

Foresight

Smart Policy Series



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INCENTIVIZING LOW CARBON PATHWAYS FOR WATER





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Against the backdrop of population growth, increased migration to cities, rainfall changes due to climate change, ageing water and wastewater infrastructure and growing demand for food and electricity, there is set to be further stress on current water and water management resources globally. This will pose a serious risk to current business as usual scenarios for industry, governments and households. In response we see an emergence of policy and regulation as well as business models, purchasing agreements and innovations working to address this risk.

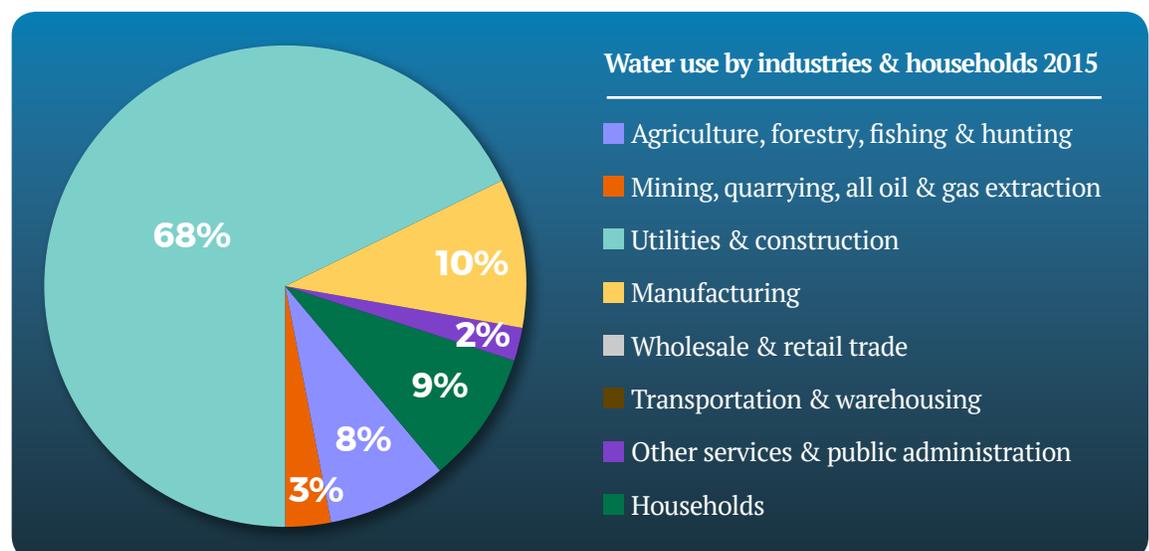
Even in Canada, a water abundant country, there is an imperative to conserve and manage water resources. Across the more Western Provinces including British Columbia, Alberta and Saskatchewan, water is more unevenly distributed and there is significant industrial and agricultural demand.

Water is a broad subject matter. For the purpose of this article we will briefly highlight industrial demand for water, wastewater practices, guiding regulation and innovations on the market.

In 2018, NRCan released data indicating water use by sector from 2015. The chart below indicates industrial water use was heaviest in utilities and construction (68.1%). This was followed by the [manufacturing \(10.2%\) and agriculture \(7.4%\) industries](#).¹ Canadian households' water use is 8.8%. As we can see the vast majority of water is used for industrial purposes.

As for wastewater, current practices in treatment in Canada are disparate, with some areas discharging untreated wastewater. However, new technology innovation and increased government effort in spending in infrastructure is set to change the status quo. Millions has been allocated for the Clean Water and Wastewater Fund, including allocation for [infrastructure in First Nation communities](#).²

The benefits of conserving and managing water and wastewater are not only about reduced costs, but also about developing resilience to water scarcity and climate change, responding to investor expectations, compliance with [government policy and regulation and ensuring a license to operate](#).³





AN EMERGING MARKET FOR WATER & WASTEWATER INNOVATION

In our research, we found that there is a number of innovations in the market today ranging from large infrastructure, modularized hardware and software applications to encourage water efficiency and recovery. We draw on a couple of sectors where clean technology innovation is making an impact in water recovery.

Oil & Gas

Water has a central role in the bitumen extraction process. Oil sands are made of a mixture of bitumen, sand, silt, clay and water. Unlike conventional sources of oil, bitumen is too thick to be extracted without first being modified in some way. In mining operations, warm water is mixed with the mined oil sands ore to separate the bitumen from the remaining clays, sands and other materials. In in-situ operations the most common recovery method uses water to create steam which is injected into the oil sands reservoir through wells. The steam heats the bitumen, causing it to separate from the sand and clay so it can be pumped to the surface.

