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SUMMARY

The Sustainable Water Management (SWM) Profile is an assessment tool to advance long-term water supply resilience and water resource stewardship at a regional scale. The Water Foundation completed extensive research within and outside the water supply community while designing this evaluation framework. The tool focuses on management actions that water supply agencies can take internally, with agency partners, and across their regions to improve the sustainability of water supplies. The profile provides standards for assessing stressors that cause water supply vulnerability, and for evaluating the responses of water supply agencies to these vulnerabilities.

This article explains how the SWM Profile was designed by the Water Foundation to meet the needs of the water community and makes recommendations for improving the effectiveness of the profile and similar assessment tools.

As the challenges facing water supply managers grow, standards that track progress toward sustainability become more important. The Water Foundation provides this article to share the lessons learned from the SWM Profile, in hopes that it will contribute to the work of other professionals in the field of water supply management.

Answering the Water Sustainability Challenge

The need for a new yardstick

California water supply agencies are embracing technology and management innovations that relieve stress on their systems. Nonetheless, they face many challenges to achieving sustainable water supply management: growing populations, aging infrastructure, degraded ecosystems, fragmented management systems, and uncertainty caused by climate change.

Despite these mounting challenges, California does not have a yardstick for measuring sustainable water supply management. A standardized assessment tool benefits decision-makers and water managers by enabling them to track progress and successes, identify stressors and vulnerabilities, and articulate a pathway toward sustainability at the regional and local scales. The Sustainable Water Management (SWM) Profile differs from most other sustainability assessments in that it includes the following information:

- Region-scale data vital to providing a meaningful assessment
- Steps agencies are already taking to address their water challenges
- Factors outside a water supply agency's jurisdictional boundaries that are difficult to assess and address without regional coordination

The importance of measuring progress toward sustainability

Over the past two decades, statewide and regional efforts have emerged in California to develop and apply indicator-based assessment frameworks to help manage water resources for sustainability. Using assessment tools could drive much-needed change in the water supply sector by offering several benefits:

- Help water supply agencies to look beyond their service areas to consider the broader geographic scope of issues and actions that affect their water management.
- Highlight an agency's successes and vulnerabilities in responding to water supply stressors in its region.
- Illustrate a road map toward sustainable water supply management.
- Encourage sound investments, policies, and regional coordination.
- Provide findings that water supply agencies' customers and the general public find meaningful and can readily understand.
- Promote healthy competition among water supply agencies.

Many audiences beyond the water suppliers themselves can use such tools to advance sustainable water management. Among these additional audiences are public utilities, residential and business customers, land use planning agencies, financial analysts, and federal and state agencies. The SWM Profile either can inform stakeholders about stressors affecting sustainable water management and brief them on the progress, status, and effectiveness of planning and plan implementation, or can provide stakeholders the framework for their own inquiries. In this way, the SWM Profile provides a tool for advocacy and action on behalf of sustainable water management.

Organization of this Document

This document presents an overview of the SWM Profile's purpose and approach, then describes its framework. The application of the SWM Profile is described using two pilot tests. The next section lists the major lessons learned through the inquiry into similar assessment systems, the SWM Profile pilot test applications, and the consultation conducted with external advisors over the course of the project. Finally, this document briefly describes where the SWM Profile is heading next.

Overview of the Sustainable Water Management Profile

Purpose of the SWM Profile and its perspective on sustainability

Recognizing the potential of an assessment tool for sustainable water management, the Water Foundation assembled a team to explore possibilities and develop a tool that could be tested. The team focused on water supply management during the development process. Team members learned from the experiences of comparable tools, held discussions with advisors in the water supply management arena, and conducted pilot testing with willing water supply agencies.

A fundamental step in developing this tool was to both define sustainability and identify an approach to recognizing it.

The SWM Profile further established an assessment approach that separated major stressors on sustainable water management from the management actions taken to reduce the stress level and mitigate their effects.

Building on the traditional definition of sustainability, the SWM Profile defines "sustainable water management" as the management of water in a way that meets current economic, ecological, and quality-of-life needs without compromising the ability to meet those needs in the future.

In addition, the team developing the SWM Profile determined that an assessment of sustainable water management must be very flexible to adapt to different regional and agency conditions. Therefore, in the SWM Profile, the entity assessed (referred to in this document as the "Profile Subject") was assigned the responsibility of more specifically defining sustainable water management for its service area through its own planning activities.

Another foundational tenet underlying development of the SWM Profile is that to achieve sustainable water supply management, water managers must look beyond their official jurisdictions, managing water as a natural resource, through regional collaboration and solutions.

Comparing the SWM Profile to other assessment tools

Tools for assessing water supply sustainability differ in many ways, particularly in their geographic scale; the breadth of topics covered; and methods for combining evaluations of real-world, water-related conditions and of water management actions to address those conditions. The SWM Profile:

- Evaluates both water supply vulnerabilities ("stressors") and agency actions ("management responses"), but uses only agency actions to assign a rating;
- Addresses the actions taken at multiple scales: the agency itself, areas affected by agency collaboration activities, and the larger region that affects the agency;
- Produces results accessible to different audiences, including agency board members, financial institutions, water professionals, and the public;
- Is a voluntary evaluation framework not associated with any regulatory mandate;

SWM Profile Terms

Profile Subject: The water supply agency undertaking the SWM Profile assessment.

