



**The Road to 2050**  
Bridging the Gap Between Challenges  
& Solutions in the Water Sector

**Water**

## Bridging the Gap Between Challenges and Solutions in the Water Sector

Water is at the heart of British Columbia's economy and culture. With its glacier-fed streams, flowing rivers, freshwater lakes, rainforests and coastal waters, drinking water from the tap, and hydroelectric power, BC enjoys a global reputation as a water-rich region.

However, despite being a water-rich region on the global scale, there are vulnerabilities and problems in the delivery and safety of water in the province. At any given time, multiple First Nations and remote communities are under drinking water advisories.<sup>1</sup> Climate change makes water systems vulnerable to flooding, storm surges, and wastewater runoff and contamination.<sup>2</sup> First Nations, local governments, watershed and community-based organizations are raising the alarm and reporting increasing water security challenges as they deal with irregular cycles of drought and flood.<sup>3</sup>

CORE Cleantech Cluster and Foresight are producing a series of roadmap landscapes in the six sectors of CORE's focus. The intent of the series is to provide a sector-by-sector overview of the roadmaps and paths being used in each sector to achieve CleanBC climate mitigation and GHG reduction targets for 2030-2050.

Water technology companies in BC are working across the value chain in multiple sub-sectors, including infrastructure (instrumentation/ hardware), purification systems, remediation, wastewater treatment and digital/analytics. Identified technology competencies in the BC water sector include renewable generation, electrochemical (separation), thermal energy, IoT technologies and platforms, digital analytics (including artificial intelligence and machine learning), and biomaterials/ biocomposites.<sup>4</sup>

## What's At Stake

- It is estimated that more than \$60 billion is needed to repair or replace aging drinking water systems in Canada.<sup>5</sup>
- As of July 31, 2020, there were a total of 16 Drinking Water Advisories in effect across 15 First Nation communities in British Columbia.<sup>6</sup>
- Globally, approximately 1 billion people lack access to safe drinking water, and this number is likely to grow to nearly 3 billion by 2050.<sup>7</sup>
- On a global scale, 80 percent of wastewater flows back into the ecosystem without being treated or reused.<sup>8</sup>
- Across Canada, approximately \$28 billion has already been spent responding to and repairing the impacts of climate-related water disasters between 2000 and 2017.<sup>9</sup>
- The global water and wastewater treatment market is expected to grow at a rate of 6.5% per year from 2019 to 2025 to reach \$211.3 billion by 2025.<sup>10</sup>

Photo courtesy of [Ostara](#)







Planning and roadmapping regarding the future of water and water tech in BC is not focused on CleanBC targets, GHG reduction or climate mitigation. It is focused on water security and adaptation. Water security encompasses concepts such as water quality, protection of water resources against pollution and water-related disasters, and preserving ecosystems.<sup>11</sup>

These climate-driven economic and societal pressures are bringing the conversation around water security to the forefront in BC, and are also revealing vulnerabilities in water and wastewater infrastructure, as well as pushing the need for building natural infrastructure for resiliency.

Globally, the demand for water technologies is also rising, as many less water-rich regions face much higher vulnerabilities and water security risks due to climate change, population pressures and increasing industrialization and pollution.

These mounting pressures are leading to an understanding in the water sector that the business-as-usual approach to water management and watertech is no longer sufficient – there is a growing demand for innovation and action.

## How Are We Getting There? The Roadmap Matrix

In BC, there is no widely used industry roadmap in place specifically to guide the water sector toward the CleanBC goal of guaranteeing clean water for future generations while meeting GHG reduction targets.

The water sector in Canada is driven by regulations and the need to comply with multiple sets of policies, laws and specifications. Many innovative technology solutions in Canadian watertech have arisen from a need to comply with new or planned water-related legislation and policy in Canada, the US and globally. Given our proximity to the US markets, many BC water technology companies are looking to the US government (particularly the Department of Energy) to guide their investment and technology development plans.

