ORIGINAL ARTICLE

Women's "Choices" and Canadian Water Research and Policy: A Study of Professionals' Careers, Mentorship, and Experiential Knowledge

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This article is an investigation of the different factors that potentially influence the career choices of Canadian female professionals working in water research and policy (WRP). This community was broadly defined as any Canadian engineers, technicians, biologists, planners, economists, scholars conducting physical and social research, public servants (e.g., national, provincial, municipal), and civil society activists who were self-identified as working on water-related issues. Participants' essay responses were assessed by using an integrated comparative framework—drawing insights from economics, social network theory, environmental psychology, innovation, knowledge management, and pro-environmental behavior. Focus was placed on participants' responses about what motivated their careers, how this motivation sustained their professional participation over time, and whether different experiences with people and/or nature influenced their contributions to Canadian WRP. The data analysis indicated that female professionals draw on their relationships and experiential knowledge to make career decisions, sustain their career progression, and direct their career contributions. The analysis suggested that both recruitment and retention within the water community could be improved by providing recognition of alternative knowledge opportunities, including opportunities to develop skill mastery over existing or new skills, and experiential knowledge in nature for children, and by facilitating mentorship relationships and social networks. By doing so, these interventions would help sustain the availability of diverse knowledge resources held by female professionals within Canadian WRP.

An en masse retirement of the North American baby boomers (born in 1946–64) may have significant implications for the economy and availability of knowledge and skill sets in both private and public organizations (MacKenzie and Dryburgh, 2003; Schellenberg, 2004; Statistics Canada, 2006). In the water sectors, detailed retirement studies from the American, Australian, and Canadian water sectors show that impending retirements and human capital shortages present a real danger to the integrity of our water systems' operations [Barrett, 2008; Environmental Careers Organization (ECO) Canada, 2010; Lacey et al., 2006; Ladson and Austin, 2009]. These individuals represent "the brain trust of the nation's water providers" (Grigg, 2010, p. 91) and represent a wealth of formal education, informal learned knowledge about water systems, institutional history, and culture. But the industry is top heavy and male dominated, with most managers and senior personnel at age 50 years or older (ECO Canada, 2010; Ladson and Austin, 2009). In the next two decades, one might anticipate similar retirement and retention issues across all facets of water research and policy (WRP) as baby boomers retire or decrease their working hours (Barrett, 2008; MacKenzie and Dryburgh, 2003; Manning et al., 2008).

Impending retirements, combined with inadequate recruitment and knowledge retention, could severely erode the Canadian WRP community's human capital and, as a consequence, its problem-solving and decision-making capacity (Barrett, 2008; ECO Canada, 2010; Lacey et al., 2006; Ladson and Austin, 2009). These problems are well known, yet water-sector recruitment remains a significant challenge (Freek, 2010; Manning et al., 2008).

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Retention of existing knowledge—the formal and informal knowledge held by longtime and experienced employees—has also been identified as vulnerable during knowledge transitions. While organizations may acknowledge that retirements may impact their processes, few are actively preparing for the transition (MacKenzie and Dryburgh, 2003). Many water utilities have no programs or strategies in place to retain knowledge or transmit knowledge to incoming professionals (Blankenship et al., 2008; Hartvelt and Okun, 1991; Manning et al., 2008). Other research has indicated that this recruitment issue, when combined with sector retirements, could mean much institutional and experiential knowledge will be permanently lost (Wolfe, 2008, 2009).

This research focused on how to help lessen the loss of valuable WRP knowledge through recruitment and retention of Canadian female professionals engaged in water research and policy making. Participants—drawn from a snowball sample of Canadian engineers, technicians, biologists, planners, economists, scholars conducting physical and social research, public servants (e.g., national, provincial, municipal), and civil society activists who were self-identified as working on water related issues—were asked about what motivated their career choices, how this motivation sustained their participation over time, and how these motivating factors may have influenced their contributions to WRP.[1] The research objective was to understand how to recruit and retain professionals who offer multiple perspectives, knowledge, and skill sets within a rapidly evolving climate and water context. In short, how do we recruit women into WRP and, once they are in, how do we keep them over the long term?

In section 2, insights from multiple literatures were drawn on to develop the integrated conceptual framework based on factors of financial, education, values, and memories. This framework was then used to organize and assess the participants' responses as the qualitative data source for the analysis. Section 3 summarizes the methodology, whereas sections 4 and 5 present the data analysis according to the integrated conceptual framework and conclusions.

An Integrated Conceptual Framework

Life circumstances often bound the range of professional opportunities available to both men and women, but women often encounter particular obstacles to advancement along their chosen career trajectories (DeWall, 2006; Valian, 1999). Diverse, contentious, and dynamic literatures—for example, economics, sociology, business administration and leadership, social psychology—have focused on women's careers, their choices, and work–life balance. These studies have used qualitative and quantitative methods; case comparisons across professional sectors, such as law, medicine and academic research; and comparisons to males' career trajectories (Fels, 2005).

