# Capacity, Capability, Collaboration, and Commitment: How Social Networks Influence Practitioners of Municipal Water Demand Management Policy in Ontario, Canada

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**Water demand management (WDM) practitioners will always need sufficient political will and financial resources to implement their WDM agenda. In addition, however, this research found that those elements, even when supported by a local champion, are insufficient to initiate *and* sustain municipal WDM. The research results affirmed that social networks have dynamic structure and function. The network's function is critical to WDM because it establishes membership parameters (e.g., deciding who is included and excluded), facilitates and regulates information exchange (e.g., through defining research questions and undertaking a research agenda), and reinforces the community's knowledge (e.g., through meetings and articulation, either implicit or explicit, of priorities and norms). These findings support the premise that adjustments in WDM research and practice is valuable. The research has shown the Ontario network makes a significant contribution to generating additional data, information, and knowledge and is a source of momentum behind the implementation of a municipal water efficiency agenda. The results indicate that a closer focus on the individuals who are responsible for implementing programs is necessary to help make WDM programs more successful. Understanding the social networks of those actively engaged in WDM implementation will be essential.**

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A water demand management (WDM) approach has conventionally been understood as a set of strategies used to increase water use efficiency and reduce consumption rates (Baumann, Boland, and Sims, 1984; Brooks, 2006). It can complement supply-based strategies—e.g., the identification and extraction of additional water supplies—in areas where there are competing rural and urban, agricultural and industrial, ecological, and residential users (Brooks and Peters, 1988; de Loë et al., 2001; International Conference on Water and the Environment, 1992; McKenzie, van Rooyen, and Stoffberg, 1999; Rothert, 2000). More broadly, WDM can be appreciated as a water management strategy within a social innovation response to changing climate conditions (Wolfe, 2008a).

Conventional WDM focuses primarily on the tools required (*the how*) and the rationale for their use (*the when and where*). We still know very little about the people, or practitioners, responsible (*the who*) for applying those tools. They are likely to be trained as engineers (Brooks, 2004), working within a bounded rationality (White, 1961) and applying WDM, at least initially, because of a crisis or acute water scarcity. Only a few studies have examined decision makers' abilities and willingness to adopt, implement, and sustain WDM initiatives (de Young and Robinson, 1984; Sawyer, 1983; Wescoat, 1984, 1985).

Investigating WDM from the practitioners' perspective can provide valuable insights into WDM successes and failures. Practitioners are responsible for the design and implementation of policies and programs. Underlying their everyday decisions is a range of complementary or contradictory values, attitudes, and perspectives on what constitutes a problem, as well as perspectives on the nature and value of water (Emel and Peet, 1989; Hamlin, 2000; Nancarrow, Smith, and Syme, 1996–1997; Sewell and Burton, 1972). These practitioners' values, attitudes and perspectives are shaped, and actively reinforced, by their acquisition and

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use of knowledge and by their social network interactions. Yet we know very little about these people, how their social networks are structured, or how those networks function. Closing this research gap is important because the knowledge could help a WDM policy be more proactively implemented in the short term and sustained in the longer term.

This article describes one half of recent research on the social networks of individuals involved in municipal WDM. The larger, comparative research included data from southern Africa—primarily South Africa and Namibia—and from Ontario, Canada. The research objectives were to:

1. Describe the state of urban WDM policies and practices in the case areas;
2. Characterize the attributes of the social networks;
3. Evaluate its influence on WDM implementation; and
4. Recommend ways in which social networks can be used to promote WDM.

For the purposes of this article, the data presented focuses only on the Canadian WDM network. The article also includes a brief review of the water efficiency situation in Ontario, the literature on social networks, a description of the research methodology and results, and a discussion of the conclusions that can be drawn from the research.

## Water Efficiency Efforts in Ontario, Canada

The provinces are almost exclusively responsible for the water resources contained within their boundaries. These sources include both surface and groundwater. The provinces are responsible for regulating flows, authorization of water use (i.e., allocation), and for development, implementation, and enforcement of legislation related to supply management, pollution, and power (i.e., thermal and hydroelectric) (Kreutzwiser, 1995).

