Engaging in the Deliberative Policy Analysis Process for Water Justice in Canada

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Student: Anna Wilson
Student I.D. #:0240309
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Introduction

From 2014 to 2017 the World Economic Forum (WEF) identified water-related illnesses as one of the top five major global risks to human health (Adeel, 2017, p. 100). Unfortunately, this has not impeded the war on science with United States (U.S.) President Donald Trump closing the Environmental Protection Agency and the former Canadian Conservative Government closing Canada's Ocean and Fisheries Library and ending Canada's Navigable Waters Protection Act (Mitchell, 2017, p. 26). Canadian Prime Minister Justin Trudeau promised to protect Indigenous lands, when he approved the Kinder Morgan Pipeline Project as twelve-year-old Autumn Peltier broke down in tears pleading with him not to let them build a pipeline on her home in Wikwemikong First Nation land in Ontario (Lau, 2016, para. 3) (refer to appendix #1). Prime Minister Trudeau promised Autumn that he would protect the water and this promise has made national headlines. Deliberative policy analysis can make Trudeau's promise Canada's national water policy.

Deliberative Policy Analysis (DPA) can be defined as a process in which policy analysts carefully consider the: "stakeholders [and citizens'] value differences, dialogue, argumentation, and deliberation as major targets of analysis to determine a policy outcome (Li, 2015, p. 26) through one of the three models of DPA: 1. mediation and stakeholder group engagement, 2. citizens' forums, or 3. citizens' initiatives and referendums (Smith, 2003, p. 77). This paper defends the urgency of Canada adopting a deliberative federal water policy that follows World Health Organization (WHO) water policy guidelines.

Canada's adoption of WHO water quality guidelines will be supported by the case studies of other countries who have adopted the WHO water quality standards. First, Canada's current water policies will be examined, second, Canada's water policies will be compared with the WHO water policies. Third, a deliberative national water policy will be synthesized through the conceptual framework of critical deliberative policy analysis through specific water management case studies from the, U.S., Italy and Brazil. Implications for future water policy practices under the guidelines of the WHO will conclude this paper.

Canada's Current Water Policies and the Abyss of Water-Related Health Problems

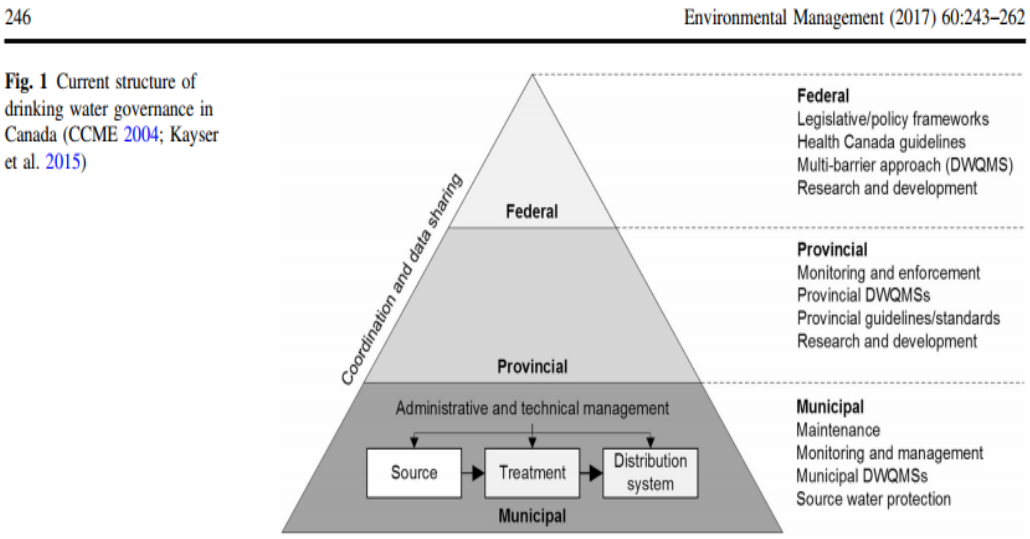
Water governance in Canada is decentralized, with provincial and territorial governments given legislative power while the federal government is responsible for waters flowing across provincial/territorial boundaries and international boundaries (Bereskie, 2017). Drinking water management in Canada is complicated with a regionalized, three-tiered governance structure responsible for clean drinking water throughout the country. This approach has "three main components consisting of the:

1. water sources,
2. treatment systems,
3. distribution systems.

(CCME 2004, as cited in Bereskie, & Rodriguez, 2017, p. 246)

Figure one in the following diagram illustrates the current structure of water governance in Canada.

Figure 1 - Current Structure of Drinking Water Governance in Canada



Bereskie, T., Rodriguez, M. J., & Sadiq, R. (2017). Drinking Water Management and Governance in Canada: An Innovative Plan-Do-Check-Act (PDCA) Framework for a clean Drinking Water Supply. Environmental Management, 60(2), 246. doi: 10.1007/s00267-017-0873-9.

Canada's three tiered top-to-bottom approach for drinking water management consists of federal, provincial/territorial, and municipal governance. Politicians on provincial and municipal levels may promise that each of these tiers are integrated to provide clean drinking water quality

throughout the country as indicated in figure one on the current structure of drinking water governance in Canada, unfortunately, promises do not always equal practice.

This water policy model is criticized as fractured, leading to governance gaps, and an absence of accountability and enforcement (Gemma & Bakker, et al., 2014, p. 4635). The federal government monitors research, and makes recommendations for clean drinking water practices as Health Canada guidelines (Bakker, & Cook, 2011, p. 277). The provincial and territorial governments have the power to decide which water quality guidelines they will follow in their drinking water management systems (DWMS) (Bereskie, 2017). For example, Health Canada (2017) studied the effects of cancer causing trihalomethanes (THMs) in the water and concluded that the level should be decreased from 350 to 50 micrograms/litre (mg/L) (Patrick, 2011, p. 389, refer to appendix 11). Unfortunately, many provincial politicians demanded a compromise level of 100 mg/L (Patrick, 2011, p. 389). This political decision was made at the expense of technical health concerns. It was cheaper for the provinces to keep the levels of cancer causing trihalomethanes at a level of 100 mg/L instead of spending the money to lower the levels to 50 mg/L (Scott, 2015, p. 11). The Canadian people should have been included in this decision which intensifies the need to empower citizens through deliberative policy processes giving them a voice in the safety of their drinking water. The Canadian Council of Ministers of the Environment (CCME) (2004), states that: “In Canada, water suppliers are committed to providing high quality drinking water at the consumer’s tap” (Bereskie, & Rodriguez, 2017, p. 244). In spite of this commendable commitment there have been a consistent number of boil water advisories (BWAs) issued nationally from 2010 to 2015 in rural, small watershed residential regions with the majority of them persisting in First Nation communities (Bereskie, & Rodriguez, 2017, p. 244). This is owing to the responsibility for clean drinking water being given

to the public authority of municipal governments (Hrudey, 2011, as cited in Bereskie, & Rodriguez, 2017, p. 244). Unfortunately, there are no legal enforcement procedures in place to ensure that the water safety requirements are adequately met. Canada and Australia are the only Organization for Economic Cooperation and Development (OECD) countries without legally enforceable drinking water standards at the federal level, despite WHO recommendations.

Health Canada (2014) publishes voluntary health-based guidelines for Canadian Drinking Water Quality (GCDWQ) which are only suggestions to provinces, territories and municipal governments which lack legislation and are not legally enforced (Bereskie & Rodrieguez, 2017, p. 247). Since 2011, only the Northwest Territories, had adopted all 94 GCDWQ (Dunn & Harris, et al., 2015, p. 245). However, the European Union and the U.S. apply enforceable national standards with legal consequences supported by the states and provinces. This makes Canada's need for a national water policy more urgent.

Comparing Canada's Decentralized Water Policy Problem to the WHO Policy Framework

Health Canada provides guidelines and a Multi-barrier Approach (MBA) which can be altered by the water management systems of the provinces/territories. Unfortunately, these alterations are decided by the provincial/territorial governments (Bereskie, 2017, p. 248). The provincial and territorial legislation is illustrated in table four on the applicable drinking water and source water protection legislation/policy and quality management frameworks in appendix four and five (Bereskie, 2017, p. 250). Table four in appendix four and five, illustrates differences between provinces for water quality monitoring, required treatments, and operator certification. It is alarming to note that only some provinces and territories have policies for the

"disinfection of raw surface source water, including filtration for turbidity and parasite removal" (Christensen et al. 2010; Bakker and Cook 2011, as cited in Bereskie, 2017, p. 250).

Since provinces and territories are permitted to interpret these guidelines to suit their economic interests, this often results in compromising regulations like the E. coli outbreak in Walkerton Ontario. Justice Dennis O'Connor was the Commissioner of the Walkerton Inquiry on the E. coli contamination in Walkerton, Ontario. Justice Dennis O'Connor, found that the original contamination originated from farm waste located on a field which washed into an improperly capped well from extreme heavy rains (Mitchell 2017, p. 15). Justice O' Connor reported that: "Due to improper practices that had stretched back years, the contamination went undetected and inadequately treated (Christensen & Goucher, et al., 2010, p. 5). Justice O'Connor detected that a "lack of binding standards and provincial government cutbacks contributed to the event" (Christensen & Goucher, et al., 2010). Justice Dennis O' Connor recommended a multi-barrier approach (MBA) to provide a backup safety system in case the water system was contaminated (Christensen & Goucher, et al., 2010, p. 6). He also recommended the legislation of federal water management laws to ensure that all Canadians have access to clean drinking water and clean water systems for sanitation and hygiene (Mitchell 2017, p. 15). The citizens of Winnipeg suffered from E. coli in their public water system in 2015 (Mitchell 2017, p. 15). The deaths and illnesses from the Walkerton water tragedy make the need for Canada to follow the WHO water quality standards a more urgent necessity.

The recommendations of the World Health Organization (WHO) could help Canadians govern their watersheds more efficiently and prevent water-related deaths. The WHO water safety plan approach for drinking water management offers an alternative preventative management framework to the current conventional, reactive drinking water management

strategies currently in use in Canada (GLAAS, 2017) (Refer to appendix 2 & 3). The mission of the WHO water safety plan is to help participating countries develop nation-wide access to safe drinking water sources that come from sustainable watersheds which will also support adequate sanitation and hygiene (GLAAS, 2017). Canada currently assists rural communities with contaminated water through helping them build and maintain on-site water treatment facilities. The WHO water safety plan can assist through linking Canada's water technicians with foreign water technicians to ensure that potential global contaminants do not flow into their watersheds. The solidarity of nations supporting the WHO water safety plan provides a global united front of water research, water protection strategies, and 24 hour online support for water emergencies (GLAAS, 2017). Therefore, it is in the best interests of Canada to join the WHO water safety plan to access this expertise and support. The WHO water safety plan provides a thirst-quenching solution for national water governance which will be given with a critical analysis of the deliberative policy framework in every drop of water Canadians drink.

