

# Public perception and participation in water reuse

Troy W. Hartley

*Department of Resource Economics and Development, University of New Hampshire, Durham, NH 03824, USA  
Tel. +1 (603) 862-1729; Fax +1 (603) 862-0208; email: troy.hartley@unh.edu*

Received 4 November 2004; accepted 29 April 2005

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## Abstract

The Water Environment Research Foundation in the United States funded an interdisciplinary and integrative social science study on public perception and participation in water reuse within the US. It employed a three-phased research protocol consisting of 1) literature review and three comprehensive case studies, including interpretive white papers from five different social science disciplines and public health and environmental engineering scientists, 2) a multi-stakeholder workshop to promote integrative, interdisciplinary analysis of the literature and case study findings, and 3) peer-review among twenty-one social science and water resource management experts. The case studies included examples of potable and non-potable reuse, with elements of success and failure. Five themes were identified as critical to building and maintaining public confidence in water resource management and water reuse decision-making: managing information for all stakeholders; maintaining individual motivation and demonstrating organizational commitment; promoting communication and public dialog; ensuring a fair and sound decision-making process and outcome; and building and maintaining trust. The study produced guidance for water resource professionals with a strategy for assessing the community context and developing a principle-based approach to public outreach, education and participation.

*Keywords:* Perception; Trust; Information; Communication; Motivation

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## 1. Introduction

Water can be a limited resource in an expanding global economy and population. Many water resource professionals believe that reclaiming water after it is treated in a modern wastewater treatment plant is an important and underutilized element of sustainable water resource manage-

ment. Water reuse for non-potable (e.g., irrigation, industrial) or indirect potable (e.g., discharge into drinking water reservoirs or supply) purposes has been considered across the United States, but particularly in drier or drought-ridden communities, such as Arizona, California, Colorado, and Texas; or communities experiencing substantial

*Presented at the International Conference on Integrated Concepts on Water Recycling, Wollongong, NSW Australia, 14–17 February 2005.*

population and economic growth that place a strain on water supplies (e.g., Georgia and Florida). It is only a matter of time before other communities consider non-potable and potable water reuse options.

Survey and case study research since the 1970s has found that the public in many of these states supports the general concept of using reclaimed water and has been somewhat supportive of non-potable reuse initiatives [1]. People generally favor reuse that promotes water conservation, provides environmental protection benefits, protects human health, and cost effectively treats and distributes a valuable and limited resource. However, as the water options become more tangible to people with specific proposed projects in their communities and the likelihood of human contact increasing, attitudes change — the public's support wanes [2].

In consumer surveys conducted in Orange County, California, where a water reuse initiative is currently underway, the public expressed concern that the reclaimed water was originally wastewater [3]. A survey study in 2000, in the UK, corroborated the existence of a “source” factor. It found people more willing to use recycled water from their own wastewater than from second parties or a common public source [4]. In other words, the “yuck factor,” the term that US water professionals have used to discuss the visceral reaction of displeasure and distain expressed by the public in regards to water reuse, may be tempered by an individual's proximity to the waste source. Table 1 summarizes the factors that seem to contribute to the degree of public acceptance of water reuse, according to survey and case study research from the late 1970s to early 2000 within communities considering water reuse options.

In addition to these site specific factors that may contribute to shaping the public's perception and the nature of their participation in water reuse decision-making, there are some significant national and regional trends in the US. In general, trust and confidence in public agencies and

Table 1

Factors contributing to the degree of public acceptance of water reuse

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**US public acceptance of water reuse seems to be higher when [2–5]:**

- Degree of human contact is minimal
  - Protection of public health is clear
  - Protection of the environment is a clear benefit of the reuse
  - Promotion of water conservation is a clear benefit of the reuse
  - Cost of treatment and distribution technologies and systems is reasonable
  - Perception of wastewater as the source of reclaimed water is minimal
  - Awareness of water supply problems in the community is high
  - Role of reclaimed water in overall water supply scheme is clear
  - Perception of the quality of reclaimed water is high
  - Confidence in local management of public utilities and technologies is high
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officials is in decline in America [6,7] — this appears to also be true for the wastewater utilities. Likewise, belief that even the best technologies can remove all impurities and pathogens from wastewater is in decline, at least in California [2]. Furthermore, while the public has reported trusting university-based scientists and the medical community on technical and health issues related to water reuse, preliminary survey evidence showed people trust their own personal impressions of water quality (often based upon the water's cloudiness or turbidity) more than these experts [4,8].

In the 1990s, a number of high profile indirect potable water reuse projects in the US encountered stiff public opposition. The public took political action and prevented water reuse projects from being implemented in these cases. Terms like “Toilet to Tap” and “Sewage Beverage” were common in the public dialog. In San Diego, the newspaper published a cartoon of a dog drinking from a toilet and a man behind the dog saying, “Move

over...” As one veteran of risk communication in California water resource said, “Discourse is often dominated by a few true believers on both sides, often with extreme views, and is usually competitive and antagonistic” [9]. Furthermore, members of the scientific and technical community disagree over the public health viability of indirect potable water reuse, with major water resource professional associations and respected research and expert panels taking opposing positions [10, 11].

In one California market study, information sharing, educational activities, and providing time to reflect upon the concept of water reuse before stating an opinion were shown to increase support; however, they also intensified the extremes. In other words, those that are opposed to water reuse became more strongly opposed and those that support it became more strongly supportive after becoming more knowledgeable and aware [3,8].

Nevertheless in spite of serious opposition in some California cases, the public has expressed an interest in being meaningfully involved in water reuse decision-making, and finding ways to ensure an independent and secure water supply for their communities [3,12,13]. The public is, in a very general sense, aware that there are water

supply problems in many parts of the US and few believe that some form of potable reuse is inevitable, given growth and water supply constraints [3,8]. Table 2 summarizes the challenges and opportunities faced by water reuse professionals, as detailed in these studies.

Last, the intensity of the public’s reaction, concern, and debate over water reuse is magnified when the reuse issues change from non-potable to potable. In fact, while many in the scientific and engineering communities believe that non-potable reuse is feasible and often desirable, the acceptance within the scientific and technical communities is far from uniform in regards to indirect potable reuse. The technical and scientific challenges and difference of opinion among scientists and engineers introduces greater uncertainty into the public debate. The uncertainty can be accompanied by more intensity in the opposition and expression of public concerns.

## 2. Methods

The research protocol sought to promote an interdisciplinary, integrative analysis of the water reuse literature and case studies. It included two advisory peer-review groups consisting of twenty

Table 2

Challenges and opportunities faced by water reuse professionals in the US [3,4,6–8,12,13]

Challenges	Opportunities
<ul style="list-style-type: none"> <li>• Decline in public trust and confidence in public agencies and officials.</li> <li>• Decline in belief that best technologies can remove all impurities and germs from waste water.</li> <li>• While the public tends to trust university-based scientists and the medical community on technical and health issues, they trust their own impressions of water quality more.</li> <li>• Public impression of water quality can often be based upon the water’s turbidity.</li> <li>• While education and outreach activities can increase support, they can also intensify the extremes – those that oppose become more strongly opposed and those supportive are more strongly supportive.</li> </ul>	<ul style="list-style-type: none"> <li>• Public interest in being meaningfully involved in water reuse decisions.</li> <li>• Public interest in finding ways to ensure independent and secure water supplies for their community.</li> <li>• While the public is not well versed in the water cycle, they are generally aware that there are water supply problems in many parts of the country.</li> <li>• Belief that some form of potable reuse is inevitable, given growth and water supply constraints.</li> <li>• Information sharing, educational activities and opportunities for reflection upon the concepts of water reuse can increase support.</li> </ul>

social science and water resource management experts from the fields of cognitive psychology; environmental engineering; information management; land use planning; political science; public administration; public health; public relations; risk communication; and sociology. An integrative, data analysis workshop was held with thirty-eight multi-stakeholder and academic experts.

As a component of this broader interpretative analysis that was informed by both empirical and normative theories, the case study research was designed with standard protocols and the large volume of data collected was analyzed with content analysis methods [14–16]. Cases were selected based upon the following criteria: US potable and non-potable reuse examples — both perceived successes and failures; cases with public involvement and community relations program; multiple stakeholders involved in decision; geographic representation; cases since 1990; and multiple scales (large, medium, and small scale cases).

For each case, documentation was collected using web-based resources, including case documentation on web sites of local, state, and federal governments; local and state environmental organizations; local citizen, business and community groups and associations; and local newspaper archives. Additional documentation was provided by some interviewees (e.g., master plan documentation, public involvement plans, newspaper articles, etc). Interview questions were designed based upon the outcome of the documentation review and guided by the factors identified in the literature review. Fifteen people were interviewed, ranging from a single 30–60 min phone call to a series of phone discussions over several days. The types of participants interviewed included: city government officials; county government officials; local elected officials; local journalists; citizen advisory board members; government contractors; state elected officials; community group representatives; and environmental group representatives.

### 3. Case studies

The water reuse cases briefly summarized here and in Table 3 consist of two potable and one non-potable example. They are detailed in a WERF technical report [17].

#### 3.1. Gwinnett County, Georgia

Rapid population and economic growth, an extended drought, and water allocation negotiations with neighboring Florida and Alabama contributed to Gwinnett County's, Georgia, need to reassess its water strategy. While building a \$245M, 20 million gallons/d, 11-step treatment facility called the North Advanced Water Reclamation Facility (NAWRF), the County undertook a multi-stakeholder planning process to update their Water and Wastewater Master Plan. Located in a less populated portion of the county between two highway interstates, NAWRF began operation in late 2000 and was renamed the F. Wayne Hill Water Resource Center for the County Commissioner, who championed the project. A \$330M expansion of the plant was approved to increase its capacity to 60 mgd; construction is currently underway. A pipeline of 10 miles is being constructed to discharge the effluent in Lake Lanier, the drinking water supply for Gwinnett County and others in the Atlanta metropolitan area. While the state has permitted the expansion and Lake Lanier discharge, the permit is being challenged by state and local environmental groups and an association of businesses, homeowners, and recreational users on Lake Lanier. The appellants believed the plant's discharge would harm the lake and were not convinced that maintenance will be a priority over the long-term.

#### 3.2. City of San Antonio, Texas

The San Antonio Water System (SAWS) relies on the Edwards Aquifer to meet the drinking water needs of the San Antonio metropolitan area. Droughts and rapid population and economic

Table 3  
Case study comparison

Cases	Content	Proposed solution	Citizen response	Advisory committee	Other public participation	Media relations	Current status
San Antonio	<ul style="list-style-type: none"> <li>• Water shortage and rationing</li> <li>• Lawsuit over environmental impact of water use</li> <li>• Legislation mandating planning</li> <li>• Reservoir voted down</li> <li>• Recycling used in area for years</li> </ul>	<ul style="list-style-type: none"> <li>• Variety of measures and criteria for selection</li> <li>• Recycling to commercial users</li> </ul>	<ul style="list-style-type: none"> <li>• Research showed recycling concerns re cost and creditability</li> <li>• Positive news coverage</li> <li>• Environmental justice concerns over possible residential reuse</li> </ul>	<ul style="list-style-type: none"> <li>• Considering water policy, broad and diverse</li> <li>• Proposed measures and criteria</li> </ul>	<ul style="list-style-type: none"> <li>• Outreach</li> </ul>	<ul style="list-style-type: none"> <li>• Little interest</li> </ul>	<ul style="list-style-type: none"> <li>• Phase I complete</li> <li>• Phase II construction underway</li> <li>• General public support</li> </ul>
Georgia	<ul style="list-style-type: none"> <li>• Population growth</li> <li>• Lawsuits over allocation by Fla. and Ala.</li> <li>• History of sewage spills</li> </ul>	<ul style="list-style-type: none"> <li>• Waste water master plan</li> <li>• Advanced tech plant</li> <li>• Nonpotable use</li> <li>• Use of Lanier for discharge</li> </ul>	<ul style="list-style-type: none"> <li>• Support for initial plant</li> <li>• Opposition of business/resident association on lake and environmental groups</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitated by GA county Dept. of Public Utilities</li> <li>• Reps from 7 stakeholder groups</li> <li>• Consensus on supply, but dissention over waste water</li> <li>• Long term membership</li> </ul>	<ul style="list-style-type: none"> <li>• Input into water plan</li> <li>• Facilitation by county (with some problems)</li> <li>• Honesty in admitting mistakes</li> </ul>	<ul style="list-style-type: none"> <li>• Charac-terized as positive by government officials</li> </ul>	<ul style="list-style-type: none"> <li>• Expansion underway</li> <li>• State permit challenged by environmental groups &amp; lake association</li> <li>• Oversight by citizen advisory board</li> <li>• Educ Ctr construction</li> </ul>
San Diego	<ul style="list-style-type: none"> <li>• Use of imported water</li> <li>• Pilot project for reliability and safety</li> <li>• Settlement of lawsuit resulted in potable water reuse system</li> </ul>	<ul style="list-style-type: none"> <li>• Use extra reclaimed water in water supply (Repurified Water Project)</li> </ul>	<ul style="list-style-type: none"> <li>• Editorial opposition (toilet to tap)</li> <li>• Environmental justice concerns over use of reservoir for reclaimed water</li> <li>• Cost concerns</li> </ul>	<ul style="list-style-type: none"> <li>• Expert panel</li> <li>• Broad stakeholder review committee</li> <li>• NRC review</li> <li>• Blue ribbon panel</li> </ul>	<ul style="list-style-type: none"> <li>• Updating of city council (different perspectives between government and city council)</li> <li>• Public hearing</li> <li>• Presentations</li> </ul>	<ul style="list-style-type: none"> <li>• Charac-terized as antagonistic by government officials.</li> </ul>	<ul style="list-style-type: none"> <li>• Despite support of blue ribbon panel, council committee voted to end project</li> <li>• Goal of 25% reuse</li> <li>• Currently 3% reuse</li> </ul>

growth have strained the aquifer, causing it to be drawn down faster than it could be replenished by scarce rainfall. In 1996, SAWS Water Recycling Program was launched in part to educate communities about the need for a water supply to supplement the Edwards Aquifer. The centerpiece of the program was a \$125M, 64-mile pipeline infrastructure to deliver approximately 35,000 acre-feet/year of recycled water from the city's existing water reclamation plants to commercial, industrial and agricultural customers. Use of recycled water was predicted to reduce demand on the Edwards Aquifer by 20%, enough to satisfy the annual water needs of up to 80,000 households. While some communities initially perceived the program as a step toward direct reuse, most accepted the benefit of reduced demand on the Edwards Aquifer. The SAWS aimed to keep stakeholders involved and informed during each phase of the program, including concept development, environmental review, design, and construction. Initial public concerns over fairness were addressed in decision-making criteria and through direct and publicly visible action during project implementation.

### 3.3. *City of San Diego, California*

In 1990, 90% of San Diego's water supply was imported. The volume imported was expected to remain the same or decrease as commercial and residential demands for water were expected to increase. In 1994, a legal settlement required the city to build a 45 million gallon/d water reclamation system. Limited demand for the reclaimed water for non-potable uses, however, would result in millions of gallons being dumped into the ocean. To address this concern and reduce reliance on imported water, the city and the county water authority proposed a project that would infuse reclaimed water into the potable-water supply. The proposal moved forward for several years, gaining approval from panels of technical experts and support from the California Department of Health Services. By 1999, however, political and public

opposition stopped the proposed project. Concerns were raised about racial and economic bias associated with the project design, and about public health and project costs. Today there remains considerable disagreement between parties over how and why events played out the way they did.

## 4. Results

Five related themes emerged from the interpretive analysis conducted by the multi-stakeholder research team and reinforced by the case studies. These themes are not independent, discrete variables, but rather broader social constructs. They may very likely interact and overlap in multiple ways; however, it may be that interaction that most significantly shapes the public participation experience and the individual's perceptions of water reuse. It is a complex, circulatory system with factors both influencing and being influenced by other factors, although it is clear that when the system fails conflicts can escalate and public decisions can become derails. If attended to properly, these themes aim to promote a more constructive public dialog on water reuse and contribute to the potential for building public trust and confidence.

### 4.1. *Managing information*

Information, knowledge, local context, and education all play an important role in shaping perception and the nature of public participation. The information relates to the science and technologies, local knowledge and site-specific characteristics, values and interests, the local context (e.g., political, social, economic, and environmental landscape) and other information-based factors. Furthermore, the uncertainty or incompleteness of information in any of these information categories influences perception about water reuse. Therefore, information and context factors contain concrete facts, as well as a flavor or richness that embellishes the influence of those facts.

When information is managed in a manner that limits data sharing with the public, creates expert panels for review and recommendation that are perceived as black boxes, or targets subsets of the community with specific, narrow messages, problems can arise. For example, the San Diego case includes evidence of a failure to share information broadly and adequately address real concerns.

After electing to move forward with a Repurified Water Project, San Diego County Water Authority (SDCWA) selected nationally recognized experts in the fields of water treatment and public health to serve on an independent advisory panel (IAP). The IAP provided technical oversight of the proposed Repurified Water Project and acted as an advisor to SDCWA. The panel completed its review of the proposed project and submitted comments to SDCWA and California Department of Health Services (DHS) in the spring of 1994, recommending that the project continue and suggesting specific modifications.

A 17-member Repurified Water Review Committee (RWRC) was then formed to assist SDCWA staff in examining all aspects of the draft proposal. Public awareness was gauged with surveys and focus groups, and public concerns and interests were identified through stakeholder interviews. Based on the information, the RWRC recommended that targeted community outreach should continue. The RWRC report indicated that: “Special emphasis should be placed on describing the total water cycle in order to help the lay person understand the process. The Committee suggested that two messages should be reinforced: the current imported water supplies have been previously used, and San Diego’s supply is 90% dependent on imported water, especially during a drought”.

Project staff periodically reported the status of the project at public hearings before the city council, though a city council staff person stated they were not kept informed and were “brought in at the ninth inning.” The editorial board of the local newspaper, *The San Diego Union-Tribune*,

expressed opposition to the proposed project. In April of 1994, the newspaper had published a cartoon of a dog drinking from a toilet and a man behind the dog saying, “Move over...” The newspaper later began to refer to the repurification project as “Toilet to Tap.” The phrase was widely used by those opposed to the project and loathed by project proponents.

Further concerns over race and economic class bias surfaced as the city council member from the district surrounding the San Vicente Reservoir voiced his opposition to the project. The San Vicente Reservoir was the only reservoir in San Diego deemed large enough to accommodate the proposed amount of reclaimed water, and was the lowest cost option. It was perceived that the reservoir served the southern section of the city, where the population is predominantly African American and of lower income than that of the northern section. While the reservoir served areas of the city of all economic classes and racial make-ups, the opposition viewed the proposal as another step in dividing the city along economic lines — “those who could afford to drink bottled water and those who could not, those who drink champagne and those who drink sewage,” recalled a resident.

Project staff prepared informational materials and made public presentations to explain the specific technical approach and merits of the project. According to one technical expert on the project, while “the city was highly concerned about the charge of environmental racism... they unfortunately... did not deal with it... [and] thought that by showing it was not true (i.e., potable reclaimed water was going to be distributed to rich and poor neighborhoods alike) they would win out.” They were wrong and the City Council voted to halt the project.

Finally, competing expert panels added to public confusion and the appearance of controlled, narrow information sharing. The US National Research Council (NRC) released a report, *Issues in Potable Water Reuse*, based on an evaluation

of several existing reuse projects and the feasibility studies of Tampa and San Diego's projects. The NRC concluded that "reclaimed wastewater can be used to supplement drinking-water sources, but only as a last resort and after a thorough health and safety evaluation". Soon afterwards, a Blue Ribbon Panel on Water Repurification compiled by SDCWA concluded, "It is the unanimous conclusion of the Blue Ribbon Panel of Experts that water repurification as proposed by the City will provide a safe and appropriate supplemental drinking water supply for the City of San Diego".

#### *4.2. Individual motivation and organizational commitment*

Individuals need to be motivated to participate in water reuse decision-making. Rarely is a single motive enough; usually someone needs multiple motives to engage and stay involved. Organizational, too, must demonstrate a genuine commitment to public participation that contributes to trust-building and the perception of fairness.

Keeping participants motivated to sustain their involvement, and demonstrating clear organizational commitment to listening to people's concerns and taking them seriously proved important in the cases. For example, Gwinnett County took a "partnering" approach with citizens on the project which demonstrated commitment and gave genuine responsibility to citizens. Formed in April, 1996 and continuing today, the Citizen Advisory Board has oversight responsibilities at the NAWRF, with an emphasis on proper operations and meeting the effluent standards. The Citizen Advisory Board serves as a communication channel between the public and the utility. The Citizen Advisory Board controls its own \$50,000/year budget. The Citizen Advisory Board has spent the funds on sampling, technical review of plans and designs, and other oversight activities.

The Citizen Advisory Board's purpose is to facilitate communication process between the public and the county about the plant, and to oversee discharge monitoring program. For

example, the Board was "instrumental in having the County Board of Commission add a county resolution to have annual budgeting [for the plant] include percentage increase labor costs for re-training... then budget accountants cannot strike training from annual budgets." Retraining is seen as important to address long-term maintenance at the facility; as one Board member put it, "we have a highly qualified group running the plant, but if they don't continue training... they could become complacent."

A county public utilities official noted that he wanted individuals to stay involved for at least five years, until the NAWRF plant was completed. While the Board's members are elected to 2-year terms, there has been little interest from new members, and old members are remaining on for longer terms. Recently, two new alternates were added from other counties bordering Lake Lanier.

#### *4.3. Communication and public dialog*

Communication is the means of exchanging information, developing mutual understanding, and defining relationships. Public dialogue is a broader factor related to the quality of the overall public discussion and cumulative influence of individual communication events. While the effectiveness of the communication events seems to be critical to the success of information exchange and expanding understanding, it is the quality of the overall dialogue that appears to contribute to relationship factors that in turn contribute to public perception and an individual's behavior when participating in public decision-making.

Water reuse decisions were becoming part of the broader water resource planning exercise in several cases. For example, in late 1996, Gwinnett County began to update their existing Water and Wastewater Master Plan. It was completed in the summer of 1998, after "extensive citizen input to develop a plan that would be flexible and into which resident's viewpoints could be incorporated." An Advisory Panel was created in 1996 and their meetings were facilitated by the Gwinnett County

Department of Public Utilities (DPU) with assistance from an environmental consulting firm. At a public meeting, attendees were polled and identified seven categories of stakeholder groups for the Advisory Panel: homeowners associations; business community; development interests; large water users; Gwinnett County cities; environmental organizations; and citizens-at-large.

Representatives were “to act as a spokesperson for the group, representing the group’s interest. The representatives were responsible for conveying information from meetings to other interested members of the stakeholder group.” Regularly-scheduled evening meetings were held consistently for 18-months. The panel meetings were open to the public, and opposition groups regularly attend. Dissenting opinions on any of the topics discussed were preserved for inclusion in the master plan update report — all concerns were heard and recorded.

The Advisory Panel evaluated all water supply and wastewater alternatives to indicate their preference in the near-term (present–2010), mid-term (2010–2030), and long-term (2030–2050). The year 2010 was viewed as an important point in time, since water supply sources had not been firmly established to meet increasing demands after 2010. When considering water supply, the Advisory Panel expressed a preference for the continued use of Lake Lanier as a water supply source in the near, mid, and long term. Furthermore, blended reuse was considered a secondary alternative in the long term.

The wastewater preferences were generally more disperse among the Advisory Panel members than their preferences for water supply. Nonetheless, the Advisory Panel made recommendations regarding wastewater: given the quality of treated wastewater effluent from the NAWRF, non-potable reuse be “pursued vigorously” through all time periods; and continue to seek conversions from septic tanks to public wastewater treatment. The Advisory Panel members actively wrote and edited the master plan update document.

During the master plan update process, county officials facilitated the public meetings. A county official noted that it made it difficult to “maintain balance among the participants and prevent some individuals from dominating” and to remain “neutral” as the facilitator and the county. However, at the same time, the official felt it was important to “not put hired help between us and the citizens... If we wanted to build trust, [obtain] a higher degree of credibility, then we could not hide [behind] a professional facilitator.”

#### *4.4. Fair and sound decision-making process*

The perception of fairness applies to both the decision-making process and the outcome. Was the process of making the decision fair? Reasoned? Involving everyone with everyone genuinely listened to? Did it address all concerns appropriately? Fairness also relates to the outcome. Are the burdens and benefits of a decision being shared fairly? Fairly distributed burdens and benefits does not necessarily mean equal, rather is everyone seen as doing their part.

While decisions needed to be technically and scientifically sound, they also needed to be perceived as fair. There were different strategies used to demonstrate a fair and sound process. For example, the City of San Antonio put forth criteria in guidance that specifically addressed fairness, trust and credibility in the process. It also took very public actions to implement those decision making criteria.

In June 1996, while instituting unpopular water rationing measures, the city council appointed a “broad and diverse community-based group of 34 representatives” to develop a water policy approach for San Antonio. The Citizens Committee on Water Policy presented their final report in January 1997, outlining a comprehensive framework that emphasized the importance of continued citizen involvement in the evaluation of current and future options for water resources. The report recommended several immediate steps to promote

responsible water management and regional cooperation. In addition, the citizens committee established clear criteria for the process of considering current and future water resource options. Those criteria included: trust and credibility of process; community and unity promotion; availability and reliability of water supply; and economic opportunity. Furthermore, the decision-making criteria included environmental benefits and sustainability; efficiency and affordability of outcomes; governance and control of options; and fairness and equity in process and outcomes.

These criteria were put in practice. For example, SAWS managers received requests from some residential customers for access to the recycled water. These requests came from residents of an affluent area that the pipeline would pass through. The residents reasoned that if their streets were going to be disrupted to lay the main pipe, access pipes ought to be laid as well to provide residents a source of lawn water that would not be subject to drought restrictions. Upon consideration, SAWS managers denied the requests and remained committed to their plan to serve only commercial and public properties. SAWS managers believed it was not fair to provide access to this community, without providing a similar service to all residential communities along the two pipelines.

#### 4.5. Trust

The cumulative impact of the previous themes contributed to the establishment (or disintegration) of public confidence and trust. As a government official noted, “we wanted to build trust, [obtain] a higher degree of credibility.” A water resource planning document stated, “It is important the agency is committed to building the public’s trust by designing a public participation process that is fair, allows for two-way communication, solicits honest community feedback, and is willing to incorporate public input into the final program design.” Another included criteria for the process

of considering current and future water resource options: “trust and credibility of process...”

## 5. Discussion

These themes comprise a framework for water resource professionals, developed through the multidisciplinary analytical approach that integrated diverse social science perspectives and practical utility management knowledge. The framework included the following principles when undertaking water resource planning initiatives:

### 5.1. Manage information for all

Diverse types of information should be managed to promote learning, communication, and mutual understanding among all the stakeholders, given that different people learn and communicate differently. This includes ensuring equal access to information, employing multiple methods of information presentation and communication, and supporting and adhering to individual’s information processes and tendencies.

### 5.2. Maintain individual motivation and demonstrate organizational commitment

People should find more good reasons (e.g., benefits for one’s self and community) than bad reasons (e.g., real or perceived risks) to engage in public dialog. Water resource managers should aim to ensure and nurture multiple motives for the public to engage, highlighting both individual and community benefits. Organizations should demonstrate genuine commitment throughout the organization to engage and hear the public and take its concerns seriously.

### 5.3. Promote communication and public dialog

Communication and the broader public dialog should take multiple forms or venues, and be ongoing at all stages of a decision-making process. Water resource professionals should expect to

have to repeat their messages multiple times (and in multiple ways) before it is truly understood by others. Likewise, people should expect to have to listen to others' message multiple times and in multiple ways before they understand it. In fact, the quality of the public dialog is an indicator of the public confidence, trust and relationship with the water agency.

#### *5.4. Ensure fair and sound decision-making and decisions*

Both the decision-making process and the outcome should be perceived as fair and sound by participants. Fairness includes process, procedural dimensions and outcome, and distributive elements. Sound decisions are reasoned, well thoughtout and based upon accepted knowledge.

#### *5.5. Build and maintain trust*

The cumulative attention to the previous principles contributes to the establishment and maintenance of public confidence and trust. It is advisable to build trust and credibility reserves with the public and tap on those reserves when they are needed (e.g., build communication channels with the media during non-crisis).

In sum, finding solutions to the technical and scientific issues and problems associated with designing and building wastewater treatment and water reuse systems can be challenging and even enjoyable to water resource professionals. However, rarely are solving "people problems" called enjoyable. Nonetheless, the people side of water reuse decisions can be equally and often more challenging than solving the technical or scientific problems. The five concepts in the framework present a strategy for building public confidence and trust through a principle-based approach to public outreach, education, participation and planning.

### **Acknowledgement**

The author is grateful for the insightful comments by two anonymous reviews. The Water Environment Research Foundation (WERF), in cooperation with the National Water Research Institute (NWRI), American Water Works Association Research Foundation (AWWARF), and the WateReuse Foundation, funded this research.

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