Long term water planning in the province happens at the regional and municipal levels (through city plans, regional watershed planning, etc). These plans also provide a roadmap of sorts for the watertech sector. Although these more locally-based plans are not focused on a technology path, they provide innovators with information regarding the overall direction municipalities and regions are moving toward, and their key areas of concern.

From an industry standpoint, many corporations and industry coalitions have developed internal roadmaps and sustainability plans that are encouraging the adoption and investment in watertech to manage water footprints. These are often industry-specific, like the [ZDHC Roadmap to Zero Programme](#) in the textile industry, or [Coca-Cola](#) in the beverage industry, and global in scope.

## Legislation, Strategies & Roadmaps: A Snapshot

ROADMAP/PROGRAM	ORGANIZATION	DESCRIPTION
Legislation - Canadian	Province of BC Government of Canada	<p>Ministry of the Environment and Climate Change Strategy - has authority for regulatory regimes affecting drinking water: waste management, pollution prevention, pesticide control</p> <p>Ministry of Health - responsible for the Drinking Water Quality and the Drinking Water Program which involves administering and enforcing the Drinking Water Protection Act, the Drinking Water Protection Regulation and the Public Health Act, and providing interventions to minimize health and safety hazards</p> <p>Ministry of Forests, Lands, Natural Resource Operations and Rural Development - responsible for stewardship of provincial Crown land and natural resources</p>
International Guidance	US Department of Energy	<a href="#">Department of Energy Grand Challenge</a>
Provincial/ Municipal Governments Planning Documents	<p>The Province of BC has published a preliminary climate preparedness and adaptation strategy that addresses water-related issues (full plan due in 2020)</p> <p>Cities across the province have water management plans for their regions that are influencing technology and market planning in BC's water sector</p>	<p><b>Examples:</b></p> <ul style="list-style-type: none"> <li>» <a href="#">Climate Risk Assessment for British Columbia</a></li> <li>» <a href="#">Metro Vancouver Drinking Water Management Plan</a></li> <li>» <a href="#">Raincity Strategy - City of Vancouver</a></li> <li>» <a href="#">Integrated Liquid Waste and Resource Management: A Liquid Waste Management Plan for the Greater Vancouver Sewerage Drainage District and Member Municipalities</a></li> </ul>
Industry Leading Sustainability Plans/ Strategies	Large multinational companies and industry organizations have published roadmaps and plans for their suppliers that are influencing technology and market planning in the BC water sector	<p><b>Examples:</b></p> <ul style="list-style-type: none"> <li>» <a href="#">Unilever</a></li> <li>» <a href="#">Nestle</a></li> <li>» <a href="#">Coca-Cola</a></li> <li>» <a href="#">ZDHC Roadmap to Zero Programme</a></li> </ul>
Community Led Water and Watershed Plans	Organizations, Associations and Partnership Coalitions are taking specialized and regional approaches to water planning	BC Water and WasteWater Association, BC Ground Water Association, Canadian Water Resources Association, Partnership for Water Sustainability in BC (PWSBC), BC Watershed Security Coalition, and Regional Watershed Organizations province-wide