In Ontario, the focus on supply-side management of water has been shifting to incorporate water efficiency and conservation considerations since the late 1980s (Kreutzwiser and Feagan, 1989). For example, in 1992, the Ontario government undertook a series of initiatives aimed at encouraging water efficiency. This effort included:

- Public Information Awareness Program;
- Water Efficiency Education Program;
- Ontario Government Facilities Water Efficiency Program;
- Plumbing code changes;
- Demonstrations of household water audits (including energy efficiency and waste management) as part of the Green Community initiative;
- Industrial audits (as part of the Green Industry initiative); and
- Agricultural Water Efficiency (creation of a report and preliminary efficiency strategy) (Sharratt, Wardle, and Fiotakis, 1994).

Unfortunately, by the late 1990s, momentum for water efficiency was lost after the Ministry of the Environment cut its staff and decentralized management responsibilities to lower levels of government (de Loë and Kreutzwiser, 2005). The Walkerton crisis in 2001—when seven people died and thousands became ill after a community's water supply was contaminated by *E. coli* O157:H7—returned provincial water issues to the public's attention (O'Connor, 2002). Though the policy focus has been primarily on quality, the relevance of quantity—because of supply restrictions in groundwater-dependent areas, the relationship to high use and degraded water quality, and the expense of water infrastructure—has been given more attention (de Loë et al., 2001; Sharratt, Wardle, and Fiotakis, 1994). For example, the Ontario Ministry of the Environment has used the Permit to Take Water (PTTW) program to encourage water efficiency across different sectors. All applicants are now required to submit a Water Conservation Schedule. This form would include an account and a description of conservation practices that have, or will, be implemented, as well as any additional program approvals or certifications related to their water conservation practices (Ministry of the Environment, 2006). In some cases, the Ministry of the Environment *may* ask the applicant to verify that the additional water supplies could not be decreased by using water conservation methods (Ministry of the Environment, 2006; italics added).

Municipal governments also have a role in water efficiency decisions. In a national study by Waller and Scott (1998), 65 Canadian municipalities indicated that they have undertaken some form of water efficiency programs or policies. Subsequent research by de Loë et al. (2001) documented that the use of water demand management regulations (municipal ordinances or bylaws) is not uniform and some bylaws are used more extensively than others: regulations for water rates (66%) and lawn-watering restrictions (59.5%) were frequently used by the surveyed municipalities. Bylaws on building/plumbing standards (7%), mandatory

plumbing retrofit of high efficiency fixtures (4%), and sectoral restrictions, such as industries and recreation (4%), were less widely implemented (de Loë et al., 2001). Water management strategies are including, if not prioritizing, elements of WDM and applying these tools to municipal operations. The rationale for this inclusion may vary—a municipality such as Waterloo has an acknowledged chronic and physical water scarcity, whereas Toronto's rationale focuses more clearly on the financial savings associated with water efficiency. How the municipal practitioners respond to water efficiency efforts is the focus of this research.

## Networks

Research on social network structures and functions has increased substantially over the last decade and across many different disciplines. Insights from sociology, political science, mathematics, communications, geography, and management studies clarify social networks' characteristics and suggest how innovations are transmitted.

### Network Definitions

There are numerous definitions of social networks in use. A simple definition is a network as "a set of actors connected by a set of ties" (Borgatti and Foster, 2003). More nuanced definitions focus on the network's relationships, its spatial structure, purpose, or a combination of the elements. For example, a relational definition of a social network would be "the kin, neighbours and friends to whom an individual is tied socially, usually by shared values, attitudes and aspirations . . . [and which] may be spatially concentrated" (Johnston et al., 2000). This definition, from geography, delimits the network according to relationships among people who share similar ideas, and emphasizes those interactions that occur within a bounded geographic space. A purpose-driven network definition is exemplified by Stein et al.'s (2001) knowledge networks, which are formal, "spatially diffuse structures, often aggregations of individuals and organizations, linked together by shared interest in and concern about a puzzling problem." The objective of these networks is to solve problems by generating and disseminating knowledge, but a network is not exclusive to personal interactions, constrained by spatial restrictions, or limited to the level of the individual. In addition to shared values and objectives, relationships may also include issues of reciprocity and dependence, where the network is a "metaphor to describe joint situations in which more than one organization is dependent on another to perform a task" (McGuire, 2002).

