

EXAMINING SOURCE WATER PROTECTION POLICIES IN NEWFOUNDLAND AND LABRADOR:

A LITERATURE REVIEW

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December 2016



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List of Abbreviations

CCME	-	Canadian Council of Ministers of the Environment
DOEC	-	Department of Environment and Conservation
NL	-	Newfoundland and Labrador
SWP	-	Source Water Protection
MBSAP	-	Multi-Barrier Strategic Approach
WHO	-	World Health Organization

1.0 Introduction

Water is a fundamental need and vital for the existence of all creatures. It contributes significantly to the occurrence of many normal human activities including physical and chemical reactions such as the regulation of temperature and metabolism in the human body. Water is indispensable for human life and the adequate supply of good quality drinking water is essential for human health (Hanrahan, Dosu, and Minnes, 2016). The United Nations' World Development Report (2015), identifies the existence of a very strong relationship between water and societal growth, which ultimately places a heavy burden on water resources. Human activities like recreation, agriculture, energy production and industry all have impacts on the use and governance of water and on the health of drinking water supplies. There is growing demand on the world's freshwater resources due to increasing populations, growth in economic pursuits and improvements in living standards (Global Water Partnership, 2000). Considering the importance of water to human existence, therefore, it is prudent that the sources of water be protected to ensure both the quality and quantity of water supplies.

1.1 Source Water Protection

Source water refers to the surface and ground water supplies such as lakes, rivers, and aquifers that provide drinking water to humans (CCME, 2004). Source water protection (SWP) has to do with implementing programs or activities targeted at lessening the likelihood of contaminants polluting these water resources (Ontario Ministry of Environment, 2004). Additionally, SWP seeks the advancement of the quality of drinking water, curtail the threats to water-borne contamination, and safeguard water resource for the future. (Patrick, 2011; Ivey, de Loe, and Kreutzwiser, 2006) which according to the WHO (2016) guarantees the safety of water usage for recreation and the protection of the environment as a whole. SWP entails detecting threats associated with drinking water sources and enacting policies towards ensuring adequate protection for the quality and quantity waters for multiple uses, hence it is a proactive and substantial element of successful water management of drinking water using different activities intended to ensure the availability of satisfactory water quality and quantity various uses (Simms, Lightman and de Loë, 2010). These activities include; identification of threats to source waters,

zoning bylaws, and local plan policies, identifying permitted activities within vulnerable areas, livestock fencing, land acquisition, capping abandoned wells, educating and creating awareness programs on SWP, septic system stewardship programs, wetland preservation or rehabilitation (Christensen, 2011).

1.2 Benefits of Source Water Protection

The benefits of SWP practices are enormous including treatment cost reduction and heightened drinking water safety (de Loë & Kreutzwiser, 2005). Available research reveals that practicing SWP costs 6 to 20 times less than resolving and dealing with polluted water supplies (Patrick, 2011; Timmer, de Loë, & Kreutzwiser, 2007). Protecting drinking water at the source results in superior quality that requires a reduced amount of treatment (WHO, 2016). Additionally, it is cheaper to spend money on natural capitals like acquiring lands inside watersheds, compared to spending money on physical capitals like systems for treating water (Patrick, Millward & Noble, 2013). The CCME (2004) identify SWP as crucial for the preservation of the quality of drinking water sources and averting pollution of drinking water sources whilst the WHO (2016) suggest that SWP is a useful remedy to conserving the limited resource or the absence of treatment opportunities which is particularly the case in many rural communities (Christensen, 2011).

Despite the enormous benefits of SWP, putting into practice SWP guidelines and procedures entails massive technical, institutional, financial, and social capacity (Rawlyk & Patrick, 2013) and, as a result, often has limited or partial success especially in rural communities. This is because of the complications and heavy demands involved in the management of drinking water, demanding especially for rural communities (Breen, Minnes and Vodden, 2015) who lack satisfactory water treatment facilities and inadequate protection of their sources of water (Ling, Zhang & Husain, 2016).