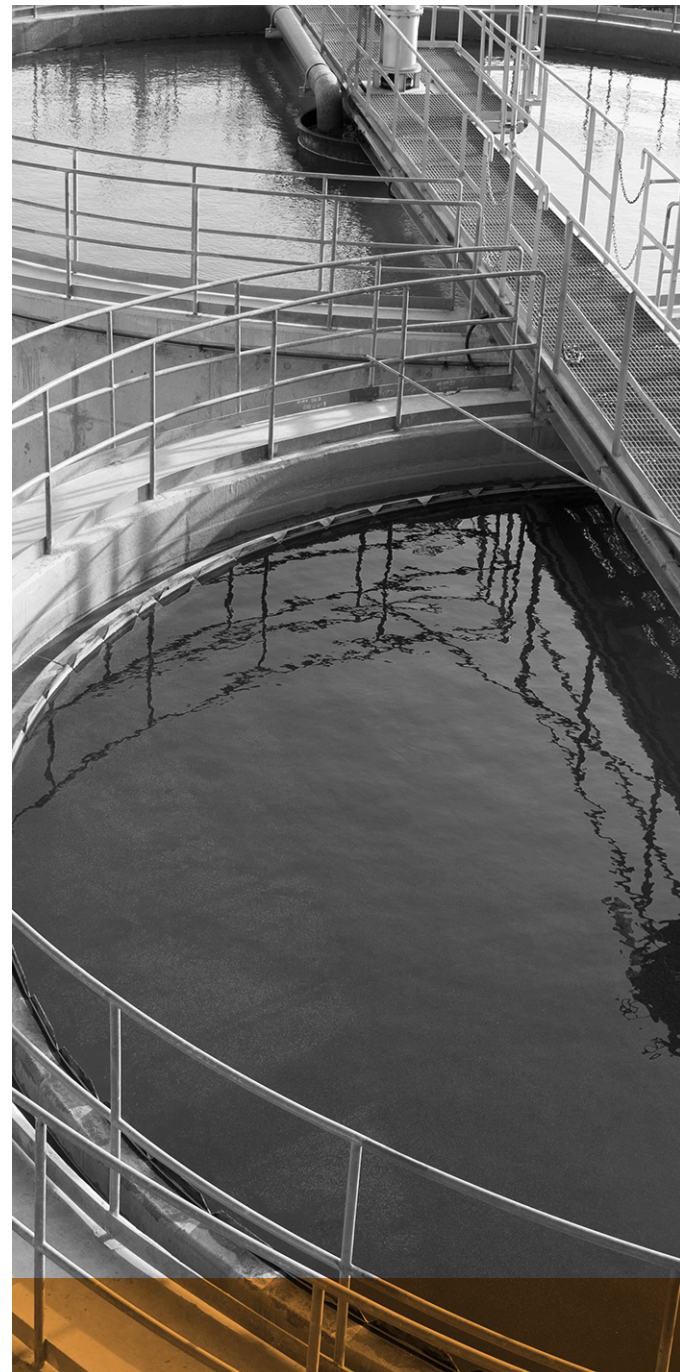


Business-as-usual will see continued loss of natural capital and growing watershed threats, in some cases reaching tipping points with irreparable consequences.<sup>12</sup>

- Watershed Security Fund Position Paper

## Observations

- **Long Term Targets** - In the USA, the Department of Energy has set 5 major areas of focus for technological advances and innovative problem solving in the water sector. Called the “Grand Challenge”, the framework includes a coordinated suite of prizes, industry challenge competitions, early-stage research and development support. Goals include:
  - » Launch desalination technologies that deliver cost-competitive clean water
  - » Transform the energy sector’s produced water from a waste to a resource
  - » Achieve near-zero water impact for new thermoelectric power plants, and significantly lower freshwater use intensity within the existing fleet
  - » Double resource recovery from municipal wastewater
  - » Develop small, modular energy-water systems for urban, rural, tribal, national security, and disaster response settings
- **Investor Influence** - Another significant trend to support the business case for BC watertech companies is that investors are pushing for corporations to publish their water usage and exposure to water risk. There is a growing recognition that poor water supply and management and lack of long term planning around water issues poses severe business risks. As a result, corporations are seeking and investing in solutions to manage their water footprint and reduce risk.
- **Regulator Influence** - Regulators are also having a growing influence in specific industries. For example, in the mining sector in BC, there is an increased focus being put on the value of the financial bonds being posted by mines. This is in part due to the risk of mining tailings contaminating water and the cost of cleanup and remediation. For watertech companies, this creates an investment opportunity for water-related process improvements in the mine operations and in sensor/data analysis technology for early detection and spill prevention. If a mining company invests in technology that proves reduced costs and risks, the bond value can be lower as the regulators gain confidence.





