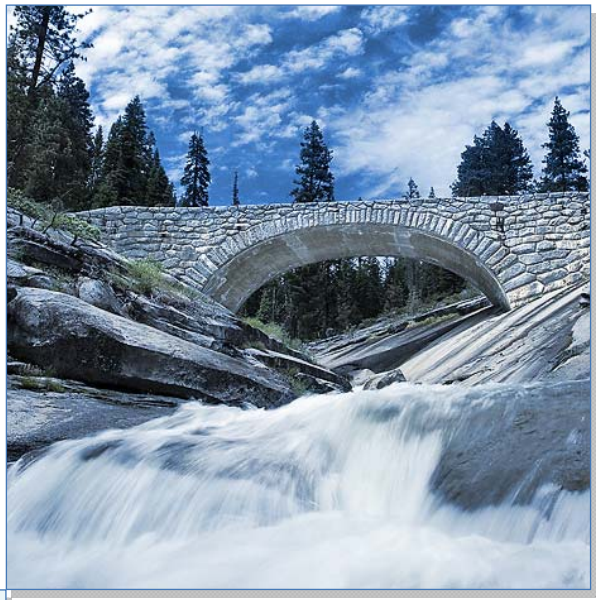

Planning for Sustainability: A Handbook for Water and Wastewater Utilities

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Introduction and Context

Sustainable water infrastructure is critical to providing the American public with clean and safe water and helping to ensure the social, environmental, and economic sustainability of the communities that water utilities serve. For the past several years, the U.S. Environmental Protection Agency (EPA), working with states and utilities, has been undertaking a number of programs to help ensure the long-term sustainability of water infrastructure. A key component of EPA's work has been to promote the adoption of practices by water and wastewater utilities that will help these utilities plan and effectively manage their infrastructure and operations to ensure sustainability and develop and maintain the necessary technical, financial, and managerial capacity to do so is an iterative process.

These efforts are embodied in programs that support Effective Utility Management based on the *Attributes of Effectively Managed Utilities*[1], such as the Safe Drinking Water Act's Capacity Development Program, and training and technical assistance on advanced asset management and energy management..

More recently, in October 2010, EPA issued a Clean Water and Drinking Water Infrastructure Sustainability Policy in accordance with directions set forth in the President's FY 2010 budget request to Congress.[2] The purpose of this Policy was to describe EPA's overall vision and priorities for ensuring the long-term sustainability of the nation's water infrastructure and the communities in which water utilities operate. This included, but was not limited to, infrastructure funded through the clean and safe drinking water State Revolving Loan Fund programs (SRFs).

During public consultation as the Policy was being developed, stakeholders emphasized that utility infrastructure investments throughout the water sector could best be impacted through the planning that takes place in the project development phase, before infrastructure solutions are selected and designed. This planning is relatively low cost and can reduce long-term infrastructure project costs. Such planning helps ensure that funded projects are financially sustainable over the long term and that they support communities by focusing infrastructure investments where they can maximize environmental and other benefits. Water utilities typically have a long planning horizon and long infrastructure operation and maintenance commitments. Returns on investment may only be realized over a period of ten to fifteen years. The costs and potential benefits of investment decisions will be realized over a long period of time. Accordingly, EPA's Sustainability Policy calls on drinking water and wastewater systems to undertake "robust and comprehensive" planning to ensure that water infrastructure investments are cost-effective over their life cycle, resource efficient, and consistent with other relevant community goals.

[1] See: http://water.epa.gov/infrastructure/sustain/upload/2009_05_26_waterinfrastructures_tools_si_watereum_primerforeffectiveutilities.pdf

[2] See: http://water.epa.gov/infrastructure/sustain/Clean-Water-and-Drinking-Water-Infrastructure-Sustainability-Policy.cfm

The policy emphasizes the important relationship between utility and community sustainability. Water infrastructure that is well-managed and sustainable is critical to ensuring the environmental, social, and economic sustainability of communities. Water and wastewater management are essential community support functions. A community's approach to economic development, transportation, housing and other relevant areas can also strongly influence the management, operations, and financial health of utility services—including the quality and quantity of available water, and drinking and wastewater capacity and treatment needs. Therefore, this Handbook highlights the important link between utility and community sustainability and describes how utilities and communities can actively consider their respective sustainability interests and priorities as part of the utility planning process.

The core mission of water sector utilities is to provide clean and safe water for the communities they serve in compliance with all applicable standards and requirements. Utilities also need to ensure a continuing source of water and a sufficient revenue stream to operate and maintain infrastructure and operations to enhance the economic, environmental, and social sustainability of these communities.

Utilities that effectively incorporate sustainability considerations into long-range planning can expect to achieve a number of benefits, including:

- **Minimizing costs** by optimizing investment choices, operating water and wastewater systems more efficiently, and pursuing cost-effective investment and management strategies, such as collaboration and partnering with neighboring systems to leverage resources and improve efficiency.
- **Maximizing results of long-range investments** to ensure a continuing source of water, treatment, and discharge capacity, as well as financing capability.
- **Improving the ability to analyze a range of alternatives**, including (as appropriate) both traditional and non-traditional infrastructure alternatives, such as green infrastructure and/or decentralized systems, **and selecting the option or mix of options that best meet the needs of the utility and the community it serves**.
- **Engendering greater support for the utility** by recognizing community values and working with the community to identify and address utility sustainability priorities that are consistent with other community priorities and needs identified by board members, local elected officials, the public, and key community stakeholders.

Reducing Costs through Greater Water Utility Energy Efficiency

Water utility planning that leads to adoption of energy efficient operational practices and technology can save utilities money. Nationally, water and wastewater energy costs are often 30-40% of a municipality's total energy bill. They are also often the largest controllable cost for these utilities.

The Hidden Valley Lake Community Service District in California, for example, found that it could save $70,000 per year in energy costs by pumping during off-peak times when rates were lower.

- **Ensuring that financial and revenue strategies** are adequate to finance, operate, maintain, and replace essential infrastructure throughout its operational life while appropriately considering the needs of disadvantaged households.

This Handbook focuses on helping utilities to effectively incorporate sustainability considerations into their existing planning processes. It will assist them in selecting projects that ensure protection of public health and water quality, support other relevant community goals, reflect full life cycle costs, are based on a robust analysis of various alternatives (including conservation or "green" approaches), and are implemented through an ongoing self-supporting financial strategy. EPA is not, however, presupposing which specific types of infrastructure projects will be selected as a result of such planning. EPA assumes that if utilities are fully undertaking the actions described in this Handbook they will make decisions that are the most appropriate for the utility and the community and optimize economic, environmental, and social sustainability.

Some utilities and communities may have long been incorporating sustainability considerations into their planning processes and are looking for ways to improve and refine their current efforts. Others may choose to focus on how such considerations can help to cost-effectively meet existing regulatory requirements. Regardless of where a utility may fall on this spectrum, the steps described in this Handbook can help to optimize infrastructure and operational investments.

Some utilities may want to start with small steps toward incorporating sustainability into their planning and operations and then pursue larger commitments to sustainability over time. In many cases, it may be helpful to gain experience by beginning to incorporate sustainability considerations into planning gradually rather than trying to do so all at once. To get started, utility managers should create time to discuss and seek input on their sustainability planning with their boards, commissions, and other leadership bodies. Resources about how to work with boards and commissions are included in the Appendix.

Utilities will want to continually improve their planning process over time. Recognizing that effectively incorporating sustainability considerations into planning is a long-term process, utilities may also want to consider codifying a policy that states that their long-range planning processes will build in sustainability considerations as outlined in this Handbook. This can provide some long-term planning continuity and drive continual improvement even as utility leadership and oversight changes over time.

Purpose and Intended Use of the Handbook

This Handbook is intended to provide information about how to *enhance* current planning processes by building sustainability considerations into planning. It is designed to be useful for various types of long-range planning (e.g., developing utility master plans, long-range strategic plans, and capital improvement plans). The scope and time period of the plan being developed will determine the scale of projects considered during the planning process. For example, comprehensive, long-range planning will typically focus on large-scale infrastructure, watershed, and/or aquifer management decisions while

more routine, smaller scale planning may focus on smaller investments in new or existing infrastructure or operational changes.

This Handbook reflects a system-wide approach to planning, which involves utilities looking "beyond the fence line" to include in their planning process new institutions and the implementation of projects that may fall outside the utility's direct span of control. It is important for utilities to take a system-wide approach because many water infrastructure decisions are intertwined with decisions about other types of infrastructure such as housing and transportation and therefore require utilities to collaborate and/or pursue coordinated strategies with other community institutions to maximize these investments. This is also an opportunity to discuss collaborative partnerships with neighboring utilities to share information, services, and/or plan on a regional basis. A system-wide approach can drive a strategic shift for utilities from a project-by-project focus to one of utilities as systems. A system-wide approach can also drive greater consideration of a utility's role within the community or watershed and open up many more opportunities to achieve water quantity and quality objectives.

This Handbook is intended to be used by utilities of various sizes and levels of capability—irrespective of their use of SRF or other federal water infrastructure funding. EPA recognizes that some elements of the Handbook may pose challenges for utilities delivering water and wastewater services at a smaller scale, those that may have limited resources or capacity, or those that have not adopted a formal planning process. Throughout the Handbook, in addition to describing the steps utilities can undertake to enhance their planning, we have attempted to describe how these steps can be implemented on a smaller scale. The Handbook also includes a number of relevant case examples, including examples from utilities implementing activities at a smaller scale, as well as references to other resources that may be useful to supplement this Handbook.

Finally, EPA recognizes that some period of testing and refinement of this Handbook will be necessary to refine and improve the document over time.

Approach

Utilities' long-range planning processes typically involve a series of consistent and predictable activities that encompass identifying goals, setting objectives, assessing alternatives, and developing a financial strategy. In many cases, this process is complemented by ongoing asset management programs and stakeholder involvement and communication. Based on this typical planning process, this Handbook identifies four "core" elements where specific practices can help utilities effectively build sustainability considerations into their planning processes. These elements (along with any related measurable results) can be revisited on an ongoing basis to ensure continuing implementation and improvement. Implementation of these elements will help utilities set sustainability goals and associated measurable objectives, consider a range of infrastructure project alternatives (including various, watershed, conservation or "green" alternatives), and implement a financial strategy to ensure that the infrastructure alternatives selected are adequately financed, maintained, and replaced over time.

These core elements are:

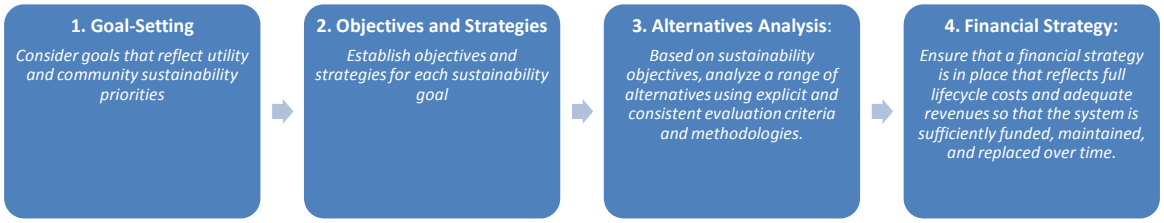
1. **Goal-Setting**: Establish sustainability goals that reflect utility and community priorities.
2. **Objectives and Strategies**: Establish explicit, measurable objectives for each sustainability goal and identify strategies for meeting objectives.
3. **Alternatives Analysis**: Based on sustainability goals and objectives, analyze a range of infrastructure alternatives based on full life-cycle costs, using explicit and consistent evaluation criteria.
4. **Financial Strategy:** Implement a financial strategy including adequate revenues so that new infrastructure and operational investments—as well as the overall system—are sufficiently funded, operated, maintained, and replaced over time, with appropriate considerations for disadvantaged households.

These elements build on each other as utilities go through the planning process. However, utilities may believe they are already adequately implementing one or more of the elements, but need to focus greater attention on other elements as a means of enhancing their planning.

For each element, this Handbook describes specific steps to enhance utilities' planning processes to aid effective and balanced consideration of sustainability in the selection of infrastructure projects. The steps described for each element, along with brief case studies and call-out boxes, also describe a set of suggested practices that are derived from the experience of utilities that have incorporated sustainability considerations into their planning. Finally, each element also includes a set of diagnostic questions that utilities can use to gauge how thoroughly they have implemented each element.

The graphic below summarizes each of the four core elements and illustrates how two sustainability goals—increasing energy efficiency and supporting infrastructure in existing communities—could be addressed in the process.

Core Planning Elements for Sustainability



Energy Use Example…

Sustainability Goal:	Objective and Strategies:	Alternatives Analysis:	Financial Strategy:
Utility seeks to reduce its energy use consistent with the community's Energy Efficiency Program	Utility sets objective of reducing energy use by 25% in 5 years; it conducts an energy audit to determine its baseline energy use and identifies potential projects to meet its objective	Utility evaluates all projects, in part, on their relative lifecycle energy efficiency costs (e.g., installation of high efficiency heat pumps)	Utility revenue and borrowing strategy ensures sustainable financing of new projects, taking advantage of lower energy costs

"Existing Communities" Example…

Sustainability Goal:	Objective and Strategies:	Alternatives Analysis	Financial Strategy:
Utility aligns itself with community goal to accommodate most expected growth by revitalizing urban areas rather than through new development	Utility sets objective to serve 75% of expected growth within its existing service boundary; it analyzes its current capacity to accommodate new growth within its existing service area and identifies strategies for increasing capacity	Utility evaluates all projects, in part, on the extent to which they increase the ability to serve growth within the service boundary (e.g., projects providing service near planned public transit services)	Utility revenue and borrowing strategy ensures sustainable financing of new projects, taking advantage of avoided costs of service boundary expansion (for example by ensuring that costs associated with growth outside of the existing service boundaries are paid by new users.

Providing a Solid Foundation for Planning through Asset Management and Community Engagement

Throughout the planning process, two aspects of utility management and operations—asset management and ongoing engagement with communities and customers—strengthen and reinforce several of the core elements.

Asset Management

An ongoing asset management program that includes detailed information on what assets a utility has, how long they will last, and how much it will cost to replace them is an essential element of an effectively managed utility and is fundamental to infrastructure stability for a sustainable management approach. An infrastructure inventory; condition assessment; a risk-based schedule for maintenance, repair, rehabilitation, and replacement of infrastructure; and a financial plan are specific parts of a system's asset management strategy. Asset management provides information on existing assets, costs, and alternatives for new infrastructure that support the planning process described in this Handbook in many ways, including:

- Providing infrastructure capacity and condition information;
- Generating options for the repair, rehabilitation, and replacement of existing assets; and
- Providing information on full lifecycle costs of existing assets.

Beyond implementing asset management, utilities are also encouraged to perform an assessment of their operations using the *Effective Utility Management Primer* developed by EPA and six national water sector associations.[3] The Primer helps utilities assess their operations based on a series of *Attributes of Effectively Managed Utilities* and identify specific actions they can take to improve their performance (see call-out).

Effective Utility Management

Effective planning is essential for an effectively managed utility. In 2007, EPA and six national water associations entered into an historic agreement to promote effective utility management based on a series of *Attributes of Effectively Managed Utilities* and *Keys to Management Success*. The Attributes describe a range of outcomes utilities should strive to achieve across all facets of their operations—from infrastructure and finances to building stakeholder understanding and support. *The Keys to Management Success* describes a series of frequently used management approaches that can help utilities achieve the outcomes called for in the Attributes.

The planning steps described in this handbook can help utilities manage their infrastructure and operations and achieve the outcomes embodied in the Attributes. In addition, two of the Keys to Management Success—Strategic Business Planning and using a Plan-Do-Check-Act management systems approach—are particularly relevant to implementing this handbook. In addition to the Attributes and Keys, the EUM partnering organizations have developed a Primer to help utilities assess their operations and identify actions to improve their performance. Utilities are encouraged to learn more about the Effective Utility Management Initiative and use the Primer to do an assessment of their operations by going to http://www.watereum.org/.

Guidance and other resources on asset management and effective utility management are included as an appendix to this Handbook.

[3] The Primer and other information about Effective Utility Management can be found at: http://water.epa.gov/infrastructure/sustain/upload/2009_05_26_waterinfrastructures_tools_si_watereum_primerforeffectiveutilities.pdf

Community Engagement

An ongoing process of engagement with the community—both in-person involvement as well as ongoing outreach and communications with communities—is important for establishing and maintaining community understanding of the value of services provided by the utility and the resources needed to provide those services. Ideally, utilities undertake long-term planning in the context of an ongoing constructive relationship and active engagement with their communities and customers. In the specific planning context, community input about goals and values related to sustainability can inform utility decisions about service levels, reliability standards, revenues, and other operational issues that affect the communities that utilities serve.

Communication and transparency throughout the planning process can help "bring the community along" by increasing public understanding of the value of water infrastructure and the services provided by the utility, leading to greater support for of utility decisions. Building customer and community appreciation of infrastructure investment value is likely to require proactive, on-going stakeholder education and involvement. For example, changes to utility rates and fees typically require the approval of some governing body (e.g., utility board, municipal or county council) and can be difficult in the absence of reasonable customer support. Support for infrastructure investments that require rate and fee increases have often been quite challenging for many utilities. In response, utilities should establish a clear case of the need for and value delivered by utility investments that require rate and fee increases. Utilities with a reputation among customers for effective management and transparency are likely to find it easier to garner support for needed increases in rates and fees.

Building Customer Appreciation of the Value of Water Infrastructure in Rural New Mexico

A small water and wastewater utility (approximately 50 connections) serving a small community located near Gallup, New Mexico undertook an asset management process to inventory and evaluate its current infrastructure and to identify future infrastructure needs. The process resulted in a plan for replacing infrastructure that would reach the end of its useful life within the next 10 years and a financial plan that would require that the utility raise rates to cover the costs of these infrastructure replacements. Through transparency with the public using information from the asset management process, the utility was able to make the case for future infrastructure investment and increase rates $6/month with no opposition from the community.