Stress Level: A broad categorization of the stress associated with a given water supply stressor; can be either High, Moderate, or Low.

Management Response: Action taken to address a stressor, by either reducing the stress level directly or mitigating its effects.

- Is designed to be completed by an outside team with data support from the Profile Subject's staff, or to be completed by the Profile Subject and verified by an outside team; and
- Focuses on water supply agencies that may encompass additional water management responsibilities. (The SWM Profile does not assess single-purpose non-supply water management entities, such as wastewater or flood management agencies.)

The SWM Profile is currently designed for use by water supply agencies in California. In contrast, many water-related sustainability evaluation tools either apply to specific sites or pieces of infrastructure, or are meant for broad application anywhere in the nation or worldwide.

The maxim "A goal without a plan is just a wish" (Antoine de Saint-Exupéry) provides the basis for the SWM Profile's framework for assessing water supply management responses to identified vulnerabilities. The SWM Profile uses a planning continuum, sometimes called a "maturity model," to gauge the level of informed planning (through data collection efforts); the implementation of planned actions; and the effectiveness of those actions in addressing vulnerabilities, thereby supporting sustainable water management. Because water supply conditions can take considerable time to show change, this type of evaluation approach provides important early feedback on the management actions being planned or taken to provide future benefits.

This approach also differs from other assessment tools. For example, the 2018 California Water Plan Update has a new Sustainability Outlook, which could evolve

into a standardized indicator-based evaluation of water management sustainability. However, the Sustainability Outlook does not focus on management actions themselves, although it does include metrics that measure management response outcomes.

History of the SWM Profile

The Water Foundation initiated development of the SWM Profile tool in late 2012. The project was given a charge to develop a rating system, akin to LEED® for buildings, that would encourage the proliferation of best practices in water supply management. Scorecards, dashboards, report cards, and related products are useful and popular. However, designing an assessment tool that produces a quantitative result in the form of a rating or score, using multiple metrics and indicators, is a specialized endeavor that requires robust expertise. When embarking on this effort, the Water Foundation assembled a "SWM Team" of scientists and technical experts in water management; sustainability indicators; economics; social, ecosystem, and hydrologic sciences; and verification processes.

The Water Foundation also convened an advisory group to guide development of the new tool. The Advisory Group included managers of water utilities and water supply agencies; private-sector advisors from the business and investment communities and corporate responsibility organizations; sustainability program developers; and technical experts from academics, government, and nongovernmental organizations.

The SWM Team evaluated several dozen existing sustainability and water management programs to identify how the SWM Profile could complement or fill a gap unaddressed by current programs, and to determine potential partnership opportunities. From this screening analysis, 15 programs were chosen for more comprehensive evaluation based on the degree to which they addressed the themes and material issues that the SWM Team identified as top priorities. These programs provided potential metrics, indicators, and performance measures.

The Water Foundation created the first version (v. 1.0) of the SWM Profile in 2013. Sonoma County Water Agency (Sonoma Water) partnered with the Water Foundation to pilot the SWM Profile in 2014. In 2015,

https://water.ca.gov/Programs/California-Water-Plan/Update-2018.

¹ The Sustainability Outlook: A Summary. Supporting document for the California Water Plan Update 2018. Available by request at

the Water Foundation conducted outreach and peer review with experts and stakeholders from within and beyond the water sector.

The v. 1.0 pilot of the SWM Profile with Sonoma Water exposed several fundamental questions that required input from a wider audience than the Advisory Group and the content experts already consulted. The SWM Team therefore conducted intensive outreach from February through June 2015 to engage potential end users of the SWM Profile, including:

- Potential water supply agency participants
- Private-sector representatives (financial, business)
- Federal and state government representatives
- Developers of other sustainability standards and tools
- Nongovernmental organizations in the water and sustainability fields
- Academics specializing in the water sector

In all, the SWM Team conducted 32 briefings with 108 people. Through this outreach, team members learned important lessons based on the experience of other certification standards, report cards, disclosure projects, and sustainability assessments. The briefings also provided insight into the influencers of water management decisions. Water supply agencies have consistently reported that their boards have greater influence over their decision-making than other potential influencers such as customers, the media, bond raters, regulators, and academics. This finding confirmed the importance of designing a profile that would produce results that are meaningful and actionable by decision-makers and stakeholders.

In 2016, a second pilot, using an updated SWM Profile (v. 2.0), was completed with Inland Empire Utilities Agency (IEUA).² Concurrent with the IEUA pilot, the SWM Team worked with Stanford Graduate School of Business Alumni Consulting Team to research and evaluate the value proposition of SWM Profile results for the financial sector. This research showed that there was value to the financial sector in information from SWM Profile generates, but that many more SWM Profile ratings would need to be completed before it would be useful to the financial sector as a relative benchmarking tool. This affirmed the results of our outreach in 2015, that the strongest audience for

the SWM Profile in more limited application was with decision-makers and stakeholders.

