What's your story? Practitioners' tacit knowledge and water demand management policies in southern Africa and Canada

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Abstract

Water efficiency research has focused on consumption rates and the tools—for example, pricing—designed to modify consumers' demand. But municipal practitioners can also be a highly influential group and have been neglected in the conventional water demand management (WDM) research.

To understand better how to make WDM policy implementation more successful, practitioners "tacit knowledge" must be identified and examined. Tacit knowledge consists of deep beliefs and values about the way the world works and is important. Grounded in practical experience, tacit knowledge is informal, unspoken and often difficult to articulate. People may not even be consciously aware of their tacit knowledge; rather, their deepest beliefs and values operate as an implicit and unquestioned background understanding that shapes how they see the world and act within it. Tacit knowledge influences why practitioners are concerned about WDM, how they act on that concern and what they say about the issue when they talk to their colleagues.

Identifying and understanding the potential influence of tacit knowledge would be tremendously valuable for day-to-day practices in growing municipalities and for government agencies that are responsible for infrastructure and sustainable development. By understanding practitioners' learning processes, their rationale for action and the organizational cultures in which they operate, it will be possible to make more informed policy recommendations.

Keywords: Canada; Municipal; Namibia; Norms; Ontario; Organizations; Practitioners; South Africa; Tacit knowledge; Toronto; Waterloo; Water demand management

"The stone in the water knows nothing of the hill which lies parched in the sun."

African proverb

"Children of a culture born in a water-rich environment, we have never really learned how important water is to us. We understand it, but we do not respect it."

William Ashworth, *Nor Any Drop to Drink*, 1982

1. Introduction

As urban communities grow and as the climate changes, existing water and wastewater infrastructures will undergo increasing strain and will become unsustainable. Eager residential developers, homeowners and politicians will increasingly press municipalities to expand these infrastructures; capital costs will threaten to overwhelm municipal budgets. Some municipal governments are using water-efficiency policies, including water demand management (WDM), to improve the sustainability of their water use. This strategy can maintain or reduce municipal water consumption, defer some capital investment and infrastructure expansion and aid adaptation to climate change.

The municipal practitioners responsible for implementing water-efficiency strategies are crucial to the strategies' long-term success; and yet, they have been sorely neglected in the research on water efficiency and governance. Most water-efficiency research has focused on the public's water-consumption rates and the tools (such as pricing) designed to modify that consumption. But municipal practitioners, as individuals and as professionals, can be a highly influential group and there are some exciting examples of their innovation and initiative.

The critical factor that needs to be explored is the "tacit knowledge" found among the water-management practitioners. Tacit knowledge consists of deep beliefs and values about the way the world works and about what aspects of the world are important (Polanyi, 1966; Ambrosini & Bowman, 2001; Gertler, 2003). Usually grounded in practical experience, tacit knowledge is informal (i.e. not written down), unspoken and sometimes almost impossible to articulate consciously. People are often not even aware of their tacit knowledge; rather, their deepest beliefs and values operate as a kind of implicit and unquestioned background understanding that shapes the way they see the world and act within it. In the case of efficiency-minded municipal practitioners, tacit knowledge shapes the reasons for their concern about water conservation, the ways in which that concern is acted upon, the ways in which that concern prompts adaptations in day-to-day practice and the things said about this concern in discussions with colleagues.

To the extent that tacit knowledge can be explicitly articulated at all, it is conveyed using ambiguous language that must be carefully assessed and interpreted. Among practitioners pursuing water efficiency, evidence of tacit knowledge can be found in stories about personal experiences of the natural environment and water, the reasons given for caring about water efficiency in the workplace, the specific water-conservation adaptations that are implemented and the network of professional relationships within which work and information exchange take place.

An understanding of this tacit knowledge and its potential applications would be tremendously valuable to growing municipalities responsible for the improvement of water-management practices and to provincial and federal governments responsible for infrastructure and sustainable development. Investigations into practitioners' learning processes, rationales for action and organizational cultures will promote more effective water-policy recommendations at the national, provincial and municipal levels.

This article reports on research that investigated the knowledge used by water demand management practitioners in several southern Africa and Ontario municipalities. It includes a brief review of the literature on WDM and knowledge management, a description of the research methodology and results and a discussion of the conclusions that can be drawn from this research.

