



Quantifiable progress of the First Nations Water Management Strategy, 2001–2013: Ready for regulation?

Alasdair Morrison, Lori Bradford & Lalita Bharadwaj

To cite this article: Alasdair Morrison, Lori Bradford & Lalita Bharadwaj (2015): Quantifiable progress of the First Nations Water Management Strategy, 2001–2013: Ready for regulation?, Canadian Water Resources Journal / Revue canadienne des ressources hydriques, DOI: [10.1080/07011784.2015.1080124](https://doi.org/10.1080/07011784.2015.1080124)

To link to this article: <http://dx.doi.org/10.1080/07011784.2015.1080124>

 Published online: 14 Sep 2015.

 Submit your article to this journal [↗](#)

 Article views: 20

 View related articles [↗](#)

 View Crossmark data [↗](#)

Quantifiable progress of the First Nations Water Management Strategy, 2001–2013: Ready for regulation?

Alasdair Morrison^a, Lori Bradford^b and Lalita Bharadwaj^{b*}

^aDepartment of Geography and Planning, University of Saskatchewan, Saskatoon, Canada; ^bSchool of Public Health, University of Saskatchewan, Canada

(Received 2 August 2014; accepted 3 August 2015)

Drinking water security is a serious issue for many First Nations reserve communities in Canada. Over the last decade, CAD \$2 billion has been invested to improve the situation by way of several key policies. Though action plans have been developed, expert panels have been struck and commissioned assessments have occurred, little progress has been reported, and on-reserve communities suffering through drinking water emergencies continue to be featured in the media. This paper presents an evidence-based critical analysis of federal policies related to drinking water on First Nations lands, and their associated follow-up progress reports and commissioned assessments. The goals and outcomes of policies since 2001 are noted, and the scope and outcomes of each are compared. This study uses an exploratory analysis of government-documented quantifiable indicators to assess the progress made through the implementation of varied policies and expert panel recommendations. The analysis highlights shortfalls in the collection of indicator data that show that communities have the technical capacities to meet policy requirements. The effectiveness of government policies to prepare communities for the imposition of regulations introduced through the passing of Bill S-8, *The Safe Drinking Water for First Nations Act* (2012), is discussed.

Sécurité de l'eau potable est un problème grave pour de nombreuses collectivités des Premières nations. Plus de CAD 2 milliards de dollars ont été investis au Canada au cours de la dernière décennie pour améliorer la situation par le biais de plusieurs éléments clés de la politique. Bien que des plans d'action ont été mis en œuvre, des groupes d'experts consultés et l'évaluation commandé ont eu lieu, peu de progrès a été rapporté et les communautés des Premières Nations qui souffrent de boire de l'eau urgences rester dans les nouvelles. Dans cet article, une analyse critique fondée sur les preuves de la politique fédérale en ce qui concerne l'eau potable sur les terres des Premières Nations, et tout suivi des rapports et des évaluations commandé sont présentées. Les objectifs et les résultats des politiques depuis 2001 sont mis en évidence, la portée et les résultats de chacun sont comparés. Une analyse exploratoire des indicateurs quantifiables gouvernement documenté est présenté pour évaluer les progrès fait sortir par la mise en œuvre des politiques variées et les recommandations du groupe d'experts. Cette analyse met en évidence les lacunes dans la collecte de données d'indicateurs attestant que les communautés ont la capacité technique de répondre à la doctrine énoncée dans le projet de loi S-8. L'efficacité de ces politiques pour préparer les communautés à l'imposition de règlements introduites par l'adoption du projet de loi S-8, *L'eau potable sécuritaire pour les loi des Premières Nations* (2012), est discuté.

Introduction

Access to safe drinking water is an ongoing issue for First Nations people living on reserves across Canada (Indian and Northern Affairs Canada [INAC] 2006). Despite numerous government assessments and monetary investments, people on First Nations reserves are 90 times more likely to have no access to running water than other Canadians (Eggerton 2006; Boyd 2011). Inequities in access, provision, management and regulation of drinking water clearly exist for First Nations people on reserves. This imbalance is exemplified through government responses to, and national news coverage of, incidents of First Nations drinking water contamination as detailed in the following two stories. First, in October 2005, high *E. coli* levels were found in the drinking

water supply of the Kashechewan Cree First Nation located near James Bay, Ontario. Residents were under a boil water advisory for 2 years, and excessive chlorine added to the drinking water led to a perceived worsening of common skin conditions among reserve children (Canadian Medical Association 2008; MacIntosh 2009), and subsequent mistrust of government interventions (Metcalfé et al. 2011). The government responded by organizing an airlift evacuation of community members to centers in Northern Ontario. Little information was subsequently reported on the status of the reserve community or the actions taken to resolve the situation (Doucet 2005; Wingrove 2008).

In comparison, the contamination of the public water system in Walkerton, Ontario, that resulted in the deaths

*Corresponding author. Email: lalita.bharadwaj@usask.ca

of seven people and the sickening of over 2300 people in the year 2000 was well publicized and reported. A major inquiry was conducted to identify causes of the outbreak and gaps in government policies. Practices potentially contributing to the incident were investigated in depth, and community outreach and involvement were paramount in the investigative process. The Walkerton occurrence and subsequent inquiry led to substantial improvements in municipal water management procedures across the country (O'Connor 2002a, 2002b; Ontario Ministry of the Attorney General and O'Connor 2002). Ongoing coverage of the inquiry and its findings remain in the news and other media today (see, for example, Cole 2014; Johns 2014; The Canadian Press 2015).

First Nations communities on reserves with serious water issues have not received the same degree of public or political attention as other communities have (White et al. 2012; Patrick 2011). As of June 2014, Health Canada listed 92 First Nations communities under drinking water advisories. Waterborne infections on reserves are 26 times the national average, and about 30% of reserve-based community water systems are classified as posing a high risk to water quality (Office of the Auditor General 2005; Eggerton 2006; INAC 2007; Simeone 2010; Heath Canada 2014). The water contamination in Kashechewan, related incidents in other communities and current statistics point to inequities in the provision and management of drinking water in Canada (Patrick 2011).

This paper details the gaps in water service provision of on-reserve populations through a review of key policy documents, and through a look at the quantifiable indicators of progress associated with key policies and actions plans to improve services put in place by the federal government and its agencies between 2001 and 2013. The management of potable drinking water and wastewater on First Nations reserves is a shared responsibility between First Nations and the federal government. Programs and services for providing clean, safe and secure water on reserves are provided through First Nations band councils, INAC/Aboriginal Affairs and Northern Development Canada (AANDC) and Health Canada, with Environment Canada serving in an advisory role. The complicated administrative structure involved in First Nations' on-reserve water provision makes it difficult to ascertain whether each agency is fulfilling its responsibilities. The evidence presented here helps contextualize the concerns of First Nations reserve populations, including the reasons why their Charter rights (Boyd 2011) are not adequately addressed. The development of common indicators for government agency reporting on progress in the provision of First Nations on-reserve water services will support the implementation of future water policies.

Increasing numbers of researchers are recognizing that a suite of quantitative and qualitative science-based indicators, as well as those grounded in traditional knowledge, are needed for assessing policy interventions with First Nations people (Cameron 2012; Hill et al. 2012; Ford et al. 2013). Qualitative indicators, such as the quality of long-term relationships with co-management agencies, and clear on-reserve leadership, among others, are also crucial in order to ensure successful water service provision on First Nations reserves (Lebel and Reed 2010). The establishment of such indicators, however, is both beyond the scope of this paper and would be more appropriately created by and/or with First Nations community members. As a first step in identifying potential indicators, this paper sources existing quantifiable indicators and reports on their appropriateness. First, the varied policy documents and their progress reports are analyzed for their goals, scopes and concepts of progress. Then, progress toward meeting policy goals is assessed using government-reported indicators. The final section reflects on and discusses the actual progress toward safe water provision, as reported through indicators and progress reports and the effects of putting Bill S-8 into place.

Background

Responses and action plans

The federal government's response to water access and management issues on First Nations reserves has primarily been in the form of directing investment for improvements in drinking water through the seven-step First Nations Water Management Strategy (FNWMS) (for complete documentation, see Aboriginal Affairs and Northern Development Canada [AANDC] 2010). The FNWMS was a 5-year strategy implemented in May 2003. It stemmed from an initial baseline assessment of the state of water and wastewater infrastructure in First Nations communities conducted in 2001 and 2002 by Indian and Northern Affairs Canada (INAC 2003). The FNWMS strategy involved a federal investment of CAD \$1.6 billion over 5 years (2003 to 2008). Projected outcomes of the strategy included increasing community capacities for water monitoring, sampling, analysis and reporting, decreasing the number of high-risk systems, and developing and implementing a comprehensive set of clearly defined standards, protocols and policies utilizing a multi-barrier approach (INAC 2007). The multi-barrier approach means putting barriers in place to eliminate or reduce threats from natural and human-made sources, as well as protecting water from contamination, using effective treatment options and maintaining the distribution system (INAC 2007). Several additional initiatives have been implemented since the

inception of the FNWMS. These plans were applied between 2003 and 2013 and included the Plan of Action for First Nations Drinking Water (PoAFNDW), the First Nations Water and Wastewater Action Plan (FNWWAP) and Bill S-8, which came into force on 1 November 2013, and which enables the federal government to work with First Nations communities on reserves, as well as other stakeholders, to develop enforceable federal regulations to ensure access to safe, clean and reliable drinking water on reserves. Although these plans grew from the FNWMS, the FNWMS remained the major vehicle for improving water management for First Nations until 2013. The progress, however, towards the objectives of the FNWMS, and of the plans that followed, has yet to be assessed in any comprehensive fashion.

Obstacles to progress on the FNWMS and Bill S-8

Several reports highlighting key obstacles for the improvement of drinking water in First Nations communities were released after the FNWMS came into force. The report of the Office of the Auditor General (OAG) in 2005 stressed the lack of enforceable regulations and standards as major obstacles for the improvement of drinking water. The second audit conducted by the OAG in 2011 reiterated this finding and expressed ongoing confusion about the roles and responsibilities of the agencies involved (OAG 2011). Hubbert (2013) confirmed that a lack of available enforcement mechanisms, the inaccessibility of remote communities and ongoing infrastructural issues increased the complexity of the problem.

In 2006, the Expert Panel on Safe Drinking Water for First Nations, an objective of the PoAFNDW, held hearings, provided recommendations and reported on options for drinking water regulation on reserve (INAC 2006). The panel members echoed many of the same conclusions put forth by the OAG and identified three prerequisite conditions for any management or regulatory regime to succeed (Swain et al. 2006). These included closing the resource gap between communities on reserves and non-First Nations communities, improving consultations and addressing high-risk communities (see Table 1). These recommendations provided a roadmap to guide the groundwork needed to resolve existent inequities and to inform, *a priori*, the introduction of a legislated regulatory regime on reserves.

Beyond the prerequisites: the gap between policy-makers and First Nations people

Regardless of the prerequisites proposed by the expert panel, on 26 May 2010, the federal government introduced Bill S-11, the *Safe Drinking Water for First Nations Act*. Bill S-11 met with great opposition.

Table 1. Initial 21 high-risk communities by region (adapted from AANDC 2008a).