Canada's Oil Sands Innovation Alliance (COSIA) has been working towards improving sector practices in Alberta with [one of their focus areas being water](#).⁴ Driving their need to innovate are recommendations from the COSIA Water EPA as well regulation supporting higher water recycling rates and recovery as well to favor brackish water over freshwater withdrawals, specifically: Oil Sands Conservation Act and Oil & Gas Conservation Act (RSA 2000, c.O-6&7) (2000) which supports water recycling for mining recovery in oil sands extraction and the Alberta Water Conservation and Allocation Guideline for Oilfield Injection (2006) which regulates in situ water recycling in oil sands extraction, requiring new thermal in situ projects to prioritize brackish water for makeup water.

There are also a number of government supported R&D projects. For example, the University of Alberta was recently awarded a grant to focus on development of a novel, low-cost and environmentally friendly polymer flocculants that are able to efficiently and significantly increase the settling rate of the fine solid particles in tailings and [allow more water to be released for recycling](#).⁵

Wastewater

Following the introduction of the Wastewater Systems Effluent Regulations in 2012, a number of treatment plants in the country will require replacing or rebuilding to achieve secondary levels of treatment by 2040 (Global Water Intelligence). In the Province of British Columbia, the Environmental Management Act regulates wastewater discharge and reuse in British Columbia, including targeting specific industries. These regulations are important, as untreated water can have negative impacts. According to Vandision 2015, globally, 80% of water is discharged [without purification with major consequences for our ecosystem](#).⁶

With these challenges, come opportunities. Wastewater is increasingly considered a resource that can provide energy, nutrients, and new drinking water. A number of companies based in British Columbia are emerging as leaders in this sector (see below and in additional Table 1 at the end of document) serving customers at home and abroad.

Valuable nutrients such as nitrogen and phosphorus can be recovered from wastewater to be used for fertilizer in agriculture. Ostara, does exactly this for cities, farms and industries and creates their own environmentally [friendly fertilizer called Crystal Green](#).⁷ Boydell, is a wastewater treatment technology development and licensing company. They started with the mission of developing a better, more controllable and reliable raw sewage treatment technology. Their product [WaterMiner processes difficult industrial feedstocks](#).⁸ SaltWorks, founded in 2008, delivers water technologies for industrial desalination that concentrate brine, achieve [zero liquid discharge & make clean water](#).⁹ They work with a variety of industries ranging from agriculture to oil and gas. Pani Energy, allows plant owners and operators to holistically



optimize plant operations over the cloud, using Pani Digital's proprietary Artificial Intelligence (AI) software to bring [data-driven technologies to the water industry](#).¹⁰ (Interestingly, similar to recent developments in the energy sector, we see that accessing data on asset performance such as ageing infrastructure can help better determine or improve their water conservation effectiveness. This is a big draw for large companies and government who are looking to maximize benefits.) To help ensure households and business have clean and safe drinking water in remote communities, Acuva's UV-LED water purification systems leverage the proven technologies of [ultraviolet germicidal irradiation and LED lights to purify the water](#).¹¹

To manage the challenge of investment and RoI timeframes, particularly for those businesses who need to process water with on-site facilities but are reluctant to invest and would rather outsource (think breweries for example), there is a new business model innovation on the market. It's called a WEPA, a water and energy purchasing agreement developed by UK outfit called [Cambrian Innovations](#).¹² Launched in late 2015, the model eliminates upfront capital costs and risks. A host customer purchases treatment services on a per-gallon basis, and Cambrian Innovation is responsible for the ownership, design, construction, installation and operation of the system. Vancouver company, Axine Water Technologies, has a similar value proposition for the [electronics, pharmaceutical and chemical markets](#).¹³ Axine owns, operates, services and maintains treatment systems at customer sites under multi-year service contracts. This allows customers to realize all the benefits of an Axine's water treatment solution without investing capital, taking technology risk, operating or maintaining equipment.