1.3 Sustainable Governance and Management of Drinking Water Sources

Patrick et al. (2013) have stated that SWP extends beyond protecting drinking water sources and involves bringing together various stakeholders from municipalities and regions with similar interests in land-use planning and management of potentially contaminating activities. Because drinking water safety is typically identified as just one of many reasons for preserving and enhancing surface water bodies and associated ecosystems multiple stakeholders may have direct and indirect interests in SWP (Hanrahan et al., 2016; Simms et al, 2010; Fin, 2010). This statement is supported by the WHO (2016) who have suggested that because various interested parties of water resources have several uses for water beyond simple safeguards, such as agriculture, aquaculture, commerce, industry, mining and recreational uses, the SWP processes should, therefore, comprise various participants to reduce harmful effects emanating from these activities (WHO, 2016).

The quality of source water quality is determined to a large extent by planning, land-use, and resource development laws (Christensen, 2011). In addition, in Canada, “provincial laws, policies and programs address integrated land and water management, pollution prevention, water use and allocation, and wetland and ecosystem protection, among other things” (Simms et al., 2010 p.15), however an article by Baker and Cook (2011), exploring Canada’s approach to water governance argues that decentralized governance of water resources has contributed negatively to Canada’s ability to effectively manage water resources and to the handling of emerging issues such as climate change. Additionally, it argues that efforts to integrate, coordinate and provide data on water resource management are constrained by the lack of integration of approaches to water governance in Canada.

Further to the assertion above, Baker and Cook (2011) portray water management in Canada as lacking inter-governmental coordination, duplicating efforts, having poor data collection and sharing, and insufficient monitoring and enforcement. The hindrances to sustainable governance emanate largely from knowledge gaps, the absence of a sound conceptual base and variations in multi-scale governance systems (Medema, Wals & Adamowski, 2014). In contrast, integrated water strategies concentrate on safeguards of water quality and quantity for

all related social, economic and environmental values of water. These strategies should be complemented by governance principles to advance the sustainable management of water resources, including integrated watershed-based planning, multi-level partnerships and coordination across all sectors (Simms et al., 2010).

The Integrated Water Resources Management (IWRM) framework for example “is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” (GWP-TAC, 2000. p.22). Nowlan and Bakker (2010, p.7), define water governance as “the range of political, organizational, and administrative processes through which communities articulate their interests, their input is absorbed, decisions are made and implemented, and decision makers are held accountable for the development and management of water resources and delivery of water services”. Water governance can greatly contribute to the design and implementation of such policies, involving shared responsibility across levels of government, civil society, business and the broader range of stakeholders who have an important role to play alongside policy-makers to reap the economic, social and environmental benefits of good water governance.

2.0 Source Water Protection Policy in Canada

Safe guarding drinking water provisions in Canada is a primary facet of fostering sustainable communities and defending rights of individuals to water for current and generations yet to come. The need to protect drinking water sources has become widely recognized as a result of unfortunate events such as the contamination of water supplies, increases in boil water advisories, threats relating to climate change and the growing burdens on water resources (Simms et al, 2010). Existing literature in Canada has demonstrated that SWP is an indispensable part of a holistic approach to the management drinking water resources, often referred to as a multi-barrier approach (Canadian Municipal Water Consortium, 2014). The multi-barrier approach to drinking water involves a blend of techniques, methods, and tools that jointly avert or curtail the pollution of drinking water from source to tap. This approach ultimately seeks to minimize threats to drinking water pollution and protect public health (CCME, 2004). The WHO

(2016) have suggested that a far-reaching steady method for dealing with the risks associated with the realization of adequate drinking-water quality and quantity goals requires an awareness of the drinking-water supply system. Specifically, an appreciation of the risks associated with providing acceptable drinking water and the effectiveness of obstacles, as well as the opportunities of implementing alternative methods to reduce the risk of contaminating drinking water sources (WHO, 2016).