Region	Communities
Atlantic	Pabineau, New Brunswick Woodstock, New Brunswick
Quebec	Kitigan Zibi Anishinabeg
Ontario	Shoal Lake #40 Constance Lake Moore Deer Point Northwest Angle #37 Ochiichagwe'babigo-ining Kingfisher Muskrat Dam Lake Wabigoon Lake Ojibway
Alberta	Dene Tha' Driftpile Frog Lake
British Columbia	Semiahmoo Shuswap Toqhaht Canoe Creek Lake Babine Nation – Community of Fort Babine Toosey
Yukon	Taku River Tlingit

Particular criticisms included that there had been insufficient consultation with First Nations, the bill lacked clarity about who would wield legislative, administrative and/or judicial power (Bowden 2011), and that parts of the Act were in conflict with treaty rights (Canadian Environmental Law Association 2012). In a letter to the Senate of Canada and to other First Nations leaders, the Assembly of First Nations (AFN) Chief stated that “First Nations have been very concerned that the liability provisions of the Bill [S-11] will transfer liability to First Nations with no commitment to funding, training or infrastructure improvement – essentially setting up First Nations to fail” (Atleo 2011, 2). Although the 2003 FNWMS was meant to address issues of management, capacity, infrastructure, monitoring and high-risk systems, questions were still raised as to how First Nations communities would create or obtain access to the facilities, skills and resources to upgrade their infrastructure, build capacity and increase water monitoring and reporting to meet the requirements of the new regulations (Simeone 2010; Rizvi et al. 2013).

The proposed Bill S-11 (2010) would have created new regulations for drinking water on First Nations reserves, meeting a goal of the FNWMS, but the legislation lacked specifics about how First Nations would be equipped to meet those regulations (Basdeo and Bhadraraj 2013). With the dissolution of Parliament on 26 March 2011, Bill S-11 died on the Order Paper.

Bill S-11 was amended and replaced by Bill S-8 on 29 February 2012. Bill S-8 enables the legal enforcement of water quality regulations and standards in First Nations

communities, and allows the government to make regulations that govern training and certification, the protection of source water, the development and decommissioning of drinking water and wastewater systems, the setting of drinking water quality standards, the monitoring of drinking water, the release of remediation orders and the taking of emergency measures on reserve land. It also allows the government to enter into agreements with non-First Nations enforcement agencies to administer and enforce the regulations of the act (Senate of Canada 2012). Again, the proposed bill received objections, particularly from the Chiefs of Ontario (COO), who stressed that the bill violates treaties and is unconstitutional, writing that the “COO vehemently opposes the inclusion of sec. 3 in Bill S-8, a clause which permits the abrogation and derogation of constitutionally protected Aboriginal and Treaty rights” (COO 2013, 2–3). The letter goes on to point out nine articles from the United Nations Declaration on the Rights of Indigenous People (2007) that are also violated by Bill S-8 (COO 2013).

Prominent legal and non-governmental organizations also publicly raised their concerns with Bill S-8 (Canadian Environmental Law Association 2012; Metro Vancouver 2012; Assembly of First Nations [AFN] 2013; Assembly of Manitoba Chiefs 2013; Blood Tribe First Nation 2013; COO 2013). These organizations found that the bill does not provide for the protection of treaty rights or recognize First Nations’ jurisdictional authority. It also does not include the dedication of additional resources to ensure that regulations are met, and places all liabilities for any failures to meet regulatory standards on the First Nations and the water system operators, opening them up to financial and criminal penalties. Bill S-8 neither addressed the issues identified in Bill S-11, which also lacked sufficient consultation with First Nations in its development, nor complied with the expert panel’s recommendations prior to its implementation (White et al. 2011). Notably, Bill S-8 did not include an adequate understanding of the progress made under FNWMS objectives, or of government responses to the letters of objection to it from across Canada when, in June 2013, it was passed into law.

Widespread doubt that Bill S-8 will meet its stated goal remains, both within and outside First Nations communities (Bowden 2011; Patrick 2011; White et al. 2011; Basdeo and Bharadwaj 2013). To date, it is unclear what evidence exists to support the June 2013 passing of Bill S-8 (Baird and Plummer 2013; Cave et al. 2013; Gajadhar 2013).

Indicators and capacity for water policy interventions in First Nations communities

Many of the challenges for Canadian communities adapting to changes intended to improve local services,

such as drinking water provision, reflect complicated human dynamics and require the assessment of individual and organizational vulnerabilities and capacities, including their readiness for change (Armenakis et al. 1993; Thurman et al. 2003; Rashman and Radnor 2005). The co-creation and use of holistic frameworks for assessing vulnerabilities and capacities is vital to communities undergoing policy change (Plummer et al. 2013). The implementation of changes must also embrace all forms of learning, improvement and innovation, so that sustainable long-term value can be gained for all stakeholders (Rashman and Radnor 2005; Jones and Stewart 2012; Rafferty et al. 2013). In the First Nations public health intervention context, the readiness models developed (e.g. Edwards et al. 2000; Thurman et al. 2003, 2004; Johnson et al. 2004; Stith et al. 2006; Plested et al. 2002) point to an essential requirement that a First Nations community should be enabled to implement a new policy prior to the policy’s formal introduction (Leiberman et al. 2013).

In the case of on-reserve water vulnerabilities, researchers have made efforts to define the human dimensions of water resource vulnerability, and develop capacity indicators for providing safe drinking water (Lebel and Reed 2010; Plummer et al. 2013; Rizvi et al. 2013); however, these have been derived from non-First Nations frameworks applied on reserve. These indicators fall into the categories of water sourcing, financial support/funding, information management, human resources (including managerial and institutional capacity and/or jurisdictional factors), social and political factors, and technical dimensions. Examples of indicators that could be used to gauge institutional capacity include: (1) the presence of a plan to guide community actions for the provision of safe drinking water; (2) federal legislation that clearly delineates the roles and responsibilities of the players involved in safe drinking water provision; (3) fair and appropriate conflict resolution processes, and (4) the federal government taking First Nations input seriously (Lebel and Reed 2010; Patrick 2011; Plummer et al. 2013; Rizvi et al. 2013). Examples of human resource indicators include adequate training for staff members involved in providing safe drinking water, and an adequate number of diligent and certified employees dedicated to water management. For examples of indicators for each of the other dimensions, see Lebel and Reed (2010) and Rizvi et al. (2013).

These capacity indicators were developed to ensure that appropriate policies are co-created, and that the communities have the readiness and capacities to implement future laws to support drinking water regulation compliance. This paper addresses three objectives

towards a critical understanding of the policies regulating First Nations drinking water in Canada, by:

- (1) Identifying the motivating factors, goals and scope of the main federal strategies implemented to improve water management in First Nations from 2001 to 2013;
- (2) Comparing these strategies and identifying common indicators utilized by government agencies to report, assess and gauge the progress of federal initiatives over this period;
- (3) Determining whether reported indicators show progress in First Nations water management under the strategies implemented from 2001 to 2013 to validate the introduction of Bill S-8 and its embedded enforcement doctrine.

In appraising these gaps, this paper aims to support future policy-makers, public health practitioners and local people in building the tools for evaluating the implementation and success of Bill S-8 and others like it in First Nations communities.

Methods

Approach and sampling

Taking lessons from evidence-informed public health practitioners and policy-makers (Kohatsu et al. 2004; Kemm 2006; Murray and Frenk 2008), the research team critically reviewed water management policies applicable to First Nations by following the stepwise process of evidence-informed public health policy reviewing outlined by Ciliska et al. (2008) and illustrated in Figure 1.

This approach was further enhanced by considering systematic public health approaches in the evaluation of programs, systems and analyses to support policy choices. Focusing on both existing and developing policies and identifying gaps in the requirements for the implementation of these policies (Brownson et al. 2010), including communities' capacities to implement them (Braveman et al. 2011), this methodology can easily be applied as a comparative tool for bridging on-site practitioner insights and progress report statistics with distant policy-makers.

This research began with a focused search for indicators in the primary literature, i.e. federally published policy documents, including legislation, reports and websites. Literature assessing the outcomes of these policies was also obtained through database searches of Scopus, Thompson Institute for Scientific Information's Web of Knowledge, Google Scholar and Canadian Human Rights Reporter Online. Information was accessed over a 10-month period from October 2013 to July 2014. Relevant progress reports were studied to identify the sources, goals and scopes of strategic plans,

obstacles to implementation and common indicators measuring progress under federal initiatives. An indicator was defined as a quantitative measure that specified the state of an assessed condition. A common indicator was defined as a measurement that was performed in at least 3 consecutive years, assessed in a similar fashion and reported within the body of progress reports reviewed.

Results were organized into two parts: first, the concrete sample of policies, their chronological development and their criticisms are presented textually in Part 1 and compared in Figure 2. Subsequent progress reports are compiled and listed in Table 2. Comparisons and gaps among these documents were identified and presented in Tables 3 and 4. Candidate indicators are synthesized in Part 2, and progress is assessed using these indicators. Evidence-based evaluation of progress is presented in Figure 3.

Results

Part 1: introduction to strategies for the improvement of First Nations water management

Federal initiatives implemented from 2001 to 2013 are summarized in the following sections and outlined in Figure 2. Each section analyzes the content of one document. Federal initiatives primarily involved the assessment of conditions in First Nations communities and investments in infrastructure, operations and maintenance, water quality monitoring skills and the development of water management protocols specific to First Nations' needs. The implementation of Bill S-8 in June 2013 was a culminating event within this timeline. As noted in Figure 2, eight policy documents including six plans or pieces of legislation, one set of expert panel recommendations and one commissioned report were included in the primary data for examining objective 1. Figure 2 summarizes the motivation, responsible agencies and major obstacles identified in the implementation of each policy.

Baseline assessment, 2001–2002

Federal strategies were born out of an initial assessment of drinking water and wastewater systems in Canadian First Nations Communities conducted by INAC in 2001–2002. The assessment evaluated the physical and operational components of on-reserve systems, and the training levels of system operators, identified water and wastewater systems unable to meet Canadian Guidelines for Drinking Water Quality and Effluent Quality and Wastewater Treatment (Health Canada 2012) and estimated the costs of remedial actions to address identified deficiencies (INAC 2003). This assessment involved the review of 740 drinking water and 492 wastewater systems serving 691 First Nations communities within