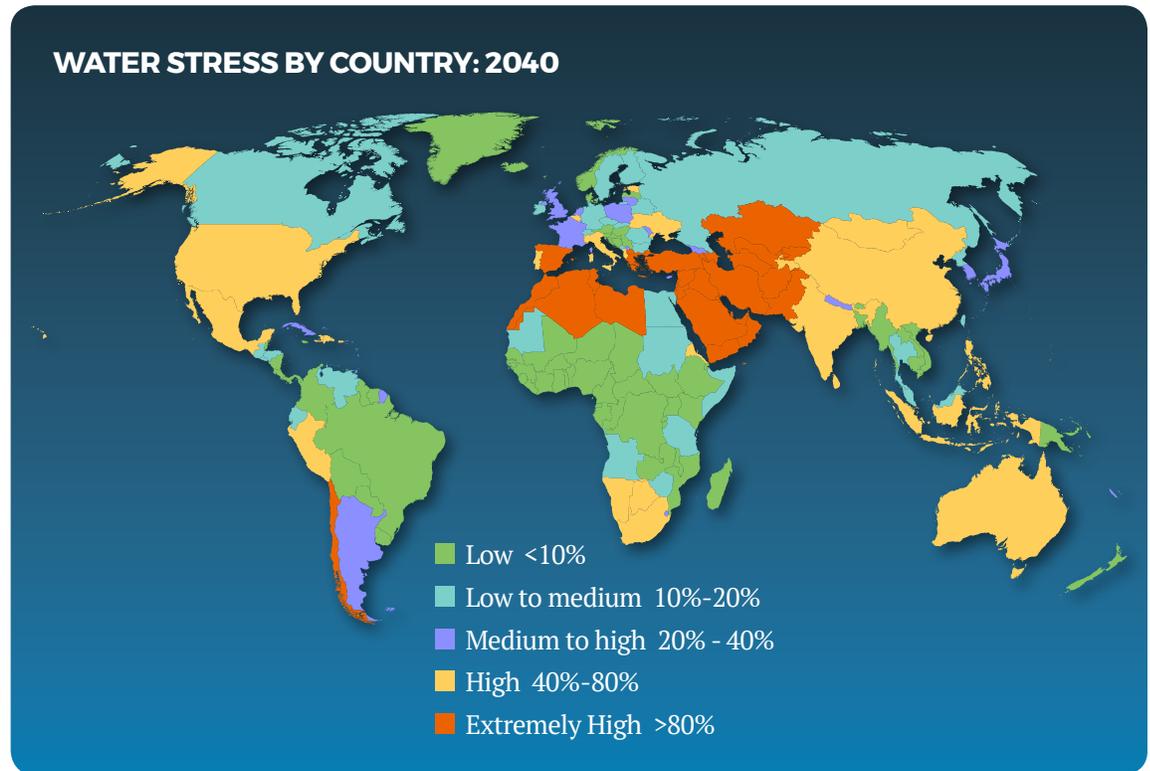
Global Impact

In this article, we provided a snapshot of activity in Canada. That’s not to say, water stress is of little significance elsewhere.

This map from World Resources Institute highlights by 2040, a number of countries across the world that will be dealing with much more **significant levels of water stress**

and management.¹⁴ Much work is needed to ensure equitable distribution and use of water resources in the face of climate change and other trends highlighted above.

Smart policy, technology and stakeholder engagement can help to create markets for innovative products and services to meet essential needs.



We’re interested in helping start-ups validate their product, their value proposition and support with market and customer engagement.

Table 1. Additional Canadian companies with water and wastewater technologies . 13

Water Innovation – Canadian based companies		
Bio Largo Water	BQE Water	Aquova
Boost Environmental Systems	CarbonNet Nano technologies	Tecta-PDS
Clean Industrial Technologies	Demizine Technology	NPower Cleantech

Endnotes

- ¹ www150.statcan.gc.ca/n1/daily-quotidien/180711/t001c-eng.htm
- ² infrastructure.gc.ca/plan/cwwf-fepeu-eng.html
- ³ edie.net/library/Top-10-business-benefits-of-reducing-water-consumption/6553
- ⁴ cosia.ca/initiatives/water
- ⁵ nrcan.gc.ca/energy/funding/current-funding-programs/eii/16130
- ⁶ sciencedaily.com/releases/2015/10/151007084301.htm
- ⁷ ostara.com/nutrient-management-solutions/
- ⁸ boydel.ca
- ⁹ saltworkstech.com
- ¹⁰ panienergy.com/company
- ¹¹ acuvatech.com
- ¹² wwdmag.com/industrial-water/water-energy-purchase-agreement
- ¹³ axinewater.com
- ¹⁴ wri.org/blog/2015/08/ranking-world-s-most-water-stressed-countries-2040