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Communication and the Narrative Basis of Sustainability: Observations from the Municipal Water Sector

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Abstract: Numerous studies attempt to operationalize sustainability and seek to characterize objective, or at least standardized, metrics of sustainable conditions and/or operations. In this paper, we suggest that sustainability is better viewed as an emergent quality, defined in terms of specific institutions and situations. Observations from the water sector suggest that sustainability is not merely a matter of "bolting on technologies", but a complex synthesis of institutional factors, social value perspectives, technologies and engineered artifacts, and natural or environmental conditions. The pursuit of sustainability appears to involve a process of broad-scale organizational transformation, a transformation that can vary significantly from utility to utility. Owing to this contingent quality, we suggest that sustainability is productively understood as a narrative construct. We illustrate how two types of discourse are particularly critical to the establishment and perpetuation of meaningful sustainability programs in water utilities and municipalities: (1) constitutive discourse, which frames and enables new ways of conceiving a particular state of affairs; and (2) transactional discourse, which provides a medium for participatory deliberation and enables the sharing of instructions and information necessary to carry out a transformation from the status quo to an envisioned future state. Although physio-chemical properties, ecological processes and thresholds, and technological factors must inform deliberations, we suggest that the realization of sustainability is at base a narrative enterprise. Observations articulated in this essay were derived through an ensemble research approach including a targeted literature review, a three-phase survey of 18 U.S. water utilities, and a workshop with water sector professionals, regulators, and experts in sustainability and organizational change.

1. Intruction

The water sector typically provides drinking water and wastewater services—including sewage treatment—for residential, commercial, and industrial customers. In industrialized nations, water systems are technologically sophisticated and costly to operate, typically consuming between 1% and 2% of a nation's gross domestic product. Energy use associated with pumping, treating, delivering, and preparing water accounts for nearly 13% of U.S. energy production [1]. In most countries, water systems are operated as public utilities, owned by a local or national government. In the United States, there are about 160,000 public drinking water systems and over 16,000 wastewater systems. Almost 85% of the U.S. population obtains potable water through these systems, and over 75% has its sewage treated by wastewater systems [2].

Water utilities have been the locus of much recent activity focused on the attainment of sustainable operations [3–6]. Water utilities confront formidable challenges as they maintain, repair, and expand infrastructure systems that supply clean water to their customers, collect and treat wastewater, and manage stormwater. These problems are exacerbated as pressures from population growth and related development increase, and new challenges such as climate change, unpredictable energy costs, environmental concerns, and aging water infrastructure arise. As these concerns converge, it has become clear to many utilities that a new approach to water system operations, which focuses on sustainability, is needed to help ensure that water providers will be able to meet the needs of the present, while retaining the ability to supply the quality and quantity of water demanded in the future.

Numerous studies attempt to operationalize sustainability and seek to characterize objective, or at least standardized, metrics of sustainable conditions and/or operations [7,8]. In this paper, we suggest that sustainability is better viewed as an emergent quality, defined in terms of specific institutions and situations. Owing to this contingent nature, we argue that sustainability is productively understood as a narrative construct. We illustrate how two types of discourse appear critical to the establishment and perpetuation of meaningful sustainability programs in water utilities: (1) constitutive discourse, which frames and enables new ways of conceiving a particular state of affairs; and (2) transactional discourse, which provides a medium for participatory deliberation and enables the sharing of instructions and information necessary to carry out a transformation from the status quo to an envisioned future state. While many would agree that communication campaigns are an important means through which to promote programs of sustainability, we suggest that the realization of sustainability is at base a narrative enterprise.

2. Research Approach

The research supporting this essay was undertaken as part of a study that the authors conducted for the Water Research Foundation and the New York State Energy Research and Development Authority, U.S.-based research organizations. The purpose of this study was to develop guidance for use by water

utility sustainability champions on how to transform the culture of their organizations in order to support ongoing programs of sustainable operation.

Our research approach included three basic steps: (1) a targeted literature review; (2) documentation of case experience shared by progressive U.S. water utilities; and (3) a practitioner workshop with focused review of factors found to influence organizational transformation in the water sector [9]. These research steps are described below.