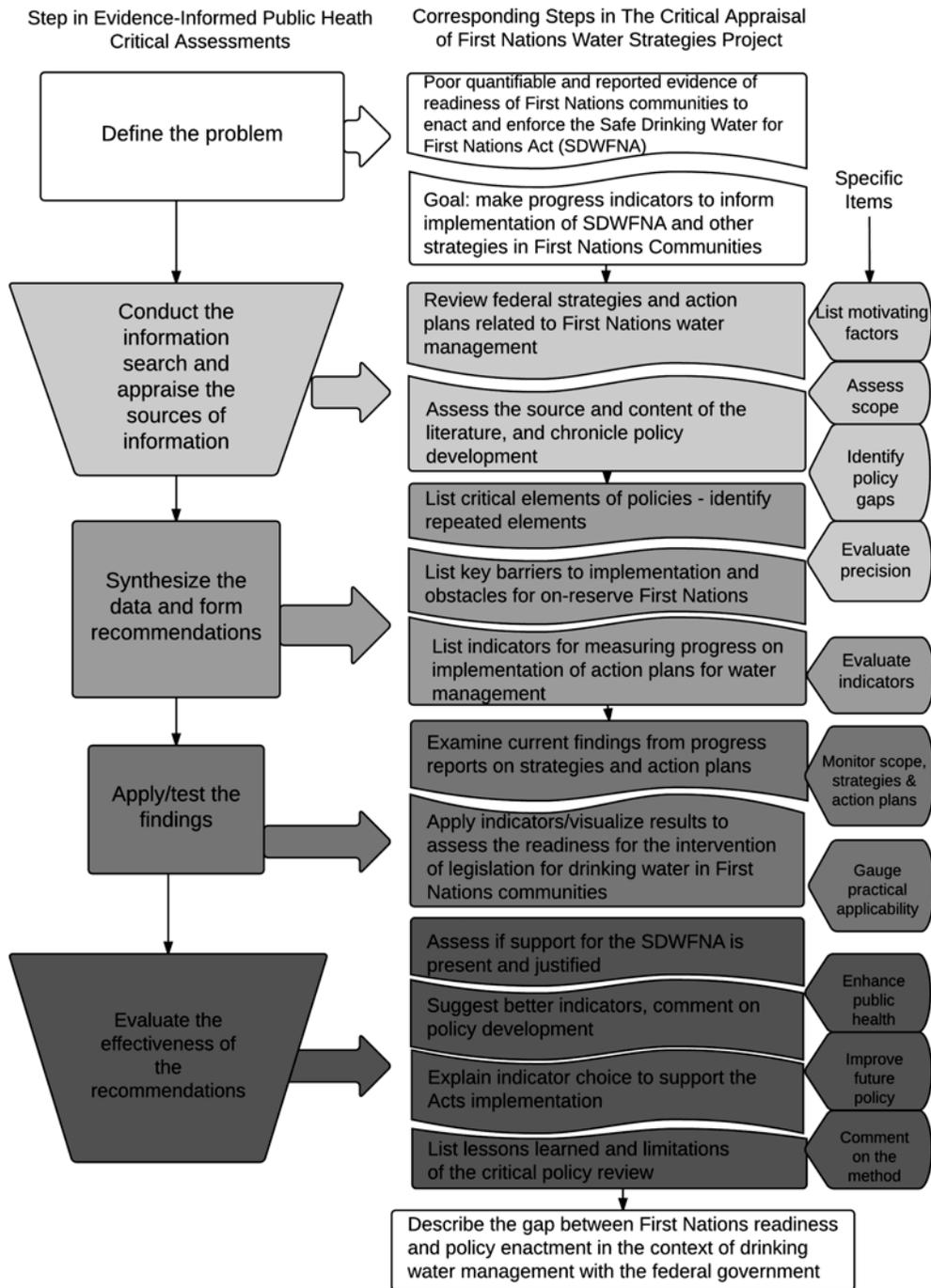


Figure 1. Evidence-informed public health policy reviewing process (adapted from Ciliska et al. 2008; Brownson et al. 2010; Braveman et al. 2011).

Canada; an additional 12% of First Nations people in Canada are not served by a drinking or wastewater system. The assessment provided a limited snapshot of very poor baseline conditions and capacities in these communities compared with public and private water system conditions and capacities across the country as a whole (Carter and Danert 2003; INAC 2003; Charrois

2010). The assessment did not include reviews of historical records or water-borne public health emergencies, and lacked systematic comparisons of First Nations community water systems with those of comparable non-First Nations communities. Such comparisons would have provided relevant information about the cost-effectiveness of investments made in First Nations water systems.

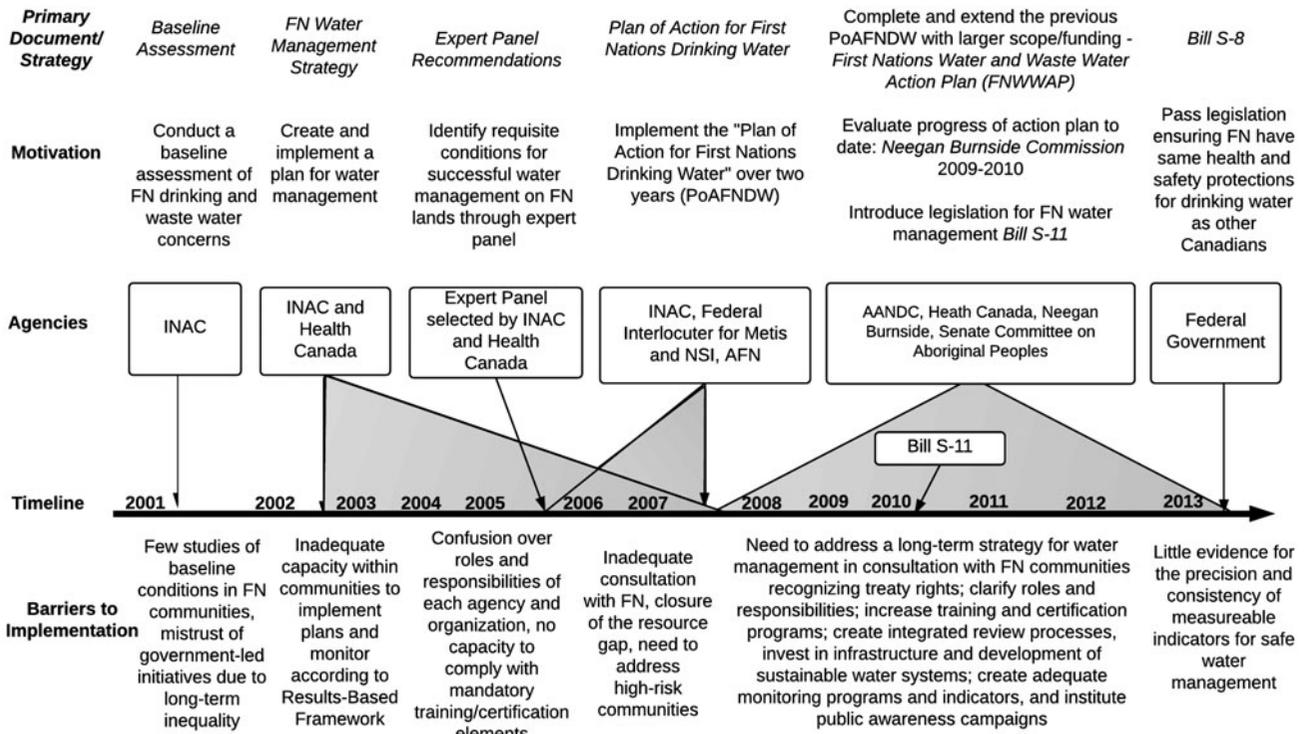


Figure 2. Timeline and characteristics of primary First Nations water policy documents.

Table 2. Federal policies and action plans, and associated progress reports.

Federal government initiative	Progress report
Baseline National Assessment, 2001–2003	2003 National Assessment (INAC)
First Nations Water Management Strategy (FNWMS), 2003–2008	2007 Summative Evaluation (INAC) 2011 National Assessment (Contracted from Neegan Burnside Ltd.)
Plan of Action for First Nations Drinking Water (PoFNDW) and First Nations Waste Water Action Plan (FNWWAP), 2006–2012	2006 PoFNDW progress report (INAC) 2007 PoFNDW progress report (INAC) 2008 PoFNDW progress report (INAC) 2008/09 FNWWAP progress report (INAC) 2009/10 FNWWAP progress report (INAC)
Post-FNWMS Investment	2010/12 Water and Wastewater Report (AANDC)

Notes: INAC, Indian and Northern Affairs Canada; AANDC, Aboriginal Affairs and Northern Development Canada.

The First Nations Water Management Strategy, 2003–2008

In response to this baseline assessment, in 2003 the FNWMS was conceived. The FNWMS was jointly developed by INAC and Health Canada. It was based on a national approach and shaped by provincial and territorial management regimes in place at the time. The strategy outlined a 7-point plan for on-reserve water and wastewater. It was implemented over 5 years (2003 to 2008), and involved a total federal investment of CAD \$1.6 billion. The strategy was intended to guide the implementation of plans to upgrade and build, in

high-priority communities, water and wastewater facilities meeting established design, construction and water quality standards, as well as for the continued expansion and enhancement of training programs with mandatory certification requirements for all operators. It also applied to plans for effective and sustainable water quality monitoring, operation and management programming. In addition, the FNWMS called for the development of integrated water-quality management protocols, inclusive of clearly defined roles and responsibilities, standards, protocols and policies consistent with national performance standards. It was to use a multi-barrier approach

Table 3. Alignment of objectives across strategy documents.

Objectives	Strategy/action plan				
	FNWMS (2003)	Expert panel (2006–2007)	PoAFNDW (2008)	FNWMS (2008)	Bill S-8
Increasing community capacity and training	✓	✓	✓	✓	
Improved water monitoring, sampling, testing, analysis, reporting	✓	✓	✓	✓	✓
Decrease high-risk systems	✓	✓	✓	✓	
Develop standards, policies and protocols for water operation, maintenance and management	✓	✓	✓	✓	✓
Investment in remote monitoring		✓	✓	✓	
Investment in small water systems			✓	✓	
Increased government-governance capacity			✓	✓	✓
Public education	✓			✓	

Notes: FNWMS, First Nations Water Management Strategy; PoAFNDW, Plan of Action for First Nations Drinking Water.

and include emergency response procedures, as well as a public awareness campaign to inform First Nations decision-makers of their roles and responsibilities in ensuring the safety of water supplies within their communities (INAC 2007).

In compliance with Treasury Board policies specific to transfer payments and evaluation, a results-based management and accountability framework (RMAF) was developed for the FNWMS. Utilizing this framework, the FNWMS strategy was implemented through four key activities and their outputs. According to the RMAF, the key activities and outputs were expected to produce immediate, intermediate and long-term outcomes.

Barriers to the implementation of the FNWMS included infrastructural deficiencies, low progress on remedial action plans, the lack of an expert panel for consultation about water management decisions, a low capacity for achieving certifications for operating and monitoring water systems, and irregular reporting (Swain et al. 2006; AANDC 2007, 2008a, 2009; Mascarenhas 2007; Neegan Burnside Ltd. 2011; von der Porten and de Loë 2010).

The Plan of Action for First Nations Drinking Water, 2006–2008

In March 2006, the 2-year Plan of Action for First Nations Drinking Water (PoAFNDW) was introduced to further the aims of the FNWMS. It included an investment of CAD \$60 million, and five major planned actions. These included the implementation of a protocol for safe drinking water that contained standards for the design, construction, operation, maintenance and monitoring of drinking water systems in First Nations communities, mandatory training for all treatment-plant operators with the oversight of certified operators, initiatives for remote water system monitoring and remedial plans for First Nations communities with high-risk water

systems. Two further actions were a clear commitment to report progress on a regular basis, and the engagement of an expert panel who would advise on appropriate regulatory frameworks and new legislation.

Barriers to the PoAFNDW included the need for additional funding and capacity-building for certification and monitoring programs, better and more meaningful consultative practices, and the expansion of the scope of water provision to include small and private systems (AANDC 2008b). Furthermore, there was a need for investment in a national wastewater system and the co-development, with community members and supporting agencies, of new procedures for addressing and preventing waterborne illnesses (Swain et al. 2006; AANDC 2008b; Christensen et al. 2010; White et al. 2011, 2012; Cave et al. 2013).

The expert panel recommendations on safe drinking water for First Nations, 2006

In 2006, INAC and the AFN appointed an expert panel on safe drinking water for First Nations to hold hearings, provide recommendations and report on options for drinking water regulation on reserve (INAC 2006). The expert panel identified three prerequisite conditions for any management or regulatory regime to succeed in First Nations communities. First, the federal government needed to close the resource gap between First Nations and non-First Nations communities across Canada by, at a minimum, giving them the same resources so that they could work to develop the necessary local capacity to administer, enforce and comply with any regulatory regime introduced. The government was to provide the means for sustainable operations and maintenance procedures to ensure that infrastructure and facilities on reserve meet the same regulatory standards as those found off reserve.

Table 4. The contribution of policy documents to the current state of First Nations water regulations.

