

# **Standardizing Sustainability for Private Water Companies: Existing Standards and Future Opportunities**

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Master's Project submitted as part of the Master of Environmental Management (MEM)  
degree requirement at the Nicholas School of the Environment, Duke University

April 2017

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## Executive Summary

Unlike public utilities, private water companies are in the unique position of having access to financial resources beyond municipal funding, allowing them to pursue innovative solutions to complex water management problems. However, private water companies must work creatively within the confines of regulations as well as stakeholder and shareholder expectations.

Private water companies, like all other businesses, are faced with the question of how much time and resources to put toward environmental concerns. In most businesses, this question is addressed by operationalizing the concept of “sustainability.” Many in the business community think of sustainability in terms of the “triple bottom line” articulated by Elkington (1998): the synergy of environmental, social/societal, and financial obligations. This project takes an inside look at how private water companies—from the very large to the very small—utilize the concept of “sustainability” in their business operations.

As we found after speaking with water utility managers from across the United States, sustainability is often perceived as such a sweeping, theoretical concept, that it can be difficult to figure out how to “use” sustainability in practice. However, we also found that many tangible opportunities exist to make utility operations more sustainable. In fact, most utilities are well aware of, and eager to embrace, the challenges presented by the goal of becoming a more sustainable company. In almost every business avenue, including financial management, operations, and even human resources, private water companies are searching for ways to improve their triple bottom line, even while confined by regulations and shareholder commitments.

Sustainability standards—guidance documents designed to make sustainability practical for companies—have played a key role in allowing businesses to measure and market their progress. Some of these documents specifically address sustainability for water utilities. But are these standards actually doing their job? Or are they a

deterrent, making sustainability seem impractical? Our task was to evaluate these questions and develop recommendations for an improved sustainability standard for private water companies. We accomplished this goal through phone interviews with utility managers and company executives, as well as literature review.

We found that an improved standard must have four major components: 1) a clear definition of what “sustainability” means, in terms that are useful for water utility operations; 2) references to established business standards, thereby linking a water utility-specific standard to a broader business context; 3) a recognition that a variety of factors influence operations, and that utilities must tailor sustainability goals to local issues; and 4) an emphasis on applying technology to enable efficient benchmarking for sustainability goals.

Standards are inherently limited in their ability to effect change, simply because each business has its own unique needs and challenges. However, improvement to existing standards is particularly timely, as technological innovation in the water industry, including smart metering and data analytics, is moving at a rapid pace (Grady 2016), and think tanks are envisioning new cradle-to-grave business models for water companies (IWA 2016). A water utility sustainability standard for the future has the potential to simplify and organize important goals in this evolving industry. It is primarily this ability—to simplify the lives of utility managers—that would make a new sustainability standard useful.

## **Acknowledgements**

We wish to thank our advisors, Dr. Emily Klein, Dr. Megan Mullin, and Dr. Martin Doyle, for their valued guidance and support. We also wish to thank our client, Grace Soderberg from National Association of Water Companies, for her interest in sustainability and her vision for the project. Finally, we wish to thank Michael Deane at NAWC for his help in reaching out to member water companies during our interview process, and to Matt Klein from Utilities, Inc., who generously contributed time and insights to project planning.

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*Thank you to the representatives of these NAWC member companies, who provided us with practical insights from the industry:*

American Water

Aquarion Water Company

Avon Water Company, Inc.

Columbia Water Company

Daufuskie Island Utility Company

Golden Heart Utilities

Golden State Water Company

Middlesex Water Company

Milford Water Company

Columbia Water Company

Newtown Artesian Water Company

Pennsylvania American Water

San Gabriel Valley Water Company

Severn Trent-North America

SUEZ North America

Utilities, Inc.

## Section I: Introduction and Methodology

In the context of widespread concerns over sustainable water management at the global scale (UN Water 2015 Aug 9), it is not surprising that several standards have been published in recent years to address how water utilities can contribute to sustainability efforts, albeit at the local scale (see U.S. EPA 2014). Such standards discuss how water utilities can address the three major components of sustainability: economic (e.g. business and finance), social (e.g. employee engagement), and environmental (e.g. low carbon footprint).

Private water utilities have unique challenges facing their implementation of sustainability. A private water system refers to assets that are held by an individual, a private corporation, or a holding company, in which the owners expect return on their investment. Unlike public utilities, they must comply with government regulations, meaning they must devote significant time and money to regulatory compliance that could otherwise be directed towards holistic sustainability implementation. Yet because they operate for profit and not as branches of local government, they have greater incentives and opportunities for flexibility when it comes to making sustainability a part of company policy.

If private water companies want to reach high performance standards for sustainability, they must have the ability not only to strengthen their corporate brand and increase profits, but also to transfer soft benefits to their surrounding communities. Therefore, sustainability is an important goal for utility operators. Sustainability is also a concept that the National Association of Water Companies (NAWC) wishes to focus on in the future.

This study seeks to understand how sustainability standards can be adapted for private water utilities. We reviewed the literature on sustainability standards, identified key themes and concepts based on interviews with professionals, and synthesized our findings to form a roadmap for a new sustainability standard, tailor-made for private water utilities.

## Study Methods

**Literature Review:** Our literature review spanned several academic fields of research, and we focused primarily on three questions: 1) how do water utilities operate from a business and regulatory standpoint, 2) what does this mean when considering sustainability implementation, and 3) what are the gaps between existing theory (including existing sustainability standards) and practice that could be filled by a new, improved sustainability standard? While this report focuses on U.S. water companies (e.g. our interviews were confined to U.S. water companies), insights from international studies are also included to inform our recommendations.

**Interviews:** We conducted open-ended, semi-structured interviews with private water utility managers. Using a template of nine questions, interview subjects were encouraged to answer each question in whatever way they felt was most relevant. Each interview subject worked for a company that was a member of NAWC. We restricted our outreach to NAWC members for two reasons: 1) we expected members to be more interested in research associated with their member organization, and 2) selecting interviewees from NAWC's membership made our population of interest more uniform. We suspected this group would be more interested in sustainability due to their participation in NAWC, as NAWC is a forward-looking organization with awareness of environmental issues. We selected utilities for interviews based on response—if we contacted a utility but they did not respond, we moved on to other companies. While this experimental design would not work well for quantitative data collection, as randomization is highly important for statistical rigor, our qualitative approach did not suffer from nonresponse bias.

Our methods were partially modeled after those of Palme and Tillman (2008), who also conducted research on water utility sustainability, although our methods differed in several ways. Interviews conducted by Palme and Tillman (2008) encouraged interview subjects to answer questions in an unspecified order, emphasizing that they could elaborate on what interested them the most. In contrast, our interviews proceeded according to the written order of our nine questions (Appendix A).

However, the questions were ordered so as to move from general to specific topics, and therefore to follow a pattern easy for interviewees to understand. Follow-up questioning was based on interviewees' perceived interest in, or depth of knowledge about, a given topic.

Palme and Tillman (2008) report that their interviews “lasted for 30-120 min, but most often for approximately 70 min.” Because we assumed managers would be reluctant to commit to such a long time period, we asked each interviewee only nine questions, and interviews lasted about 20-25 minutes. Also unlike Palme and Tillman (2008), transcripts were not sent back to interviewees for “additional comments or corrections,” although final drafts of our research were sent to interview subjects for comments. On the other hand, our post-interview techniques were very similar to those of Palme and Tillman (2008). We recorded our interviews after we received consent from interview subjects (Appendix B), transcribed the interviews, and coded the transcriptions.

We used NVivo Version 11 (Kiwi Data Science) for coding, organizing and analyzing our interview responses. In the field of qualitative data analysis, interview responses are usually organized by coding text. Coding refers to the process of analyzing interview responses, “breaking it down into more manageable chunks” (Welsh 2002). We aimed to follow, at least in general, the practice of Summary Oral Reflective Analysis (SORA), a concept suggested in Thompson and Barrett (1997). SORA places emphasis on investigating the data in its original context, rather than arbitrarily categorizing data through coding (see discussion in Welsh 2002). SORA embraces three key principles: 1) repeatedly returning to the data (e.g. interview transcripts) to glean new insights; 2) recording immediate ideas generated from reviewing the data; and 3) looking for connections among these reflections to “enhance theorizing” (Thompson and Barrett 1997). In accordance with the SORA framework, we took the approach that coding should be an iterative process, a balance between investigating and categorizing information.

## Section II: Privatization and Sustainability

The emergence of private water utilities in the United States is a relatively new trend, and few scholarly studies discuss private water companies with respect to sustainability. However, several scholars have evaluated the relative benefits of privatizing water through the lens of political economy, considering economic development and neoliberalism (Boag and McDonald 2010; Bond 2010; Bakker 2013). This sociological focus on private water companies is likely due to the rapid change in water sector privatization in the United States. Private providers had a long history of delivering water services to many cities in the United States, including Boston, New York, and Philadelphia. As these cities grew larger at the beginning of the 20<sup>th</sup> century, water services tended to be incorporated into local government, largely driven by the need to safeguard public health amid urban population growth (Troesken 2004; Davis 2005). It was not until the 1990s that private water companies became common in the United States, as municipal utilities struggled to keep up with more stringent regulations and aging infrastructure; privatization was often seen as a solution to relieve pressure on tight municipal budgets (Howe et al. 2002). By 1995, private water supply utilities made up about 14% of total water revenues and 11% of total water system assets in the United States, and there were about 40,000 investor-owned utilities in the United States by the end of the 20<sup>th</sup> century (Howe et al. 2002).

Around the same time, several articles were published discussing the downsides of water utility privatization, with some concluding that privatization was not necessarily economically efficient (Bhattacharyya et al. 1994; Rees 1998).

Privatization has also raised concerns within communities and civil society (Hall et al. 2005). Community members worry about the impact privatization will have on their monthly water and sewage bills, long-term protection of watersheds that supply raw water, environmental protection, participation in and transparency of policy decisions, and possible loss of control over an essential public service. Environmental justice is a large part of this concern. For example, grassroots nonprofit Greywater Action recently published an online blog post titled "Water privatization: Theft of the commons," where they note that in California, 1 million people drink from

contaminated wells, mostly in poor communities in the Central Valley (Conant). Scholars have echoed these concerns, noting that privatization does not necessarily promote social justice, as was the initial intention for international privatization efforts (Davis 2005; Bakker 2013).

On the other hand, privatization is viewed as a useful way to supplement financial resources for aging infrastructure. Davis (2005) identifies two major drivers of privatization. First, municipalities in debt face increasing infrastructure costs and feel they have no choice but to contract with the private sector to raise funds; and second, private sector management and operation is generally deemed more cost efficient than public sector management (Davis 2005). Lieberherr and Truffer (2015) note that scholars recognize that public organizations, constrained by political mandates, are usually less innovative than private companies, which are driven to flexibility and creativity in response to market competition. Further, private water companies may face stricter enforcement of regulations, prompting better environmental stewardship (Davis 2005). Yet Davis (2005) also found that rigorous scientific literature comparing private and public utilities was scarce; most research was produced by organizations with ideological biases, either for or against privatization. While scholarly studies have not universally condemned private water utilities, private utilities should be aware of community bias against their right to operate, and factor these biases into their sustainability strategies. The history of debate about privatization in the water sector also speaks to the question of how to report sustainability to shareholders and the public, in order to maintain a positive public image.

## **Sustainability Reporting**

As a growing trend for large businesses (see Eccles and Saltzman 2011), sustainability reporting has been the subject of many research articles, including studies that criticize such reporting for inadequately conveying meaningful information about company performance (Aras and Crowther 2009; Delmas and Blass 2010). In the context of increasing concerns about sustainable development within the business

community, useful tools like Sustainable Development Indicators (SDIs) have been adopted to measure various dimensions of sustainability in the areas of production, environmental impact, social impact, and efficiency. Several different indicator systems exist to measure sustainable development within an organization. Schwarz (2002) suggests that five basic sustainability indicators are energy intensity, material intensity, toxic emissions, water consumption, and pollutant emissions. The indicators in ISO 14031 further simplify the sustainability concept by dividing it into two categories: environmental performance indicators (EPIs) and environmental condition indicators (ECIs), including subgroups of performance indicators to measure sustainable development in an organization (Palme and Tillman 2008).

However, few studies discuss how sustainability reporting relates to private water companies; most discuss sustainability as it relates to water systems in general. For example, Balkema et al. (2002) describes a way of conducting a sustainability assessment using "sustainability indicators" (metrics) for a wastewater treatment system. Sustainability indicators are a common topic in the literature; whether a water utility is public or private, the company should be aware of the general and long-standing tradition of using indicators in monitoring and reporting environmental performance (Hopkinson 2000). Balkema et al. (2002) list several elements to include in assessment methodology: definitions and selections of appropriate sustainability indicators (e.g. environmental, technical metrics of interest); institutional requirements (e.g. regulatory demands); cultural acceptance of the wastewater system attributes; expertise for operations; and designing the system to nudge performance towards sustainability, so that sustainability "is the most convenient option." Similarly, Muga and Mihelcic (2008) focused on developing sustainability indicators for wastewater treatment, but with a simple table for recording quantitative data for economic indicators (e.g. capital costs), environmental indicators (e.g. energy use), and societal indicators (e.g. nuisance from odor).

Some studies relate more closely to the interests of private utilities. Recent research by Lieberherr and Truffer (2015) specifically looks at sustainability for private water

companies from a governance and political science standpoint. Lieberherr and Truffer (2015) focus on three measures of sustainability: *sensing* (identifying future trends in the industry, usually through R&D); *seizing* (translating these future trends into "product and process innovation"); and *reconfiguring* (being an industry leader by integrating new technology into strategic planning). Milman and Short (2008) do not specify the difference between private and public water utilities, but their Water Provision Resilience (WPR) indicator applies well to both. Operators fill out a "qualitative questionnaire" to score several aspects of their water system within eight areas—supply, infrastructure, service provision, finance, water quality, and governance—and the combined total number of points equals the WPR score. In keeping with how most sustainability standards work, Milman and Short (2008) believed that their research should lead to development of a "qualitative indicator," rather than one based on a numerical score.