The protection of sources of drinking water by way of managing watersheds and safeguarding groundwater has become a crucial policy advancement tool in preventing the pollution of drinking water sources (Ferreira, Loe, & Kreutzweiser, 2008; Ministry of the Environment, 2004; Rawlyk & Patrick, 2013). However, Canada still has improvements to make in regards to the protection of drinking water. Bakker and Cook (2011) have said that there is not a well-defined authority on water governance in Canada and mandates on drinking water quality in the country are not compulsory. Furthermore, the absence of a national water law and the non-enforceable water quality standards has resulted in an imbalance which exists within provincial water regulations protecting drinking water (Ecojustice, 2014), generating a sequence of governance gaps, overlaps and challenges (Baker and Cook, 2011)

According to Ziegler et al. (2009) safe drinking water delivery in Canada is the sole responsibility of each province and territory. In addition, it is voluntary for provinces and territories to adopt the Guidelines for Canadian Drinking Water Quality, which is the foundation for instituting consistent and science based standards for Canadians. Whilst very little of the federal water policy has been put into effect (Bakker & Cook, 2011; Bakker, 2007), the Canadian Water Act requires that federal and provincial governments collaboratively discuss consultation water related concerns (Department of Justice, 2012). This notwithstanding, the apparent variation in organizational arrangements, laws, and regulations regardless of shared federal regulations is because of the fundamental duty of quality drinking water delivery rest on the provinces (Bakker, 2007; Breen et al., 2015). The crucial and specific constitutional duty of creating water legislations and policies applicable to the supply of water, managing resources and governance are handled by provinces in Canada (Hill et al, 2006), therefore, provincial ministries spearhead the enactment of drinking water policies in collaboration with relevant

authorities in the regions and municipalities whilst the Ministries of Environment or Health usually acts as lead agency in developing and implementing drinking water policies and the Minister is conferred with massive authority over the management of protected water supply (Simms et al., 2010).

Table 1: Source water protection policy in Canada (Adapted from Patrick et al, 2013)

Jurisdiction	Broad Water Strategy	“SWP” referenced in Strategy	Multi-barrier Approach	Enabling Legislation	Dedicated Water Agency	SWP Required or Discretionary	Scale of SWP Planning
Alberta	Yes	Yes	Yes	Water Act (2000); Environmental Strategy Protection and Enhancement Act (2000)	No	Discretionary	None
British Columbia	Yes	Yes	Yes	Drinking Water Protection Act (2001)	No	Discretionary	Watershed-based
Manitoba	Yes	Yes	Yes	Drinking Water Safety Act (2002); Water Protection Act (2006)	Yes	Required	Watershed-based
New Brunswick	Yes	Yes	Yes	Clean Water Act (1989)	No	Discretionary	“Wellfields” designated as protected areas
Newfoundland and Labrador	Yes	Yes	Yes	Water Resources Act (2002); Environmental Protection Act (2002)	No	Discretionary	Municipal/Local
Nova Scotia	Yes	Yes	Yes	Water Resources Protection Act (2000)	Yes	Discretionary	“Protected Water Areas” delineated
Ontario	Yes	Yes	Yes	Clean Water Act (2006)	Yes	Required	Watershed-based
Prince Edward Island	Yes	Yes	No	Environmental Protection Act (1998)	No	Required	“Wellfield” Protection Plans
Quebec	Yes	Yes	No	Groundwater Catchment Regulation (2002)	No	Discretionary	Watershed-based
Saskatchewan	Yes	Yes	Yes	SWP are not legally binding and have no regulatory authority	Yes	Discretionary	Watershed- based

All Canadian provinces have referenced SWP in a broad water strategy as shown in figure 1 above. In most cases this is to avoid the recurrence of catastrophic events such as the Walkerton water tragedy in Ontario, where seven people died and thousands became seriously ill due to a waterborne disease outbreak (Ferreira et al., 2008), as well as the pollution of drinking water in North Battleford, Saskatchewan with the parasite cryptosporidium (Jameson, Hung, Kuo and Bosela, 2008). Almost all provinces have adopted the multi barrier approach as the first step to SWP and employ a mix of procedures, processes, and tools that collectively prevent or reduce the contamination of drinking water from source to tap in order to reduce risk to public health (CCME, 2004). According to Simms et al. (2010, p.13), “with varied details, scope, and timelines, most provinces, have clearly tackled SWP through provincial water-related policy documents with a focus on multiple water uses for some and drinking water specific for others”. Even though the ultimate aim for SWP is to protect the sources of drinking water from contamination, in all provinces, the approach and methods vary in most cases. For example, while some regulations are mandatory with legislative backing, others are discretionary implying that SWP optional (Simms et al., 2010).