Integrating Canada' current drinking water management systems with WHO water regulations requires deliberative dialogue between federal, provincial/territorial, and municipal governments. Climate Change Canada (CCME), Health Canada, and the Federal-Provincial-Territorial Committee on Drinking Water (CDW) work together on the federal management of drinking water (CCME 2004) using a Multi-Barriers Approach (MBA) (refer to appendix #6). The MBA is a water drinking management strategy that implements multiple administrative, behavioral, and physical barriers to prevent contaminants from polluting clean drinking water (CCME 2004). If a water system becomes contaminated, back-up systems and processes are in place to protect the safety of drinking water (GNWT 2005). Unfortunately, many isolated rural populations still endure contaminated water flowing from their taps.

There are many challenges with documenting and reporting water safety concerns between levels of provincial and municipal governance which boils down to the harsh reality that reporting water concerns accurately or promptly involves lower stakes if they are answering to the mayor as opposed to the federal government (Bakker & Cook, 2011). That is why Trudeau's national promise to protect Canada's waters must become a national water policy to make water pollution a national crime instead of a national health crisis!

Structuring Canada's Water Policies with WHO Water Policy Framework Goals

The Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) is a UN-Water initiative implemented by WHO. The objective of GLAAS is to provide policymakers at all levels with a reliable, accessible and global analysis of the investments and environments to make informed decisions for sanitation, drinking-water and hygiene. The WHO Framework for clean Drinking-Water, consists of three components:

(1) the establishment of health-based targets (based on public health goals),
(2) the development and implementation of WSPs,
(3) a system of independent surveillance.

(WHO 2004, 2011; Kot et al. 2015; Goodwin et al. 2015, as cited in UN, 2017, para. 2)

This approach is based on preventing contaminants from entering a water supply system which differs from most water management systems that focus on the mitigation of contaminants already present in a water supply system (Bartram et al. 2009; Kot & Castleden, et al. 2015, as cited in Bereskie, & Rodriguez, et al., 2017, p. 253). Kot and Castleden, et al. (2015) identified

short-term tangible outcomes of WSPs implementation from a review of case studies which included:

- changes in organizational structure or daily procedures within a water supply,
- better risk awareness among water operators,
- more efficient water management practices,
- improved compliance with water regulations.

(Bereskie, & Rodriguez, et al., 2017, p. 253)

Through reviewing the case studies through the lens of the strengths, weaknesses, opportunities, threats (SWOT) analysis of drinking water management and governance in Canada at the federal, provincial/territorial, and municipal levels; a modified water safety plan (defined as the plan-do-check-act (PDCA)-WSP framework) is proposed (Bereskie, & Rodriguez, 2017, p. 244).

Figure two in following diagram illustrates the strengths, weaknesses, opportunities and threats (SWOT) of the current provincial and municipal water systems in Canada:

Figure 2 - SWOT Analysis of the Current Canadian federal, provincial/territorial and municipal governance drinking water management structure

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Fig. 4 SWOT analysis of the current Canadian federal, provincial/territorial, and municipal governance and drinking water management structure

	Strengths	Weaknesses
Federal	• Incorporates source protection, drinking water treatment, and the distribution network • Multiple barriers in place to prevent drinking water failures, including health-based water quality guidelines (i.e. GCDWQ)	• Broad general concepts with discrepancies among mandates and administration • Fragmentation across political boundaries • Lack of coordination between governance tiers • Low adoption rate of outdated/lenient GCDWQ • No legally binding enforcement/monitoring
Provincial & Territorial	• Freedom to incorporate drinking water management systems/elements given specific provincial/territorial needs and priorities • Some provinces have strong DWMSs in place	• Inadequate monitoring and enforcement • Lack of data sharing between provinces • Overlapping responsibilities within province/ territory
Municipal	• Ability for internal improvement • Easily changed organizational structures and/or daily procedures • Have direct communication with consumers	• Difficulty in evaluating performance • Lack of data sharing between municipalities • Lack of transparency for consumers • Generally more reactive than preventative
	Opportunities	**Threats**
Federal	• Opportunity for implementing federal supporting programs • Responsibilities on federal lands, in federal facilities, and in some First Nations communities	• Financial and human resource constraints • Tension between harmonization and subsidiarity • Water quality and quantity uncertainty into the future
Provincial & Territorial	• Most direct responsibility for drinking water management • Much room for improvement (legislative and management) with provincial/territorial freedom	• Economic pressure and market uncertainty • Provincial/territorial government pressure • Resistance to change and barriers to learning
Municipal	• Ability to coordinate with other municipalities • Ability to prioritize improvements • Directly accountable for drinking water quality and management of DWSS	• Aging infrastructure and limited financial resources • Limited financial and human resource availability • Un-trained or undertrained operators

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The strengths, weaknesses, opportunities and threats of the SWOT analysis in the figure two diagram above can be summarized through the difficulty in communicating breaches in water treatment systems across municipal and provincial jurisdictions. In rural and isolated communities limited infrastructure, finances, resources and operators exacerbates timely reporting and repair of contaminated water systems and watersheds. Federal intervention and expertise can provide a foundation to build a strong water system workforce.

There are many reasons why the federal government in Canada resists making a national water policy. One paramount reason is the need to coordinate policy with the United States (Norman & Bakker, 2010, as cited in Mitchell, 2017, p. 15). The Canada–United States border is the longest non-militarized border in the world. Canada is the United States' largest trading partner; and the countries share significant transboundary water resources (International Joint Commission, 2000, as cited in Mitchell, 2017, p. 14). Water-related issues also fall within the mandate of the Commission on Environmental Cooperation (created under the North American Free Trade Agreement). Other examples of bilateral water-related initiatives include the Great Lakes Water Quality Agreement (Bakker, & Cook, 2011, p. 279).

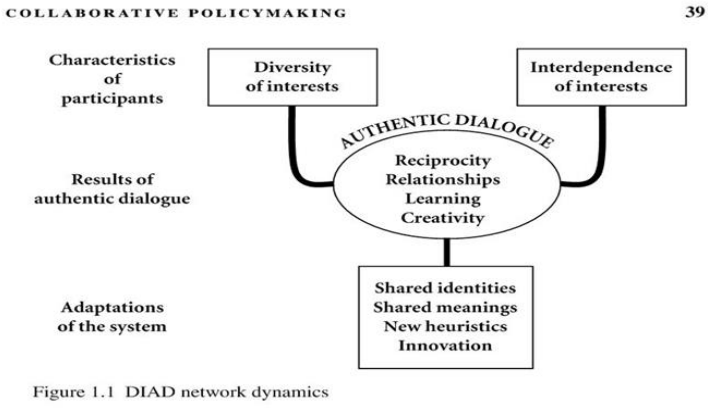
A second reason is the shift from government to governance. Since the 1980s, environmental non-governmental organizations (eNGOs) have taken on an increasing importance in environmental and water governance in both Canada and the United States (Parson, 2001, as cited in Bakker, & Cook, 2011, p. 280). A third reason involves the new actors of governance consisting of stakeholders, land owners and environmental organizations who have conflicting interests that challenge water policies in Canada. Water governance in Canada is also complicated by Aboriginal and treaty rights, especially those rights deemed by "the Supreme Court of Canada that are lands where treaties were not signed, [therefore] Aboriginal

rights and title were not extinguished" (Bakker & Cook, 2011, p. 278). Unceded First Nations lands such as these are also lands upon which twelve-year-old Autumn Peltier resides at Wikwemikong First Nation land in Ontario (Lau, 2016, para. 3). Therefore, the vulnerable First Nations People have a right to determine the policies that impact their watershed. This defends their right to a deliberative policy in which they have a strong voice in the policy-making process.

How Deliberative Policy Analysis Processes Solve Water Policy Problems in the U.S., Italy and Brazil

Two feasible deliberative policy analysis processes are citizens' forums and citizen initiatives and referendums (Smith, 2003, pp. 84-93). Through deliberative opinion polls, citizens' juries and consensus conferences, citizens are provided with a space to deliberate on pressing policy issues. These three types of citizen forums consist of a group of people chosen by the population who discusses public concerns. These delegated citizens are given information and listen to testimonies from witnesses whom they can question on the gravity and implications of the situation. The impartiality of the proceedings are entrusted to an independent facilitating organization (Smith, 2003 p. 84). For example, Judith Innes and David Booher analyze experiments in intergovernmental cooperation and consensus-building processes in the Sacramento Water Forum where citizens engaged in a collaborative dialogue to decide upon the best policy for citizens to have the most efficient, sustainable and affordable water supply. This is illustrated in figure 3 in the following diagram on building authentic dialogue (Hajer, & Wagenaar, 2003, p. 39).

Figure 3 – Collaborative Policymaking through Authentic Dialogue



Hajer, M. A., & Wagenaar, H. (2003). Collaborative policymaking. *Deliberative policy analysis: understanding governance in the network society*. Cambridge, UK: Cambridge University Press. (39).

Two equally effective deliberative policy analysis processes are the citizen initiatives and referendums. These processes enable populations to vote directly on policy issues. Referendums can be advisory or mandatory – in certain countries, laws and constitutional changes require a popular vote. The initiative offers a process through which citizens can propose new legislation or extinguish unfair laws (Smith, 2003 p. 93). A case in point is the Italian Forum of Water Movements who collaborated with other Non-Governmental Organizations (NGO) to conduct a citizen's referendum against water privatization in Italy. Citizens were contacted online and in person. Together, they formed the "Water Common Good" social movement and gathered enough votes to control the regulation of private water companies in Italy (Francesca, 2015, p. 649). Through reciprocal relationships they creatively governed their policy solution through collaborative dialogue as indicated in figure three.