Based on rational choice theory, neoclassical economics suggests that people make decisions motivated by estimates of both the probabilities and the costs or benefits of available choices and outcomes. An individual's ability to maximize gain—usually expressed in monetary terms—and opportunities for future gains influences decision making. Disincentives—whether these push or pull women out of the marketplace or workforce—are a related economic argument to explain women's economic participation and "choices" (Fels, 2005; Stone, 2008). Illustrative cases have drawn from the private sectors like business, human resources/leadership, law, information technology, and engineering (O'Neil, Bilimoria, and Saatcioglu, 2004; Tortajada, 2003; Whitmarsh et al., 2007; Wilson-Kovacs, Ryan, and Haslam, 2006), and public sectors like education and medicine (Ceci and Williams, 2011).

For example, while the number of female engineering graduates is rapidly increasing, they leave the engineering profession far faster rate than male professionals (DeWall, 2006; Franzway et al., 2009). For female academics, the overlap between their pretenure years and early motherhood often impedes productivity, economic progress on the salary scale, and ultimately long-term career prospects (Finkel and Olswang, 1996; Perna, 2001; Trower and Chait, 2002). Chronic or palliative care of parents or in-laws, including cooking, cleaning, errands, bodily care, and medical appointments, also falls disproportionately on women regardless of their professional status or career stage (Marcinkus, Whelan-Berry, and Gordon, 2007; Mattei and Jennings, 2008; Radcliffe Public Policy Center, 2000). Even for women who are highly educated with commensurate economic power, the hiring and management of other women to provide service care for children or elders remain their responsibility (Devetter, 2009; Wolf, 2013).

Thus, variation in women's career trajectories has been partially explained by the diversion of time to child-rearing and family care; contradictions in cultural, biological, and institutional expectations (i.e., "chilly climates"); and inadequate economic incentives (Arun, Arun, and Borooah, 2004; Cohen and Bianchi, 1999; Coltrane, 2004; Fels, 2005; Hirshman, 2006; Statistics Canada, 2006; Stone, 2008).

Knowledge and organizational management studies have indicated that new employees can offer alternative values, perspectives, and norms to a professional community (Ambrosini and Bowman, 2001; Mostert et al., 2008). New employees, whether male or female, may contribute problem definitions and solutions by using knowledge that is interdisciplinary, experiential, gendered, or qualitatively different in other ways (Eaglys and Johannesen-Schmidt, 2001; Kennedy, 1997; Mostert, Craps, and Pahl-Wostl, 2008; Thagard and Kroon, 2006; Wolfe, 2009; Woolley et al., 2000).

These alternative "ways of knowing" could be highly beneficial, but the gender–labor–participation literatures suggest that women's early career participation does not always lead to—and should therefore not be confused with—a long-term availability of diverse human capital (Goldin, 2004; Hewlett 2007; Reskin and Roos, 1990; Turton, Schreiner, and Leestemaker, 2001). However, if valuable human capital can be retained, social network theories tell us individuals' professional communities can both shape and reinforce perspectives. An individual's perspectives are potentially shaped through their networks' knowledge acquisition opportunities (e.g., conferences, training, informal conversations) and through their network interactions (e.g., the extent or diversity of a network, as well as the types of relationships within that network) (Berry and Mollard, 2010; Pahl-Wostl, 2009; Wolfe, 2009).

The conventional, innovation-diffusion literature focuses on demographic factors such as income and education levels for their influence on idea adoption and behavior (Rogers, 1983; Valente and Rogers, 1995). Behavioral psychologists contribute information on conditioned responses (Lehman and Geller, 2004), social psychologists emphasize context and construct (Clayton and Brook, 2005) and cognitivists explore information-processing strategies and limits of rationality (Bazerman and Hoffman, 1999; Tversky and Kahneman, 1974). All of these perspectives are possible explanations for the influence of motivation on female professionals' participation and career trajectories.

Bridging these two approaches—the demographic characteristics of the innovation literature with the individual-level psychological responses—is the pro-environmental behavior literature. This perspective examines endogenous, motivating factors—such as individuals' values, norms and knowledge—and how these elements aggregate to influence group decisions about environmental management and resource use by groups and individuals (Armitage and Connor, 2001; Bamberg and Möser, 2007; Jensen, 2002; McKenzie-Mohr, 2000; Stets and Turner, 2010; Strang, 2004;

Figure 1. Integrative conceptual framework for research on Canadian water research and policy professionals.

Vining and Ebreo, 2002). Social psychology and theories of planned behavior tell us that values, norms, and knowledge then consciously and unconsciously influence career decisions and create a complex behavioral feedback loop (Northoff, 2010; Trumbo and O'Keefe, 2001).

As outlined in the afore-mentioned literature, there is a diverse range of explanatory factors (small circles in Figure 1) for women's professional career motivation, participation, and actions (center of Figure 1):

- Costs/benefits
- Education and information
- Social networks/organizations
- Value, attitudes, and norms
- Memories and experiences

These are the factors anticipated to motivate individuals to action, sustain their participation, and influence professional contributions within a WRP community.

In the assessment of female WRP professionals' career trajectories and motivation—with recruitment and retention goals for the WRP community in mind—an integrative conceptual framework (Figure 1) drew from the multiple literatures outlined earlier. In this framework, no single factor was differentially weighted, but the framework was used to organize the ideas and themes identified in the participants' essay data.