For the purposes of this research, social networks are defined simply as "a collection of people, each of whom is acquainted with some subset of the others" (Newman, 2001). Underlying this definition are two assumptions: first, that to be acquainted implies the exchange or conveyance of information between and among individuals, and second, that social networks can be both personal and professional, with varying or evolving relationship forms.

## Methodology

### Process and Participants

Qualitative and quantitative data, extracted from interviews, electronic communications, and secondary documents, were used for this research. The baseline interview list was generated through a non-random selection of 31 names, based in Ontario, from the POLIS Project on Ecological Governance's database of Canadian WDM contacts. Individuals interested in, or actively involved in, water demand management had self-identified and contacted the POLIS Project to be included in the national list (Brandes and Ferguson, 2004). The 31 baseline contacts for this research project included federal and Ontario provincial organizations' representatives, municipal authorities, and other individuals (e.g., academic researchers).

A second round of interview contacts was generated as initial participants described the structure and composition of their WDM network. The second round participants were told that they had been suggested for the interview, but they were not informed of who had nominated them. This omission was to avoid influencing their network description. The data collection procedure and questions were identical in both rounds of interviews.

Data were collected using a set of semi-structured questions, and the questions were administered using in-person and telephone interviews, as well as email. Additional data were collected from the numerous documents related to the case studies. These documents were often used as a comparative baseline and to triangulate the evidence from the interviews and email correspondence.

Three sets of questions guided the discussion and correspondence. The first set explored each individual's professional, educational, and WDM training and his/her personal experiences with water scarcity. The second set focused on specific WDM responsibilities involved in the individual's

current professional position; the successes and challenges of a program or policy were discussed, including any resolution strategies for organizational difficulties. The third set focused on the individual's WDM network: the friends, colleagues, mentors, and challengers with whom the person exchanged different types of information and knowledge. This third set of questions served two purposes: first, it provided information on information exchange, and second, the names were also suggested as additional contacts for further interviews. In this way, the network was mapped using a "snowball" approach (Byrne, 2004), also called a "name generator" approach in the social network analysis literature, and extended through primary, secondary and, less often, tertiary contacts.

Throughout the interviews, the network relationships were broadly categorized as:

- *Friendship*, a social relationship that extends beyond the work environment;
- *Collegial*, a non-social, professional relationship existing in the work environment;
- *Mentorship*, relationship based on advice or guidance, usually professional; and
- *Challenger*, relationship based on debate and controversy, typically within the professional sphere.

Within these categorizations, modified from Rogers (1983), the participants were free to interpret their relationships as either one or the other or as overlapping.

### Methodological Challenges

The social network characterization was complicated by the imposition of a static structure on an inherently dynamic and evolving process. The data collected, particularly from the interviews, were highly subjective and reliant on individuals' memories, emotional state, interpretation, and overall comfort with the interview process. This methodological limitation is acknowledged but is also not unprecedented in field research. In the biological sciences, for example, a field transect methodology would not expect permanence of the identified population but would interpret the findings as representative of current conditions. In the social sciences, a similar position was articulated by Coleman, Katz, and Menzel (1957), Granovetter (1973) and, more recently, by Barabási (2002) and Wenger and Snyder (2000). The approach taken in this research was similar and recognizes that the results of a WDM networks study completed in 2007 would vary from the 2004 results reported here.

## Results

### Response Rate

The Ontario response rate was 80%. Thirty-one baseline requests were emailed, six requests (20%) did not generate a response, and 25 positive responses were received. One person requested an electronic communication; 20 in-person interviews and four telephone interviews were completed. Because the number of potential and actual participants in this study was small,[1] it was possible to include multiple interviews with participants: eight people had two or more interviews during the study period.