2. Conventional water demand management knowledge

Conventional water demand management (WDM) has traditionally been understood as a toolbox of strategies used to increase the efficiency of water use and to reduce consumption rates in areas where there are competing rural and urban, agricultural and industrial, ecological and residential users (Baumann *et al.*, 1984; ICWE, 1992; McKenzie *et al.*, 1999; Vickers, 2001). These strategies include pricing and technical innovations; social innovations, such as those concerned with institutional and legal arrangements; and interventions to shape consumer education and awareness (ICWE, 1992; Winpenny, 1994; Rogers *et al.*, 2002).

Multiple assessments, by numerous researchers since the 1980s, confirm that substantial obstacles exist for WDM implementation (for example, Geller *et al.*, 1983; Baumann *et al.*, 1984; Brooks & Peters, 1988; Rogers *et al.*, 2002). Yet, our understanding of how researchers and policymakers can overcome these obstacles and make WDM strategies more successful remains inadequate: what constitutes good governance, enabling environments and capacity building for WDM is still ambiguous. How we can effectively realize these outcomes is also unclear.

One suspects that an underlying problem is that explicit knowledge, upon which the conventional understanding of WDM wholly relies, is insufficient-but-necessary (Mackie, 1965) to sustain WDM momentum and programmes (Wolfe, 2006). An understanding of WDM practitioners' tacit knowledge will help to explain implementation problems and to make water-resource strategies more effective in the long-term, but the research along this line of inquiry is limited.

Some research has focused on the perspectives of resource managers (e.g. Sewell & Burton, 1972), but less attention has been given to WDM practitioners' perspectives or to the influence of their social context on water management in general, or WDM specifically (Sewell & Burton, 1972; Sawyer, 1983; de Young & Robinson, 1984; Wescoat, 1986, 1987). No research has articulated the tacit knowledge held by WDM practitioners or applied this framework to a comparative analysis between northern and southern case countries.

Closing this research gap is important because it could help ensure that WDM will be implemented more proactively in the short-term. It could also help sustain WDM policies in the longer term. The various institutional factors—such as political will and available finances—will undermine WDM programmes if researchers fail to consider how WDM practitioners define and use their knowledge, how they transmit their data, information and knowledge and how they innovate.

3. Tools for exploring water demand management knowledge

3.1. Concepts in knowledge management

It is important to distinguish between data, information and knowledge because they are not interchangeable concepts. Davenport & Prusak (1998) explain the differences: data are context-neutral, often randomly organized and move easily through both hard (e.g. wires, letters, etc.) and soft (e.g. conversations) networks. Bits of data become information when they are contextualized, categorized, calculated, corrected and condensed. Information is more organized than data and its form determines how it is transferred, while the recipient determines its value. Information is transformed into knowledge when there is a recognized problem and an environment in which the information can be

altered (Alaerts, 1996). The transformation from information to knowledge occurs through activities such as comparison, conversation and the determination of consequences and connections (Davenport & Prusak, 1998).

Decades ago, Polanyi (1966) disaggregated knowledge into its sub-types of explicit and tacit knowledge. Explicit knowledge still dominates because our mechanistic, problem-solving society tends to divide a question into its component parts (Norgaard, 1994). Explicit knowledge is also preferred because it is based on evidence and is communicated with an established, "global" language—such as that found in engineering or mathematics—which can be easily captured in instructions or formulas. These characteristics allow it to be readily conveyed to those who have similar frames of reference, including language and education.

Polanyi (1966:4, italics in original) proposed that as individuals, "*we can know more than we can tell*". This "tacit knowledge" is substantively different from explicit knowledge because it is more likely to be highly interpretive, informal and experiential. It is difficult to articulate and it is communicated with ambiguous language that attempts to capture deeply held or subconscious values, beliefs, attitudes, norms, conventions and behaviours within any given social environment (Ambrosini & Bowman, 2001; Gertler, 2003). These deeply held beliefs might not be fully articulated—for example, what the beliefs are, where they originated, or how they influence decision making.