Ongoing community engagement can support the planning process by:

- Providing necessary input early in the process;
- Providing understanding of community goals and values (e.g., for green space or economic redevelopment) to guide the utilities' strategic direction in its planning process and the identification and weighting of criteria used in alternatives assessment;
- Generating specific ideas about strategies to meet goals, which may be also considered as part of the alternatives analysis; and

- Building a base of community understanding for selecting service levels, establishing reliability standards, and meeting revenue needs through rate changes or other mechanisms.

Recording and tracking issues raised by community members should be carefully undertaken and can help utilities be transparent and responsive. Several guides, tools, and case studies with other strategies for engaging with the community are included in the Appendix to this Handbook.

What Comes Next

The remaining chapters of this Handbook focus on each of the core planning elements. For each core element, the chapter includes:

- A description of the element and how it enhances existing planning approaches;
- Key steps for implementing the element;
- Approaches for utilities implementing at a smaller scale;
- A set of diagnostic questions for utilities to do a "self-assessment" of their implementation of the element; and
- One or more illustrative examples

Planning Element 1: Goal Setting—*Establish Sustainability Goals that Reflect Utility and Community Priorities*

Element Description

To provide a foundation for incorporating sustainability considerations throughout the planning process, utilities should consider and set sustainability goals as an initial planning step. These goals should reflect utilities' internal assessment of sustainability priorities for their infrastructure and operations as well as community sustainability priorities identified through information gathering and consultation with local institutions and stakeholders.

Sustainability goals will be strongly influenced by the mission and strategic direction of the utility, regulatory and legal requirements, an assessment of vulnerability related to sustaining operations and financing, considerations related to the effective operation of the utility, and customer expectations about services and rates. These goals should also support other community sustainability priorities related to economic development, quality of life, and other factors whenever possible. Ideally, upfront consultation occurs in the context of utilities' ongoing constructive engagement with customers and the community about the utilities' services, key decisions, and revenue needs. However, information gathering about community sustainability priorities can take many forms, from review of plans or other documents to consultation with community representatives (e.g., planning agencies, elected officials, stakeholder groups, etc.).

Potential Sustainability Goals

The following list describes a range of sustainability goals along with examples of approaches utilities can take to meet them: The examples are illustrative only. More information on how to use the goals to make appropriate infrastructure and operational decisions is contained in the remainder of the Handbook.

- Improve compliance
  - *For example, establish collaborative partnerships with neighboring utilities to increase or maintain technical, managerial, or financial capacity and/or to share information and expertise.*
- Reduce energy cost.
  - *For example, invest in more energy efficient equipment, explore operational changes that can enhance energy efficiency (such as pumping at night when the rate is lower), or replace non-renewable with renewable energy sources.*
- Extend the projected adequacy of current water supplies (or reduce vulnerability to water supply disruption).
  - *For example, implement consumer water conservation programs, implement water metering, fix distribution system leaks, and/or make use of reclaimed water.*
- Address wet weather impacts
  - *For example, implement a mix of non-traditional infrastructure alternatives such as green infrastructure solutions with integrated stormwater and combined sewer overflow control.*
- Preserve critical ecological areas in the community.
  - *For example, adopt management programs for septic systems to reduce nutrient loadings to lakes*
- Improve the economic vitality of the existing community.
  - *For example, target water infrastructure projects to support existing community infrastructure.*
- Enhance community livability.
  - *For example, incorporate green space or recreational opportunities into projects.*
- Reduce long-term system operational costs
  - *For example, use natural treatment systems, such as functioning wetlands, to reduce the input of energy and chemicals for treatment.*
- Improve operational resilience
  - *For example, understand operational and financial vulnerabilities and incorporate them into alternatives analysis as part of a broader risk management strategy.*

Sustainability goals are critical for guiding utilities as they move through the other elements described in this handbook in order to set measurable objectives and strategies, analyze alternatives, and develop a financial strategy to support chosen investments.

Lenexa, Kansas: Aligning Community and Utility Priorities

Lenexa, Kansas is a Kansas City suburb of 45,000 people. Its"Rain to Recreation" program illustrates how a utility and community can align sustainability priorities to address stormwater management for a growing population.

To respond to rapid population growth, Lenexa undertook a citizen-led community planning process that resulted in a community strategic visioning report, "Vision 2020" (released in 1997). The community's vision statement was:

> "Showing commitment to a superior quality of life and respect for the natural environment, Lenexa will provide an atmosphere where people desire to live, work, and play. Our unique villages and parklands, residential, commercial and industrial developments will reflect a community in which the heritage of the past and the pride of the present are preserved for citizens of the future."

A component of the Vision 2020 process addressed water, and the community showed a strong interest in stormwater management to reduce flooding, improve water quality, enhance recreation, and preserve open space. This interest became the foundation of the community's "Rain to Recreation" program—an integrated watershed protection program.

Rain to Recreation evolved to include both regulatory and non-regulatory components, including:

- Regulatory requirements for stormwater management practices at new and redeveloped properties that favor infiltration, reuse, and evapotranspiration, such as rain gardens, bioswales, and other forms of green infrastructure in private development projects;
- Major capital projects, such as new stormwater facilities and infrastructure repair funded by a 1/8 cent sales tax levy; and
- Land acquisition to provide flood mitigation, stream protection, water quality improvements, and recreational amenities.

Funding for the components of the Rain to Recreation program comes from a sales tax levy, stormwater charges based on runoff surface area on land parcels, one-time capital improvement fees for new developments, state and federal grants for water and transportation infrastructure, and permitting fees charged to developers. Overall, the program has allowed the utility and community to protect natural resource areas in the watershed, create greenways along streams, and require green infrastructure practices on site.

Additional reading:

- City of Lenexa's Rain to Recreation Web site at www.raintorecreation.org
- Map of Lenexa's green infrastructure: http://maps.lenexa.com/greeninfrastructure/greeninfrastructuretour.html
- EPA, Green Infrastructure Case Studies: http://cfpub.epa.gov/npdes/greeninfrastructure/gicasestudies_specific.cfm?case_id=75
- City of Lenexa, "Rain to Recreation: Making the Case for a Stormwater Capital Recovery Fee": http://www.environmental-expert.com/Files%5C5306%5Carticles%5C11741%5C299.pdf
- City of Lenexa, Vision 2020: http://lenexa.com/main/pdfs/Vision2020.pdf

Current Planning Process

In their existing planning processes, utilities often set goals based on community planning information that defines the amount, type, and location of future demand for the utilities' services. Relevant information often includes population growth projections, the location and nature of planned

development, and zoning changes. However, this information typically flows one-way from community development plans, master plans, and growth management plans to the water utility. Water sector utilities are then in a position to describe how they will be able to help address other community priorities in the future, but they typically have a limited role in helping the community to understand the expected impacts of planned growth. Communities need to understand how growth in different areas would impact the need for infrastructure and its associated costs. Utilities have critical information for informed decision making and should be at the table for discussions about the community's future. For example, projections of lifecycle infrastructure costs of accommodating planned growth can allow a community to make better informed decisions.

Building Sustainability Considerations into Goal Setting

For purposes of this Handbook, setting sustainability goals at the outset of the planning process should involve information gathering and, where feasible, consultation with community members or other planning institutions about community sustainability priorities. This upfront activity can take several forms depending on the capabilities and needs of the utility and its relationship to the community. The graphic below illustrates a continuum of different types of up-front information gathering and/or consultation between a utility and the community.

Continuum of Utility-Community Information Gathering and Consultation

The left hand side of the continuum represents the utility gathering information from existing community planning documents and/or key individuals (such as the town manager or town clerk) about sustainability priorities related to areas such as transportation, recreation, and housing. Although this approach may be appropriate for some utilities and communities (particularly in cases where utility capacity or resources are constrained), most utilities will find that there is significant value added from more active consultation with their community, as described below.

The center of the continuum represents more active engagement between the utility and the community to discuss community sustainability priorities. This engagement can be through meetings with planning officials, involvement in ongoing community forums about desired growth and development, or convening stakeholders representing community organizations to better understand their priorities.

The right hand side of the continuum represents active partnership between the utility and the community to jointly formulate sustainability priorities that both the utility and the community can actively pursue. Partnerships, either formal or informal, allow the utility and community not just to understand others' priorities but also to influence each others' activities. For example, the water utility that serves Hidden Valley Lake, California worked over time to have a much larger role in land use permitting (under the direction of the local planning department) to adequately protect the quality of drinking water sources by influencing the nature and location of development (see call out box later in this section).

Any of the approaches along this continuum can be used depending on the utility's capacity and resources, as well as local conditions. Regardless of the approach taken, the following steps can help utilities effectively engage in upfront consultation at the beginning of the planning process and set sustainability goals.

Step 1. Identify sustainability priorities and potential opportunities for the utility.

The first step for utilities is to undertake an internal process to consider its own sustainability priorities and to do an internal assessment of what aspects of its infrastructure and operations may provide opportunities for increased sustainability and improved performance. For example, utilities may want to do an internal assessment of their operations using the Effective Utility Management Primer described in the Introduction to this Handbook. Similarly, many aspects of a utility's asset management plan can provide useful information for identifying sustainability priorities. A vulnerability assessment can also pinpoint opportunities for improved system resilience and identify vulnerabilities in technical, managerial and financial capacity that can be addressed to help utilities achieve their sustainability goals.

For many utilities, sustainability priorities may focus on strategies for meeting regulatory requirements or approaches for sustaining existing infrastructure and operations as opposed to new projects. Although this is an internal process, it can often be informed by ongoing relationships with customers and the community and the expectations that this broader stakeholder community has about the role and operation of the utility. It can also be informed by the range of incentives utilities have to become more sustainable, including cost savings, financial benefits, and alignment with the utilities' traditional mission or sustainability policies.

This step should also incorporate the identification of vulnerabilities in technical, managerial and financial capacity that would preclude the utility from achieving its sustainability goals and set a priority for addressing them.

Increasing Resilience and Saving Money through Energy Efficiency in New Mexico

Entranosa Water & Wastewater Association serves slightly more than 3100 residential connections in a suburban and rural area east of Albuquerque, NM. Its decision to pursue infrastructure investments to save money, become more energy efficient, and make its electrical supply more resilient illustrates how a utility can set and act on sustainability priorities.

Entranosa's ground water supply is fed from seven deep wells (ranging from 605 to 1080 feet of depth). The water is delivered to two booster/disinfection stations, from which the water is lifted to an array of tank storage at varying elevations. It uses a LOT of electrical energy to fulfill its mission. The electrical supply for production and delivery is provided by a rural electric cooperative, and it is subject to outage from snow storms, occasional hurricane-force winds, and cattle knocking down power poles. In order to address these challenges, Entranosa took some common sense, relatively low-cost steps to reduce its operational costs and meet the needs of its customers:

- The Association changed a highly productive well from electric to natural gas, which helped cut operational cost (depending on the cost of gas) as well as providing an emergency source of power to provide baseline flows to feed the needs of its membership.
- It equipped two of its deep, production wells with a variable speed drive which helped clean up the quality of the power to protect its motors (and reduce repair costs), and to provide lower flows over sustained longer periods of time during the winter—which cut the demand charge.
- Finally, it installed VFDs in two new booster stations to serve the needs of a developing area—enabling it to provide lower cost reduced flows as the subdivisions in the area grew, as well as provide higher flows to meet emergency (fire) resupply for the storage tanks.

Taken together, these changes helped reduce the Association's operational costs by approximately $7,000.

Step 2. Identify community sustainability priorities.

As a second step, utilities should gather information that helps them understand the sustainability priorities of the broader community. Utilities can identify planning documents or ongoing planning efforts that provide relevant information on community sustainability priorities. This will likely require the utility to look at some documents that it would not typically use as resources in its usual planning process, such as transportation plans, climate action plans, watershed plans, or community "visioning" documents.

In addition to identifying the plans themselves, utilities should familiarize themselves with the community-wide priorities these plans are seeking to address, the institutions (and key contact personnel) responsible for planning, and the ways in which utilities can get involved in ongoing planning processes (e.g., as part of steering committees, through direct agency-to-agency dialogue, etc.).

Step 3. Engage the community about its sustainability priorities.

In many cases, utilities will find that there is value in pursuing active engagement or partnerships with the community. These utilities will need to identify forums or other opportunities for consultation with community planning institutions and/or stakeholders. (Some utilities with limited resources or capacity may not be able actively engage the community but can still gather available information as described in Step 2. In some cases, this can also be accomplished by holding discussions with key individuals in the community, such as the town manager or clerk.

The purpose of active engagement with the community is to identify community sustainability priorities, describe how water infrastructure decisions affect the ability of the community to achieve its priorities, and discuss ways in which the utility and community can align their efforts on sustainability. Part of these discussions should address what communities are willing and able to afford in the event that new infrastructure is needed or other costs are accrued that will result in increased rates or fees. This will help set realistic expectations about levels of service and costs to the community as well as inform the process for evaluating alternatives described in Element 3.

It is very important for utilities to consult with stakeholders who will play a key role in supporting the goals set by the utility as well as specific infrastructure decisions. For example, utilities considering goals related to watershed protection will likely want to engage local land use agencies, private land owners or developers, and/or local watershed groups. Among other things, these types of

Approaches for Involving Stakeholders in Planning

There are a variety of approaches for involving stakeholders in planning that can be used individually or in combination in various stages of a utility's planning process. Some options include:

- Using existing boards or other governing bodies to provide stakeholder perspectives and/or as a means for collecting information about community priorities and communicating about utility activities
- Establishing and maintaining an informal network of community opinion leaders that can be periodically consulted on community priorities and/or utility sustainability objectives
- Ongoing communications through websites, press releases, and other channels to keep the broad community informed about the utility planning process and decisions
- Public meetings to inform the community about the utility's planning process at key milestones and solicit feedback on key decisions
- Focus groups, surveys, or related strategies for soliciting information about community goals, priorities, values, and ideas
- A stakeholder steering committee to advise utilities on key planning decisions throughout the process, such as setting long-range goals and establishing project selection criteria and/or weighting schemes.

The selection of an approach to stakeholder involvement should be informed by an assessment of how much stakeholder input and support is needed for utilities to make decisions that support both utility and community priorities. Utilities should consider:

- What are the potential rate implications, including implications for disadvantaged households?
- What is the potential for community disruption?
- What is the overall cost and duration of the effort?
- Do we need consensus?

Answers to these questions will help utilities determine what stakeholders should be involved, how often, over what period of time, and what type of outcome is needed. This information will drive the time and other resources needed for stakeholder engagement.

stakeholders may see vulnerabilities to the utility's management that internal personnel have not identified.

Other important stakeholders include economic development, transportation, or other agencies that help set the long-term growth and development strategy for a particular area. When the discussion between these types of agencies takes place, the forum and nature of the discussion can vary widely depending on institutional context. For example, when a utility is housed in a city public works or other department, consultation with a sister department about planning may be facilitated through the leadership of the mayor, city manager, or city council and governed by city-wide policies. In contrast, a utility run as an independent enterprise seeking to consult with municipal or county planners may need to establish new institutional relationships, such as a formal or informal steering committee made up of the senior management from the relevant agencies.

At the federal level, the Departments of Housing and Urban Development (HUD) and Transportation (DOT), along with EPA, have joined together through the HUD-DOT-EPA Partnership on Sustainable Communities to help improve access to affordable housing, more transportation options, and lower transportation costs while protecting the environment in communities nationwide. Through a set of guiding livability principles and a partnership agreement this partnership will coordinate federal housing, transportation, and other infrastructure investments to protect the environment, promote equitable development, and help address the challenges of climate change. One goal of the federal partnership is to have this kind of cross-sector coordination occur at all levels of government. More information about this Partnership is available at http://www.epa.gov/smartgrowth/partnership/.

Hidden Valley Lake, California: Encouraging the Community to Engage with Water Utilities about Planning

For utilities to pursue some sustainability goals—such as source water protection—they will need to actively work with other community institutions that are involved in guiding local land use and economic development. The experience of the water utility in Hidden Valley Lake, California illustrates how utilities and communities need to work together on sustainability goals—in this case by bringing community planners around to listening to what utilities have to say about sustainable growth and development.

Hidden Valley Lake is a rural community of around 4,000 people in northern California. The Hidden Valley Lake Community Service District (CSD) provides drinking water to around 1,500 lots from three high quality domestic water supply wells. In the early 1990s, CSD sought a greater role in commenting on development permits issued by the county planning department. CSD was interested in avoiding development that might harm groundwater resources and potentially lead to costly treatment needs.

The county planning department was initially reluctant to alter its existing permitting process to include a greater role for CSD. By working with the local County Board of Supervisors and other means, CSD eventually obtained a role in commenting on permits on a project-by-project basis. CSD recognized, however, that commenting on individual projects was insufficient to protect the area's water resources over the long term. With continued support from the County Board of Supervisors, CSD moved from commenting on individual permits to playing a deeper and deeper role in county planning—both on a working level and as a "critical stakeholder" in the county's Master Plan development. Today, CSD maintains a productive working relationship with county planners and has a strong voice in how the community grows.

The types of opportunities for consultation are as varied as the communities in which they take place. Some examples include the following:

- ***Participating in direct discussions with other planning institutions and community bodies early in their planning processes***. Utilities can go directly to other local planning institutions to discuss sustainability priorities. In some cases, the consultation may need to be supported and encouraged, by community institutions such as city managers or county councils. Utilities may need to build relationships with planning agencies and encourage support for collaboration over time. In Hidden Valley Lake, California, for example, the independent local utility's efforts to provide better service and maintain water quality by influencing development permits (which were the responsibility of the county planning department) were limited until the utility received support from the local County Board of Supervisors. With the support of the Council, the utility moved over time from commenting on individual project permits to becoming more involved in the development of the overall Community Master Plan.

- ***Getting involved with existing community-wide planning efforts***. Where communities are already involved in community-wide planning or "visioning" about the future of the community, utilities can play an active and important role in helping to define community goals and the actions to support them. For example, the city of Portsmouth, New Hampshire undertook a master planning process (culminating in a plan in 2004) that involved many citizens and community institutions in discussions to define a future vision for the city. The role of water infrastructure was an integral part of the plan, which called out as a key priority "water and sewer policies and infrastructure [that] make use of best practices in environmental protection and provide incentives for conservation." The development of the communities' Master Plan was influenced by utilities' existing water and wastewater plans. The Master Plan then drove subsequent infrastructure decisions by the local utilities, including construction of a LEED-certified water treatment plant (see case study at the end of this section for more information on the Portsmouth, New Hampshire case).