From the top of Figure 1 and moving clockwise, participants' essay data related to comments on the *costs and benefits* themes or ideas. Exogenous factors included the

participants' essay data related to their *education and information availability* and *social networks and organizations* factors. Responses within this category related to the participants' external characteristics (e.g., their education or family) or other contextual settings largely beyond their immediate control (e.g., work culture or social network structures) (Thompson and Stoutemyer, 1991; Wenger and Snyder, 2000). Endogenous factors included the participants' essay responses related to their *values, attitudes, and norms* and *memories and experiences* factors. These data related to participants' internal world(s) that are, to some extent, within the participants' perceived range of influence (Bechara, 2004; Mercer, 2010; Zhu and Thagard, 2002).

Methodology

The research design was a qualitative analysis of factors that motivate, sustain, and influence female professionals in Canadian water research, including both applied and conceptual, and policy making at all levels. The primary data set was composed of participants' essays, participants' feedback to a draft analysis, and subsequent correspondence with self-selected individuals about the research findings.

Participant Identification

The WRP participant pool was limited to women who held, or were near completion of, an undergraduate degree with expertise in technical and/or policy-related water issues.

Targeted invitations were used to invite and recruit female participants to submit a self-reflective essay as described later in the article. As a female professional with ties to the WRP, the researcher drew on her existing network to initiate a nonrandom sample of three Canadian women, with a focus on professionally trained WRP elites. *Elites* were defined as women who held, or were near completion of, an undergraduate degree with recognized professional expertise in technical and/or policy-related water issues. From these three first participants, a snowball sample and targeted invitations were then used to recruit additional female participants (Robson, 2011).

Participants were designated within one of four categories: undergraduate, graduate students, and academics (researcher category), and professionals in the public (policy-maker category), private, and nongovernmental sectors (visionary and advocate categories) (Tables 1 and 2). Participants were further suborganized as either *emerging* or *established* career stages. So, for example, a graduate student or untenured academic were coded as *emerging researchers*, a tenured

professor as an *established researcher*, a senior advisor with the government as an *established policy maker*. This identification by first, career category, and second, by approximate career stage, was used to ensure that there was similar participation across the various WRP sectors and career stages.

The data were purposefully inclusive of the many research and policy roles but not focused on a single profession such as, for example, female wastewater engineers. The participant group was intended to be comprehensive but not representative because the intent was not to definitively characterize or generalize across a population but to advance the early discussion in this area and to deepen our understanding of what motivated individuals to action, sustained their participation, and influenced professional contributions within a WRP community.

Data Requested from Participants

Individuals were sent a *research invitation*—a 10-page color booklet outlining the study and including art and photographs related to water imagery and women—and were aware that they were being contacted through a snowball process. They also knew that all of the potential study participants were female professionals working in Canadian WRP. Participants were asked—through the invitation and subsequent e-mail correspondence—to submit a self-directed essay, on their own time and of any word length, on any or all of the following open-ended themes:

- Experiences with water and/or childhood memories
- Recollections of their professional history, education, training, or development
- Goals, ambition, objectives, opportunities, and vision for the future
- Issues of balance, priorities, and responsibilities

These broad themes were not specific to the water industry, nor are they specific to female professionals only. Participants were all told via e-mail correspondence after the booklet invitation was sent that the selected themes were used to explore ideas about professionals' motivation, how that motivation was sustained over time, and what factors influenced their contributions to WRP. Participants were never asked for information about topics of gender identity/sexuality or workplace discrimination. Instead, the broad themes allowed participants flexibility in their interpretation and expression of the writing task. The stated intention in all correspondence was for the participants to express and impose their own priorities on the study data rather than have categories imposed from above.

Because the themes were broad, participants could define their own perspectives, prioritize the issues most important to them, and set the explicit boundaries for what they were comfortable contributing to the study.

Essays were considered to be the best method for data collection because they allowed participants to compose thoughts and revise their comments in private, without any time constraints, and to set the parameters for what they were willing to share with the researcher (Stake, 1995). From a data-quality perspective, this allowed for nuanced and thoughtful responses from individuals across Canada. One limitation of this essay method is the significant time lag between when participants agreed to provide an essay and the date that they actually submitted. In two cases, essay submissions arrived over a year after the initial agreement to participate in the study. However, the data richness more than compensated for the significant time delays.

Data Coding

The participants' essays were evaluated by using qualitative textual analysis and based on the conceptual framework in Figure 1. Prior to the data collection, the intention was to use qualitative software (i.e., NVivo, QSR International, Melbourne, Australia) for analysis. However, a preassessment showed that the qualitative software did not match the researchers' style, the study budget, or interface-analysis preferences (Seale, 2004). For example, the software was less effective at interpreting the affective or emotional values that participants attributed to concepts and how they linked concepts. The software interface also created a distance between the intimate, very personal stories participants trusted us with—the data sources embodied by the essays—and the analysis. While this distance may be preferable in some research, for the purposes of this study it was not useful for data engagement. A close engagement with the data set was necessary to allow the faculty and graduate researcher to reflect on, and manage, their own positionality and assumptions as they undertook the data coding and analysis (Byrne, 2004; Moss, 2002; Rose, 1997; Sultana, 2007).

Because quantifying inherently qualitative data is a challenge across the many variables operating within the water sector, a low-technology approach was used for data organization and thematic coding (Sijbesma and Postma, 2008). Participants' essays were blinded, reviewed in both hard copy and electronic forms, and were then coded, cross-checked, and assessed.