SWM Profile Framework

The SWM Profile provides standards for assessing vulnerability of the water supply to key stressors (risks or threats) and evaluating management responses to those stressors. The SWM Profile evaluates stressors within four themes:



To understand the sustainability of water supply management from the perspective of a Profile Subject, the SWM Profile describes and evaluates the following factors:

- The Profile Subject's unique hydrogeographical and jurisdictional context. The context evaluation is critical for illuminating the Profile Subject's interdependencies, defining the region of interest, and understanding the specific stressors being faced.
- A total of 10 stressors that can create vulnerabilities for the Profile Subject in its regional water supply management setting. By characterizing the severity of these stressors, the SWM Profile highlights the Profile Subject's most important management challenges.
- 3. The management response to the stressors. The response is evaluated at three scales, as described below.

https://waterfdn.org/wp-content/uploads/2017/08/SWM-Technical-Report-FINAL-8.14.17.pdf.

² The technical report documenting this assessment, Sustainable Water Management Profile: Inland Empire Utilities Agency and Its Region of Interest, is available at

SWM Actor Levels

As implemented in the pilot assessment of a water supply wholesaler, the SWM Profile (v. 2.0) recognizes that actions affecting sustainable water management occur both at the level of the Profile Subject and at a regional scale, as defined below.

Agency Operations*: Activities carried out by the Profile Subject within its sphere of direct responsibility, including the requirements for the Profile Subject's member agencies (if any). Actions by member agencies are not controlled by the Profile Subject, however; member agencies are therefore considered as separate entities within the region of interest.

Agency Collaboration: Activities carried out by the Profile Subject with others in realms outside its sphere of direct responsibility, and that fall within the "focused scope of analysis." (The focused scope of analysis is geographically limited to the surface water and groundwater source areas for supplies relied upon by entities located wholly or partially within the Profile Subject's service area.) *Example:* IEUA's membership/involvement in the Santa Ana River Watershed Project Authority.

Regional-Scale Actions: Activities carried out at a broad regional scale, in most cases well beyond the jurisdiction of the Profile Subject. Regional-Scale Actions must occur at a scale appropriate to address a given stressor and are typically carried out by organizations that operate at a large geographic scale (e.g., federal and state agencies, regional wholesalers, or joint powers authorities). *Examples:* Actions by entities including the Metropolitan Water District of Southern California, of which IEUA is a member agency; the State Water Project; and the Upper Colorado River Commission.

*Note: Many Profile Subjects are regional entities and operate at a regional scale. For the purposes of the SWM Profile, regional actions within the direct sphere of influence of the Profile Subject are included under "Agency Operations."

Closest to home is Agency Operations. Here, the SWM Profile assesses the Profile Subject's own activities in its service area with respect to its water supply operations. Stressors that are not relevant to the Profile Subject are not assessed. For example, if an agency has little or no groundwater in its supply mix, the assessment at the Agency Operations level will not address groundwater supply.

Next is the assessment of Agency Collaboration among nearby agencies. Forces beyond the control of the Profile Subject strongly influence water management sustainability; therefore, the SWM Profile also assesses how well the Profile Subject engages with partners that can reduce stress on the water supply resources on which the Profile Subject relies directly or indirectly.

Lastly, the SWM Profile looks beyond the actions of the Profile Subject to consider actions by other entities that influence stressors. For these Regional-Scale Actions, the geographic scope qualifying as "regional scale" is not fixed, but instead reflects the geographic scope at which a given stressor can be effectively addressed, and at which stress level (High, Moderate, or Low) the metrics can be affected.

The multi-scale approach of the SWM Profile assesses a water supply agency's stressors and management

responses, and relevant actors and elements (e.g., watersheds, groundwater basins) in the areas the agency, its wholesale supplier, and/or its customers rely on for water supply, and areas to which the agency supplies water. The framework is oriented to examine regional water supply management through the lens of a Profile Subject that must look beyond its jurisdiction to achieve results. The regional scale of the analysis was critical to achieving the intent of the SWM Profile, because many stressors extend far beyond the direct influence of any Profile Subject.

The SWM Profile produces ratings based on points earned for the management response level for each stressor, weighted by its stress level. There are five possible ratings: Not Rated, Bronze, Silver, Gold, and Platinum. Management response is evaluated using objective criteria that determine which step on the path toward sustainability—from "Initial Steps" to "Leading Practice"—the agency and the larger region currently occupy (see **Figure 1**).

The SWM Profile sets a high bar to move regions toward a sustainable water future. Very few, if any, Profile Subjects were expected to achieve a Gold or Platinum rating, given the profound gap between what is presently considered to be "leading-practice" water management and true sustainable water management.



Figure 1. The SWM Profile's Conceptual Path Toward Sustainable Water Management

The SWM Profile's regional perspective and management standards, while difficult to meet, were deemed necessary to achieve sustainability.