- ***Aligning utility planning with existing community plans***. If community plans already exist, utilities can incorporate the goals identified in those plans into their own planning efforts. This may not involve active utility participation in community planning itself, but rather a strategic decision by the utility to incorporate community goals into their own planning efforts—essentially "by reference." For example, the City of Portland, Oregon Water Bureau aligned itself with Portland's Climate Action Plan by setting specific objectives in the Water Bureau's Strategic Plan to reduce carbon emissions. It then identified (and monitored) specific carbon reduction actions through the Water Bureau's Sustainability Action Plan. (See more about the Portland case at the end of the next section.)

- ***Convening a stakeholder process for water planning.*** Absent on-going processes, utilities may need to take the initiative to convene and consult directly with members of the community. For example, as the first step in its effort to develop a 40-year water plan, Quay County, New Mexico convened a stakeholder steering committee representing the rural county's 10,000 residents to outline a vision and goals for the plan and to guide its development. Similarly, the Envision Utah program, itself a community-wide conversation about the future of the state,

provided guidance that outlined a "Community Design Workshop" process that provided communities with a blueprint for developing a water conservation plan involving "teams of citizens representing a cross-section of local interests."[4]

As part of the consultation process, utilities may want to consult with neighboring utilities. This can help inform how peer institutions are addressing sustainability. This is also an opportunity to explore potential opportunities for collaboration and partnering relationships.

Step 4. Identify and document sustainability goals.

Regardless of the approach a utility chooses for implementing up-front consultation, the utility should document and make available a description of the process it undertook and identify the sustainability goals that emerged, in part, from the consultation. These goals will be used by the utility as a guide through the remaining elements of the planning process, including as it makes decisions about infrastructure investments and other potential changes to utility operations. By having a transparent decision-making process, utilities are more likely to have the support of the community.

As utilities develop goals, they may also want to be in regular communication with the stakeholders that were consulted and with the relevant regulatory agencies to ensure that everyone understands the process, to maximize support, and to lay the foundation for subsequent decisions about specific strategies and investment alternatives.

Implementing These Steps at a Smaller Scale

Utilities implementing on a smaller scale may not have the staff or funding resources to actively consult with other community institutions and/or stakeholders. These utilities should consider employing less resource-intensive approaches to identifying community sustainability priorities. These approaches include gathering information through documents, such as community comprehensive plans, or by holding discussions with key individuals in the community who have access to this information, such as the town manager or clerk.

Depending on resources and capacity, some utilities may only be able to pursue Steps 1 and 2. These utilities may also find that Steps 1 and 2 are sufficient to understand community priorities.

In most cases, utilities in smaller communities will find it beneficial to pursue active engagement with the community, with community planning institutions and/or with stakeholders to the extent possible. Even smaller communities will occasionally need to make decisions for which the support of the community is critical, and community-wide planning has multiple benefits. For example, utility managers in the City of Live Oak, Florida worked with the local water management district to develop plans for wastewater reuse before any funding was available to do so. When state legislation

[4] See: (http://www.envisionutah.org/eu_qgs_waterconserv.html) (call out pp. 119)

established a funding source for reuse, Live Oak was well-positioned to receive the money, which funded a significant amount of its reuse infrastructure.[5]

Key Diagnostic Questions

Utility managers can use the following questions as diagnostic tools to help gauge their implementation of this element.

- What was the internal process your utility undertook to identify its sustainability opportunities? What opportunities did the utility identify?
- What community plans or information sources did your utility consult to identify community sustainability priorities?
- As appropriate, how did your utility consult with other community members or community planning organizations about utility and community sustainability priorities and the relationship between them?
- As appropriate, how did your utility consult with neighboring utilities about potential partnership opportunities to share information or services?
- As a result of its own internal discussions and upfront information gathering and consultation with the community, what sustainability goals did your utility set and why?
- How were your utility's sustainability goals documented and incorporated into long-range planning?

Example of Sustainability Planning in Practice: Portsmouth, New Hampshire Incorporates Water and Wastewater Decisions into Community-wide Master Planning

Portsmouth, New Hampshire, a community of approximately 20,000 people, provides an example of how utility planning informed the development of the community Master Plan and the utilities helped implement parts of the Master Plan through ongoing water system operations.

Portsmouth produced a community-wide Master Plan in 2005. [6] The Master Plan established goals, objectives, and strategies for the city over a ten year period. It covered land use, housing, economic development, transportation, natural resources, and a range of other issues—including "community facilities and services," which included the city's water and wastewater utilities.

[5] Bob Farley, 7/1/10

[6] City of Portsmouth. 2005. *Portsmouth Master Plan*: http://www.cityofportsmouth.com/masterplan/MasterPlanFinalComplete-Aug2005.pdf

The city's residents and public officials contributed to the development of the plan—mainly through the "Portsmouth Listens" process that convened citizens through numerous "study circles" (i.e., small group citizen discussion groups)—as well as several meetings with City boards, regional institutions, neighborhoods, and private interest groups. This process contributed to the development of a vision for Portsmouth that reflected its citizens' aspirations for the city's future and informed the identification of priority areas for community action. The resulting vision read, in part:

> *Portsmouth should be a livable, walkable city that preserves it history, lives in balance with its natural resources, protects its waterfront and views, provides a good climate for entrepreneurial opportunity, acts on its belief in socio-economic diversity through affordable housing and connects neighborhoods through multiple and innovative modes of transportation.*

Key priorities in the plan included maintaining a vital downtown area as the heart of the community (including increased public transit, mixed-use buildings, and higher density housing options), enhancing certain transportation corridors, and housing affordability. Sustainable development—including environmental, economic, and social sustainability—was also called out as a key priority. As a component of sustainable development, the plan said that "water and sewer policies and infrastructure should make use of best practices in environmental protection and provide incentives for conservation." To help implement the plan, the city established a Committee on Sustainable Practices to advise the City Manager and City Council on improving the sustainability of city operations.

In Portsmouth, city operations include water and wastewater services, which are provided by the Water Division and Sewer Division, respectively, of city government. The city sources its drinking water in the Bellamy Reservoir (located in nearby Madbury and Dover, New Hampshire) which is piped to a water treatment plant in Madbury and then distributed to Portsmouth and several other towns in the area.

The Portsmouth Master Plan incorporated strategies already identified in water and wastewater plans (i.e., the *Water System Master Plan*, the Sewerage Improvement Program, and the *Combined Sewer Overflow Long Term Control Plan*). It also outlined new strategies for water conservation, energy efficiency, "green infrastructure" and others to be implemented by the water and wastewater systems. Table 1 provides examples of goals, objectives, and strategies related to water and wastewater from the Master Plan.

An example of how the Master Plan was influenced by—and in turn influenced—water utility operations is the Madbury Water Treatment Plant. Under the goal to "provide drinking water that meets federal and state regulatory requirements and serves the needs of Portsmouth's residents and businesses," the Master Plan said that one of the related strategies was implementation of the Water System Master Plan—including upgrading and/or replacing the Madbury Treatment Facility. The aging Madbury facility, built in 1958, needed to be upgraded to meet future regulatory requirements and rectify past turbidity violations. In 2009, the city put out a bid to build a new plant (the plant was financed, in part, by the State Revolving Loan Fund). Driven by the sustainability goals in the City's Master Plan, the new facility was to be designed according to sustainability principles, including promoting energy efficiency,

minimizing waste, being durable over its lifecycle, reducing the City's carbon footprint, and reusing existing structures wherever possible. The design followed LEED (Leadership in Energy and Environmental Design) principles and used 30 percent less energy than conventional designs (including technologies such as solar hot water collectors, heat pumps, and "daylight harvesting"), saving costs and reducing the facility's carbon footprint. The plant is scheduled for completion in 2011.

Table 1: Examples of Water and Wastewater Related Goals, Objectives, and Strategies from the Portsmouth, NH Master Plan

Selected Master Plan Goals	Selected Objectives Related to Water and Wastewater	Selected Strategies Related to Water and Wastewater
Promote new development and redevelopment that supports the Master Plan vision.	• Promote new development and redevelopment that... minimize demands for new infrastructure and services	• Revise site review regulations to allow for a fuller consideration of off-site and neighborhood impacts (e.g., stormwater). • Consider fiscal impacts when reviewing proposals for zoning changes or zoning map updates.
Provide drinking water that meets federal and state regulatory requirements and serves the needs of Portsmouth's residents and businesses.	• Protect and improve the quality and supply of the City's groundwater and surface water resources. • Maintain and upgrade water distribution and treatment systems to meet current and future domestic, commercial, and fire protection standards.	• Protect reservoir watershed areas and wellhead zones. • Promote water conservation and increase public awareness of best practices in watershed management. • Implement recommendations made in…the *Water System Master Plan* (e.g., improve the distribution system efficiency, upgrade and/or replace the Madbury Treatment Facility)
Protect the Region's water resources through effective collection and treatment of wastewater and stormwater.	• Operate and maintain the City's wastewater treatment facilities and expand and upgrade as needed to comply with regulatory requirements and to accommodate growth. • Minimize impacts to the City's waterways from combined sewer overflow. • Participate in regional approaches to wastewater treatment and disposal.	• Continue to implement…the Sewerage Improvement Program. • Review site review regulations with respect to stormwater management and upgrade to current best practices. • Implement the *Combined Sewer Overflow Long Term Control Plan*. • Consider implementing a stormwater enterprise fund to provide for and fund the construction, operation, improvement, and maintenance of stormwater facilities.
Develop an approach to natural resource protection and planning that is based on watershed boundaries, wildlife habitat areas, and open space corridors.	• Direct new growth to areas that are already developed and where adequate infrastructure for growth is in place.	• Consider adopting the "green infrastructure" concept as a component of open space planning and site plan review.
Incorporate sound environmental practices into all municipal policies and projects.	• Develop and adapt an environmental policy to guide City projects and operations in order to achieve City-wide goals of improving and sustaining environmental quality.	• Identify goals for reducing water consumption..., improving energy efficiency, [and] implementing natural landscaping techniques.
Maintain and improve the quality of wetland and waterfront areas.	• Protect significant wetlands. • Reduce non-point source pollution.	• Require the design of stormwater management systems to maximize habitat value. • Minimize runoff by clustering development on the least porous soil and using infiltration devices and permeable pavements. • Limit impervious surfaces and add green spaces.

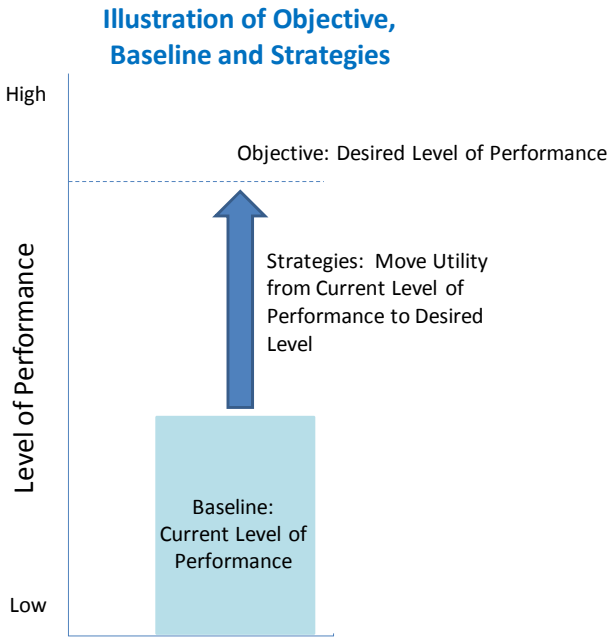
Planning Element 2: Objectives and Strategies—*Establish Objectives and Strategies for Each Sustainability Goal*

Element Description

Utilities should develop one or more explicit and measurable objectives for each of the sustainability goals selected in Element 1. These sustainability objectives translate sustainability goals into the specific achievements the utility will work toward. Utilities should also assess their current performance (or "baseline") relative to each sustainability objective and identify general strategies to meet their objectives.

For example, if a utility has a sustainability goal to effectively manage runoff in wet weather events using green infrastructure, it might set an objective, baseline, and strategies as follows:

- Objective: *Reduce projected wet weather combined sewer collection (CSO) system capacity needs by 10 percent through green infrastructure.*
- Baseline: *Current CSO capacity needs given historical and anticipated precipitation event flows*
- Potential Strategies: *Green infrastructure alternatives and deployment options that will meet the 10% objective.*



Specific project and program alternatives based on the strategies identified at this stage of planning will be specifically evaluated later in the planning process through alternatives analysis (Element 3).

In implementing these objectives and strategies, the results should be measured and further evaluated to determine whether further advances and improvements can be made to support sustainability goals.

Current Planning Process

Some utilities establish planning objectives or, similarly, establish "levels of service" through asset management programs.[7] However, many utility long-range planning documents never explicitly identify

[7] Levels of service describe desired performance on issues that are a high priority to customers or are required by regulators. They represent a commitment on the part of the utility to offer service that meets an expected quality

objectives. Whether objectives are explicitly stated or not, utility plans typically focus on conventional drinking water or wastewater objectives, such as providing adequate and reliable services, providing high quality water, protecting water resources, and operating cost-effectively. When evaluating baselines, utilities typically analyze current and projected service demand, the adequacy of current supply capacity, the ability to meet current and anticipated regulatory requirements, and the baseline condition of existing infrastructure. Strategies typically focus on infrastructure repair, rehabilitation, or replacement.

Building Sustainability Considerations into Objective Setting

For the purpose of this Handbook, developing specific measurable objectives, analyzing baselines, and identifying strategies may involve enhancements to the existing process, including:

- Incorporating a broader range of objectives, which are aligned with sustainability goals, into the planning process;
- Analyzing baselines for the sustainability objectives, which may require utilities to undertake new (and possibly unfamiliar) types of monitoring and analysis, such as conducting an energy or water audit;
- Identifying different types of (and also possibly unfamiliar) strategies for meeting objectives, such as assessing green infrastructure options or opportunities to partner with other utilities.
- Using the sustainability objectives and related strategies as the basis for making subsequent project decisions through alternatives analysis (Element 3) and developing a supporting financial strategy (Element 4).

The following steps will help utilities establish effective sustainability objectives, measure baselines, and identify strategies.

Step 1. Identify sustainability objectives.

Utilities should identify an objective or objectives for each sustainability goal. These objectives describe the specific accomplishments a utility seeks to achieve or the activities it commits to undertake in order to achieve its sustainability goals.

Any vulnerabilities in technical, managerial and financial capacity of the utility that would preclude achieving sustainability goals should be targeted for specific objectives and strategies to overcome them. Measuring the success in overcoming vulnerabilities is critical to achieving a sustainable course of action.

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standard. Utilities that establish service levels typically also seek to collect and report performance data that assess the utility's success in meeting the established levels.

In some cases, utilities may want to express sustainability objectives in terms of specific quantitative targets to be achieved. For example, a utility may want to reduce energy consumption by 10 percent or increase water efficiency by 25 percent. In other cases, a utility may want to develop procedural objectives, such as developing policies that favor targeting infrastructure investments in existing communities over new development. Utilities may also simply want to establish a procedural objective that says the utility will consider, on a level playing field, a broader range of options—including those that are more sustainable. For example, a utility may want to set an objective that it will evaluate non-traditional project alternatives (e.g., decentralized wastewater solutions, green infrastructure for stormwater, etc.) along with conventional "grey" infrastructure or that it will evaluate partnership opportunities in any analysis of system expansion options. Element 3 describes steps utilities can take to evaluate a range of alternatives

Step 2. Ensure that objectives are SMART.

The most effective objectives are SMART objectives, where SMART stands for:

- Specific – Utilities specify exactly what they want to achieve.
- Measurable – Utilities are able to measure whether they are meeting the objectives or not.
- Attainable – Utilities can realistically achieve the objective in the time period specified.
- Realistic – Utilities can achieve the objective with the capacity, funding, and other resources available.
- Time-based – Utilities set a timeframe for achieving the objective.

The City of Walla Walla, Washington Sets Water Conservation Objectives

Washington State requires that all utilities develop and implement a cost-effective water conservation program in order to have Water System Plans approved and when applying for new water rights. The State's planning handbook outlines a conservation program planning approach that includes setting objectives as an early step in program development.

Following the state guidance, the city of Walla Walla—a community of 58,000 people in arid Eastern Washington—set the following objectives for its conservation program:

- Reduce unaccounted-for-water;
- Increase customer awareness of water-use habits;
- Reduce peak water consumption;
- Protect natural resources; and
- Comply with State guidelines.

These objectives are all aimed at achieving a measurable conservation program goal set by the City "to reduce losses before customer meters of an average of 0.2 percent per year until 2010, with a goal of reaching a 10 percent [unaccounted for water] level by 2024."

Walla Walla identified several strategies for achieving the objectives, including source meters, service meters, leak detection, and conservation pricing.

Further Reading:

- Washington State Department of Health. "Water System Planning Handbook," April 1997, Chapter 4. (On file)
- City of Walla Walla. "Comprehensive Water System Plan Update—Final Report." October 2006. See: http://www.ci.walla-walla.wa.us/vertical/Sites/{5C31B82F-5E63-4200-9CF4-237E5245E279}/uploads/{06C6AB02-467C-4C10-BDAB-9E4944C6698A}.PDF

Examples of actual SMART objectives include:

- "Reduce the bureau's overall electrical use by 5 percent (excluding variation due to weather and groundwater operation) by July 2012, compared to a 2005-08 baseline." (City of Portland, Oregon Water Bureau)

- "Reduce losses before customer meters of an average of 0.2 percent per year until 2010, with a goal of reaching a 10 percent [unaccounted for water] level by 2024." (City of Walla Walla, Washington)

While these objectives clearly establish a target, other types of objectives can be similarly "SMART." For example, a hypothetical utility could establish an objective to evaluate green infrastructure alternatives for any proposed infrastructure investment of over $10 million and revisit the investment threshold in five years.

