BUSINESS COUNCIL OF ALBERTA

DEFINE THE DECADE

Discussion Paper Series

How innovation is helping Alberta adapt to a changing water future

Vicki Lightbown
Alberta Innovates

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Land Acknowledgement

In the spirit of truth, reconciliation, and respect, we honour and acknowledge the lands upon which we live and work as guests, including the traditional territories of the First Nations in Treaties 6, 7, and 8 and the citizens of the Metis Nation of Alberta. We thank the First Peoples of this land, which we now call Alberta, for their generations of stewardship of the land, and we seek to walk together in the spirit of truth and reconciliation to build a shared future for all in Alberta.

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About the Author

Vicki Lightbown
Alberta Innovates

Vicki Lightbown is the Director for the Water Innovation Program at Alberta Innovates. She is a Professional Engineer with a BSc in Civil Engineering from the University of Calgary. In 2015, Vicki was a recipient of the Young Women in Energy award and in 2016 she was named in the Top 35 under 35 in Canada's Energy Sector by the Alberta Oil Magazine.

In Vicki's role with Alberta Innovates she works proactively to identify critical technology and knowledge gaps and apply world-class research to develop solutions for some of the biggest water challenges in Alberta.

Introduction

This year is another year of drought in Alberta.

Early spring saw an early start to fire season and calls for water conservation. Early indications predicted that 2024 could be Alberta's worst drought on record since 2001.

Some late spring and early summer rain has reduced the intensity of this year's drought, but Alberta would need constant rain from now until the end of the summer to build back its water reserves and pull itself out of drought—that doesn't mean the water in our reservoirs; it means our rivers, lakes, streams and underground aquifers.

The public has grown increasingly concerned about how much water we have and where it is. As a result, more attention is being paid to the science of water, conservation, and treatment technologies, and how innovation will be key to managing our water resources as climate change continues to impact water availability now and into the future.

Even with the rain, signs of drought are piling up. Here are just a few:

Many reservoirs in Alberta were lower than they should have been in Spring. In May, low levels forced the Municipal District of Pincher Creek to pay up to $7,500 a day to transport water out of the dam for use in the community. While spring rains have returned reservoirs to normal levels, the mountain runoff forecasts are significantly below- to below-average for the southern Alberta basins. This runoff is what we rely on to help maintain our river flows during the drier summer months.

The St. Mary River Irrigation District delivers irrigation water to farmers in the southern part of the province. At the time of water allocation this Spring, low snowpack from the dry winter was expected to affect reservoir storage. As a result, farmers in the area are restricted to half of the water they would normally be allotted to irrigate their crops. It is unclear if higher reservoir levels will be enough to offset the below-normal runoff forecasts to change those allocations. Low water allocations can drastically impact the amount and type of crops that farmers in the region are able to produce, affecting not only the food supply, but also farmers' income.

While the late season rain has tamped down the early forest fires for now, warmer weather later this summer could cause them to flare up again. If water supplies are low in areas where fires are burning, that could put a greater strain on municipalities' already tight supplies.

On April 19, the Government of Alberta announced it had negotiated with license holders the largest series of water-sharing agreements in the province's history. As part of these agreements, many municipalities will volunteer to reduce water consumption by between five and 10 per cent to ensure farmers, energy producers and other essential industries have the water they need. This could lead to restrictions for things like watering lawns and community fields and calls for households to find ways to use less water—something Calgary has had an early and extreme taste of as a result of the catastrophic failure and resulting weeks-long repair of the city's main feeder main on June 5, 2024.

It's clear from these examples that we need water for all aspects of our lives—to drink, to produce the food we eat, and to support the natural ecosystems around us. It powers our lives and our economies. We all have a right to access it, and by the same token, we all have a responsibility to use it as responsibly as possible.

Even if the summer rain we have seen has reduced the severity of the drought, we are likely to face the same challenges again in the coming years and we need to have the tools and knowledge in place to manage them. In other words; yes. It's raining, but now is not the time to stop talking about how innovation can help us manage drought.

Innovation's role in drought management

Tough decisions will be needed—and are already being made—by governments and our communities to ensure that we have the water we need for necessities. But managing this drought is going to be about more than just turning off our sprinklers and taking shorter showers.

To adapt and prepare, we need to understand possible future scenarios and then build resiliency into our infrastructure, communities, and business practices so we are able to manage this drought, and future ones as well.

Our governments, cities, industries and utilities are going to have to find better solutions to manage, use and reuse the water available to us.

Having a clear understanding of what Alberta's water resources look like now and decades into the future is essential to identifying and effectively implementing those solutions. This is where innovation comes in.

None of this can be done without significant investments in research, technology development and knowledge generation—otherwise known as innovation. Alberta Innovates plays a key role in not only supporting this work, but also in setting the innovation direction to meet the province's future needs. We do this through the forecasting done by our applied research subsidiary, InnoTech Alberta, and in collaboration and connection with researchers and stakeholders.

Innovation makes us resilient in the face of crisis

Innovation is a long-term play. Our scientists, researchers and innovators are not the ones on the front lines fighting droughts, floods and fires, but they are the ones helping ensure the best tools are available to those who are.

The investments made in developing better knowledge, technology and best practices to date have directly influenced policies and practices at a provincial, municipal and industrial level. This has put the province in an even better position for managing this year's drought than in 2001.