This obvious disparity of protection laws from province to the province has led to gaps in effective implementation, which eventually endangers the health of citizens (Ecojustice, 2015), and gives rise to many difficulties for rural communities, who are also responsible for their own drinking water systems (Hanrahan et al., 2016). According to Christensen (2011) “- the biggest risks to drinking water came from gaps or deficiencies in the “frontline” of drinking water protection: the laws, programs, policies and personnel directly responsible for collecting, treating and delivering safe drinking water” (p.8).

2.1 SWP in Newfoundland and Labrador

The NL government clearly utilizes the Canadian Guidelines for Drinking Water Quality, (Christensen, 2011, Breen et al, 2015) and similar to several other jurisdictions, has decided to employ an overall plan to safeguard the quality and quantity of drinking water through all the levels of the water system, from ‘source to the tap’ using the Multi-Barrier Strategic Action Plan (MBSAP) established in 2001 (Government of Newfoundland and Labrador, 2014) as shown in Table 2. It is explained, “the multi-barrier approach aims to reduce the risk of drinking water contamination and to increase the feasibility and effectiveness of remedial controls or

preventative options with the ultimate goal of protecting public health.” (CCME, 2004, p.15). The WHO (2016) identifies the multiple barrier approaches to surface water pollution as imperative to the delivery safe drinking-water. The continued delivery of safe drinking-water necessitates preventive methods and the predominant aim of curtailing public health dangers since due to several factors, the safety of drinking water cannot be guaranteed all the time. SWP has been identified as the foremost barrier in the multi-barrier approach to ensuring the safety drinking water (CCME, 2014; Canadian Water Network, 2010; Simms et al, 2010).

Table 2: The Multi-Barrier Strategic Action Plan of NL

Level	Activities
Level 1	<ul style="list-style-type: none"> - Source Water Protection - Drinking Water Treatment - Drinking Water Distribution
Level 2	<ul style="list-style-type: none"> - Monitoring - Data Management and Reporting - Inspection and Enforcement - Operator Education, Training, and Certification - Corrective Measures
Level 3	<ul style="list-style-type: none"> - Legislative and Policy Frameworks - Public Involvement and Awareness - Guidelines, Standards, and Objectives - Research and Development

Source: Government of Newfoundland and Labrador (2015)

Policies and legislations governing public drinking water systems in the province under the MBSAP includes; the Water Resources Act, the Municipal Affairs Act, and the Municipalities Act. (Government of Newfoundland and Labrador, 2015)

2.2 SWP Implementation in NL

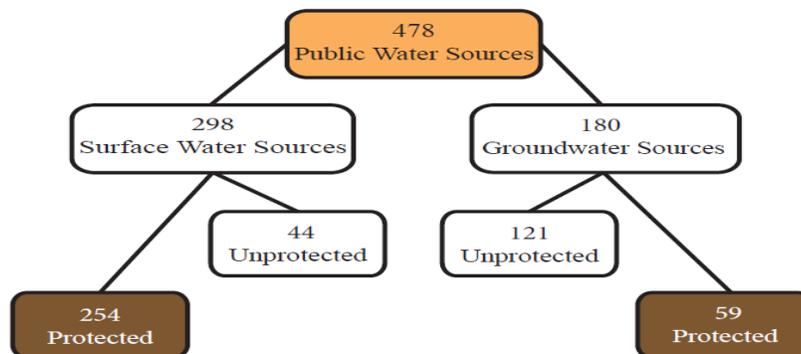
The implementation of SWP measures in NL is a joint effort between provincial and local governments (Government of Newfoundland and Labrador, 2013). Relevant provincial agencies include the Department of Environment and Conservation acting as lead agency, Health and Community Services, Municipal Affairs, and Service NL (Annual Drinking Water Safety Report, 2015). SWP is legally enforced in NL through the *Water Resources Act, SNL 2002 cW-4.01* Section 39(4), which states that;

