

SOURCE WATER PROTECTION IN NEWFOUNDLAND AND LABRADOR

ANNOTATED BIBLIOGRAPHY

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Government of Newfoundland and Labrador, (2015). Drinking Water Safety in Newfoundland and Labrador - Annual Report 2015. St. John's, NL. Retrieved from http://www.env.gov.nl.ca/env/waterres/reports/drinking_water/annual_report_2015.pdf

The drinking water safety report is an annual report prepared by the Department of Environment and Conservation, Government of Newfoundland and Labrador and mainly describes the initiatives, activities and accomplishments pertaining to the Multi-Barrier Strategic Action Plan (MBSAP) for drinking water safety of public drinking water systems in the province. This report is for the 2014–15 fiscal year. The MBSAP is a comprehensive plan of action employed for protecting the quality and quantity of drinking water at all levels of the water system in the province.

Breen, S., Minnes, S., Vodden, K., Leslie Harris Centre of Regional Policy Development, issuing body, & Canadian Electronic Library, distributor. (2015). *Final report: A regional approach to drinking water management: NL-BC comparative water systems study*

The authors in their report propose a new approach to managing drinking water, using the regional scale and incorporating best practices related to regional development, new regionalism, regional resilience, water management, and sustainable infrastructure. The key characteristics of their proposed approach included: self-identified working region; collaborative efforts; flexibility in institutional and governance structure; inclusive participation; tailor made approaches; integrated decision making; innovation and creativity; and adaptation. The authors especially noted that there was not a definitive response with respect to the feasibility and benefits of a new regional approach, but rather an additional gap between theory and practice.

Minnes, Sarah. (2015). Potentials for Public Engagement in Source Water Protection in Newfoundland and Labrador: A Literature Review

The author, drawing literature, explores the role of citizen engagement in watershed planning, governance, and management, and their implications for increased citizen engagement in source water protection efforts in Newfoundland and Labrador. The author particularly noted that concerns for rural Newfoundland and Labrador, suffers from a lack of capacity to adequately manage source water supplies that contribute to their drinking water systems. The author found that in other provinces of Canada and beyond increased citizen engagement can have a myriad of benefits for watershed stewardship in general, and can help to address the lack of human and financial capacity to sustainably plan, govern and manage source water supplies. The author provides potentials for more opportunities for public engagement and better methods of public engagement in source water protection.

Vodden, Kelly, & Minnes, Sarah. (2014). *Exploring Solutions for Sustainable Rural Drinking Water Systems: A Study of Rural Newfoundland & Labrador Drinking Water Systems*.

This project focused on communities with 1,000 residents or less in rural NFL and their unique challenges the communities face concerning their drinking water systems as well as exploring appropriate solutions to the identified challenges. The authors also explored four main components of drinking water systems: 1) source water quality and quantity; 2) infrastructure and operations; 3) public perceptions, awareness and demand; and 4) policy and governance. They found that many municipalities and communities reported high drinking water quality, aging and degrading infrastructure due to lack of funds, health risks as a result of high disinfectant by-products (DBPs), lack of human, financial, technical and institutional capacity to address the drinking water governance together with local governments. The authors especially noted that due to the lack of human resources at the local level and the limited provincial resources supporting local communities, source water protection efforts are often overlooked in many rural communities of 1,000 residents or less. They concluded with recommendations for changes in drinking water policy and governance in NL.

Ramalho, C., Will, A., Macleod, J., & van Zyll de Jong, M. (2014). Exploring the Sustainability of Drinking Water Systems in Newfoundland and Labrador: A Scoping Document.

This report presented the results of an integrated assessment of public drinking water systems. To conceptualize complex socio-ecological systems, the authors employed an integrated assessment framework known as DPSIR. The DPSIR framework allows multidisciplinary knowledge to be integrated and is intended to provide a holistic understanding of the state of the environment. The report scope secondary data sources as a first step in an integrated policy analysis. They found that the overall state of public drinking water systems in NL is complex due to the sheer number of water systems, the differences between those systems, and the diversity of local socio-ecological systems within the province. The report also indicated that the current fragile state of drinking water systems in NL impacts both the quality of ecosystems and the health of individuals in short and long terms. To address the issues, the report highlighted the necessity to briefly identify the key policy actors and authorities responsible for drinking water policy in Canada.