Utilities should strive to set objectives that are "achievable" and "realistic." However, they may be operating in an environment where they don't have much information on their baseline and what they can realistically achieve. In this case, utilities may want to set provisional objectives that can be refined later. As part of a continual improvement process, these objectives may be refined and adapted over time as more information is gathered and project alternatives are evaluated and selected. For example, a utility may want to identify its current energy consumption and the relative costs and benefits of energy efficiency alternatives before setting a specific target (i.e., utilities with a lot of "low hanging fruit" may want to set an ambitious objective, while a utility that has already implemented most if its low-cost efficiency options may want to set a more conservative target).

Step 3. Analyze baseline performance.

Utilities should conduct and document a baseline analysis for each of their sustainability objectives.

For some objectives, the analysis of baselines will be data-driven and quantitative. For example, a utility with an

Envision Utah: A Guide to Baseline Analysis in Water Conservation Planning

Envision Utah is a stakeholder-based statewide effort to establish a vision "to keep Utah beautiful, prosperous, and neighborly for future generations." Envision Utah's toolkit on water conservation includes a step-by-step guide for conducting baseline analysis. Key steps are:

1. *Describe the water storage and delivery system*, including the size of the physical system, the number of people and connections, services, land use, demographics, and any unique characteristics that affect supply or demand.
2. *Inventory the water supply system*, including sources of water supply, the status of water rights, and any limits on system capacity.
3. *Estimate present water demand* (e.g., with information from current billing records).
4. *Estimate future water demand* based on population growth projections and other relevant information.
5. *List and rank water problems*, including high per capita use, significant losses, constraints on system capacity, and/or insufficient water rights.
6. *List and analyze potential solutions*, including water conservation through infrastructure investments (e.g., repairing leaks, replacing old lines and tanks, etc.) and/or demand reduction.

The first five steps establish a baseline for the current system. Step 6 describes the identification of potential strategies.

Further Reading:

- Envision Utah. "Urban Planning Tools for Quality Growth," Chapter 5 (pp. 115-118)

objective to reduce energy use by 10 percent over five years will want to conduct an energy audit to identify its current baseline energy use. The utilities' analysis can use tools that are publicly available, such as the EPA Energy Star/Portfolio Manager for water utilities, and information the utility may already be collecting, such as utility bills (see Appendix for links to a variety of energy audit and analysis tools).

Examples of other information sources that may be useful for analyzing baselines include the following:

- Asset inventories and condition assessments related to green infrastructure to establish a baseline analysis of the degree of deployment, effectiveness, and cost
- Population and land use projections to forecast future demand inside and outside of service areas to identify needs and opportunities to focus future infrastructure investments on existing communities
- Water service supply and demand data to establish a baseline for water efficiency and use (e.g., for an analysis of water conservation opportunities)

Where objectives are procedural, the analysis of baselines can be qualitative. For example, a utility may set the following sustainability objective: "For all proposed infrastructure investments to accommodate new growth, consider alternatives that can accommodate the same amount of growth through investment in existing communities." In this case, the utility would describe its current (i.e., baseline) capacity to analyze and implement alternatives that focus growth in existing communities.

To help with the analysis of baselines, utilities can take advantage of a number of available tools and resources for both quantitative and qualitative analysis, which are included in the appendix.

Examples of Potential Types of Baseline Analysis

Although the specific kinds of baseline analyses utilities will undertake will be driven by their specific objectives, some examples are listed below:

- Through asset management, evaluation of the baseline condition of existing infrastructure and needs for repair, rehabilitation, and replacement to maintain target service levels, reliability, etc.
- Assessment of current revenue adequacy and needs to cover full costs of asset repair rehabilitation, or replacement
- Assessment of service demand that could be addressed through green infrastructure and opportunities for deployment (i.e., what kind, where located, capacity, etc.)
- Energy audit and analysis of conservation/efficiency opportunities
- Water audit and analysis of conservation/efficiency opportunities, including consumer-based strategies (e.g., water conservation programs)
- Assessment of service demand or other needed technical, financial, and managerial capacity that could be met through joint infrastructure development or other types of collaboration with adjoining utilities
- Assessment of opportunity to more cost-effectively use existing collection capacity through in-fill development within the existing service area
- Assessment of community land use options and the impact on water utility infrastructure operation and maintenance costs

Step 4. Identify key strategies.

Baseline analysis can help utilities identify general strategies for achieving sustainability objectives and conducting an in-depth analysis of alternatives described later in this Handbook. In addition to considering strategies that would involve new infrastructure, utilities can consider, where appropriate, collaboration and partnering relationships as a way to meet objectives. In many cases, a basic "brainstorming" approach may be useful to undertake.

As utilities begin this step, they should keep in mind basic tips about brainstorming, such as:

- Don't judge, challenge, evaluate, or criticize suggested strategies
- Emphasize the quantity of ideas, not quality
- Put analysis and organization in the background

Many resources are available to suggest strategies and best practices related to sustainability. Some examples of relevant best practices guides include:

- State of Wisconsin "Water and Wastewater Energy Best Practice Guidebook"
- Water Infrastructure Finance Authority of Arizona, "Sustainable Infrastructure: A Best Practices Guide for Arizona Wastewater Utilities" (chapter on "sustainable design strategies")
- Water Environment Research Foundation (WERF): "Performance and Whole-Life Costs of Best Management Practices and Sustainable Urban Drainage Systems"
- EPA, "Gaining Operational and Managerial Efficiencies Through Water System Partnerships"
- EPA, "Setting Small Drinking Water System Rates for a Sustainable Future"
- Vermont Agency of Natural Resources, "Growth Center and Growth Management Guidance Document."

The City of Panora, Iowa, Improves Water Quality and Saves Money by Partnering with a Neighboring Utility

The City of Panora, Iowa, serves a population of 1,175 people through 700 residential connections. To address nitrate levels that were exceeding water quality standards, Panora chose a strategy of partnering with a neighboring utility. Through this partnership, Panora purchased low-nitrate source water from the neighboring Panorama Lake Association and blended it with Panora's source water to meet the water quality standards. This partnership strategy was more cost-effective than installing expensive new nitrate treatment infrastructure at Panora's wastewater treatment plant.

Further Reading:

- EPA, System Partnership Solutions to Improve Public Health Protection :http://www.epa.gov/ogwdw/smallsystems/pdfs/publichealthstudyv1.pdf

Links to these and other resources are included in the appendix.

Step 5. Document objectives, baselines, and strategies.

Once a utility has set objectives, it should codify them as part of its planning process, along with information about baselines. Utilities should document how their achievements will be measured and tracked over time. Some utilities choose to document objectives through an Environmental Management System (see call out box about Camden County, N.J. later in this section). EPA has developed a variety of tools to help water and wastewater utilities adopt environmental management systems. These tools are referenced in the appendix to the Handbook.

Utilities should also document general strategies (and related tools and resources) that suggest project alternatives to be considered in alternatives analysis (Element 3). For example, a utility evaluating the feasibility of non-traditional project alternatives or partnerships as strategies for meeting future drinking water needs would identify and assess a range of strategies that include source water protection, reduction of non-point sources of pollution, and potential service interconnections with adjacent utilities. The most promising strategies can be further analyzed as specific alternatives in the alternatives analysis step of the planning process.

Camden County, NJ Municipal Utilities Authority: Documenting Objectives in an Environmental Management System

The Camden County Municipal Utility Authority (CCMUA)—serving a population of around 500,000 people—has codified the specific objectives that the utility strives to achieve related to water quality, odor control, and cost minimization in its Environmental Management System (EMS) manual. All of the decisions that the utility makes have to be consistent with these objectives, which are expressed in the manual as:

"The CCMUA will do its utmost to:

1. Optimize the quality of its effluent
2. Minimize adverse impact from odors emanating from the wastewater treatment and sludge disposal processes.
3. Minimize cost impacts to ratepayers."

The EMS Manual goes on to describe the ways in which the utility will achieve its objectives, such as:

- Operating the plant in a manner which will minimize the potential for odors from the wastewater treatment and sludge thickening, dewatering and drying processes.
- Implementing and maintaining a comprehensive record keeping and reporting system that tracks water quality, odor minimization and cost minimization efforts.
- Providing regular training opportunities to personnel associated with the wastewater treatment and biosolids management program.

Further Reading:

- Camden County Municipal Utilities Authority EMS Manual: http://www.ccmua.org/ccmuaems.pdf

Implementing these Steps at a Smaller Scale

All utilities should set realistic sustainability objectives. However, when implementing this Handbook at a smaller scale, utilities may want to set qualitative rather than quantitative objectives. For example, a utility may choose to set an objective to "reduce unaccounted-for water." After some implementation experience the utility may choose to turn this into a quantitative objective, such as, "reduce unmetered losses by 25% over 5 years."

Utilities setting qualitative objectives can also do a qualitative analysis of baselines. In some cases, just gathering information on baseline conditions can be enough for utilities implementing on a smaller scale to understand what types of strategies to pursue to achieve sustainability objectives (see call-out box on Arenas Valley, NM). All utilities, can take advantage of the range of tools described above and listed in the appendix to this Handbook that have been developed to estimate baselines and identify strategies.

Arenas Valley, New Mexico Establishes an Asset Baseline through an Inventory and Condition Assessment

The small community of Arenas Valley, New Mexico, the Arenas Valley Water District Association—which maintains around 430 connections—used an asset inventory and condition assessment to better understand the condition of its baseline infrastructure. This analysis revealed that small investments in repair of existing pipes made much more sense than large-scale pipe replacement—a solution that saved the community money and allowed it to invest in other types of system upgrades.

Concerned about leaks from its distribution system, the AVWDA Board sought to replace significant portions of the water distribution system, which were old and degraded. With assistance from the New Mexico Environmental Finance Center, AVWDA undertook an asset inventory and condition assessment to understand the utility's baseline infrastructure condition and needs for upgrades. As part of this work, AVWDA also established a level of service agreement, which described the kind of service it sought to provide. It included service levels related to operating costs, responsiveness, reliability, regulatory requirements, water quantity, and customer satisfaction. This information provided AVWDA with the ability to assess how to fill the gap between its current baseline and the service levels it sought to provide.

In doing the asset inventory and condition assessment, AVWDA came to realize that replacing PVC pipe was not the most cost-effective strategy for reducing leaks and upgrading its service. The analysis revealed that the existing PVC pipe should remain in good condition for another 25 years and that replacing it would not help prevent breaks related to junctions with service lines or damage from construction contractors, which accounted for a large number of breaks and service disruptions. An analysis of full lifecycle costs identified pipe repair (rather than replacement) as a more cost-effective strategy.

Key Diagnostic Questions

Utility managers can use the following questions to help them confirm whether they have established effective objectives related to sustainability, assessed baselines, and identified strategies:

- How was each of your utility's long-range sustainability goals reflected in specific, measurable objectives?
- In what ways were your utility's sustainability objectives articulated consistent with the *SMART* principles?
- For each sustainability objective, what kind of baseline analysis did you conduct to assess your utilities' current status?
- What types of tools and/or resources did you use for the baseline analysis?
- Are there monitoring programs already in place to generate the necessary data?

- For each sustainability objective, what traditional and non-traditional strategies did your utility identify?
- How and where were the sustainability objectives described and codified in a planning document?
- What is your plan for measuring and tracking the accomplishment of sustainability objectives over time?

Example of Sustainability Planning in Practice: The Portland, Oregon Water Bureau Turns Goals from the Portland Climate Action Plan into Specific Objectives

The Portland, Oregon Water Bureau provides drinking water to nearly 900,000 residents in Northwestern Oregon. Its role in implementing the Portland Climate Action Plan illustrates how a utility can set SMART objectives to achieve its sustainability goals and help achieve an important community priority.

The City of Portland issued a City-wide Climate Action Plan in October 2009, which outlined several actions to be accomplished by 2012.[8] Since that time, the Portland Water Bureau has become a partner in the City's effort to reduce greenhouse gas emissions by incorporating the community's goals into its own strategic and sustainability planning.

The Portland Water Bureau's 2008-2011 Strategic Plan reflects both a general commitment to support community goals and specific objectives and tactics related to the City's Climate Action Plan.[9] As an indication of the Bureau's high level commitment to support community goals, it included as part of its mission "to provide the citizens and the City Council with a water system that supports their community objectives and overall vision for the City of Portland." Accordingly, as reducing greenhouse gas emissions became an explicit community priority for Portland, it was also explicitly incorporated into the Water Bureau's strategic plan as a commitment (described in the plan as a "tactic") to:

> *"Develop and implement a carbon emissions mitigation strategy. Continue to make improvements in energy-efficient operation and design [and] increase both use and generation of renewable energy."*

The commitment was further elaborated in two related utility service levels described in the plan:

- "Bureau's carbon emissions are reduced from 2007 levels."
- "Percentage of energy generated from renewable sources increases from 2007 levels."

[8] See: http://www.portlandonline.com/bps/index.cfm?a=268612&c=49989

[9] See Portland Water Bureau Strategic Plan: 2008-2011

The Water Bureau spelled out its specific action plan for reducing carbon emissions and increasing renewable energy use in the 2009 update to the utility's "Sustainability Action Plan." The Action Plan contained the utilities' goals and actions to reduce energy use, transportation-related emissions, paper use, water use, and toxics use and enhance neighborhood livability.

The 2009 update to the Sustainability Plan included specific actions to reduce Portland's carbon footprint in its sections on energy use and transportation. The plan identified specific, measurable goals, which are very similar to the concept of "SMART objectives" described for this element.[10] For example, under the heading of energy, the Water Bureau listed:

- Reduce bureau's overall electrical use by 5 percent (excluding variation due to weather and groundwater operation) by July 2012, compared to a 2005-08 baseline.
- Reduce electrical use by 5 percent at top 10 facilities (highest electrical use) by July 2012, as compared to a 2005-2008 baseline.
- Install renewable energy facilities with minimum capacity of 400 KW by July 2010.
- Take energy efficiency and renewables generation opportunities into account when planning for facilities to comply with Long Term 2 Enhanced Surface Water Treatment Rule (LT2) requirements.

These objectives were specific enough that annual updates to the plan could provide status reports on the bureau's progress in meeting the goals and identify specific actions related to each. Greenhouse gas emissions are tracked through the Bureau's annual carbon footprint report.[11]

[10] See: http://www.portlandonline.com/water/index.cfm?c=49430&a=279197.

[11] See: http://www.portlandonline.com/water/index.cfm?a=246396&c=31525

Planning Element 3: Alternatives Analysis—*Analyze a Range of Alternatives Based on Consistent Criteria*

Element Description

Effectively integrating sustainability goals and objectives into an analysis of infrastructure alternatives is a critical component of planning. It allows utilities and local officials to make infrastructure decisions consistent with sustainability goals and objectives that are best suited for the utility and the community.

For this step in the planning process to be effective, utilities need to establish explicit and consistent project selection criteria for each sustainability objective. Identifying and applying sustainability criteria is the critical juncture at which utilities choose the specific economic, environmental, and social benefits they will weigh in selecting among alternatives. A replicable, consistent, and transparent approach to alternatives analysis will ensure that each alternative is considered on a "level playing field." When done well, this approach will enable utilities to choose a mix of projects that meets customers' service expectations, optimizes the sustainability of utility infrastructure and operations, and supports other community sustainability priorities whenever feasible. The selected alternatives will thus represent "best value" projects for the utility and for the community as a whole.

Following and documenting a consistent set of steps for alternatives analysis can help utilities explain the "logic" of decisions to utility boards, local elected officials, and others. These steps also provide utilities with information that may be useful for guiding the work of consultants to analyze and document a variety of traditional and non-traditional alternatives.

Current Planning Process

Utilities commonly undertake some type of alternatives analysis as part of long-range planning and then describe selected or recommended alternatives in their planning documents. Alternatives often involve the repair, rehabilitation, or replacement of aging infrastructure or investment in new infrastructure to meet regulatory requirements or demand growth. Utilities often approach alternatives analysis by identifying options that fulfill a specific need—such as meeting a new regulatory or demand requirement, addressing a known deficiency, or meeting a specified reliability or design standard—and then selecting the most cost effective option that addresses the need.

Blacksburg, Virginia Selects a Decentralized Solution with Input from the Community

The Public Works Department owns and manages wastewater infrastructure in and around Blacksburg, serving approximately 95,000 people. Blacksburg's approach to deciding how to serve a growing community shows how a utility can engage public stakeholders to evaluate project alternatives and come up with a decentralized solution that saves money while meeting service needs and protecting the environment.

To decide how to provide wastewater services to a growing community, the town of Blacksburg established a workgroup to evaluate wastewater treatment system alternatives, including building a decentralized system or extending its existing centralized sewer system. The workgroup and town considered factors such as cost, construction-related traffic disruptions, floodplain and creek impacts due to centralized sewer main construction, collection system infiltration/inflow and leakage, treatment effectiveness, and other factors.

After careful review, Blacksburg chose to conduct a pilot project in the community of Tom's Creek to test the feasibility of a decentralized, clustered system. Approximately 200 residents implemented a hybrid collection system including a Septic Tank Effluent Pump (STEP) pressure system combined with a Septic Tank Effluent Gravity (STEG) system. Each house had an individual septic tank for which residents had maintenance responsibilities, including avoiding practices such as dumping large quantities of fats, oils, grease, chemicals, or solid waste down drains or toilets. Users of the decentralized system paid the same residential water and wastewater rates as customers served by centralized sewers in the area.

The Public Works Department owns and manages the clustered system (as it does other wastewater infrastructure in the area). Department personnel inspect each tank every two years (and pump tanks as necessary).

The selection of the decentralized, clustered system saved the community more than $1 million in construction costs. Operations and maintenance costs are similar to those of conventional centralized systems. One of the town's concerns was centralized sewer collection system leakage. During heavy rains, the decentralized, clustered system showed no infiltration/inflow or leakage and maintained a stable level of treatment.