Mediation and stakeholder group engagement involves diverse groups who are in conflict with each other and are willing to achieve a resolution in which all groups are in agreement with

the policy. Some mediators believe that for this process to be productive that all groups must be cooperative so they can focus on collective concerns instead of personal interests. The final policy decision is a collective group conscience of the stakeholders involved. Therefore, the final policy decision is not imposed by an outside corporation. In the stakeholder model of the deliberative policy process there is the successful case study of the San Francisco Estuary project. The San Francisco Estuary project involved two years of collaboration between stakeholders who learned that the health of the estuary was related to the land use, the water use, the fisheries, the water quality and biodiversity (Hajer, & Wagenaar, 2003, p. 41). In the Water Forum they spent over a year developing an agreement for two "co-equal objectives of meeting environmental and human needs for water in the Lower American River" (Hajer, & Wagenaar, 2003, p. 41). All stakeholders who were property developers, business owners, residents and environmentalists realized that they all had a role to play to ensure the sustainability of the estuary. They wrote a collective policy that protected the ecosystem and the rights of the stakeholders who interacted with the ecosystem. This involved fishing conservation regulation and regulation of property developers to not disrupt the natural habitat of the wetlands. Businesses and residents were governed to ensure that proper waste disposal, recycling and composting were maintained. The learning that occurred in this case study is indicated in the following figure four: The Double-Loop Learning in collaborative planning.

Figure 4 -Double-Loop Learning

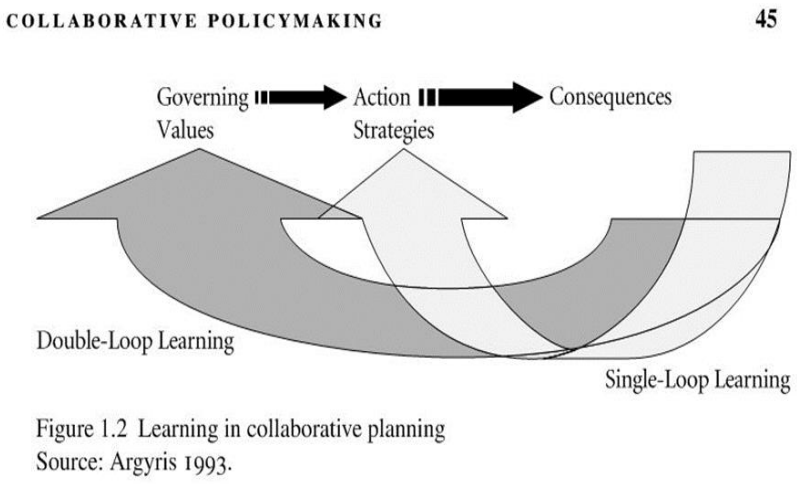


Figure 1.2 Learning in collaborative planning
Source: Argyris 1993.

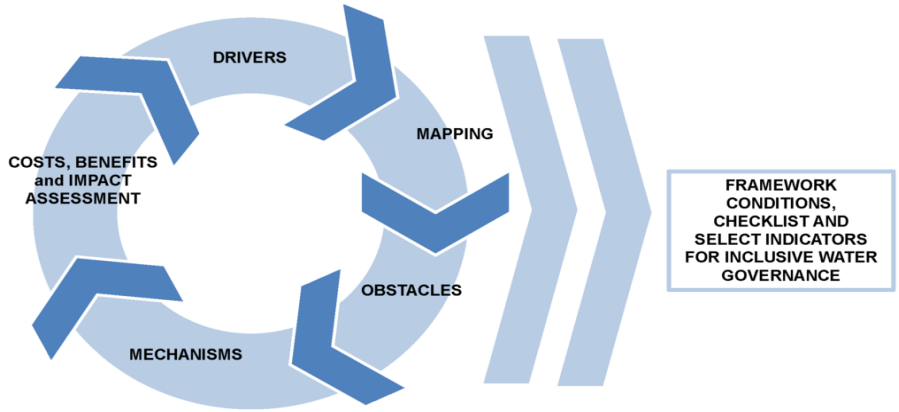
Hajer, M. A., & Wagenaar, H. (2003). Collaborative policymaking. Deliberative policy analysis: understanding governance in the network society. Cambridge, UK: Cambridge University Press. (p. 45).

In double-loop learning actors must re-contemplate and re-evaluate their primary objective through reframing their conflicts, re-orientating their values and reconsidering their interests (Schon & Rein, 1994, as cited in Hajer, & Wagenaar, 2003, p. 45). For example, during Sacramento Water Forum, people catalyzed four types of changes within their values, their relationships with their opposing parties and their perceptions of policy solutions. They moved their complex policy problem into an adaptive policy solution through their capacity to listen to each other, learn and evolve through reciprocal feedback (Hajer, & Wagenaar, 2003, p. 47). Therefore, Canada's national water policy must evolve through the reciprocal deliberation of engaged citizens over time, space and consensus.

Brazil struggled with water shortages and contamination of the great Amazon watershed. Brazil's National Water Agency (ANA) helped states collectively form a National Water Management Pact. State level stakeholders, council authorities, civil society representatives,

water user sectors and river basin committees collaborated on water development goals (Brazil National Water Agency, 2015, as cited in OECD, 2015, p. 123). Through signing a bilateral contract with the Brazil National Water Agency, each state in Brazil receives federal funding to achieve their watershed management goals (Brazil National Water Agency, 2015, as cited in OECD, 2015, p. 123). This has improved water governance through closer cooperation between Brazil's states, stakeholders, businesses and citizens. The following diagram (figure five) is an OECD analytical framework of stakeholder engagement in water governance:

Figure 5 – Analytic Framework for Stakeholder Engagement

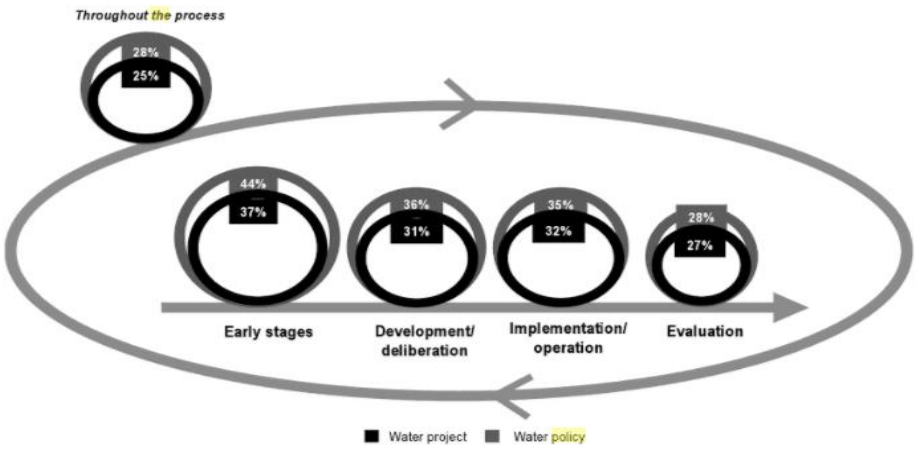


Akhmouch, A. & Clavreul, D. (2016). Stakeholder Engagement for Inclusive Water Governance: "Practicing What We Preach" with the OECD Water Governance Initiative. *Water*, *8*, (204), 5. doi: 10.3390/w8050204.

This is a diagram of a policy framework that examines five areas of deliberative stakeholder engagement in global and national water management that encompasses the drivers of deliberative stakeholder water system engagement, the role that these stakeholders play (eg. who they are, their interests), how these stakeholders engage in the policy frameworks, their obstacles they are driven to overcome, the mechanisms for engaging stakeholders and the "assessment of costs and benefits (Akhmouch & Clavreul, 2016, p. 5). This analysis is based on a qualitative and quantitative survey conducted online in 2014 to gather data on a diverse scope

of stakeholders with conflicting interests and experiences. This survey engaged stakeholders through deliberative dialogue on the premise that exploring a common ground with our greatest critics will improve our moral reputation and our economic sustainability. This mixed method approach of data collection provides quantitative data that can inspire stakeholders' funds and qualitative data that can open their hearts (Akhmouch & Clavreul, 2016, p. 6). For example, the "Water and Waste Services Regulation Authority of Portugal has developed a mobile application that provides water service quality to users in 278 municipalities" (Akhmouch & Clavreul, 2016, p. 6). Figure six in the following diagram reveals how the stakeholders' commitment to the deliberative policy analysis process evolved from the initial survey to collaboration with citizens.

Figure 6 - Involvement of stakeholders across the stages of the policy/project cycle



OECD, (2015). Stakeholder Engagement Mechanisms in the Water Sector, in OECD. (2015). *Stakeholder Engagement for Inclusive Water Governance*, OECD Studies on Water, OECD Publishing, Paris. Retrieved from http://dx.doi.org/10.1787/9789264231122-en.

In figure six, the survey results are mapped across the policy process cycle considering data in relation to the average between target and promoters for the responses as "always" and "almost always" to the question "At which stage of a water-related project and/or reform does your

organization usually get involved?" (OECD, 2015, p. 130). These survey results reveal the stakeholder interactions in the initial "stages of conception, planning, design, and feasibility studies when most of the respondents surveyed [stakeholders] intervene" (OECD, 2015, p. 130), throughout the stakeholder engagement of deliberating over the most effective policy for everyone. Stakeholders can be encouraged to engage in ethical deliberation with OECD countries to enable their organization to wear the OECD seal of approval for following the OECD Environmental Performance Guidelines (OECD, 2010, pp. 57-79). Canada could benefit from adopting a similar stakeholder engagement policy process with provinces and territories. The Ontario Environment Minister has initiated a similar stakeholder engagement process across Ontario's municipalities. The Ontario Environment Minister engages citizens on climate change, through utilizing their input to transform Prime Minister Justin Trudeau's carbon taxes into energy saving incentives and affordable renewable energy programs (De Souza, 2017, para. 11). All Canadian citizens can make positive actions on provincial and municipal levels by learning from California and Ontario (De Souza, 2017, para. 11). Canada's federal engagement in mixed methods stakeholder research can also inspire deliberative dialogue to bring corporate stakeholders and Indigenous peoples to the table of negotiation through deliberative policy analysis processes. For example, Lytton First Nation installed a water treatment plant that was built in a lab at the University of British Columbia UBC by Indigenous students and by RES'EAU-WaterNET, which was an engineering project for clean water development so people in remote areas can drink water from their tap (Fontaine, 2017, para. 5). This project was initiated by Indigenous Affairs and Northern Development (INAC) and IC-IMPACTS, an initiative of water experts from Canada and India who strive for integrated water management in remote areas (IC-IMPACTS, as cited in Fontaine, 2017, para. 9). The stakeholders from IC-

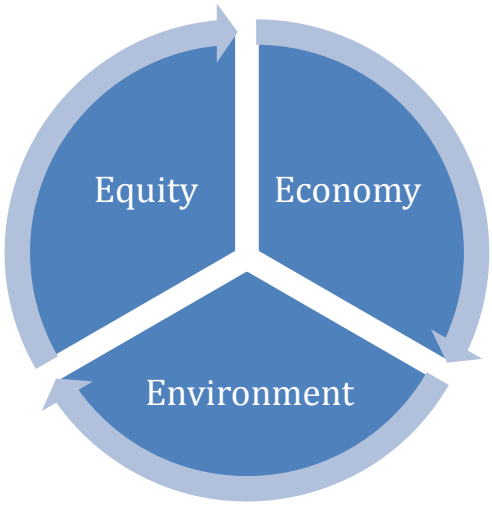
IMPACTS also trained University of Alberta engineering students to utilize special water deionization processes through solar nanotechnology for constructing onsite water treatment plants in remote northern First Nations communities so they can get clean tap water. This is a program called *Engage North* which occurred in the summer of 2017 through two graduate Fellowship projects in the Yellowknife's Dene First Nations (YKDFN) communities of Ndilo and Dettah, Northwest Territories (Fehr, 2017, para. 11).