Years	Policy and its source	Goal	Scope	Outcomes
2001–2003	Baseline Assessment, INAC	Assess physical and operational components of on-reserve water systems	Evaluated training of operators, identified below-standard water and wastewater systems, and estimated costs for remediation	Assessed 740 drinking water and 492 waste water systems in 691 First Nations communities to provide a snapshot of baseline conditions
2003–2008	First Nations Water Management Strategy, INAC and Health Canada	Create and implement a plan for First Nations water and wastewater management	Included upgrades and new water systems to meet standards in high-priority communities, enhanced training programs and certification, the implementation of water quality monitoring, and operational and management programs	<p>(1) Developed a 7-point plan implemented over 5 years</p> <p>(2) Supported the development of integrated water management protocols with standards and emergency measures, as well as public awareness campaigns</p> <p>(3) Developed a Results-Based Management and Accountability Framework (RMAF)</p>
2006–2008	The Plan of Action for First Nations Drinking Water, INAC and Federal Interlocutor	Invest CAD \$60 million, conduct five major actions to further the FNWMS over 2 years	<p>(1) Protocols for safe drinking water in First Nations;</p> <p>(2) Mandatory training for treatment plant operators;</p> <p>(3) Remote water system monitoring programs;</p> <p>(4) Remedial plans for high-risk communities;</p> <p>(5) Commitment to regular reporting and expert panel creation (see next entry)</p>	INAC began to implement the five actions; protocols with standards for design, construction, operation, maintenance and monitoring were developed; the Expert Panel was struck; training for operators began under the oversight of certified operators and remedial plans were initiated
	Expert Panel on Safe Drinking Water for First Nations, INAC and Assembly of First Nations	Appoint a panel to hold hearings, provide recommendations, and report on the progress of First Nations community water systems	Panel identified three conditions for the success of regulations in First Nations communities:	Provided recommendations for the Federal Government to meet, i.e.:
			<p>(1) Close the resource gap;</p> <p>(2) Community consultation;</p> <p>(3) Address high-risk communities</p>	<p>(1) Increasing the capacity in First Nations communities to administer and enforce the regulatory regimes;</p> <p>(2) Consulting First Nations with respect to treaty rights and regulatory impacts;</p> <p>(3) Investing in support systems for First Nations communities</p>

(Continued)

Table 4. (Continued).

Years	Policy and its source	Goal	Scope	Outcomes
2008–2012	First Nations Water and Waste Water Action Plan (FNWWAP), INAC	Enact a plan to supersede the PoAFNDW with a CAD \$330 million investment and an additional eight actions	Added engineering assessment, consulting on legislation, increased training funds, funding for inspections/monitoring, process enhancements for reviewing proposals, and waterborne illness procedures	Demonstrated commitment to build or renovate on-reserve water infrastructure and support the development of long-term strategies for improving water quality in First Nations communities
	Neegan Burnside Commissions (2009–2010), INAC, Neegan Burnside Ltd.	Conduct a national engineering assessment of First Nations water systems	Compiled first comprehensive assessment since initial baseline (2001–2002); identified necessary upgrades and estimated costs	Assessed 97% of FN water systems; revealed water supply breakdown: 72% piped, 13.5% truck delivery, 13% individual wells, 1.5% have no water service; closer inspection of a 5% sample of systems revealed 36% of wells did not meet standards for health, and 75% did not meet aesthetic standards
2013	Bill S-11 (2010), federal government	Introduce a legislated regime to build federal regulations governing First Nations water management	Pressure from 116 First Nations communities under long-term drinking water advisories ensured the bill was introduced and referred to a Senate Committee	Widespread opposition to the bill and First Nations concerns prevented Bill S-11 from proceeding to a third reading; the bill died on the Order Paper when Parliament dissolved in March 2011
	Bill S-8, federal government	Introduce a refined legislative initiative providing for the development of federal regulations governing First Nations water management	Contained 15 clauses, the majority about governance and the authority to make regulations about the provision of drinking water and disposal of waste water on First Nations lands	Listed guiding policies for developing federal regulations for First Nations source water protection, drinking water and waste water systems and management and the incorporation of provincial regulations, and spelled out the Governor in Council's power to make regulations

Notes: INAC, Indian and Northern Affairs Canada; PoAFNDW, Plan of Action for First Nations Drinking Water; FNWWAP, First Nations Water and Waste Water Action Plan; FN, First Nations; RMAF, Results-Based Management and Accountability Framework.

Improved Capacity for First Nations Water Management from 2002 – 2013

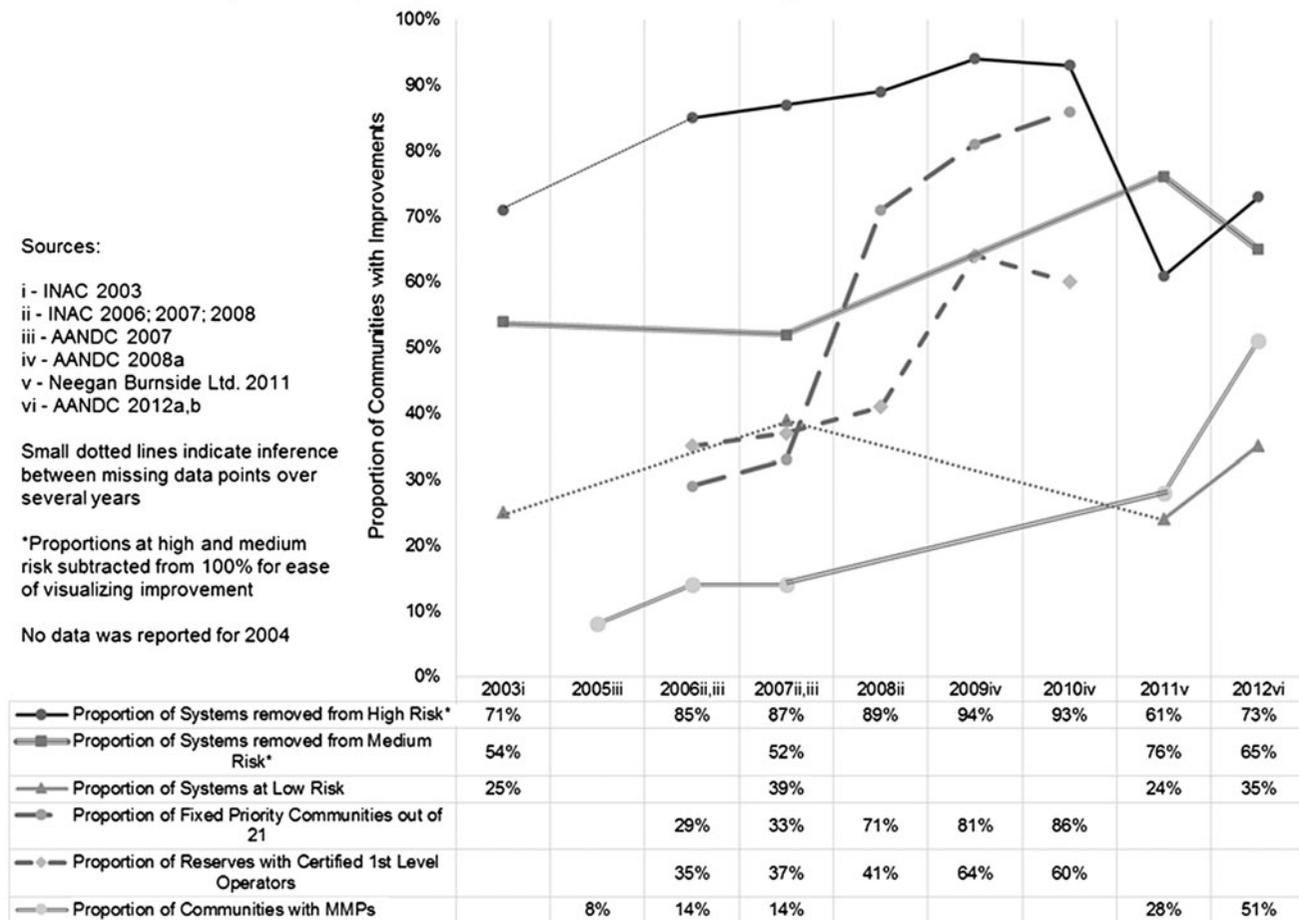


Figure 3. Common quantifiable indicators for progress tracking, 2001–2013.

Consultation with First Nations was the second prerequisite. This requirement focused on the need for federal government to consult with First Nations for the purpose of assessing regulatory impacts on existing treaty rights. Addressing high-risk communities was the third prerequisite proposed (Table 1); it was recommended that the management of risks and the evaluation of individual drinking water supply systems be added to the federal RMAF. The federal government was also to invest in building stronger technical support networks through engaging local operators with provincial and federal technical experts on water management systems and emergency support services. The federal government needed to increase the governance capacity of communities by expanding self-government agreements and devolving more water management responsibilities to First Nations. Finally, an investigation into the feasibility of using remote drinking water quality monitoring, and continued collaboration with Health Canada's

community-based programs, was expected (Canada Expert Panel on Safe Drinking Water for First Nations 2006; Health Canada 2015).

The First Nations Water and Wastewater Action Plan, 2008–2012

The PoAFNDW was superseded by the First Nations Water and Wastewater Action Plan (FNWWAP) in 2008. The FNWWAP, a CAD \$330 million investment, was approved and implemented based on reported PoAFNDW progress (INAC 2006, 2007). This plan carried forward five primary activity areas of the PoAFNDW, but extended them to include an additional eight actions. These actions included:

- (1) A national engineering assessment to determine the state of, and propose solutions for, existing water and wastewater systems for every First Nations community in Canada;

- (2) Consultations on a federal legislative framework for safe drinking water;
- (3) Doubling of funding for training programs (including the Circuit Rider Training Program) with an effort to increase the number of trainers;
- (4) Modifications of existing policies to create more effective policy in collaboration with on-reserve communities;
- (5) Development of protocols to facilitate investments in small water systems, such as individual and community wells, trucked water and septic systems, as well as agreements with neighboring municipalities;
- (6) Investments in Health Canada for the inspection, monitoring, advising and education about community and on-site wastewater systems, including the implementation of public awareness initiatives targeting First Nations leaders, administrators and community members, with instructions on how to visually inspect and prevent contamination of individual wells;
- (7) Renewal of integrated review processes for water and wastewater infrastructure project proposals in First Nations communities; and
- (8) Development of procedures for the identification and containment of waterborne illness.

The augmented plan officially ended on 31 March 2012, and was not formally renewed; however, the federal government committed another CAD \$330 million over the next 2 years to build and renovate on-reserve water infrastructure and to support the development of a long-term strategy to improve water quality on reserve.

Introduction of Bill S-11, 2010

Within a 2-year period after FNWWAP implementation, Bill S-11 was introduced by the federal government. At the time of its introduction, 116 First Nations communities were under drinking water advisories, with an average duration of 343 days (AANDC 2012a). Bill S-11 was introduced in the Senate on 26 May 2010 and was referred to the Standing Senate Committee on Aboriginal Peoples for examination on 14 December 2010. This committee held nine meetings about the proposed legislation during the period of 2 February to 9 March 2011. Due to widespread opposition from both First Nations and non-First Nations groups, Bill S-11 did not proceed to a third reading, and further discussions on proposed changes to the bill between government officials and First Nations representatives ensued. Bill S-11 subsequently died on the Order Paper when Parliament dissolved on 26 March 2011.

Neegan Burnside commissioned assessment, 2009–2010

A national engineering assessment of First Nations water and wastewater systems was commissioned by INAC and carried out from 2009 to 2010 (Neegan Burnside Ltd. 2011). This work is considered to be the only comprehensive assessment performed since the Baseline Assessment in 2001–2002 (see INAC 2003; White et al. 2011). This evaluation involved identifying the upgrades required in order for water and wastewater systems to meet INAC's Level of Service Standards and Protocols for Safe Drinking Water and Wastewater Treatment and Disposal in First Nations Communities. A community serviceability assessment of private, on-site communal and/or central systems and preparation of cost estimates for each community were also to be completed.