Building Sustainability Considerations into Alternatives Analysis

Incorporating sustainability considerations into alternatives analysis may involve the following adjustments to current planning processes:

- Using a broader set of assessment criteria that explicitly link to the utility's specific sustainability goals, objectives and other community priorities, where applicable;
- Using a consistent and documented methodology for evaluating and comparing projects using the criteria, including specific consideration of natural or "green" systems; and
- Potentially using other relevant community input to inform the assessment methodology (e.g., by weighting criteria according to community priorities).

The following steps will help utilities incorporate sustainability considerations into alternatives analysis.

Step 1. Identify alternatives.

Utilities should list and describe a broad range of project alternatives that, individually or in combination, allow the utility to achieve each of its stated objectives. Many of these project alternatives will come from the general strategies identified in Element 2 of the planning process. For example, a facility with an objective to actively consider non-traditional project alternatives may have identified source water protection as a viable strategy for protecting groundwater to meet future demand and identified key source water locations and protection strategies. In the alternatives analysis, the utility would evaluate specific source water protection options that specifically identify candidate source water areas, protection strategies, time frames, and other specific characteristics.

Evaluating Green Infrastructure Alternatives

As part of alternatives analysis, utilities should assess what types of non-traditional or "green" infrastructure alternatives may help them achieve their objectives. Lack of familiarity or experience with these alternatives, however, can be a challenge. In particular, utilities may be uncertain about what kinds of results green infrastructure alternatives can produce and what ongoing operations and maintenance costs may be.

One strategy utilities use is to phase in green infrastructure on a smaller scale and then consider further deployment based on what they learn about effectiveness and cost. In alternatives analysis, utilities may want to examine a range of deployment options from a pilot scale to "maximum technically achievable" to identify the right level of deployment given their needs and the level of knowledge or uncertainty about green infrastructure.

Step 2. Develop sustainability criteria.

The criteria used to assess and select projects in the alternatives analysis should reflect the utilities' sustainability objectives identified in Element 2. Utilities will also likely include criteria in the assessment process related to other utility objectives (e.g., reliability, risk management, etc.). Setting and applying project selection criteria is the critical juncture at which utilities select the economic, environmental, and social benefits they will weigh in selecting among alternatives and choosing the mix of projects that optimizes the sustainability of utility operations.

The views of community stakeholders are also important considerations when evaluating alternatives. Where feasible, utilities should consider using community input to identify project selection criteria and/or their relative importance. For example, Louisville and Jefferson County Metropolitan Sewer District in Kentucky convened community stakeholders to identify a series of community values that could be used to analyze and select among options for reducing wet weather flows. The community values, which included "public health enhancement" and "economic vitality" among others, were used to calculate benefit scores for each project alternative that could be combined with cost information for a benefit-cost comparison across alternatives (see the Louisville case study at the end of this section). When considering how to engage the community when evaluating alternatives, utilities should also carefully consider how much input is optimal for the utility to make informed decisions and receive community support. Some factors to consider when making this determination are described in Chapter 1 of this Handbook.

Neighbors Helping Neighbors: Regional Cooperation and Partnerships in New Mexico

New Mexico covers over 121,000 square miles with a population of slightly more than two million people. A majority of the population is located within the metro areas of Albuquerque, Las Cruces, and Santa Fe. The State is served by over 600 community water systems, of which 93% serve less than 10,000 people. While the smaller community water systems must be resourceful to meet their own needs, many simply do not have the resources and the talent pool to do everything – so neighbors help neighbors.

Regionalization is an active concept in New Mexico, and there is a concerted effort by public officials to encourage physically connected regional systems … but regionalization does not always mean connected systems, nor does it have to be nudged by governmental action in all cases.

In the mountains east of Albuquerque, within a 600 square mile area, there are 19 community water systems (CWS) ranging in size from 25 meters to 3100 meters with various organizational forms, including non-profit privately owned cooperatives, private for-profit companies and corporations, public mutual domestic associations – and four community sewer associations. In order to ensure high quality and efficient service for their customers, these systems work together in a variety of ways pursuant to both written and unwritten agreements:

- The largest CWS provides a certified water operator (under contract) to three much smaller CWSs and certified wastewater expertise for two community sewer associations serving less than 100 homes each, and it frequently helps troubleshoot problems, provide managerial expertise and regulatory knowledge to the smallest entities without charge.
- The owner of a private for-profit CWS also owns a construction company and provides construction and repair crews for its neighbors below its normal rates.
- A private for-profit CWSs provides a certified wastewater operator, under contract, to a public mutual domestic sewer association.
- Some of the smaller systems share billing and work order systems, share expenses for a back hoe and operator, and assist one another in repairing damage.
- As drought reduces the availability of wet ground water, systems within proximity of each other have created interconnections to provide temporary assistance to resolve a water supply challenge of their neighbors – and in many cases, that water can flow in both directions.

Neighbors in rural communities help each other – the same is true for the CWSs and sewer associations that serve them. In rural New Mexico, necessity is the mother of invention.

Step 3. Assess the benefits of each alternative.

Each of the alternatives should be analyzed on an individual basis using the criteria. Different types of analysis may be appropriate for different types of plans or for utilities with different levels of capacity. These options constitute a "tiered" approach that begins with a qualitative assessment and becomes increasingly more complex and resource intensive. Options include:

- A narrative, qualitative assessment of potential benefits and risks of each alternative (may be most appropriate for utilities with limited resources or capacity). For example, in the development of its capital improvement plan, Bloomington, Indiana's water utility qualitatively evaluated several alternatives according to criteria such as redundancy, consequences of a failure, capital and operations and maintenance costs, and flexibility for expansion.

- A qualitative "scoring" of potential benefits and/or risks. For example, Louisville and Jefferson County Metropolitan Sewer District scored project alternatives on a scale from -5 to +5 for several criteria related to the alternatives' impacts on ecosystems and the community and then calculated an overall score across the criteria. (See a more detailed Louisville case study at the end of this section). The Tualatin Valley Water District also used this approach, as described in a call-out box in this section.

- A quantitative assessment, such as monetizing benefits and/or risks using economic valuation techniques. For example, Seattle Public Utilities uses economic valuation techniques to quantify benefits and costs for infrastructure investment alternatives (See a more detailed case study as a call-out in this section).

Sustainability Criteria and Conventional Criteria

When analyzing alternatives, utilities should use sustainability criteria along with conventional project selection criteria.

Examples of potential sustainability criteria include:

- Ecological and economic impacts, such as the extent to which projects damage (or create) important habitat, or create green space and recreation opportunities.
- Preference for treatment or operational functions that rely on natural systems for lower life cycle operating costs through reduced energy and chemical inputs.
- Reduced reliance on the energy grid through greater energy efficiency.
- Water efficiency, such as the extent to which projects increase or decrease lost "revenue water."
- The extent to which projects focus on sustainability of infrastructure in a utility's existing service area.
- Cost-effectiveness based on an assessment of full lifecycle costs.

Conventional criteria often include considerations such as:

- Ability to meet future demand growth.
- Ability to improve reliability.
- Ability to meet regulatory requirements.

The evaluation of each alternative should be documented using a common template. Utilities should use the same methodology for all of the alternatives so that they can be easily compared. Consistent tools and templates make analysis and documentation of a potentially large number of projects efficient.

One way to analyze a range of alternatives across several criteria is to use a "scorecard" approach. This approach helps utilities organize both qualitative and quantitative information to make decisions. Implementation can range from fairly simple to complex. Once developed, it can be reused whenever necessary.

An illustration of a "scorecard" approach is shown below. This hypothetical illustration shows how two alternatives can be scored in a consistent manner according to three criteria. (This kind of approach can be used for several alternatives and several criteria.) The hypothetical alternatives represent two strategies to control odors at an aging wastewater treatment plant with poor odor control systems on some of its older infrastructure. Alternative 1 involves connecting to an adjacent utility to reduce volumes of wastewater and avoiding the need to use the older infrastructure most of the time. Alternative 2 involves building new tanks with modern odor control systems in wetlands that are adjacent to the current plant. This example illustrates the use of three criteria for evaluating the alternatives: aquatic and terrestrial habitat protection, odor control, and, non-obtrusive construction techniques (in reality, these alternatives would be compared using a much broader set of criteria related to cost, effectiveness, etc., but these criteria serve to illustrate the score card approach). While the first alternative would be less effective in controlling odors (the old tanks would still be used some the time) it wouldn't affect critical wetland habitat, and the only disruption would be laying some additional pipe along a few miles of road. The second alternative would be highly effective in controlling odors, but would involve permanent loss of sensitive endangered species habitat.

Illustration of a "Report Card" for Two Infrastructure Alternatives

HYPOTHETICAL ALTERNATIVE 1: WASTEWATER SYSTEM CONNECTIONS WITH ADJACENT UTILITY TO REDUCE VOLUME OF WASTEWATER TREATMENT								
Criteria	**Scores**							**Score for Each Criterion**
	-5	-3	-1	0	1	3	5	
Aquatic and Terrestrial Habitat Protection	Elimination of habitat for rare or endangered species	Elimination of minor amount of common habitat	Minor impairment of existing habitat	No impact on habitat	Minor enhancement of existing habitat	Creation of minor amount of common habitat	Creation of critical habitat for rare or endangered species	0
Odor Control	Create annoying odor source affecting > 20 customers often	Create annoying odor source affecting < 20 customers occasionally	Create detectable odor source affecting < 50 customers occasionally	No impact on odors	Eliminate detectable odor source affecting < 50 customers occasionally	Eliminate annoying odor source affecting < 20 customers occasionally	Eliminate annoying odor source affecting >20 customers often	1
Non-obtrusive Construction Techniques	Permanent loss of green space or sensitive area disruption	Widespread dust and noise, blasting, secondary street closures	Minor dust and noise, traffic lane closures	No construction impacts	Not applicable	Not applicable	Not applicable	-1

HYPOTHETICAL ALTERNATIVE 2: NEW WASTEWATER TREATMENT TANKS WITH ODOR CONTROL SYSTEMS ON ADJACENT PROPERTY								
Criteria	**Scores**							**Score for Each Criterion**
	-5	-3	-1	0	1	3	5	
Aquatic and Terrestrial Habitat Protection	Elimination of habitat for rare or endangered species	Elimination of minor amount of common habitat	Minor impairment of existing habitat	No impact on habitat	Minor enhancement of existing habitat	Creation of minor amount of common habitat	Creation of critical habitat for rare or endangered species	-5
Odor Control	Create annoying odor source affecting > 20 customers often	Create annoying odor source affecting < 20 customers occasionally	Create detectable odor source affecting < 50 customers occasionally	No impact on odors	Eliminate detectable odor source affecting < 50 customers occasionally	Eliminate annoying odor source affecting < 20 customers occasionally	Eliminate annoying odor source affecting >20 customers often	5
Non-obtrusive Construction Techniques	Permanent loss of green space or sensitive area disruption	Widespread dust and noise, blasting, secondary street closures	Minor dust and noise, traffic lane closures	No construction impacts	Not applicable	Not applicable	Not applicable	-5

The shaded areas of the report cards show the "score" for each criterion based on the alternatives' impact. The corresponding numerical score is recorded in the right-hand column. These scores can then be used to come up with an overall score for each alternative to facilitate comparison among alternatives.

Because the utility in the above example is analyzing alternatives according to several criteria, there needs to be some type of weighting approach for the criteria to come up with an overall "score" for the alternative. Utilities may choose to weight each criterion equally, or they may choose to weight the "most important" criteria more highly. In some cases—as in the Louisville example described at the end of this section—utilities base their weighting scheme on community priorities. In this way the package of selected projects reflects community values and is likely to be more acceptable to the community.

One way to weight criteria is to distribute a total number of "points" among criteria. In the example above, for example, the weighting approach could distribute ten points among the three criteria. Odor control may be considered a more important criteria than the others, and therefore receive a weight of 6 while the other criteria are each weighted as 2. The calculated scores for the alternatives would be:

Alternative 1: (0 *2) + (1*6) + (-1*2) = 4

Alternative 2: (-5 *2) + (5*6) + (-5*2) = 10

In this case, Alternative 2 would score higher than Alternative 1.

Tualatin Valley, Oregon uses this type of Scorecard approach to evaluate potential projects according to economic, social, and environmental criteria (see call-out box later in this section).

For scoring some criteria, utilities can use readily available analytical tools that show the effectiveness, cost, and other characteristics of project alternatives. Examples include:

- EPA's Energy Star/Portfolio Manager for water utilities to calculate energy reductions
- Center for Neighborhood Technologies (CNT) Green Values Stormwater Management Calculator to calculate the effectiveness and cost of some types of green infrastructure
- EPA's Check Up Program for Small Systems (CUPSS) to calculate the 10 year financial projection based on the operating and capital budgets (i.e., cost of asset maintenance and annual revenue and expenditures entered into the software)

Links for each of these resources are included in the Appendix.

Tualatin Valley Water District Uses "Triple Bottom Line" Criteria for Alternatives Analysis

The Tualatin Valley Water District (TVWD) serves 200,000 customers through 58,000 connections (http://www.tvwd.org/). The system covers 44 square miles of incorporated and unincorporated Washington County in northwestern Oregon. The District uses a triple-bottom line methodology to systematically evaluate, score, and compare alternatives against a consistent set of criteria. Once the District undertook the upfront effort to develop the methodology, it has an approach that can be consistently applied whenever major infrastructure decisions need to be made.

The methodology has three main components:

1. Criteria. TVWD uses nine criteria to evaluate each alternative—three each for economy, society, and environment
2. Consistent "scores." For each criteria, TVWD defines scores that range from 1 (low) to five (high)
3. Weighting. TVWD assigns 10 weighting points to be allocated among the three criteria within each category (i.e., economy, society, and environment) to reflect the relative importance of the criteria.

The approach assigns an overall score to each alternative by multiplying the criteria score by the criteria weight and summing across all of the criteria. The overall scores can then be compared to each other to select the highest value alternative. Representatives from TVWD say that this structured approach is an efficient way to organize a lot of qualitative and quantitative information about each alternative. In practice, TVWD staff has found that the discussions spurred by implementing the methodology have been one of its most useful characteristics. The table below shows the criteria and scoring approach used by TVWD.

Category	Criteria	Weight	Scoring Guidelines	
			Score	Characteristic
Economy (total weight=10)	Supports economic growth and development	3	5 3 1	Project will directly allow increased development. Project will only serve existing development. Project incidental to existing and/or new development.
	Utilization of local employment and manufacturing	3	5 3 1	Oregon/Washington employment and manufacturing. US employment and manufacturing. Outside US employment and manufacturing.
	Improves efficiency (1) Improves effectiveness (1) Improves reliability (1) Reduces long-term costs (1) Other economic benefit (1)	4	5 3 1	Five criteria addressed Three criteria addressed One criterion addressed
Society (total weight=10)	Meets regulatory or contractual requirement or recognized standards of practice	5	5 3 1	Corrects current violation of regulation, contract, or standards of practice Prevents future violation of regulation , contract, or standards of practice Not related to regulation, contract requirements or standards of practice
	Supportive of community esthetics and livability	2	5 3 1	Elements of the project enhance esthetics and livability. Project is neutral to esthetics and livability. Project reduces esthetics and livability.
	Improves public/employee safety, including fire protection capacity; improves drinking water quality	3	5 3 1	Exceeds standards for safety / water quality. Meets standards for safety / water quality. Not related to safety / water quality.
Environment (total weight=10)	Construction impact on natural environment	3	5 3 1 0	Minimize impact w/ significant improvement of natural systems. Minimize impact w/ some improvement to natural systems. Minimize impact w/ restoration as found. Negative impact on natural environment
	Project Sustainability	3	5 3 1	Significant incorporation of sustainability principles. Modest incorporation of sustainability principles. Low incorporation of sustainability principles.
	Supports conservation and/or demand management goals	4	5 3 1	Significant support. Modest support Project not related to conservation or demand management.

Step 4: Assess the full life cycle costs of each alternative.

Utilities should assess the full life cycle capital costs of each alternative to provide the utility with a full accounting of the annualized cost and revenue impacts of the new projects. Life cycle costs are the net present value of all costs for a project over its lifetime, including primary project costs, secondary financing costs, operations and maintenance and the cost of rehabilitation, repair, and replacement.

Taking the Long View in Alternatives Analysis

When analyzing alternatives, utilities should look to the future to maximize long-term benefits and reduce long-term costs. For example, when considering a project to replace underground pipe in areas of the existing service area that are likely to experience increasing demand from urban infill, a utility should consider installing extra capacity for the future. While this may involve additional up-front expenses, it may reduce costs over the long term by avoiding the need to re-excavate the lines.

Primary project costs include:

- Construction;
- Engineering and technical services (e.g., surveying and subsurface investigations);
- Pilot studies;
- Environmental review and permitting;
- Bidding and contracts;
- Administration and legal services;
- Land and right-of-way acquisition;
- Bond issuance,
- Commissioning costs, and
- Construction management.

Indirect financing costs include the cost of capital (interest rate), capital acquisition costs (such as financial advisory fees, rating agency fees, closing costs, etc.), and costs related to creating any required reserve funds and/or meeting debt coverage covenants. Utilities should be aware that grants or other financing incentives can affect indirect costs and potentially influence which alternatives appear to be most cost-effective. For example, because incentives often reduce initial capital costs but do not reduce operations and maintenance costs, long-lived capital-intensive projects may appear more favorable on a net present value basis.

Operating costs related to new projects can include those from energy use, chemical use, operating staff, and the project's share of general utility overhead expense. Basic maintenance costs associated with the projects will likely include the personnel, equipment, and materials needed to keep the project infrastructure operating properly and reliably. Alternatives that require more ongoing monitoring and maintenance will generally have higher lifecycle operations and maintenance costs. Effective asset management programs can help utilities assess these maintenance costs for infrastructure investments as well as costs for rehabilitation, repair, and replacement.

Key considerations in assessing life cycle costs are the time period analyzed and the discount rate. A long period of analysis will tend to favor longer-lived infrastructure that doesn't need to be replaced during the time period. Take as an example a utility considering two alternatives for managing stormwater: 1) an underground storage basin with a 110 year life and 2) high capacity remote treatment technology with a 40 year life. With a 100 year view, the utility might favor the storage basin because the remote treatment technology would need to be replaced twice over the 100 year period. If that same utility only looked out 35 years, the analysis might turn economically favorable for the remote treatment technology.