Critical Analysis Discussion

There is a media misconception that Canada has an abundance of water when in truth Canada only has just over "six percent of the world's annual renewable water supply" (Sprague, 2007, p. 22). Climate change alters clean water availability and communities need to alter their methods of management. "An environmentalist sees an environmental problem and says, 'Let's regulate it!' An entrepreneur sees an environmental problem and says 'How can I make money by solving it?" (Keilbach, 2009, p. 294). Environmentalists and economists must be open-minded enough to embrace the interdependent relationship between the environment, the economy and equity. Environmentalists' and economists' collaboration will diffuse the arguments and utilize the scientific expertise available to find solutions. The question of what needs to be done to move toward safe drinking water involves complex political and technical frameworks. Bleaching the water is similar to how the government bleached the school curriculum with white European authors, history and language. This is a common pattern for political frameworks that infiltrate culturally diverse populations with white European culture and values (Mander, & Tauli-Corpuz, 2006). The bleached water is a metaphor for the white veil the government uses to

hide the injustice of contaminated water. Just as the white European curriculum absorbed Aboriginal culture, the white bleach absorbs the pathogens in the water. This political framework of the subaltern view has contributed to compromised drinking water standards in Canada. Political conflicts over unhealthy chemical water treatment methods put uninformed citizens at the mercy of unethical politicians. Empowering citizens through deliberative policy processes can give Canadians the political equity they need to establish higher quality water treatment standards. The government will save millions of healthcare dollars spent on contaminated water related illnesses. Water quality equity reduces health costs for the economy and sustains the environment. This reflects the 3-E's of citizenship sustainability instilling equity, environment and the economy into the political framework of Canada's waterways. This is illustrated in the following diagram figure seven which is the writer's synthesis of the 3-E's of citizenship sustainability instilling equity, environment, and the economy integrated to the shape of the peace sign symbol to represent the federal government's jurisdiction to protect drinking water quality under the "peace, order and good government" (Sprague, 2007, p. 23) (POGG) with authentic deliberative dialogue and reciprocity flowing in the circular arrows:

Figure # 7 - 3-E's of Citizenship Sustainability: Equity, Environment & Economy & POGG



The constitutional basis for Canada Water Act law is the national concern doctrine under POGG, which provides the federal government with the power to control the pollution of waters that are beyond the capacity of the provinces and territories provinces to control (Clancy, 2014).
The Canada Water Act is a law that enables the federal government to enter into agreements with provinces for the management of water resources, including planning, conservation, development and utilization of the resource (Sprague, 2007, p. 23). In citizen forums peaceful deliberative dialogue building good policies through authentic dialogue. Stakeholder engagement invests in sustainable solutions while negotiating with citizens in peaceful forums to voice their environmental rights of their watersheds.

Federal water management enables transjurisdictional integrity of surface water and groundwater to help provinces who are unable to deal with these water bodies because they lack the requirements and conditions to maintain the eco-system of these water sources (Saunders & Wenig, 2007, p. 120). However, some provinces and territories argue that they can resolve their functional limitations through working with neighboring provinces in monitoring their watersheds, potential contaminants, and hazards to their water management systems. Yet, this approach requires federal facilitation and mediation in resolving conflicting interests and management concerns across national borders (Saunders & Wenig, 2007, p. 121). Deputy Chief Randy Fobister attended legal court hearings to pressure Ottawa to help clean mercury contamination in the water that has poisoned fish and caused chronic health problems in his community over the last 40 years (Chin, 2016, para. 3). First Nations peoples have also faced the threat of water privatization, or public-private partnerships between companies and the government, according to the Council of Canadians (Chin. 2016, para. 9). Through deliberative

policy analysis processes, the federal government can help stakeholders and citizens to resolve these issues.

Federal engagement water administration ensures the health of marine wildlife and wetlands species such as ducks, geese and other majestic creatures who thrive in Canada's watersheds. They are essential to Canada's biodiversity and water cycles (Saunders & Wenig, 2007, p. 121). Many provinces and territories lack the infrastructure to monitor and care for endangered species (Bakker, 2007, p. 120). For example, diseased farmed salmon from Atlanta swam into British Columbia (B.C.) waters and infected wild B.C. salmon. Jennifer Nener, director of Salmon management of the department of Oceans and Fisheries Canada, said: "Sockeye salmon return on a four-year cycle, and the 2017 run is based on the previous returns from 2013 and 2009. The lowest return every recorded was in 2016 when just 850,000 sockeye came back [owing to] warmer temperatures in the Pacific Ocean (McSheffrey, 2017, para.9). The salmon's journey of swimming upstream to their mother's place of spawning is disrupted by the Atlantic farmed salmon accidental invasion (Linnett, 2017, para. 9). Atlantic farmed salmon are diseased and deformed from being in cramped living conditions and fed synthetic fish food pumped full of antibiotics. When they swim with wild salmon they disrupt the natural ecosystem which impacts the wild salmon (refer to appendix #7 pictures).

B.C. photographer Tavish Campbell says he performed four dives off the B.C. coast and found effluent contaminated with piscine neo-virus released into the ocean. Wild salmon off the B.C. coast are swimming metres away from a stream of blood pouring into the water — the byproduct of farmed-salmon being processed at Brown's Bay Packing Company, near Campbell River, B.C. (Campbell, 2017, para. 3). The wild salmon, marine wildlife and ocean cannot voice their concerns, that is why they need the federal government to facilitate deliberative policy

analysis processes across provinces, waterways, First Nations and municipalities to urge stakeholders and residents to collectively create policies for sustaining Canada's oceans and marine wildlife for future generations. The suffering in Canada's waterways extends into the homes of First Nations children who do not have access to clean tap water which exacerbates water-related illnesses. Dr. Loewen and Booking et al (2017) conducted a review at the Sioux Lookout Meno Ya Win Health Centre (SLMHC) from 2009 to 2014 to examine rates of streptococcus infection and found that:

> The rate of invasive group A Streptococcus infection in the predominantly First Nations population served by the SLMHC exceeded the Canadian rate eightfold and is comparable to rates observed in low-income countries and among Indigenous populations in Australia. This disparity may result from inadequate housing, overcrowding or limited access to clean water.
>
> (Loewen, & Booking, et al, 2017, p. 138)

The suffering of the First Nations people of Sioux Lookout reverberates with their children and the marine wildlife who have no voices in the water policies requiring the federal government to facilitate deliberative policy analysis processes with stakeholders, citizens, provincial legislators and municipalities to find a common ground through authentic deliberative dialogue. It is not enough for Health Ministers to make promises with gallons of bottled water when no time frames are established with First Nations to have clean water running from their taps so they can bathe. When the treaties were signed First Nations Peoples were exiled on flood land reserves. This resulted in yearly floods in many reserves causing sewage back up in homes with toxic mold related illnesses persisting in children (Paling, 2016, para. 5, refer to photos in appendix #10). A 100 years ago, the Shoal Lake First Nations band living on the shores of the lake was forced to move to a peninsula in order to make room for the construction of a 140-kilometre

aqueduct to provide water to the city of Winnipeg (Barlow, 2017, p. 17). The better side of the aqueduct has fresh clean water; the other side, which is home to several hundred Indigenous people, lives with water boiling advisories (Barlow, 2017, p. 18).

During Hurricane Katrina in 2005, many Canadians commented that they would never neglect people in disasters like the hurricane in New Orleans, yet water emergencies are a continuous occurrence for First Nation Reserves. Deliberative authentic dialogue across Canada with citizens could help people to solve this water crisis as a nation instead of turning to the Nestle Bottled Water company who has been illegally siphoning Ontario's watershed without an updated permit (Lui, & Barlow, et al, 2017). Then Nestle sells the water to Indigenous Affairs and Northern Development (INAC) so that INAC can provide bottled water to the First Nations in Ontario who lack a clean, plentiful watershed. Economic injustices of illegal water extraction require the consequences enforced through a national water policy deeming the theft of this life saving resource as a federal crime so the corporation is prosecuted in court while the whole world is watching!

Unsafe drinking water and water-related illnesses in Canada have been extensively researched by medical doctors and legal officials as caused by absence of nationally enforced water regulations standards (Loewen, & Booking, et al, 2017, p. 138). Voluntary Health guidelines have been poorly interpreted by many provinces, territories and municipalities resulting in the compromised safety and health of many innocent Canadians. As a result, First Nations and rural communities suffer from waterborne diseases, endure boil water advisories and depend on bottled water dreaming of the day when they can flow clean water from their taps for a bath. This "patchwork of drinking water laws across the country" (Christensen et al. 2010; Bakker and Cook 2011), can be seen as checkered chess board where poor rural, isolated and

Aboriginal communities are the "pawns in the [corporate neo-liberal] game" of marketing water as a commodity instead of sustaining water as a human right (Dylan, 1963, as cited in Margotin, & Guesdon, 2015, p. 9).