Literature review. The literature review addressed three broad topic areas: (1) factors that influence organizational transformation; (2) cultural change as it pertains specifically to sustainability (in water utilities, state and local governments, and other organizations); and (3) practices that support sustainable operations at the level of the utility or municipality. Literature reviewed included fields such as organizational psychology, urban planning, leadership studies, public policy, public administration, management studies, and professional water system management. Our objective was to identify organizational factors documented to have either constrained or enabled organizational transformations toward increasingly sustainable modes of operation. Through the literature review, we identified a series of factors that have been documented to enable or constrain organizational efforts to transform their operations. Factors identified included organizational structure, staff motivation, management information system capacity, technical capacity, human resources practices, and others. Our utility survey (described below) was structured to query utility professionals on the degree to which these factors have played a role in their efforts to adopt sustainable modes of operation. One factor that emerged as especially critical to effective organizational transformation was leadership. Discussions of the leadership role seem frequently to emphasize the importance of "vision" or definitional pronouncements. In addition to factors that influence organizational transformation, our literature review also included a focus on communication tools, communication campaigns, and an emphasis upon internal and external communication as a means to mitigate constraints and facilitate factors that enable organizational transformation toward sustainable operations.

Utility survey and case studies. Case studies were synthesized from information captured through a three-phase survey with 18 U.S. water utilities viewed as progressive and accomplished with respect to sustainable operations. Utilities were selected based on a snowballing process informed through the authors' practitioner networks. Interviews were semi-structured and thematically focused, lasting approximately one hour. As mentioned previously, interviews were structured to emphasize utility experience in dealing with factors that enable or constrain organizational transformation toward sustainable operations, with an emphasis on communication-related efforts to mitigate constraints and facilitate enabling factors. Interview subjects were provided with background material and guidelines, but were encouraged to focus on areas of particular salience to their experience. Interactions with utilities typically included multiple staff, often representing different functional areas and different levels of hierarchy and responsibility.

Practitioner workshop. Findings synthesized through the literature review and case study process were consolidated into a white paper focused on organizational factors that tend to either enable or constrain water utility efforts to achieve sustainable operations. These findings were presented and critiqued by water sector professionals during a series of facilitated focus sessions at a two-day workshop, hosted by the New York City Department of Environmental Protection. Workshop participants included

utility professionals, municipal officials, experts in the arenas of sustainability and organizational change, and specialists in communication and education.

Our analysis of inputs gathered through the three research steps was qualitative and narrative. We did not attempt quantitative or comparative analysis of our inputs because our purpose was to list and explicate organizational factors thought to affect utility cultural change.

3. Deconstructing Sustainability

Over two decades ago, the Brundtland Commission [10] challenged governments, organizations, and citizens to act in a manner that meets the needs of present generations in ways that are economically viable, environmentally sound, and socially equitable, while ensuring that future generations have the resources to do the same. Put simply, sustainable development is about meeting today's needs without hampering future generations.

Although the Brundtland formulation provides a broad conceptual outline, it does little to operationalize the term "sustainability". Indeed, the quest to define and operationalize sustainability has proven long and circuitous. Alternative models of sustainability vary widely and incorporate a welter of meanings. The term is used in numerous disciplines and a variety of contexts [7,11–13]. Existing models of sustainability focus upon a variety of issues, including impairment of human health, diminished biodiversity, species extinction, violation of human rights, reduction in quality of life, and conflict with other values. Sustainability frameworks may or may not focus on greenhouse gas emissions, criteria air pollutant emissions, water quality parameters, regulatory violations, release of toxic or bioaccumulative substances, energy use, energy conservation, water use, water conservation, rates of resource extraction, environmental justice, fair trade, loss or depletion of habitat types, and a range of socioeconomic indicators. Sustainability initiatives can focus on a building, facility, economic sector, community, water body, watershed, state or province, region, nation, or even global-scale resources or processes [14,15]. Widely recognized models of sustainability include the triple bottom line [16], the "backcasting" approach [17], the natural step [18], the ecological footprint [19], Graedel and Klee's sustainable emissions and resource usage [20], Bell and Morse's systemic sustainability analysis [21], and Marshall and Toffel's sustainability hierarchy [8].