First, electronic essays had the participants' names removed, leaving only their participant number (e.g., P1, P2, P3), career

category (e.g., researcher, policy maker, advocate, visionary) and stage (e.g., emerging or established). The 13 essays were then printed and manually coded by the faculty researcher to identify general themes. Second, a graduate-student researcher cross-checked the thematic coding, added or modified existing coding decisions, and then organized the direct quotes in to an Excel spreadsheet (Microsoft, Redmond, WA). The faculty researcher and the graduate-student researcher reviewed the spreadsheet and coding decisions and then finalized framework factors. These factors were organized in rows while each of the participants' essay responses were allocated individual columns. Notes from the scholarly research were cross-referenced and added to the spreadsheet by using the comments tool to provide context and connection the literature.

The spreadsheet was then checked against the original essays, analyzed for a third time, and revised, if necessary, by the faculty researcher. This analysis allowed for the identification, indicated by participants' response frequency and diction attributes, of the ideas or themes that participants deemed most important. Secondary themes were broadly understood to be interesting ideas that were mentioned by only one or two participants. The interface enabled direct text comparisons of the commonalities and differences across, and within, the career categories and stages.

As a methodology, the approach was time intensive, simple, inexpensive, and enabled an easy interface between the faculty and graduate-student researchers. By assessing the data three times, a robust comparison of priorities and ideas was possible.

Results and Discussion

Response Rate

Given the time-intensive nature of qualitative data coding, only 25 participant requests were made, and 13 participants (P1–P13) submitted essays. As a small in-depth study using qualitative methods, this response rate was comparable with other similar study designs and methodological norms (Byrne, 2004; Stake, 1995). Table 1 illustrates the participants' response rates, occupational categories and their percentage representation across the data set.

Participants were drawn from western and central Canada, including Quebec. That busy professionals would allocate their limited time to writing self-reflective essays on what half of them perceived to be a "difficult task" (P3) was remarkable. Why participants were willing to contribute to

Table 1. Occupational categories' total response rates across the data set

Participant category	Researcher	Policy maker	Visionary	Advocate
Number of requests	8	5	4	6
Number of participants	5 (38.5%)	3 (23%)	2 (15.5%)	3 (23%)
% Response rate per category	63	60	50	50

Table 2. Response rates across emerging (EM) and established (EST) career stages

Participant category	Researcher		Policy maker		Visionary		Advocate	
Career stage	EM	EST	EM	EST	EM	EST	EM	EST
Number of participants	5	0	2	1	0	2	2	1
% Response total rate	38.5	0	15.5	7.5	0	15.5	15.5	7.5

EM, emerging professional; and EST, established professional.

this study was not clear from the data. One might anticipate that this willingness may be an indication of the individuals' eagerness to discuss their work, to learn about and contribute to new research in the field, and to expand their professional network.

Of the 12 nonparticipants, two were unable to contribute essays because of professional constraints or restrictions. Two potential participants were willing to contribute but eventually were unable because of heavy professional commitments. One participant agreed to send an essay but did not. Seven did not respond at all to the invitation. There was not an equal distribution of participants across career stages, as shown in Table 2.

Our response rates were consistent across three of the four subcategories, except in the research category. Of the emerging researchers, there was a 100% return rate, whereas none of our established researchers responded to the invitation or the subsequent e-mail query to confirm that they had received the invitation.

Response Data

Participants' identities, specific occupations, and locations across Canada are confidential: responses were cited as participants 1–13 and, as appropriate to provide context, by their professional category or career stage. The data were organized by using integrative conceptual framework (Figure 1) factors were used to assess the data and to answer the questions of motivated action, sustained participation, and influence on contributions within the Canadian WRP community.

Assessment of career costs and benefits
When the participants were asked about their goals, ambition, objectives, opportunities." one potential issue would be that of the pay equity and financial independence associated with working as a professional in the water sector across both emerging and established career stages. But participants did not to write essays about the financial benefits—for example, salaries, pensions and benefits— associated with their careers. Although 12 of 13 participants were employed within the Canadian WRP communities, there was no mention of financial costs associated with their water careers, and there was only limited (P4 and P7) acknowledgment of the financial rewards as a motivating factor. Instead, participants wrote of the importance of skill mastery or working on issues that are aligned with their personal values (P6) and job satisfaction (P12). For example, a policy maker (P13) wrote about when she realized that financial gain was less important than work that complemented her values:

> That two weeks [at a professional conference] confirmed for me how little I valued money—as I consistently walked away from offers of lucrative jobs right out of my undergrad that would see me making more money than I could reasonably ever make in the NGO [nongovernmental organization] sector.

It would be simplistic to assume, and erroneous to generalize, from these data that women professionals are not interested in equitable financial returns for their labor. Decades of women's labor equity efforts—equal pay for equal work—confirm that women are determined to receive financial recognition of their professional contributions (Stone, 2008). But, for these individuals, during the one-year

research period and within the specific data-collection context, financial rewards were not the first or only factor that motivated and sustained their participation. In these data, the size of ones' paycheck was not the prevailing theme.

The participants' essays included multiple examples of shared values, attitudes, and norms. These values and norms related to emotional and spiritual connections with water and to the high regard for formal and experiential education. Other common elements in the essays included the individual's sense of agency and willingness to assume risk or challenge convention. All of these factors are discussed next.