The federal government should declare surface and ground water as a public trust to protect water for public health and safety. Giving water the sentient rights under the public trust protects water from corporations and privatization because water use would only serve the function of the public interest. Corporations would have to acquire legal permission to extract groundwater under the public trust and be required to prove that the use of the water was for public benefit only. Water would only be allocated for ecosystems and basic human needs first, and not corporate needs such as large-scale industrial projects or by bottled water companies (Barlow, 2013). Water is a public health and safety concern and is best managed, regulated and financed by public systems that are accountable to the community. When for-profit interests control drinking water, quality decreases and costs increase. Money is needed to ensure municipal infrastructure is rebuilt to provide publicly-owned and operated water infrastructure

A national water policy approach involving at least two of the deliberative policy analysis strategies would reach the water needs of many Canadians from diverse socio-economic and cultural populations. In adopting these strategies, a central goal should be the importance of supporting good governance approaches that are already in place provincially and municipally. The provinces can be collaborated with to improve water governance in Canada. Recent water governance initiatives have the potential to make significant changes. For example, in 1993, Canada, Yukon and First Nations agreed on a consultative process for development of land-use plans in regions including the watersheds. The process led to the creation of a recommended plan for the watershed, but the process broke down when the Yukon government changed the final

plan over the objections of the First Nations, who argued the territory did not have authority to do so. Environmental groups say the government's changes drastically altered the final plan by removing protections and opening up more than "70 per cent of the watershed to roads, mining and drilling "(Bronskill, 2017, par. 2). The Supreme Court of Canada ruled that the Yukon government was not entitled to rewrite a land-use plan for the large area of wilderness in the territory. In this situation, the deliberative efforts of Chief Roberta Joseph from the Tr'ondëk Hwëch'in First Nation and the Canadian Parks and Wilderness Society saved the Peel Watershed of the Yukon and its pristine ecosystem from environmental destruction.

The Forum for Leadership on Water (FLOW) identifies seven priority areas for federal action:

1. creating a federal water strategy;
2. prioritizing water in assessments from the impacts of energy production;
3. ensuring clean drinking water through legally enforceable drinking water standards;
4. recognizing Aboriginal water rights;
5. enforcing water protection laws and
6. fostering water conservation,
7. supporting transboundary water governance; and expanding the federal government's role in water science.

(Morris et al., 2007, as cited in Bakker & Cook, 2011, p. 281)

Reinstating Canada's Navigable Waters Act can protect Canada's waters from transboundary pollution and foreign farmed fish. There are approximately "275 fresh water-related indicators that deal with environmental health, and human health in Canada" that have been compiled by federal and provincial agencies, as well as municipalities and NGOs (Bakker & Cook, 2011, p. 279). Unfortunately, there is no repository to archive this information, making it difficult to assess the quality of water across Canada (Bakker & Cook, 2011, p. 280). Thus, the federal government should reopen the ocean and fisheries library to collect, store and archive this valuable data that impacts the health of all Canadians.

Specification of the Deliberative Water Policy Research Model: Plan-Do-Check-Act Water Safety Plan (PDCAWSP)

The proposed Plan-do-check-act water safety plan (PDCAWSP) framework was designed to fit within the current Canadian provincial, territorial and municipal governance structure within the WHO standards (Bereskie, & Rodriguez, et al., 2017, p. 254-256). The top box in the following diagram describes the responsibilities of the Canadian Federal Government. The federal government is responsible for areas of federal jurisdiction, developing and maintaining provincial/territorial the Guidelines for Canadian Drinking Water Quality (GCDWS) (p. 255). Figure eight on the proposed Plan-do-check-act water safety plan (PDCAWSP) in the diagram illustrates how Canada's provinces, territories, First Nations Reserves, Metis settlements and municipalities can collaborate on protecting their neighboring watersheds from contamination.

Figure #8– Plan-do-check-act water safety plan (PDCAWSP)

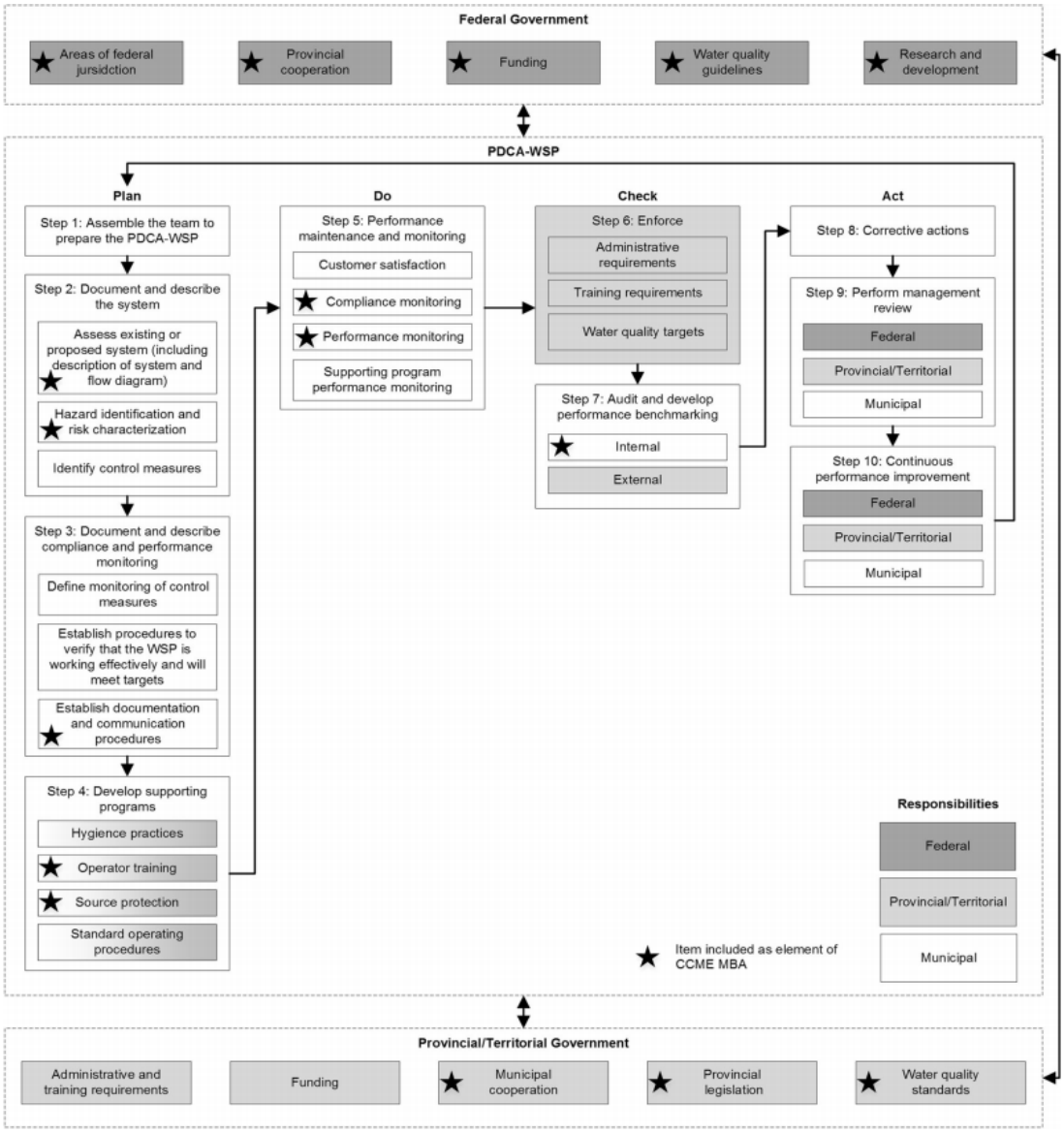


Fig. 6 Proposed PDCA-WSP framework for drinking water management in Canada

Bereskie, T., Rodriguez, M. J., & Sadiq, R. (2017). Drinking Water Management and Governance in Canada: An Innovative Plan-Do-Check-Act (PDCA) Framework for a Safe Drinking Water Supply. *Environmental Management*, *60*(2), 255. doi: 10.1007/s00267-017-0873-9.

The proposed PDCA-WSP framework is based on the recommendations by the WHO water standards:

1. The arrows out of the top box are the flow of resources and information between the Federal Government, the provincial/territorial governments, and the PDCA-WSP.
2. The bottom box of Fig. 6 describes the monitoring responsibilities of the provincial/territorial governments.
3. The arrows out of the top box represent the flow of resources and information between the Provincial/Territorial Government, the Federal Government, and the PDCA-WSP.
4. The large middle box at the center of Fig. 6 represents the bulk of the proposed PDCA-WSP framework.

(Bereskie, 2017, p. 256)

The provincial and territorial governments manage funding, support federal legislation, and the development of national water quality standards. Municipalities monitor training requirements (Bereski, 2017, p. 256). The PDCA-WSP framework engages municipalities with provincial and territorial governments facilitating professional water technician training and enforcement. The federal government supports these regions with consistent monitoring, expertise and resources for management, review and performance evaluations (Bereski, 2017, p. 256). The provinces, territories, municipalities and Aboriginal communities can be collaborated with to determine and improve the enforcement of the water governance policies in Canada. Recent water governance initiatives have the potential to make significant changes. A viable possibility is the development of a federal water strategy that follows WHO water quality standards and is coordinated with provincial, territorial and First Nations' policies. In order to protect the rights of the people directly impacted by these policies, the creation of these policies should be deliberative processes to allow for true participation by engaged citizens (Bakker & Cook, 2011, p. 287).

Implications for the Future

Canadians are faced with many challenges with the deliberative policy processes for deciding upon a national water policy that follows WHO water policy standards. The urgency of preventing further waterborne illnesses may require policymakers to integrate the WHO standards within Canada's current provincial and municipal frameworks. Deliberation with stakeholders, businesses, and citizens within these policy frameworks is critical in relation to future water shortages and contamination problems that can be exacerbated from climate change and population growth (Bakker & Cook, 2011). The primary threat to Canada's water is the lack of social consciousness, the absence of enforced regulations and the lack of federal leadership.

The federal government should collaborate with provincial, territorial, and Aboriginal governments in adopting legally enforceable Canadian Guidelines for Drinking Water Quality with a Safe Drinking Water Act that has health-related long term objectives that are legally enforceable national standards and regulations (Clancy, 2014). Citizens need to collectively advocate for the restoration of the Fisheries Act, the Navigable Waters Protection Act and the Canadian Environmental Assessment Act to provide national stewardship of Canada's waterways.

The proposed framework provides an organized water management policy approach that can be channeled in rural populations, municipalities, provinces, territories and eventually nationally across Canada's vast oceanic landscape. The PDCA-WSP is a water management system that is flexible enough to be adapted for the specific needs of all types of watersheds. The

development of this proposed framework can enable policymakers at all levels of governance to apply the process for effective risk assessment and risk management in drinking water safety systems. After the Walkerton crisis and the Kaschechewan First Nation evacuations (refer to appendix #10), Canada's social consciousness is plagued with the moral question: "As a nation, have citizens done everything possible to prevent another crisis from water-related illnesses and deaths?" (Clancy, 2014). The WHO Water Quality Resources need to be made available for appropriate treatment and distribution, wastewater treatment and collection, source water protection, training and ongoing support of water and wastewater treatment operators (Christensen & Goucher, 2010, p. 13).