Better forecasting and stream flow predictions:

To effectively allocate and provide water each each year, irrigation districts and reservoir managers need to understand long-term future forecasting and stream flow predictions. Understanding how climate change and land use impact downstream flows is essential to this work.

Alberta has invested in developing a model with key water stakeholders and experts that enables decision makers to understand the impacts that different actions will have on the South Saskatchewan River Basin watershed. As a result, dams, once only used for power generation, now play a key role in drought and flood mitigation. Similar projects are in development for the North Saskatchewan River Basin.

Stable water supply for businesses and communities:

Innovation has enabled use of alternative sources of water such as municipal effluent, storm runoff and non-potable groundwater to be treated and used to irrigate community sports fields or in oil and gas production. Research on treatment standards of this water have influenced policies to allow this once unusable source of water to be utilized, freeing up more of our freshwater supply for other uses.

New water treatment technologies are also driving new approaches to water use for industry, enabling agriculture and oil and gas sectors to use less water and recycle more within their processes.

Understanding water security

Glaciers are the source of a large amount of Alberta's water supply. Glaciers are shrinking and disappearing much faster than anticipated, and Alberta's population is growing at unprecedented rates. This makes it essential to gain a clearer picture of how climate change is affecting our natural water sources. To support more sustainable water management practices, Alberta invests in applied research to explore mountain, surface and ground water hydrology, and how snowpack will affect the province's water supply. The findings from these studies are used to inform Alberta's water management strategies, mitigation measures and policy development.

Innovation is only effective if it is used

The potential for Alberta's research and innovation ecosystem to identify solutions to our biggest water challenges is endless, but none of these solutions matter if they're not adopted. Removing systemic barriers to adoption is the best way that we can accelerate the pace at which essential groups can access the knowledge, technologies and best practices developed by our innovators to better manage water.

Regulatory challenges

Regulations are essential to ensuring our communities, workers and environment are protected. But regulations often can't, or are slow to, take into account the impacts of new technologies and knowledge. The slower pace of regulatory change can hinder the adoption of new ways of working that could benefit the industries that want to adopt them, and others that could benefit from the water these new innovations have the potential to free up.

For example, finding alternative sources of water for oil and gas is essential to ensuring Alberta has access to the energy it needs, while also freeing up fresh water for farmers and communities. Currently, process water from oil and gas operations can only go to deep well storage, and cannot be reused except for in specific oil and gas applications. However, some of it is clean enough and available to be treated and used for other purposes.

Many regulatory bodies are looking to be innovative and are working with industry and environmental experts to develop standards for how this could be done safely and effectively. By using that information to update regulations, Alberta could reduce the amount of freshwater used to produce our energy. This would make available large volumes of process water that are currently disposed of and lost to the water cycle. The desire is there, and investments in research and recommendations to guide this policy change are essential to accelerating the change.

Reuse perceptions and possibilities

New water treatment technologies have the potential to enable more water from municipal wastewater, storm water and industry process water to be directly reused as potable water. Right now, this water is reused indirectly by being returned to the environment and then treated to a standard acceptable for drinking water, which is a much slower process.

But public perception on water reuse is mixed. Canadians often see "reused" potable water as unclean or unfit for human consumption. But many parts of the world, including the U.S., Australia and Israel are treating a wide range of wastewater and returning it to their pipes with great success. San Diego, California has implemented a program that will see half of the city's water supply made up of recycled water by 2035.

It will take time to change Alberta's policies and gain public confidence in the safety of this readily available source of drinking water and the technologies available to produce it.

The cost of change

While water is essential for almost every industry, it is not considered a core part of business. It can be hard to get internal approval for water management efforts, especially when access to water is cheap and abundant, as it historically has been in Alberta. Implementing new water management technologies and ways of working can be expensive and it can be hard to quantify the benefits of water management in a standard cost/revenue accounting framework. This means that if there are limited funds to go around, water management may be deferred to future dates to make room for core business projects like increasing production.

If industries are unable to justify the cost of implementing new water management systems, it can be hard to remove the barriers to update regulations to set new standards. A vicious cycle of the slow pace of regulatory change, public perception and inability to justify the costs of new technology keeps us in the status quo.

We can look to other industries that have found innovative ways of creating the business case for new ways of working. Organic certification of fruits, vegetables, meats and more has allowed the agricultural industry to assess the cost benefits of changing their approach to production. Clear regulations create entrepreneurial opportunities for producers and processors that want to capitalize on consumer growth in the organic sector.

Alberta's governments and industries have the opportunity to work together to identify innovative ways of creating a case for water management and accelerating innovation adoption.

Conclusion

The work of Alberta's water innovation ecosystem has led to real, tangible changes that are making the management of this current drought easier and more effective. There is so much more to be done to understand how climate change will continue to affect our water resources now and decades into the future.

We need to continue to support that work and act on its findings by developing new technologies and strengthening the regulatory, social and economic structures in place to enable them to be adopted. It takes everyone to create and maintain the innovation cycle and not get stuck in the status quo.

Alberta Innovates is an essential steward of this process. We do more than support investment in innovation; we look ahead to build a clear picture of Alberta's future so we can anticipate our innovation needs and maintain the structures and systems necessary to respond to our constantly changing world.

1600, 635 8th Ave SW
Calgary, AB T2P 3M3

BusinessCouncilAB.com
info@businesscouncilab.com

Define the Decade is a vision for the future of Alberta and a roadmap to get there. To learn more about this project and how you can get involved, please visit DefinetheDecade.com