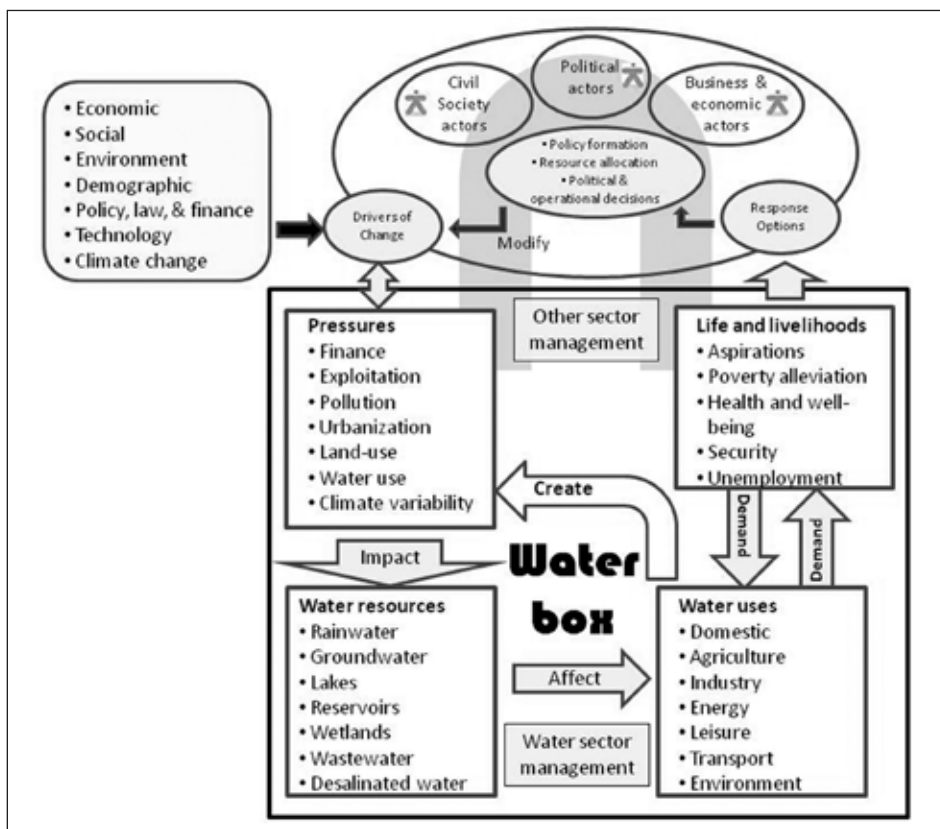


FIGURE 2 The Water Box. Source: WWAP, 2009.

It is not unusual for significant national decisions with water implications to be made without a comprehensive discussion of the implications on the affected resources. For example, recent U.S. actions in support of ethanol production and energy extraction were made outside the water box with only marginal analysis of the long-term implications for water resources.

For those outside the water box to make sustainable decisions, communication between those in the box and external actors must be dramatically improved. Water professionals must do a better job of getting their messages to principal decision makers and insisting that they understand the full story before they make sometimes irreversible commitments.

In *Vision 2025*, ASCE argues that civil engineers must learn to lead and become motivated to initiate, communicate, negotiate, and participate in cross-professional efforts to envision societal changes that shape the quality of life (ASCE, 2007). In a follow-on document, *Achieving the Vision for Civil Engineering 2025: A Roadmap for the Profession*, ASCE continues the argument that engineers “have to raise their visibility, becoming proactive within public policy forums and promoting an awareness that their unique background and skills are crucial...engineers cannot just provide engineered solutions; they must define the problems that affect quality-of-life improvements” (ASCE, 2009b).

That statement translates into increased participation in local meetings, working with legislatures, delivering testimony, and providing knowledge and expertise when and where it is needed through lobbying and other activities. Those tasks are also crucial to the water community.

Conclusion

The time has come for the water community to step up to the challenge and begin to educate and influence those outside the water box about the challenges facing the nation to the efficient, effective, and sustainable management of water resources and what must be done to navigate the uncertainties of the future. No doubt, this mission will make some people uncomfortable—communication is not what we normally do—but it needs to be done, and it needs to be done now!

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