This proposed water policy framework provides a pathway to help preserve the health of the current population, while providing a means for protecting drinking water into the future and ensuring Canada's role as a world leader in regards to drinking water management. Just as Canada is world renowned for universal healthcare, now Canada can be world renowned for universal safe drinking water systems. Future studies related to this research should be focused on how other modified WHO water systems function throughout the world to inform water management practices in Canada. A mixed methods approach of quantitative data and qualitative data across the policy project cycle can encourage key stakeholders to invest in communities and replenish their watersheds. The WHO water quality standards and the OECD environmental performance evaluations can educate businesses on ecosystem management and water conservation while enhancing their moral reputation. Information acquired could then be analyzed to tailor the framework to the unique governance structure and environmental factors impacting the diverse ecosystems throughout Canada. A survey of water treatment systems and natural watersheds require continuous monitoring and maintenance through a national water

policy framework (Bereskie, & Rodriguez, 2017, p. 262). Through the regulation of quarterly water quality reporting mechanisms to increase transparency and monitor variances in the level of water pathogens in drinking water and wastewater systems through a collaborative federal, provincial and territorial body is required. This proposed Canadian Drinking Water Committee should provide this information to the public through a quarterly report to Parliament to monitor the seasonal impact on water quality through climate change (Christensen & Goucher, 2010, p. 13).

Conclusion

A national water policy for Canada can protect Canadians from the threat of water-related illnesses through following the WHO water quality standards (Adeel, 2017, p. 100). Canada's national healthcare policies will hold more water with a national water policy to ensure all citizens have access to clean tap water since "water is the first medicine" according to Lewis Cardinal (personal communication, 2017). Deliberative policy analysis can transform neoliberal policies into a new era of public participation and deliberative democracy (Li, 2015, p. 31). As citizens negotiate in authentic deliberative dialogue they will become the policymakers in public forums of social change. Collective expertise, local knowledge, citizen agency and stakeholder engagement can co-create deliberative policy analysis processes that find resolutions.

When twelve year old Autumn Peltier placed her trust in Prime Minister Justin Trudeau to protect Canada's waters, her voice reverberated with all children. Canada's waterways should be held in the public trust to ensure Canada's children and grandchildren have a pristine water supply to nourish their survival. The public trust of Canada's waterways begins with the flow of

deliberative dialogue across First Nations reserves, Metis settlements, villages, towns, cities, provinces and territories channeling into the hearts of citizens. Clean drinking water is not a Liberal issue, a Progressive Conservative issue, nor a Green Party issue, it is a human rights issue. A federal water policy that follows the WHO water safety standards will improve communication between water management systems across municipalities, provinces and territories to report on water quality and potential contaminants. The deliberative policy processes of citizen forums, mediation, stakeholder engagement and referendums can co-create collective reciprocity strengthening Canada as a unified nation. Through the ebb and flow of authentic dialogue the conservation of Canada's sacred waters are Canadians' responsibility of stewardship that they all mutually understand, so they will stand on guard for Canada's waters through deliberative policy analysis processes. Prime Minister Justin Trudeau's national promise to protect Canada's waters can become a national water policy flowing with justice and "righteousness like a mighty stream!" (King, 1963, p. 4).

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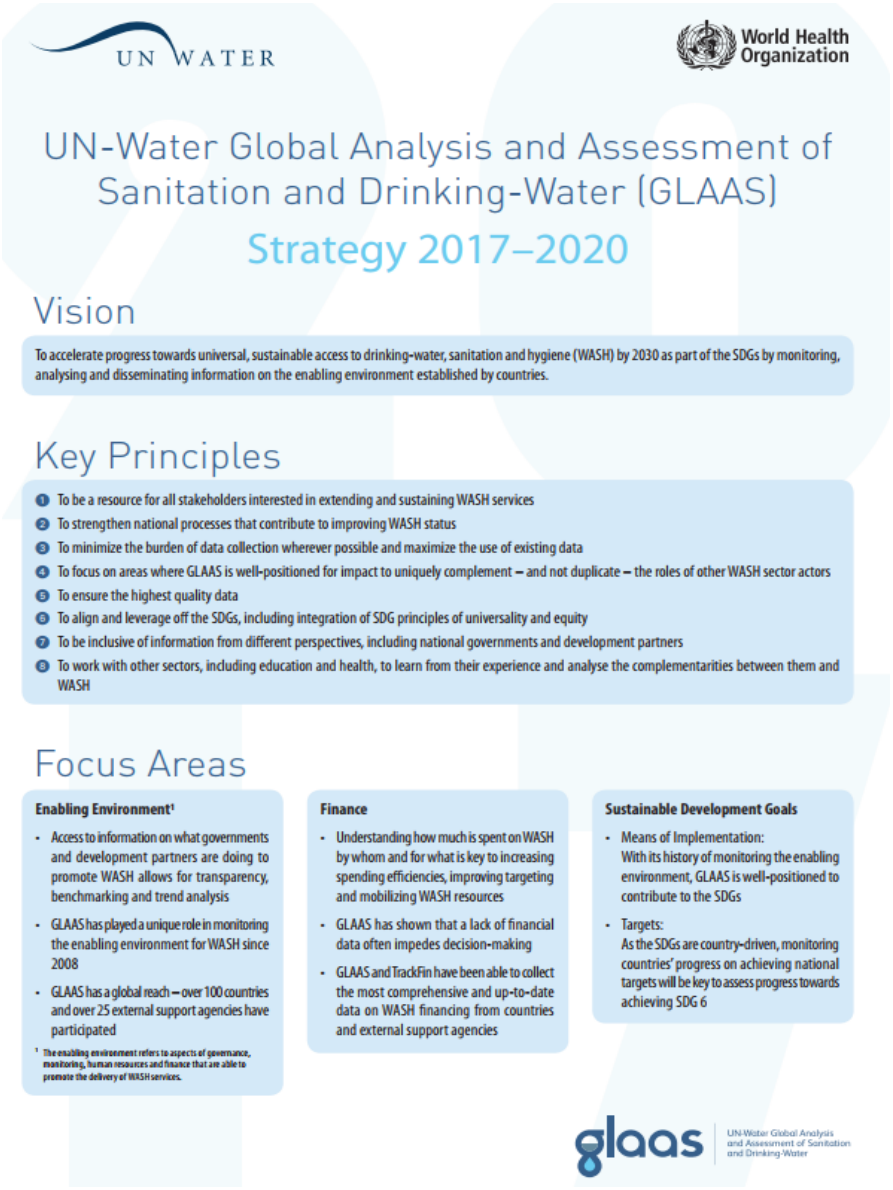
Appendix #1

Prime Minister Trudeau's National Promise to Protect the Water

Lau, A. (2016). Autumn Peltier Asks Prime Minister Trudeau To Protect Canada's Water. *Huff Post Canada*. Retrieved from http://www.huffingtonpost.ca/2016/12/08/autumn-peltier-trudeau-assembly-first-nations-letter_n_13518870.html.

Appendix #2



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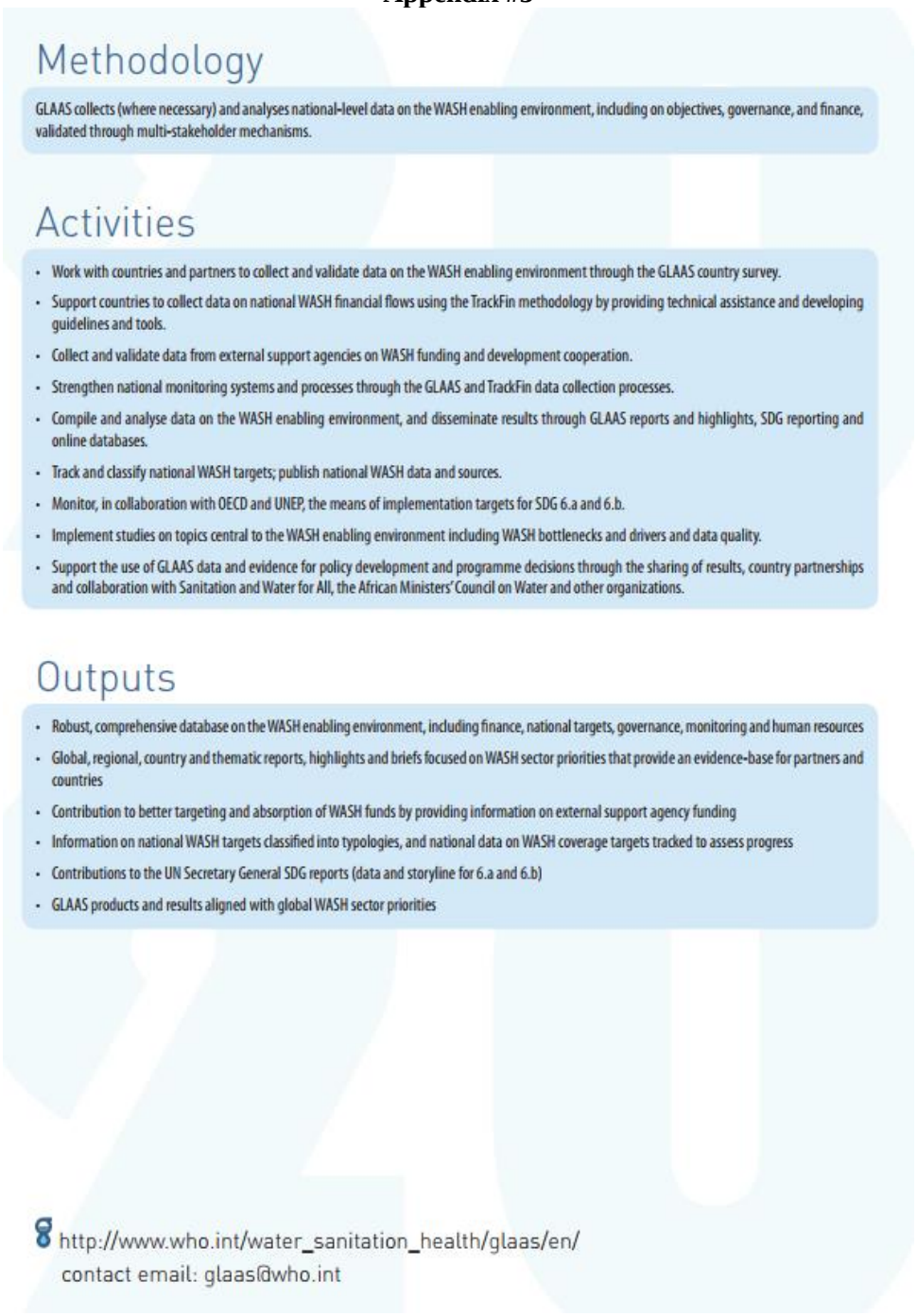
Appendix #3



Methodology

GLAAS collects (where necessary) and analyses national-level data on the WASH enabling environment, including on objectives, governance, and finance, validated through multi-stakeholder mechanisms.