“• (4) In the area defined under subsection (1), a person shall not

- (a) place, deposit, discharge or allow to remain in that area material of a kind that might impair the quality of the water;
- (b) fish, bathe, boat, swim or wash in, or otherwise impair the quality of the water; or
- (c) use or divert water that may unduly diminish the amount of water available in that area as a public water supply.” (Government of Newfoundland and Labrador, 2016)

During the 2014-15 fiscal year, 254 out of a total of 298 public surface water supplies were designated as PPWSAs, while 59 out of a total of 180 groundwater sources were designated (Government of Newfoundland and Labrador, 2015). There are 44 and 121 unprotected surface and ground water sources respectively as shown in Figure 1 below.

Figure 1: Status of Public Water Sources in NL



Source: Government of Newfoundland and Labrador, 2015 (p.2)

It is the responsibility of communities who want to have their water supply designated as a PPWSA to apply to the DOEC and pay a fee of \$400 + HST (Government of Newfoundland and Labrador, 2015), which makes the protection status optional and voluntary to communities. The DOEC uses information collected from the community to delineated watershed boundaries used to produce a map, which is reviewed by the government's Interdepartmental Land Use Committee. Designation of protected is granted after successful review and a legal description posted in the *Newfoundland and Labrador Gazette* (Dore, 2015). This method enables the provincial government to designate demarcated endangered areas around municipal water supply. Land use and activities around such designated areas are controlled. The WHO (2016) states that "buffer zones around watercourses play an important role in mitigating the impacts of surface-water run-off by increasing the distance to the watercourse and by intercepting hazards such as pathogens, sediment, and nutrients" (p.138). The Water Resources Act, SNL 2002 cW-4.01, according to Dore (2015), secures buffer zones around the protected water supply area of a "minimum of 50m for major tributaries, lakes or ponds, up to a minimum 150 m for intake ponds and lakes where restrictions apply" (p.139). It also sets the basis for the protection policy and bans activities considered potentially harmful to drinking water quality.

Development within PPWSAs is regulated using several different tools, such as referrals from the Interdepartmental Land Use Committee, Crowns Lands, Natural Resources, MIGA and other agencies; permits for development; watershed sensitivity classification system; watershed. While the placing, depositing, discharging or allowing to remain in PPSWA's of materials of any kind that might impair the quality of the water and the usage or diversion of water that may unduly diminish the amount of water available in PPWSA are prohibited. Other activities such as fishing, bathing, boating, swimming or washing in a PPWSA are not permitted without approval from the Minister (Government of Newfoundland and Labrador, 2013, 2014). Other banned activities include sewage, chemicals, or industrial wastes; transporting logs or riding any motor vehicle when the area is ice-covered; construction and development; storage of chemicals; clear cutting of forests; establishing camp sites; establishing cemeteries, waste disposal facilities, or any other facilities that the NL Minister of Environment considers unacceptable (Dore, 2015). Dore (2015) goes on to add activities that require prior ministerial approval in protected systems

as the expansion or upgrading of existing facilities; development of farm lands for non-animal food production (grains, fruits and vegetables, and forage); forest logging, resource road construction and use, tree farming, and other related forestry activities not considered harmful by the minister; mineral exploration; installation of pipelines; and any other activities which the minister considers to have potential for harm to drinking water.