Although sustainability reporting (e.g., using sustainability indicators) gives a simplified view of company performance, making companies appear to be good environmental stewards, it is important to remember that these reports do not show the complexity behind integrating sustainability into an organization. To fully respond to environmental and societal challenges, organizations must undergo important cultural change and transformation (Post & Altman, 1994; Stead & Stead, 1992; Welford, 1995). Those private water utilities that have not formed a sustainability committee may also wish to develop a sustainable-driven company culture. The business community tends to value the idea of a uniform company culture that values sustainability, but such a unified culture may not be essential (Linnenluecke 2010). Employees from different culture types put emphasis on various elements to achieve the goals of corporate sustainability, and sustainability programs and policies are still able to achieve satisfactory results in an organization where employees value different parts of sustainable development (Linnenluecke 2010). It may be useful to create a company sustainability policy for the purposes of marketing and risk management; the fact that sustainability and corporate social responsibility reporting have become so commonplace implies that sustainability reporting has inherent value.

## **Private Water Utility Regulation**

Private water utilities and wastewater utilities must follow state economic regulations that oversee rates charged, infrastructure investments, and profits. In the United States, water utility regulation began in the nineteenth century, when the U.S. railroad system began to extend westward. In order to support the railroad operations and maintain reasonably priced services, a new state regulatory organization was developed to control such natural monopolies, which later included water services. Private water utilities were required to comply with applicable standards that also applied to public water systems, as well as having to follow additional economic regulation. At the federal level, the U.S. Environmental Protection Agency regulates all water service providers, both public and private (NAWC). Water providers must comply with the Clean Water Act and the Safe Drinking Water Act. Both of these laws allow communities to have access to safe and reliable drinking water and wastewater services for public health and welfare.

States are responsible for reviewing, establishing, and revising water quality standards. The public utility commission for each state regulates private utility rates, to reflect the full cost of providing water service (NAWC). The regulation is there to ensure that customers can receive safe and reliable water without having to pay an unreasonable price or have unjust, discriminatory service.

To illustrate, under the rules of the Public Utility Commission of Oregon, private water utilities must comply with water quality, pressure, customer service, and plant repair and maintenance regulations (PUC of Oregon, 2015). A private or investor-owned water system in Oregon is regulated by its state commission for service if it charges an average annual monthly residential rate of \$24 or more, provides inadequate service as determined by the Commission, or provides discriminatory service as determined by the Commission. In addition to service regulation, the Commission reviews and approves rates charged by private water utilities to ensure they are just. A private or investor-owned water utility is subject to rate regulation if it serves more than 500 customers, requests regulation and the Commission approves

its request, charges rates above the Commission established thresholds and 20% of the customers petition for rate regulation, or jointly provides wastewater and water service for customers residing within city limits (PUC of Oregon, 2015).

## **Section III: Private Water Utility Sustainability and the Business Context**

### **NAWC Member Case Studies**

The transparency of sustainability information varies greatly among private water companies. Among the 76 members of NAWC (considering acquisitions), only six have corporate responsibility reports (sustainability or corporate citizen reports) available online. These reports belong to large companies that publish annual sustainability reports to keep the public informed about their commitments to sustainable practices. They are American Water, Aqua America, Connecticut Water, California Water Service Group, EPCOR Water (USA) Inc. and CH2M. The remaining twenty-nine members have annual water quality consumer confidence reports available online, although some reports have not been updated on the websites. These reports and reporting procedures, as well as the business models they reveal, illustrate the opportunities and challenges private water companies face when implementing sustainability.

### **Organizational Structures and Reporting**

The most common management structure among private water utilities involves either an independent committee for social responsibility, or a structure that integrates sustainability with other organizational departments. For example, American Water has an individual Corporate Responsibility (CR) Steering Committee, which oversees strategies and programs across the organization, and runs the Executive Leadership Team (Figure 1). Similarly, at Connecticut Water, a CR Committee leads the implementation of sustainability policies and programs. Recently, this Committee formed a Green Team to evaluate recycling practices throughout the company.

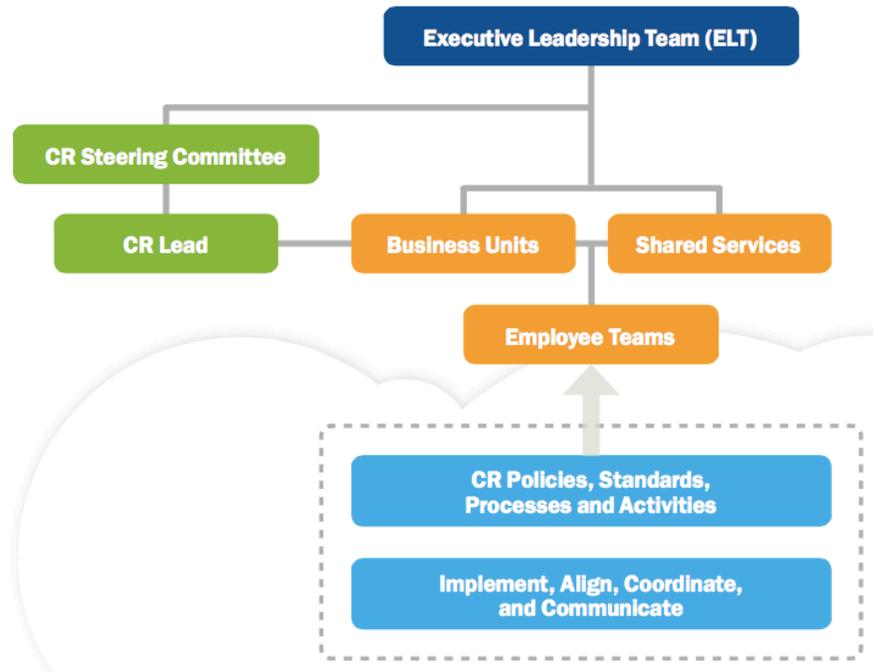


Figure 1: American Water Corporate Responsibility Management Structure<sup>1</sup>

### Priorities in Common

A common theme among the corporate responsibility reports was an emphasis on how daily operations could embrace sustainable development. This section summarizes common topics and categorizes them into four groups: social awareness, environment, business, and energy (Figure 2, Figure 3). Despite the fact that sustainability includes three aspects (environment, economy, and society), the "environment" component tends to play the largest role in shaping sustainable development within a company. This focus on environmental sustainability makes sense; for both public and private water companies, it is especially important to stress water conservation and quality, as water supply and treatment is the main service provided to customers.

In terms of environmental sustainability, large companies may make special efforts to protect watersheds and deliver exceptional services to customers and stakeholders.

<sup>1</sup> Source: American Water Corporate Responsibility Report 2013-2014.

Every private water company must comply with state and federal regulations, but larger companies may spend extra revenue going above and beyond compliance, creating voluntary environmental programs that improve their public image and stakeholder/shareholder relations. For example, preservation programs at Aqua America protect native vegetation and wildlife surrounding watersheds to improve habitat and water quality, while EPCOR reuses treated wastewater for industrial processes and biogas production. In addition, companies economize by adapting their environmental strategies according to their specific needs. For example, California Water Service Group (CWSG), located in a drought-prone region, prioritizes drought management programs to enhance water conservation. High-efficiency retrofit kits and appliances are adopted by CWSG to save 292 million gallons per year.

Energy conservation is often a key component of company environmental policy. Companies like Connecticut Water have implemented energy management programs to achieve goals related to energy conservation and energy efficiency. For instance, energy use monitoring equipment is developed to reduce energy consumption, and generators are being used for shaving peak demand and reducing long-term energy costs. Similarly, EPCOR is encouraged to operate at non-peak hours, when energy costs are lower.

The "social" side of the triple bottom line is often overlooked in comparison with environmental initiatives, but for water companies that require consistent, exceptional employee engagement, this branch of sustainability often takes the form of employee development. Most CR reports stressed the importance of professional development. Common approaches cited in these reports include competitive salaries, benefits packages, and training programs. For instance, Aqua America's Employee Recognition Program rewards superior performance, and their Wellness Blueprint program is designed to foster a healthy workforce. On the other hand, companies also place emphasis on community engagement. Private water utilities make a commitment to community engagement in different ways, such as donation of time

and resources for philanthropy, contributing money to local recreation parks, and education programs to support local children.

On the economic side, many utilities identify opportunities to reduce costs by upgrading infrastructure or promoting technical advances in facilities. A major difference between private and public water utilities is the fact that private companies pay more attention to return on investment as a means of attracting shareholder support. For example, CWSG has taken aggressive cost control measures to reduce operational costs, and thus they increased annual dividends for the 49<sup>th</sup> consecutive year in 2016. Similarly, Aqua America's first sustainability report in 2009 emphasized the need for structural reorganization to create value for customers and stakeholders. Water production and supply reliability are two important targets that closely align with the "economic" component of the triple bottom line, as they form the backbone of the product customers pay for. For example, on the supply side, American Water established a Safety Council to implement strategies for a safe and sustainable environment throughout the company's supply chain.

Software can help companies improve their financial bottom line; for instance, a Water Information Management System installed by Aqua America provides feedback on operations, allowing the company to improve customer usage management. At CWSG, aging and high-risk water mains have been replaced, and the depth of the pumps has been extended. Infrastructure reliability and financial sustainability are closely related for both private and public water utilities. Without solid infrastructure planning (a capital intensive element of the water business), water utilities struggle to serve their customers and maintain revenues.

| Social Awareness           | Environment                              |                                   |
|----------------------------|--|-----------------------------------|
| Community Engagement (80%) | Water Conservation (100%)                | Wastewater Treatment (40%)        |
| Customer Service (60%)     | Watershed Protection (80%)               | Wetland Protection (20%)          |
| Corporate Giving (20%)     | Water Quality (60%)                      | Wildlife Protection (20%)         |
|                            | Climate Change (40%)                     | Environmental Standards (20%)     |
| Energy                     | Business                                 |                                   |
| Energy Conservation (40%)  | Employees' Engagement (80%)              | Safety (20%)                      |
| Energy Efficiency (20%)    | Infrastructure (40%)                     | Structure Reorganization (20%)    |
|                            | Technical Advances (40%)                 | Water Production & Delivery (20%) |
|                            | Shareholders' Return on Investment (40%) | Water Supply Reliability (20%)    |

Figure 2: Common Sustainability Topics from Corporate Responsibility Reports




### Opportunities

- Lower Compliance Cost if Controlling earlier
- Customers Awareness
- Entrepreneurship
- Employees Awareness
- Technical Advances

### Threats

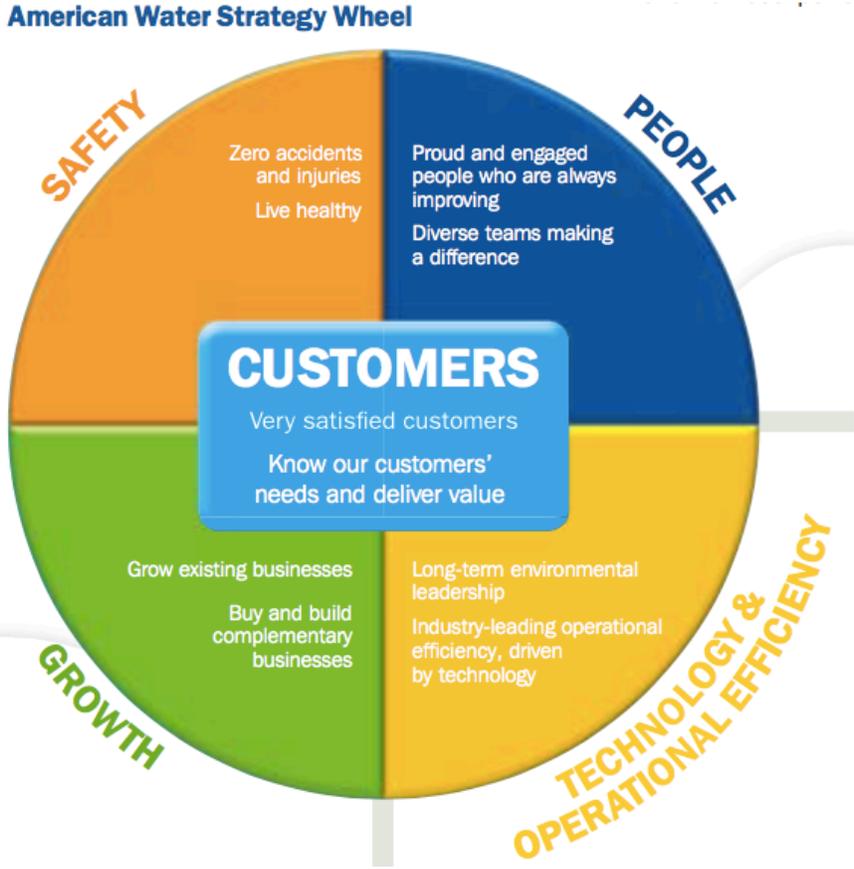
- Strict Regulations
- Large Upfront Cost
- Decreasing Availability & Quality of Natural Resources
- Uncertainty in Return on Investment
- Structural Reorganization