Activities

- Work with countries and partners to collect and validate data on the WASH enabling environment through the GLAAS country survey.
- Support countries to collect data on national WASH financial flows using the TrackFin methodology by providing technical assistance and developing guidelines and tools.
- Collect and validate data from external support agencies on WASH funding and development cooperation.
- Strengthen national monitoring systems and processes through the GLAAS and TrackFin data collection processes.
- Compile and analyse data on the WASH enabling environment, and disseminate results through GLAAS reports and highlights, SDG reporting and online databases.
- Track and classify national WASH targets; publish national WASH data and sources.
- Monitor, in collaboration with OECD and UNEP, the means of implementation targets for SDG 6.a and 6.b.
- Implement studies on topics central to the WASH enabling environment including WASH bottlenecks and drivers and data quality.
- Support the use of GLAAS data and evidence for policy development and programme decisions through the sharing of results, country partnerships and collaboration with Sanitation and Water for All, the African Ministers' Council on Water and other organizations.

Outputs

- Robust, comprehensive database on the WASH enabling environment, including finance, national targets, governance, monitoring and human resources
- Global, regional, country and thematic reports, highlights and briefs focused on WASH sector priorities that provide an evidence-base for partners and countries
- Contribution to better targeting and absorption of WASH funds by providing information on external support agency funding
- Information on national WASH targets classified into typologies, and national data on WASH coverage targets tracked to assess progress
- Contributions to the UN Secretary General SDG reports (data and storyline for 6.a and 6.b)
- GLAAS products and results aligned with global WASH sector priorities

http://www.who.int/water_sanitation_health/glaas/en/
contact email: glaas@who.int

UN-Water Global Analysis and Assessment of Sanitation and Drinking-water (GLAAS). (2017). *World Health Organization: Water Sanitation Hygiene.* Retrieved from http://www.who.int/water_sanitation_health/publications/glaas-strategy-2017-2020-261017.pdf?ua=1.

Appendix #4
Table 4 Applicable drinking water and source water protection legislation/policy, quality management frameworks

Table 4 Applicable drinking water and source water protection legislation/policy, associated quality management frameworks, and other requirements (Hill et al. 2008; Dunn et al. 2014a, Bereskie et al. 2017a)

Province/territory and responsible ministries	Drinking water legislation/policy[a]	Source protection legislation/policy[b]	Drinking water management framework[c]	Legally binding drinking water standards[d]	Number of drinking water parameters used[e]	Required treatment[f]	Operator certification requirements[g]
Alberta (AB) • Alberta environment	• Standards and Guidelines for municipal waterworks, wastewater and storm drainage systems (1997) • Public Utilities Board Act (2000) • Water Act (2000) • Potable Water Regulation (2003)	• Water for life (Government of Alberta, 2003; Government of Alberta, 2008; Government of Alberta, 2009)	Alberta drinking water safety plan	Yes	72	Disinfection and filtration (for surface water and GUDI supplies)	Yes
British Columbia (BC) • Ministry of Environment • Ministry of Health Services	• Water Act (1996) • Water Regulation (1988) • Ground Water Protection Regulation (2004) • Water Protection Act (1996) • Water Utility Act (1996) • Drinking Water Protection Act (2001) • Drinking Water Protection Regulation (2003) • Water Sustainability Act (2016)	• Drinking Water Protection Act (2001) • Environmental Management Act (2003) • Water Sustainability Act (2016)	British Columbia Comprehensive Drinking Water Source-To-Tap Assessment	No	94	Disinfection	Yes
Manitoba (MB) • Manitoba Conservation • Manitoba Water Stewardship	• Water Rights Act (1987, 2005) • Ground Water and Water Wells Act (2001, 2003) • Drinking Water Safety Act (2002) • Water and Wastewater Facility Operators Regulation (2003) • Water Supply Commissions Act (2005)	• Environment Act (1987) • Water Protection Act (2005) • Nutrient Management Act (2008) • Livestock Manure and Mortalities Management Regulation (2008)	Manitoba Drinking Water Plan	Yes	94	Disinfection	Yes
New Brunswick (NB) • New Brunswick Environment • New Brunswick Natural Resources	• Municipalities Act (1973, 1981, 1995) • Public Utilities Act (1973) • Potable Water Regulation (1983) • Health Act (1988, 2005) • Water Act (1989, 1990, 1994, 2000, 2001, 2002)	• Clean Environment Act (1982) • Clean Water Act (2000) • Wellfield Protect Area Designation Order (2000) • Watershed Protected Area Designation Order (2001)	NA	No	94	NA	Yes
Newfoundland and Labrador (NL) • Department of Environment and Conservation	• Public Health Act (1996) • Municipalities Act (1999) • Water Resources Act (2002, 2003, 2004, 2005)	Water Resources Act (2002) • Environmental Protection Act (2002, 2005)	Newfoundland and Labrador Multi-barrier Strategic Action Plan	No	94	Disinfection	No
Nova Scotia (NS) • Nova Scotia Environment and Labor • Nova Scotia Natural Resources	• Municipal Government Act (2998, 2001, 2002, 2004) • Water and Wastewater Facilities and Public Drinking Water Supplies Regulations (2005)	• Water Resources Protection Act (2000) • Drinking Water Strategy (Government of Nova Scotia, 2002)	A Drinking Water Strategy for Nova Scotia	Yes (microbial, physical, and chemical) A esthetic parameters are not enforceable.	96	Disinfection and filtration	Yes
Ontario (ON) • Ministry of the Environment • Ministry of Natural Resources	• Municipal Water and Sewage Transfer Act (1997) • Safe Drinking Water Act (2002) • Sustainable Water and Sewage Systems Act (2002) • Ontario Clean Water Act (2006)	• Lakes and Rivers Improvement Act (1990) • Ontario Water Resources Act (2001) • Nutrient Management Act (2002) • Clean Water Act (2006)	Ontario Drinking Water Quality Management Standard	Yes	106	Disinfection and filtration	Yes
Prince Edward Island (PE) • Environment, Energy and Forestry	• Water and Sewerage Act (1988, 2003) • Environmental Protection Act (1988, 2005) • Water Wells Act (1988, 2004) • Water and Wastewater Facility Operating Regulations (2004)	• Environmental Protection Act (1988, 2005) • 10 Points to Purity (Government of Prince Edward Island, 2001) • Prince Edward Island Watershed Strategy (Government of Prince Edward Island, 2015)	Ten points to purity	No	94	NA	Yes
Quebec (QC) • Ministère du Développement durable, de l'Environnement et des Parcs	Public Health Act (2001) • Environmental Quality Act (2005) • Regulation respecting the quality of drinking water (2001)	Quebec Water Policy (Quebec Ministry of Environment, 2002) • Strategy of protection and conservation of water sources intended for human consumption (Government of Quebec, 2012) • Regulation for water intake and sources protection (Government of Quebec, 2014)	Quebec Water Policy/ Integrated Water Resources Management	Yes	83	Disinfection and filtration (above certain turbidity)	Yes

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Bereskie, T., Rodriguez, M. J., & Sadiq, R. (2017). Drinking Water Management and Governance in Canada: An Innovative Plan-Do-Check-Act (PDCA) Framework for a clean Drinking Water Supply. *Environmental Management, 60*(2), 249. doi: 10.1007/s00267-017-0873-9.

Appendix # 5

Table 4 Continued Applicable drinking water and source water protection legislation/policy, quality management frameworks, and requirements

Table 4 continued

Province/territory and responsible ministries	Drinking water legislation/policy[a]	Source protection legislation/policy[b]	Drinking water management framework[c]	Legally binding drinking water standards[d]	Number of drinking water parameters used[e]	Required treatment[f]	Operator certification requirements[g]
Saskatchewan (SK) • Saskatchewan Environment • Saskatchewan Water Corporation • Saskatchewan Water Security Agency	• Rural Municipalities Act (1989) • Public Health Act (1994) • The Water Regulations (2002) • Health Hazard Regulations (2002)	• Conservation and Development Act (1978) • Water Management Framework (Government of Saskatchewan, 1999) • Environmental Management and Protection Act (2002) • Safe Drinking Water Strategy (Government of Saskatchewan, 2003) • Saskatchewan Watershed Authority Act (2005)	Saskatchewan Safe Drinking Water Strategy	Yes	65	Disinfection (for groundwater) and filtration (surface, mixed, or GUDI supplies)	Yes
Northwest Territories (NT) • NWT Environment and Natural Resources • NWT Public Works and Services, Water, and Sanitation	• Public Utilities Act (1988, 1993, 1995, 1998, 1999, 2004) • Public Health Act (1990, 2004) • Public Water Supply Regulations (1990, 2004, 2009)	• Arctic Water Pollution Prevention Act (1970) • Environmental Protection Act (1988, 1991, 1998) • Environmental Rights Act (1988, 1999, 2000)	Northwest Territories Safe Drinking Water Framework and Strategy	Yes	94	Disinfection	No
Nunavut (NU) • Department of Environment	• Public Utilities Act (1999)	• Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002)	NA	No	94	Disinfection	Yes
Yukon (YT) • Environment Yukon • Yukon Health and Social Services	• Public Health and Safety Act (2002, 2007) • Public Utilities Act (2002) • Water Regulation, Bulk Delivery of Drinking Water Regulation (2003) • Yukon Waters Act and Regulation (2003)	• Environment Act (1991, 2002) • Yukon Waters Act and Regulation (2003)	Yukon Water Strategy and Action Plan	Yes	28	Disinfection	Yes

[a] Drinking water legislation/policy refers to applicable legislation and policy in place relating to ensuring drinking water quality

[b] Source protection legislation/policy refers to applicable legislation and policy in place relating to protecting drinking water sources or freshwater resources

[c] Drinking water management frameworks refer to formal, published provincial/territorial drinking water management systems (or lack therof)

[d] Legally binding water standards represent whether or not meeting the established drinking water standards is a legal provincial obligation

[e] The number of drinking water parameters used refers to the number of different drinking water standards used for evaluating drinking water quality

[f] Required treatment refers to the legal minimum drinking water treatment required in a system