The Cost of the "No Action" Alternative

When assessing whether to make new investments, utilities should account for the costs of the "no action" alternative—or maintaining the status quo. These costs may be hidden and substantial. They include:

- The cost of inefficient operations and excess maintenance for older "underperforming" capital,
- The cost of expensive reactive emergency repairs to aging infrastructure (vs. predictive and preventive maintenance for newer infrastructure), and
- Fines or other penalties (e.g., for not meeting regulatory requirements).

The longer utilities wait to replace underperforming capital, the more these types of costs are likely to increase. When utilities examine all of the costs of inaction, they may find that new investments can save money and improve sustainability over the long term.

When a lower discount rate is used to calculate net present value lifecycle costs, it will tend to favor projects with low operations and maintenance costs in the future and/or low future investments in infrastructure repair, rehabilitation and replacement. A higher discount rate will tend to minimize these future costs.

Step 5. Compare and select alternatives.

Utilities should employ a consistent approach for comparing projects to each other and ranking alternatives in terms of their benefits and costs. The approach should allow for the comparison of a wide range of alternatives. Again, different types of analysis may be appropriate for different types of plans or utilities. Options include:

- A qualitative comparison of each alternative's advantages or disadvantages, referencing the evaluation criteria and cost analysis, for each option.
- Cost-benefit analysis that either uses a "scoring" approach or monetized costs and benefits to rank alternatives according to their cost-benefit ratio. For example, the project alternatives in the example above can be compared to each other and to the scores of other possible project alternatives, taking into account total direct and indirect costs in addition to the types of criteria described in the example.

Seattle Public Utilities: Triple Bottom Line Decision-making Using a Quantitative Approach for Monetizing Costs and Benefits

Seattle Public Utilities has adopted a "triple bottom line" approach for decisions about key infrastructure investments. Although focused on asset management rather than long-range planning, the example illustrates how a utility can operationalize sustainability goals in the project selection process.

Seattle Public Utilities (SPU) has a formal asset management program to assess the condition of infrastructure assets, understand the likelihood and consequence of failure, consider life cycle costs of investment decisions, and manage a range of other asset-related issues. SPU sums up the purpose of their program as "meeting agreed customer and environmental service levels while minimizing life cycle costs."

An executive-level Asset Management Committee at SPU meets regularly to make decisions about what project alternatives to select or whether or not a project is needed. Decisions are based on information contained in Project Development Plans (PDPs), which contain pertinent information about projects' financial, social, and environmental costs and benefits. To the extent possible—especially for larger projects—the economic value of projects are calculated and compared with project costs to allow a quantitative cost-benefit analysis.

For the triple bottom line analysis, SPU does not use a standard set of cost and benefits criteria for every project. Rather, relevant costs and benefits are identified on a project-by-project basis. In addition to assessing costs and benefits that accrue to SPU customers (i.e., internal costs and benefits), SPU economists also analyze costs and benefits that accrue to those external to SPU and its customer base, such as the general public, other city departments, other jurisdictions, Tribes, and the environment (i.e., external costs and benefits). In addition, analysts generate a "risk signature" for each project that quantifies financial, social, and or environmental risk. Projects with higher risk may warrant more thorough analysis or steps to mitigate risk.

Further Reading:

- Seattle Public Utilities. "2007 Water System Plan," (November 2006). (http://www.cityofseattle.net/util/About_SPU/Water_System/Plans/2007WaterSystemPlan/index.asp)
- Compendium of Best Practices in Water Utility Asset Management (SPU example; on file)
- Seattle Public Utilities. "Asset Management at Seattle Public Utilities" (undated). (On file)

Step 6. Document the alternatives analysis.

Utilities should document what projects were selected through the alternatives analysis and why they were selected—with reference to the criteria and scoring system. As part of this description, utilities should also describe what other alternatives were considered and why they were not selected. Utilities should also document their criteria and methodology.

Implementing These Steps at a Smaller Scale

Some utilities use highly sophisticated quantitative approaches for conducting alternatives analysis (see, for example, the Louisville example at the end of this section). However, utilities implementing on a smaller scale can use a more qualitative and descriptive approach to alternatives analysis. This kind of approach can still be rigorous, well documented, and consistent across projects being assessed.

Key Diagnostic Questions

To check whether the alternatives analysis followed the process described above and appropriately reflected sustainability criteria, utilities should consider the following questions:

- Did you describe, analyze, and rank all alternatives?
- What were the methods for analyzing alternatives and the criteria for ranking them?
- Were all planning objectives—including sustainability objectives—reflected in the specific ranking criteria and/or in the alternatives analyzed? How?
- How were alternatives ranked according to the criteria? In what ways did the ranking process reflect specific consideration of non-traditional alternatives to integrate the use of natural or "green" systems?
- Were alternatives all assessed on a full life cycle cost basis?
- Was the alternatives analysis transparent, and were the approach, rationale, and results communicated to community members?
- To what extent was the community involved in, or kept up to date on, the alternatives considered and selected?

Example of Sustainability Planning in Practice: Louisville, KY Combined Sewer Overflow Project Selection Process Uses a Consistent Alternatives "Scoring" Approach

As a component of a process to resolve water quality, public health, and regulatory issues related to sanitary and combined sewer overflows, Louisville and Jefferson County Metropolitan Sewer District (MSD) in Kentucky used an innovative process for analyzing and selecting projects using a range of community values to inform project evaluation and selection criteria.[12] Over 400 projects were evaluated, and 23 projects were selected. The process used to evaluate and select projects was based on a benefit-cost analysis that calculated benefits in terms of reductions in community threats and enhancements to community amenities. Costs were calculated using a comparative costs model that incorporated (among other costs) construction costs, administrative costs, land purchases and easements, operations and maintenance, and salvage values.

Key steps that the utility used to identify, evaluate, and select projects were:

[12] Swanson, Gary, CH2M Hill, Inc. "Values-Based CSO LTCP Project Selection Process."

- Defining a list of potential projects that could control each CSO; in addition to traditional infrastructure solutions, this included green infrastructure options and customer-based solutions;
- Developing cost estimates for projects (based on conceptual designs) using the comparative costs model;
- Calculating a "benefit" score for each of the initial solutions using a multi-variable set of performance measures; and
- Ranking projects based on benefit-cost ratios to pick the preferred projects

The "benefit" score was based on a set of eleven community values identified by a stakeholder group. These included both "project-specific" values for evaluating individual projects and "programmatic" values for evaluating effects of a package of projects on a specific neighborhood, the community, a watershed, or the entire project area (see table below for the list of values used in the analysis). Each of the values was represented by specific, measureable criteria. Louisville then employed a methodology for "scoring" each alternative using a consistent scale and approach. These scores allowed the utility to use values generated from a qualitative assessment for quantitative analysis. For example, projects might be scored on a scale from negative 5 to positive 5 based on the extent to which they harmed aquatic habitat (the negative end of the scale) or enhanced it (the positive end of the scale). Scores across all project-specific values were summed (using a weighting procedure to reflect the relative importance of different values) into a total benefit score. When combined with cost information, the benefit score could be used to develop a cost-benefit ratio, which was used to select projects. Following initial project selection, the six programmatic values were applied to the suite of recommended projects to assess whether the package of projects was consistent with community values.

Throughout the process, stakeholders were kept involved through their identification of community values and presentations about the analytical approach used to score alternatives. They were provided with detailed information on the analysis of specific alternatives and the results that led to the final selection of alternatives.

Louisville Community Values Used to Analyze CSO Project Options

Values	Criteria/Factors Considered
Project-specific Values	
Environmental Enhancement	Aquatic habitat protection, surface water dissolved oxygen, aesthetics, stream flow, and biochemical oxygen demand reduction
Public Health Enhancement	Peak flow measurements and characteristics of the release
Regulatory Performance	Discharge frequency, discharge peak flow rates, average annual overflow volume, and release point characteristics
Asset Protection	Flood damage and basement backups
Eco-Friendly Solutions	Energy consumption, use of natural systems, multi-use facilities, pollutant control, construction techniques, land use, and permeable surfaces

Values	Criteria/Factors Considered
Programmatic Values	
Economic Vitality	Affordability criteria, costs for general sewer service, and drainage and flood protection costs
Financial Stewardship	Cost-effectiveness of the solution set developed (first costs, total present worth cost, dollars per gallon of annual average overflow reduced)
Education	Number of people contacted by various means, their knowledge of issues, and number of pollution prevention devices installed
Environmental Justice and Equity	Distribution of resources, project impacts and benefits, consistent application of project development criteria
Customer Satisfaction	Adequate and reliable sewer capacity, implementing response procedures to unauthorized overflows, and notifying customers regarding issues of concern
Financial Equity	Fair assignment of cost, the volume and type of waste introduced into the system, and socioeconomic status

Planning Element 4: Financial Strategy—*Ensure that Investments are Sufficiently Funded, Operated, Maintained, and Replaced over Time*

Element Description

By the time utilities have reached this point in the planning process, they have already identified the set of new investments or other actions that help the utility achieve its sustainability objectives. In Element 4, utilities determine how best to pay for these new investments and develop a successful financial strategy that ensures that revenues cover costs over the long term, including a pricing and rate structure sufficient to cover all costs of constructing, operating, maintaining, and replacing the infrastructure assets associated with their selected project alternatives.

Under Element 4, utilities should use the information gathered though the other core planning elements, as well as their asset management program, to understand how the selected project alternatives will affect the utility's cost and revenue structure. This understanding will in turn help the utility determine a financial strategy that ensures adequate revenues to support these investments over their complete life cycle. Ideally, this effort builds on an ongoing process of identifying future needs and planning ahead to finance future investments.

The Element 3 alternatives analysis should provide a complete picture of direct capital, operations, and maintenance costs associated with the selected project(s), and this information will be relied on for determining current revenue adequacy. The utility's asset management program will be critical to understanding the full life cycle costs of the project(s) over time by articulating anticipated operational and maintenance needs, as well as anticipated timeframes for renewal or replacement.

A typical indicator of a successful financial strategy is a maintained or improved bond rating (if relevant), which reflects that the utility is meeting required or desired debt coverage ratios and required reserves. Healthy financial conditions will help maintain operating budgets and avoid future deferred maintenance conditions for the utility's infrastructure and will also allow for capital planning projects and other capital expenditures.

Current Planning Practice

Utilities engaged in long-term utility planning processes that result in recommendations for major capital and/or operational expenditures typically also develop a concomitant capital and operations and maintenance financing strategy. Conventional practice generally involves the following activities:

- Articulation of the anticipated costs (capital, operations, and maintenance) of the selected project alternatives on a net present value and annualized basis;

- Selection of a project capitalization approach (e.g., capital financing from current revenues, government grants/loans, and/or revenue bonds); and
- Articulation of project-driven revenue requirements (based on costs and capitalization approach) and the development of a strategy to ensure revenue adequacy.

However, current financing strategies have often resulted in deficiencies in the determination of revenue requirements, the options for capital financing, and degree of community support for changes to rates, fees, and charges. These deficiencies have resulted in constraining the ability of utilities to meet level of service expectations and/or underfunding of utility infrastructure maintenance activity and capitalization of infrastructure repair and replacement reserves. A 2002 EPA study estimated that water utilities faced a 20-year operations and maintenance funding gap of $148 billion for clean water utilities and $161 billion for drinking water utilities.[13] A General Accounting Office report from the same year concluded that over 25 percent of drinking water utilities and over 40 percent of wastewater utilities did not collect enough in user fees and other local sources of revenue to cover the full cost of service (including operations and maintenance, debt service, depreciation, and taxes).[14]

Building Sustainability Considerations into Financial Strategies

For the purposes of this Handbook, building a sustainable project financing strategy may involve altering and/or emphasizing a variety of aspects of the traditional project financing strategy, as follows:

- Ensuring a complete accounting of all project-related capital, operations, maintenance, and replacement costs on a full life cycle cost basis (making sure to account for asset depreciation and full costing of predictive and preventive maintenance);
- Undertaking a fair and complete comparison of capital financing alternatives, covering interest, acquisition, and implementation costs; and
- Reviewing and adjusting, as needed, the timing, amount, and structure of rates, fees, charges, and other revenue sources consistent with projections for new project related revenue requirements.

The following steps will help utilities build sustainable financial strategies for their selected project alternatives, as well as maintain or improve the overall financial health of their organization.

Strategies for Reducing Direct Capital Costs of Projects

Utilities can employ a number of strategies to reduce construction-related direct costs, including:

- Value engineering
- Using construction management to minimize cost over-runs and change orders
- Providing clear specifications for projects

[13] Reported amounts are central estimates assuming no increase in revenues. EPA, "The Clean Water and Drinking Water Infrastructure Gap Analysis," http://www.epa.gov/ogwdw000/gapreport.pdf.

[14] General Accounting Office, "Water Infrastructure: Information on Financing, Capital Planning, and Privatization," http://www.gao.gov/new.items/d02764.pdf

Step 1: Account fully for all project capital costs.

Project capital costs generally fall into two categories: primary project capital costs; and secondary capital costs, which are often dependent on the financing method selected. *Primary* project capital costs should have been built into costs used for alternatives analysis. They typically include: construction; engineering and technical services; environmental review and permitting; bidding and contracts; legal services; land and right-of-way acquisition; commissioning costs, and construction management. These costs represent the base capital funding requirement associated with the selected alternatives, and it is critical to ensure such costs have been fully accounted for as part of the alternatives analysis.

Secondary capital costs are linked to the capital financing method. They include the cost of capital (interest rate), capital acquisition costs (such as financial advisory fees, rating agency fees, closing costs, etc.), and costs related to creating any required reserve funds and/or meeting debt coverage covenants. Even grants have some costs, such as grant application and administration costs.

The example below shows a cost analysis from the Quay County, New Mexico "Forty Year Water Plan." The analysis is for a conventional treatment and pumping system that includes an intake structure, pumping station, storage tanks, treatment plant, pipelines, and other pieces of component infrastructure. It illustrates several of the types of costs described above. Direct costs include construction, design services, funding activities, public education, and other items—along with 5-year projected costs for operations and maintenance and replacement. In addition, the cost estimate includes the secondary capital cost of "debt service on financed share" for the financed component of the project.

Example Cost Analysis from the Quay County, NM "Forty Year Water Plan"

FIXED COSTS	
TOTAL CONSTRUCTION COST	**$216,000,000**
CAPITAL OUTLAY FOR FEDERAL SHARE (80%)	$172,800,000
CAPITAL OUTLAY FOR STATE SHARE (10%)	$21,600,000
CAPITAL OUTLAY FOR LOCAL ENMRWA MEMBER SHARE (10%)	$21,600,000
NON-CONSTRUCTION COST	
DETAILED DESIGN SERVICES	$13,000,000
FUNDING ACTIVITIES	$250,000
PUBLIC EDUCATION PROGRAMS	$250,000
ENVIRONMENTAL AND PERMITTING	$1,500,000
CONSTRUCTION MANAGEMENT SERVICES	$13,000,000
TOTAL NON-CONSTRUCTION COST	**$28,000,000**
CAPITAL OUTLAY FOR ENMRWA MEMBER SHARE	**$2,800,000**
TOTAL FIXED COSTS - ALL PHASES FULL DELIVERY	**$244,000,000**
FEDERAL SHARE (80%)	$195,200,000
STATE SHARE (10%)	$24,400,000
ENMRWA MEMBER SHARE (10%)	$24,400,000
RECURRING COSTS	
RAW WATER COST ($25 PER AC-FT TO ISC)	$600,000
DEBT SERVICE ON FINANCED SHARE (20 YEAR PERIOD)	$1,950,600
COST OF OPERATION AND MAINTENANCE (5 YEAR PERIOD)	$9,815,000
REPLACEMENT COSTS (5 YEAR PERIOD)	$478,000
ISC UTE RESERVOIR O&M FEE ($5.60 / AF)	$134,400
SUB-TOTAL ANNUALIZED COSTS	**$12,978,000**
SYSTEM AVERAGE WATER RATE PROJECTION ($ PER 1000 GALLONS)	**$ 1.66**

Source: Quay County, New Mexico "Forty Year Water Plan," September 2004

It is critical that the utility account fully for the full range of capital financing costs—using up-to-date information on interest rates and other factors—and build them into future revenue requirements analysis. A key aspect of understanding the effects of the new projects on utility cost structure will be to calculate the overall impact on average annual capital financing costs and the maximum annual future debt service payment.

Step 2: Account fully for operations and maintenance costs.

The selected project alternatives will likely change overall operations and maintenance (O&M) costs for the utility (either up or down). Although these costs should have been fully profiled during alternatives analysis, it is important to thoroughly review the estimates at this point in the process. This will ensure revenue requirement estimates are fully reflective of any changes in O&M costs resulting from the new project(s).

From a project financial sustainability point of view, one additional operating cost area to consider relates to asset depreciation. Establishing a project depreciation expense, which is an area of potential weakness in revenue adequacy determination, is critical to estimating revenue requirements sufficient to replace aging infrastructure. Depreciation costs built into calculating revenue requirements can provide the utility with a means to establish and fund repair and replacement accounts.

Operations and Maintenance Funds in Greeley, Colorado and Salem, Oregon

To ensure that operations and maintenance expenses are adequately funded, some utilities establish separate funds for these expenses. For example, the City of Greeley, Colorado (serving a population of 93,000 people) separates its enterprise funds for operations from several other capital improvement funds. The operations fund is primarily funded by water and wastewater rates and has a minimum reserve of 90 days of O&M expenses. Transfers of funded depreciation from operating funds are used to pay for the replacement and renewal of capital assets.

Similarly, the City of Salem, Oregon (serving a population of 177,000) has established rehabilitation and replacement funds to cover future infrastructure rehabilitation and replacement costs—as determined by the city's capital improvement plans.