Polanyi (1966:19–20) argued that tacit knowledge formed "an indispensable part of all knowledge", while, years later, Alaerts (1996:64) made the following observation:

"Information in itself is of low value and receives its meaning only through the context of tacit knowledge ... if no effort [is] made to simultaneously transfer the tacit knowledge to the projects, the new information cannot be interpreted and translated into action."

Both Polanyi (1966) and Alaerts (1996) recognized the interdependence of tacit and explicit knowledge: one cannot exist without the other. Tacit knowledge provides the context—the meaning, priorities and values, or how we understand the world—while explicit knowledge provides the tools that we use to act upon that understanding. Without the context of tacit knowledge, we would be an incoherent society, bombarded by information noise and without any means to understand each other. Where organizations are responsible for complex tasks, such as water policy implementation, the recognition and deliberate use of explicit and tacit knowledge could be critical (Al-Jayyousi, 2004).

3.2. Managing an organization's knowledge resources

By the 1990s, researchers and corporate leaders in North America and Europe recognized that the economic cuts of the 1980s had undermined valuable institutional memory and experience (King & McGrath, 2004). Strategies for organizing and retaining existing knowledge, while attracting and generating new information sources, became a priority. The questions included: how can knowledge be distributed within an organization or across boundaries; which individuals are best able to accomplish this task; and what are the barriers that prevent knowledge distribution?

Two knowledge management (KM) approaches have been used to address these questions in theory and practice (King & McGrath, 2004; for the influence of KM practices on knowledge development, see Boisot & MacMillan, 2004).

The first approach has been technical, with emphasis on the management of explicit knowledge and the use of new technologies, such as intranets and email (Michaels, 2004). The organization's primary

goal is to improve the availability, access, consolidation and reliability of data and information (Dinar, 1998; Måtensson, 2000; King & McGrath, 2004; Michaels, 2004). Data collection and transfer are relatively straightforward tasks with well-defined objectives and evaluation measurements (Burke & Moench, 2000). The challenge has been to maximize the data's utility by transforming it into information and knowledge and to create effective distribution methods.

But the existence of information does not guarantee its use. Knowledge acquisition requires interdependent elements of transfer, absorption and acceptance (Thompson & Stoutemyer, 1991; Grindle & Hilderbrand, 1995; Alaerts, 1996; Davenport & Prusak, 1998; Mårtensson, 2000; Martin et al., 2001; King & McGrath, 2004). Implicit in the conventional approach to WDM is the assumption that the greater the supply of information to practitioners, the more likely learning, decisions and adaptation will result. But research has documented that merely providing data and information does not ensure that projects or policies will be successful.

"Learning, which mostly upsets beliefs and habits in individuals and in organizations, is hardly likely to be embraced easily or enthusiastically, even though there is a growing and sometimes powerful, recognition of the need for change" (Michael, 1995:470).

The efforts of WDM practitioners may be perceived as threats to the organizations in which they work and to the implicit cultural norms of those organizations. This institutional resistance to change differs from conditions of insufficient political will, where politicians do not want to be associated with increased water charges, for example. The resistance to change can be entrenched in an organization's culture and identity. An organization's culture can be powerful and have implications for the actions of the individuals operating within its bounds (Sewell & Burton, 1972; Martin et al., 2001). This may help explain why the efforts to overcome WDM obstacles have met with such limited success.

Since the technical approach "rarely enhances the process of knowledge use" (Davenport & Prusak, 1998:142), it is the second approach – where knowledge is perceived to be a fundamentally human and social process – that is gaining some traction in research and practice (Senge, 1990; Borgatti & Foster, 2003; Al-Jayyousi, 2004; Schamp et al., 2004).

Two objectives underlie the effort to incorporate tacit knowledge into an organization's knowledge management strategy: first, to retain the rich details of each individual's tacit knowledge and, second, to ensure that other individuals can access that knowledge. The rationale is that successful organizations— including those in the public sector—improve productivity, efficiency, impact and the validity of their work by anticipating, generating and supplying tacit knowledge (Augier & Vendelø, 1999; Mårtensson, 2000; Martin et al., 2001; Carrillo, 2004; King & McGrath, 2004).