The combination of methods used in this research—i.e., the inclusion of both telephone and in-person interviews and electronic question options—has been used previously in studies focused on residential water consumers (e.g., de Young and Robinson, 1984; Hamilton, 1985; Nancarrow, Smith, and Syme, 1996–1997; Thompson and Stoutemyer, 1991; Trumbo and O'Keefe, 2001).

### Data Assessment

Upon conclusion of the interviews, the data were interpreted and assessed for their influence on networks, knowledge, and water demand management (WDM) implementation. Qualitative thematic analysis was used to analyze the collected data (Seale, 2004). The decision on what aspects to measure in the network characterization was a compromise. Because the network characterization was just one part of a larger project, it was not undertaken as a full "social network analysis" as it is understood in the literature, for example, as outlined by Hawe, Webster, and Shiell (2004). The researcher's priority was an emphasis on the social attributes of expressed relations between the participants. The assessment included measures of:

- the homogeneity in professional representation;
- how horizontal the connections were (i.e., whether links went up and down the power- and decision-making structure); and
- the level of integration (i.e., measured by overlapping and two-directional communication links).

Data were not collected to explicitly assess the institutional origins of the network—for example, the established political and policy structures for water management responsibilities in Ontario.

## Network Structural Characteristics

The network characteristics—outlined in the series of tables below—include both first- and second-round participants. Not all of the second-round participants could be located or interviewed; however, these second-round names played an important role in defining the social network's perimeter and illustrated the integration through the overlap of links. Central hubs were identified using the total of their incoming and outgoing links; the hub's self-identified relations (i.e., with whom they interact) reinforced or refuted their position within the network. If, for example, one participant gave a high number of contact names, but no one mentioned him or her in return, it would suggest that the person was not well, or actively, integrated into the network.

The WDM network is homogeneous, horizontal, and relatively integrated. The homogeneity and horizontal characteristics are important because they help determine the types of questions asked (e.g., a network of only engineers will tend to ask only engineering questions), while the level of integration can partially determine the potential for new ideas to infiltrate (e.g., the different ideas introduced from outside of the group). Table 1 depicts the professional affiliations of network members. These affiliations are indicative of the networks' homogeneity and horizontality (i.e., the professional affiliations of the network members).

The network identified had a core group of participants that were members of the Water Efficiency Network committee of the Canadian Water and Waste Association (CWWA-WEN). It was characterized as homogeneous because a large proportion of the core participants—i.e., those with the highest number of links—were municipal professionals who are practicing WDM (Pleasance, 2004). There are few references to external government participation or support, either provincial or federal. In fact, it was rare for representatives from the higher levels of government to participate in the network.[2] They are considered, at times, unhelpful in efforts to overcome the resistance to municipal WDM and to accomplish the research goals of the project-based network. Table 2 indicates that, although there are a large percentage of non-reciprocal links (i.e., uni-directional contacts named), there is also a level of reciprocity and overlap in Ontario. This link structure is likely due to participants' ongoing and monthly participation in the CWWA-WEN and its endeavors.

**Table 1.** Canadian participants' professional affiliations

| Professional affiliation | Ontario network (% of total) |
|---|---|
| Government employee | 5 (11.5%) |
| Municipal practitioner | 23 (53%) |
| Consultant/private sector | 8 (19%) |
| Academic | 4 (9%) |
| Local or regional non-governmental organizations | 2 (4.5%) |
| Other/unknown | 1 (2%) |
| Total number of participants | 43 |

**Table 2.** Characterization of network links

| Network characteristics | Number (% of total) |
|---|---|
| Non-reciprocal links | 45 (63%) |
| Reciprocal links | 26 (36%) |
| Total number of links | 71 |

The network is also spatially limited and based around a single WDM hub. The network's hub was linked to 24% of the rest of the network, i.e., was well-connected in comparison to other individuals. Finally, the links' spatial distribution in Ontario provided evidence of geographically limited networks. While the questionnaires and interviews did not specifically request that only local contacts be mentioned, only one respondent listed international WDM contact names and only two respondents provided contacts from other provinces.