Nationally, 571 of 587 First Nations communities (97%) participated in this assessment. Four First Nations did not participate and 12 First Nations were identified as having no active infrastructure. In total, the evaluation of 807 water systems serving 560 First Nations and private water systems serving 11 First Nations communities was conducted. The assessment revealed that drinking water supplies vary within and among First Nations. It was reported that, by 2010, 72% of First Nations people's homes had a piped drinking water supply, 13.5% were on truck delivery, 13% relied on individual wells and 1.5% had no water service. Approximately 5% of individual wells and septic systems were assessed. Parameters from the Guidelines for Canadian Drinking Water Quality (GCDWQ) governing health-related chemical and/or bacterial contamination (e.g. with arsenic and/or barium) and aesthetic qualities (e.g. hardness, or concentrations of sodium, iron, manganese, etc.) of drinking water were not met in 36 and 75% of individual wells sampled, respectively.

Bill S-8, June 2013

Bill S-8, the Safe Drinking Water for First Nations Act, was the second legislative initiative introduced by the federal government to address safe drinking water on reserves. This bill was introduced in Senate on 29 February 2012. Bill S-8 contained 15 clauses, the majority of which speak to the Governor in Council's power to make regulations governing the provision of drinking water and the disposal of wastewater on First Nations lands (AANDC 2012a, 2012b). It also establishes that federal regulations may incorporate, by reference, provincial regulations governing drinking water and wastewater in First Nations communities (AANDC 2012a). This legislation addresses the application of regulations to source water, the liability of on-reserve First Nations for non-band-owned water systems, liability of self-governing First Nations and agreements with, and powers of, third parties used for enforcement of the legislation (AANDC 2012a).

Progress reports, 2003–2012

The research team identified reports assessing the progress of implemented federal strategies and action plans. After the baseline assessment was completed, several progress reports were published about major initiatives actioned from 2001 to 2013. A list of reports about each initiative (the FNWMS, PoAFNDW and FNWWAP) is provided in Table 2.

Common measures or indicators used by commissioned agents to evaluate the progress toward strategic initiatives were traced through reports. The 2007 summative evaluation (INAC 2007) and the Neegan Burnside Ltd. Commission (2011) specifically assessed FNWMS progress. The PoFNDW and FNWWAP programs released annual progress reports on their overall progress, including the numbers of high-risk and priority communities, improvements to protocols, changes to certification processes, and infrastructural developments. Progress updates included information on enhanced engagement and consultations, confidence levels in communities, health risks and procedures, economic assessments and project-by-project reporting. Despite common goals and overlapping areas of focus, only four indicators appeared consistently. These are described in Part 2 of the results.

Summary of part 1: literature search and cataloguing

Eight key pieces of policy, including action plans, progress reports and expert panel recommendations, were chosen as the key set of documents for further analysis and synthesis. These together illustrated the progression of the written legislation, but gave little information about how the enhancement of on-reserve water systems and operations was going to occur on the ground, or what the First Nations communities themselves deemed workable (Swain et al. 2006; Christensen et al. 2010; AFN 2011). Common objectives of the strategies are summarized in Table 3. The major obstacles identified through the implementation of these policies, namely confused roles and responsibilities, lack of consultation, poorly defined indicators of progress, the large resource gap and no integrated review process, echoed what has been discussed in the literature (Carter and Danert 2003; Morales 2006; AFN 2008; Christensen et al. 2010; White et al. 2011, 2012; Simeone and Troniak 2012).

The goals of each plan grew with each progress report, as new needs became apparent after feedback from First Nations and other advocates. They included the need for more meaningful consultation and engagement, the addition of health risk monitoring and educational campaigns, the investigation of alternative forms of infrastructure, such as small, shared,

private and remote systems, and the creation of long-term plans.

Progress reports from this period supported an expansion of the government's initial strategies and action plans as more details about the conditions and capacities in First Nations communities were uncovered. More consultation and meaningful engagement were recommended by the AFN and the expert panel members numerous times to improve the relevance of potential regulations to the communities, and to legitimize the capacity of First Nations communities, given the push for federal legislation, but the progress reports do not include evidence demonstrating an increase in meaningful engagement over the period. Table 4 summarizes and compares these findings.

Part 2: introduction to a comparison of effectiveness of policies and the identification of government-documented indicators

This section begins with a discussion of the government-documented indicators of strategy progress. An examination of the data supporting each potential quantifiable indicator is described in several subsections, followed by a list and visual representations of these progress indicators.

The primary policy documents described in the previous section focused on direct actions within communities to discover the extent of the water problems on reserves, improve infrastructure and create regulations; in short, they were imposed from the top down and progress was measured by outside agencies. Meaningful consultation and engagement, awareness of communities' capacities to implement proposed legislation and long-term planning for First Nations water management only became priorities after little progress was reported between 2003 and 2007. Critiques were made by academics and representative groups (AFN, COO) regarding the confusion of responsibilities, and feelings of ongoing colonization that arose from the continued outside intervention and imposition of non-First Nations-derived frameworks and measurements on reserve water systems (Murdocca 2010; White et al. 2012).

The authors of this paper acknowledge that a co-created progress-measuring approach with First Nations communities would have been helpful in order to produce a comprehensive analysis of the state of water system management on First Nations reserves while minimizing the continuation of the legacy of colonialism; however, resource constraints have limited this research project to the study of quantifiable indicators obtained from government documents and progress reports. The goal of this paper is therefore limited to demonstrating

that, even according to the government's own evidence, little progress occurred during the reporting period.

Progress reporting on First Nations drinking water systems, 2001–2012

Progress relative to the baseline assessment and the FNWMS was evaluated via a review of progress reports available on government websites. Only four consistent quantitative indicators could be tracked over the 12-year period from 2001 to 2013. These included the relative proportions of high-, medium- and low-risk communities, the number of high-priority communities identified and addressed, the number of trained operators and the number of systems with maintenance and monitoring plans (MMPs). These four indicators appeared to inform progress under the federal initiatives implemented (Figure 3). These four indicators also represent progress tracking in several of the dimensions described above: institutional (risk reduction in high- and medium-risk communities, and the presence of MMPs), financial and political (the influx of federal targeted funding along with community collaboration to fix problems quickly), and human resources (the training of operators). We did not find evidence of indicators in the categories of social dimensions, information management, the expansion of and collaboration with actor networks, or the securing of water sources among the documents. The absence of these indicators is also emphasized in the opposition letters arguing against Bill S-11 and S-8.

Though the general trend for each of these indicators is upward, each quantifiable indicator also has missing data, and there are some important downturns that must be noted, as discussed below. Each subheading refers to the indicator under discussion.

Proportion of high-risk drinking water systems

The relative proportions of high-, medium- and low-risk systems indicator was built from a variety of sources from 2003 to 2012, and is displayed as three separate plotted lines with interpolation across large data gaps (Figure 3). Only those systems serving five or more homes were evaluated for progress reporting. Systems were classified as high-, medium- or low-risk using a weighted score such that the water source accounted for 10% of the score, system design for 30%, system operation and maintenance 30%, operator training and certification 20% and record keeping 10%.

High-risk systems were defined as systems that had major technical deficiencies in several of these aspects. Baseline conditions were established in 2003, when INAC reported that 29% of systems were high-risk, in their assessment of 740 drinking water systems in 691 communities. Forty-six percent and 25% of water

systems were classified as medium and low risk, respectively (INAC 2003).

The general trend by 2012 is towards fewer high-risk systems and more medium- and low-risk; however, in 2011, the Neegan Burnside Ltd. Commission reported a spike in high-risk systems at 39%, up from 7% the previous year. It is unknown whether the reported increases in 2011 are due to data deficiencies prior to the Commission's report, unexpected events or other reasons.

Data about the number of medium- and low-risk systems had gaps between 2003 and 2007, and then again between 2008 and 2010. In 2011, there was a drop in the number of medium- and low-risk systems, while the numbers of high-risk systems increased. As of 2012, 35% of systems were either medium or low risk.

The continued fluctuations in system risk levels suggest that the risks to drinking water security in First Nations have not yet stabilized, and that the technical capacities that would enable the management of at-risk water systems to devolve to communities are insufficient. More work is needed to reduce the risk levels associated with water systems, and to understand the sources of fluctuations in the data.

Number of high-priority communities addressed

High-priority communities were defined as communities that had both high-risk drinking water systems and drinking water advisories in place at the time of Minister Prentice, then Minister of Indian and Northern Affairs Canada, and National Chief of the Assembly of First Nations Phil Fontaine's Minister's announcement of the establishment of the PoAFNDW in March 2006. Six of 21 communities (Table 1) were addressed in 2006, and further reporting on improvements occurred from 2006 to 2010, when the number of priority communities addressed increased to 18. Data on high-priority communities were not reported in 2011 or 2012, but the general trend is towards fewer such communities, not including communities with no water provision in place. Given the unpredicted climate events that have been occurring in the last few years, such as flooding and permafrost thaw, a re-evaluation of the priority list may need to be considered as First Nations reserve communities face unexpected challenges (see Henderson and Sayers 2012). Indeed, unprecedented ice jamming and subsequent flooding in Manitoba in 2014 led to contaminated drinking water and sewer backups in downstream First Nations reserve communities (CBC News 2014). The indicator of the number of high-priority communities addressed has the potential to be used to track both the financial and political capacities necessary to implement Bill S-8, because both financial support and an active link between local and federal governments need to be in place for high-risk communities to witness improvement.

Number of water operators certified to the first level

The percentage of water operators certified to the first level was first reported in 2006 and then yearly until 2010. Water operator certification consists of four levels, and is determined by the years of water operating experience and how much direct responsible charge experience (experience being in control of a shift running a system) a person has, as well as the class of water system (Canadian Water and Wastewater Operator Certification Committee 2009). A Level 4 water operator certification indicates that the water operator has at least 4 years of operating experience and 2 years of direct responsible charge experience on a Class 3 or Class 4 water system. In contrast, a first-level qualified drinking water operator has obtained an Operator in Training (OIT) certificate, completed at least 1 year of operational experience and successfully completed a Level 1 water operator examination (AANDC 2012a).

In 2003, INAC reported that only 10% of water and wastewater plant operators combined were certified to meet the industry standard (INAC 2003). INAC did not, however, specify the level of operator training that had already been done, nor was data specific to drinking water operations separated out. Baseline conditions outlined in the 2006 PoAFNDW progress report indicated that 35% of all drinking water operators were certified to the first level (AANDC 2006). The numbers of certified operators increased from 35% in 2006 to 64% in 2009, but were reported to fall to 60% in 2010. This human resources indicator could benefit from more specific types of data, to help pinpoint the barriers to achieving certification. Additional work demonstrating the training and certification differences among First Nations and other communities in Canada would also augment the calculation of water system capacity.

Number of maintenance and management plans (MMPs)

The number of MMPs was also a common technical indicator reported over the timeline of the federal strategies studied. MMPs are defined as compilations of paper or electronic records formalizing the planning, scheduling, documenting and reporting of both preventative maintenance and unscheduled or corrective maintenance activities. Under federal initiatives, MMPs were intended to improve the effectiveness of maintenance activities to optimize spending, minimize service disruptions and extend the lives of water systems.

In First Nations communities, MMPs are often developed by water system operators, who are assumed to understand their systems. The system operators use MMPs to carry out and monitor maintenance procedures. Baseline information on MMPs was first reported in the

summative evaluation (AANDC 2007). In this report, 8% of water and wastewater systems combined had MMPs in place. The percentage of MMPs was reported to increase to 14% in 2006 and 2007. Data were not available for the period between 2008 and 2010. The number of MMPs increased from 14% in 2007 to 28% in 2011, and jumped to 51% in 2012 when a template was developed for the on-reserve context by AANDC with advice from their regional engineers and technicians (AANDC 2014). As of 2012, this indicator therefore expresses local capacities for producing management plans from templates, but fails to assess whether these plans are followed. Given the data deficiencies in ascertaining the certification levels of water system operators, the use of MMP completion data is also lacking without a comparison of MMP quality among certification levels, and between First Nations communities and other communities.

Synthesis of indicators and capacity to implement Bill S-8

These four government-documented indicators give moderate support at best for improvements to the quantifiable aspects of a few dimensions of the management of water systems in First Nations communities. The indicators illustrate increased capacities in four ways: first, financial investment in infrastructure in priority areas is working, as evidenced by the reports of gradual reductions in the numbers of high-risk and high-priority water systems. A reassessment of high-priority communities or, even better, all First Nations water systems, is warranted, however, given recent climatological events (i.e. the widespread flooding in prairie provinces in 2011, 2013 and 2014, the fires in the prairie provinces in 2015, and the Northern Ontario flooding in 2014). There is also the need to evaluate the water-associated risk levels of on-reserve communities that have no access to drinking and wastewater systems.

Second, the shift from a large proportion of high-risk to more medium- and low-risk systems indicates that advances have taken place in infrastructure, management and monitoring of water systems on-reserve. Comparative information for non-First Nations communities would also help in deciding the weighting and scores that more accurately reflect the level of risks associated with on-reserve First Nations water systems. That information would round out the technical indicator.

Third, human resources capacity improvements are evidenced by the increase in the number of certified operators. More information about the appropriate level of certification for each community system is required to gauge readiness to manage and enforce safe drinking water policies within reserve communities. A comparison

with Canada-wide certifications of the operators of similarly classified systems would better characterize the true human resources scope of First Nations operators. Information about the capabilities of back-up operators would also improve the ability to judge the water system capacity of First Nations reserves.

Finally, a longer term commitment to improving the technical dimensions of water systems on reserves is evident through the increase in the development of MMPs. The observed increase in the presence of these plans is a positive first step in documenting water system maintenance needs. Reporting on compliance with MMPs would be a good next step in moving toward the development of best practice manuals and integrated water management plans for First Nations and their watersheds.

Summary of part 2: quantifiable indicators

None of the four quantifiable indicators demonstrated enough evidence or was comprehensive enough to allow it to be said that First Nations reserves as a whole are approaching a workable capacity for water systems management (Leiberman et al. 2013). Indeed, reports on progress as of 2013 suggest that, on the whole, the First Nations water management system is no more than half-way through its course of possible improvements to the more urgent aspects of community drinking water management. There is no set of guidelines applicable to the percentage improvement in the four indicators obtained in this research that could determine whether it is possible to suggest a level of readiness for the implementation of the federal acts dealing with water system management; however, given the long history of imperialism and colonialism in First Nations resource management in Canada, caution in the introduction of new laws is warranted (Borrows 1997; Mascarenhas 2007; Jackson et al. 2012). Even using these four indicators on a national scale, First Nations community capacities to operate and monitor community drinking water systems can be determined only roughly, at best.

Discussion

The motivating factors for the ongoing strategies, action plans and, more recently, introduction of legislation concerning First Nations drinking water include the prevalence of water management issues such as contamination, including longstanding boil water advisories, and public outcry over inequities. Problems are evident yet underreported in all First Nations jurisdictions in Canada and across all types of water systems: large, small, private and remotely managed (Boyd 2011).

First Nations scales of readiness for policy intervention in the public health context call for the use of holistic frameworks and consistent approaches among policy-makers (Hartvelt and Okun 1991; Edwards et al. 2000; Plested et al. 2000; Jackson et al. 2012; Gajadhar 2013). It is also crucial that changes, including new policies, are implemented in a spirit of openness and fairness that also embraces all forms of learning (Baker and McLelland 2003; Rashman and Radnor 2005; Rafferty et al. 2013). In the case of the policy process leading to Bill S-8, the Safe Drinking Water for First Nations Act, the evidence suggests that these ideals were not used to guide the approach. The expert panel members, academics and on-reserve leaders called for a focus on water management system capacity across a wide variety of indicator categories, including meaningful engagement and consultation with First Nations communities, to develop a long-term plan and, with that meaningful engagement, to build support and capacity so that the implementation of policy can be geared to community readiness for it.

The results of this study's review of the strategies, action plans and progress reports on this topic indicate that the initial strategies deployed were directed at solving urgent and localized problems and overcoming barriers as they arose, without working on a long-term plan created through the co-direction and cooperation of First Nations as full partners (Campbell 1996; Houde 2007; Cave et al. 2013). The failure of the first attempt at federal legislation signalled a need to abandon the "patchwork" approach to building safe drinking water legislation (Auclair and Simeone 2010).

This patchwork approach had led to a patchwork of progress indicators without any unifying framework for reporting, and no system for judging progress or reviewing the utility of the indicators themselves. Comprehensive lists of indicators across multi-dimensional models of the complexity of First Nations water provision exist, and could be used to guide progress reporting. Piecing together evidence from the progress reports on the four government-documented indicators provided some evidence for progress, but caution is warranted given a multitude of missing data. Using these four incomplete indicators, it is, at best, evident that there is a long way to go to meet the ideal level of progress toward compliance with First Nations water regulation in the form of Bill S-8.

There is also little reported progress on non-quantifiable indicators, such as whether meaningful consultation about water-related issues on reserves is occurring, whether treaty rights are being respected, and whether communities and governments are working together adequately on the co-production of water management plans. Data on responses to crises and successes in addressing urgent water and wastewater situations is

scarce. No consideration for capacity-building for longer term sustainable water management issues, including population growth, community and economic development, infrastructure and asset management, and the need for environmental stewardship is evident among the primary documents or progress reports analyzed in this research. Thus, the data support the assertion that there is not enough evidence (as per Hartvelt and Okun 1991; de Loë et al. 2002; Timmer et al. 2007; White et al. 2011) to suggest that First Nations across Canada are ready to implement and be responsible for the regulations following from Bill S-8.

The indicators of water system management progress identified in this study need further consideration. The indicators from which the research team could garner useable data were limited in their scope and usefulness, and developed from a perspective informed by Western science with its positivistic world view, and in a governance structure founded on colonialism. The use of these measures to evaluate capacity in First Nations communities is subject to the problem of “category fallacy” – the uncritical imposition of constructs developed in one culture on another culture (Kleinman 1977). As a consequence, these indicators do not necessarily encompass First Nations’ cultural notions of what water provision should include and how or whether it should be externally policed (Tanner 2004), or how a person’s connections to the land and the environment, as well as other cultural and social perspectives, influence their use of resources and, thus, their compliance with rules about resource use (Kirmayer et al. 2009). The gap in readiness to run devolved water systems observed quantifiably through the indicators identified here is minor compared to the lack of acknowledgement and understanding of the historical, cultural, social, political, economic and legal framework that has led to the current situation (Basdeo and Bharadwaj 2013).

Conclusions

The approach used in this study followed the stepwise evidence-informed critical public health assessment methodology developed by Ciliska et al. (2008). This methodology provided a sequence in which to review and discuss the different policies and legislation governing water system management as they evolved from 2001 to 2013. Though a complete understanding of the water-borne public health threats in the context of historical and ongoing mistreatments of First Nations communities is a noble, dignity-enhancing and necessary endeavor, this research was constrained to evaluation of the progress of the components of the policy from the federal government’s perspective. The research demonstrates that on-reserve communities face ongoing

challenges in order to be ready to meet the requirements of Bill S-8.

The findings of this study suggest that there are some valuable lessons to be learned for the future implementation of water management policies in First Nations communities in Canada. First, it is vital to commit to a long-term integrated approach for policy intervention for on-reserve populations in Canada. It is difficult to develop strategies when the progress indicators are changing, not consistent across regions and not reported reliably. Communities and government agencies need to share in the co-production of readiness and capacity measurements, and strategies for implementation, so that everyone involved in designing the solutions to the problem understands the purpose of the policy intervention, and how progress will be measured and reported over the intervention period. The piecemeal approach to creating policy and action plans for on-reserve water provision has been paralleled by a piecemeal approach to measuring progress, which, as the data show, has been ineffective. Second, meaningful engagement with on-reserve community members should be sought in the identification of a policy-related problem so that potential solutions can be collaboratively discussed. Such a strategy would be helpful to reduce the confusion over roles and responsibilities between communities and federal agencies. Third, indicators of progress should be designed to avoid data deficiencies and ill-applied indicator usage – for example, assuming that quantifiable indicators that work in one context will work in another.

Incorporating traditional knowledge-based indicators into the reporting process would also go a long way in building bridges between the different world views held by First Nations people and policy-makers (Lebel and Reed 2013). In this paper, the four indicators identified did not have enough scope, precision or accuracy to provide adequate evidence in support of the readiness of communities for the implementation of Bill S-8 in 2013. Other indicators might have provided more evidence, but no such indicators were available in the key documents analyzed here under the scope of this study. It remains to be seen whether the communities can comply with the legislation.

Serious issues over inequities between on-reserve First Nations populations and other communities in Canada have been reported in educational, housing, poverty and health services contexts, among others (see for example, Carr-Stewart et al. 2012; Palmater 2012; Pahwa et al. 2015; Webster 2015). While it is suggested that the negative effects of antiquated policies written within the context of colonial goals of assimilation make it difficult to create new policy for First Nations populations (Palmater 2012), more descriptive research on the policy processes for First Nations populations provides lessons for creating policy spaces where mutually beneficial goals, such as equal

access to drinking water, can be accomplished. This study asserts that there is an inadequate quality of information available on the progress made toward achieving the goals of government initiatives to improve water quality on reserves, such that it is impossible to even say for certain why progress has been so slow in many cases. Future government initiatives should draw on the rich literature on co-creation of policies so that they include traditional knowledge, are accepted by the communities and meet community goals while also meeting federal goals.

Acknowledgements

We'd like to thank the *Canadian Water Resources Journal* reviewers who provided critical reviews which substantially improved the quality and depth of this manuscript. This paper was edited by Sara Scharf.

Funding

This work was supported by Canadian Institutes of Health Research [grant number Water Regulations: Impact on First Nations Health]; Social Sciences and Humanities Research Council of Canada [grant number 895-2011-1029].