Figure 3: Summary of Opportunities and Threats in Private Water Utilities

**Reporting Methods for Five Private Companies**

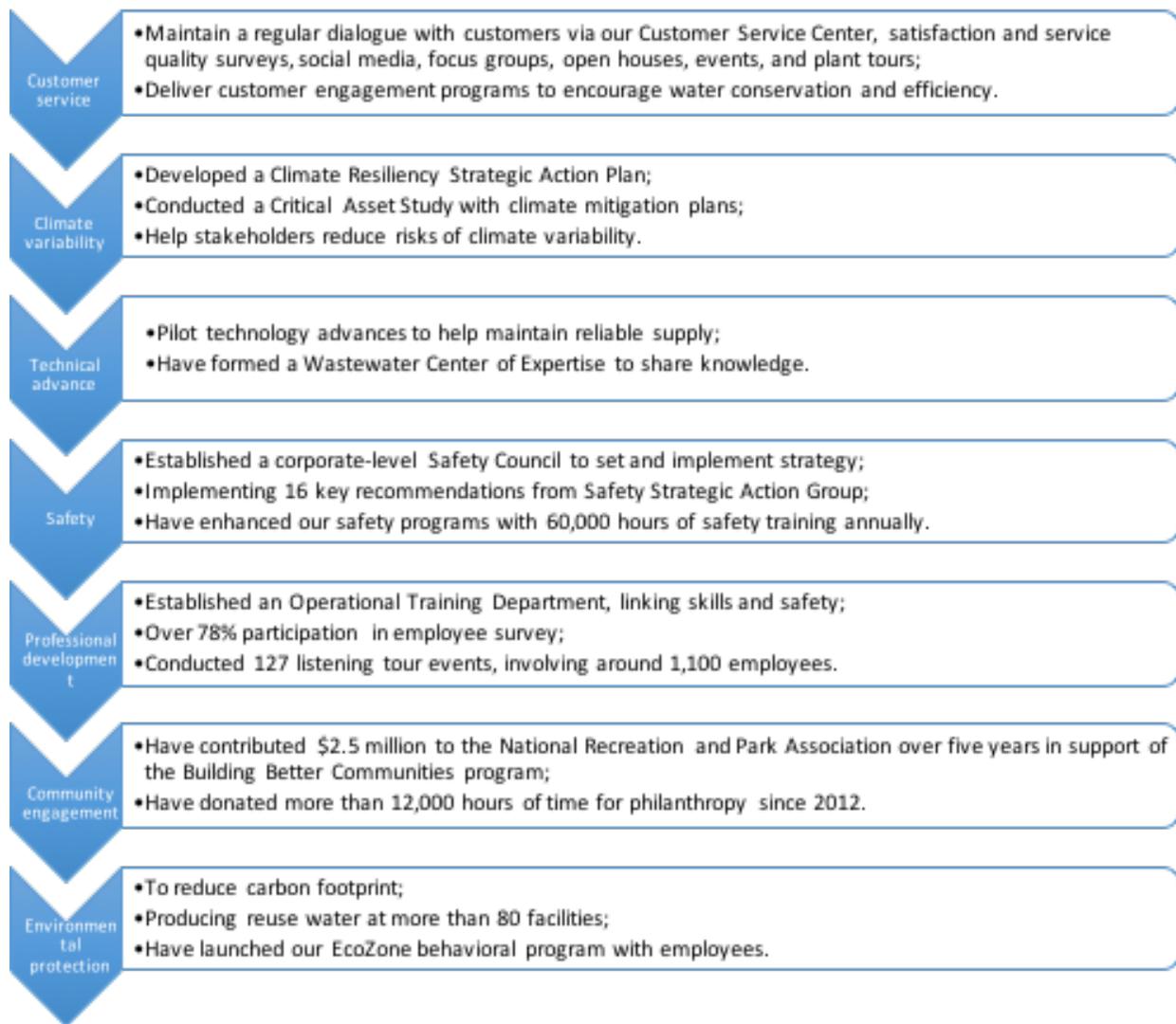
**1. American Water**

"Clean Water for Life" is American Water's vision to commit to delivering clean water that is reliable, safe and affordable. As part of this initiative, American Water has published an annual Corporate Responsibility report since 2010, with content generated by internal audit staff. Its sustainability strategy is shown in Figure 4. In 2014, a third-party review of top priorities was commissioned, involving stakeholders and American Water staff, to address the concerns of all internal and external stakeholders. Figure 5 presents the results of this strategic analysis.



*Figure 4: Strategy Wheel for American Water<sup>2</sup>*

<sup>2</sup> Source: American Water Corporate Responsibility Report 2013-2014.



*Figure 5: Topics and Approaches for Sustainability at American Water*

American Water was notable for its use of materiality assessment in its corporate sustainability report (Figure 6). Materiality assessment involves the ranking of stakeholders' interests, relative to internal company interests. This type of two-dimensional assessment should be taken into consideration because private water utilities are facing such a complex market environment. The concept of materiality is derived from financial reporting for influencing the economic decisions of those using an organization's financial statements, investors in particular (Hsu 2013). In the case of the American Water assessment, a third-party review was conducted to confirm the

top priorities for stakeholders and the company itself. The assessment concluded that water quality is the company’s most important priority, followed by regulations and performance (Figure 6).

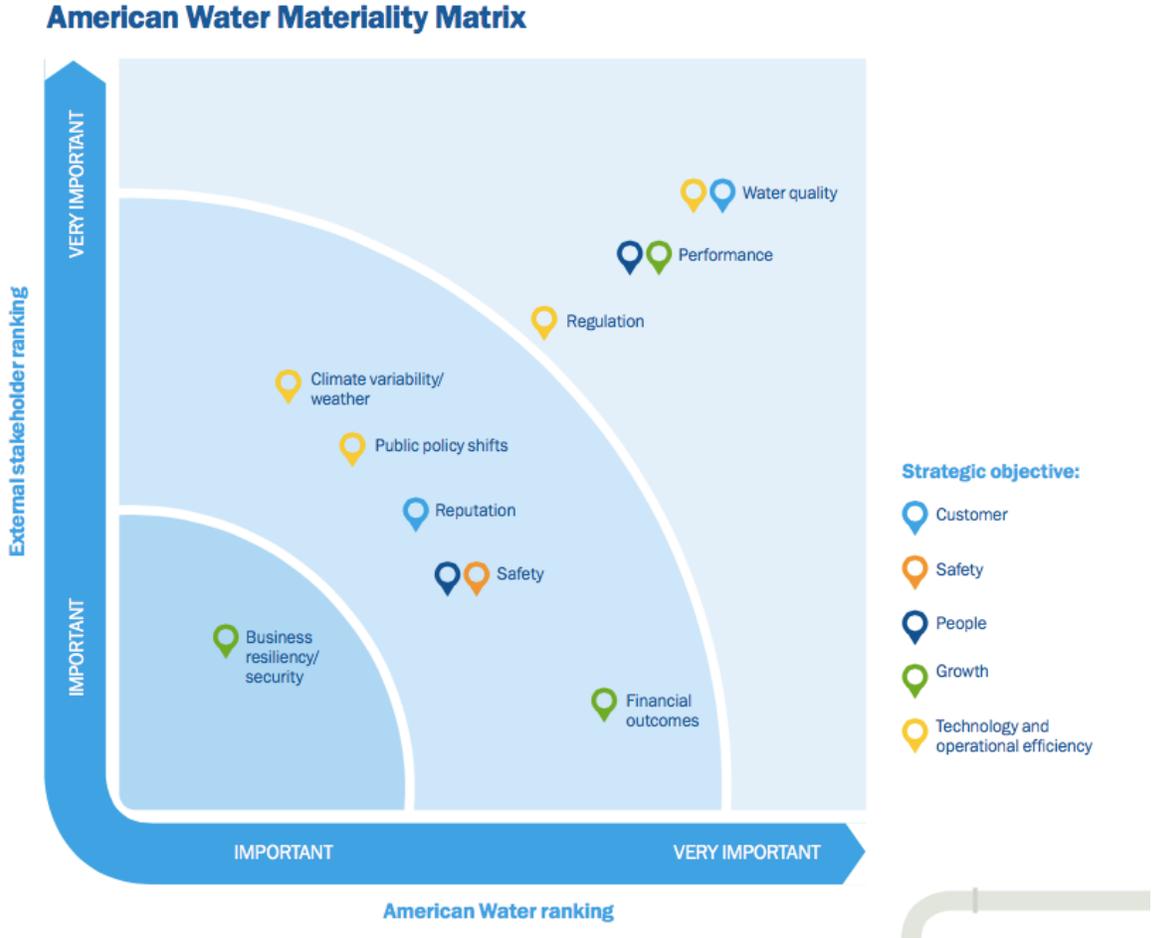


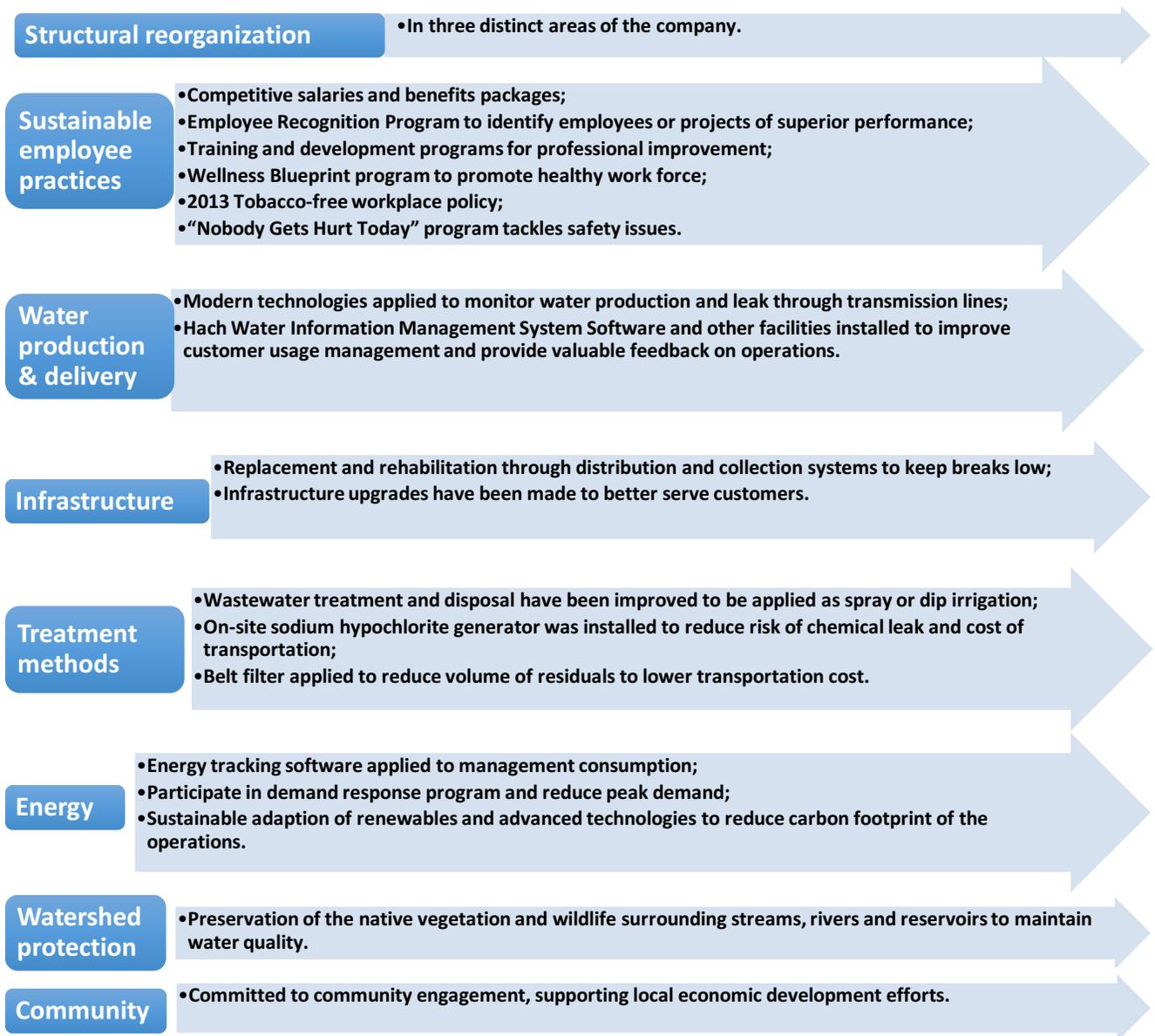
Figure 6: Materiality Matrix for American Water<sup>3</sup>

**2. Aqua America**

Aqua America, the second largest publicly traded water utility in the United States, published its first sustainability report in 2009. Aqua America has made green efforts part of its long history—the company has been providing water to customers for 131

<sup>3</sup> Source: American Water Corporate Responsibility Report 2013-2014.

years. Aqua American continues to pursue a sustainable business and environmental strategy (Figure 7).