Exogenous factors

Education, experience, and information. The majority (85%) of participants indicated that education and travel were critical to shaping their knowledge of water issues and career choices. The participants were well educated—12 held advanced postgraduate designations; the one undergraduate participant was considering graduate school. Their specializations included law, aboriginal studies, commerce and marketing, microbiology, chemical engineering, wastewater management, international development and rural extension, geography and environmental studies, and resource (water) policy. Participants indicated that summer field courses or cooperative work terms in government or research postings at the postsecondary and graduate levels were significant.

Participants were well traveled. Over half of the participants wrote that Canadian and international travel was immensely important in defining their water knowledge, leadership skills, and professional interests. Participants wrote of their experiences in the Arctic, Yukon, and James Bay, as well as the coastal Bay of Fundy National Park and the Juan de Fuca plate. International travel—for example, to Antarctica, South and Central America, Southern Africa, and Western and Eastern Asia—was considered influential in one's professional development. The travel experiences generated explicit knowledge of research skills and data context but were also important in other, less tangible, ways (P2). For example, P2, the youngest participant and an undergraduate student about to complete her four-year degree, indicated that

> The Middle Eastern deserts, the mountains and valleys of North Africa, and fishing in the Beaufort Sea, each of these places played an important part in shaping me [and] traveling… expanded my horizons like nothing else.

P2 also argued for the influence of international travel in the development of her water career, recalling that her time in Ecuador allowed her to "reflect on my Canadian upbringing and examine where I had been, what was and is important to me and what it was I wanted to do." Overall, participants indicated that their formal educations and travel experiences provided immense sources of new knowledge, different perspectives, and valuable professional and personal contacts. These factors helped to determine and solidify their interests, preferences, and choices related to water careers.

Social networks and organizations. One's interests, preferences, and choices will often influence the communities and social networks that one identifies with, contributes to, and builds relationships within. In this research, participants indicated that both personal and professional relationships influenced their water careers.

Personal relationships. Participants' personal relationships—with family, friends, and their personal communities—were important for their professional development. For example, the parents of participants played multiple roles, including providing career guidance and inspiration (P6), encouraging one's ambitions (P12), and using teaching skills such as discussion and debate (P3). The support provision—to pursue one's goals and ambitions—was another role. A policy maker mentioned her mother's role:

> For as long as I can remember I've been a goal-driven personality. I think I draw this strength directly from my mother, who always taught my brother and I to go after what we wanted and helped us find our ways there if we weren't sure of the first steps. (P13)

Specific to participants' water interests, responses included the influence of family history—a history that was connected to water and its associated activities (P6)—and family members, including their spouses (P6 and P12), and uncles (P10), fathers (P13), all of whom provided information, comments, and collaboration. The influence of childhood experiences—discussed in more detail in the Water Memories and Experiences section—was another frequent theme throughout the essays.

Participant's water interests have been sources of new friendships (P3), and these friendships, in turn, have provided encouragement and support over many years. For example, one established policy maker indicated that she still meets with her early-career female friends. This cohort, a "small, informal group of three, has provided and continues to provide [her] with a supportive, nurturing

environment" (P11). Other participants attributed their longtime friendships—with the trust inherent to those relationships—and shared water interests to their willingness to try a new professional project (P4) and to overall career success (P13).

Relationships within the participants' broader community were identified as another influence. University peer groups (P13), communities of Indigenous Peoples (P9), and early teachers and librarians (P7) were identified as influential knowledge sources who directed and supported participants' water interests and career trajectories.

Professional relationships. participants indicated that these relationships existed predominantly within structured organizations such as universities or within a workplace organization. These professional relationships were discussed in relation to their value and contributions. For example, an established visionary (P1) wrote how her "deep connections" with people around the world—those who made calls and sent e-mails asking for her help—bolstered her resolve and active involvement. Other participants indicated that their professional relationships included mentorship. In these examples, participants recounted that more established individuals provided advice, acted as role models, and provided important training and encouragement for career development (P11). Professional relationships also provided resource access and extended participants' connections in Canada and abroad (P2, P3, P4, and P13). Inspiration came from professional relationships (P2), encouraging one participant to "push [her]self harder, put [her]self out there, and follow [her] passions in a way that would have otherwise been very difficult" (P13). A policy maker admitted that her female professional relationships and network gave her comfort:

> I find comfort in how many of my peers working in the field are women…. I see them making a great contribution to Canadian water policy issues [since]… I went from business meetings where I would be one of two women at the table to the policy realm where more than half of those at the table are women. (P3)

The presence and, by extension, the availability of other women for professional relationships was a frequent essay theme. Emerging early-career participants indicated that the presence and visibility of other, more established and successful, women ahead of them motivated their work within the WRP community. Established participants indicated that other women motivated their ongoing professional contributions. These responses were not surprising because, according to some participants (P6 and P12) and research, the industry is top heavy and male

dominated, with most managers and senior personnel at age 50 or older (ECO Canada, 2010; Ladson and Austin, 2009).

To our knowledge, no demographic assessment of the Canadian water WRP community currently exists, but this gender imbalance, if it exists, may be shifting at least in the early-career population, where ever more women are represented at professional conferences and involved in professional associations (P3 and P5). However, P9 indicated that the visibility and availability of women as mentors or role models were irrelevant because her "responsibility begins with remembering that as a human… it no longer matters so much… to which race or gender I belong. I will build community with anyone who wishes to join me and I will join with others who also feel this way."