→ **Contaminants of Emerging Concern** - Contaminants of Emerging Concern (CECs) refers to any chemical discovered in water or in the environment that had not previously been detected, or were only present at insignificant levels.<sup>13</sup> These cover a wide range of compounds, including pesticides, pharmaceuticals, synthetic and natural hormones, personal care products, antibiotic resistant bacteria and genes, and excess nutrients from agricultural runoff or mining waste. This growth in the number of contaminants that the water sector is (or ought to be) monitoring was frequently mentioned by interview participants as an area of concern. The water sector, particularly treatment companies, wants guidance around future regulatory plans from the government so that they can plan ahead and develop new treatments and detection methods.

In particular, participants mentioned a class of chemicals known as PFAS. Sometimes referred to as "forever chemicals," PFAS (perfluoroalkyl and polyfluoroalkyl substances) is a family of synthetic chemicals that is extremely persistent in the environment and our bodies. The potential adverse health impacts associated with PFAS exposure include liver damage, thyroid disease, decreased fertility, low infant birth rates, high cholesterol, obesity, hormone suppression and cancer.

→ **Smart Water** - In the City of Vancouver's Raincity Strategy Report, one of their recommendations is to "drive innovation and system effectiveness through data collection and analytics." What this refers to is what's been called 'smart water' - the use of advanced sensors, data analytics, data mining, AI, predictive analysis, to increase the overall effectiveness of water systems. Interview participants considered smart water technologies as a significant and growing area of opportunity for monitoring assets.

→ **Data as Infrastructure** - There was also a recognition that data itself is an infrastructure and there is a need to advance both policies and technologies that support FAIR principles (Findable, Accessible, Interoperable and Reusable) for water data, and integrate Indigenous traditional and local knowledge.

→ **Wastewater Recovery** - Waste water recovery processes and wastewater treatment plants are growing in importance as the economy transitions to more efficient energy use and adapts circular and sustainable models of doing business. Technological systems that allow water and energy recovery from wastewater and sewage are an area of opportunity and driving innovation in multiple areas, including 'smart water' and water distribution systems.

Photo courtesy of [BQE Water](#)



Vancouver harbors a deep connection to its local waterways. However, we know that our natural watershed has changed. We're charting a new course in how we manage our water.

- City of Vancouver, Raincity Strategy

## Challenges:

- **Water Regulation** - While there was some disagreement over whether BC is better or worse than other provinces in regards to water regulations, there was general agreement that Canada lags many other jurisdictions worldwide. This is likely in part because we don't have the same water scarcity issues (and thus sense of urgency) as other regions.
- **Limited Local Markets** - While BC has successful watertech companies, many of them are selling into international markets. Because the regulations in BC and Canada are not as stringent as other areas, commercial opportunities for innovative water technology companies to sell locally are not being realized.
- **Commercialization Funding** - There is a gap in access to capital for commercialization of new watertech in British Columbia. Canada is known as a source of great ideas, R&D and early-stage start-ups, but the financing available for the scale-up of companies is not available here and watertech companies often look outside Canada for later-stage funding. As noted above, given that there is a limited local market, as Canadian water tech companies expand and focus on export markets, they attract foreign rather than local or Canadian investment.
- **Approvals/Permitting for New Technologies** - In British Columbia, water policy does not provide companies or municipalities with lists of Best Achievable Technologies (BATs), but rather mandates outcomes. While this opens possibilities for new technologies to be deployed, in practice, regulators will not approve new tech that has not been demonstrated and/or there are delays in approval and permitting compared to other jurisdictions. This is stifling technology deployment in innovative technologies.
- **Climate Change** - Climate change impacts all sectors in BC. However, the water sector has a pivotal role to play in not only achieving CleanBC targets and transitioning to a low carbon economy, but also in adapting to climate change. Traditional slow moving systems of gradual improvements and updating of water infrastructure is no longer a viable option due to the current and predicted effects of climate change.