In the natural resource sector, there are some examples of organizations that have incorporated knowledge-management techniques (e.g. Boiral, 2002; Carrillo, 2004). But investigation of tacit knowledge specific to WDM policy implementation and programme sustainability has not yet been integrated into mainstream WDM research and practice. There is solid evidence for and general agreement about the tools required for WDM and the rationale for their use. There is much less information available about the people responsible for applying those tools. They are likely to be trained as engineers, working within a bounded rationality (White, 1961) and applying WDM, at least initially, because of a crisis situation (e.g. drought).

Insights from knowledge management, organizational theory and innovation diffusion encourage the exploration of new questions about the practitioners of WDM: their capabilities (skills and knowledge), their capacity (ability to act), their collaboration (social networks) and their commitment to WDM

(willingness to act). Only by exploring these types of questions will researchers begin to uncover the full picture of what takes place as a WDM policy or programme is implemented, or dismantled (see also Goucher & Michaels, 2004 for measures of commitment).

4. Methodology

The research described here included cases drawn from Ontario (the Region of Waterloo and the City of Toronto) and southern Africa (the Regional Municipality of Overstrand and the City of Windhoek). The cases were selected because they were undergoing rapid residential development—from pressures such as in-migration from rural areas, tourism and population growth—and had water scarcity or infrastructure-expansion concerns. These communities also had a history of WDM initiatives with varying degrees of implementation.

Prior to the interviews, the theoretical and applied literatures were reviewed and consolidated. This review incorporated theory from geography, planning, sociology and organizational management. The applied literature included policy statements and regulation from multiple levels of government in Canada, South Africa and Namibia and NGO programme documents. This literature was a rich source of information and included items such as project proposals, evaluations, financial reports, position papers, newspaper articles, training and capacity-building materials, interviews and internal project correspondence. The southern Africa and Ontario contact databases were derived from these documents and provided an initial set of potential candidates for interview.

The semi-structured interviews investigated:

- the participants' professional, educational and water-efficiency training and his/her personal experiences of water scarcity;
- water-efficiency responsibilities in the participants' organization and their successes and challenges, including any resolution strategies for organizational difficulties; and
- the professional network with which the participants exchanged information and knowledge about water efficiency.

The answers to these questions provided a picture of data and information transfer. They also supported the snowball sampling procedure for additional contacts and interviews.

The question schedule was designed to help the participant feel at ease. It started with low-risk questions related to education, professional affiliations and responsibilities, and professional participation in water-efficiency-related activities. The questions and responses became increasingly abstract, gradually leading into deeper questions about the ways in which the participant learned about water efficiency and the beliefs and values held by the participant about his or her role in water demand management and related environmental issues.

The primary (semi-structured interviews) and secondary (literature review) data were then assessed using a qualitative thematic analysis (Seale, 2004). A series of spreadsheets organized the data for each of the project cases and knowledge characteristics. These characteristics are presented in Table 1.

The knowledge characteristics were used to (1) identify what aspects of tacit water-efficiency knowledge were being used and (2) assess the possible influence of this tacit knowledge on programme sustainability and success.

Table 1. Characteristics of explicit and tacit WDM knowledge.

WDM process	Explicit knowledge...	Tacit knowledge...
Learning about WDM	Is easily verbalized	Is difficult to articulate
	Is easily conveyed through text	Is difficult to transfer by text
	Is learned through formal, one way communication structures	Is transferred face-to-face
		Is transferred through informal or small group discussions
		Is learned experientially
Practicing WDM	Is mechanistic	Use is motivated by multiple factors, such as duty, a desire to achieve excellence, and accountability to a professional network
	Use is motivated by desire to problem-solve	
	Uses quantitative formulas and strategies	
Proving value of WDM	Takes the form of quantifiable results	Takes the form of implicit personal, organizational and societal norms

5. Results of the characterization of explicit and tacit WDM knowledge

5.1. Evidence of explicit knowledge

Explicit knowledge is water demand management knowledge (McKenzie, 2004) and it dominates WDM discussion, practice and research. The information and knowledge used—whether it relates to water-pricing tiers as efficiency incentives or pipe-fittings for leakage control—can be easily expressed and conveyed through the language of numbers. Throughout the research interviews, participants easily and readily verbalized their explicit knowledge of water charges, consumption increases and declines, leakage and pressure percentages (Buckle, 2004; Gombos, 2004; Kasaczij, 2004; Pleasance, 2004; van der Linde, 2004; Gauley, 2006).