All of the participants indicated that they had intentionally sought connections to the established professional networks, including the Canadian Council of Ministers of the Environment Water Conservation and Economics Task Group, Ontario Water Works Association Water Efficiency Committee, Canadian Water and Wastewater Association National Water Efficiency Committee, and the various Student and Young Professionals (SYP) groups. Two participants indicated that these professional relationships helped them to remain "connected to water issues closer to home" (P8) and that these connections were considered to be "invaluable" (P2). One visionary reported that "the connections I [made]… with these communities mark the highlight of my career as an activist and moved me to my core" (P1).

Professional relationships within these networks were also seen as a safe testing ground for new or different ideas. For example, a policy maker indicated that "active participation on internal and external committees is invaluable. You not only learn, but also have an expanded ability to test ideas and influence outcomes" (P11). Another researcher indicated that she saw immense power in the relationships developing in the "emerging expert cohort [in the Canadian water community] as incredible opportunity to interact and mobilize on issues that matter to us" (P2). The perspective that the participants were part of a larger, exogenous community or cohort provides evidence that this community—engaging with both men and women—sustained their efforts and influenced their contributions over time.

Endogenous factors

Values, attitudes, and norms. Participants identified multiple values and attitudes toward their work and life that enabled the pursuit of their professional WRP goals.

For example, one participant mentioned her "patience, determination, and long-term, unwavering focus" (P9), whereas others described their ability to multitask and be independent (P2), stubborn (P12), curious (P10), optimistic (P6), goal-driven in following their passions (P13), and motivated and independent learners (P10 and P11).

An attitude of openness to novelty and willingness to take risks was a theme in eight of the 13 submissions. Emerging and established visionaries, advocates, researchers, and policy makers all referred to childhood experiences that helped to establish their professional risk tolerance. Participants wrote of assuming risk "for something you believe in" (P2), for the sake of technical and research innovations (P8), and for career trajectory changes (P3 and P6). Others mentioned the prospect of appearing "crazy" (P4), the challenges of a steep learning curve (P5), and the possible financial costs of a different career path (P13). One emerging researcher described the process of professional risk taking as "the constant contemplation of passions versus practicality, risks versus security, the well-trotted versus the atypical paths, leading one to a never-ending whorl" (P10).

Varying personas or self-identities emerged from the aforementioned attitudes expressed. For example, one established visionary self-identified herself as a "water warrior" (P1), whereas a researcher identified herself as a "collector of 'data' but also the keeper of stories… [to create] a tapestry of information that incorporates both the social and the ecological sciences of water" (P8). Others spoke of the uncertainty associated with their persona—for example, how to use their "political voice" (P3) or what their exact role(s) will be in the future. One researcher wrote that she "would like to say that I have had a clear goal or vision, but this simply is not true. I've followed areas that are of interest to me, and have worked hard to create and take advantage of opportunities that I feel suit the person I am" (P12). These different personas—publicly expressed through the essays to an outside researcher—indicated that participants were largely self-aware, if not always self-confident, about their roles and contributions to WRP.

Participants also emphasized and used different career strategies or norms as they progressed through their careers. An emerging researcher wrote candidly of her approach: "I have been relatively ambitious all my life, but typically within a very narrow realm of interest. I pursue an interest with great vigor, but leave everything else behind" (P6). In contrast, an established policy maker uses a more measured approach by "making small increments of change through my everyday work and volunteer activities" (P3), whereas

another indicated that they were entrepreneurial and "carved [their] own space" (P2). In the essays, there was no agreement on one *right* strategy for career building or sustaining one's motivation. Instead, participants very openly struggled with identifying workable strategies—within and beyond the conventional career path's boundaries—and modified those strategies at different career stages.

Diverging from conventional norms and social expectations was a theme expressed within 80% of the essays. A willingness to diverge from the mainstream was also articulated through participants' responses to authority. Policy makers and advocates wrote about their fight for "climate justice," the necessity to challenge the assumptions and approaches of multimillion-dollar international projects (P13), and the need for "truth and reconciliation… for all of us to be able to fulfill our responsibilities to water" (P9). Four participants wrote specifically about challenging conventional norms in their personal and professional roles. An accomplished emerging researcher, who was at the time struggling to decide whether to marry or to enroll in graduate school, was the only participant to mention religion or stereotypes when she wrote that she felt driven to "break down the various existing stereotypes of Muslim women" (P10), including what roles they could play in society and where they should contribute.

Another emerging researcher wrote about society's reaction to mothers who maintained their professional careers:

> Women before me have fought for choice, democratic and economic freedom, and political power. Now, we are judged for the choices we make…. It is destructive and is an insult to the women who fought so hard to give us that choice. (P2)

Still others indicated that their professional trajectories had diverged from the conventional career norms. An advocate admitted that, for her, "none of these [water management] goals fit exactly right, and I have been trying to understand exactly why that is" (P9), whereas an emerging researcher stated that she "had no interest in becoming a 'typical' engineer" (P6).

These responses are supported by multiple literatures. For example, individual-level research from clinical psychiatry has detailed the roles of ambition, evolving goals, skill mastery, and public recognition in directing women's career trajectories (Fels, 2005). In contrast, organizational or institutional-level research in the career, business/management, and psychology literatures has suggested that career types, male-defined organizational structures and

incentives (O'Neil, Bilimoria, and Saatcioglu, 2004), and definitions of success (Dyke and Murphy, 2006) influence one's professional trajectory and job satisfaction. Still other studies, hybrids of the personal and organizational approaches, have focused on one's sense of control over their work and time and have evaluated the merits of fluid or solid boundaries between professional and personal time (Eriksen, 2001; Hilbrecht et al., 2008).