The increased intensity of storm events, expected increase in climate variability and extreme weather events are driving the need for resilience in water and wastewater infrastructure across the world, and opening opportunities for innovation.



We do not currently have the necessary capacity to drive the level of cooperation and collaboration needed to deal with Canada's changing hydrological realities and the implications for communities and economies are dire.<sup>14</sup>

- The Canadian Water Security Initiative



### Water Security, Watertech & First Nation Communities

First Nations across Canada have clearly articulated that water, water security and water governance are priority areas of concern. However, as noted, there are often multiple boil water and do not consume advisories in effect at any given time in First Nation communities across British Columbia.

The potential and growing impact of climate change (sea-level rise, coastal erosion, flooding, loss of land and resources, contamination of water sources) on First Nations and remote communities brings an increased level of urgency to this already-urgent problem.

CleanBC has committed to work in collaboration with Indigenous people to develop a provincial climate preparedness and adaptation strategy that integrates Indigenous knowledge and expertise.<sup>15</sup>

The uses and applications of watertech in delivering safe water and adapting to climate change for First Nations communities have enormous potential. For example, digital technologies, (such as AI, sensors, robotics and predictive analysis), could be used by communities to think through complex issues such as infrastructure analysis, water usage, flood monitoring, health and environmental monitoring.

These technologies could be of great benefit to solving multiple water and infrastructure issues that

arise in remote locations. Predictive analytics and machine learning can be used to predict failures in water treatment plants before they occur, allowing for technicians to be dispatched to perform preventive or emergency maintenance before a boil water or do not consume advisory needs to be issued. Like in digital healthcare, where you can consult and share data with a doctor on your cell phone, advances in digital watertech could mean a remote water technician monitoring for problems before they arise or being immediately dispatched in case of a water emergency.

The recommendations discussed below for the water sector are about efforts to accelerate innovation. We believe that water treatment technologies that are amenable to remote sensing, AI and predictive analytics could have a significant role to play in providing safe, consistent water supply to remote communities.

Many technologies that could accelerate this are currently at the prototype or demonstration phase, or perhaps not yet commercially deployed on a mass-market scale. Accelerating innovation and progress on early stage technologies in the water tech sector along with market development and training/capacity building is a direct path to solving this urgent problem.



Water is fundamental for life and health. The human right to water is indispensable for leading a healthy life in human dignity. It is a prerequisite to the realization of all other human rights.

- The United Nations Committee on Economic, Cultural and Social Rights



## Recommendations:

The watertech ecosystem in BC includes a number of successful SMEs and leading research institutions with proven capabilities to spin out successful companies like Saltworks in Richmond or Ostara in Vancouver. BC is also home to one of the world's leading water intelligence firms - BlueTech Research. Our coastal location, freshwater supply and proximity to US markets are also attractive to water tech companies wanting to locate or launch in the province.

If governments, communities and companies want to reduce their risk and move quickly towards a circular economy and water security, then progress on early stage water technologies needs to be accelerated. The water innovation ecosystem including market development, technology adaptation and education/training, must be energized.

The following are concrete recommendations for action to develop the water tech ecosystem in British Columbia:

→ **Innovation Sandboxes** - There is an opportunity for government and industry to enable business innovation, and keep up with the changing technology landscape (while executing on their mission to ensure clean, safe water supply) through a technology sandbox program that allows demonstrations, and supports pilot programs in a collaboration environment.

Watertech sandboxes focused on solving challenges around potable water, sewage, industrial/agricultural water, would allow innovators to pilot new approaches in a low-risk environment that fosters innovation. This would be connected into and strengthened by the [developing water cluster in BC](#) and Canada that is fostering the growth of innovative water technology companies.

→ **Smart Water Digital Innovation Programs** - Funded industrial challenges should be launched that focus on 'smart water' digital technologies such as sensors, AI & predictive analytics, data analytics, etc. This could be done as part of the watertech sandbox initiative recommended above.