In the larger community, the understanding of WDM is easily conveyed through texts, such as national reports or municipal case study documents. Empirical results can be readily exchanged verbally at conferences, in meetings, through electronic media such as the Internet, or through formal learning activities (McKenzie, 2004). There are numerous WDM courses offered in southern Africa (McKenzie, 2004), such as the one conducted by the Training and Instructional Design Academy of South Africa (TIDASA) for municipal water managers (Forster, 2004; Raimondo, 2004).

This explicit information and knowledge is used to develop formulas that quantify the requirements for WDM and to develop strategies that solve WDM problems. Participants in both southern Africa and Ontario readily recounted the WDM problems they faced and the strategies they might apply to address these problems (e.g. a quantitative assessment of ability to pay and increasing block rates, as described by van der Merwe, 2004). Water demand management practitioners aspire to create successful programmes that are "evaluated not on theoretical [criteria] but on the actual [data]" (Kaszczij, 2004).

The use of explicit knowledge of WDM makes sense. Explicit WDM knowledge fits our society's definition of what constitutes legitimate knowledge; it can be conveyed across disciplines using the

language of numbers and those numbers can be further used to evaluate strategies and prove their value. In Hermanus, for example, van der Linde (2004) was quick to explain the value of his electronic system for monthly, quantitative monitoring of household water consumption. But this reliance on explicit knowledge has limitations. It does not take into account the variable responses to explicit knowledge; nor does it account for the motivation and other forms of tacit knowledge necessary to create new explicit knowledge or to apply existing knowledge.

5.2. Evidence of tacit knowledge

Do the WDM practitioners and advocates in southern Africa and Canada hold and use tacit knowledge? If that question were answered using only WDM documents, the result would be an unequivocal "No!". Project reports, government assessments, case studies and academic articles do not distinguish between explicit WDM knowledge and tacit WDM knowledge. But this absence of tacit knowledge was not unexpected; the literature is dominated by technical, political and economic discourse. While there is some discussion of social equity and moral obligation related to water allocation and basic water rights (e.g. McDonald, 2002), the broad, normative prescriptions concerning WDM are not connected in the literature to the tacit knowledge of the individuals responsible for WDM implementation.

The interviews conducted for this research, however, yielded evidence of tacit knowledge among WDM practitioners. While the researcher did not ask about "tacit knowledge" directly—with questions such as, "Does tacit knowledge exist in WDM?" or "How do you feel about learning, doing or implementing WDM?"—evidence was extracted from participants by asking them progressively more probing questions about their experiential learning, their motivations, their emotions and the norms that operated at the personal, organizational and societal levels. Other questions about how WDM information was transferred highlighted the value of face-to-face communication and informal discussions among friends, colleagues and mentors (Buckle, 2004; Chapman, 2004; Gombos, 2004; Hildebrand, 2004; Lavictoire, 2004; Pleasance, 2004; van der Linde, 2004). There were many similarities in the tacit knowledge of participants in southern Africa and in Ontario, Canada.

5.3. Experiential learning

Southern Africa and Ontario participants believed that involvement in a successful water efficiency programme was critical in the development and extension of their WDM knowledge (Forster, 2004; Hazelton, 2004; Hildebrand, 2004; Lavictoire, 2004). Additional knowledge relevant to WDM emerged from other life experiences: Matross (2004) acknowledged that had she not grown up in water scarce Namibia, she probably would not be as concerned about water issues; Fakir (2004) recounted memories of unexpected water shortages during his childhood in the western Cape; and Ontario practitioners discussed their experiences growing up on farms and having to rely on well water supplies. Forster (2004) explained the experience when he recognized the importance of a sufficient water supply:

"[I was working along the] Mozambique border surrounded by landmines and gunfire at night. . . [We were] walking into villages in the Transkei [to work. The villages] had been taken over by the PAC Youth armed gangs [who] held the councillors hostage unless we connected up their water supply. So they were pretty turbulent times."