References

- Aboriginal Affairs and Northern Development Canada (AANDC). 2006. Government announces immediate action on First Nations drinking water. <http://www.aadnc-aandc.gc.ca/aiarch/mr/nr/j-a2006/2-02757-eng.asp> (accessed March, 2014).
- Aboriginal Affairs and Northern Development Canada (AANDC). 2007. Summative evaluation of the First Nations water management strategy. <https://www.aadnc-aandc.gc.ca/eng/1100100012016/1100100012033> (accessed July, 2014).
- Aboriginal Affairs and Northern Development Canada (AANDC). 2008a. Appendix A: 21 priority communities progress report. <https://www.aadnc-aandc.gc.ca/eng/1100100034958/1100100034966#appa> (accessed February, 2015).
- Aboriginal Affairs and Northern Development Canada (AANDC). 2008b. Background – First Nations Water and Wastewater Action Plan. <http://www.aadnc-aandc.gc.ca/aiarch/mr/nr/j-a2008/2-3019-bk-eng.asp> (accessed February, 2014).
- Aboriginal Affairs and Northern Development Canada (AANDC). 2009. National Assessment of First Nations Water and Wastewater Systems, 2009–2011. <http://www.aadnc-aandc.gc.ca/eng/1313426883501/1313426958782> (accessed July, 2014).
- Aboriginal Affairs and Northern Development Canada (AANDC). 2010. Summative evaluation of the First Nations Water Management Strategy, Appendix A. Results-based management and accountability framework (RMAF). <http://www.aadnc-aandc.gc.ca/eng/1100100012056/1100100012057> (accessed July, 2014).
- Aboriginal Affairs and Northern Development Canada (AANDC). 2012a. Frequently asked questions – Safe Drinking Water for First Nations Act. <http://www.aadnc-aandc.gc.ca/eng/1330528850798/1330529057245> (accessed February, 2015).
- Aboriginal Affairs and Northern Development Canada (AANDC). 2012b. Water and wastewater infrastructure report – April 2010 – March 2012. <http://www.aadnc-aandc.gc.ca/eng/1352820960474/1352822705434> (accessed February, 2015).
- Aboriginal Affairs and Northern Development Canada (AANDC). 2014. Maintenance management plan for drinking water and wastewater systems in *First Nations communities: Guide and template*. https://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-HQ-ENR/STAGING/texte-text/maintenance_1398348830503_eng.pdf (accessed February, 2015).
- Armenakis, A. A., S. G. Harris, and K. W. Mossholder. 1993. Creating readiness for organizational change. *Human Relations* 46(6): 681–703.
- Assembly of First Nations (AFN). 2008. Climate change and water: Impacts and adaptations for First Nations communities. http://www.afn.ca/uploads/files/env/08-03-27_climate_change_and_water_research_paper_final.pdf (accessed July, 2014).
- Assembly of First Nations (AFN). 2011. *First Nations water rights and access to safe drinking water*. http://www.afn.ca/uploads/files/usb/8_-_sca_water_final.pdf (accessed July, 2014).
- Assembly of First Nations (AFN). 2013. *Assembly of First Nations submission to the House of Commons Standing Committee on Aboriginal Affairs and Northern Development Bill S-8: Safe Drinking Water for First Nations Act*. <http://www.afn.ca/uploads/files/water/afn-s8-submission.pdf> (accessed February, 2014).
- Assembly of Manitoba Chiefs. 2013. *Written submission to Standing Committee on Aboriginal Affairs and Northern Development – Bill S-8: Safe Drinking Water for First Nations Act*. <http://www.afn.ca/uploads/files/water/amc-s8.pdf> (accessed February, 2014).
- Atleo, S. A. 2011. *Letter to First Nation Leaders on behalf of Assembly of First Nations. 8 March 2011*. [http://www.afn.ca/uploads/files/11-03-08_nc_ltr_fn_leaders_re_bill_s-11_\(2\).pdf](http://www.afn.ca/uploads/files/11-03-08_nc_ltr_fn_leaders_re_bill_s-11_(2).pdf) (accessed February, 2015).
- Auclair, N., and T. Simeone. 2010. *Legislative summary of Bill S-11: The Safe Drinking Water for First Nations Act*. Library of Parliament Research Publication 40-3-S11-E. Ottawa: Parliamentary Information and Research Service, Library of Parliament. <http://www.parl.gc.ca/Content/LOP/LegislativeSummaries/40/3/s11-e.pdf> (accessed July, 2014).
- Baird, J., and R. Plummer. 2013. Exploring the governance landscape of indigenous peoples and water in Canada – An introduction to the special issue. *Indigenous Policy Journal* 23(4): 1–6.
- Baker, D. C., and J. N. McLelland. 2003. Evaluating the effectiveness of British Columbia's environmental assessment process for First Nations' participation in mining development. *Environmental Impact Assessment Review* 23(5): 581–603.
- Basdeo, M., and L. Bharadwaj. 2013. Beyond physical: Social dimensions of the water crisis on Canada's First Nations and considerations for governance. *Indigenous Policy Journal* 23(4): 1–14.
- Bill S-11. 2010. The Safe Drinking Water for First Nations Act. 3rd session, 40th Parliament, 2012, SC, 2010–2012. http://www.parl.gc.ca/About/Parliament/LegislativeSummaries/Bills_ls.asp?Language=E&ls=s11&source=library_prb&Parl=40&Ses=3 (accessed February, 2014).
- Blood Tribe First Nation. 2013. *Respecting: Bill S-8 Safe Drinking Water for First Nations Act*. <http://www.afn.ca/uploads/files/water/blood-tribe-s8.pdf> (accessed February, 2014).

- Borrows, J. 1997. Frozen rights in Canada: Constitutional interpretation and the trickster. *American Indian Law Review*: 22: 37–64
- Bowden, M. A. 2011. *A brief analysis of Bill S-11: Safe Drinking Water for First Nations Act*. http://www.cba.org/cba/cle/PDF/ENV11_Bowden_Paper.pdf (accessed July, 2014).
- Boyd, D. R. 2011. No taps, no toilets: First Nations and the Constitutional right to water in Canada. *McGill Law Journal* 57: 81.
- Braveman, P. A., S. A. Egerter, S. H. Woolf, and J. S. Marks. 2011. When do we know enough to recommend action on the social determinants of health? *American Journal of Preventive Medicine* 40(1): S58–S66.
- Brownson, R. C., E. A. Baker, T. L. Leet, K. N. Gillespie, and W. R. True. 2010. *Evidence-based public health*. New York: Oxford University Press.
- Cameron, E. S. 2012. Securing Indigenous politics: A critique of the vulnerability and adaptation approach to the human dimensions of climate change in the Canadian Arctic. *Global Environmental Change* 22(1): 103–114.
- Campbell, T. 1996. Co-management of Aboriginal resources. *Information North* 22(1): 1–6.
- Canada. Expert Panel on Safe Drinking Water for First Nations. 2006. *Indian Affairs and Northern Development Canada and Federal Interlocutor for Métis and Non-Status Indians*. Report of the Expert Panel on Safe Drinking Water for First Nations. <http://publications.gc.ca/collections/Collection/R2-445-2006E2.pdf> (accessed March; July, 2014).
- Canadian Environmental Law Association. 2012. *Briefing note to the standing committee on Aboriginal Peoples Re: Bill S-8 First Nations Safe Drinking Water Act*. http://s.cela.ca/files/846CELA_BriefingNoteBills-8.pdf (accessed July, 2014).
- Canadian Medical Association. 2008. *Investigative report: 1776 boil water advisories now in place in Canada*. <http://www.cmaj.ca/cgi/reprint/178/10/1261.pdf> (accessed March, 2014).
- The Canadian Press. 2015. Winnipeg officials await further water tests after positive samples of *E. coli*. *Herald News.*, 28 January, 2015. <http://thechronicleherald.ca/canada/1265898-winnipeg-officials-await-further-water-tests-after-positive-samples-of-e-coli>. (accessed February, 2015).
- Canadian Water and Wastewater Operator Certification Committee. 2009. *Canadian water and wastewater operator certification best practices*. http://www.gov.pe.ca/photos/original/elj_CWWOCBP.pdf (accessed July, 2014).
- Carr-Stewart, S., J. Marshall, and L. Steeves. 2012. Inequity of education financial resources: A case study of First Nations school funding compared to provincial school funding in Saskatchewan. *McGill Journal of Education/Revue des sciences de l'éducation de McGill*, 46(3): 363–377.
- Carter, R. C., and K. Danert. 2003. The private sector and water and sanitation services – Policy and poverty issues. *Journal of International Development* 15(8): 1067–1072.
- Cave, K., R. Plummer, and R. de Loë. 2013. Exploring water governance and management in Oneida Nation of the Thames (Ontario, Canada): An application of the institutional analysis and development framework. *Indigenous Policy Journal* 23(4): 1–27.
- CBC News. 2014. Manitoba cuts into crumbling dike threatening western communities. *CBC News*, 28 April. <http://www.cbc.ca/news/canada/manitoba/manitoba-cuts-into-crumbling-dike-threatening-western-communities-1.2624212> (accessed July, 2014).
- Charrois, J. W. A. 2010. Private drinking water supplies: Challenges for public health. *Canadian Medical Association Journal* 182(10): 1061–1064.
- Chiefs of Ontario. (COO). 2013. *Submission to the House of Commons Standing Committee on Aboriginal Peoples: Bill S-8: Safe Drinking Water for First Nations Act*. <http://www.afn.ca/uploads/files/water/coo-s8.pdf> (accessed February, 2014).
- Christensen, R., M. A. Phare, and N. Goucher. 2010. Seeking water justice: Strengthening legal protection for Canada's drinking water. Ecojustice Canada. <https://www.ecojustice.ca/publications/reports/seeking-water-justice/attachment> (accessed July, 2014).
- Ciliska, D., H. Thomas, and C. Buffett. 2008. A compendium of critical appraisal tools for public health practice. <http://www.empho.org.uk/Download/Public/11615/1/CA%20Tools%20for%20Public%20Health.pdf> (accessed July, 2014).
- Cole, L. 2014. Walkerton legacy not tapped into. *Daily Commercial News*, 19 November. <http://www.dailycanadiannews.com/Infrastructure/News/2014/11/Walkerton-legacy-not-tapped-into-1003884W/> (accessed February, 2015).
- de Loë, R. C., S. E. Di Giantomasso, and R. D. Kreuzwiser. 2002. Local capacity for groundwater protection in Ontario. *Environmental Management* 29(2): 217–233.
- Doucet, B. 2005. Native poverty: Why relying on government is a poor solution. *Le Québécois Libre*, 15 November. <http://www.quebecoislibre.org/05/051115-8.htm> (accessed July, 2014).
- Edwards, R. W., P. Jumper-Thurman, B. A. Plested, E. R. Oetting, and L. Swanson. 2000. Community readiness: Research to practice. *Journal of Community Psychology* 28 (3): 291–307.
- Eggerton, L. 2006. Safe drinking water standards for First Nations communities. *Canadian Medical Association Journal* 174(9): 1248.
- Ford, J. D., M. Knight, and T. Pearce. 2013. Assessing the “usability” of climate change research for decision-making: A case study of the Canadian International Polar Year. *Global Environmental Change* 23(5): 1317–1326.
- Gajadhar, A. 2013. Drinking water quality in Canadian First Nations communities: Do divergent strategies for addressing the issue contribute to the problems? PhD thesis, Carleton University.
- Hartvelt, F., and D. A. Okun. 1991. Capacity building for water resources management. *Water International* 16(3): 176–183.
- Health Canada. 2012. Canadian drinking water guidelines. <http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php> (accessed July, 2014).
- Health Canada. 2014. How many drinking water advisories are in effect in First Nation communities? <http://www.hc-sc.gc.ca/fniah-spnia/promotion/public-publique/water-eau-eng.php#s2d> (accessed July, 2014).
- Health Canada. 2015. Drinking water and waste water. <http://www.hc-sc.gc.ca/fniah-spnia/promotion/public-publique/water-eau-eng.php#s1> (accessed February, 2015).
- Henderson, C. and J. Sayers. 2012. 4. Aboriginal communities. In *Climate change adaptation: A priorities plan for Canada. Report of the Climate Change Adaptation Project (Canada)*, ed. B. Feltmate, and J. Thistlethwaite, 65–72. Waterloo: University of Waterloo.
- Hill, R., C. Grant, M. George, C. J. Robinson, S. Jackson, and N. Abel. 2012. A typology of indigenous engagement in Australian environmental management: Implications for knowledge integration and social-ecological system sustainability. *Ecology and Society* 17: 1–17.
- Houde, N. 2007. The six faces of traditional ecological knowledge: Challenges and opportunities for Canadian co-management arrangements. *Ecology and Society* 12(2): 34.