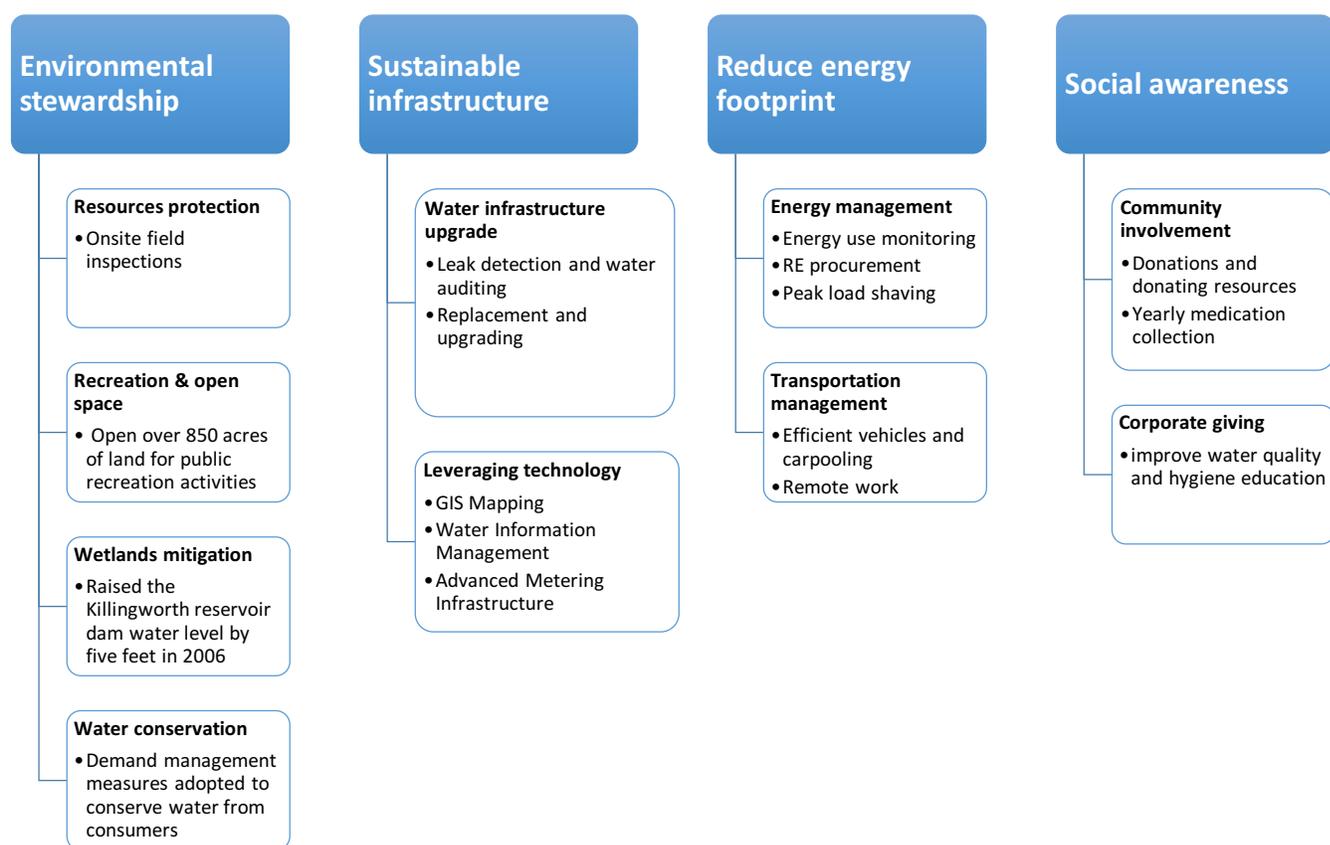


*Figure 7: Segments and Mitigations of Sustainability Strategies of Aqua America*

### 3. Connecticut Water

Connecticut Water established a Corporate Responsibility Committee in 2008 and published its first sustainability report in 2011. The committee fosters socially responsible programs and policies and enhancing environmental stewardship. Green

Team was formed to recommend company-wide recycling practices, and to identify best management practices for sustainability initiatives. Connecticut Water has four main programs to apply their corporate responsibility policies to daily operations (Figure 8).



*Figure 8: Overview of Sustainability Strategies of Connecticut Water*

#### 4. California Water Service Group (CWSG)

Martin A. Kropelnicki, president and CEO of CWSG, reported that the years 2015-2016 were especially difficult for the company due to drought: “California endured the worst drought in state history and all of our California districts were subject to mandatory water-use reductions.” The company used the limited water supply challenge as an opportunity to improve their operations and bring benefits to consumers, communities, employees, stockholders and the environment (Tables 1-5).

Table 1: Overview of Sustainability Strategy in Stockholders

| Stockholders         |                         |  |  |
|----------------------|-------------------------|--|--|
| Topic                | Challenges/risks        | Mitigations  | Results  |
| Return on investment | Confidence of creditors | Aggressive cost control measures were implemented to reduce operational costs;<br>A settlement agreement with CPUC to generate gross revenue by infrastructure improvements. | In 2016, CWSG increased annual dividend for the 49 <sup>th</sup> consecutive year. |

Table 2: Overview of Sustainability Strategy in Communities

| Communities              |  |   |   |
|--------------------------|--|---|---|
| Topic                    | Challenges/risks   | Mitigations   | Results   |
| Community support        | Erskine fire and Valley fire destroyed homes and businesses. | Brought portable generators, bottled water and relieve personnel to the ground;<br>Made donations to Red Cross and other organizations;<br>College scholarship program. | Helped damaged villages recover and support community education and construction.                         |
| Water supply reliability | Effects of drought on water level                            | Secured grant from DDW without impacting customers' rates;<br>Extended the depth of the pumps;<br>Replaced aging and higher-risk mains                                  | Increased reliability of water supply equipment and mitigated risks from potential environmental impacts. |

Table 3: Overview of Sustainability Strategy in Consumers

| Consumers                  |   |  |   |
|----------------------------|---|--|---|
| Topic                      | Challenges/risks  | Mitigations  | Results   |
| <b>Water use reduction</b> | In 2015, California Governor claimed a 25% reduction in urban water usage compared to 2013. | Financial incentives: rewarded consumers who saved water;<br>Research projects: to help inform long-term water-use efficiency standards for commercial, industrial, and institutional customers. | CWSG reduced water use by 26.8%, which exceeds the target by 1.8%.  |
| <b>Water quality</b>       | Increasingly stringent federal and state standards  | 10 water treatment plants completed in 2015 and 2016;<br>Pilot research on strong-base anion exchange technology.  | Received grants to offset impact for consumers;<br>Compliance with lifetime health advisory set by EPA                      |
| <b>Customer service</b>    | Committed to provide affordable, excellent service  | Launched online Customer Contact Update system;<br>Implemented new customer service platform;<br>Launched Low-Income Rate Assistance program.  | Service is provided at a higher efficiency and with more options;<br>Ranked highest in customer satisfaction by J.D. Power. |

Table 4: Overview of Sustainability Strategy in Employees

| Employees                 |                                    |  |   |
|---------------------------|------------------------------------|--|---|
| Topic                     | Challenges/risks                   | Mitigations  | Results   |
| <b>Employer of choice</b> | 1,100 employees' trust and loyalty | Deployed an innovative mobile tool to schedule field work orders;<br>Executive Safety Committee was formed in 2016 to address safety concerns throughout the organization;<br>Professional development and continuing education courses have been offered. | CWSG has been named a Top Workplace in the Bay Area for the 5 years and was certified as a Great Place to Work in 2016. |

Table 5: Overview of Sustainability Strategy in Environment

| Stewards of the Environment          |  |  |  |
|--------------------------------------|--|--|--|
| Topic                                | Challenges/risks   | Mitigations  | Results  |
| <b>Ground water basin management</b> | Sustainable Groundwater Management Act                                 | Created or worked with a ground water sustainability agency to form or participate in groundwater protection.  | Supply reliability increased and site improvement are underway.  |
| <b>Wildlife protection</b>           | Crack in water main caused discharge of drinking water into the creek. | Embarked on streambed restoration to protect native fish.<br>Special precaution to ensure kit foxes in protected areas.  | Wildlife in protected area was caught special concern by projects.   |
| <b>Conservation</b>                  | Drought management program   | High-efficiency retrofit kits, high-efficiency appliance and irrigation device rebates; Further enhanced industry-leading conservation program.  | In total customers in conservation programs saved 292 million gallons per year.  |
| <b>H2O challenge</b>                 | Recycled water and wastewater  | Partnered with the City of Sunnyvale to provide recycled water to campus;<br>Provided recycled water to refineries in Rancho Dominguez and Westlake districts;<br>MBR technology was applied to treat wastewater and invested in improving reliability of wastewater treatment systems | Amount(mm gallons) of waste water treated in 2015: 48 in CA, 435 in HI, 108 in NM and 8 in WA.   |
| <b>Environmental standards</b>       | Multiple agencies with higher standards                                | Discharge permit: all districts applied for and received permits by February 1, 2016.<br>Upgraded 14 booster pumps to reduce diesel particulate matter;<br>Risk identification mitigation of potential hazards from operational and construction activities.                           | Operated in accordance with state water discharge regulations;<br>Reduced exhaust emissions by 85% on average as a result with pump fleet; In 2016, 5 of the largest districts accomplished risk management. |

## 5. EPCOR Water (USA) Inc.

EPCOR operates water supplies and wastewater treatment both in competitive and regulated markets. The company published its first corporate responsibility report in 2008 and promises to provide great tasting drinking water, clean wastewater and safe, reliable electricity. The detailed efforts related to environmental and social responsibility are presented in Table 6.

Table 6: EPCOR Water Sustainability Efforts

### Environmental responsibility

- Watershed protection
  - Partner with stewardship groups to support best management practices;
  - Research on water quality, climate change impact on water quantity and other issues.
- Water resources management
  - Monitoring and preventive maintenance programs to reduce water losses;
  - Implement utility “best practices” activities such as leak detection, water loss control and unidirectional flushing of water mains.
- Wastewater management
  - Reuse treated wastewater for industrial processes;
  - Wastewater treated to produce biogas.

### Social responsibility

- Community
  - Hot lunch program and blood donation routinely held to local communities and community consultations formed;
  - Employee volunteer to donate their time to support communities;
  - Education programs to local students and teachers about water safety;
- Customers
  - To increase system reliability for customers, especially in weather events;
  - Offer self-service system to customers to monitor water consumption.
- Financial performance
  - Reduce investment to guarantee sustainable financial performance.
- Employees
  - EPCOR’s school of business support employees’ professional development;
  - New pay system applied to ensure internal consistency and appropriate external salary benchmarking;
  - Offer equal employment opportunities regardless of gender and races;
  - Employee safety regarded as top priority.

## Section IV: Existing Sustainability Standards

Many standards for business sustainability exist, but we found that two sources of guidance documents, in particular, stood out as most relevant for private water companies. The Effective Utility Management (EUM) framework (EUM Utility Leadership Group 2017), along with EPA's Handbook for water utilities (2012), are both specific to water companies, and so were especially useful to consider.



*Figure 9: The Ten Attributes of EUM and Five Keys to Management Success<sup>4</sup>*

Without water company-specific concepts, applying a generic sustainability standard would be too general, and relatively useless to utility managers, who deal with very specific business requirements. However, we found that the more general, broadly

<sup>4</sup> EUM Utility Leadership Group. 2017. Effective Utility Management: A primer for water and wastewater utilities.

applicable Environmental Management System standard from the International Organization for Standardization (ISO) was a useful template. When considering our final standard roadmap (the final section of this report), we used both the EUM framework and ISO 14001 to inform the structure of our new standard, allowing us to better organize and synthesize our research. Both sources are discussed below.

### **Environmental Protection Agency (EPA)**

The EPA has endorsed a framework called Effective Utility Management (EUM). The most recent EUM Primer document, published in January 2017, is designed to help water and wastewater utility managers make practical, systematic changes to achieve excellence in utility performance. The EUM Primer includes ten attributes that water companies should consider, all of which relate closely to the triple bottom line concept in the sustainability literature. EPA has also released a more conceptual guidance document, titled "EPA's Planning for Sustainability: A Handbook for Water and Wastewater Utilities." This document recommends that water utilities follow four major steps when considering how to integrate sustainability into their business:

**Establish Goals:** Utilities should first consider their own sustainability priorities by doing internal audits, looking for opportunities for increased sustainability and enhanced performance. Next, utilities should attain information to gain an understanding of community sustainability priorities, which can include their community vision and watershed plans and documents. Third, utilities should pursue active engagement or partnerships with the community in order to seek opportunities for consultation with community planning institutions or stakeholders to receive ideas on sustainability priorities and how water infrastructure can influence the community's ability to achieve those priorities.

**Define Objectives and Strategies:** Drinking water utilities should consider setting both near- and long-term water quantity and quality objectives by assessing their current performance and setting it as a baseline for various sustainability objectives. The baseline analysis can be supplemented with publicly available tools, such as EPA's

Portfolio Manager for water utilities and utility bill information. Some of the assessments that utilities can carry out to measure their baseline include current and future service demand, sufficiency of current supply capacity, and the ability to meet current and future regulatory obligations. Finally, utilities need to make sure that the objectives are SMART- Specific, Measurable, Attainable, Realistic, and Time-based.

**Alternative Analysis:** Utilities need to have explicit and consistent project selection criteria for each sustainability objective in order to conduct an effective alternative analysis. Alternative analysis refers to assessing the technical performance, cost, maintainability, and reliability of infrastructure, and investing in new infrastructure to meet regulatory requirements. When setting and applying project selection criteria to assess and select projects in the alternative analysis, the utilities should try to involve views from community stakeholders.

When evaluating benefits of each alternative, utilities can use the same methodology along a common template for easier comparison. For example, utilities can use a scorecard (provided in the EPA's Portfolio Manager) to calculate energy reduction. In addition, the EPA's Checkup Program for Small Systems allows small companies to calculate financial projections based on project operation and capital requirements. When considering financial costs, utilities should also take into account life-cycle costs of each alternative that reflects the full accounting of the project's annualized cost and revenue impacts.

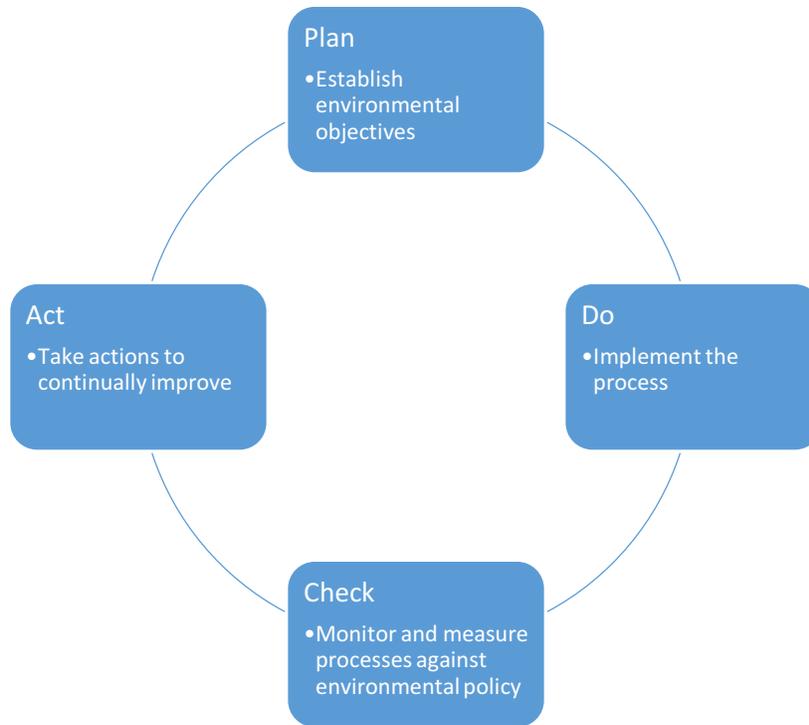
**Assess Financial Strategy:** Utilities should account fully for all project capital costs, both the primary and secondary costs. Primary project capital costs are costs included in alternative analysis, such as cost involving construction, engineering services, environmental permitting, commissioning costs, and construction management. Secondary capital costs include cost of capital and capital acquisition costs, such as financial advisory fees and rating agency fees. The utilities should also account fully for operations and maintenance costs and impacts that new projects may have on the overall system's costs and revenues. It is critical for utilities to look at all the funding

options, especially small utilities. There are resources available to help small utilities obtain favorable financing rates and receive technical assistance, including EPA's resources for small public water systems and SRF Loan.