Other, larger forces influenced the direction of some participants' experiential learning, attitudes and beliefs. Turton (2004), referring to the political turmoil in apartheid and post-apartheid South Africa, credited the uncertainty of the time for his ability to adapt and think critically:

"If I grew up in a time where there was great political certainty, I would not have been forced to use my mind. Because of the uncertainty… I've been forced to think… I could become a victim or an architect for things in the future. The thing that drives me is a sense of insecurity and the excitement of living on the edge. It's exhilarating but also very exciting…[These are] the social stresses that created the inquisitiveness in my life."

Turton (2004) believes that both his learning and his motivation to practice WDM came from uncertainty and insecurity.

5.4. Motivation

Practitioners had different motivations for pursuing WDM. In southern Africa, an active "sense of obligation" (Adams, 2004), "duty" (Rodkins, 2004) or "mission" (Fakir, 2004; Windhoek Official, 2004) were the most frequently cited explanations for involvement in WDM. Participants in both southern Africa and Ontario said they were motivated by societal goals, primarily within a national context (Rodkins, 2004); by a responsibility to the environment (Georgeopoulos, 2004, 2005); by their involvement in a professional WDM network; and their desire to contribute to that network's agenda or mandate (Hoko, 2004; Lavictoire, 2004). Hoko (2004), in an email to WDM colleagues in southern Africa, opened his message with a greeting to "All partners in the fight for WDM"; he wrote with a missionary-like zeal about a recent presentation in which he and a colleague stuck "to the WDM gospel [and] made some progress in converting some people and in provoking serious consideration of WDM". The participants were also motivated by professional recognition, by a desire to achieve excellence in their professional capacity and by a desire to make a valuable contribution (Kasaczij, 2004; Lavictoire, 2004; Windhoek Official, 2004; Manolakakis, 2005).

Motivation was a dynamic and evolving component of tacit knowledge among participants in southern Africa and Ontario. And if motivation influences WDM practices, then declining motivation will affect WDM success. An example comes from Windhoek. With obvious and unexpected grief, the Windhoek Official (2004) described the decline in his motivation to practice WDM after the departure of his supervisors and mentors:

"I'm starting to lack [motivation] as well. Because it's the environment, it's like you are fighting against a closed door…. Things have really changed…There was a time when I wanted to do it…But [*deep sigh*] I don't know… well, you see, when [my colleagues] were here…. "

5.5. Emotions

Participants' emotional response to questions about their WDM efforts was not anticipated. But across southern Africa and Ontario, these practitioners consistently and repeatedly alluded to their deeper motivations and the ways in which they identified themselves with a WDM movement.

In many of the interviews, discussion about participants' feelings about WDM became deeply poignant. Forster (2004) spoke with nostalgia and pride about the history of South African water engineers. He spoke of the "tremendous pleasure and honour" it was for him to work with them and referred to the debt that South Africans owed to these skilled engineers. This sense of a past and,

subsequently lost, golden age also pervaded the conversations with participants from Hermanus and Windhoek, but was not evident in any of the Ontario interviews.

Other responses in southern Africa and Ontario focused on a "passion" for water demand management (Chapman, 2004; Kaszczij, 2004; van der Linde, 2004). Turton (2004) described the WDM community in southern Africa as "very often not very loudly heard but often very passionate". Van der Linde (2004) considered this passion a key ingredient for successful WDM: he described his role and passion for WDM, as well as the frustration:

"I think that sometimes I'm expecting that everyone must have a passion for water demand [management]. And it's not like that. Other guys are making money and doing other things, so I must realize that I'm just one in a group."

Frustration, either expressed or implicit in participants' comments, was also a frequent emotion for individuals working in WDM in southern Africa and Ontario (Buckle, 2004; Hazelton, 2004; Kaszczij, 2004; Pleasance, 2004, 2006; Windhoek Official, 2004; Gauley, 2006). Turton (2004) believed the frustration was caused by two factors: a lack of influence and a lack of recognition:

"I think the reason that they are passionate [and frustrated] is because they are not heard and they have to be driven by something inside them because there are very few external stimuli that are going to give them enough positive reinforcement to continue to do what they do."