- Hubbert, D. 2013. Identifying drinking water regulatory frameworks. <https://dspace.library.uvic.ca/handle/1828/4811> (accessed July, 2014).
- Indian and Northern Affairs Canada (INAC). 2003. *National assessment of water and wastewater systems in First Nations communities: Summary report*. <http://www.aadnc-aandc.gc.ca/eng/1100100034982/1100100034983> (accessed July, 2014).
- Indian and Northern Affairs Canada (INAC). 2003–2008. First Nations water management strategy. <http://www.aadnc-aandc.gc.ca/eng/1100100010369/1100100010370> (accessed March, 2014).
- Indian and Northern Affairs Canada (INAC). 2006. Plan of action for drinking water in First Nations communities: Progress report, 7 December. <http://www.aadnc-aandc.gc.ca/eng/1100100034978/1100100034980> (accessed February, 2014).
- Indian and Northern Affairs Canada (INAC). 2007. Plan of action for drinking water in First Nations communities: Progress report, 22 March. <http://www.aadnc-aandc.gc.ca/eng/1100100034968/1100100034976> (accessed February, 2014).
- Indian and Northern Affairs Canada (INAC). 2008. Plan of action for drinking water in First Nations communities: Progress report, 17 January. <http://www.aadnc-aandc.gc.ca/eng/1100100034958/1100100034966> (accessed February, 2014).
- Indian and Northern Affairs Canada (INAC). 2009. *First Nations water and wastewater action plan: Progress report, January 2008–March 2009*. <http://www.aadnc-aandc.gc.ca/eng/1100100034945/1100100034956> (accessed February, 2014).
- Indian and Northern Affairs Canada (INAC). 2010. *First Nations water and wastewater action plan: Progress report, April 2009–March 2010*. <http://www.aadnc-aandc.gc.ca/eng/1100100034932/1100100034943> (accessed February, 2014).
- Jackson, S., P. Tan, C. Mooney, S. Hoverman, and I. White. 2012. Principles and guidelines for good practice in Indigenous engagement in water planning. *Journal of Hydrology* 474: 57–65.
- Johns, C. M. 2014. 11 The Walkerton Inquiry and policy change. In *Commissions of Inquiry and Policy Change: A Comparative Analysis*, ed. G. J. Inwood and C. M. Johns. 214–243. Toronto: University of Toronto Press.
- Johnson, K., C. Hays, H. Center, and C. Daley. 2004. Building capacity and sustainable prevention innovations: A sustainability planning model. *Evaluation and Program Planning* 27(2): 135–149.
- Jones, G., and J. Stewart. 2012. Local government: The past, the present and the future. *Public Policy and Administration* 27(4): 346–367.
- Kemm, J. 2006. The limitations of “evidence-based” public health. *Journal of Evaluation in Clinical Practice* 12(3): 319–324.
- Kirmayer, L. J., G. M. Brass, and G. G. Valaskakis. 2009. Conclusion: Healing/invention/tradition. In *Healing traditions: The mental health of aboriginal peoples in Canada*, ed. L. J. Kirmayer and G. G. Valaskakis, 440–472. Vancouver: UBC Press.
- Kleinman, A. 1997. *Writing at the margin: Discourse between anthropology and medicine*. Berkeley: University of California Press.
- Kohatsu, N. D., J. G. Robinson, and J. C. Torner. 2004. Evidence-based public health: An evolving concept. *American Journal of Preventive Medicine* 27(5): 417–421.
- Lebel, P. M., and M. G. Reed. 2010. The capacity of Montreal Lake, Saskatchewan to provide safe drinking water: Applying a framework for analysis. *Canadian Water Resources Journal* 35(3): 317–338.
- Lieberman, L., S. D. Golden, and J. A. L. Earp. 2013. Structural approaches to health promotion: What do we need to know about policy and environmental change? *Health Education and Behavior* 40(5): 520–525.
- MacIntosh, C. 2009. Public health protection and drinking water quality on First Nation reserves: Considering the new federal regulatory proposal. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2100519 (accessed July, 2014).
- Mascarenhas, M. 2007. Where the waters divide: First Nations, tainted water and environmental justice in Canada. *Local Environment* 12(6): 565–577.
- McClenaghan, T., and R. Nadarajah. 2012. Briefing Note to the Standing Committee on Aboriginal Peoples re: Bill S-8 First Nations Safe Drinking Water Act. *The Canadian Environmental Law Association*, June 6, 2012. http://www.cela.ca/sites/cela.ca/files/846CELA_BriefingNoteBills-8.pdf (accessed July, 2014).
- Metcalfe, C., C. Murray, L. Collins, and C. Furgal. 2011. Water quality and human health in Indigenous communities in Canada. *Global Bioethics* 24(1–4): 91–94.
- Metro Vancouver. 2012. A Metro Vancouver position paper on Bill S-8: The Safe Drinking Water for First Nations Act. <http://www.ubcm.ca/assets/Whats~New/1-Brief%20-%20A%20Metro%20Vancouver%20Position%20Paper%20on%20Bill%20S-8%20The%20Safe%20Drinking%20Water%20for%20First%20Nations%20Act.pdf> (accessed February, 2014).
- Morales, S. N. 2006. A glass half empty: Drinking water in First Nations communities. In *Aboriginal policy research: Moving forward, making a difference*, vol. 3, ed. J. White, S. Wingert, D. Beavon, and P. Maxim, 161–185. Toronto: Thompson Educational Publishing.
- Murdocca, C. 2010. “There is something in that water”: Race, nationalism, and legal violence. *Law & Social Inquiry* 35 (2): 369–402.
- Murray, C. J. L., and J. Frenk. 2008. Health metrics and evaluation: Strengthening the science. *The Lancet* 371(9619): 1191–1199.
- Neegan Burnside Ltd. 2011. National Assessment of First Nations water and wastewater systems — Saskatchewan regional roll-up report. <https://www.aadnc-aandc.gc.ca/eng/1315530095418/1315530190074> (accessed July, 2014).
- O’Connor, D. R. 2002a. *Part one, a summary. Report of the Walkerton Inquiry: The events of May 2000 and related issues*. Toronto: Ontario Ministry of the Attorney General, Queen’s Printer for Ontario.
- O’Connor, D. R. 2002b *Part two: Report of the Walkerton inquiry: A strategy for safe drinking water*. Toronto: Ontario Ministry of the Attorney General, Queen’s Printer for Ontario.
- Office of the Auditor General of Canada (OAG). 2005. 2005 September report of the Commissioner of the Environment and Sustainable Development: Chapter 5 – Drinking Water in First Nations Communities. http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200509_05_e_14952.html (accessed July, 2014).
- Office of the Auditor General of Canada (OAG). 2011. *2011 June status report of the Auditor General of Canada: Chapter 4 – Programs for First Nations on reserves*. http://www.oag-bvg.gc.ca/internet/english/parl_oag_201106_04_e_35372.html#hd5f (accessed July, 2014).

- Ontario Ministry of the Attorney General, and D. R. O'Connor. 2002. *Report of the Walkerton Inquiry: The events of May 2000 and related issues: A summary*. Toronto: Ontario Ministry of the Attorney General, Government of Ontario.
- Pahwa, P., S. Abonyi, C. Karunanayake, D. C. Rennie, B. Janzen, B., S. Kirychuk, J. A. Lawson, et al. 2015. A community-based participatory research methodology to address, redress, and reassess disparities in respiratory health among First Nations. *BMC Research Notes* 8(1): 199.
- Palmater, P. D. 2012. Stretched beyond human limits: Death by poverty in First Nations. *Canadian Review of Social Policy/Revue canadienne de politique sociale* 65/66: 112–127.
- Patrick, R. J. 2011. Uneven access to safe drinking water for First Nations in Canada: Connecting health and place through source water protection. *Health and Place* 17(1): 386–389.
- Plested, B. A., P. Jumper-Thurman, and R. W. Edwards. 2002. *Community readiness manual*. http://collectiveactionlab.com/sites/default/files/Edwards_et_al_2000_Community_Readiness.pdf (accessed July, 2014).
- Plummer, R., D. de Grosbois, D. Armitage, and R. C. de Loë. 2013. An integrative assessment of water vulnerability in First Nation communities in Southern Ontario, Canada. *Global Environmental Change* 23(4): 749–763.
- Rafferty, A. E., N. L. Jimmieson, and A. A. Armenakis. 2013. Change readiness: A multilevel review. *Journal of Management* 39(1): 110–135.
- Rashman, L., and Z. Radnor. 2005. Learning to improve: Approaches to improving local government services. *Public Money and Management* 25(1): 19–26.
- Rizvi, Z., J. Adamowski, and R. J. Patrick. 2013. First Nation capacity in Québec to practise integrated water resources management. *International Journal of Water* 7(3): 161–190.
- Senate of Canada. 2012. Bill S-8, An Act respecting the safety of drinking water on First Nation lands. 29 February <http://www.parl.gc.ca/HousePublications/Publication.aspx?Docid=5409485&file=4> (accessed July, 2014).
- Simeone, T. 2010. *Safe drinking water in First Nations communities*. *Parliamentary Information and Research Service. Background Paper No. 08-43-E*. <http://www.parl.gc.ca/Content/LOP/researchpublications/prb0843-e.pdf> (accessed June, 2014).
- Simeone, T. and S. Troniak. 2012. *Bill S-8: The Safe Drinking Water for First Nations Act*. Ottawa, ON: Parliamentary Information and Research Service.
- Stiith, S., I. Pruitt, J. Dees, M. Fronce, N. Green, A. Som, and D. Linkh. 2006. Implementing community-based prevention programming: A review of the literature. *Journal of Primary Prevention* 27(6): 599–617.
- Swain, H., S. Louttit, and S. Hrudehy. 2006. *Report of the Expert Panel on Safe Drinking Water for First Nations*. Minister of Indian Affairs and Northern Development and Federal Interlocutor for Métis and Non-Status Indians, Ottawa. http://www.safewater.org/PDFS/reportlibrary/P3_EP_-_2006_-_V1.pdf (accessed June, 2014).
- Tanner, A. 2004. The cosmology of nature, cultural divergence, and the metaphysics of community healing. In *Figured worlds: Ontological obstacles in intercultural relations*, ed. J. R. Clammer, S. Poirier, and E. Schwimmer, 189–222. Toronto: University of Toronto Press.
- Thurman, P. J., J. Allen, and P. B. Deters. 2004. The Circles of Care evaluation: Doing participatory evaluation with American Indian and Alaska Native communities. *American Indian and Alaska Native Mental Health Research: The Journal of the National Center* 11(2): 139–154.
- Thurman, P. J., R. W. Edwards, B. A. Plested, and E. R. Oetting. 2003. Honoring the differences: Using community readiness to create culturally valid community interventions. *Handbook of Racial and Ethnic Minority Psychology*. Thousand Oaks, CA: Sage, 591–607.
- Timmer, D. K., R. C. de Loë, and R. D. Kreutzweiser. 2007. Source water protection in the Annapolis Valley, Nova Scotia: Lessons for building local capacity. *Land Use Policy* 24(1): 187–198.
- von der Porten, S. and R. C. de Loë. 2010. *Water challenges and solutions in First Nations communities: Summary of findings from the workshop Sharing Water Challenges and Solutions: Experience of First Nations Communities, April 15–16, 2010, Kitchener-Waterloo, Ontario*. Waterloo: Water Policy and Governance Group.
- Webster, P. C. 2015. Housing triggers health problems for Canada's First Nations. *The Lancet* 385(9967): 495–496.
- White, J. P., J. Dinsdale, P. and D. Beavon, D. 2011. *Aboriginal policy research: Voting, governance and research*. Toronto: Thompson Educational Publishing.
- White, J. P., Murphy, L., Spence, N. 2012. Water and Indigenous Peoples: Canada's paradox. *The International Indigenous Policy Journal* 3(3): <http://ir.lib.uwo.ca/iipj/vol3/iss3/3> (accessed July, 2014).
- Wingrove, J. 2008. Kashechewan rescue efforts thwarted. *Toronto Star*, 27 April, A6. http://www.thestar.com/news/ontario/2008/04/27/kashechewan_rescue_efforts_thwarted.html (accessed July, 2014).