Roche, S., Jones-Bitton, A., Majowicz, S., Pintar, K., & Allison, D. (2013). Investigating public perceptions and knowledge translation priorities to improve water safety for residents with private water supplies: A cross-sectional study in Newfoundland and Labrador. *BMC Public Health*, 13, 1225

The authors used a cross-sectional telephone survey of households with private water supplies to test respondents' perceptions of their tap water, water concerns, alternative water use, well characteristics, and water testing behaviors. The authors found that majority of households (94%) were supplied with private wells, and this contrasts with water from roadside ponds, rivers or springs (6%). While the 85% respondents rated water quality as high, 55% nevertheless had concerns about its overall safety. The authors indicated that more than one-third of respondents reported treating their water in the home, and 78% employed active carbon filtration methods. The authors also noted that respondents wanted more information on testing options and advice on effective treatment methods. To increase awareness, the authors recommended advertising through television, flyers/brochures and/or radio. They also highlighted that more active knowledge translation methods that including key stakeholders may be most effective in improving testing and treatment behavior. They concluded that their findings can assist public health

practitioners in tailoring current knowledge translation initiatives to influence well owner stewardship behavior.

Daniels, J., Vodden, K., & Leslie Harris Centre for Regional Policy Development, issuing body, sponsoring body. (2015). Sunnyside drinking water project; examining chlorinated disinfectant by-products, resident perceptions and practices and municipal responses in securing safe drinking water in the town of Sunnyside, NL.

The authors explore the persistent drinking water-related challenges facing Sunnyside, eastern Newfoundland and Labrador (NL), primarily through the viewpoint of local residents. They identified challenges including: threats to source water; effective water treatment, disinfection and distribution, including dealing with high levels of disinfectant by-products (DBPs) as a result of their current disinfection system; and developing strategies for addressing these issues. They also argued that many rural municipalities in Newfoundland and Labrador face similar issues, which present a challenge to municipalities in ensuring residents access to clean, safe drinking water.

Fonkwe M.L.D. (2016): A framework for better understanding drinking-water quality in Happy Valley-Goose Bay, Labrador: Implications for optimization and protection of municipally supplied water. The Harris Centre, Memorial University of Newfoundland, St. John's, NL, Canada, xiii + 74pp.

The authors make the argument that drinking water is absolutely essential for optimum healthy living and wellbeing, and must be kept free of undesirable chemical constituents and bacteria, which are capable of adversely impacting human health. To the authors, drinking water must not only be safe, but also aesthetically acceptable for human consumption. The quality of drinking water is determined by the physical, hydrochemical and biological qualities of water sources (i.e. surface water, groundwater or others), combined with the applied treatment process and distribution practices.

Hanrahan, M., Minnes S., & Dosu B., (2016). Government and community responses to drinking water challenges and crises in Rural Newfoundland and Labrador. The Harris Centre, Memorial University of Newfoundland, St. John's, NL, Canada

The authors study investigated government and community understandings of and responses to water crises in three rural communities in Newfoundland and Labrador. The authors revealed that water crisis was defined differently by each community and shaped by specific experiences of water insecurity. Further, the communities define water crisis in

term of the effects of such a crisis. Community definitions contrast with the provincial government's restrictive definition which relates to source water issues. The authors additionally highlighted that each of the communities has experienced water crises relating to contamination, infrastructure, water shortages, and/or weather. Government's decentralization approach to water policy has resulted in local communities being responsible for the management of drinking water systems; this is problematic and inappropriate for rural communities. The authors therefore proposed long-term solutions include broader definitions of the term water crisis; development of a comprehensive provincial wide water management plan; the creation of community- or region-specific water emergency preparedness plans; the provision of adequate financial resources and consultation and participation of communities through the establishment of multi-level water management committees. They concluded by noting that the provision of potable water is a right and should be guaranteed by senior governments through the necessary resource allocations. Access to water has a strong relationship with other basic needs and as such, should be supported.

Sarkar A, Cooper TJ, Thomson KK, Rahman MA. (2015). Exploring appropriate business models for establishment of water quality monitoring service in Newfoundland and Labrador. Memorial University of Newfoundland, St John's, NL, Canada.

To ensure acceptable levels of any microbiological, physical or chemical contaminants, the authors note that the government of Newfoundland and Labrador (NL) regularly tests public drinking water supplies. In NL private water supplies, including wells, however fall outside the mandate of these testing regimes and monitoring is the sole responsibility of the individual well owner. Limited information on private well water quality is available, especially for physical and chemical contaminants. Citing preliminary studies, the authors pointed out that wells in parts of the province are contaminated with bacteria, arsenic and fluoride, but the extent of this problem is unknown. In addressing this important public health issue, the authors scanned of provincial government water quality reports of public wells to create a proxy model of the potential risk of private well contamination. They found potential problems with toxic levels of arsenic, barium, cadmium, chromium, lead, mercury and selenium. The authors also used key interviews to help inform solutions, and address what the problem on the ground with the people who

will be looking to utilize service. Finally, the authors use a business model to provide evidence for future entrepreneurs to use and develop service to residents of NL that is a sustainable solution to an important public health risk.