The water sector has not coalesced around a common, operational definition of sustainability. Nevertheless, leading-edge utilities have adopted the parlance of sustainability and are clearly designating numerous activities as consistent with "sustainable" water operations. Utilities, state and local governments, and other organizations have developed a wide range of plans that describe their sustainability challenges and present recommendations for addressing these issues [22–26]. In addition, a variety of authors and organizations, including government agencies, foundations, corporate planners, and experts in management and organizational change, have attempted to lay out frameworks to conceptualize and guide the formulation of sustainability programs [3–6,27–29]. These frameworks adapt different terminology, stipulate different process steps, and advocate use of differing tools.

The unsettled and ill-defined nature of sustainability is seen by some as a limitation on efforts to achieve meaningful sustainability [8,30–32]. The lack of a clear, operational framework has prompted some to argue that the prospect for widespread and robust sustainability in the water sector will go unrealized until utilities or their regulatory counterparts develop or adapt standards, consensus-based

best practices, or other authoritative "codifications" of sustainability. This push toward standardization is prompted by valid concerns. A sustainability consensus or standardized framework could help to avoid "greenwashing," spur technological development, and facilitate regulatory uptake and consistency [32].

The pursuit of sustainability appears to involve a process of broad-scale organizational transformation, a transformation that can vary significantly from utility to utility. In this paper we will share observations suggesting that sustainability is an emergent quality best addressed through a deliberative process. Our utility interviews suggest that sustainability in the water sector is not merely a matter of "bolting on technologies," but a complex synthesis of institutional factors, social value perspectives, technologies and engineered artifacts, and natural or environmental conditions.

4. Understanding the Narrative Basis of Sustainability

Linguistics scholars, philosophers of language, and literary theorists have long explored the ways in which language controls and enables the realities of social life. One of the seminal proponents of this so-called illocutionary view of language was J.L. Austin, whose classic "How to do Things with Words," introduced the concept of speech acts, or the notion that "by saying something, we do something" [33]. Building upon Austin, John Searle developed a theory of speech acts, in which he demonstrates how the utterance of a word or phrase serves to perform or otherwise realize a specified action. In Searle's view, speech acts can be assertive, declarative, commissive, expressive, or declaratory. The concept of discourse is central to this constructivist view of language and understanding. A discourse is a systematically interrelated set of statements. Discourses can serve many basic roles, including the constitution or representation of social, human, and natural realities. A constitutive discourse creates the possibility of something; for example, the rules of baseball create the possibility for baseball games [34]. Similarly, in his essay, "Declarations of Independence," Jacques Derrida explores how the drafting and signing of the United States Declaration of Independence can be understood as both an artifact of literature and, perhaps more fundamentally, as a political action expressed by means of a "performative" discourse [35].

The constitutive role of language has come under close scrutiny in fields such as organizational psychology, leadership studies, and public administration, where it has been documented that organizational transformation involves a visioning (or perhaps re-visioning) process through which a champion for change articulates (1) why the status quo is no longer tenable or acceptable and (2) how the organization can change to accommodate new conditions or contingencies. In other words, organizational transformation is facilitated and enabled through a process of representing experience in a manner that makes it resonate for others [36–40]. Frequently, this process of re-visioning is cast as a leadership role. As Howard Gardner writes, "[t]he ultimate impact of the leader depends…on the particular story that he or she relates or embodies…it is the leader who succeeds in conveying a new version of a given group's story who is likely to be effective" [36]. As Marshall *et al.* elaborate, "those in positions of power [must] "manage meaning" using symbols, rituals and stories to create a perceived legitimacy of their actions" [38]. This ability to use words, symbols, and other impressions is critical in the context of organizational transformation, such as changes associated with efforts to achieve sustainable operations.

Constitutive discourse, or the ability to tell compelling stories, is keenly important in the context of water sector sustainability because one utility's vision of sustainable operations may be very different

from that of another utility, although both may be legitimate [41]. For instance, "sustainable operations" in the context of a small, rural, surface water system will likely differ substantially from "sustainable operations" in the context of a large, urban, combined system. Utilities are adopting diverse models of sustainability, and include a variety of approaches, including increased utilization of renewable energy, adoption of conservation and efficiency measures, investment in green infrastructure, policies to adopt watershed-scale planning, low impact approaches to development, and utilization of decision frameworks such as lifecycle costing. Sustainability champions must forge a story of forward action that is more than merely a collection of projects and/or technologies. Rather, those seeking to compel fundamental and lasting change must develop persuasive narratives that embed contemplated actions within a value orientation that resonates with staff and stakeholders [37]. It is this narrative that enables an organization to take an "imaginative leap" toward sustainable operations [42].

5. Sustainability as a Product of Deliberative Rationality

In suggesting that the pathway to sustainability depends upon acceptance of a transformative or constitutive narrative, are we opening the door to definitional chaos? Isn't this merely another way of saying that sustainability is a subjective and non-scientific construct? More to the point, if sustainability is a matter of story-telling, how are we to distinguish genuine sustainability from the yarns of snake oil salesmen? We believe that there are at least two solid lines of response to this concern.

In the first place, all analysis involves judgment and derives from narrative points of origin, including statements of problem formulation, articulation of analytical assumptions, and the operationalization of data constructs. As Donald Schon has written, "problems do not present themselves as givens… When we set a problem, we select what we will treat as the "things" of the situation, we set the boundaries of our attention to it, and we impose upon it a coherence which allows us to say what is wrong and in what direction the situation needs to be [analyzed]" [43]. Although research and analysis may produce hard data and quantitative findings, these outputs are based upon a foundation of judgment, choice, and interest [44–46]. In other words, many types of rigorous research and analytical activities involve some sort of narrative foundation; in this sense, characterization of sustainability is no different than other exercises in systematic reflection and analysis.

Secondly, and perhaps importantly, to say that something is a narrative construct is not to say that it is not subject to rigorous formulation, review, and validation. In most circles of thought we have moved beyond the naive empiricist position that objectivity is a feature of brute phenomena. We now understand that objectivity is a highly socialized construct. As Jay Schulkin [40] puts it:

> *The most general feature of what one does when making an objective claim is giving a plausible story. One states one's beliefs (or those most likely to be challenged) and the reasons for the beliefs, making the case for their viability by persuading an audience of the merits of the claim and subjecting the beliefs to criticism. What is persuasive or warranted varies according to the subject matter. In one case prediction may be the persuasive factor. In another, it may be the perspicacious analysis of a text. In both cases, what makes it objective is that it can be criticized, tested, or challenged in some form. The inquirer makes a case to which the community of inquirers can respond.*

We have suggested that the journey toward sustainability must begin with a constitutive vision, a new perception toward which to strive. But the mere propoundment of a vision is not enough to carry through the long-term transformation necessary to achieve lasting sustainability. This is because sustainability is a wicked problem [47], involving a complex synthesis of emerging and established technologies, ecological and other natural thresholds, geo-chemical factors, shifting economic conditions, and of course, social and political values. In other words, although a constitutive narrative may serve to frame and "ignite" a sustainability movement, its implementation requires instruction, descriptive observation, discussion, and critique [48]. In short, the perpetuation of a sustainability program requires an ongoing deliberative process and venue.

Drawing on the U.S. National Research Council, Stern defines deliberation as "any process for communication and for raising and collectively considering issues… In deliberation, people discuss, ponder, exchange observations and views, reflect upon information and judgments concerning matters of mutual interest, and attempt to persuade each other" [44]. Further, there are principles and techniques that promote and govern "processes of deliberation that communities use to understand complex systems so that they can make informed choices while confronting multiple and sometimes conflicting…objectives" [44]. As articulated by Beierle and Cayford [49], recognition and application of principles such as the following can help to assure high-quality, non-distorted deliberation in the public sphere:

- Strive for broad-based deliberation; assure that parties to deliberations represent a wide spectrum of perspective, value orientation, interests, and knowledge of the situation.
- Strive to base the deliberations on available scientific data and information.
- Strive to make participants value positions known and explicit.
- Strive to assure that the deliberative process is transparent.
- Adopt rules or procedures for deliberative closure and reconsideration.

To be clear, we are not suggesting that these or any other package of deliberative principles will lead to a consensus position or "truth" concerning sustainable utility operations; indeed, we have already suggested that there may be many legitimate models of sustainability. Rather, we follow Brown [50] in arguing that sustainability and other modes of environmental management entail an explicitly adaptive and pluralist conception of values such as environmental stewardship, economic development, and social equity.

6. Establishment of an Ongoing Communication Infrastructure to Support Organizational Transformation and Deliberation

Achievement of sustainable operations at the utility scale is not a simple, single-dimensional transaction. Water utilities have adopted sustainability programs to address combinations of persistent and thorny issues, such as climate change, combined sewage overflow, aging infrastructure, and shifting socio-economic conditions. As we have already emphasized, multi-dimensional issue clusters such as these probably cannot be "solved" through application of standards, best practices, or existing policy mechanisms [47].

The uncertainty and complexity associated with these problems requires an adaptive and flexible management approach that can accelerate the learning cycle to enable rapid assessment and implementation of the consequences of new insights [51]. Utility representatives interviewed for this study used phrases such as "trial and error" and "learn as you go" to describe their journeys toward sustainable operations. Similar to findings from other sectors, organizational transformation in the context of water system sustainability frequently involves the execution of an "inquiry, learning, action cycle" through which ideas are raised and explored, methods piloted, lessons learned, and adjustments made [38,52].

Most of the utilities we spoke with confirmed that organizational change cannot occur in the absence of a thorough and focused communication effort, both within the utility and with external stakeholders (e.g., municipality and state agencies, nonprofits, educators, and the public). As outlined in Table 1, a meaningful transformation requires a shared comprehension and understanding of the reasons behind a utility's efforts to achieve sustainable options. It also requires a process of ongoing deliberation with regard to the viability of different technologies, processes, and policies. Utilities interviewed for this project have devised, adapted, and used a broad array of communication tools to animate staff, spread messages of sustainability, and create a means and environment conducive to deliberation and organizational learning.

Table 1. Communicative aspects of utility transformation to sustainable operations. Each of these communication objectives may require different communication tools and/or strategies. Sources: Based on a review of the literature on phases of cultural change [4,5,51,53–58].

Communication objective	Description
Raising awareness	Raising awareness of sustainability issues, benefits, policies, and programs
Increasing understanding	Developing a more in-depth understanding of sustainability-related issues, policies, and programs, including grasping the benefits of sustainable actions and the risks of not adopting sustainable approaches
Changing attitudes	Addressing value orientations or dispositions that may block or impede genuine consideration of sustainable alternatives to the status quo
Facilitating dialogue	Engaging in ongoing deliberation about water sustainability in order to learn by doing, adapt to unforeseen contingencies, and perpetuate efforts to achieve sustainable operations

The research conducted to support this study indicates that many water utilities are approaching sustainability as a communication challenge, and work to establish both constitutive and transactional modes of discourse among stakeholders. To illustrate water utility emphasis upon the communicative foundations of sustainability, the diverse approaches employed by three systems included in our study are summarized below [9].

Philadelphia Water Department—a stormwater management approach to sustainability. In 1999, the Philadelphia Water Department (PWD) integrated three historically separated programs—Combined Sewer Overflow, Stormwater Management, and Source Water Protection—into a single Office of Watersheds, with the goal of meeting the city's regulatory requirements while enhancing the health and aesthetics of Philadelphia's environment. Its "Green City, Clean Waters" [59] is a 25-year plan to protect and enhance the city's watersheds by managing stormwater through the use of green infrastructure. Internal communication approaches that helped promote success included:

- Focus groups with internal teams and departments to communicate the utility's goals, enable expression of concerns, and ensure that everyone was part of the transformational conversation. The ultimate goal was for all employees to see themselves as "ambassadors" for their programs.
- Use of internal newsletters, videos, and social media to provide a predictable, ongoing means of communication among and between utility employees.
- Recruitment and cultivation of "passionistas" among office staff who were enthusiastic about green infrastructure and tenacious in working for its implementation.

The PWD also initiated an outreach program intended to build understanding about the importance of sustainable stormwater management. Some of the outreach activities include:

- A website that provides interactive tools for consumers. For example, a "CSOcast" alerts the public to possible overflows from Philadelphia's combined sewer system outfalls. The Philly RiverCast provides a daily forecast of Schuylkill River water quality to tell residents when it's safe for recreational activities involving contact with the water. The website also provides videos showing green infrastructure projects and a map of all projects.
- Demonstration programs (e.g., permeable pavement, green roof) to show the feasibility and benefits of these actions and gain support both within and outside the PWD.
- Targeted education to schools, recreation centers, and other stakeholders. PWD conducts sessions when a green infrastructure project, such as a green street, is being built near a school or center in order to explain and demonstrate the project.

Tualatin Valley Water District—a green utility. The Tualatin Valley Water District in Oregon has emphasized the "greening" of its facilities, and has identified close to 200 utility-based sustainability opportunities, ranging from simple actions such as turning off lights and making double-sided copies, to actions that require extensive planning, management support, and financial investment [6]. These sustainability activities include (1) policies and utility-wide initiatives (e.g., hiring a sustainability coordinator); (2) energy efficiency and carbon emission reduction (e.g., installing a programmable heating, ventilating, and air conditioning system); (3) water efficiency within utility facilities (e.g., design and installation of water-efficient landscaping); (4) sustainable construction in new facilities (e.g., requiring Silver Leadership in Energy & Environmental Design (LEED) Certification); (5) sustainable purchasing (e.g., using life-cycle costing); (6) waste reduction and pollution prevention (e.g., instituting a paperless plan review process); (7) reducing/reusing/recycling products (e.g., cell phones, motor oil, uniforms); (8) transportation (e.g., using alternative fuels); (9) outreach and education (e.g., training new employees in sustainable practices); (10) community service and civic involvement (e.g., sharing unused property with the community for recreation purposes); and (11) employee attraction and retention (e.g., allowing alternative work schedules).

The utility recognizes that sustainability involves organizational change and that change can be difficult for many people. The utility's sustainability team has found that success requires listening to customers and stakeholders to discern their needs, speaking with passion about sustainability, modeling sustainable behavior, and targeting communication and education to the needs and knowledge of various audiences. A few of the more innovative communication practices include:

- Staff participation in a utility-wide "steering committee" that discusses alternative courses of action, considers investments, reviews policies, and authorizes program activities.
- Conducting sustainability training for all new employees. This training includes playing a DVD where utility employees discuss their sustainability activities.
- Requiring sustainability actions in each employee's job description. Since employee pay raises are merit-based, this helps to make sustainability a central topic of staff focus and provides an incentive to act in a sustainable manner.
- Engaging employees in face-to-face conversations about sustainability. For example, during staff meetings, the utility invites employees from different offices to talk about the sustainability aspects of their work.

Austin Water Utility—sustainability through water conservation and reclamation. Reflecting its arid setting, this Austin, Texas water utility has implemented an aggressive and far-reaching water conservation and reclamation program, which includes mandatory watering restrictions, a revised rate structure, use of reclaimed water, city-wide water conservation (e.g., through leak detection and repair), conservation incentives, and conservation education. Utility managers instituted a large public relations and education campaign to help gain utility and community support for this program, recognizing the importance of clearly communicating the importance of water conservation and how it benefits the community. In addition to an emphasis on one-on-one discussion, the outreach campaign included a number of innovative approaches, including:

- Consumer research to evaluate changes in water conservation attitudes. Findings are used to refine outreach strategies.
- Creation of a WaterWise Partnership that recognizes local businesses for their water conservation efforts, and a "3C Challenge" that offers recognition to customers who calculate their water usage, commit to change, and conserve water.
- Installation of "watering stations" in utility facilities that provide reclaimed water for employees to use to water their plants. Labeled with the phrase "Give your plants a treat—it contains nutrients plants love," the watering stations were installed to demonstrate to employees that what they perceived to be "dirty" water looks clean and has valuable uses.

Expanded school education programs, including a musical program for primary grades, fifth and sixth grade curricula on water conservation awareness and the water system, and an annual science expo that supplements classroom instruction with hands-on learning opportunities and community presentations by utility employees.

- The programs being orchestrated by these three utilities begin from different visions and utilize a variety of strategies and tools, yet all are designed to build upon a communicative foundation by means of which internal and external stakeholders can learn, question, and develop an active understanding of what it means to live with and operate a sustainable water system. Importantly, these communication campaigns are not merely instructive and/or directive, but include means to encourage exploration of the topic, enable give-and-take between utility actors and stakeholders, and support ongoing reevaluation of goals and approaches. In all cases, these tool sets appear to be constructed with the understanding that

they are part of an ongoing transformational process, not as a one-time mechanism for the broadcast of information.

7. The Upshot, Some Limitations, and Research Needs

Over 50 years ago, the political theorist, W.B. Gallie, introduced the idea of "essentially contested concepts" [60]. In simple terms, contested concepts are concepts that lack a broadly agreed-upon, fixed definition [61]. Different groups tend to define the concept in different ways depending on their interests, moral commitments, value orientations, and other factors. This overlap between the definitional characteristics and moral implications of a concept tends to render them especially contentious. Examples of contested concepts include notions such as "disability", "deviant", "superstition", and "democracy". It has been suggested that "sustainability" constitutes a contested concept [62].

Whether or not it should be viewed as "essentially contested" the concept of sustainability clearly constitutes a communication challenge. This is because the concept of sustainability is inherently complex, touches on moral and/or value-laden issues, and is difficult for many utility stakeholders to understand. Below, we summarize factors mentioned during our utility interviews that combine to make sustainability a deliberative challenge.

- *Diverse nature of sustainability*: As described earlier, the sustainability programs undertaken by different water utilities vary considerably. For example, some utilities focus their sustainable operations on practices that involve energy and water conservation within their facilities (e.g., recycling, energy efficiency, green fleets, and green buildings), while other utilities define sustainability as encompassing green infrastructure, land use controls, water reclamation, watershed management, decentralized water systems, and/or other approaches that enhance the community's water sustainability.
- *Ideological foils*: Sustainability programs often face ideological opposition, especially if associated with value-laden and divisive issues such as climate change, limitations on land use or development, or advocacy for governmental restriction.
- *Technical nature of the topic*: Water system sustainability is a complex, multi-disciplinary technical issue. It will likely involve technologies, concepts, and analytical methods that are unfamiliar to staff, customers, political leaders, and other stakeholders. These technologies and/or changes in operational practices are in a state of developmental flux.
- *Material impacts on all utility operations*: A comprehensive program of sustainability can affect nearly all utility operations, including procurement, engineering, maintenance, and facilities departments in addition to water and wastewater treatment.
- *Need for sustainability to be integrated across local governments—not just the utility*: The pragmatic context for implementing water sustainability is not just that of drinking water, wastewater, or stormwater utilities, but may also impact other functions of city and even state government. Sustainability programs need to cut across governmental silos, and leading cities are integrating sustainability initiatives across water, energy, transportation, parks and recreation, public works, and other departments. This means that deliberations cannot merely adopt established organizational protocols, but must be subject to ongoing negotiation and accommodation of differing operational viewpoints.

- *Broad-based impact on customers and rate payers*: A meaningful program of sustainability could affect all utility customers, possibly resulting in rate increases, mandatory conservation measures, recycling requirements, and land-use restrictions. Sustainability programs have also provided benefits such as enhanced open space, green jobs, public parks, and streetscapes.

In this paper we have discussed how achievement of sustainable water operations appears to involve an act of authorship, a story that describes an anticipated future state. But this is not enough. Achievement of ongoing sustainable operations at the utility level also requires a long-term communication effort to inculcate staff and stakeholders to new ways of thinking, teach new perspectives, and evaluate progress. Perhaps most importantly, it seems that communication campaigns must enable an inclusive, participatory process of deliberation. At base, we recognize sustainability as a social process that necessitates ongoing deliberation regarding choices between difficult and contentious courses of action. As Shrivastava and Hart write, "sustainability may be more of a journey than a destination: it is a social process requiring continuous…attention" [63]. We have expressed doubt that sustainability programs defined in terms of technological best practices and performance standards will provide lasting resolution for many of the problems that give rise to water utility sustainability programs, and suggest instead that sustainability may prove most durable if it is the focus of ongoing critical deliberation.

In this essay, we have been careful to couch our findings in appropriately tentative language. We readily acknowledge that the results of our work are not demonstrative. We believe our research and interaction with U.S. water utility professionals provides a variety of insights for the growing literature of sustainability science and policy. Although our essay focuses upon the narrative foundation for sustainability, it does not attempt to deconstruct the content or emphasis underlying any particular expression of sustainability. Literature in the arena of corporate social responsibility can be reviewed to provide approaches for characterizing how and why specific utilities have adopted particular narratives of sustainability rather than plausible alternatives. Research orientations such as stakeholder theory [64,65] and legitimacy theory [66,67] can be utilized to explore why specific approaches to sustainability seem to "work better" in some situations rather than others, supporting both theoretical and applied research efforts. Our work focused almost exclusively on U.S. water utilities. It would be illuminating to compare our observations with those derived from studies of other sectors and other national settings, especially in the developing world.

Conflicts of Interest

The authors declare no conflict of interest.

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