## **ISO 14001**

The International Organization for Standardization (ISO) writes standards to help businesses ensure that products and services are safe, reliable, high quality, and low cost by reducing waste and errors while increasing productivity. The purpose of ISO 14001 is to give organizations a framework to protect the environment and respond to changing environmental conditions, while considering socio-economic needs (BSI ISO 14001: 2015). Because ISO 14001 is designed for any organization, without specifications for certain businesses or industries, it recognizes that application of the standard can differ from one organization to another because of different compliance needs, commitment to environmental policy, technologies, and environmental performance goals. ISO 14001 is based on the premise that the environmental management system's success depends on commitment from all levels and functions of the organization, which are overseen by the top management.

For ISO 14001, the basis for an environmental management system is the Plan-Do-Check-Act model (Figure 10). The model provides a repetitive process that helps organizations attain continuous improvement.



*Figure 10: ISO 14001 Plan-Do-Check-Act model*

In the context of the Plan-Do-Check-Act model, ISO 14001 organizes its environmental management standards within the following categories:

**Context of the Organization:** First, it is important to understand the organization and its context to determine the environmental conditions being affected by, or capable of affecting, the organization. The organization should also understand the needs and expectations of interested parties that are relevant to the environmental management system. By evaluating external and internal environmental pressures, compliance obligations, the organization’s activities and services, and the organization’s authority, the organization can decide the scope of the environmental management system.

**Leadership:** Top management must demonstrate leadership and commitment to the environmental management system by 1) establishing environmental objectives for

the organization; 2) ensuring that the environmental management system is given sufficient resources to operate, and that it is integrated into the organization's business practices; and 3) creating and maintaining environmental policy within their environmental management system by looking for continual improvement for the system, and providing a framework that is appropriate for the purpose and context of the organization.

**Planning:** The organization needs to consider the life cycle context of its operations by determining the environmental impacts associated with products, services, and activities. The organization should document the details and the criteria used to determine their environmental management system, including the company's environmental impacts and compliance obligations. Once the organization gathers data on their environmental impacts, the organization must establish objectives that are consistent with the overall company's environmental policy that are measurable, monitored, communicated, and updated as appropriate. The organization looks at what will be done, the resources required, who will be responsible, when it will be completed, and how the results will be evaluated.

**Support:** In order to establish, implement, maintain, and continually improve the environmental system, the organization will require resources. First, people doing work that affect environmental performance and potential environmental impacts need to be competent and aware of the environmental management system, including its benefits and the implications of failing to meet compliance obligations. Employees should be educated about the environmental management system, and information about the system should be distributed among all levels of the company. The organization must also be able to communicate information about its environmental management system to external stakeholders.

**Operations:** Consistent with the life cycle perspective, the organization establishes and keeps record of environmental requirements to control the design and development process for the product or service by considering each life cycle stage,

including transportation and delivery, end-of-life treatment, and final disposal of its products and services. In addition, such environmental requirements are communicated to external providers, such as contractors. The organization also needs to be prepared for potential emergency situations by periodically testing the planned response actions and providing training related to emergency preparedness and response to people working under its control.

**Performance Evaluation:** The organization needs to implement compliance obligations and determine how often compliance will be evaluated. The organization also needs to conduct internal audits at planned intervals to make sure that it conforms to the organization's own requirement for its environmental management system and ISO 14001. Top management reviews the organization's environmental management system, also at planned intervals, in consideration of the status of actions from previous management reviews. The outputs of the management audit include conclusions on the continuing suitability and effectiveness of the environmental management system, decisions related to continual improvement opportunities, and changes needed if environmental objectives have not been achieved.

**Improvement:** The organization needs to take action in the event of nonconformity to the environmental management system, in order to eliminate the cause of the nonconformity. The organization should document each incidence of nonconformity, identifying the evidence and the nature of the nonconformity, along with any subsequent actions taken and the results of corrective action.

## **Section V: Interviews with Private Water Utilities**

We asked interview subjects nine questions, including some qualifying questions (Appendix A). The purpose of the interviews was not necessarily to “solve” problems related to each question, but rather to uncover key insights about the nature of sustainability for the modern private water utility. Sometimes, themes and implicit concerns emerged in cases where a basic question acted as a prompt for further

discussion. Like Palme and Tillman (2008), we encouraged subjects to elaborate on topics that seemed to draw special interest from a certain question prompt. Therefore, the discussion below does not break down interview responses by question, but rather explains themes that emerged from the interviews, taken together. Interview responses varied with respect to local pressures (e.g. extreme temperatures, isolated location) and company size, yet identical themes came up in most of the 15 interviews. Below is a discussion of some of these topics, with reference to research subjects' opinions.

### **Ambiguity of Sustainability**

One of the most commonly discussed themes was the definition and nature of sustainability itself. Managers from both small and large companies acknowledged that sustainability is difficult to conceptualize, and even more difficult to implement and apply to operations. The concept of sustainability itself—a broad, sweeping and theoretical idea—was sometimes enough to frustrate professionals in the industry. For example, one manager working at a large company noted that before making improvements, it was important to realize when existing practices already fit under the umbrella of sustainability. Although his company had a corporate sustainability report, he believed that the report itself did not translate into an increased awareness of how sustainability should be applied in day-to-day operations. When asked to recommend an idea for an improved sustainability standard, he pointed out that “being able to recognize, ‘hey, that’s a sustainability aspect of what I’m doing,’” was an important element to consider.

Similarly, a business representative from the same company’s headquarters discussed the difficulty of applying sustainability, referencing the disconnection between the highly technical information provided by the SCADA data system, and the goal of achieving sustainable operations. Although it was clear that efficient energy usage is a component of sustainability (and a key element of most sustainability standards), he felt that current standards failed to provide the detail needed to assess whether pump energy usage was “sustainable” enough. A representative from another large

company summarized the overriding problem of sustainability's conceptual ambiguity: "It's not a fixed program, it's just very open, and I think people have trouble getting their hands around it."

On the other hand, some managers had a very specific idea of what sustainability meant to them, yet these definitions varied from company to company. A manager at a mid-sized company noted that sustainability, for his company, meant "the ability to continue providing water as necessary for our retail customers." Meanwhile, a manager at a large company noted that sustainable development could be divided into four concepts: governability, concreteness, circularity, and common good. He implied that his company thought of sustainability as encompassing a broader scope; "sustainable development" is usually associated with economic development at the international scale.

### **Efficiency as a Driver of Sustainability**

Several utility managers mentioned that their main goal for operating their utility was achieving "efficiency." In fact, it appeared that efficiency was considered the driver of sustainability efforts, with sustainability as a coincidental outcome. For example, one manager remarked that although his company considers sustainability, "it's more from a selfish standpoint in that we're trying to control costs. That tends to be more of the driver." On the other hand, larger water companies tended to take a more idealistic approach to sustainability, emphasizing the concept of a "long-term view." In these larger companies, presumably where revenues were higher and shareholder demands more stringent in terms of stakeholder expectations, sustainability became a business priority in its own right, quite apart from the concept of efficiency. For instance, one large company manager remarked that sustainability was a key component of reducing risks and increasing market share. Yet even in these larger companies, the concept of efficiency was recognized as a major focal point for operations. One manager remarked: "in the short term, it's really around being an efficient water utility, because all of those are cost—those are operating costs that are passed on to our customers. So the focus right now is to be more efficient and

manage those operating costs, but to have an environmental benefit to them.” It appears that efficiency is the preferred way to justify and achieve best practices for sustainable operations.

## How to Reach “Efficiency”?

**Technology, Data and Benchmarking:** A large company discussed a new SCADA system to monitor pump efficiency, suggesting the importance of using technology to improve overall sustainability in operations, as technology is often the most cost-effective means of achieving energy and water conservation. Yet another representative from the same company noted that they themselves do not have a sustainability department—in fact, the “sustainability” office only exists at corporate headquarters, rather than at the utilities themselves, while the local utility focuses on environmental compliance. A general trend of inconsistency between the branch and the corporate headquarters is understandable and reflects the operational inertia that is an inherent challenge in managing any large corporation. It is possible that while technology may be piloted at the corporate level, this technology may not be quickly distributed to subsidiaries.

Benchmarking, an important concept in the literature, was rarely mentioned by interview subjects, perhaps because it is a difficult step for most companies, requiring rigorous and thorough data analysis. In fact, only a few company managers made reference to benchmarking, usually in a vague, implied way. For instance, one manager discussed comparing results with peers, but did not make specific reference to benchmarking with quantitative data: “you try to figure out what's going on in the industry, seeing who's doing it the best, and sort of emulate that kind of process.” One especially unusual case was that of a larger company that was part of an overseas investment group. This company was required to meet certain shareholder-driven goals, and the incentive was competition and comparison: “we get compared against the other companies that they hold, to see which companies are doing the most to try to remain sustainable, or to improve their sustainability.” One large company practiced a similar type of quasi-benchmarking, implying a similarly qualitative search

for differences between their own practices and those of competitors. This company's representative remarked that he is "always looking at what other companies are doing," aiming to "see if we are more or less the same, the same scope on sustainable development."

***Financial Barriers to Sustainability:*** Financial barriers, or high costs for increased sustainability, were arguably the most fascinating and complex topic discussed in the interviews. Although cost was often seen as a major deterrent for implementing sustainability, several interviewees explained how practicing sustainability could save money. It appeared that sustainability and financial security were not necessarily at odds, provided that sustainability was integrated into an efficient plan for the utility as a whole.

High cost of operation was one of the most frequently discussed topics, pertaining to both small and large utilities. One interviewee acknowledged that the drive to stay in business, at a time when private companies were disappearing due to competition, was a component of sustainability—and sound financial management was therefore an implied concern. Another small company manager felt that costs had to be allocated to the system as a whole, implying that sustainability can potentially be squeezed out: “you know, what little money you do receive or get, is spent to improve your product or your system.” On the other hand, some discussed cost more in terms of investing in measures that would not only save money, but also enhance sustainability. One corporate representative from a large company noted, “There will probably come a time in the future where...to prove your energy profile, may result in some additional cost. But, you know, the pump that’s pumping inefficiently now, we can make it more efficient, that’ll save you money.” Cost concerns also related to worries about water rates. One utility was involved in a rate case that had lasted for over a year. This representative noted, “large legal fees involved and consulting fees, you know, all of that gets put back into the rates and ultimately to the customer...every penny is accounted for, and has to be explained.” A small utility echoed these concerns, implying that changes to the system (in terms of

sustainability) could potentially be more trouble than they were worth, due to high costs and hassle. This manager claimed: “that idea may be good, but is it worth the money going there, that’s going to raise the rates for the customers, and would it be necessary compared to what’s already happened? There can be the good idea, but is the good idea necessary at this time to disrupt what’s happening already?” This same utility discussed the challenge of being located on a small island, with “just a handful of operators that are on-island,” implying concerns about logistical costs.

Several companies expressed concerns about how much standard implementation would cost. A corporate representative from a large company acknowledged, “the ISO program, this is a challenge...the value of having external verification of programs is an additional cost and effort that we haven’t incurred.” Similarly, another large company representative stated, “I think there are certainly costs involved in conforming to an ISO standard because you have to get audited.” More generally, this same individual acknowledged the difficulty of deciding how to allocate an inherently limited resource—and suggested that in general, money put towards improvements must be worthwhile: “I think we want to demonstrate financial savings—if I replace a motor or pump, am I going to see my energy bill go down?” For his company, the major question was, “is there a way to do this, to have a sustainability management system, that doesn’t require a lot of overhead?” Another company representative mentioned that sustainability standard compliance would be more attractive if there were built-in cost incentives. He explained, “if the state regulator were to say, “hey, if you could reach this sustainability standard, we’ll let you gain another half a percent return, or a quarter percent or three quarters of a percent return, you could make 10%,” then our investors would say, “let’s go for that, let’s get that extra half a percent.”

On the other hand, many interview subjects discussed the use of sustainability practices for reducing financial burdens. One small company manager said that sustainability had a twofold purpose: environmental benefits and cost savings. Another theme was the connection of cost savings to energy efficiency. One manager

remarked, "electricity is probably the biggest overhead we have," while another explained, "the pump that's pumping inefficiently now, we can make it more efficient, that'll save you money." Similarly, reducing leaks was linked to lowered costs; one manager described how installing a new treatment facility had enabled the company to recycle water and use less water overall. Even for those companies who were less optimistic about sustainability's cost-effectiveness, most interview subjects expressed optimism. One manager at a regional subsidiary company noted that "we're not quite there yet" in terms of cost effectiveness, but "it's still in process" after partnering with their local Public Utilities Commission.

### **Problems with Current Standards**

When questioned about whether they found specific standards (such as ISO standards and the EPA Roadmap) useful, most interviewees responded that such standards were not used. Little explanation was given in most cases as to why standard documents were not useful, although one manager remarked that the cost of third-party verification is a deterrent. Based on discussions of sustainability as a whole, it seems likely that standards are overlooked by private water companies because they tend to state the obvious and fail to overcome the cost barrier. In other words, because standards do not address *how* sustainability measures can accomplish the efficiency goal, such standards are not perceived as worthy of the expense.