Innovations in smart water technology have the potential to be a contributing factor in the delivery of consistent clean water, given the urgency of climate change and the importance of safe water delivery to First Nations and remote communities, this should be a priority.

Photo courtesy of [Saltworks Tech](#)

# We're no longer talking about fuzzy ideas of what might happen down the road, far off in the future. It's real.

- Participant comment, "Lessons From the BC Energy Step Code" report

→ **Water Data** - The provincial government should lead a project to improve data sharing and access to water data. An application that allows public access to a variety of water resources data, (e.g. drinking water quality data, protected water supply areas, ambient water quality data, watersheds, real-time water quantity and quality data, location of sewage outfalls and location of dams, etc) should be developed. This would be a cooperative project and include watertech ecosystem stakeholders across the province, with a special focus on First Nations traditional knowledge and FAIR data principles.

[\(The Newfoundland and Labrador Water Resources Portal\)](#) is a leading Canadian example of a public resource sharing comprehensive, real-time and historical water data).

→ **BC Water Step Code** - There is an opportunity for the provincial government to implement a step code style water regulation policy that, like the BC Energy Step Code, provides an incremental and consistent approach to improved water quality and management. The BC Energy Step Code is more than a set of regulations - it is a step-by-step long-term policy road map for improved energy-efficiency performance for buildings that has transformed the building market in BC into a world-leader in net-zero energy-ready building technology. (See "[Lessons From the BC Energy Step Code](#)" report for an interesting story of how this innovative legislation came about).

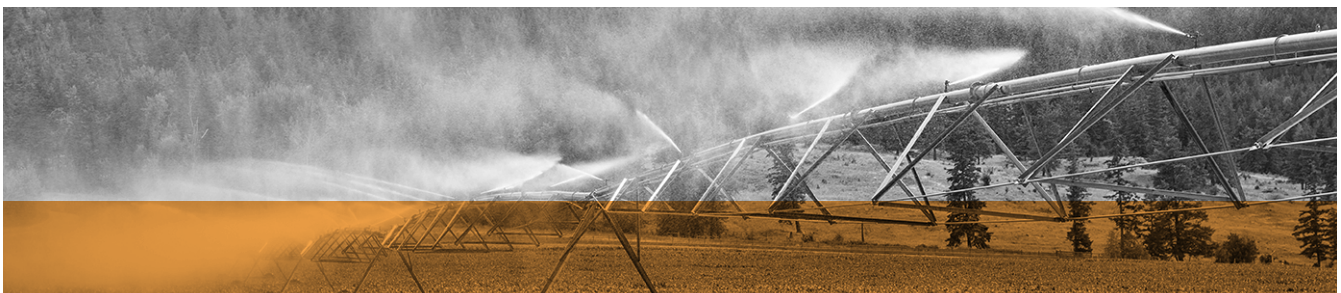
This approach for water tech could have a similar transformative effect as it would give industry time to prepare and invest in new technologies, and academia and SMEs time to develop new technologies to address the upcoming regulations. This would likely result in better compliance as well as made-in-BC technologies that could get to market quicker. It would also address the concerns regarding what contaminants they should plan to monitor for and remediate as planned future regulations would be outlined in the BC Water Step Code.

→ **Made-in-BC Grand Challenge** - With the BC Water Step code established, the opportunity then arises for a made-in-BC 'grand challenge' program modelled after the US Department of Energy. As the industry knows what specific regulations will be coming, the grand challenge program would guide them on major areas of focus for technological advances and innovative problem solving in the water sector.

The framework could include a coordinated suite of prizes, industry challenge competitions, early-stage research and development support, and could be integrated into the Water Innovation Sandbox program such that the funding and challenges would be made available in advance of the BC Water Step Code regulation coming into effect.