Christensen, R. (2011). Waterproof 3- Canada's Drinking Water Report Card. Retrieved from http://www.ecojustice.ca/files/updated-full-waterproof/at_download/file

The author indicated that Waterproof 3 is the third drinking water report card from Ecojustice. It evaluates water policies, programs and legislation across the country and gives each province and territory, as well as the federal government, a grade based on how well they are protecting drinking water. Released every five years, Waterproof also shows how each jurisdiction has performed over time when it comes to things like treatment and testing requirements, drinking water quality standards, source water protection, and transparency and accountability.

Hrudey, S. E. (2011). Safe drinking water policy for Canada - turning hindsight into foresight. *Commentary - C.D. Howe Institute*, (323), 0_1,0_2,1-29. Retrieved from <http://search.proquest.com/docview/857450969?accountid=1237>

The author suggests that despite a system that demonstrated a major improvement in Canada's drinking water system, much of the country remains out of step with the international leaders in adopting management systems for assuring safe drinking water. The author especially argues that public drinking water in Canada generally poses a negligible health risk to consumers. However, the regulation of drinking water in Canada is generally guided and managed in a fragmented, almost ad hoc, manner that leaves us vulnerable to future water-quality failures, most likely in smaller systems. Despite this, under a "know your own system" water safety plan approach, those assigned to provide drinking water need to be afforded the training, intellectual support and compensation that is commensurate with their taking responsibility, through their actions or inactions, for the health of an entire community. Using the case of Australia and England, the author noted that these countries provide small communities drinking water via large and competent regional water authorities. The author therefore proposes the universal adoption of a "know your own system" water safety plan approach in Canada that would be based on a tangible demonstration of operator competence for understanding and delivering safe drinking water.

Simms, G., Lightman, D. and de Loë, R. 2010. Tools and Approaches for Source Water Protection in Canada. Governance for Source Water Protection in Canada, Report No. 1. Waterloo, ON: Water Policy and Governance Group.

The report argued that source water protection (SWP) is a significant component of effective water management. The authors called for the protection of sources of drinking water, including lakes, rivers and aquifers, by using a suite of management approaches designed to ensure acceptable water quality and quantity conditions for a diverse range of uses. They also indicated that source water protection is most closely linked to drinking water safety. While this is appropriate, a broader perspective also exists. Using the case of agriculture, the report highlighted that water quality is required for purposes such as watering livestock and irrigating certain crops. The report also pointed out that consistent quantities of water of a certain quality is critical to many other industrial and commercial activities. Further, the report indicated that at the same time, protection of sources of water for human uses can contribute to the maintenance of watershed conditions that support aquatic and other wildlife.

Simpson, H. C., & de Loë, R. C. (2014). A collaborative approach to groundwater protection: the Rural Water Quality Program for Waterloo Region. *Canadian Water Resources Journal/Revue canadienne des ressources hydriques*, 39(2), 228-239.

The authors use the case of groundwater protection in the Region of Waterloo, Ontario, to illustrate how collaborative approaches can facilitate the integration of scientific and local knowledge with existing community beliefs and values. Drawing from academic and empirical literature, they found the importance of collaboration between diverse actors for the successful development and implementation of a source water protection that meets the needs of different stakeholders. In particular, the actors representing different stakeholder groups were able to create a forum that encouraged an open process for addressing a complex problem and integrated expert science, local knowledge and community beliefs and values.

Patrick, R. J. (2011). Uneven access to safe drinking water for First Nations in Canada: Connecting health and place through source water protection. *Health & place*, 17(1), 386-389.

This is a short report in which the author explores health and place through an examination of access to safe drinking water among First Nations in Canada. The study especially argues that SWP has gained considerable attention in the water resources literature particularly after several well publicized non-First Nations water contamination events in Canada. The author further noted that for First Nations in Canada, safe drinking water remains a serious problem yet this is under reported in the literature. Therefore, attempts to 'fix' water quality problems using technology alone have produced only limited success. The author concluded that greater attention to source water protection has potential for both to improve drinking water quality as well as to re-connect health and place for First Nations in Canada.