Participants were motivated to ensure water quality—and, by extension, a healthy environment—for their own children. One's concern for the future health and welfare of one's children—that is, a concern that extends beyond the immediate and selfhood—and a connectedness to nature have been shown to be predictors of engagement in environmental issues or advocacy (Bord and O'Connor, 1997; Frantz et al., 2005; Mayer and Frantz, 2004) and willingness to pay for environmental services or change (Dupont, 2004). The willingness to take risks, to diverge from—or at least struggle against—social expectations associated with religion, motherhood, and authority stood out as one of a dominant theme in these data. Putting the data in context, there many theories to explain how values, attitudes, and norms influence the pro-environmental behavior (Armitage and Conner, 2001; Bamberg and Möser, 2007; Jensen, 2002; Vining and Ebreo, 2002) and career contributions made by these participants. The final section explores data on emotional responses expressed through their childhood experiences, memories, and connection to nature.

Water memories and experiences. Participants' early childhood experiences and memories were important for setting their identity and priorities. They wrote about experiences such as their childhood homes from across Canada, including the Yukon (P13), on the Canadian Shield (P7), and around the mining and forestry areas (P2). These locations were the source of strong memories, an awareness of Canada's diverse landscapes, and helping to define their current identities. Participants indicated that early experiences often helped to shape "worldview and career paths ever since" (P13) and formed "an appreciation for the incredible diversity in Canada" (P2) and its "spectacular and almost unbelievable legacy" (P7).

Cherished water experiences most often were related to undomesticated water and outdoor adventures as a child or later with a partner or with their children. These water memories were most frequently from meaningful spaces (P3, P5, P6, P10, and P11). For example, many recounted experiences of cottages, canoeing, fishing, hiking, "stomping in spring ditches" (P7), boating, windsurfing, sailboarding (P6),

activities at summer camps, and competitive swimming, kayaking, sailing, and rowing (P13). A participant recalled her childhood and family cottage, where "the greatest delights came from jumping off the wooden deck into the fresh lake" (P5). Awe for the natural world was another theme in the essays. One advocate recounted a canoe-camping vacation in Quebec: "The night where we took our canoes to the middle of the lake for a session of stargazing. There, on still waters under the clear, deep-tinted skies and thousands of stars, I laid suspended in time" (P5). Participants' childhood water memories were described in powerful, emotional language: a policy maker, reflecting on her childhood on the East Coast, as a time when "the ocean was an old friend" (P13) and source of great comfort and adventure.

Participants also identified the negative experiences related to water. Writing about their specific professional engagements, many participants discussed their fears for the future (P1 and P7), disillusionment (P6), and urgency (P10 and P13) because of the change needed to address impending water crises. A visionary wrote how she was

> stricken by the fear that [the severity of water issues] can't be communicated, that there are blank looks out there, not comprehending the phenomenal treasure we have in inhabiting this country. (P7)

Other influential water memories were more prosaic and related to variance in Canadian water quality. One policy maker admitted that she did not "recall any times when water quality or quantity were ever at issue" (P11). Another mentioned a first summer job where she spent hours "lugging back and forth buckets of water from the lake to kitchen…. I took it for granted that we had clean water and all these visitors from afar were so amazed" (P3). In contrast, an established researcher recalled that her earliest water memory was of the neighborhood's a waterborne illness event that "was just seen as 'one of those things'" (P12).

For all of the participants, their interactions with water provide an ongoing confirmation of their water interests. One participant wrote, "Each time I stand under a waterfall, or swim in the lake, or bathe, or quench my thirst I remember and I learn" (P9). An advocate recalled her reaction after completing an arduous canoe portage: "I fell to my knees and cried out of exhaustion…. The tears were liberating. Then, somewhere deep inside me, I found the courage to stand up again and continue on this adventure" (P5). She wrote in a subsequent e-mail that she did not

> associate this arduous portage experience with a negative emotional…. To me it represents my attitude towards life. Difficult passages can bring me down

and allowing myself to cry is part of my healing process. Then I connect with who I am, my hopes and dreams and they give me the courage to continue.

Beyond emotional responses, four participants went on to suggest a more spiritual connection—referring specifically in their essays to their "souls" and "passion"—to water (P1, P4, P7, and P8). Some participants, writing about their personal spirituality and faith, echoed this water connection. P10 wrote that her readings on water management and Islam—where "Sharia… literally means the 'path to the water source' in classical Arabic"—was the "big defining moment" and that it "set the groundwork for my working vision" (P10). Not all participants were comfortable with the overlap between emotion, faith, and intellect. P9 recounted how she "found it uncomfortable when I began to feel (rather than think) that reconnecting to the spiritual significance of water is important" in the early part of her career. She later wrote eloquently about the spiritual connection—and implications of its loss—to water:

> To sever the spiritual connection that we have to water is devastating to both ourselves and water. We might not realize it immediately, in fact most aspects of modern life are designed so that we do not notice it at all, but we sense a pervasive, 'non-point source,' lack of connection that cannot be restored through occasional trips to the beach.