Underfunding predictive and preventive maintenance (i.e., failing to fully estimate costs as part of the revenue requirements determination) is a key vulnerability of revenue adequacy determinations. An important additional cost to consider relates to the need for on-going condition assessment of any new infrastructure consistent with the utility's asset management program requirements. Overall, maintenance costs will be unique to the particular assets involved, but should be driven by the utility's asset management program, which will set the type and frequency of desired maintenance. Because underfunding predictive and preventive maintenance is a common problem, thorough consideration of project maintenance costs with the underpinning of the utility's asset management program is critical to ensuring maintenance needs are fully represented when establishing funding adequacy. A 2002 GAO report estimated that 29 percent of water utilities deferred maintenance due to inadequate funding.[15]

Step 3: Account for the impacts new projects may have on overall utility system costs and revenues.

In addition to the direct capital, operations, and maintenance expenses associated with selected project alternatives, the alternatives may also affect the utility's overall cost and revenue structure. To ensure

[15] General Accounting Office, "Water Infrastructure: Information on Financing, Capital Planning, and Privatization," http://www.gao.gov/new.items/d02764.pdf

revenue requirements associated with the new projects are correctly established, these potential impacts should be examined. Areas of potential impact include:

- Changes in the cost of service to different classes of customers;
- Changes in the utilization (and therefore the operations, maintenance, and depreciation expense) of potential new projects;
- Changes in the type and utilization rates of personnel;
- Changes in the need to provide emergency services; and
- Changes in the resiliency of existing infrastructure and facilities (with potential implications for emergency preparedness and insurance costs).

Water Conservation and Financing in Marin County, California

An example of how projects can explicitly (and intentionally) affect utilization and revenues comes from the Marin Municipal Water District in California, which serves 190,000 people. The Marin Municipal Water District operates under a comprehensive integrated resource management plan that includes a demand-management program to reduce water use. Through conservation and water recycling, the utility has kept demand at 1980 levels in spite of a rising population.

While water conservation reduces the revenues for the utility, it also allows the utility to avoid or delay the financial costs of developing new water supplies. Monthly service and usage charges (using increasing block rates) cover the full operating costs of the utility, and connection fees cover past and future capital costs.

As indicated above, new project(s) may also affect revenues available to the utility. The utility should therefore examine if the project(s) will affect any of the assumptions used in its revenue projections. One key area for consideration is any change to the size of the customer base and any change to customer utilization rates. For example, conservation pricing has the potential to decrease utilization rates as customers conserve water, which may reduce revenues and potentially make them less predictable.[16] Similarly, an economic downturn can reduce the number of utility customers or their ability to pay. This decreased rate payer base can place substantial financial pressure on the utility.

Cash vs. Debt Financing

When considering financial strategies for new projects, utilities should consider the pros and cons of cash vs. debt financing. Key considerations include:

- The opportunity cost of using cash that could be deployed elsewhere or kept as a liquid asset
- The need to manage and protect asset replacement funds over time
- The cost of capital (i.e., don't use cash for something you can inexpensively finance)
- Whether or not benefits will accrue to future customers, which favors spreading out the repayment terms through debt financing
- The useful life of an investment (i.e., don't borrow for 30 years if the useful life is 10 years).

Step 4: Develop a capital financing strategy.

[16] EPA, Water and Wastewater Pricing: An Informational Overview," http://www.epa.gov/owm/waterinfrastructure/pricing/pdfs/waterpricing_final2.pdf

An effective capital financing strategy is critical to the financial sustainability of the selected project alternatives and the utility system as a whole. A utility should seek a capital financing strategy that keeps capital acquisition and interest costs as low as possible and keeps the repayment schedule (principal and interest) consistent with revenue capacity (cash flow). This will be influenced by the mix of financing options used by the utility and how that debt is structured. There are two basic building blocks of an effective capital financing strategy: identifying and comparing the full range of project financing options available; and managing capital commitments and debt structure on an on-going basis consistent with utility revenue capacity and borrowing conditions.

Examining the Options - It is critically important to look at all funding options and carefully consider the differences in financing costs they represent. Four basic options exist for capitalization of proposed project(s): rates and other utility direct revenue sources; federal or state loan or subsidy programs; revenue bonds; and state grants. The (mix of) capitalization approaches used can substantially affect borrowing costs and repayment schedules.

In general, utilities can take one of two approaches to funding new capital investments: 1) using revenues to "pay as you go" for new investments or 2) using long-term debt financing. Under a "pay as you go" approach, capitalization through utility rates and other revenues does not carry debt financing costs, but it is typically reserved for routine replacement of existing facilities, system extensions, and basic improvements that can fit comfortably into annual utility revenue capacity. Major capital replacements and improvements, on the other hand, are typically financed using long-term debt. The use of long-term debt allows for capital costs to be distributed over a number of years and better matches customer charges with the long-term benefits provided by the new projects. The primary options for addressing major capital financing needs are Federal and state loan programs and the private bond market. Each will subject the utility to different interest, acquisition, and implementation costs.

EPA's "Financing Alternatives Comparison Tool" (FACT) provides an illustration of how different types of financing can affect borrowing costs. [17] FACT is a tool for utilities to compare alternative financing strategies taking into account information about interest rates, financing periods, amortization methods and other financing factors. The table below shows key input assumptions and results for an illustrative example for the "Town of Clean Water." It compares two financing approaches—SRF Direct Loan and Revenue Bond—to illustrate how different capitalization approaches can substantially influence borrowing rates and the associated long-term costs for utilities. Because the interest rate for the SRF option is substantially lower than the revenue bond alternative (along with no reserve requirements), total net present value financial costs for the SRF alternative are substantially lower for the utility. (Note that there may be other considerations in weighing different financing approaches; for example SRF-funding is subject to Davis-Bacon wage requirements while a revenue bond approach does not have these requirements.)

[17] See: http://water.epa.gov/grants_funding/cwsrf/fact.cfm

FACT: Illustrative Example for "Town of Clean Water"

Key Financial Assumptions and Results	SRF Loan	Revenue Bond
Project Cost to be Financed	615,000	615,000
Construction Period Interest Rate (24 months)	2%	5.5%
Repayment Period Interest Rate (20 years)	2%	5.5%
Reserve Interest Rate (20 years)	(no reserve)	5.5% (interest rate on a reserve fund that equals 10% of the loan principal)
Other selected costs specific to financing method	Reporting	Bond counsel, underwriter, rating agency fee, bond insurance, SEC disclosure
Results		
Total Financed	$616,230	$699,744
Total Costs	$800,260	$1,114,407
Net Present Value (NPV) of Total Costs (5.5% discount rate)	$428,810[18]	$617,945
Average cost per year	$36,375	$50,655
Source: EPA, FACT Overview presentation (on file)		

As illustrated above, government loan programs, such as the Clean Water and Drinking Water State Revolving Loan funds, will often carry lower interest rates than private bond issues. (In practice, the comparison of rates will depend on factors such as a state's or community's bond rating.) Depending on community eligibility, government loan programs may also provide interest and principal forgiveness options. These features hold the prospect to substantially reduce a utility's debt financing costs. These subsidies are designed to provide an incentive for utilities to make sound investments (including investments in sustainability) that they would not otherwise be able to make if they had to use commercial debt. SRF eligibility, review, and selection processes are intended to ensure that utilities are making the best possible use of the subsidy.

Capital acquisition costs will be different for SRF funding and private capital. Government loan programs will have loan application and on-going reporting-related administrative costs. Private capital acquisition costs will typically include financial advisory services, bond counsel, underwriting fees, rating agency fees, closing costs and fees, and bond insurance, and will have a mix of recurring costs including those for reporting, accounting, and general administration. Further major project capitalization costs include contributions to specified reserves (e.g., reserve account needs related to annual principal and interest payments, for emergency repairs, and for replacements) and/or meeting coverage covenants imposed by the indenture. There are no specific federal SRF requirements for reserves or coverage covenants, although many state SRF programs require one or the other. Through coverage covenants,

[18] Readers will note that the NPV under the SRF financing as calculated by FACT is lower than the financed amount. This results from the difference between the interest rate charged on the principle (2%) and the discount rate used for calculating NPV in the tool (5.5%).

state SRFs can require that, after operating and maintenance expenses are met, net annual revenues must equal some increment above 100 percent (e.g., 120 percent) of the annual debt service payments for principal and interest.

Although more favorable borrowing terms—including incentives in some states for "green" project investments—are a principal reason utilities seek SRF financing, not all utilities are eligible. For those utilities that are eligible, there are other considerations to take into account. For example, a utility with many capital projects may choose to seek SRF funding only for those that are most likely to be approved or that would have the most difficulty getting favorable terms in private markets. SRF funding can also help accelerate project implementation because utilities with SRF loans can often get accelerated consideration of environmental and other permits. However, SRF funding covers only a small portion of the funding needed for water and wastewater capital needs and cannot be used for operations and maintenance.

Camden County Municipal Utilities Authority and the Benefits of SRF Financing

The Camden County (NJ) Municipal Utilities Authority (CCMUA) financing approach for a new sludge drying facility at its 80 million gallon per day wastewater treatment plant provides an example of the benefits of SRF financing. The capital cost of the project is approximately $27.5 million. The CCMUA considered financing through the low interest New Jersey SRF and also through normal government revenue bonds. According to the Deputy Executive Director at CCMUA, "the difference in total cost and annual cost was startling."

Specifically, the CCMUA was able to obtain 75 percent interest free funding through the New Jersey SRF. As a result, the annual cost to CCMUA with SRF financing is approximately $1.65 million per year for 20 years. This compares very favorably to the $3 million per year that the CCMUA would have paid had it utilized commercial funding. Paying $1.35 million per year ($3 M-1.65M) less in annual debt service enabled the CCMUA to implement this important plant improvement without having to raise rates. Over the 20 year life of the loan, the CCMUA will save approximately $27 million for its ratepayers by utilizing the SRF program for financing this project.

Structuring Capital Commitments and Debt - Debt structure is the second critical aspect of a financing strategy. It is linked to prevailing borrowing conditions and the phasing of capital project(s) implementation. A utility, in structuring its debt, should consider prevailing and anticipated future bond market conditions (to the extent that revenue bonds are an important element of its capital financing approach). Key variables a utility can manage, depending on conditions, are the timing of borrowing, the amount of each increment of borrowing, and the mix of interest and principal paid on an annual basis over the life of the repayment schedule. Maintaining on-going awareness of bond market conditions can provide refinancing opportunities throughout the life of the project, particularly in cases where a utility has strategically deferred principal payments as a result of financing during an unfavorable interest rate climate. Irrespective of the public or private financing option(s) selected, a utility can adjust project phasing and, therefore, the associated annual capital principal and interest cost requirements. Project phasing can act to smooth revenue requirements over a several year period and help to strike an effective balance with utility revenue capacity over the debt financing period.

Step 5: Determine current revenue adequacy and develop future revenue strategy.

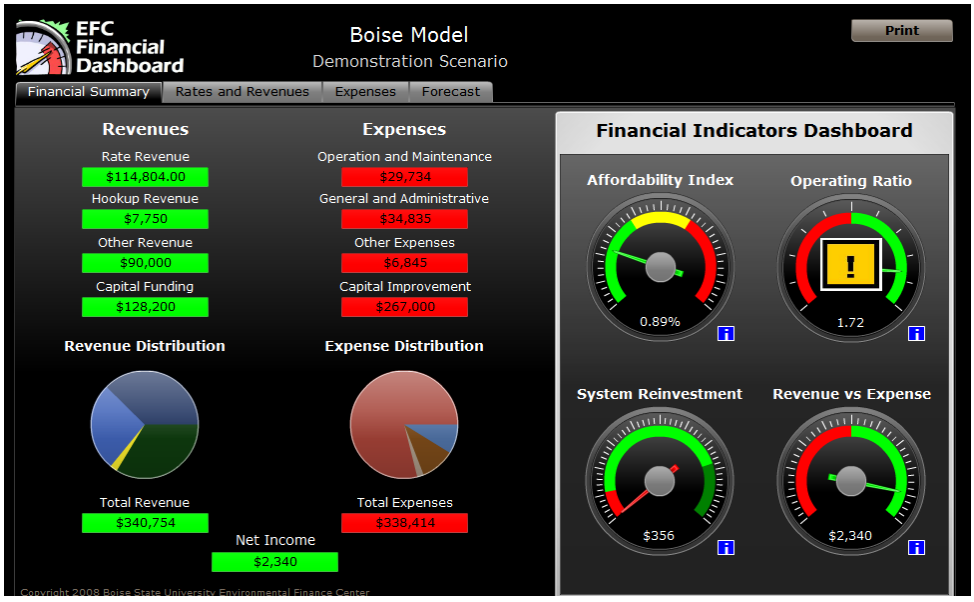
Steps 1 through 4 will provide the utility with a full accounting of the annualized costs and revenue impacts of the new projects. This information can be overlaid on the utility's current revenue projections to determine revenue adequacy. In some cases, cost savings from new capital projects (e.g., from reduced maintenance costs or more efficient operations) and current revenue generation will be sufficient to cover new debt payments. In other cases, major capital projects may shift the utilities' cost structure in a manner that requires increasing utility revenues, unless rates, in particular, have been previously structured with future capital project financing needs in mind.

Assessing Revenues Using the Financial Dashboard from the Environmental Finance Center at Boise State University

The Financial Dashboard, developed by the Environmental Finance Center at Boise State University, provides drinking water wastewater, and stormwater utilities with a concise way to track, view, and evaluate the adequacy of revenues and other elements of their financial sustainability. To use the dashboard, utilities enter information on expenses, rates and other revenue sources, and service demand. The dashboard quickly shows how total revenues compare to total expenses, and it also provides several indicators of financial sustainability, such as:

- Affordability—the percent of annual median income to pay for water service;
- Operating ratio—the ratio of ongoing operating revenues to operating costs;
- System reinvestment—a measure of funds for replacement compared to annual depreciation; and
- Revenues vs. expenses—the difference between annual revenue and annual expenses

The dashboard can be used to assess the utilities' current structure of revenues and expenses and evaluate alternative approaches.



Once the level of adequate revenues has been established—and if a utility determines that increased revenues are required—the utility will need to decide how to generate the necessary amount of revenues through customer rates and fees. This involves balancing several considerations:

- The timing, amount, and structure of any needed rate increases (e.g., phasing in increases over time);
- Alterations of the rate structure to reflect changes in the full cost of service to different classes of customers (e.g., industrial, commercial, and residential) and/or explicit acknowledgement of any transfer of revenues generated from one class to investments that serve another class;
- Deviations from full cost of service pricing to accommodate special community conditions, such as low income customers (typically, states have their own guidelines regarding identification and accommodation of disadvantaged households);
- The structure and amount of system development fees (placed on, for example, developers) to help offset the capital cost of providing service to new customers; and
- The structure and amount of direct customer service connection fees.

Newport, New Hampshire: Setting the Stage for Raising Rates

Newport, New Hampshire is a small town of approximately 6,500 residents in West Central New Hampshire. Its city water system provides drinking water from a protected watershed and a single groundwater well to approximately 5,000 people, commercial customers, municipal agencies, and a single large industrial user. Newport is an example of a system that had to re-evaluate its revenues in light of a changing revenue and cost structure and adjust rates to put the system on a sustainable (and equitable) foundation.

Newport invested in an expensive new treatment plant for its surface water supply in the early 1990s. To cover debt service and part of the capital project costs Newport raised its water rates at that time.

By 2002, however, a study by the city showed that rates were not adequate to cover ongoing operating costs and anticipated infrastructure upgrades. Costs included administration, treatment, distribution services, and debt service. Rates would also have to cover part of future infrastructure upgrades, because the city anticipated that the costs would not be fully covered by capital reserve funds, Drinking Water State Resolving Fund loans and Community Development Block grant funds. With expenses increasing and capital investments on the horizon—at the same time that rates were static and usage was declining—the revenue adequacy study predicted that cash and working capital balances would decline to critical levels by 2004-2005.

Based on a 10-year planning horizon, the city chose to raise rates 10 percent over four years. For residential customers, the new rates were a straight usage charge based on metering. To soften the impact on lower income ratepayers and shift more of the cost burden to larger users, the city also reduced the minimum usage charge from 5,000 gallons per month to 3,000 gallons. The utility estimated that it will not have to raise rates again until 2013.

As the city was considering the need to raise rates, it informed the town selectmen and residents about the need for the increase and was ultimately successful in getting rates approved.

Further Reading:

- EPA, "Case Studies of Sustainable Water and Wastewater Pricing: http://www.epa.gov/safewater/smallsystems/pdfs/guide_smallsystems_fullcost_pricing_case_studies.pdf

Resources that can help utilities calculate revenue requirements and set rates include:

- EPA, "Setting Small Drinking Water Rates for a Sustainable Future"—a step-by-step rate setting guide for small utilities for assessing annual costs, revenue needs, and reserve requirements and setting appropriate rates

- American Water Works Association (AWWA), "Principles of Water Rates, Fees, and Charges"—a comprehensive guide for assessing costs and revenue requirements and setting rates

- Missouri Department of Natural Resources, "Show-me Water Ratemaker"—spreadsheet tool for analyzing rate structure and developing revised rates

Links to these resources are provided in the appendix.

Implementing These Steps at a Smaller Scale

Utilities implementing at a smaller scale may face challenges in developing sustainable financial strategies due to a lack of credit (e.g., to seek out favorable financing or do necessary analysis of revenues and rates), lack of asset management programs, and/or pressure not to increase rates. These utilities need to be aware of resources that are available that may help them obtain favorable financing and receive technical assistance. These resources include:

- The Rural Community Assistance Partnership, which works with small, rural communities to build sustainable water systems.[19]

- The National Rural Water Association, which has state affiliate "circuit riders" that can provide assistance to smaller utilities, including assistance in applying for SRF loans.[20]

- The American Water Works Association's Capacity Assistance Program, which assists smaller utilities with "business planning."[21]

- Various Federal and State resources for building technical, financial, and managerial capacity, such as EPA's resources for small public water systems and capacity development.[22]

Utilities implementing at a smaller scale may have a more limited range of options for generating revenues and/or obtaining financing than larger systems—or at least they may not realize what other options are open to them. For example, the small community of Hidden Valley Lake, California achieved significant cost savings by merging a public and private utility, and the merger opened up new opportunities for financing drinking water infrastructure (see call-out box below for a more detailed case study).