In Ontario, Bussato (2004) described the emotional, "intestinal fortitude" required to be a municipal WDM practitioner:

"You have to have a lot of intestinal fortitude to do these [municipal water efficiency programmes]. You do believe me because you get beat up [i.e. harassed] like there's no tomorrow. [*Interviewer: By whom?*] By everybody.

The true believers, they're OK but they are usually silent. So they're not out there backing you up so you're usually on your own. So the first couple of years like this it was like hell on earth, you know, to the point where I'm getting hate mail and I'm getting phone calls to my house and I'm getting threatened and all that stuff."

That citizens would send hate mail to a municipal WDM practitioner hints at the powerful attachment people have to their water consumption habits. A WDM strategy asks consumers to think, to evaluate, to reconcile and, if the strategy or mechanism is effective, to adjust water use significantly. This process will be difficult and practitioners will bear the brunt of society's resistance.

5.6. Values or personal norms

Among participants in Ontario and southern Africa, one of the personal values that appeared to support WDM initiatives was that of environmentalism and connection with the natural environment (Bussato, 2004; Gombos, 2004; Georgeopolous, 2004; Hildebrand, 2004; Kasczij, 2004; Lavictoire, 2004; Pleasance, 2004; Manakokis, 2005). What it meant to identify oneself as an "environmentalist" varied from one individual to the next. For some, being an environmentalist meant finding work that corresponded with one's environmental beliefs (Georgeopolous, 2004); for others, it meant buying water-efficient appliances (Kasczij, 2004; Manakokis, 2005). In southern Africa, planting xeriscape or indigenous gardens was an indicator of environmental sensitivity (Gumbo, 2004; van der Linde, 2004; van der Merwe, 2004). Other individuals rejected the environmentalist label completely but subscribed to an environmentally sensitive ethic where water efficiency is "just the right thing to do" (McKenzie, 2004). Gauley (2006), an Ontario engineer and expert on low-flow toilets, described his position in this way:

"I wouldn't call myself an environmentalist because I don't think we really need to sacrifice a lot of our comfort for these results...I'm not a fanatic [but] I don't waste water...I do it because it makes sense to not waste things. It just makes sense. My philosophy on life is for the greater good of society. For the good of society, does it make sense to waste things? When I was a kid, I worked in heavy construction and the guys would throw their coffee cups on the ground and I would pick them up. They would laugh at me. But who doesn't think that is wrong? . . . It's about respect. Do unto others, I always say [*laughing*]."

5.7. Organizational norms

Participants consistently identified three organizational norms supportive of WDM initiatives.

The first organizational norm is the presence of a professional network of individuals with similar values and attitudes who can agree on common goals, modes of operation and standards. The Canadian Water and Wastewater Association's Water Efficiency Network (CWWA-WEN) was suggested as an Ontario example, because "there's a fair amount of like-mindedness on it and a general abhorrence of anything that doesn't move things forward" (Pleasance, 2004).

The second organizational norm is the availability of leadership to provide a sense of mission and to sustain proactive WDM attitudes. A South African consulting firm (Tsinde Development Consultants, 2001:17), in its assessment of the Directory of Water Conservation at the Department of Water Affairs and Forestry, found:

"Where a leadership group lacks capacity in a concept that is their core function, those who are supposed to implement may develop negative perceptions and attitudes not because they are opposed to the concept, but because they are not receiving proper direction and leadership."

This idea about the importance of leadership, usually expressed as the need for a champion, was mentioned frequently in the African interviews (Buckle, 2004; Hazelton, 2004; van der Linde, 2004; van der Merwe, 2004; Raimondo, 2004; Turton, 2004; Windhoek Official, 2004), but was given less emphasis in Ontario.

The third organizational norm that supports WDM initiatives is a culture that encourages innovation. This was considered important whether the organization was an NGO or a municipal or state government. In response to the question of what he thought were the most important attitudes, behaviours, experiences or beliefs held by people who conserve water or support WDM, Hazelton (2004) proposed that individuals must "work in environments where original thinking and balanced risk-taking (rather than just following tradition) is appreciated". Further evidence of the importance of the organizational environment comes from the municipal government of Hermanus, where there is a culture of competition, territoriality and programme sabotage. Van der Linde (2004) said, "There will always be people saying that we are wasting time...I've heard through the grapevine that one of the Councillors said that this [WDM programme] is a gimmick . . ."