## Network Relationships

This research characterized the multiple layers of relationships, specifically examining mentors, colleagues, friends, and challengers. Table 3 outlines the number of participants' links that were allocated to each relationship category. The subsequent text discusses the nature of individual relations and the role that they often played within the network's function.

### *Mentors*

Respondents indicated that their mentors have experience and a range of connections (Thompson, 2004) and fre-

**Table 3.** Categorization of network relationships

| Network relationships | Number (% of total) |
|---|---|
| Mentorship links | 5 (7%) |
| Friendship links | 6 (8%) |
| Collegial links | 58 (82%) |
| Challenger links | 2 (3%) |

quently act as information providers and as guides. This relationship could be likened to a master-apprentice learning relationship. Unlike leaders, who are charged with providing inspiration (Kotter, 1996, 1999), mentors provide ongoing support because they are "information reservoirs" (Hildebrand, 2004) and because apprentices feel that they can approach their mentor with questions as part of an ongoing interaction. When learning curves are steep, at the beginning of training or new professional work, the mentors are considered particularly important (Gombos, 2004; Schmitt, 2005). The mentor relationship is not static: apprentices increase their own knowledge, become colleagues, or even friends, of their former mentors, and sometimes emerge as mentors to other individuals (Gombos, 2004; Hildebrand, 2004).

### *Colleagues and Friends*

Even though the CWWA-WEN Chair insisted that the committee was "not a social club," participants stressed the importance of their network relationships (Pleasance, 2004). Lavictoire (2004), a relatively new WDM professional, found it heartening to suddenly find a group working on the same issues; it helped him to see new possibilities. For Lefrancois (2004), the relationships have become personal because "they share a passion" for what they are trying to do. Hildebrand (2004) suggested that good professional relationships, often deepening into friendships, allowed for the degree of comfort that was necessary for being open, the candid admission of error, and ultimately, a more productive sharing of information and knowledge. The importance of "enthusiasm" (Hazelton, 2004) and having "fun" (Manolakakis, 2005) are identified as critical factors for overcoming organizational problems and for generating sustained commitment to, or additional effort for, the WDM project (Manolakakis, 2005). Similarly, the "fun environment" of the CWWA-WEN meetings is credited by Pleasance (2004) for generating "a real strong sense of moving things forward." He added, "That's the feeling that I come away with every meeting—you know, we make a lot of progress in five or six hours." Good professional relationships were also credited for retaining people within the network or on their project (Kasaczij, 2004).

But these positive professional and friendly relationships, the underlying social capital (Putnam, 2000) or glue that holds the network structure in place, do not develop quickly and are not easily substitutable. Friendly, professional relationships, built over time through ongoing interactions and shared experiences, are essential. They serve not only to sustain existing momentum (e.g., finishing projects), but also—and this is critical—to spark new initiatives. Of course, not all staff turnover need undermine professional relations: people who move on from the WDM network could potentially extend the boundary and act as representatives for the agenda.

Face-to-face interactions were highly valued by many participants for three reasons: they are considered important opportunities for information exchange (Gombos, 2004; Hildebrand, 2004), they reinforced collegial relations and friendships, and they provided professional momentum under normal and extraordinary circumstances. Under normal circumstances, WDM practitioners frequently drew resources from their social network. Pleasance (2004) candidly said that the CWWA-WEN meetings and the interactions with his colleagues were "probably the most enjoyable part" of his job: "The camaraderie—it keeps me going." Lefrancois (2004) admitted that when she is frustrated, her small network of people working on water efficiency is "essential" to maintaining her momentum, energy, and commitment.