[19] See http://www.rcap.org/
[20] See: http://www.nrwa.org/
[21] See: http://www.awwa.org/files/Resources/SmallSystems/CAPSelfAssessmentChecklist.pdf
[22] See: http://water.epa.gov/type/drink/pws/smallsystems/index.cfm

Hidden Valley Lake Community Services District: Changing Ownership and Operation for a Sustainable Financial Strategy

The example of Hidden Valley Lake Community Services district demonstrates how a small utility can change its ownership and operations structure to put itself on a sustainable financial footing. Hidden Valley Lake is a community of 2,400 residential lots and 34 commercial lots within a 1,400 acre service boundary.

Prior to 1993, Stonehouse Mutual Water Company (established in 1968) supplied water to the Hidden Valley Lake subdivision and sewer to 200 lots around Hidden Valley Lake. As the community grew, the financial future of the company became more and more uncertain. As a private company, it had no access to low interest loans or grants for infrastructure projects that the community would inevitably need.

Stonehouse Mutual Water Company's financial problems led to discussions of a merger with Hidden Valley Lake Community Services District, a public utility that provided sewer service to most of the community. It became evident that merging into one utility company resulted in large benefits, including:

- $300,000 savings per year in administrative and operational costs,
- Additional protection to the community by State oversight with full transparency, and
- Access to low cost loans and grants.

The merger of the two utilities was accomplished on January 1, 1993. State law transitioned full ownership of water rights to the Community Services District and exempted the transfer of funds from Stonehouse Mutual Water to the Community Services District from taxation. In order for the merger to occur, a vote from the Hidden Valley Lake property owners was required. 1,544 votes were in favor with and 46 opposed.

The shift from a private agency to a public agency allowed access to low interest loans and grants that were greatly needed for water and sewer infrastructure improvements and expansion for the rapidly growing Hidden Valley Lake community. In addition, the $300,000 annual savings from the merger of the two institutions was used to offset new infrastructure investment. For example, the savings allowed the Community Services District to issue four sewer bonds and receive a State loan to pay for a Water Reclamation Plant project while keeping rates stable.

In 2004, the Community Services District obtained a low interest $3 million loan as a public agency and launched the Water Infrastructure Improvement Project (WIIP) allowing an additional million gallons of stored water, SCADA system improvements, replacement of water regulator valves throughout the water system, and new pump stations. The WIIP allowed the Community Services District to operate its' pumps during off peak hours, utilizing the lowest energy costs. These savings helped sustain the water rate structure.

Moving from the private sector to the public sector allowed customers to have a say in decision making. There was a full transparency under a public agency, which created more confidence from the public at large.

Currently, drinking water revenues are generated through:

- Water rates, which pay for the cost of operating and maintaining the water system (including improvements to increase system reliability and sustainability).
- Water service hook-up fees, which reimburse the District for the incremental costs of capital investment and funding for improvements necessary to provide the capacity for growth.

Key Diagnostic Questions

The following questions can help your utility check to see if critical aspects of a sustainable financing strategy have been well considered.

- Was a full range of capital financing options considered and were their interest, acquisition, and implementation costs fully identified and thoroughly compared?
- Does the capital financing strategy keep capital acquisition and interest costs as low as possible and keep the repayment schedule (principal and interest) consistent with utility revenue capacity (cash flow)?
- What was considered in determining whether to use cash versus debt financing?
- Are rates, fees, and charges sustainable so that they generate sufficient revenue to fully cover long-term, full life cycle costs of the selected project alternatives? For example, they provide sufficient revenue to avoid deferred maintenance, and/or deferred requirements (e.g., not meeting water standards).
- Are costs allocated fairly/appropriately (e.g., reliability costs to current customers, cost recovery for industrial wastewater permitting and treatment, growth costs to new development, rates for disadvantaged households)?
- Does the rate structure create appropriate customer incentives consistent with your utilities' objectives (e.g., conservation pricing)?
- Does the financial strategy maintain or improve the bond rating, debt coverage ratio, or capital financing reserves where relevant?

Example of Sustainability Planning in Practice: Camden New Jersey Invests in New Infrastructure and Benefits the Environment without Raising Rates

The Camden County Municipal Utilities Authority (CCMUA) operates an 80 million gallon per day wastewater treatment plant in Camden, NJ (population approximately 500,000). The sewage treatment plant was completed in 1987 and, as a result, many of its key process units were due for replacement during the period 2007-2012. As these process units aged, the CCMUA noted steadily increasing maintenance costs, and overtime costs increased as well due to the increased incidence of unplanned repairs. In addition, the CCMUA was aware that newer technology was available that could reduce energy costs and operating costs. Camden provides an example of a utility that was able use its environmental management system (EMS) and associated asset management program to make needed infrastructure upgrades and reduce its impact on the environment using a financial strategy that allowed it to maintain current rates.

As part of its environmental management system (EMS) ,The CCMUA embarked on a five year plan to replace its five main treatment process units (sedimentation tanks, pure oxygen aeration tanks, sludge thickening facilities sludge dewatering facilities and sludge drying facilities). These capital improvements all resulted in significantly reduced maintenance and overtime costs, when compared with the aging equipment that had been replaced. Moreover, the pure oxygen system upgrade utilized new technology that resulted in reduced electricity costs. Similarly, the new sludge thickening, dewatering and drying facilities resulted in significant reductions in sludge disposal costs due to the much dryer sludge cake generated.

In all cases, the CCMUA utilized the New Jersey State Revolving Fund (New Jersey Environmental Infrastructure Financing Program) which offered 75 percent interest free loans for these capital upgrades. The much lower interest rate corresponded to much lower annual debt service costs. In fact, the annual operations and maintenance cost savings associated with the plant upgrades exceeded the annual debt service costs. As a result, the CCMUA was able to replace or upgrade all of its main treatment process units without raising user rates. As a result, public support for these plant improvements was quite easy to obtain.

In addition to the economic benefits realized through this EMS and its associated asset management plan, the CCMUA also improved its environmental performance. Specifically, the new sludge thickening and dewatering facilities increased the treatment plant's capability to capture more sludge through the treatment process. Effluent quality improved by about 70 percent. However, because the new sludge thickening and dewatering facilities were able to achieve a higher sludge cake dryness level, the CCMUA prevented more dry tons of solids from being discharged to the Delaware River, while actually reducing the overall quantity of wet tons to be disposed of (via the more efficient removal of water through the improved thickening and dewatering process). In addition, the reduction of overall wet tons of biosolids to be disposed of resulted in a corresponding reduction in odor potential.

In summary, the CCMUA's utilization of a judicious asset management program, as part of its overall EMS, which called for replacement of underperforming, high maintenance capital with new, more efficient equipment, coupled with its use of the low interest New Jersey State Revolving Fund enabled it to (1) replace its main treatment plant process units (2) reduce its annual operating and maintenance costs and (3) improve environmental performance without raising rates. Replacement of underperforming capital, use of the SRF, and implementation of improved internal efficiencies, enabled the CCMUA to improve its internal capital sustainability, improve environmental performance and keep user rates stable in a low-income community.

Conclusion

Water and wastewater utilities that incorporate sustainability considerations into their planning processes can:

- Reduce lifecycle costs by operating more efficiently, pursuing cost-effective investment strategies and optimizing investment choices;
- Optimize social, environmental, and economic benefits by selecting projects through a systematic process of setting sustainability goals and objectives and consistently assessing a range of traditional and non-traditional infrastructure alternatives;
- Increase fiscal sustainability by analyzing the full lifecycle costs of investments, developing low cost financing strategies, and ensuring that revenue needs are accurately assessed so that utilities can maintain, renew, and replace infrastructure while meeting all regulatory requirements;
- Provide the information for making replicable, consistent, and transparent decisions that consider the sustainability benefits of long-range investments and for explaining decisions to board members, local elected officials, the public, and others.
- Increase community support through upfront dialogue with community members and active consideration of other community priorities as alternatives are considered.
- Increase customer support through clear rate expectations (and avoided "rate shocks"), increased system reliability, and increased responsiveness when disruptions occur.
- Enhance the technical, financial, and managerial capacity of the utility.

The case studies in this Handbook provide utilities with examples of how to undertake certain aspects of planning. The guidance and tools referenced in the Handbook and its appendix give utilities helpful resources. Utilities applying this guidance and these tools should utilize the processes identified on an iterative basis to support the sustainability of their approaches, refining them over time.

As the practice of planning for sustainability evolves, more effective practices will emerge. EPA envisions this Handbook as a resource that can continue to be updated to provide water utilities with advice and resources to more effectively use this planning approach over time in order to optimize their infrastructure and operational decisions.

Appendix A: Useful Sustainability Planning Resources

Water Utility Sustainability and Strategic Planning

- Cheryl Welch, The Green Utility: A Practical Guide to Sustainability, American Water Works Association (2010)—includes ideas, plans, and tools to reduce environmental impacts, positively impact communities, and deliver high quality service: http://www.normas.com/AWWA/pages/20706.html

- Honolulu Board of Water Supply, Development of a Strategic Planning Process: Tailored Collaboration Project, American Water Works Association Research Foundation

Community Engagement

Guides and Tools:

- EPA, Public Involvement Tools website—compendium of public involvement manuals, tools, and techniques for public involvement in environmental decisions: http://www.epa.gov/publicinvolvement/involvework.htm

- Envision Utah Community Planning Process—describes a participatory planning process that involves a stakeholder steering committee, community "values analysis," and a community information and education campaign: http://www.envisionutah.org/eu_about_euprocess.html

- American Water Works Association Public Communications Toolkit—members-only resources for public relations and public communications for water utilities: http://www.awwa.org/Government/Content.cfm?ItemNumber=3851&&navItemNumber=3852

- Water Environment Federation, "Survival Guide: Public Communications for Water Professionals"—public communications guidance and best practices for water managers: http://www.wef.org/WorkArea/DownloadAsset.aspx?id=7120

- International Association of Public Participation (IAP2) website—compendium of public involvement tools and resources: http://www.iap2.org/

Case Studies:

- University of Arizona Water Resources Research Center, "Best Practices for Stakeholder Engagement in Water Resources Planning"—Summary of poster sessions for 2009 conference that briefly describe case studies of various efforts to involve stakeholders in water planning: http://cals.arizona.edu/AZWATER/programs/conf2009/posters.pdf

- peopleandparticipation.net case studies—international collection of public participation case studies: http://www.epa.gov/publicinvolvement/involvework.htm

Working with Boards and Commissions

- EPA, *Talking To Your Decision Makers: A Best Practices Guide*—describes the role of board and commissions and provides information about effective engagement and communication: http://www.epa.gov/ogwdw/smallsystems/pdfs/guide_smallsys_decision_makers_08-25-06.pdf

Asset Management

- EPA, "Asset Management: A Best Practices Guide": http://epa.gov/safewater/smallsystems/pdfs/guide_smallsystems_assetmanagement_bestpractices.pdf
- EPA, "Asset Management: A Handbook for Small Water Systems": http://epa.gov/safewater/smallsystems/pdfs/guide_smallsystems_asset_mgmnt.pdf
- Water Environment Federation, "Implementing Asset Management: A Practical Guide": http://www.e-wef.org/timssnet/products/tnt_products.cfm?primary_id=P07011&Action=LONG&subsystem=ORD
- EPA Office of Wastewater Management Asset Management resources: http://www.epa.gov/owm/assetmanage/index.htm
- New Mexico Environmental Finance Center Asset Management resources: http://nmefc.nmt.edu/AssetManagement.php
- EPA, Check Up Program for Small Systems (CUPSS)—tool for inventorying assets, maintenance, and associated costs and short and long term budgeting: http://epa.gov/safewater/cupss/

Energy Efficiency

- EPA, Energy Audit Tools for Water Utilities—provides links to several guides and tools for tracking and understanding water utility energy use: http://water.epa.gov/infrastructure/sustain/baseline_energy.cfm

- EPA, *Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities* http://www.epa.gov/owm/waterinfrastructure/pdfs/guidebook_si_energymanagement.pdf

- EPA, Report on Evaluation of Energy Conservation Measures for Wastewater Treatment Facilities

  http://water.epa.gov/scitech/wastetech/upload/Evaluation-of-Energy-Conservation-Measures-for-Wastewater-Treatment-Facilities.pdfEnergy Star/Portfolio Manager for water utilities—tool for

plant managers to assess and track energy use, energy costs, and associated carbon emissions and benchmark performance against other similar facilities: http://www.energystar.gov/index.cfm?c=water.wastewater_drinking_water

- EPRI. "Energy Audit Manual for Water/Wastewater Facilities"—guide for assessing energy use at the process level: http://www.cee1.org/ind/mot-sys/ww/epri-audit.pdf
- New York State Energy Research and Development Authority (NYSERDA), "FlexTech Program"—technique for energy assessments for facilities that will receive CWSRF funding: http://www.nyserda.org/programs/flextech.asp
- State of Wisconsin "Water and Wastewater Energy Best Practice Guidebook": http://www.werf.org/AM/Template.cfm?Section=Home&CONTENTID=10245&TEMPLATE=/CM/ContentDisplay.cfm
- Alliance to Save Energy. "Watergy: Taking Advantage of Untapped Energy and Water Efficiency Opportunities in Municipal Water Systems" http://ase.org/uploaded_files/watergy/watergysummary.pdf
- Rural Community Assistance Corporation, "Sustainable Infrastructure for Small System Public Services: A Planning and Resources Guide": www.rcac.org/assets/green_infra/gig.pdf

Non-traditional Project Alternatives

- EPA, Managing Wet Weather with Green Infrastructure—provides background and resources on various green infrastructure strategies for stormwater: http://cfpub.epa.gov/npdes/home.cfm?program_id=298
- Center for Neighborhood Technologies (CNT) Green Values Stormwater Management Calculator—assesses hydrological impacts and cost-effectiveness of green infrastructure options: http://logan.cnt.org/calculator/calculator.php
- Water Infrastructure Finance Authority of Arizona, "Sustainable Infrastructure: A Best Practices Guide for Arizona Wastewater Utilities" (chapter on "sustainable design strategies"): www.azwifa.gov/publications/BestPracticesGuideForWastewaterUtilities.pdf
- Water Environment Research Foundation (WERF): "Performance and Whole-Life Costs of Best Management Practices and Sustainable Urban Drainage Systems": http://www.werf.org/AM/CustomSource/Downloads/uGetExecutiveSummary.cfm?FILE=ES-01-CTS-21Ta.pdf&ContentFileID=10452 (Executive Summary)
- Vermont Agency of Natural Resources, "Growth Center and Growth Management Guidance Document"—guidance on strategies to support existing communities for wastewater utilities:

http://www.anr.state.vt.us/dec/fed/financial/docs/GROWTH%20CENTER%20AND%20GROWTH%20MANAGEMENT%20GUIDEANCE%20November%202010.pdf

Water Quality

- EPA, Small Systems Guide to Safe Drinking Water Act Regulations—resource for understanding current and anticipated drinking water regulations with which utilities need to comply: http://epa.gov/safewater/smallsystems/pdfs/guide_smallsystems_sdwa.pdf

Collaboration and Partnerships

- EPA, "Gaining Operational and Managerial Efficiencies Through Water System Partnerships": http://www.epa.gov/ogwdw000/smallsystems/pdfs/casestudies_smallsystems_gainingoperational.pdf

Sustainable Financial Strategy

- Financial strategy: EPA, Financing Alternatives Comparison Tool (FACT)-- financial analysis tool that calculates and compares the costs of various financing options for water quality projects: http://www.epa.gov/owm/cwfinance/cwsrf/fact.htm

- EPA, "Setting Small Drinking Water Rates for a Sustainable Future"—a step-by-step rate setting guide for small utilities for assessing annual costs, revenue needs, and reserve requirements and setting appropriate rates: http://www.epa.gov/owm/waterinfrastructure/pdfs/final_ratesetting_guide.pdf
- American Water Works Association (AWWA), "Principles of Water Rates, Fees, and Charges"—a comprehensive guide for assessing costs and revenue requirements and setting rates: http://apps.awwa.org/ebusmain/OnlineStore/ProductDetail/tabid/55/Default.aspx?ProductID=6695
- Missouri Department of Natural Resources, "Show-me Water Ratemaker"—spreadsheet tool for analyzing rate structure and developing revised rates: nmefc.nmt.edu/documents/Showme41Water(clean).xls

- American Water Works Association, *CAP: Capacity Assistance Program Self Assessment Workbook Checklist*—a series of self-assessment questions to help utilities "operate like a business": https://www.awwa.org/files/Resources/SmallSystems/CAPSelfAssessmentChecklist.pdf

- Government Finance Officers Association, guidance manuals and reports on financing topics: http://www.gfoa.org/index.php?option=com_content&task=view&id=332. Key publications include:

    - *Debt Issuance and Management: A Guide for Smaller Government*—introduces the essential concepts of tax-exempt debt financing and compares and contrasts options.
    - *Benchmarking and Measuring Debt Capacity: GFOA Budgeting Series Volume 1 (Putting Recommended Budget Practices into Action)*—provides a useful analytic approach to implementing budget practices.
    - *Capital Project Planning and Evaluation*—discusses considerations associated with most capital project types (e.g., public participation, cost estimation and budgeting, and project oversight) and a short description of twelve important capital project types.

- Rowan Miranda, Ronald Pincur, and Doug Straley, "Elements of a Comprehensive Local Government Debt Policy," Government Finance Review (October 1997): http://www.gfoa.org/downloads/GFRElementsofDebtPolicy.pdf

- Margaret C. H. Kelly and Matthew Zieper, "Strategies for Passing a Bond Referendum," Government Finance Review (June, 2001): http://www.gfoa.org/downloads/GFRPassingBondReferendum.pdf

- California Debt and Investment Advisory Commission, "Bond Insurance as a Form of Credit Enhancement in California's Municipal Bond Market," http://www.gfoa.org/downloads/CDIACCreditEnhancementReport.pdf

Effective Utility Management

- Effective Utility Management Collaboration Effort: www.watereum.org

Environmental Management Systems

- Resources on Environmental Management Systems for Water and Wastewater Utilities: http://www.peercenter.net/sas/water.cfm