Section 39 of the *Water Resources Act, SNL 2002 cW-4.01* provides policy directives for land and water related developments in protected public water supply areas to ensure sustainable development of natural resources without adversely affecting water quality (Government of Newfoundland and Labrador, 2016). Activities not permitted include placing, depositing or discharging or permitting the placing, depositing or discharging into a body of water any sewage, refuse, chemicals, municipal and industrial wastes or any other material which impairs or has potential to impair water quality. Regulated activities under this policy include recreational activities or facilities including cottage development, fishing, swimming, boating, hiking, camp grounds, or canoe routes, vacation or other camps, or recreational facilities. Others include mineral exploration related activities and aggregate extraction, or any other construction activity incidental to mining and quarrying including access roads, stream crossings, land drainage with adequate treatment, land clearing and excavation (Government of Newfoundland and Labrador, 2016).

Dore (2015) also states that municipalities are responsible for compliance with the provisions of the Act in their own protected water system, and are compelled to halt and notify the government unapproved activities and violations. This is corroborated by Simms et al. (2015), who also state the implementation of designations are at the local level and municipalities assume duty for regulating and enforcing designations. It implies therefore that, while the provincial government plays the role of an overseer, municipal authorities are largely responsible for the safety of drinking water, even for rural communities in NL (Hanrahan et.al., 2016). This responsibility on municipalities has resulted in concerns about the implementation of SWP regulations, including limited watershed planning and monitoring of water supplies due to the lack of human, technical and financial capacity at the local level (Minnes & Vodden, 2014). Particularly, communities of a thousand or less residents (COTOLs) according to Ramalho, Will,

Macleod & van Zyll de Jong, (2014) are frequently deprived of the human capacity required to carry out their SWP obligations and responsibilities in NL.

2.3 Watershed Management Plans

Municipal councils in NL are empowered under the *Municipalities Act* to enact regulations that will avert contamination to their source of drinking water mainly due to multiple water uses in PPWSAs. Developing a watershed management plan is one way to municipalities can avoid the contamination of their drinking water source (Hearn, 2007). Watershed management plans are encouraged in PPWSA's to prevent pollution and ensure the judicious use of resources by outlining processes and procedures for activities around designated areas to safeguard water quality. (Department of Environment and Conservation, 2013). In addition, watershed management plans and committees are used as monitoring tools for developmental activities within PPWSA by Department of Environment and Conservation (Government of Newfoundland and Labrador, 2015).

Notwithstanding, the importance of the watershed management plans and committees to SWP in NL, there are currently five watershed management committees in the towns of Clarenville, Corner Brook, Gander, Grand-Windsor and Steady Brook have watershed management committees, out of which only three watershed management plans exist in the towns of Corner Brook, Gander, and Steady Brook watershed management plans (Government of Newfoundland and Labrador, 2014; Minnes, 2015). Inadequate capacity at local and provincial levels have been suggested as one of the reasons several NL communities have not developed watershed management plans (Minnes & Vodden, 2014). Additionally, the CCME (2016) have suggested that watershed management plans limited mandate and scope in NL.

There are five steps involved in the development of a watershed management plan, namely; (1) establishing a watershed management committee, (2) characterizing the watershed - Protected Public Water Supply Area, (3) identifying potential contaminants & conduct risk assessment, (4) developing the Watershed Management Plan and finally (5) implementation, review and amendments. (Hearn, 2007). The watershed management committees comprise of multiple stakeholders such as government agencies, private and non-governmental organizations,

individual community members and organizations who have an interest in developmental activities within PPSWA's (Department of Environment and Conservation, 2013).

3.0 Conclusion

The purpose of this literature review was to examining SWP protection policies in NL. The literature highlights the enormous benefits of SWP including the drastic reduction in the cost of drinking water treatment, safe guarding public health and guarantees adequate protection of the quality and quantity of drinking water supplies. A multi-stakeholder approach is needed in water governance to avoid contamination of water supplies and encourage responsible multiple water usage, in addition to resource development.

SWP is legally enforced in NL through the *Water Resources Act, SNL 2002 cW-4.01* Section 39(4). In addition to the Canadian Guidelines for Drinking Water Quality and the Multi-Barrier Strategic Action Plan (MBSAP). Municipalities are responsible for the implementation of policies and regulations with the provincial government playing the role of an overseer. This has resulted in limited watershed plans and inadequate implementation of SWP regulations due to limited financial and human capacity.

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