### **Recommendations**

Evidence from our interviews suggests that the concept of "efficiency" may help to address barriers to sustainability, enabling utilities to holistically improve their social, environmental, and economic (financial) performance. Therefore, amendments to current standards (or drafts of new standards) should focus on this idea: how can utilities achieve efficiency, in a way that embraces the concept of sustainability? Future sustainability standards for private water utilities must be based not only on idealistic, often costly landmarks (e.g. become LEED certified, install low-energy light fixtures), but must also focus on the mechanisms by which such landmarks could be

evaluated, along with best practices to consider. Otherwise, standards risk ignoring the factors that make utilities unique: company size, customer base, location, and surrounding ecosystem. Based on this premise of the importance of efficiency, we suggest the following recommendations to improve sustainability standards for private water utilities:

1. **Define Sustainability:** Discuss the meaning of sustainability both in reference to established definitions from the literature, and with respect to the concept of “efficiency.” Utility managers tend to immediately connect with the idea of efficiency, and illustrating the link between the two concepts is crucial.
2. **Use a Business Focus:** Integrate ideas from the most respected business sustainability standards, such as ISO 14001 and ISO 50001, into a private water company standard. Maintaining a business-oriented focus allows the standard to be practical and accessible to executive-level managers and those tasked with implementing sustainability.
3. **Incorporate Flexibility:** Acknowledge that not all utilities work in the same way; explain how the standard can be adjusted to fit several different “types” of utilities (e.g. companies of different sizes and locations).
4. **Discuss Benchmarking:** Emphasize benchmarking techniques and different approaches that will allow utilities to consider the most realistic option for their system.

## **Section VII: Roadmap for a New Standard**

Below is an outline, or preliminary “roadmap,” for a new private water utility sustainability standard. The outlined standard is based on existing standards (e.g. the EPA documents and ISO standard discussed in previous sections), but it also incorporates observations from the case studies and interviews. The format of our proposed standard is modeled after ISO 14001: 2015, as this standard was considered a comprehensive document with high levels of detail.

## **Sustainability Standard for Private Water Utilities: A Roadmap**

### **Scope**

The scope of this standard is private water companies, and/or utilities, within the United States, of all sizes and in all locations across the country. This standard is designed for water companies wishing to enhance their environmental performance and overall sustainability. Sustainability, as applied to private water companies, is relevant in that it is a framework for integrating economic, environmental, and social factors in a business. Other relevant definitions include:

- Meeting the needs of the present without compromising the ability of future generations to meet their own needs
- Systems that utilize Life Cycle Assessment (LCA) to quantify the environmental impacts of inputs into the system, with the goal of maximizing system efficiency
- In a business context, ensuring that the triple bottom line is integrated into a sound financial plan for the future

Our interview results indicate that efficiency is an important concept that drives sustainability efforts. Efficiency may relate to the concept of "productivity," or increasing the ratio of outputs to inputs in a system; "efficiency," which involves "establishing a standard and determining how close the firm comes to meeting that standard," or "effectiveness," the extent to which a utility achieves certain pre-determined goals (Berg 2010). Depending on utility needs, each company may wish to choose which definition of efficiency best aligns with their business model.

### **Organizational Context**

In keeping with recommendations from ISO 14001: 2015, the water company should begin sustainability evaluation by defining their organization's mission, business goals (e.g. financial plans), and the interests of stakeholders, including investors, customers, and regulatory agencies. The EUM framework is based on the premise that organizations should conduct internal audits before implementing sustainability priorities. The case studies discussed above provide templates for these audits, and

interview results imply the most popular and material topics to consider when defining organization-wide goals. At a more micro level, Balkema et al. (2002) provides a table of possible metrics to measure, most of which are applicable to private companies. EPA also recommends conducting a survey of community priorities, for example, conducting surveys via social media to gauge customer satisfaction. To further community outreach and social stewardship, water companies should gather information on challenges facing the communities they serve, such as local economic development goals.

## **Leadership**

Without leadership, implementing sustainability will become difficult, and may not be realistic in the long run. We recommend the following policies be adopted:

- At least one individual within the company should be responsible for taking initiative on sustainability implementation.
- Sustainability should be written into company policy, enabling effective enforcement of objectives.
- The company should produce regular reports on the performance of sustainability implementation, and communicate the report results to relevant parties within the company and external to the company (i.e. stakeholders).
- Make resources available to promote improvement in sustainability; regardless of whether the water company plans to expand sustainability efforts, management should focus on improving the efficiency of current implementation efforts, if nothing else.
- Draft realistic sustainability objectives; goals must be in keeping with organization size. Large water companies may have greater capacity to implement sustainability-specific measures as compared to small utilities.

Some businesses, especially large organizations, may elect to have a separate department devoted to sustainability. However, smaller companies may wish to integrate sustainability into an existing department (e.g. the Regulatory Compliance Department). Regardless of company structure, sustainability must play a central role in leadership activities.

## Planning

The water company must draft a plan or policy that outlines what sustainability measures will be implemented, and how they will be implemented, with special consideration of the company's environmental impact. There are tools that can be used to measure baseline performance, such as EPA's Portfolio Manager for water utilities, and utility bill information. These assessments can help utilities measure current and future water service and regulatory obligations. However, because not all utilities may have the resources to compile a complete report with detailed plans for each of the above ten points, it is acceptable to draft a more basic plan, in keeping with ISO 14001: 2015 directives. The ISO standard claims that companies can use the standard "in whole or in part to systematically improve environmental management." However, the ISO standard specifies that companies cannot claim to conform to the standard unless "all its requirements are incorporated into an organization's environmental management system and fulfilled without exclusion."

Private water utilities vary greatly in terms of both company size and location. Some private utilities are large international companies, operating throughout the United States and in Europe, while others are small companies that serve a single municipality. In addition, some companies are located in remote areas (e.g. on a small island) or in regions with extreme climate (e.g. Northern Alaska). Therefore, an important component to this standard is flexibility. The following tables show how any private water company, regardless of size or geographic limitations, can practice sustainability to a meaningful extent. Each table corresponds to a practice area defined in the Effective Utility Management (EUM) framework, with modifications based on our other findings.

| <b>Product Quality</b>   |  |  |   |
|--|--|--|---|
|  | <b>Company Size</b> (customer estimates are approximations)  |  |   |
|  | <b>Small</b><br><i>Less than 5,000 customers</i>   | <b>Medium</b><br><i>5,000-10,000 customers</i>   | <b>Large</b><br><i>Over 10,000 customers</i>  |
| <p><b>Drought-prone</b></p> <p><i>Score on Palmer Drought Severity Index: less than -0.5</i></p> | <p><b>Water Supply:</b> Small water companies should, in general, follow the guidelines for medium-sized, dry climate companies, but they should take care to prioritize goals carefully, and to set realistic objectives. The biggest constraint on innovation in terms of water supply will be financial and personnel resources; however, such constraints can serve as catalysts for creativity. Utility managers should take advantage of the lack of bureaucratic barriers to making changes in their company.</p> <p><b>Water Quality:</b> Consideration of water quality, like water supply, should generally follow the guidelines provided for medium-sized water companies in dry climates.</p> | <p><b>Water Supply:</b> Medium-sized companies in drought-prone regions should focus on improvements to their existing drought response policy, rather than a complete overhaul of the existing drought policy. Drought policy should include scenario planning and forecasting for potential climate change scenarios. Making adjustments should be simpler in a medium-sized company as compared to a larger company, since smaller organizations tend to have smaller bureaucracies.</p> <p><b>Water Quality:</b> Like large companies, medium-sized utility companies need to be mindful of how low flows affect water quality, but unlike larger companies, which may have financial resources to go above and beyond regulatory compliance, medium-sized companies should focus on meeting or exceeding regulations for water quality standards. Voluntary measures to enhance water quality can be added on to enhance customer satisfaction.</p> | <p><b>Water Supply:</b> Drought affects water intakes, and efficiency for water use on-site should become a priority. Large companies in drought-prone areas should consider policies that promote low-flow toilets and other options for reducing on-site water usage. Large organizations should strive to compare both leading and lagging indicators for performance (e.g. pump efficiency, non-revenue water) across utilities, focusing on benchmarking and big data. For example, large water companies with utilities in multiple locations should compare performance with respect to location.</p> <p><b>Water Quality:</b> In drought-prone regions, it is important to take extra precautions regarding low flows and how low flow might affect environmental quality. As outflows from treatment plants will more significantly affect drought-prone rivers and streams, managing treated water outflows should become a priority. Because large companies have access to more capital and financial resources, and because they are more visible to customers</p> |

|   |   |  |   |
|---|---|--|---|
|   |   |  | <p>and other stakeholders, they should expect to go beyond regulatory compliance. Extra voluntary water quality improvement should be factored into business planning and efforts to increase market share. Large companies should plan to introduce cutting-edge treatment technologies and update infrastructure if necessary.</p>  |
| <p><b>Moderate Drought Risk, Temperate Climate</b></p> <p><i>Score on Palmer Drought Severity Index: -0.5 - 2.5</i></p> | <p><b>Water Supply:</b> Small water companies should, in general, follow the guidelines for medium-sized, temperate climate companies, but they should take care to prioritize goals carefully, and to set realistic objectives. The biggest constraint to innovations in terms of water supply will be financial and personnel resources; however, such constraints can serve as catalysts for creativity. Utility managers should take advantage of the lack of bureaucratic barriers to making changes in their small company.</p> <p><b>Water Quality:</b> Consideration of water quality, like water supply, should generally follow the guidelines provided for medium-sized water companies in temperate climates.</p> | <p><b>Water Supply:</b> Medium-sized companies in temperate regions should focus on planning for increased resiliency given climate change predictions. In addition to meeting water supply needs for the communities they serve, medium-sized companies should consider alternative water supply options in the face of increased drought in the future. For example, companies can plan for constructing additional water supply plants to create redundancy and minimize risks. Taking on new pilot programs should be relatively simple in a medium-sized company as compared to a large company, as smaller organizations tend to have smaller bureaucracies.</p> <p><b>Water Quality:</b> Unlike water companies that face frequent drought, companies in more temperate areas should put more focus on enhancing the quality of water they discharge into the environment, as well as the quality of treated water piped to drinking water mains. Voluntary measures to enhance water quality</p> | <p><b>Water Supply:</b> Focus on benchmarking and big data. With limited drought stress, larger companies can strive to work on the cutting edge of data management and technological innovations. Large organizations should strive to compare both leading and lagging indicators for performance (e.g. pump efficiency, non-revenue water) across local utilities. For example, large water companies with utilities in multiple locations should compare performance with respect to location.</p> <p><b>Water Quality:</b> Because large companies have access to more capital and financial resources, and because they are more visible to customers and other stakeholders, they should expect to go above and beyond regulatory compliance. Extra voluntary water quality improvement should be factored into business planning and efforts to increase market share. Large companies should plan to introduce cutting-edge treatment technologies and</p> |

|  |  |  |   |
|--|--|--|---|
| <p><b>Low Drought Risk, Cold Climate</b></p> <p><i>Score on Palmer Drought Severity Index: more than 2.5</i></p> | <p><b>Water Supply:</b> Small water companies should, in general, follow the guidelines for medium-sized, cold weather companies, but they should take care to prioritize goals carefully, and to set realistic objectives. The biggest constraint to innovations in terms of water supply will be financial and personnel resources; however, such constraints can serve as catalysts for creativity. Utility managers should take advantage of the lack of bureaucratic barriers to making changes in their small company.</p> <p><b>Water Quality:</b> Consideration of water quality, like water supply, should generally follow the guidelines provided for medium-sized water companies in cold, wet climates.</p> | <p>can be added on to enhance customer satisfaction.</p> <p><b>Water Supply:</b> In cold, wet climates, water companies may face lower drought risk, but they must be diligent when considering how climate change may impact water supply options. Warming temperatures may allow for greater financial planning flexibility, as less money may need to be allocated to repairing infrastructure stressed by the cold. On the other hand, a scenario in which climate change intensifies periods of cold weather could lead to more investment in utility maintenance. Benchmarking with water companies in similar climate conditions may help these companies decide on the right course of action.</p> <p><b>Water Quality:</b> Improvements to treatment infrastructure should be considered alongside scenario planning for climate change risks. Although water quality improvements beyond regulatory requirements may not be a top priority, they should still be considered with respect to other product quality concerns, especially since water quality of outflows, as well as drinking water quality, tend to be highly visible to customers.</p> | <p>update infrastructure if necessary.</p> <p><b>Water Supply:</b> In colder climates, large companies can look for energy generation mechanisms that save money on infrastructure maintenance in the face of inclement weather. For example, piloting a solar power project to heat infrastructure could help fix frozen leaking pipes. In addition to climate change scenario planning, water utilities should focus on benchmarking and big data. Large organizations should strive to compare both leading and lagging indicators for performance (e.g. pump efficiency, non-revenue water) across local utilities. For example, large water companies with utilities in multiple locations should compare performance with respect to location.</p> <p><b>Water Quality:</b> Because large companies have access to more capital and financial resources, and because they are more visible to customers and other stakeholders, they should expect to go above and beyond regulatory compliance. Extra voluntary water quality improvement should be factored into business planning and efforts to increase market share. Large companies should introduce cutting-edge treatment technologies and update infrastructure if necessary.</p> |
|--|--|--|---|

## Customer Satisfaction

### Company Size

| Small   | Medium  | Large  |
|---|---|--|
| <p><i>Less than 5,000 customers</i></p> <p>Small water utilities should communicate with customers to understand their complaints and take into account of their customer satisfaction feedbacks. The company should assess the complaint rates by subcategorizing them by type and aspect (e.g., problem responsiveness, taste, flow and pressure, and etc.). They should carry out customer satisfaction surveys that give information on topics such as adequacy and reliability of sewer capacity and response procedures to unauthorized overflows. For smaller companies, the customer satisfaction surveys can be given immediately after a service provision to keep the process simpler and easier for the water utility to develop when there is no professional advice. Also, the water utilities need to provide responsive and affordable services with timely customer feedback during emergencies.</p> | <p><i>5,000-10,000 customers</i></p> <p>Medium private water utilities should communicate with customers to understand their complaints, meaning they should invest more time and money into measuring complaint rates from the customers and customer satisfaction feedbacks. The company should assess the complaint rates by subcategorizing them by type and aspect (e.g., problem responsiveness, taste, flow and pressure, and etc.). They should carryout customer satisfaction surveys that give information such as on their adequacy and reliability of sewer capacity and response procedures to unauthorized overflows. The customer satisfaction surveys can be given immediately after a service provision or be given periodically. Also, the water utilities need to provide responsive and affordable services with timely customer feedback during emergencies.</p> | <p><i>Over 10,000 customers</i></p> <p>Large private water utilities should have greater responsibility in communicating with customers to understand their complaints, meaning they should invest more time and money into measuring complaint rates from the customers. The company should assess the complaint rates by subcategorizing them by type and aspect (e.g., problem responsiveness, taste, flow and pressure, and etc.). They should carry out customer satisfaction surveys that give information such as on their adequacy and reliability of sewer capacity and response procedures to unauthorized overflows. The customer satisfaction surveys can be given immediately after a service provision, or be given periodically. The utility can assure comprehensive surveys by verifying survey information through holding conversations with customers during public meetings or individual telephone calls. Also, the water utilities need to provide responsive and affordable services with timely customer feedback during emergencies.</p> |

## Employee Leadership and Development

| Company Size  |  |   |
|---|--|---|
| Small<br><i>Less than 5,000 customers</i>   | Medium<br><i>5,000-10,000 customers</i>  | Large<br><i>Over 10,000 customers</i>   |
| <p>Employee turnover rate is used to measure a utility's stable workforce and leadership. For small organizations, budget for employee development is comparatively small but also has to be effectively distributed to achieve the goals. Personalized employee development planning is effective and enables employees to feel highly valued by the organization, which leads to low turnover for leadership.</p> | <p>For the medium-sized companies, workforce safety is always among the top priorities to achieve sustainable development. Internal and external auditing programs are implemented to secure a safe and reliable environment for the staff. The competitive compensations are often available together with professional development opportunities for employees to satisfy their career goals. Highly effective management of the workforce is implemented throughout the organization to make sure the sustainability goals are completed according to a timeline.</p> | <p>Large organizations should take advantage of competitive salaries and benefit packages to maintain employee satisfaction. As they have routine training programs and professional development plans, employees will make systematic progress and grow in the leadership abilities. Training programs could include degrees, certifications, and reimbursement for the staff. Some large utilities outsource training sessions routinely for employees.</p> |

| <b>Operational Optimization</b>  |   |  |
|--|---|--|
| <b>Company Size</b>  |   |  |
| <p><b>Small</b><br/><i>Less than 5,000 customers</i></p>   | <p><b>Medium</b><br/><i>5,000-10,000 customers</i></p>  | <p><b>Large</b><br/><i>Over 10,000 customers</i></p>   |
| <p>Operational optimization ensures persistent and reliable sustainable management improvements through effective use of data and performance monitoring. Small private water utilities need to conduct occasional performance improvement through resource use efficiency, including material per unit of output. Examples include energy use per volume delivered/processed and customer accounts per employee. Small private water utilities should carry out occasional internal audits to examine which part of their day-to-day operations can save the most resources. Small utilities should have at least one person that manages performance information on drinking water production and delivery efficiency.</p> | <p>Operational optimization ensures persistent and reliable sustainable management improvements through effective use of data and performance monitoring. Medium private water utilities need to conduct performance monitoring that measures resource use efficiency, including labor and product per unit of input. Examples include energy use per volume delivered/processed and customer accounts per employee. Medium private water utilities should carry out frequent internal audits to examine which part of their day-to-day operation can save most resources. Medium private water utilities should have a person or a team that manages performance information on drinking water production and delivery efficiency.</p> | <p>Operational optimization ensures persistent and reliable sustainable management improvements through effective use of data and performance monitoring. Large private water utilities need to conduct regular performance improvement through performance monitoring that measures resource use efficiency, including labor and material per unit of output. Examples include energy use per volume delivered/processed and customer accounts per employee. Large private water utilities should carry out frequent internal audits to examine which part of their day-to-day operation can save most resources. Large private water utilities should have a team that manages performance information on drinking water production and delivery efficiency.</p> |

## Finance and Infrastructure Strategy and Performance / Asset Management

All water companies, regardless of size, must consider GAO’s finding that asset management, including infrastructure maintenance, is “not a step-by-step, linear process.” Rather, asset management is “an integrated system” that can be tailored to “what makes sense” for a particular company (see GAO 2004). Part of this system should focus on benchmarking. Benchmarking is defined by EUM as “the comparison of similar processes or measures across or within organizations and/or sectors to identify best practices, set improvement targets, and measure progress.” Utilities should have capital improvement plans, as advocated by Bloetscher (2011), but the focus and approach that each utility takes to analyze financial and infrastructure performance may differ with respect to size. Utilities may want to focus on a specific type of benchmarking, depending on their priorities. Berg (2010) describes five major types of benchmarking for water utilities:

- Focusing on core indicators such as non-revenue water
- Performance-based, comparing departmental performance within a company or comparing performance across companies
- Creating an idealized “engineered” water company model as a baseline
- Considering the entire process of each aspect of the utility’s operation, from production of materials to disposal
- Customer survey benchmarking
- Financial sustainability benchmarking
- Water source sustainability benchmarking

Larger utilities may be equipped to focus on more than one benchmarking approach, while smaller companies may find it more efficient to focus on one approach.

## Finance and Infrastructure Strategy and Performance / Asset Management

| Company Size   |   |  |
|--|---|--|
| Small<br><i>Less than 5,000 customers</i>  | Medium<br><i>5,000-10,000 customers</i>   | Large<br><i>Over 10,000 customers</i>  |
| Relevant to small utilities in particular is a finding from the GAO report: collecting suitable data on utility assets, and creating complete data sets, is in and of itself challenging. In small utilities with limited resources, financial planning may be a significant drain on manpower and revenues, so focusing on “cleaning up” existing data should be a priority, as should planning for future, streamlined data management | With more staff to analyze performance, mid-sized utilities should consider applying conceptual frameworks such as “Comprehensive Asset Management,” a program in which utilities link four components together as part of holistic asset management: strategy for addressing infrastructure needs; collecting and organizing information on assets; analyze data to make decisions about assets; and | Results from our interviews imply that large utilities place greater importance on maintaining competitive advantage, as they may be international companies wishing to increase market share through expansion to other locations. Therefore, benchmarking with other companies is not feasible from a competitiveness standpoint. Internal communication across departments, while desirable, could become excessively |

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| <p>initiatives. The model developed by Haider et al. (2016) may be particularly useful when considering how to integrate asset management into existing planning.</p> | <p>integrate data across the organization (GAO 2004). Inter-utility benchmarking would take this latter point a step further, allowing companies in different locations to integrate their asset management data. Unlike small local-area-only utilities, which can maintain competitive advantage despite benchmarking with other private companies, medium-sized utilities may wish to avoid communications with competitors, instead focusing on communications across locations (e.g. the Arizona branch of XYZ Water will reach out to the California branch of XYZ Water).</p> | <p>complicated as company size increases. However, increased access to capital allows such companies to fund external consulting projects (cited by Berg (2010) as a feasible option), which may give outside perspective to financial management concerns. Additionally, partnerships with groups such as environmental NGOs may prove useful; there is a wide body of literature discussing the potential benefits of such partnerships (see, for example, Wassmer et al. 2012). Although most private companies may avoid contracting with outside groups, large companies should have a section of their plan that evaluates whether this option is feasible, with potential to save money overall.</p> |
|---|--|---|

| <b>Enterprise Resiliency</b>   |  |   |
|--|--|---|
| <b>Company Size</b>  |  |   |
| <b>Small</b><br><i>Less than 5,000 customers</i>   | <b>Medium</b><br><i>5,000-10,000 customers</i>   | <b>Large</b><br><i>Over 10,000 customers</i>  |
| <p>Small private water utilities should provide training to their employees in the event of an emergency so that they are well prepared. The company should also establish and keep records of environmental requirements to control the design and process for the service.</p> | <p>Medium private water utilities should provide training to their employees in the event of an emergency so that they are better prepared in handling the problem. The medium sized company should put out documents for the employees to read on how to handle emergencies. The company should also establish and keep records of environmental threats to their utility, such as long-term climate change threats and short-term extreme weather threats (e.g. combined sewer overflows). Medium water utilities should have at least one person overseeing the environmental health and safety components of company operations.</p> | <p>Large private water utilities should establish a company-wide policy governing safety and emergency preparedness for employees. The larger the company, the more important safety will become. The training might include mandatory one or two day courses, as well as documents that the employees must read. Planned response actions should be periodically tested and practiced. The company should also establish and keep records of environmental requirements to control the design and process for the service. Large companies should also have an Environmental &amp; Health Safety (EHS) team that oversees and manages risks related to environmental regulations and natural disaster-related events. Large companies could enhance their resiliency by drafting a climate change response policy.</p> |

| <b>Community Sustainability</b>                  |  |  |
|--|--|--|
| <b>Company Size</b>                              |  |  |
| <b>Small</b><br><i>Less than 5,000 customers</i> | Medium sized utilities first need to conduct internal audits to find opportunities for increased sustainability and enhanced performance. Utilities need to seek opportunities for consultation with community planning institutions or stakeholders to receive ideas on sustainability priorities. Utilities should attain information from community organizations on their sustainability priorities, including watershed plans and community vision documents. By holding scheduled meetings with the community members, small utilities can communicate their efforts on reaching and carrying out sustainability goals. When setting and applying project selection criteria for sustainability objectives, utilities should try to involve views from community stakeholders to gauge the relative importance of community interests.   | Larger utilities need to conduct scheduled internal audits and see opportunities for increased sustainability and enhanced performance within their own facility and management system. Utilities need to seek opportunities for consultation with community planning institutions or stakeholders. Utilities should attain information from community organizations on their sustainability priorities, including watershed plans and community vision documents. Large utilities should survey their customers to receive ideas on sustainability priorities and how water infrastructure can influence community's ability to achieve those priorities. When setting and applying project selection criteria for sustainability objectives, utilities should try to involve views from community stakeholders to gauge the relative importance of community interests. Large utilities should ensure that their stakeholder communications reach disadvantaged households, if applicable. |
| <b>Medium</b><br><i>5,000-10,000 customers</i>   | Medium sized utilities first need to conduct internal audits to find opportunities for increased sustainability and enhanced performance. Utilities need to seek opportunities for consultation with community planning institutions or stakeholders to receive ideas on sustainability priorities. Utilities should attain information from community organizations on their sustainability priorities, including watershed plans and community vision documents. When setting and applying project selection criteria for sustainability objectives, utilities should try to involve views from community stakeholders to gauge the relative importance of community interests.  | Larger utilities need to conduct scheduled internal audits and see opportunities for increased sustainability and enhanced performance within their own facility and management system. Utilities need to seek opportunities for consultation with community planning institutions or stakeholders. Utilities should attain information from community organizations on their sustainability priorities, including watershed plans and community vision documents. Large utilities should survey their customers to receive ideas on sustainability priorities and how water infrastructure can influence community's ability to achieve those priorities. When setting and applying project selection criteria for sustainability objectives, utilities should try to involve views from community stakeholders to gauge the relative importance of community interests. Large utilities should ensure that their stakeholder communications reach disadvantaged households, if applicable. |
| <b>Large</b><br><i>Over 10,000 customers</i>     | Larger utilities need to conduct scheduled internal audits and see opportunities for increased sustainability and enhanced performance within their own facility and management system. Utilities need to seek opportunities for consultation with community planning institutions or stakeholders. Utilities should attain information from community organizations on their sustainability priorities, including watershed plans and community vision documents. Large utilities should survey their customers to receive ideas on sustainability priorities and how water infrastructure can influence community's ability to achieve those priorities. When setting and applying project selection criteria for sustainability objectives, utilities should try to involve views from community stakeholders to gauge the relative importance of community interests. Large utilities should ensure that their stakeholder communications reach disadvantaged households, if applicable. | Larger utilities need to conduct scheduled internal audits and see opportunities for increased sustainability and enhanced performance within their own facility and management system. Utilities need to seek opportunities for consultation with community planning institutions or stakeholders. Utilities should attain information from community organizations on their sustainability priorities, including watershed plans and community vision documents. Large utilities should survey their customers to receive ideas on sustainability priorities and how water infrastructure can influence community's ability to achieve those priorities. When setting and applying project selection criteria for sustainability objectives, utilities should try to involve views from community stakeholders to gauge the relative importance of community interests. Large utilities should ensure that their stakeholder communications reach disadvantaged households, if applicable. |

| <b>Water Resource Sustainability</b>   |   |  |
|--|---|--|
| <b>Company Size</b>  |   |  |
| <b>Small</b><br><i>Less than 5,000 customers</i>   | <b>Medium</b><br><i>5,000-10,000 customers</i>  | <b>Large</b><br><i>Over 10,000 customers</i>   |
| <p>Small companies should divide the metrics used for measuring water supply adequacy into short-term and long-term indicators. Small companies with a smaller territory also have to deal with forecasting demand and severe weather related to demand changes. To maintain watershed quality, small water utilities need to build relationships with other organizations to ensure an effective strategy for watershed management.</p> | <p>Medium-sized water utilities use short-term and long-term supply adequacy and water reuse metrics to conduct strategies for sustainable supply. More efforts are made to engage in supply and demand management to cope with uncertainties in demand. Watershed protection is important to provide reliable services to customers for water companies.</p> | <p>Large utilities make plans for water resources sustainability based on geographical regions. Supply and demand management varies depending on weather conditions, local population growth and other scenarios. Assumptions of drought scenarios and mitigation are more complicated for larger companies. However, it is less difficult for large companies to conduct watershed sustainability programs because they have more resources, and they cover larger service areas.</p> |

## Stakeholder Understanding and Support

| Company Size   |   |  |
|--|---|--|
| <p><b>Small</b><br/><i>Less than 5,000 customers</i></p>   | <p><b>Medium</b><br/><i>5,000-10,000 customers</i></p>  | <p><b>Large</b><br/><i>Over 10,000 customers</i></p>   |
| <p>Stakeholder understanding and support requires water utilities to address the main concerns of stakeholders in an effective way. Small utilities should identify a group of stakeholders, reach out, and use stakeholder consultation tools to improve utility management. Metrics such as overall customer satisfaction and stakeholder perception of the utility can be applied to management planning. Small organizations can pay attention to potential partners (e.g. local NGOs) when considering communication.</p> | <p>Water utilities of medium size should consider a stakeholder consultation plan with respect to the number of active contacts, active inputs from stakeholders, and frequency of consultation. Tools like “overall value added” are applied in business to analyze internal benefits gained from stakeholder’s input, and may be useful for medium companies taking initial steps to work with external stakeholders.</p> | <p>As they have a larger group of stakeholders to target, large companies may wish to use more sophisticated technology to survey customer opinion. One company interviewed used social media as a way to engage with customers. In addition, large companies can use comparative rate rank to see how well they perform in the industry. Large companies must place greater value on media coverage and efforts to make a positive impression on stakeholders. Large companies can focus their communications on data-driven objectives and accomplishments, highlighting real data using sustainability reporting.</p> |

## **Implementation: Support and Operations**

**Competence:** In environmental management systems (EMS), the necessary competencies of employees are required to help implement programs effectively. A three-step process is needed, including competence, training and awareness. In terms of competence, it is important to determine a list of qualities and skills that employees need to acquire to support the sustainability plan. After evaluating staff competencies, companies should set up training plans. Education and training programs may be presented in different forms, ranging from university degrees to online coursework or on-site professional training.

**Awareness:** Even after employees have acquired new competencies, some may not be aware of how their behavior will result in irreversible changes. Once employees are told how deviations from the environmental policy could potentially impact the environment, they may be more likely to comply with the company's policy, making sustainability implementation easier. People in different business units should understand their respective roles relative to the entire policy.

**Communication:** Private water utilities should establish, implement, and maintain frameworks on the methods and process of communication in terms of their environmental management system. It is critical for the company to maintain a uniform method of internal communication and ensure that the environmental information generated from the management system is reliable and consistent. The company should make sure that relevant information about the environmental management system or standard is distributed among all levels and functions of the company. For external communication, the private water utility should share relevant information on sustainability goals with stakeholders, along with environmental compliance results.

**Documented Information:** When creating and updating documented information on the sustainability standard, the water company should have a document review procedure consistent with leadership frameworks within the organization. Documents should be easily accessible and protected from improper use or loss of integrity.

**Emergency Preparedness and Response:** Private water companies must be prepared in case of emergency situations. By planning actions to either prevent or mitigate potential risks or emergencies and periodically testing the planned actions, the company can be better prepared for unexpected events. First, managers should look at how the company's interaction with their surrounding natural environment could cause damage to the utility itself, or to the integrity of the ecosystem. If the environmental aspect is determined to hold a significant risk, then managers should prepare an emergency plan, which must be reviewed periodically and updated if necessary. All sectors and levels of the company should be familiar with the emergency response protocol.

### **Performance Evaluation**

Utilities should evaluate the relative merits of internal benchmarking—quantifying performance within the company itself. This benchmarking process involves selecting appropriate indicators for monitoring, as well as selecting a method for monitoring these indicators. Berg (2010) provides a good overview of benchmarking methods (discussed above). Because measuring performance is often costly, utilities must include this option in their financial accounting, analyzing how much labor and money they can devote to data collection, considering its importance for operational efficiency and sustainability improvements.

### **Improvement**

Once a company sustainability policy is drafted, utilities must enforce the policy, taking action to correct non-conformity. In keeping with ISO 14001, the methods of enforcement should be left to the company's discretion. Repeated evaluation of this policy, along with regular enforcement, will allow companies to improve their

sustainability performance over time. Even if companies do not wish to devote extra resources to sustainability improvements, they should consider how such improvements could benefit company resiliency in the face of climate change (Milly et al. 2008), as well as daily operational efficiency.

## **Section VIII: Conclusion**

We hope that this report accomplishes three main goals. First, we aim to provide an overview of existing sustainability standards and current business practices among private water companies. Second, we wish to help utility managers learn from their peers by analyzing the opinions and perspectives of current practitioners in the industry. Finally, we attempted to outline a standard "roadmap" that can serve as a starting point for managers to create their own, tailor-made sustainability strategy or company policy. We believe that we accomplished all three goals in this report, but we also recognize that this study has limitations, and further research pertaining to all three areas would be beneficial.

We found that achieving our first research objective was complicated by a lack of comprehensive secondary resources. After reviewing company reports and scholarly literature, as well as existing standard documents such as the ISO 14001 Environmental Management System, we were surprised to realize that many sources fail to address the specific needs of private water companies. We hope that the integration of interview analysis with existing publications will provide a broad overview of current knowledge in the area of sustainability for private water companies. The output pertaining to our third goal reflects the limitations of standardization in general. A standard that is very broad and conceptual is virtually useless, leaving companies with the monumental task of implementation, while a standard that is too specific is not broadly applicable, and is hardly worth calling a "standard." Given these limitations, we believe that the best approach for using this document is to treat it as a starting point for drafting a specific company policy. Perhaps one person at each water company could benefit from creating a living

document for company sustainability, a document that could be reviewed annually to integrate new findings, research, and opportunities for growth within the business. In general, our research suggests that standardizing sustainability for private water companies is effective to the degree that the standards inspire utility managers to make practical changes in their organizations—in other words, the standard should make sustainability relevant for day-to-day operations. When integrated with an efficient operation and business model, utilizing the concept of sustainability gives private water utilities the opportunity to save money, improve stakeholder relations, and benefit their communities.

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## Appendix A: Interview Questions

- Do you have a person/department who is in charge of sustainability?
- What does sustainability mean to your utility? eg. Minimize waste, energy conservation, water conservation, recycling, infrastructure efficiency, financial management, product quality, customer satisfaction and community sustainability.
  - Do you have a plan for focusing on energy efficiency?
  - Do you have a plan for focusing on water efficiency?
- Can you share any success stories where sustainability has improved your daily operations?
- Are there any standards like the ISO standard and EPA roadmap are useful for your utility? If not, are there parts of the standard your utility find difficult to implement?
- Have you found that sustainability implementation has saved money for your utilities?
- Have there been any barriers for you to implement sustainability at your utility?
- What are your objectives when you implement sustainability?
- Do you have plans to increase your focus on sustainability in the next few years?
- Our final product is expected to be an improved sustainability standard for private water utilities. Is there anything you want us to take away about how we could make sustainability more practical?

# Appendix B: Consent Forms for Interviews

## Informed Consent for in-person Interviews

Duke University, Nicholas School of the Environment

Durham, North Carolina

Our names are Vanessa Waller, Mavis Zhou, and Eunji Oh, and we are graduate students at the Nicholas School of the Environment at Duke University. Working on our master’s project with the National Association of Water Companies (NAWC), we are researching how sustainability relates to private water utilities. We are interested in the perspectives of utility managers regarding how sustainability can be made practical in the context of the day-to-day operations of a private water utility. Our goal is to create a guideline, or standard, that makes sustainability more operational and practical for private water utilities.

To ensure an accurate understanding of your thoughts, we plan to make an audio recording of the conversation. This recording will be kept only while drafting our final report, and it will not be distributed or published. Let us know if you prefer not to have a recording made of the interview.

Please indicate the things that you’re comfortable with in our final publication.

| Interview component                                       | Yes/No |
|---|--------|
| Your company name   |        |
| The city where your utility is located                    |        |
| The state where your utility is located                   |        |
| The size of the region/city where your utility is located |        |

If you do not want to respond to any questions we ask, you can ask us for the next question. If after the interview you would like to restate parts of what you have said, or if there are parts you would not want to have published in our final report, please contact us.

If you have further questions about how the interview will be used in our research, or any other questions about our research, feel free to contact us at [vanessa.l.waller@duke.edu](mailto:vanessa.l.waller@duke.edu) (Vanessa Waller), [mz91@duke.edu](mailto:mz91@duke.edu) (Mavis Zhou), and [eunji.oh@duke.edu](mailto:eunji.oh@duke.edu) (Eunji Oh).

If you have a question about your rights as a subject in this study contact, Duke’s Campus Institutional Review Board at 919-684-3030 and [campusirb@duke.edu](mailto:campusirb@duke.edu). Thank you for your participation!

**Statement of Consent:** I have read the above information and agree to the interview and audio recording.

Your Name \_\_\_\_\_

Your Signature \_\_\_\_\_

Date \_\_\_\_\_

## Oral Consent Script

Hi, our names are Vanessa Waller, Mavis Zhou, and Eunji Oh. We are graduate students currently studying at Duke University working on our Master's project in environmental management. Our project involves investigating sustainability management guideline for water utilities and we are interested in getting perspectives from utility managers on how sustainability can be practical for their day-to-day operations. Our research focuses on creating a guideline that brings sustainability to water utilities, which could bring potential benefits to the subjects in the future if they decide to follow the guideline. We wanted to ask you some questions about how sustainability relates to your work as a utility manager; this should take no more than 30 minutes. Is that okay? (Wait for a response)

We would like to audio record this conversation to make an accurate transcription of our interview. Would that be okay? (Wait for a response)

Are you comfortable if we mention the name of your company in our report? (Wait for a response) [If not, then...] We would also like to publish the name of the city/state where your utility is located. Is that acceptable to you? (Wait for a response)

[If not, then...] We could instead just mention the region/city size where your utility is? Would that be okay? (Wait for a response)

If you do not want to respond to any questions we ask, you can ask us for the next question. If after the interview you would like to restate parts of what you have said, or if there are parts you would not want to be in our final publication, please contact us. (Wait for a response)

If you have any further questions about how the interview will be used in our research or just anything general about the research, feel free to contact us. We can give you the information over the phone now, or if you prefer we could email you the information now or after the interview. Our contact is: [vanessa.l.waller@duke.edu](mailto:vanessa.l.waller@duke.edu), [mz91@duke.edu](mailto:mz91@duke.edu), and [eunji.oh@duke.edu](mailto:eunji.oh@duke.edu). If you have question about your rights as a subject in this study contact, Duke's Campus Institutional Review Board at 919-684-3030 and [campusirb@duke.edu](mailto:campusirb@duke.edu).

## Appendix C: Email Scripts for Contacting Water Utilities

Note: change details in these emails to fit the specific person or organization as necessary.

### First Email

FILLING OUT AN ONLINE FORM:

Duke University Water Utilities Sustainability Research

Hello,

I'm a student at Duke University working on my master's project with the National Association of Water Companies (NAWC). Our student group is researching how sustainability relates to private water utilities. Would it be possible to schedule a brief phone conversation with a utility manager regarding a few questions on sustainability?

Thanks very much for your help,

Vanessa Waller

Master of Environmental Management Degree Candidate, 2017

Duke University | Nicholas School of the Environment

[vanessa.l.waller@duke.edu](mailto:vanessa.l.waller@duke.edu)

phone: 630-715-4576

ACTUAL EMAIL (MAKE SURE TO ATTACH INTERVIEW QUESTIONS AND WRITTEN CONSENT FORM):

Hello,

I'm a student at Duke University working on my master's project with the National Association of Water Companies (NAWC). Our student group is researching how sustainability relates to private water utilities. Would it be possible to schedule a brief phone conversation with a utility manager regarding a few questions (attached) on sustainability?

Thanks very much for your help,

Vanessa Waller

Master of Environmental Management Degree Candidate, 2017

Duke University | Nicholas School of the Environment

[vanessa.l.waller@duke.edu](mailto:vanessa.l.waller@duke.edu)

phone: 630-715-4576

### Second Follow-up Email

Hi Dr. (Name),

Just wanted to follow up on an email I sent last week regarding my master's project research. Our student group is working with the National Association of Water Companies to research sustainability in private utilities (research info. attached), and I'm wondering if you might be available for a brief phone conversation this week to discuss how sustainability plays a role at your utility. Feel free to get in touch via email ([vanessa.l.waller@duke.edu](mailto:vanessa.l.waller@duke.edu)) or phone (630-715-4576). Look forward to talking soon, and thank you very much for your help.

Sincerely,  
Vanessa Waller

Master of Environmental Management Degree Candidate, 2017  
Duke University | Nicholas School of the Environment  
[vanessa.l.waller@duke.edu](mailto:vanessa.l.waller@duke.edu)  
phone: 630-715-4576

## Appendix D: Phone Scripts for Contacting Water Utilities

### First Phone Call

Hi Dr. (Name),

My name is Vanessa Waller, I'm a student at Duke University working on my master's project with the National Association of Water Companies, and I'm hoping to talk to you for a few minutes about how you integrate sustainability into utility management. Just whenever it's convenient, feel free to give me a call back at 630-715-4576, and I also sent an email to your inbox from [Vanessa.l.waller@duke.edu](mailto:Vanessa.l.waller@duke.edu) if you'd prefer email. Thank you so much, and I look forward to talking soon!

### Second Follow-up Phone Call

Hi Dr. (Name),

This is Vanessa Waller at Duke University, and I just wanted to follow up on a message I left you last week. I'm working on my master's project with the National Association of Water Companies, and I'm hoping to talk to you for a few minutes about how you integrate sustainability into utility management. I'm happy to talk whenever it's convenient, so feel free to call me back at 630-715-4576, and I also sent an email to your inbox from [Vanessa.l.waller@duke.edu](mailto:Vanessa.l.waller@duke.edu) if you'd prefer email. Thank you so much, and I look forward to talking soon!