Assessing sustainability at the regional scale

California's most advanced water management guidance, such as the California Water Plan Update 2018 and the Sustainable Groundwater Management Act, recognize the need to manage water at a regional level. However, there are practical and perception issues associated with assessing conditions and management responses at multiple scales and scoring a Profile Subject in part on actions they cannot control. These aspects of the SWM Profile were the most difficult to develop, implement, and present, particularly because the resulting tool was intended to garner voluntary participation.

The SWM Profile establishes different geographic areas for evaluation of stressors and management responses. The SWM Profile focuses on the most important parts of the region of interest for each stressor, within the limits of data availability. Each stressor assessment therefore focuses on specific entities or features within a specified maximum geography, collectively termed the "scope of analysis" for that stressor.

Stressors falling within the Environmental theme are assessed at the broadest scale, the "region of interest." The SWM Profile defines a Profile Subject's Region of Interest as the geographic area that includes the watersheds and groundwater basins from and to which the Profile Subject (and its member agencies or retailers, if applicable) receive or deliver water. Another way to think of a Profile Subject's Region of Interest is that it

includes all the water sources of its customers, and the service areas of all the customers of its water sources. Evaluating conditions and management at the scale of the Region of Interest rewards collaborative Profile Subjects and regions; attention to "upstream" sources of problems; and collaboration with entities beyond traditional water management agencies, such as federal and state natural resource agencies, land use authorities, and stormwater agencies.

Stressors and management responses falling within the Supply and Demand themes are evaluated within the smaller "local Region of Interest," a subset of the Region of Interest that does not include any import watersheds, yet still includes the activities of multiple actors besides the Profile Subject.

Lastly, because of constraints on data availability resulting from privacy concerns, stressor and management responses falling within the Finance theme were limited to the Profile Subject.

This multiple-scale approach provides a mechanism for looking outside of the governance and service area limitations of the Profile Subject to the regional context within which the Profile Subject operates. The SWM Profile rating is attributed to the Profile Subject as a means of recognizing and evaluating the role the Profile Subject plays, or can strive to play, in the larger region that can affect its ability to sustainably manage its water supply.

Figure 2 and Figure 3 illustrate the necessity and difficulty of accounting for broader regional scales when assessing water supply sustainability.

Example 1: Inland Empire Utilities Agency

IEUA is both a wholesale water supplier and a wastewater utility that operates at a regional scale, providing supplies and managing wastewater for cities, special districts, and agricultural users. The 242square-mile IEUA service area is in southwest San Bernardino County in the Santa Ana River watershed, overlying four groundwater basins. IEUA's larger Region of Interest (Figure 2) extends into eight states and includes the watersheds of the Colorado River, the San Francisco Bay/Sacramento-San Joaquin Delta, and the Klamath-Trinity Rivers, all of which are sources of water for Metropolitan Water District of Southern California (MWD), the supplier of imported water to IEUA and other agencies in the Santa Ana River watershed. Within the Region of Interest, the watersheds and groundwater basins that provide the local supply sources for IEUA and MWD member agencies and other Santa Ana River agencies make up the "local Region of Interest" (Figure 3). This area generally corresponds to the area referenced in the California Water Plan as the South Coast Hydrologic Region.

IEUA's Region of Interest is complex and difficult to assess, but the water supply linkages to faraway watersheds clearly affect IEUA's ability to sustainably provide water. As for all



Figure 2. Inland Empire Utilities Agency Region of Interest



Figure 3. Inland Empire Utilities Agency Local Region of Interest

water suppliers on California's South Coast, these linkages necessitate a regional-scale analysis.

Example 2: Sonoma County Water Agency

Sonoma Water is a wholesaler of potable water, servicing nine primary customer municipalities in Sonoma and Marin Counties and a population of approximately 600,000. Sonoma Water's Region of Interest includes its water supply source areas and the watersheds and groundwater basins in Sonoma, Mendocino, and Marin Counties that influence and/or are influenced by its management decisions.

Sonoma Water's primary supply source is the Russian River watershed. Sonoma Water relies on reservoirs created by two federal dams in the Russian River watershed: Lake Mendocino in Mendocino County and Lake Sonoma in Sonoma County.

The Region of Interest includes source waters relied on by Sonoma Water's customers, such as Marin Municipal Water District's water from the Lagunitas Creek watershed. The Eel River watershed is included because Pacific Gas and Electric Company's Potter Valley Diversion diverts water from the Eel River into the East Fork of the Russian River, at times representing a significant supply to the upper Russian River.

Thus, the Region of Interest for Sonoma Water integrates its physical watersheds, its water sources, retail service areas, and regional political jurisdictions (**Figure 4**).

Context

A water supply agency's potential to achieve sustainability is highly dependent on the opportunities and constraints created by its specific geographic and legal setting. As noted previously, the context evaluation illuminates the Profile Subject's interdependencies and

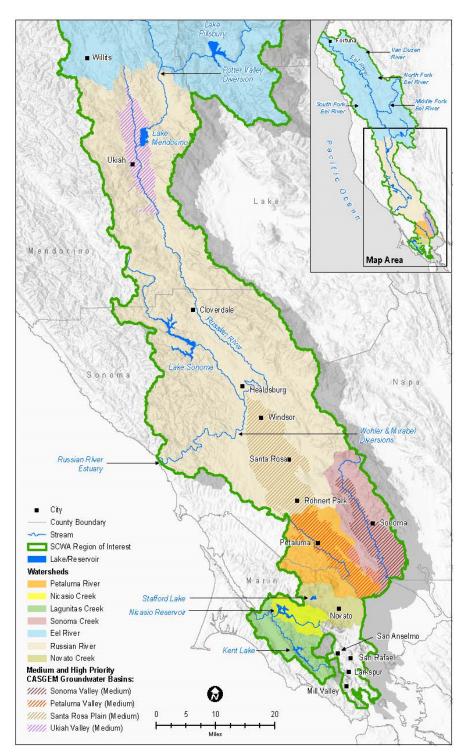


Figure 4. Sonoma Water (Sonoma County Water Agency) Region of Interest

defines its Region of Interest. Context is described narratively and graphically along with maps of the Region(s) of Interest. For the pilots, the context section

included qualitative and quantitative information characterizing the following elements:

- The Profile Subject's water management responsibilities. Both pilot Profile Subjects were wholesale suppliers with multiple mandates beyond providing potable water supply, including wastewater treatment and stormwater management.
- 2. Suppliers, customers, and member agencies, as well as the entities in their region that affect regional supply sustainability.
- 3. Water sources; that is, the surface watersheds and groundwater basins used for water supply by the Profile Subject and its member agencies, as well as those of other users within their service areas and source watersheds.
- 4. Supply and demand information, segregated by supplier and user type in different water year types.
- Basic hydroclimatic information (temperature and precipitation) in the service area and source watersheds.

Stress levels

The SWM Profile calculates a stress level for each of 10 stressors. based on evaluating one or more metrics against scoring thresholds. Stress level results can be High, Moderate, or Low. Because it is often difficult or impossible to justify a more sophisticated evaluation of a stress level (e.g., the "distance to target" approach), the SWM Profile uses these three categorical results for the stress level analysis. Each stressor has a scope of analysis (e.g., local Region of Interest) indicating what

geographic parts of the region and entities or features are to be evaluated. In many cases, the scope of analysis includes only a subset of the entire Region of Interest, so that the most important drivers of the overall stress level can be captured, while reducing the effort required to complete the assessment.

Table 1 lists the stress level metrics.

To reiterate, although the SWM Profile does evaluate stress levels affecting a water supply agency, these stress levels do not affect how the tool rates the agencies. Rather, each participating agency is judged by the SWM Profile for how it responds to the stress. This approach to scoring emphasizes the management response to the stressors.

Table 1. Stress Level Metrics for the Sustainable Water Management Profile

Theme	Stressor	Metric
Environment	Natural Hazards	Water Supply Exposure
	Climate Change	Climate Risks to Water Supply: Snowpack-dependence of Water Supply
		Climate Risks to Water Supply: Percent of Water Supply at Risk from Sea Level Rise
		Climate Impacts of Water Supply: Reliance on Non-Renewable Energy Sources
	Sensitive Species	Sensitive Species Constraints on Supply Operations
	Watershed Health	Freshwater Ecosystems: Native Fish and Frog Populations
		Stream Water Quality: Impaired Waterbodies
		Watershed Condition: Proportion of Land in a Pervious Condition
Supply	Supply Reliability	Portfolio Strength: Source Vulnerability
		Incidence of Unplanned Mandatory Delivery Cutbacks
		Future Need for Additional Supplies
	Groundwater Supply	Declining Water Levels
	Source Water Quality	Surface Water: Drinking Water Source Water Quality Impairment
		Groundwater: Groundwater Quality Impairment
Demand	Urban Demand	Residential Indoor Water Use
		Urban Outdoor Water Use
		Urban Water Demand: Future Use Trend
	Agricultural Demand	Acreage and Use Trends
Finance	Finance & Investment	Debt Coverage Ratio
		Days of Working Capital
		System Renewal/Replacement Rate

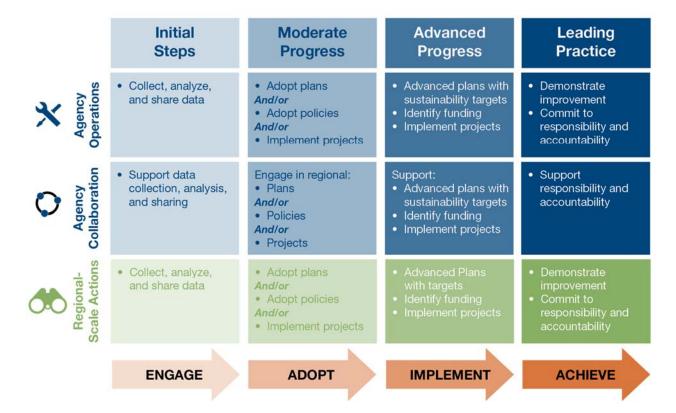


Figure 5. Management Response Framework

Management responses

The scoring of the SWM Profile emphasizes management responses to stressors, assessing the level and quality of actions taken to address each stressor based on specified criteria. This emphasis avoids penalizing agencies that are located in areas of high vulnerability, and it creates ratings results that can be improved relatively quickly through intentional action. The SWM Profile establishes a continuum of management responses along which Profile Subjects can progress, from initial recognition of an issue, to development of plans, to undertaking of actions and achievement of responses that advance water supply management toward sustainability.

As shown in simplified form in **Figure 5**, the management response framework includes three actor levels (rows) and the criteria associated with each of the four management response levels (columns). In the SWM Profile, each actor level's management responses are evaluated and rated against detailed criteria for each stressor:

- At the level of *Initial Steps*, a Profile Subject, its closest partners, and its region engage with potential vulnerabilities by collecting, analyzing, and sharing data.
- The Moderate Progress level requires stating or acting on formal intentions toward sustainability, in the form of adopted plans, policies, and/or projects.
- A major leap is required to achieve Advanced Progress. At this level, entities must define for themselves what the condition of sustainability means for each stressor, and set formal timelines for achieving those defined targets. They must also fund and implement tangible projects that help achieve those targets.
- At the level of Leading Practice, two additional challenges must be met: Some entity, not necessarily the Profile Subject, must have the responsibility and the authority to achieve sustainability target conditions; and progress toward achieving those targets must be empirically demonstrated.

Actions may be accounted for at multiple actor levels. For example, a Profile Subject could be working with another entity on a regional-scale activity to address a given stressor, allowing it to be accounted for in both the Agency Collaboration and Regional-Scale Actions assessments.

At the Leading Practice level, the detailed SWM Profile management response framework includes a criterion at the Agency Operations and Regional-Scale Actions levels requiring completion of an integrated benefit-cost assessment. The SWM Profile defines such an assessment as one that has a term of at least 25 years, assesses benefits and costs beyond water supply, and considers both economic and non-economic results of management decisions. An example of an integrated benefit-cost assessment that is used in the business world is a triple-bottom-line sustainability assessment, which covers economic, environmental, and social factors.

SWM Profile scoring and rating system

The SWM Profile Assessment is scored for each stressor and actor level based on management responses and adjusted based on stress level. It does not penalize Profile Subjects and regions for having higher stress levels; rather, a poor assessment would follow demonstrated poor management responses to those stressors. Conversely, the tool rewards Profile Subjects and regions that are actively managing to address higher stress levels.

The SWM Profile scoring combines stress level scores (High, Moderate, Low) and scores for management responses (N/A, Initial Steps, Moderate Progress, Advanced Progress, Leading Practice) at three different actor levels (Agency Operations, Agency Collaboration, and Regional-Scale Actions) to develop a single overall numeric score, which is then translated into a final rating.

The scoring protocol allows the evaluation to omit, without penalty, any stressor deemed not applicable for a particular Profile Subject. For example, if a Profile Subject does not use groundwater as a significant water supply source, groundwater considerations can be omitted from the Agency Operations level of analysis.

On the following page is an example SWM Profile rating result for IEUA, completed in 2017.

SWM Profile report

A SWM Profile report developed for each pilot included an introduction to the SWM Profile, a summary of the findings and rating, a description of the Profile Subject, a narrative context presentation and graphical presentation of the contextual data, a summary of each stressor's stress level and management response findings, and recommendations. Two different report formats were tested during the pilots. The report format used for Sonoma Water yielded 14 pages of print in booklet format (folded 8.5 x 11 in). The IEUA Technical Report format was significantly more expansive and included 48 pages of print in 8.5 x 11 format. To make the reports more visually approachable and accessible, color icons and forms were used to communicate content graphically and break up text.

SWM Profile Pilot Assessments

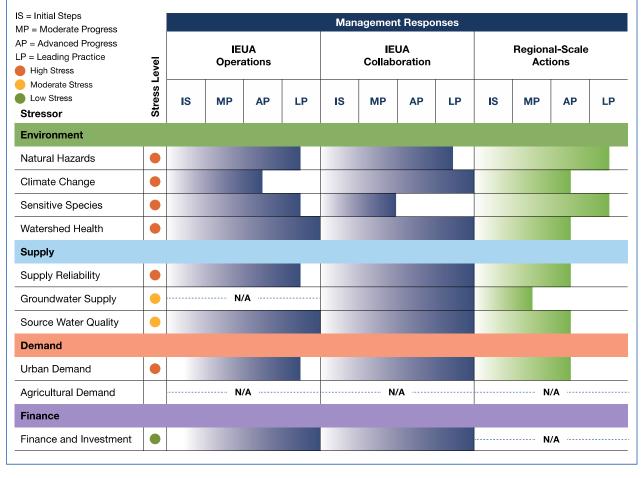
The agencies that piloted the SWM Profile, Sonoma Water and IEUA, are exemplary water suppliers and volunteered to help pioneer the SWM Profile. Both scored very well in Agency Operations and Agency Collaboration. Their vulnerabilities lie largely at the scale of their larger regions of interest. Over such large geographic areas, it is daunting for any entity to seek to reach measurable targets that could credibly achieve water supply sustainability, such as climate change mitigation and adaptation on a regional scale or aquatic species recovery at an ecosystem scale. Yet, this is the scale of action required to achieve water supply sustainability. A comment from IEUA's report could be applied to many water suppliers across the West:

Remaining vulnerabilities—climate change, watershed health, conflicts with species protection, and natural hazards—call for more action in collaboration with entities beyond traditional water management agencies, such as state and federal natural resource agencies, land use authorities, and stormwater agencies.

IEUA and its region earned a Gold rating

The following table summarizes Stress Levels and Management Responses for IEUA and its region. Stresses facing IEUA and its region, based on the evaluated metrics, are predominantly High. In response to constrained new supplies and vulnerable imports, IEUA, SAWPA, MWD and other water supply management entities within the Local Region of Interest are highly proactive, innovative, collaborative leaders in assuring reliable water supplies. IEUA demonstrates and supports exemplary management practices for many Stressors. Regional-Scale Actions, those which occur within IEUA's broader Region of Interest, are also commendably moving towards advanced management practices.





Lessons Learned

Based on the extensive outreach and interviews done for the SWM Profile, California and the West still need standardized evaluation tools for assessing the sustainability of water supply management. The SWM Profile provides lessons, approaches, and procedures that can inform the next generation of assessment tools.

Evaluate management response, not condition

If the desired outcome of a water management assessment tool is better water management, then emphasizing management actions as a basis for evaluation—as the SWM Profile does—has advantages over an approach that emphasizes biophysical or operational conditions. Better water management is achieved when an assessment evaluates management responses to address vulnerabilities, rather than just evaluating the vulnerabilities. It helps users see the impact of their actions, increasing the likelihood that the evaluation will provide a meaningful assessment and an actionable road map for improvement. Similarly, visually conveying the road map toward better management as part of the findings helps to achieve the assessment's intention to support improved water management.

Self-assessment with external verification is preferable

There are credibility issues when a water supply agency completes a self-assessment, and there are cost issues when a third party completes an assessment. The SWM Team concludes that a good compromise between comprehensiveness, cost, and credibility is to simplify the assessment to the point that a Profile Subject's staff can carry out the assessment itself, perhaps with assistance from a local academic institution, and have the results verified by a third party.

Context matters

The pilot Profile Subjects and the SWM Profile advisors and reviewers reinforced the importance of providing and evaluating hydrogeographical and jurisdictional context as an integral part of the assessment framework. In the pilots, context helped the Profile Subject better appreciate the specific stressors that it faces locally, regionally, and in distant watersheds, as

well as their interdependencies. Context is also helpful for the reader to better understand the assessment findings and recommendations.

Regional scope is essential but difficult

The breadth of forces affecting water supply sustainability, present at the global, state, regional, and local scales, demands that agencies be driven to consider how to respond within their authority, regardless of the scale of the forces at play.

Evaluating vulnerabilities and management responses across large geographies is extraordinarily difficult when the data for metric evaluation are held by multiple entities. Information may not be readily available for all areas or agencies within the scope of interest, or may also not be consistent across agencies or areas. These challenges must be considered when designing the specifics of an assessment tool.

The outreach and pilot tests confirmed both the importance and the difficulty of evaluating multiple levels of management response. For example, global climate change directly affects water managers, yet most water management agencies can play only a very small role in reducing global emissions. It is important that future applications of the SWM Profile shine a bright light on how even small roles, properly engaged, are fundamental to progress toward sustainability. Assessing whether managers are aware of forces outside their control and are seeking to engage in whichever way possible must be part of the tool's methodology to support change.

The necessity and difficulty of assigning a sustainable water management score to a Profile Subject and region based in part on regional factors that the Profile Subject cannot control is an inherent, unavoidable aspect of this endeavor. Profile Subjects resist being judged for factors beyond their control or even knowledge. In addition, the nexus between distant conditions and local sustainability is sometimes difficult to pinpoint. The SWM Profile and similar assessments encourage water supply agencies to examine their regional vulnerabilities. It was telling that, even though the two pilot applications of the SWM Profile relied heavily on information provided by the Profile Subjects, Profile Subject staff were generally unfamiliar with data or management actions at the scale of the Region of Interest.

Simpler is better, but not at the risk of misrepresentation

Completing a SWM Profile assessment, as currently designed, requires a significant investment of time and budget. Therefore, in its current construction, the tool will not be implemented broadly enough to advance sustainable management at a regional scale. However, oversimplifying the SWM Profile, such as by using only a set of yes/no questions, could lead to results that misrepresent the complexities of water management.

It is difficult for water or sustainability professionals to drastically simplify the complexities in their fields, but such simplification is essential to conduct assessments at a broad scale. Costs increase dramatically in the pursuit of the perfect metric or the most current dataset. Many topics must be left out. An assessment tool is a proxy for a complex reality: If the tool can capture the key essence of issues and actions, thus informing and encouraging more sustainable management, it is sufficient. Future versions would do well to be parsimonious in selecting stressor metrics and choosing only those for which data are readily available. Systems for simplifying the assessment of management responses are also desirable, though also daunting.

Progress incrementally

Water supply agencies confirmed the value of starting with less complexity and taking incremental steps. A new, untested assessment tool has limited appeal. Voluntary assessments like the SWM Profile that set a high bar must be phased in carefully, to garner support. For example, a "pre-assessment phase," in which participants are not publicly scored, may be needed to promote early adoption and widespread use of the tool. Based on the experience of the Water Foundation with the SWM Profile, it is not important to focus much on convincing a large number of initial users to participate. A better approach is to focus on making the tool work for the willing. Their experience

with the tool, and their support of it, will build a tool that becomes more attractive to others.

Postpone rating

It is a mistake to focus on an overall rating, grade, or score roll-up, instead of on the assessment's more meaningful narrative results. Focusing on one final score leads to time-intensive tinkering with scoring procedures and negotiating with Profile Subjects who are understandably nervous about the outcome. A roll-up score or rating should be used only if an assessment tool becomes a standard that is used by a significant share of potential users. Two examples of recent water sustainability assessments that do not use a rating system are the One Water One Watershed Plan³ and the California Department of Water Resources' (DWR's) Sustainability Outlook.⁴

If scoring is used, the procedure should be designed so that any numerical score presented does not resemble a percentage. The pilots demonstrated that water supply agencies will translate these into grades, which is not necessarily appropriate. Notably, percentage scores for a tool that sets a high bar will likely be low enough that readers will tend to translate percentages into failing school grades.

What Lies Ahead

Although the Water Foundation is no longer funding the development and application of the SWM Profile, the SWM Profile approach is being applied and modified in several ways, as described below.

The 2018 update of the One Water One Watershed Plan⁵ by the Santa Ana Watershed Project Authority includes a sustainability assessment, a much-simplified form of the SWM Profile that relies on 12 metrics for each of six goals. It echoes the SWM Profile in calling for the definition of sustainability to be defined locally and focusing the findings on management response, not condition assessment. The effort was a pilot

Pages/Programs/California-Water-Plan/Docs/Update2018/Final/SupportingDocs/Sustainability-Outlook-Indicator-Descriptions-and-Methodology.pdf.

³ Santa Ana Watershed Project Authority. 2018. *One Water One Watershed Plan Update 2018: Moving Forward Together, Santa Ana River Watershed*. Available: https://sawpa.org/owow/owow-irwm-plans/owow-planupdate-2018/.

⁴ California Department of Water Resources. 2019. Sustainability Outlook Indicator Descriptions and Methodology. Prepared by Stantec. May 2019. Available: https://water.ca.gov/-/media/DWR-Website/Web-

⁵ Santa Ana Watershed Project Authority. 2018. *One Water One Watershed Plan Update 2018: Moving Forward Together, Santa Ana River Watershed*. Available: https://sawpa.org/owow/owow-irwm-plans/owow-planupdate-2018/.

application for the California Water Plan Update 2018's Sustainability Outlook, which was released in July 2019.

The Pacific Institute is engaged in several efforts that key off the SWM Profile. They are developing a Guidebook for elected leaders on water agency boards and municipalities to foster sustainability in their water supply operations. The developers are using the SWM assessment framework to develop thought-provoking questions to help readers develop their own perspective about managing water sustainability at the agency and regional scale and thereby more effectively engage their staff on these issues. In addition, the Pacific Institute is working with two retail water supply agencies to develop and apply a SWM-based (or SWM-inspired) Profile tool for retailers, and members of the current SWM Team are serving on an Advisory team for this effort.

Portions of the SWM Profile can be taken up on their own to focus improvement in specific vulnerability areas. For example, a water supply agency concerned about how climate change in distant water source areas may affect its supply reliability could evaluate this vulnerability area, and its management response, using an approach based on or informed by the SWM Profile's climate change stressor.

There is growing interest in water sustainability and resiliency. In California, Governor Gavin Newsom signed an executive order in April 2019 directing the secretaries of the California Natural Resources Agency, California Environmental Protection Agency and the California Department of Food and Agriculture to develop a water resilience portfolio – a suite of complementary actions to ensure safe and resilient water supplies, flood protection and healthy waterways for the state's communities, economy and environment. This increased emphasis on water supply sustainability and resiliency in California's changing climate may stimulate interest in sustainability assessments among entities in the public sector (State Water Resources Control Board, DWR) and private sector (regional business organizations and the financial sector). The SWM Team invites conversations about improving the SWM Profile, applying its findings to other assessment efforts, and fostering the greater use of assessment tools for advancing water supply sustainability and resiliency.



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The SWM Team

The SWM Profile is a collaborative effort among experts in the field of water management and sustainability. The SWM team consulted advisors with nongovernmental organizations and in the private sector, sustainability program developers, technical experts, and water utility and agency advisors.

The SWM team consists of the following individuals:

Mike Myatt, Water Foundation

Elizabeth (Betty) Andrews, Environmental Science Associates (ESA)

Peter Vorster, The Bay Institute

Caitlin Cornwall, Sonoma Ecology Center

David Mitchell, M.Cubed

Mike Antos, Stantec (formerly with the Santa Ana Watershed Project Authority)

This paper may be downloaded from http://waterfdn.org/resources/swmprofile/.