Under extraordinary conditions, such as the active dismantling of a WDM program or professional, internal-politics attack, social networks also provided invaluable support. An us-against-them mentality was easily kindled and individuals rallied their mentors, professional colleagues, and friends to generate strategies and supporting data or information, or to provide personal encouragement under difficult circumstances (Kasaczij, 2004; Lefrancois, 2004; Ontario Practitioner, 2006; Pleasance, 2004).

### *Challengers*

There were few admissions of challenger relations.[3] The researcher compiled off-hand, informal comments, but no verifiable, on-the-record data were collected; however, distinct "cliques" were identified (Ontario Water Consultant, 2006; Pleasance, 2006). Within the Ontario WDM network, different clique memberships could be defined, ac-

cording to Pleasance (2006) and an Ontario Water Consultant (2006), by motivation:

> It's the difference between people whose first motivation is to look after themselves versus people whose first motivation is to try to do the best that they can within their vocation, and by those individuals that want real data versus those that just want to stay on the sunny side of the street.

Pleasance (2006), for example, was highly critical of those individuals who set the water efficiency bar too low. He argued that they undermine the entire water efficiency movement:

> Simply put, they've gone about [their water efficiency programming] in ways that compromise their ability to maximize their water efficiency. In a lot of cases it's because they are not brave enough to take chances. And given the infant state of water efficiency in Canada, if you're doing anything, you are innovating. (Pleasance, 2006)

He cited an example of municipalities that were "just running programs" with the goal of attaining a set number of rebates. In this case, the success of the water efficiency program was evaluated on the basis of whether or not the number of rebates is achieved, rather than on how much water is actually saved or whether consumption is decreased.

These subtle challenger relationships had implications for the sustainability of any municipal project. Ontario Practitioner's (2006) intra-organizational problems provided an example: he refused to request support or ideas from the CWWA-WEN: "I don't have the trust with certain people to be able to do that . . . [and] because the group is so tight and closed, it is either trust all, or trust none." Another example came from an Ontario Water Consultant (2006) who had strong opinions and a wealth of expertise but is reluctant to speak on record: "If I lose six clients I lose my entire business." The differences in "life philosophy" among the WDM practitioners, and their related data priorities, were powerful forces in the Ontario WDM network (Gauley, 2006; Pleasance, 2006).

## Results Analysis

This research has shown that issues of capacity, capability, and collaboration are extremely important for WDM policies within Ontario. Yet these issues are often dealt with separately. For example, capacity studies examine the enabling environment within an organization, research on individual capabilities documents information and skills, and collaboration projects identify communication and cooperation. But the confluence and interaction of these issues is rarely examined. In water demand management, understanding—and influencing—this interaction is essential for generating commitment to sustained policy implementation.

### Capacity

There are numerous organization-level capacity issues for the municipalities attempting to implement WDM. There is insufficient funding (Soroczan, 2004) and, as re-iterated by Maas (2004), "a general lack of political leadership on water issues is the most challenging obstacle to furthering the progress of [demand side management]."

The research results supports Maas' general finding but also suggests that municipal WDM is undermined by:

- A lack of courteous communication and guidance from higher levels of government (Georgeopolous, 2004; Kasaczij, 2004; Pleasance, 2004);
- Narrowly conceived organizational mandates that restrict initiative, innovation, and partnership (Bussato, 2004; Etienne, 2004; Soroczan, 2004);
- Municipalities' "silo" approach to information management; and
- Dependence on outside consultants (Lavictoire, 2004; Soroczan, 2004).

Other factors include the dominant institutional norms, such as a supply-side perspective where "success is measured on pouring concrete and steel . . . [and] of all the engineering projects, water demand management is the least glamorous" (Turton, 2004).

Interdepartmental politics can be detrimental to WDM policy success. An Ontario Practitioner (2006) in WDM recounted that his region's water efficiency program has been a provincial leader and at the forefront of social marketing, water efficient housing programs, and other initiatives. Data showed that rapid residential growth has not resulted in corresponding water consumption increases.

The Ontario Practitioner, for the past ten years, had also successfully generated external partnerships and professional linkages, project funding, and has been widely recognized for his expertise and contributions to the water efficiency community. But his program is now being threatened. A new Commissioner of Finance (CoF) reduced the Water Efficiency program budget from $400,000 to zero, and only after internal negotiations was a compromise

amount (agreed for 2006 fiscal year only) of $50,000 reached. According to Ontario Practitioner (2006), the CoF has publicly admitted that he wants the Water Efficiency program "eliminated" because it is a threat to regional water revenues. Ontario Practitioner is now drawing from his professional network to generate strategies to address this internal threat. He remains "stupidly optimistic" that his budget for 2007 will be restored through successful negotiations or through new provincial regulations to an operational level (Ontario Practitioner, 2006).

Differing organizational priorities, or turf battles, can result in significant resistance to, or outright sabotage of, WDM policy implementation and program sustainability. For the individual working within these organizational constraints, the professional risks associated with pushing the WDM agenda can be high. The participants repeatedly emphasized that being a "true believer [in WDM]" meant adjusting that faith to fit within the organizational and political environment (Gombos, 2004; Lavictoire, 2004; Pleasance, 2004, 2006). These "true believers" considered themselves to be "anomalies" within their organizational structure, lacking support from their supervisors and often battling to push forward their agenda. Some felt they must check their enthusiasm or initiative by requesting only "realistic" support from their administration (Gombos, 2004). Finally, these individuals are challenged by the extra obligations and disadvantages of "pushing the envelope" (Pleasance, 2006). Schmitt (2005) acknowledged that there had been a financial disadvantage to being a leader in municipal WDM initiatives; the municipality was "testing" the various WDM strategies while other municipalities could learn from Waterloo's "mistakes."

The capacity to act described by the research participants provides more nuance and detail than the standard description of WDM implementation barriers. This multileveled assessment includes organizational and individual levels and the previously under-explored generalizations about political will, good governance, and enabling environments.

## Capability and Collaboration

Mentorship, collegial, and friendship relationships assist in the network's knowledge exchange and generate a positive feedback for additional knowledge creation and acquisition. The social network helps to reinforce knowledge acquisition by providing a recognized structure for ongoing, personal interactions and relationships. The social capital developed during this process, in turn, leads to the various forms of collaboration necessary to generate additional knowledge (e.g., through research partnerships) and helps overcome resistance to new ideas or policies (Gertler, 2003).

The Ontario WDM network that extends from the CWWA-WEN has become a highly proactive entity pushing forward the WDM agenda and research. This reaffirms March and Simon's (1958) well-established analysis that it is borrowing, rather than actual invention, from which organizational-level innovations most often result. The network structure is instrumental in generating necessary explicit knowledge—i.e., the facts and numerical data needed to make a strong empirical case for WDM—because it is a vehicle for ensuring that the necessary water-efficiency research is completed (Hildebrand, 2004; Kasaczij, 2004; Pleasance, 2004). By pooling small municipal donations, the network is able to contract research projects to generate the data required for their municipal programs. The Ontario WDM network also exerts, with varying degrees of success, pressure on government agencies, regulators, and manufacturers (Gauley, 2006; Gombos, 2004).

Within a network structure, the existing knowledge can also reinforce the inclusion or exclusion of individuals within the group. Network members perceived to only partially share the group's tacit knowledge[4] may be excluded from the development of deeper social capital (Putnam, 2000). The collaboration that occurs, or does not occur, within the network highlights the importance—if not the absolute necessity—of physical proximity. In our technical world, knowledge is thought to be divorced from space and time. Through technology, such as e-mail, the Internet, and even long-distance telephone, we assume an ability to access data, information, and knowledge from anywhere, at anytime, from anyone. This research, for example, began with a naïve assumption that the WDM networks would be global, thriving, and innovative, unhindered by spatial constraints. But knowledge *is* tied to space. Spatially-determined social networks influence the type, frequency, and mode of information and knowledge exchanged (Wolfe, 2008b).

Proximity matters because the ability to interact in person allows for a nuanced form of knowledge—a tacit knowledge held by the practitioners involved in the network—to be more readily exchanged (Wolfe, 2008b). While the network practitioners all indicated their use of electronic mail and telephone to exchange information (e.g., meeting notes or articles they had read), it was the in-person interaction that catalyzed projects or decisions by facilitating, and sometimes regulating, individuals' willingness to participate, initiate and sustain partnerships, share information, or provide

support to another network member. These findings provide additional evidence that for resource management to be successful, local-level interventions are often more viable. This is not only because the practitioners are more familiar with the resource constraints and critical issues, but also because they can be, or are already, embedded in the social networks required to generate the knowledge and momentum to implement decisions.

### Commitment

Finally, social networks can influence WDM by generating the commitment to, and momentum behind, the policy process and outcomes. The research results indicate that where social networks are inadequate or conflicted, individuals are more likely to become disillusioned and their willingness to support WDM declines. In contrast, individuals who were involved in WDM social networks and provided evidence of WDM knowledge exhibited a deeper commitment to the WDM agenda or philosophy. They indicated a willingness to go beyond their job description, mandate, or expectations; they also evaluated their colleagues on the basis of this commitment (Gauley, 2006; Georgeopolous, 2004, 2005). The professional costs associated with supporting water demand management can be high. WDM is considered to be a less glamorous and professionally limiting path (Adams, 2004), yet voluntary contributions to research projects often occur (Pleasance, 2006). Some respondents subscribed to the belief that personal adversity was not unacceptable in support of the broader WDM policy objective (Bussato, 2004). Adams (2004) summarized the importance of finding the necessary tools for ensuring WDM success: "At the end of the day, there are certain challenges in life and it mustn't stop you from what you need. You work around, or you work over or under it. You mustn't let somebody stop you."

Political will, enabling environments, financial reform, and the application of appropriate technologies: all of these elements are critical for realizing the objective of water efficiency and responsible use. But if we—the researchers, the practitioners, and the policy advocates—want to achieve our goal of sustainable resource use, we must find ways to support the commitment expressed by this study's participants.

## Conclusions

These research results support the well-established understanding that WDM practitioners need political will and financial resources to implement their WDM agenda. The results also suggest, however, that those elements, even when led by a local champion, are insufficient to initiate *and* sustain municipal WDM. The research affirmed that social networks have dynamic structure and function. Their role is critical to WDM because they set up membership parameters (e.g., deciding who is included and excluded), facilitate and regulate information exchange (e.g., through defining research questions and undertaking a research agenda), and reinforce the community's knowledge (e.g., through meetings and articulation, either implicit or explicit, of priorities and norms).

These findings support the premise that adjustments in WDM research and practice are valuable. The research has shown the network in Ontario is playing a significant role in generating additional data, information, and knowledge, and is compelling the implementation of a municipal water efficiency agenda. We need to focus more closely on the individuals who are responsible for implementing programs. To help make WDM programs more successful, understanding the social networks of those actively engaged in water demand management implementation will be essential.

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## Notes

1. The sample size was small in comparison to other projects that have investigated residential water efficiency knowledge, intentions, and attitudes related to environmentally appropriate behavior (for example, see Hamilton, 1985; Thompson and Stoutemyer, 1991; Trumbo and O'Keefe, 2001). The size was similar to the number of experts surveyed by de Young and Robinson (1984).
2. At the time of the field research (fall of 2004) there were no government representatives involved in the CWWA-WEN. Upon following up with the network in the fall of 2007, a provincial representative from the Ontario Ministry of the Environment was regularly attending meetings.
3. None of the five practitioners who expressed this opinion were willing to make that statement on the record, because the WDM community is very small.
4. Tacit knowledge consists of deep beliefs and values about the way the world works and about what aspects of the world are important

(Ambrosini and Bowman, 2001; Gertler, 2003; Polanyi, 1966). Usually grounded in practical experience, tacit knowledge is informal (i.e., not written down), unspoken, and sometimes almost impossible to consciously articulate. 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.

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