But even given these participants' deeply emotional responses to the natural environment and water, the analysis did not include, and therefore should not suggest, that female water professionals embody a unique "woman–nature connection" as per an a populist ecofeminist framework or other interpretations of women in society (Kalnicka, 2006; McDevitt-Pugh, 2003). While recognizing the critiques of the ecofeminist perspective—related to domination and subjugation of women and nature (Agarwal, 1992; Alesina, Giuliano, and Nun, 2013; Jackson, 1993; Leach, 2007; Nabhan and Trimble, 1994)—this research reports participants' unprompted assertions of their powerful, emotional connections to water.

These data, while unexpected, have been similarly identified elsewhere—for example, in Strang's (2004, 2006) research on the sociocultural meanings of water, identity, and community. Other research, from history and religion, has documented the long-standing cultural traditions that use emotional connections to water (e.g., lakes, wells, rivers) as powerful motivators to action and worship (Amery, 2001; Blackstock, 2001; Faruqui, Biswas, and Bino, 2001; Gibbs, 2009; Hamlin, 2000; Voeller, 2011).

That these powerful emotions and memories continue to be referenced by participants should not be surprising. Beyond their conscious memories, some participants also wrote that they recognized an underlying, or intrinsic biophysical connection to water (P3, P5, P7, and P9) that would extend beyond one's sex or gender (Stern, Dietz, and Kalof, 1993). These participants considered their water memories to be embedded in their subconscious, where immersion represented an "initial connection to water [that] began when I was in the womb of my mother" (P10).

This biophysical connection to nature, in general, has been investigated with research from anthropology, developmental psychology, sociology and the cognitive sciences. For example, these disciplines have articulated the many influential roles of nature, if not specifically water, during childhood. Foci have included the formation of memories and emotional health through nature play (Louv, 2005; Nabhan and Trimble, 1994), feelings of connectedness to nature (Kaplan, 1987), and ongoing brain–environment interactions (Chiao, 2009; Gifford, 2008; Franks, 2010; Kellert, 1993; Northoff, 2010; Rilling, 2008). These could be broadly linked within the *biophilia hypothesis*—that is, a genetic trait that drives the human need for association with nature and life (Balling and Falk, 1982; Kahn, 1997; Kellert and Wilson, 1993; Wilson, 1984).

The childhood experiences and memories generated powerful emotional responses—the wonder, awe, inspiration, calm, connection, and fear—that have become etched in the identities of participants. Whether these identities are specific to these participants, have evolved because of a unique women–nature connection as per some ecofeminist arguments, or are genetically based on a biophilia argument remains for future research. But what the data have shown is that these emotions can sustain and influence the female professionals' values, attitudes, and norms—the willingness to continue seeking the oxymoronic "work–life balance," to challenge authority, take risks, and engage with their professional communities—as they pursue their career objectives.

Conclusions and Recommendations

This study was an investigation of whether and how different factors influence the careers of Canadian female professionals working in water research and policy (WRP). Participants' essay responses were assessed by using an integrated comparative framework—drawing insights from economics, social network theory, environmental psychology, innovation, knowledge management, and pro-environmental behavior. Of specific interest were participants' responses to

ideas about what motivated their careers, how this motivation sustained their professional participation over time, and whether different experiences with people and/or nature influenced their contributions to Canadian WRP.

At an individual level, participants expressed an appreciation of skill mastery, value alignment, and job satisfaction as explanation for what motivated and sustained careers over obstacles. At a community level, participants were motivated to contribute at different the provincial, national, and global scales. They were also motivated by the importance of sustained water security, minimizing water-scarcity pressures and ensuring the continued provision of in situ services by the natural environment, aesthetics, and recreation.

The data indicated that, similar to professionals in law or medicine, WRP female professionals draw on their relationships and experiential knowledge to make career decisions (e.g., whether to continue working after the birth of children), sustain their career progression (e.g., whether to seek promotion), and direct their professional contributions (e.g., to mentor other emerging professionals). Participants who recounted significant mentorship relationships or strong social networks indicated, at the time of the research, that they were less likely to leave the WRP field and had more plans for contributions. Participants indicated that these connections with others, both personal and professional, and their experiential knowledge—in nature as a child or ongoing interactions in to adulthood—were critical for their initial career direction, as well as their contemporary motivation and contributions to their professional fields.

Therefore, these essays suggested that both recruitment and retention within the water community could be improved by providing both ongoing informal and formal education options, including opportunities to develop mastery over existing or new skills, and experiential knowledge in nature for children and for emerging and established professionals, and by facilitating mentorship relationships and social networks. These "on ramps" (Hewlett, 2007; Mason and Ekman, 2007) would help sustain the availability of diverse knowledge resources held by female professionals within Canadian WRP.

One may suspect that a diversity of voices and perspectives—including the contributions of these female professionals—will positively affect water policy, research, operations, management, and overall governance. We know from this study that diversity in perspectives, opinions, networks, and experience affects professionals' motivated actions and their sustained

participation, and influences the nature and focus of their contributions. But whether this characteristic will help Canadian water governance better anticipate or respond to changes in rapidly evolving water circumstances remains for another, longer-term and differently designed, study.

Notes

1. In 2009, participants 1–13, in locations across Canada, who had various jobs in various organizations related to water research and policy, submitted confidential essays.

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