→ **Water Cluster** - While there are high levels of dedication, technical competencies and expertise in the province, (and a drive to protect our water systems and rise to the challenge presented by climate change), the water technology ecosystem in BC and Canada remains fragmented. There are communications gaps between sub-sectors, stakeholders and regions that are slowing down the positive environmental and economic impact they could have by working together.

Given our strengths in BC and Canada with regards to leading water tech companies, research and development activities, and proximity to the US market, there is an opportunity to lead a world-class water cluster for Canada. A water cluster that serves a coordinating function, breaks down communication gaps between stakeholders and communicates to the world the high-level of technology competencies and impact of Canada's water sector would not only drive global market positioning and customer acquisition, but would increase the number of made-in-Canada water companies, bring in and retain talent, attract capital and increase the number of jobs in the sector.





An aerial photograph of a wastewater treatment plant. The image shows several large, circular aeration tanks with metal grates on top. In the center, there is a small, rectangular, light-colored building with several windows. The surrounding area is green with trees and some streetlights. The overall scene is captured from a high angle, looking down at the facility.

## About the Project

The CORE Cleantech Cluster is driving economic development goals of job growth, company growth, investment attraction and trade opportunities in British Columbia by activating, coordinating and developing collaboration opportunities and energizing an innovation ecosystem centred around cleantech and sustainability.

A more detailed analysis of the Water Sector and its role in the cleantech innovation ecosystem is available in the report [Accelerating British Columbia's Clean Economy: A Cleantech Cluster Strategy for the Province of British Columbia.](#)

# Foresight

## About Foresight Cleantech Accelerator Centre

This roadmap landscape report is funded through [Foresight Cleantech Accelerator Centre](#). Foresight is Western Canada's Cleantech Innovation Centre which supports the identification and validation of cleantech opportunities and the successful commercialization of solutions.



[waterNEXT](#) is Canada's water cluster.

<sup>1</sup> <https://www.fnha.ca/what-we-do/environmental-health/drinking-water-advisories>

<sup>2</sup> <https://vancouver.ca/home-property-development/one-water.aspx>

<sup>3</sup> <https://poliswaterproject.org/2019/11/27/a-watershed-security-fund-for-british-columbia/>

<sup>4</sup> [https://corecleantech.com/wp-content/uploads/2020/07/CCC-Report\\_Final\\_20July20.pdf](https://corecleantech.com/wp-content/uploads/2020/07/CCC-Report_Final_20July20.pdf)

<sup>5</sup> [https://www.canadianinfrastructure.ca/downloads/Canadian\\_Infrastructure\\_Report\\_2016.pdf](https://www.canadianinfrastructure.ca/downloads/Canadian_Infrastructure_Report_2016.pdf)

<sup>6</sup> <https://www.fnha.ca/what-we-do/environmental-health/drinking-water-advisories>

<sup>7</sup> <https://www.unwater.org/publications/world-water-development-report-2020/>

<sup>8</sup> <https://www.un.org/en/sections/issues-depth/water/>

<sup>9</sup> [https://gwf.usask.ca/documents/WaterSecurityForCanada\\_FINAL\\_April-9-2019.pdf](https://gwf.usask.ca/documents/WaterSecurityForCanada_FINAL_April-9-2019.pdf)

<sup>10</sup> <https://www.meticulousresearch.com/product/water-and-wastewater-treatment-market-5026/>

<sup>11</sup> <https://www.unwater.org/publications/water-security-infographic/>

<sup>12</sup> <https://poliswaterproject.org/files/2019/11/Watershed-Security-Fund-Position-Paper-1.pdf>

<sup>13</sup> <https://scix.com/applications/environmental-testing/contaminants-of-emerging-concern>

<sup>14</sup> [https://gwf.usask.ca/documents/WaterSecurityForCanada\\_FINAL\\_April-9-2019.pdf](https://gwf.usask.ca/documents/WaterSecurityForCanada_FINAL_April-9-2019.pdf)

<sup>15</sup> <https://www2.gov.bc.ca/gov/content/environment/climate-change/adaptation/working-group>