5.8. Societal norms

Societal norms also have a role in WDM. Fakir (2004) argued: "[When leaders] cultivate [a] set of norms and ways of behaving, the social mechanisms and instruments kick in. They naturally become ways in which people define their relations with each other". In other cases, societal norms were indirectly acknowledged: Pleasance (2004, 2006) railed against the competition between philosophies of conservation and economics that exist in North America. He perceived this competition

as a philosophical divide that transcended personalities and that originated (or was reinforced) within formal, disciplinary education and training (Pleasance, 2004, 2006).

Another issue, mentioned only in southern Africa, was the influence of international development agencies. In the international development milieu, there is a history of reliance on aid financing, which ensures that donors wield significant power over recipient governments (Norgaard, 1994). Forster (2004) observed that the water-efficiency community and some government ministries were repeatedly undermined by the priorities of international donors because:

"If the donor community come[s] in and [says] . . . 'Hey I'll sell you a whole bunch of cheap pipes here for a water supply system', then it's pulling the rug out from underneath us [the water-efficiency community]. The donors have to come together [on water-efficiency priorities] and they have to agree to back them up".

These social norms, reflected by individuals, intellectual philosophies and international development priorities, all influence the ability of WDM practitioners and advocates to implement WDM strategies successfully.

6. Conclusions

This research has considered how to identify tacit WDM knowledge and whether this knowledge can help us to develop and, more critically, to sustain WDM programmes. We adapted Gertler's (2003) and Polanyi's (1966) conceptions of tacit knowledge in order to explore this premise. Gertler (2003) agreed that tacit knowledge was a highly interpretive, informal, experiential and difficult to articulate. It is difficult to articulate because it relies on ambiguous language to capture deeply held (or subconscious) beliefs, attitudes, norms, conventions and behaviours within a given social environment. The exchange of tacit knowledge, therefore, is more likely when there is a common social context, including values, language and culture, often derived from shared institutions (Gertler, 2003). Such an exchange requires trust, face-to-face interactions and experience, where the learning cycle includes observation, imitation, correction and repetition (Polanyi, 1966; Davenport & Prusak, 1998; Gertler, 2003). This research developed a characterization of WDM knowledge by building on the attributes of explicit knowledge, as described in the literature and on Gertler's (2003) extended definition of tacit knowledge. The intent was to identify whether practitioners' tacit knowledge exists and, if so, whether it contributes to their decisions about water demand management.

Identifying the explicit WDM knowledge used by practitioners in southern Africa and Ontario was uncomplicated. However, what was intriguing about this research was that, without exception, every participant provided evidence of tacit knowledge. Even the most reticent participant indicated that he (or sometimes, she) held specific values, attitudes and beliefs related to WDM, or based decisions on particular personal, organizational or societal norms related to WDM.

Some individuals, often in southern Africa, recognized that their tacit knowledge originated from, or was informed by, their personal experiences of water scarcity. More often, individuals did not connect their tacit knowledge with their professional activities. This is unsurprising since tacit knowledge is often so subtle that individuals may not be conscious of their impact on their professional decisions, actions, values or expectations. In both situations, participants were initially reluctant to discuss aspects of their tacit knowledge. Only after a circuitous tour of their explicit WDM knowledge did the participants begin to recount the less tangible aspects of their personal and professional knowledge.

Yet it is important to identify tacit WDM knowledge because it may clarify the environment in which decision makers define, use and transmit their data, information and knowledge and ultimately help WDM policies succeed. Research has shown that tacit knowledge is critical because it increases the likelihood of the cross-sectoral and interdisciplinary collaboration and transfer of information that are required to overcome resistance to new ideas or policies (Gertler, 2003). Tacit knowledge can be used to overcome the WDM implementation obstacles. Social networks can facilitate the exchange and uptake of explicit knowledge (Polayni, 1966; Gertler, 2003). Rather than merely disseminating explicit data and information, WDM programmes should support and exploit practitioners' tacit knowledge.

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