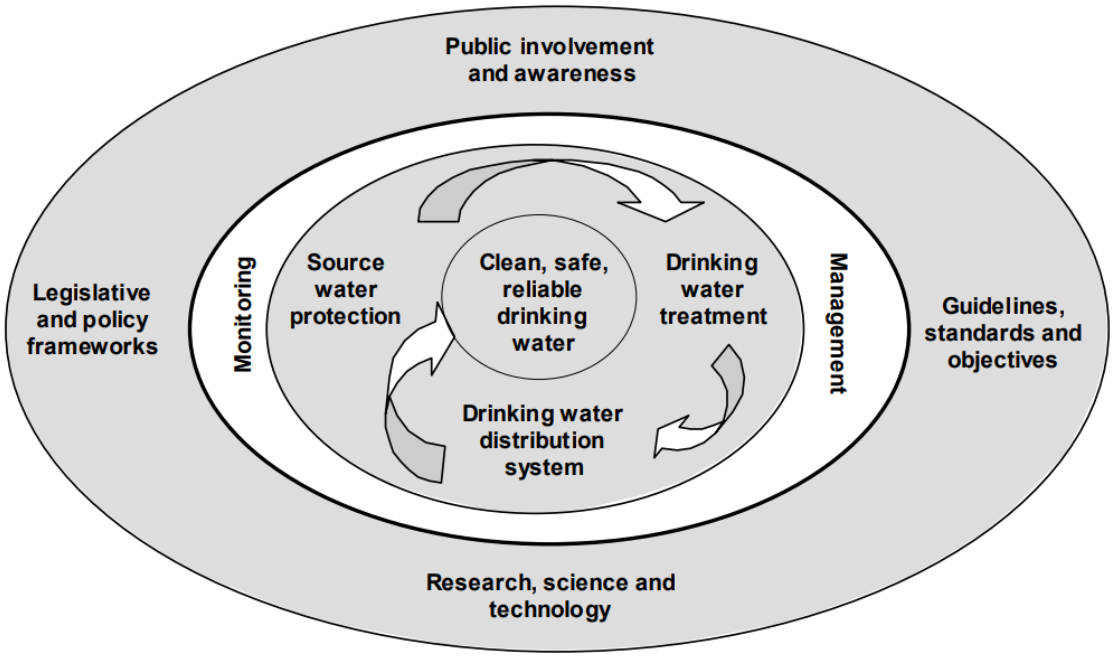
[g] Operator certification requirements refers to the provincial obligation of having drinking water operators certified

Bereskie, T., Rodriguez, M. J., & Sadiq, R. (2017). Drinking Water Management and Governance in Canada: An Innovative Plan-Do-Check-Act (PDCA) Framework for a clean Drinking Water Supply. *Environmental Management, 60*(2), 250. doi: 10.1007/s00267-017-0873-9.

Appendix #6

FROM SOURCE TO TAP:
GUIDANCE ON THE MULTI-BARRIER APPROACH TO SAFE DRINKING WATER

Figure 2.1: Components of the multi-barrier approach



Canadian Council of Ministers of the Environment (CCME). (2002). *From Source to Tap: The multi-barrier approach to clean drinking water.* 16. Retrieved from http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/ pdf/water-eau/tap-source-robinet/tap-source-robinet-eng.pdf

Appendix #7

Impact of Salmon Farming on Wild B.C. Salmon

Giplin, E. (2017).The fight to protect wild salmon. *National Observer*. Retrieved from https://www.nationalobserver.com/2017/08/31/first-nations-cast-line-wait-bc-government-bite.

Campbell, T. (2017). Blood discharge spewing into B.C. ocean infecting salmon: scientist. *The Current with Anna Maria Tremonti.* Retrieved from http://www.cbc.ca/radio/thecurrent/the-current-for-november-30-2017-1.4425138/blood-discharge-spewing-into-b-c-ocean-infecting-salmon-scientist-1.4425193.

Appendix #8

Traditional Policy Analysis versus Deliberative Policy Analysis

Table 1 Traditional policy analysis versus deliberative policy analysis

	Traditional policy analysis	Deliberative policy analysis
Philosophy	Positivism	Post-positivism
Rationality	Instrumental or technical rationality	Communicative or cooperative rationality
Social background	A modern society where professionalism prevails	An era of public participation and collaborative governance
Role of policy analysts	Advisors to policy makers	Supports both policy makers and citizens, assists to create forums and conditions for dialogue and negotiation
The way to handle value/interest	Separation of fact/value, focuses on facts and technical analysis, leaves value judgment to decision makers or develops inquiries on the analysts' preference	Acknowledges and respects different values and interpretations, takes values/interest as central part of analysis
Relations with public participation	Separation of analysis from public participation	Policy analysis serves and gets inputs from public participation
Mode of problem solving	Analysts as technical problem solvers invent options and suggest favorite solution for policy makers	Analysts assist the communication and negotiation among citizens, stakeholders, and decision makers to help them find their own solutions
Basic units of analysis	Data, models	Dialogue, argumentation, and deliberation
Knowledge and capacity used	Expertise and professional abilities of analysts and experts; information is used for strengthening professional analysis	Both expertise and local knowledge; and capacity of citizens and stakeholders is employed

Li, Y. (2015). Think Tank 2.0 for Deliberative Policy Analysis. *Policy Sciences, 48*(1), 31. doi: http://dx.doi.org/10.1007/s11077-014-9207-4.

Appendix # 9

Federal Legislation related to Drinking Water

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Table 2 Description of applicable federal legislation related to drinking water (Health Canada 2013; Morris et al. 2007; Zubrycki et al. 2011)

Federal legislation	Description
Guidelines for Canadian Drinking Water Quality (GCDWQ)	Basic parameters chosen to provide clean, safe drinking water. They are designed to be used in every jurisdiction in Canada as a basis for establishing their own requirements for drinking water quality with the goal of ensuring national consistency. Other applicable policies and guidelines include the Canadian Water Quality Guidelines, Guidelines for Canadian Recreational Water Quality, and Water Quality Guidelines for the Protection of Aquatic Life
Constitution Act (1867)	Gives federal government responsibility to protect navigable waters, but declares provinces as the "owners" of water resources. The criminal law power also gives the federal government the power to legislate protect the health and safety of Canadians
Boundary Waters Treaty (1909)	Foundation for cooperation between Canada and the United States in regards to managing boundary waters
Canada Water Act (1970)	Specifies management of the water resources in Canada. This includes research, planning, and implementation of programs related to the conservation, development, and utilization of water resources
Canada Labor Code (1985)	The federal government's legal obligation to its employees to provide potable waters to employees in accordance with prescribed standards
Fisheries Act (1985)	Gives power to the federal government to prevent and control pollution that would affect fish habitat
Food and Drugs Act (1985)	Bottled water (including all pre-packaged water and ice) is considered as a food under Canadian Law and must be free of poisonous or harmful substances. The GCDWQ provides the basis for establishing levels of safe substances as there are no specified limits in this regulation
National Defense Act (1985)	Act giving the Chief of the Defense Staff powers of command, responsibilities, and discretion regarding health of members of the Canadian Forces. Some of the responsibilities are applicable to drinking water
Corrections and Conditional Release Act (1992)	Regulations to provide safe drinking water for inmates in correctional institutions
Canadian Environmental Protection Act (1999)	While this act is most well known as the cornerstone of Canada's environmental legislation, in terms of drinking water, this legislation (along with the Fisheries Act, Antarctic Environmental Protection Act, and Arctic Water Pollution Prevention Act) provides a framework for source water protection from hazardous contaminants

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Appendix # 10

Kashechewan First Nations impact of flood/ water related illnesses

Paling, E. (2016). Kashechewan First Nation's Children at Front and Centre of Recurrent Crisis. *The Huffington Post Canada*. Retrieved from http://www.huffingtonpost.ca/2016/03/23/kashechewan-children-skin-rashes-lesions_n_9534604.html.

MacPhee, , N.J. (2016). Cape Breton's Potlotek First Nation protests dirty water: Thick, black liquid pouring out of taps at the Cape Breton reserve. CBC News.Retrieved From http://www.cbc.ca/news/canada/nova-scotia/potlotek-dirty-water-protest-1.3781301.

Appendix #11

Health Canada Guidelines for Canadian Drinking Water Quality –Carcinogens 2017

Guidelines for Canadian Drinking Water Quality — Summary Table (February 2017)

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I	Antimony (1997)	0.006		Naturally occurring (erosion); soil runoff; industrial effluents; leaching from plumbing materials and solder	**Health basis of MAC:** Microscopic changes in organs and tissues (thymus, kidney, liver, spleen, thyroid)	MAC takes into consideration analytical achievability; plumbing should be thoroughly flushed before water is used for consumption.
I	Arsenic (2006)	0.010 ALARA		Naturally occurring (erosion and weathering of soils, minerals, ores); releases from mining; industrial effluent	**Health basis of MAC:** Cancer (lung, bladder, liver, skin) (classified as human carcinogen) **Other:** Skin, vascular and neurological effects (numbness and tingling of extremities)	MAC based on treatment achievability; elevated levels associated with certain groundwaters; levels should be kept as low as reasonably achievable.
I	Asbestos (1989, 2005)	None required		Naturally occurring (erosion of asbestos minerals and ores); decay of asbestos-cement pipes		Guideline value not necessary; no evidence of adverse health effects from exposure through drinking water.
P	Atrazine (1993)	0.005		Leaching and/or runoff from agricultural use	**Health basis of MAC:** Developmental effects (reduced body weight of offspring) **Other:** Potential increased risk of ovarian cancer or lymphomas (classified as possible carcinogen)	MAC applies to sum of atrazine and its *N*-dealkylated metabolites - diethylatrazine, deisopropylatrazine, hydroxyatrazine, diaminochlorotriazine; Persistent in source waters.
P	Azinphos-methyl (1989, 2005)	0.02		Leaching and/or runoff from agricultural use	**Health basis of MAC:** Neurological effects (plasma cholinesterase)	All uses were phased out by 2012.
I	Barium (1990)	1.0		Naturally occurring; releases or spills from industrial uses	**Health basis of MAC:** Increases in blood pressure, cardiovascular disease	
O	Benzene (2009)	0.005		Releases or spills from industrial uses	**Health basis of MAC:** Bone marrow (red and white blood cell) changes and cancer (classified as human carcinogen) **Other:** Blood system and immunological responses	MAC takes into consideration all exposures from drinking water, which include ingestion, as well as inhalation and dermal absorption during showering and bathing.
O	Benzo[*a*]pyrene (2016)	0.000 04		Leaching from liners in water distribution systems	**Health basis of MAC:** Stomach tumours (classified as human carcinogen)	

Health Canada. (2017). Guidelines for Canadian Drinking Water Quality—Summary Table. *Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario*. Retrieved from https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf.