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A high-speed photograph of water splashing into a pool, with a clear horizontal line separating the air above from the water below. The water is captured in mid-air, creating a dynamic and refreshing visual.

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A Failure of Governance

BY ANDREW MACKLIN

THOSE FOUR WORDS still ring loud and clear in my ears, several weeks after I heard them fall from the lips of former Ontario Premier Bob Rae during his lecture at the University of Waterloo on World Water Day.

The words were in reference to the May 2000 Walkerton crisis, which occurred a year into the second term of the Mike Harris-led Progressive Conservative government in Ontario. The O'Connor Commission's 28 recommendations addressed the failures in governance that led to the crisis, putting a system in place that would prevent further tragedy.

That tragedy should have taught our policy makers a valuable lesson: governance must be in place for technology to succeed. Regardless of the millions poured into a community to create or rehabilitate a drinking water distribution system, if the institutional knowledge does not also exist, the system is doomed to fail.

But that message has not been heard by those in power, at least not to the extent that it must be in order for us to succeed in the effort to provide clean drinking water for all Canadians. We continue to see water infrastructure idled by a lack of knowledge on how to properly run it, the same issue that threw the small Ontario community into crisis some 19 years ago.

Why does this keep happening?

From a people perspective, governments must continue to put physical boots on the ground, inspecting systems to ensure that the people operating them know how to do so. And those individuals who

are sent to inspect must continue to have the necessary credentials and training to be able to perform those inspections safely and accurately.

We must also lean more heavily on the technology providers to help provide legacy documentation for the operation and maintenance of our installed systems. In the age of cloud-based computing, surely we can provide a digital space where data on a given system can be stored. However, accessing that data requires an effective nationwide 5G wireless network, something that governments across the country are seemingly united in their efforts to establish.

There is also a financial issue to consider, one that could cause a crisis in the long term. As the governments of the day continue record investment in water and wastewater infrastructure, that investment must come with a system of funding that supports operations and maintenance. If that funding is not readily available, then it needs to be demonstrated by the municipality or community that it has a funding solution in place to cover the lifecycle costs.

We must provide drinking water for all Canadians. But doing so without appreciating the lessons learned from the Walkerton crisis will doom us to fail once again. Hopefully, the policy-makers are finally listening. WC

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ABOUT THE COVER

Global leaders in flood resilience are offering their solutions to Canada. Are we prepared to listen? Learn more on page 10.



Health Canada Sets New Guideline for Lead in Drinking Water

BASED ON THE LATEST SCIENCE, Health Canada has updated the drinking water guideline to reduce the maximum acceptable concentration of lead from 0.01 mg/L, which was set in 1992, to 0.005 mg/L. The guideline was updated in collaboration with the provinces, territories, and other federal departments.

While lead levels have been significantly reduced over the last 30 years, the metal can still be found in the world around us. Lead is usually found in drinking water after leaching from distribution and plumbing system parts. It was historically used in service lines (i.e., pipes connecting a home or business to a street’s watermain) and in plumbing fittings and solders.

Until 1975, lead was an acceptable material in pipes based on the National Plumbing Code of Canada, so it is more

likely to be found in older homes and neighbourhoods. Since lead was regularly used in these plumbing system parts for many years, drinking water systems in Canada may still have some of these lead components in place today. As such, it is expected to take time before all jurisdictions are able to meet the new guideline for the maximum concentration of lead in drinking water.

Health Canada will continue support provinces, territories and other federal departments in implementing the new guideline. Health Canada will also work with provinces, territories, and other federal departments to provide accurate and relevant information to municipalities and Canadians concerned about the health effects of lead levels in drinking water. WC

Coming up in the next issue:
JULY/AUGUST

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NEWS: Study Examines Impact of Pharmaceuticals on the Great Lakes. bit.ly/PharmaLakes



Barry Orr presented the findings of the Defining 'Flushability' for Sewer Use report at event hosted by Ryerson Urban Water on April 4, 2019.

New Test Produces Failing Grade for 'Flushability' of Single-Use Wipes

THE FIRST-EVER TEST of single-use wipes against rigorous criteria for flushability produced failing grade for all 101 products.

The findings are summarized in a report, *Defining 'Flushability' for Sewer Use*, that comes out of Ryerson University's Flushability Lab at Ryerson Urban Water. Tests evaluated 101 single-use products, of which 23 were labeled as 'flushable' by the manufacturer. Results showed that not one single wipe was able to fall apart or disperse safely through the sewer system test. This can negatively impact household plumbing, municipal sewage infrastructure, and consequently, the environment.

"This research confirms conclusively what those of us in the industry already knew that single-use wipes, including cleansing and diaper wipes, cannot be safely flushed, even those labelled as

"flushable," said Barry Orr, the report lead and master's student in environmental applied science and management at Ryerson University. He is also a sewer outreach and control inspector with the City of London in Ontario.

To test the flushability of the samples, the researchers created a working model of the average home's lavatory system from toilet to sewer, including the bends and slope, plus average water pressure typical of urban infrastructure. Each wipe was then tested to the wastewater industry's specifications for toilet and drainline clearance plus disintegration. The report findings show that none of the wipe samples fell apart or dispersed enough to safely pass through the sewer system without a risk of clogging or causing damage to infrastructure. **wc**

Watch for the **July/August issue of Water Canada** where we will announce the theme and the host city for the **2020 Canadian Water Summit!**

THE ADVENTURES OF FATBERG



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STORY & DRAWINGS BY NATHAN T. WRIGHT



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A few Canadian cities, like Calgary and Winnipeg (seen here), are already investing heavily in flood resilience measures.

Learning to Adjust

Canadian communities struggle for solutions for severe weather events.

BY ANDREW MACKLIN

CITIES AROUND THE WORLD are grappling with the new water realities caused by the changing global climate. Wet seasons and dry seasons are more severe, as are the storm events that bring significant rainfall.

Canadian communities are among those wrestling with the problem of how to minimize the damage of severe storms despite existing infrastructure that exacerbates the issue.

“Canada, like so many countries around the world, is struggling in how to its head around flood resiliency, because there is no single way on how to do it,” explained Henk Ovink, a renowned global flood expert who is the special envoy for international water affairs for the Kingdom of the Netherlands. “At the same time, we know that cities, and the way city infrastructure has been developed over time, they have a hard time dealing with rain events.”

Stormwater runoff, capturing water, lack of green space, and sewer system design are among the issues that cause today’s cities to struggle with water mitigation during significant rain events. And as a result, multi-billion-dollar losses have been experienced in major urban centres around the world, including in Calgary and Toronto.

Working Together

Ovink suggests that partnerships and

collaboration are key to driving towards solutions for flood resilience.

At the municipal level, flood resilience starts with a partnership between the private and public sector.

“A lot of urban development is private sector; a lot of infrastructure development is public sector. In the mix lies the solution, but it demands a vision that is a little bit more comprehensive than only looking at the single issue.”

That solution involves ensuring that both parties respect each other’s needs for the land: the private sector needs to be able to provide for its consumer, while the public sector needs to be able to institute resilience measures that protect people beyond the property.

Beyond the municipal partnership, cities are collaborating with each other on flood resilience more than ever, working together to establish best practices and increase institutional knowledge for the benefit of everyone.

“Because of the rapid change in climate change impacts, you see a lot of cities wrapping their heads around it (stormwater),” said Ovink. “Toronto is part of the 100 Resilient Cities network. You have these foundation-initiated networks, and there are government-led networks [...] that really want to bring cities’ learning capacity together to exchange best practices and examples.”

For its part, the Netherlands launched a Global Climate Adaptation Centre, a centre that brings together all stakeholders impacted by the changing climate including governments at all levels, business, investors, NGOs, and academia. And in September of 2018, it was announced that the centre will house the Global Commission on Adaptation, which will be led by former United Nations secretary-general Ban Ki-moon, Microsoft founder Bill Gates, and World Bank chief executive Kristalina Georgieva.

In Ovink’s role, he is working with cities around the world to develop strategies around mitigating flood risk. This includes Ho Chi Minh, Vietnam, where the government is showing a willingness and capacity to work towards solving its resilience issues.

“I launched a program called Water as Leverage in Asia for the cities of Chennai in India, Khalna in Bangladesh, Semarang in Indonesia, tapping into the need and opportunities to intervene.” He is also working closely with several major cities in South America, including Lima in Peru, Santiago in Chile, and Buenos Aires in Argentina, stating that the cities all “take the challenges seriously, and are moving with bold action.”

The Netherlands has become a laboratory on climate adaptation—with about one-third of its land lying below

sea level and many of Europe's key rivers running up through the country—which has provided valuable knowledge on flood resilience for the rest of the world to learn from.

“We created more room for our rivers, more capacity for our cities and around our cities in the system. With rain events, and the amount of water increasing in our rivers, we can actually deal with the extremes, while at the same, parts of (countries downstream such as) Germany flood because of the same extremes.”

Testbed for technology

In the process of tackling its own climate resilience issues, the Dutch have become innovators of technology that is benefitting communities around the world with their own plans.

Deltares is an independent institute for the applied research in the field of water and subsurface. The institute works to develop technology solutions for predicting storm impacts, and have developed a critical infrastructure tool, which uses 3D modelling to show, in real-time, the impact of flooding on critical infrastructure.

In a presentation at the CatIQ conference, held earlier this year in Toronto, Deltares statistics, hydrology, and probabilistic modelling specialist Ferdinand Diermanse demonstrated the technology using the example of a dyke bursting upstream from a town in the



A screenshot from one of the Deltares software solutions, showing flood impact on critical infrastructure points throughout the city.

defined period of time. As a result, urban centres can use the software to answer the key question that must be understood during rain events in order to improve resilience: where will the water go? How much will stay on the property, how much will flow to other properties or through underground systems, how fast will the water move, where will it end up? Using the software to answer those questions.

“From our experience in the Netherlands, everyone can sort of understand the concept (of the cascading impact of critical infrastructure shutdown during a storm event),” said Diermanse.

The assessment is just one part of the equation however. With the assessment complete, proper governance, as well as

technical solutions, are still needed to address the risks identified by the software.

Diermanse suggested that all parties involved must come together to discuss solutions, and that public participation

is important to get municipal buy-in for the expense of the resilience measures that must be put in place.

He also suggested that there is work that cities can do now with developments that are in the design phase. Most resilience modelling for new developments looks at a given level of precipitation over a certain amount of time. As an example, a municipality might require the most recent severe storm experience as the test for a building's resilience. However, Diermanse suggested that it is also

valuable to look beyond that target. If it is 100mm of rain that is the threshold being considered, it is valuable to take the time to also look at the impact of 120mm or 150mm to appreciate the impact of an even more severe storm, and then weighing the cost of further resilience measures against the risk of a storm of even greater severity.

There are multiple solutions for dealing with stormwater in urban areas, but one that doesn't receive enough attention, according to Ovink, is the construction of additional on-site stormwater capacity.

“When building anything, you can also build additional stormwater capacity. A lot of the investments just don't take this into account; but can. It can become an investment opportunity for mitigating risk, and ensuring that there is a prevented loss. That prevented loss is something an insurer or a fund could be very interested in.”

Knowledge is the key. Knowing how water impacts a city, how quickly, and what the cascading impacts of that flooding will cause, provides the information needed to make evidence-based decisions on resilience measures, often times at a cost far less than the cost of failing to put the measures in place. Cities have a lot to learn. But with the help of colleagues from around the world, and best practices from the Netherlands and others, cities can begin to build resiliency to help weather the next storm. **wc**

Multi-billion-dollar losses have been experienced in major centres around the world, including in Calgary and Toronto.

Netherlands. The modelling program showed how the water would spread throughout the city on an hourly basis over a 48-hour period.

“To have good insight into what your actual risk is, is very critical in the decision-making process,” explained Diermanse. “Risk is a combination of three components: the hazard (event), the exposure (people and assets), and the vulnerability.”

The same software can be used for rain events, showing where the water will end up based a given volume rain over a

Andrew Macklin is the managing editor of Water Canada.

Super pipe lays ready for installation in Mayo, Yukon.



Northern Exposure

Climate change a pipe buster in the Territories. BY SAUL CHERNOS

REDUCED PRECIPITATION, wild temperature swings, thawing permafrost and geographic isolation. All challenge the design, construction, and maintenance of water and wastewater systems in Canada’s three northern territories.

While some measures help mitigate climate change in the north, tools aren’t always close at hand. Water can be clean and delicious yet in short supply. Fixing pipes busted by melting permafrost can be costly. Water and wastewater projects are ramping up, enabled by relatively accessible federal government climate change and infrastructure dollars, but climate change itself delivers hardship and uncertainty, demanding fundamental changes in how projects are conceived and accomplished.

Where successes are reported, a common denominator is active engagement by multiple levels of government. “We collaborate with various organizations to manage water sustainably, including the Government of Canada and First Nations governments,” explained Diana Dryburgh-Moraal, a communications representative with Environment Yukon.

The territorial government has financial help from its federal counterpart, for instance, in maintaining a network of monitoring stations to assess water quality. The Yukon is in the throes of a five-year strategy, with community partnerships, research projects, and transboundary water management agreements to address surface and groundwater resources.

“We provide technical interventions to the environmental assessment and the licensing process in the Yukon to ensure that major development projects (mining, hydro, and municipal wastewater treatment) are conducted in a way that protects our fresh water,” Dryburgh-Moraal said, describing targeted monitoring and ongoing support for inspectors to ensure licence compliance and improved understanding of land-use impacts.

The Government of Yukon has accessed federal Clean Water and Wastewater Fund dollars for recent lagoon upgrades in Haines Junction, Old Crow, and Watson Lake. While the Small Communities Fund which has helped realize the Dawson City water pumphouse, a new water treatment



Super pipe installation in trench with service connection. The new pipe is in the foreground and the old pipe is in the background, not yet connected.



in the Uluhaktok WTP with community operator Gibson Kudlak and MACA Circuit Rider Trainer Justin Hazenberg performing filter maintenance.



Inside the Tsiigehtchic WTP with community operator Herbert Andre and (former) MACA Circuit Rider Trainer Patrick Gruben testing pH for a clean-in-place (CIP).

plant in Burwash Landing, and water and wastewater line rehabilitation in Whitehorse.

Municipalities, unincorporated communities, and First Nations can access the federal Gas Tax Fund for water and wastewater projects, and the territory

lagoons, which are seen as reliable when space is available, and several have treatment plants, which are also considered effective. Dryburgh-Moraal said the territory works with municipalities and First Nations on needed upgrades, assisting with acquiring federal funding and even supplementing when money is needed.

One notable challenge with water and wastewater piping is a gradually thawing permafrost. “We engineer and monitor

the distribution of water to ensure that we have the right water temperatures to keep the water from freezing,” Dryburgh-Moraal said. Innovative engineering is key. In Dawson City, high-density polyethylene pipe with electro-fusion

couplers help keep pipes from freezing.

The remote geography has benefits and drawbacks. In the Northwest Territories, people sometimes drink water, untreated, from rivers and lakes. Yet Justin Hazenberg, engineering team lead for water and sanitation with the NWT Department of Municipal and Community Affairs, said it’s tough landing skilled tradespeople and quickly sourcing materials.

The Department visits communities participating in its Circuit Rider Training Program to offer support. “We’ll go through their inventories to make sure they have enough chemical supplies and spare parts and we’ll help line them up with suppliers so they can get orders in and be prepared,” Hazenberg said. “We also assist with sampling, calibrating equipment, and routine and non-routine maintenance.”

With water samples taking too long to reach accredited labs outside Nunavut, there are challenges lifting advisories.

is preparing initial applications for projects under the Green Infrastructure stream of the 2018 Canada-Yukon Investing in Canada Infrastructure Program Agreement.

Nearly a dozen communities have

An action plan to upgrade water treatment facilities to include filtration is nearly completed. “Our last three water treatment plants are being constructed,” Hazenberg said, adding one is slated to travel by barge this summer.

Most communities have passive wetland lagoon treatment systems,

In the Northwest Territories, people sometimes drink water, untreated, from rivers and lakes.

including Fort Resolution, which recently started work on a new one. However, Fort Simpson uses mechanical water treatment because the community, an island on the Mackenzie River, lacks space.

Water supply shortages are also on tap. A new CSA standard slated to be published under the Northern

Infrastructure Standards Initiative will recommend all new systems have at least one year’s retention in-line. “You get minimal treatment during the winter, you have solid ice coverage on the top, and it’s so cold you don’t have a lot of biological activity for treatment during the winter months. But you do get accelerated treatment in the summer with the long daylight hours,” Hazenberg explained.

As for permafrost, Inuvik is a leader in locating pipes above ground, using adfreeze piles for support. “It’s quite an involved process so it’s the most expensive distribution system in the north by far,” Hazenberg said.

Still, most communities deliver water by truck. Even Yellowknife, which draws from its namesake river and has a membrane treatment plant with chlorine disinfection, trucks water to some neighbourhoods, its industrial park and nearby hamlets. “It’s a very

practical solution,” Hazenberg said, citing high-priced emergency repairs and low reliability from shifting ground conditions.

In Nunavut, Iqaluit Mayor Madeleine Redfern described drinking water from Lake Geraldine as safe, fresh, and delicious. However, the winter freeze-up and drier weather keep supplies tight, so the city is looking to establish a second permanent source. “We’re in the process of developing a business case so we can present this to both levels of government to see about getting financial assistance,” Redfern said.

As well, the city’s infrastructure, some dating to the 1970s, is aging. “We need a proper strategy to replace it in a timely manner,” Redfern said. Iqaluit is looking at flexible couplers and sensors to monitor permafrost changes and track pipe breaks so repairs can be done quickly. “We’re also considering whether or not to put pipes above ground. A few of our pipes are above ground and they cause the least amount of trouble.”

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This simple water treatment plant is what's currently in use in Arctic Bay, Nunavut.

The federal government is also financing roughly three quarters of a \$26 million upgrade to help Iqaluit's wastewater treatment facility meet evolving national standards. The multi-year project should be completed by 2020. "We're a community of 8,000, with 2,000 ratepayers, so we wouldn't have been able to proceed with the wastewater treatment plant upgrade without that funding support," Redfern said.

Federal funding is also on tap for water treatment plant upgrades in 11 smaller Nunavut communities. Except for Sanikiluaq and Whale Cove, all plants are capable of producing safe water. However some of them don't contain the more comprehensive treatment system required to align with the rest of Canada, said Tim Brown, director of community infrastructure with the territory's Department of Community and Government Services.

Brown says Whale Cove and Sanikiluaq have unique water chemistry that chlorination alone cannot address, and high summertime bacterial coliform counts in Whale Cove have led to boil-water advisories. Furthermore, with water samples taking too long to reach accredited labs outside Nunavut, there are challenges lifting advisories. "To address Whale Cove's coliform issues in the short term, we installed a temporary emergency water treatment plant to

operate seasonally while preparing to build a permanent one," Brown said.

Climate change is also a factor. Brown said Sanikiluaq has seen changes in its source water that it cannot sufficiently treat. While bacteria in the water is effectively disinfected, the treatment train is ineffective at handling mineral loads. "This change is likely a result of changing temperature and highlights the need for water monitoring from a climate change lens," Brown said.

On the wastewater side, Iqaluit, Pangnirtung, and Rankin Inlet have mechanical treatment, with lagoon-wetland systems in the remaining 21 communities. "Lagoon-wetland systems are providing effective treatment, but even with these systems we are looking to upgrade passive lagoons to impermeable cells for better treatment control, pending new federal wastewater treatment regulations appropriate for Nunavut," Brown said.

Federal funding to proceed with water and wastewater treatment plant upgrades is identified under the Investing in Canada Infrastructure Program – Green Stream. Pending legislative approval, Brown said, this infrastructure deficit will be addressed over the next few years. *wc*

Saul Chernos is a freelance writer based in Toronto, Ont.

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According to research from the University of Waterloo, Halifax could be one of the hardest hit cities in Canada when it comes to flooding over the next century.

New Dimensions of Risk

Preparing for climate change through asset management. BY DUSTIN CAREY

LOCAL GOVERNMENTS are responsible for more than half of the infrastructure in Canada. These assets safeguard against flooding, enable morning commutes into work, deliver water to faucets, and then carry it back away to be treated—all things that Canadians rely upon daily. At their core, municipal governments are service delivery organizations. If they fail to deliver those services, then our quality of life suffers.

Reliable service delivery is often dependent on supporting infrastructure being in a good state of condition; however limited budgets have led to years of underinvestment in infrastructure across the country, with evident results. Today, approximately \$141 billion in municipal public infrastructure sits in poor or very poor condition, risking more unanticipated and expensive failures.

Climate change brings a new dimension of risk to managing infrastructure, one that could have disastrous results. Extreme storms, hotter summers, colder

winters, rising sea levels, flooding, and drought—these are just some examples of the new reality climate change presents for Canadian communities of all sizes. Our infrastructure is designed to operate within certain parameters, including climate conditions. Yet with the shifting nature of extreme events that climate change brings, the conditions we expect our infrastructure to perform in are also changing at an accelerated rate.

Simply maintaining municipal assets without taking any actions to adapt to a changing climate undercuts the utility of the investments that communities have made, and the resulting consequences are likely to be very costly. For example, a recent study from the University of Waterloo projected that, without aggressive action to both reduce greenhouse gas emissions and adapt to severe weather events, Halifax is likely to experience a 300 per cent increase in property and casualty losses due to flooding by the century's end.

While this situation presents a significant challenge to municipalities, it also presents an opportunity.

How asset management can help

Local governments across Canada are adopting asset management practices to help them prioritize infrastructure investment—balancing cost, service expectations, and risk. Recognizing that climate change represents a substantial risk seldom considered in a holistic approach to managing municipal infrastructure portfolios, in 2017 the Federation of Canadian Municipalities, with funding from the Government of Canada, launched the Climate and Asset Management Network (CAMN). The network's 19 participating communities have committed to adapt their asset management governance models to ensure that climate change considerations are integrated into their infrastructure intervention and investment decisions.



After significant flooding last year, the City of Saint John in New Brunswick is taking a serious look at climate risk as it relates to infrastructure assets in the community.

Some CAMN members have prioritized using risk management processes to view how municipal infrastructure might be impacted by serious climate events. In light of the floods, fires, and other extreme events that have affected communities in recent years, risk assessment is increasingly recognized as critical to guiding adaptive planning.

Reliable service delivery is often dependent on supporting infrastructure being in a good state of condition.

Saint John's experience with flooding in the spring of 2018 offers a timely reminder. The city is working on an updated risk management framework with protocols for assessing the likelihood and consequences of climate events through structured risk assessments.

"Following the recent flooding event, the City of Saint John is more determined

to take climate change adaptation and mitigation risks into consideration to prioritize capital investment on existing and new infrastructure, as well as adopting by-law, operational, and design changes to improve community resilience to extreme weather events," said Samir Yammine, manager of asset and energy management for the City of Saint John.

"CAMN has provided us with the guidance, knowledge, and capacity to implement and adopt a comprehensive climate risk framework into our infrastructure decisions."

Having a comprehensive risk management framework means that municipalities can balance competing priorities using a data-driven approach.

It is also an effective approach to strategically integrate climate adaptation into one of the municipality's most important functions—asset management. Armed with knowledge about the consequences of infrastructure failures, local governments are better able to implement risk-based decision-making into already familiar processes. They can prioritize sustainable service

delivery while planning for future lifecycle events. When long-term asset planning is aligned with climate-adaptation planning, municipalities can not only mitigate risks but improve cost effectiveness by targeting the right activity on the right asset at the right time.

With so much of Canada's municipal infrastructure in need of rehabilitation or reconstruction, now is the time for communities to take corrective steps to improve resilience through adaptive, risk-based asset planning. CAMN's work strives to ensure that municipalities have the skills and processes to continue providing the high-quality services that Canadians rely on regardless of how the climate changes.

FCM intends to share the lessons and experiences learned through CAMN in a 2018-19 national workshop series designed to advance the conversation between asset management and climate adaptation practitioners. **wc**

Dustin Carey is a capacity building officer with the Federation of Canadian Municipalities.

Hydroelectric dams, like the one shown here in Pointe Fortune, Quebec, could become structurally vulnerable as a result of the increasing impact of a changing climate.

Dam Science

How climate change impacts the structural integrity of our dams. BY SHOOKA KARIMPOUR

DAMS AND LEVEES, dikes alike, serve as critical infrastructures whose design and performance have significant economic, social, and environmental outcomes. They make a significant contribution to the efficient management of finite water resources that are unevenly distributed and subject to seasonal fluctuations. In Canada, hydropower is the country's number one electricity source. Dams have been a reliable and stable source of electricity in the country while providing other ecosystem services such as flood control, water storage, and irrigation. Dams however, have to sustain in a new reality in the face of climate change. Climate change is now an unequivocal truth, and it is expected to strongly affect the hydrologic cycle in the coming decades.

Changes to surface run-off

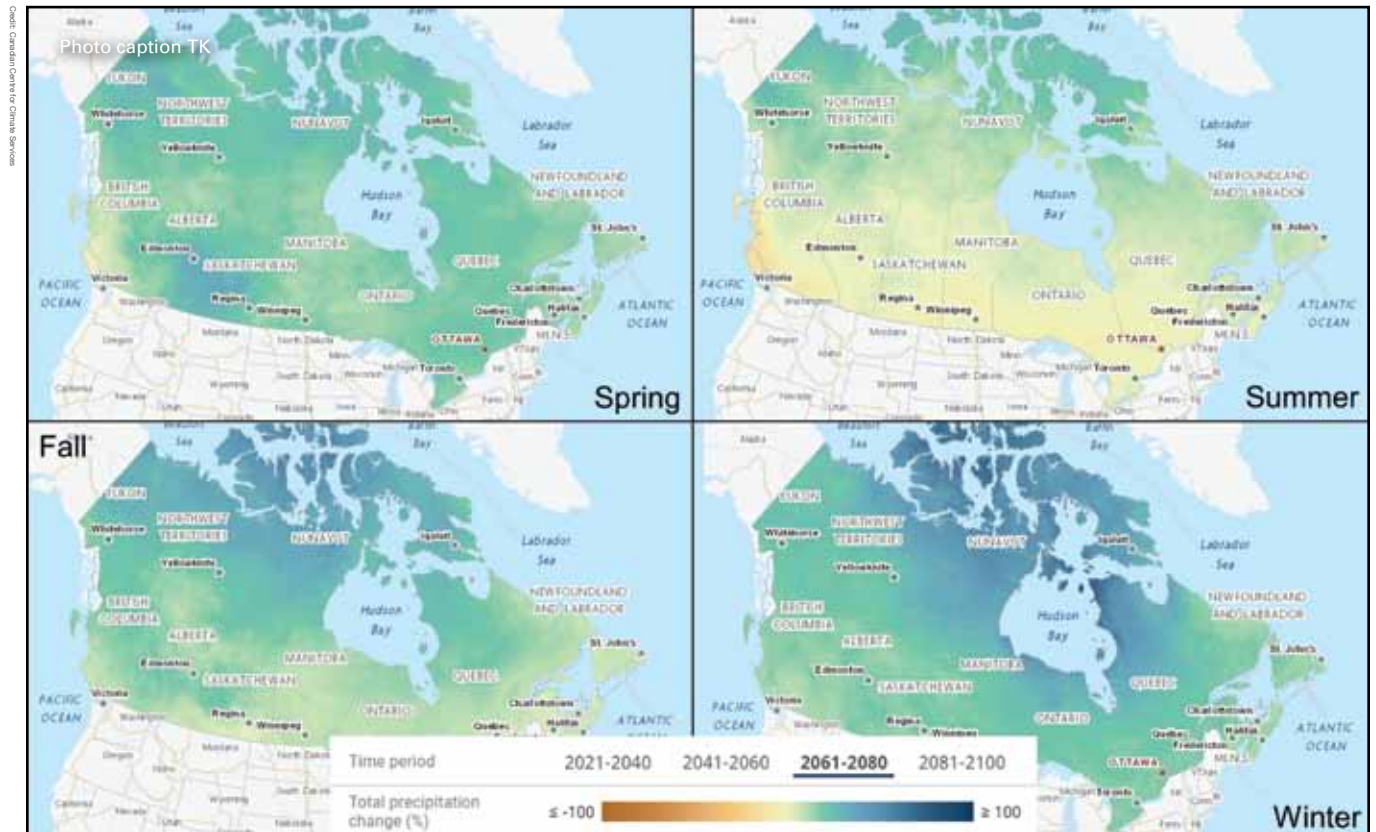
Using multiple climate models, Environment Canada provides different tools and datasets on the temperature and precipitation projection under different climate change scenarios. As an example, Figure 1 demonstrates changes

in precipitation in relation to historical data, based on a high emission (RCP 8.5) scenario and in a mid-to-long-term prospective (year 2061 - 2080). This figure demonstrates how an increase in precipitation across most of the country is expected in winter, spring, and fall (with an exception for parts of British Columbia that are anticipated to experience less precipitation during the spring months). This projection in wet months leads to higher seasonal surface run-off. During the summer, on the other hand, changes in precipitation vary across the country. An increase in precipitation is reported in northern Canada, where as in southern Canada precipitation drops compared to the seasonal historical data. Since a uniform change in precipitation pattern isn't expected across the country, commenting on the changes in the surface run-off in summer isn't possible based on cumulative rainfall and snowfall alone. The geographical extent of a catchment basin, its elevation, vegetation, and soil cover are among other factors affecting the run-off volume.

Warming temperatures and higher emissions impact the precipitation patterns as well as the type and storage of precipitation. In a warmer climate, less precipitation will be stored as snow; also, faster snowmelt and less snow accumulation on the ground are expected. Therefore, the combined effects of changes in perception and temperature will most likely lead to smaller run-offs in summer months in southern Canada, where most of dams and reservoir bodies are distributed. This will be accentuated by higher evapotranspiration rates in warmer temperatures.

Dams as recipients of surface run-off

With the patterns of participation and run-off changing under climate change scenarios, it is likely that dams will soon be exposed to large flooding events with higher frequencies. The vast majority of large dams are constructed in southern Canada where greater population concentration exists. These dams are exposed to warmer temperatures and



higher precipitation in wet months and drier summer months, and hence higher annual run-off fluctuations. The survival of these existing dams and the design of new dams now face great uncertainties. Increase in reservoir storage capacity is only one of the consequences of warming climate: some others are:

Dam safety: The change in design flood would directly impact the dam safety measures. In storage-based dams, as the flood is routed through the reservoir, the water level and outflow are affected. The safety of the dams for the future climate is based on the evaluation of changes in design floods and the freeboard available to accommodate the increase in the flood levels. Furthermore, greater water level fluctuation is expected mainly due to increased precipitation variability (intensity and duration) and potential increased evapotranspiration associated with global warming. The reservoir freeboard must be designed to accommodate a greater level of water depth fluctuation. One other mechanism that can lead to dam failure is overtopping. For instance, earth-

fill dams are inherently erodible and uncontrolled overtopping can lead to catastrophic failure.

Sedimentation in reservoirs: Increase in rainfall intensity and river runoff leads to greater rates of erosion and potentially a greater level of sediment transport. In turn, this leads to increased sediment deposition in the reservoir and hence loss of storage leading to lower service life, among many other deleterious effects.

Environmental flow: With increased temporal runoff variability due to climate change and intensified dry seasons, maintaining a healthy annual environmental flow downstream of a dam and reservoir is critical. This consideration of environmental flow requirement may lead to modifications to reservoir and dam operations, as human-use of water may become restricted.

Dams play important roles in Canada's economy and on every Canadian's day-to-day life. More than 60 per cent of the electricity in our country is generated by hydropower. With growing global

concerns around changes to climate and alteration to extreme precipitation and flooding events, the concepts around the dam and reservoir design have to be reassessed. While dams and reservoirs are inherently designed to sustain and provide services for centuries, little knowledge is available on their vulnerability to the changing climate. Even without considering the rising water demand, the water stress on these critical infrastructures will worsen in the coming decades. In this paper, we have looked briefly at the climate change trends across Canada and enlisted some of the potential impacts on the existing and new dams. With our economy and growth heavily relying on dams and to ensure our long-term sustainability and climate change resilience, we have to change our prospective and embrace new approaches to dam design and operation. WC

Shooka Karimpour is an assistant professor in the department of civil engineering at the Lassonde School of Engineering at York University.



Severe flooding along Toronto's lakeshore and in the downtown has caused several rail lines to cease service in the past, something Metrolinx hopes to avoid during the next severe storm.

Building in Resilience

Metrolinx plan helps minimize the impact of climate change. BY ANDREW MACKLIN

FEW IN TORONTO WILL FORGET the image from July of 2013, when a GO train found itself stuck in flood waters in the Don Valley as a severe rainstorm blasted the region.

That event, coupled with the floods of a month earlier throughout the Calgary region in Alberta, made it clear that infrastructure project owners needed to build resiliency into its assets to avoid the multi-billion-dollar threats being posed by the impacts of climate change.

With shovels in the ground on billions of dollars of infrastructure projects, and a total \$43-billion infrastructure program in the offing, Metrolinx has provided its commitment to improve the resilience of its entire network with the release of its 2018 Climate Adaptation Strategy. The report, three years in the making, provides 40 call-to-action items across five different departments focused on ensuring that, regardless of the weather event, the system can withstand its impact.

The plan states "In 2016, we consulted with experts and scientists on how to deal with the changing climate as a transit agency. The resulting report, Planning for Resiliency: Toward a Corporate Climate Adaptation Plan, outlines the broader context and rationale for climate

resiliency and adaptation, and provides overarching direction on how we manage the effects of climate change."

That direction begins with aligning the agency with provincial and federal initiatives on resiliency. According to Quentin Chiotti, senior advisor on sustainability and climate change for regional planning at Metrolinx, they became the first transit agency in Canada to apply the Engineers Canada PIEVC (Public Infrastructure Engineering Vulnerability Committee) protocol, starting with six of its assets. Doing so helped inform thinking around design standards for new capital projects.

But direction is lacking from the provincial and federal governments, even though resiliency has been set as a clear priority for infrastructure assets. The Infrastructure for Jobs and Prosperity Act, 2015 mentioned that government bodies, such as Metrolinx, needed to demonstrate climate resiliency, but did not clearly define what that entailed. Also, the Environmental Protection Act states that consideration to climate change must be given in the environmental assessment process, but again, does not clearly define what that involves. "We can't wait," stated

Chiotti, which is why Metrolinx has pushed forward with the release of its own approach and best practices.

Assessing flood impacts

Following the Don Valley incident in 2013, the land surrounding that section of track saw the installation of expanded culverts, strengthened embankments, and further measures to reduce erosion issues. Those actions have provided a framework for what must be addressed as part of flood-resilient measures at stations and track sections identified as 'at-risk' by the agency.

In order to identify those at-risk areas, Metrolinx sought the expertise of conservation authorities throughout the region. By accessing and analyzing floodplain maps, Metrolinx could identify assets that could become exposed to damage in the event of a convection storm, similar to the one that caused the 2013 incident.

That knowledge has been transferred into the procurement of new assets. By taking climate resiliency into account at the environmental assessment phase, the agency can apply a variable that will assess flood threats to the site. Using a variable of



“Caution” yellow tape in front of flooded lakeshore in Toronto.

the rainfall record plus 25 per cent, which might reflect the increased severity based on current climate change projections, it is able to reasonably assess the risks posed at the point of construction.

That same variable has also been applied to existing assets. Metrolinx has undergone an inventory of its culvert network and, applying the same variable, have assessed any points of concern where current capacity would be unable to handle a future severe rain event.

Heat and ice

The financial impact of flooding across Canada poses a severe concern for infrastructure resilience in Canada, but isn't the only faced in recent history by the transit agency.

Increasing temperatures can wreak havoc on a transit system, and resilience measures have to be put in place in order to ensure that operations can continue to maintain service levels even in extreme heat conditions. Recognizing the impact that it could have on its rail line, Metrolinx analyzed its Preferred Rail-Laying Temperature (PRLT) for continuous welded rail, and increase it by 10 degrees Fahrenheit, essentially from 90 to 100 degrees. Chiotti stressed that those temperature increases must be evaluated carefully, as increases can impact other parts of the lines causing cracking. However, the successful

implementation of the increase has prevented track warping and sun kinks, significantly reducing the number of days in a year where heat causes service issues throughout its expansive rail corridor. That increase has now become standard as part of their track standards manual.

After the ice storm that hit the region in 2013, the agency realized that several of its stations lacked back up power generation. That led to a change in the design requirement manual, which now includes measures that demand expanded capacity for backup systems. That requirement has further been extended to the procurement of all new station assets as part of the expansion of the transit corridor. Also, they have built in co-generation, and in some cases tri-generation, into its maintenance facilities, allowing those buildings to function for days in the event of a significant power outage.

Flood, heat, and ice risk may not severely impact every asset throughout the system, but Chiotti stressed that it is important to understand the site-specific needs in building in resiliency. That's why it's important to assess current sites to identify areas of risk, and use best management practices to determine the best solution for eliminating the risk as severe weather events increase in frequency.

But what that impact of climate change will be in the years to come is still

unknown, which is why it is so important for the agency to identify those individual and system-wide vulnerabilities.

“We did some work on scenario planning, trying to figure out some of the potential future scenarios that the region could be faced with,” said Lisa Salsberg, senior manager of systems planning for regional planning at Metrolinx, and also one of the architects of the 2041 Regional Transportation Plan. “In the context of climate change, we tried to make sure that we develop a plan that itself is resilient to a range of possible futures.”

The agency engaged climate change experts both here and abroad in an effort to try and forecast the weather realities by mid-century, but have already identified the need to look even further out, as far as 2080.

Most importantly, the plan put in place by Metrolinx will have the flexibility to adapt as climate change projections are adjusted. The United Nations' Intergovernmental Panel on Climate Change (IPCC) is scheduled to release its sixth assessment report in 2022, at which time the agency is likely to review if further resiliency measures are necessary.

This article originally appeared in ReNew Canada magazine. WC

Andrew Macklin is the managing editor of Water Canada.



THE BLUE ECONOMY

Canadian Water Summit celebrates its 10th Anniversary.

BY SIMRAN CHATTHA

IN MAY 2019, the Canadian Water Summit celebrates its 10th anniversary at the Blue Mountain Resort in Georgian Bay, Ontario.

The annual event gathers 250 to 300 business, government, academic, and non-profit water leaders to discuss current opportunities and challenges facing the Canadian water sector.

This year, speakers at the Canadian Water Summit will be showcasing projects, partnerships, and initiatives that are driving innovation in the blue economy.

Given that innovation in the water sector is currently being driven by technology and data, one of the sessions at the Canadian Water Summit will examine the latest trends, ideas, and partnerships that leverage artificial intelligence and Internet of Things to better manage our water.

At the same time, public and private stakeholders in the water sector often face barriers when they are trying to adopt innovative approaches. This is natural given there are legitimate

concerns about what happens in the event of a failure given that stakeholders could be found responsible for results that might negatively impact public health and the environment.

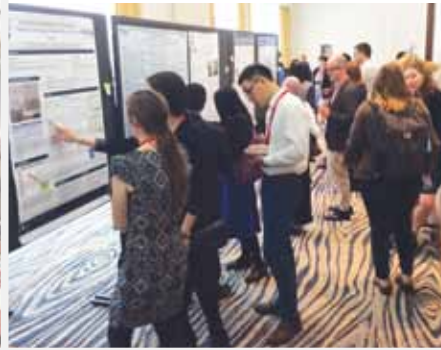
Having said that, there is an opportunity to adopt approaches that could help us do our work more efficiently and effectively. During the Canadian Water Summit, attendees will hear from public and private stakeholders who are dismantling traditional barriers, forming partnerships, and using innovative ideas to change the way we think about managing our water.

The Canadian Water Summit will also explore issues that are affecting not only the water sector, but also our communities at large. For example, flooding is an issue that affects communities across the country and throughout the year. Over the last few years, some major flooding events have significantly impacted cities such as Toronto, Ontario (August 2005 and July 2013) and Calgary, Alberta (June 2013).

These types of flooding events can have significant financial consequences on communities. To that end, one of the sessions at the Canadian Water Summit will explore how stakeholders are managing and paying for risk and flood resiliency as extreme weather and climate change impact our water systems.

These are just some of the current topics that will be explored during the Canadian Water Summit. Other topics that will be explored during the event include:

- Indigenous water partnerships
- Implementation of green infrastructure and low impact development
- Water stewardship in the supply chain
- Small and remote water systems
- Progress through partnerships: Advancing on sustainable development goals
- Plastics and water



Recognizing leaders in the water sector

Following the formal program of the Canadian Water Summit, we will be hosting the annual Water's Next Awards program, which honours the achievements and ideas of individuals in the Canadian water sector.

This year, six business, academic, non-government, and government leaders will be recognized during the event. Six projects and technologies will also be recognized in categories such as drinking water, wastewater, stormwater, and early adoption.

This event provides an important opportunity to recognize individuals, projects, and technologies for their significant leadership and innovation. In an interview for the March/April issue of Water Canada, Kat Hartwig, the executive director of Living Lakes Canada and winner of the 2017 Water Steward of the Year award at Water's Next noted: "It was a privilege and honour to be recognized. Often when you win those kinds of awards, you get lots of notes of congratulations from your colleagues. It is just nice to have the recognition of because often this work is unrecognized. I think Water Canada is doing a good thing by recognizing the hard work of people who have been involved and

dedicated over the decades."

Water Canada will be showcasing the winners of the Water's Next awards in the July/August 2019 issue of the magazine. Stay tuned for more details about each of the winners!

Increasing collaboration between stakeholders

As a part of the Canadian Water Summit, we will also be hosting a roundtable that will bring together provincial and national water associations from across Canada. During the roundtable, we will be facilitating a discussion to determine how we can collectively break down silos and prevent unnecessary overlap. We will also search for common interests where partnerships and collaboration will help fulfill association mandates and membership goals.

A brief summary of the outcomes from this association roundtable will be prepared and shared with delegates as part of the closing remarks at the Canadian Water Summit on May 31, 2019. A more detailed, action-item oriented document with notes from the discussion will be prepared by Water Canada and shared with association roundtable participants in June 2019.

Supporting women in the water sector

How do we support women in water and greater diversity in the water sector? What actions can we take together to increase diversity across the sector?

These are two key questions that attendees will be exploring during the Women in Water Workshop and Networking Brunch on May 31, 2019.

The session will kick off with a panel discussion with women who are working to advance diversity in the water sector. Following the panel discussion, attendees will participate in smaller group discussions to develop ideas that they can use to increase diversity within their workplaces. A detailed report, which will summarize the panel and group discussions, will be developed following the workshop. wc



Simran Chattha is the associate editor of Water Canada.



Join us at the 10th annual Canadian Water Summit. For more information about the event, visit watersummit.ca

The Co-op Refinery in Regina built a wastewater recycling system into its operation to significantly reduce its water dependency.



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Corporate Conservation

Finding water savings for the ICI sector. BY JOHN NICHOLSON

WITH DAY-TO-DAY PRIORITIES and other competing demands, the focus on water conservation can be pushed down the list of priorities. However, organizations that don't make water conservation a priority are not only losing out on water savings but energy savings as well. There are any number of studies that show that water savings also results a corresponding savings in electricity costs. The cost of pumping, distribution, and treatment of water and wastewater is a significant expense. There is a very good report on the water-energy nexus prepared by the Ontario Water Conservation Alliance (2010).

The first step in water conservation

As the adage goes—we can't control what we can't measure. The first step of any water conservation program is assessing the current practices at the facility. This takes the form of a water audit. You can hire a specialist consultant to conduct the audit or do it in-house by following any number of guidance manuals.

When deciding between hiring a consultant to conduct a water audit or doing it in-house, you should weight the costs and benefits of hiring a professional with expertise in industrial water use efficiency. In many cases, a consultant's advice on water conservation measures

can pay for the consulting fees. Moreover, a typical water conservation program run by a municipality will require that an independent third-party consultant (often a professional engineer) sign-off of the water audit, recommendations, and water savings implementation prior any incentive being granted.

Any useful water audit will include a list of recommendations that will fall into one of three categories—immediate/short term payback (typically involving simple operational changes), medium term payback, and longer-term payback (typically technology implementation).

Municipal incentives across Canada

Depending where you are located, the local municipality may have incentives for reducing water usage. There may also be funding to offset the costs associated with conducting a water audit and implementing water reduction practices or installing water-saving technologies.

In some cases, a municipality may offer free water audits by an expert. The logic behind this free service is that the implementation of the recommendations saves the municipality significant amounts of money in water treatment and conveyance as well as wastewater treatment. The City of Victoria, British

Columbia offers free water audit program for the industrial-commercial-institutional (ICI) sector found that organizations that implemented the recommendations from the audit reduced their water bills by 30 per cent to 50 per cent and, in a few instances, achieved water savings have been greater than 80 per cent. With the water savings was a corresponding savings in electricity use.

Besides providing free water audits, some municipalities across Canada have other water conservation programs as well. For example, the City of Toronto has a capacity buyback program, an Industry Water Rate Program, and a Sewer Surcharge Rebate Program in an effort to conserve water use across its water distribution system.

In 2005, a survey of municipalities across Canada was conducted to determine water conservation efforts. It was conducted by the Partnership for Water Sustainability. One of the findings of the survey was that 35 per cent of the municipalities that responded to the survey had introduced laws, bylaws, and regulations or ordinances as part of water conservation initiatives.

Once you've made the right decision to embark on a water conservation program, you will be able to realize costs savings similar to the companies discussed below.

A tier one automotive parts supplier

hired Altech Environmental Consulting Ltd. to assist it in conducting a water assessment audit. The water audit found that the facility had an annual water usage of over 15,800 cubic metres for industrial purposes of which over 98 per cent was used for cooling.

A number of recommendations resulted from the water assessment audit. The major recommendation was the use of a water softener to the water in the cooling towers to increase the water concentration cycle. By increasing the water concentration cycle, the frequency in which blowdown occurs is reduced. Cooling tower blowdown is the flushing of a portion of high mineral concentration cooling tower system water down the drain, while simultaneously replacing it with fresh water. This process dilutes the system water mineral concentrations that steadily increase due to water evaporation.

The cost of the implementation of the proposed change was \$7,000 and the annual savings in water use was \$3,600.

Furthermore, the company was eligible for a 30 per cent discounted water rate from the City of Toronto.

The Co-op Refinery in Regina, Saskatchewan uses steam to refine crude oil. When the refinery wanted to expand, it was limited by water availability as Regina is one of the driest cities in Canada. To achieve its expansion goals, the company made the decision to recycle all of its wastewater. The project took seven years to complete at a cost of \$2 million.

The zero-discharge design for water management at the refinery involves stormwater ponds that capture and store precipitation and the use of ultrafiltration to treat the pond water prior to use. The ultrafiltration system used was the patented ZeeWeed hollow-fiber membranes.

Besides capturing and treating stormwater for use in the refinery, wastewater is treated using a reverse osmosis system supplied by GE.

There is a limit on how many times

water can be recycled resulting in the reject water from the reverse osmosis process, which has a high salt concentration.

The refinery doesn't measure the payback period on its investment only in time. "The payback isn't on the project itself, but on its sustainability, on social licence," said Gil Le Dressay, vice-president of refinery operations in an interview with the Canadian Fuels Association.

The time to assess water use at your facility is now. The first step is to determine if your water utility offers a free water assessment audit or supplements the costs associated with conducting one. There are very few times that a water audit will not uncover potential cost savings. WC



John Nicholson is the co-founder of Environmental Business Consultants.

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Challenges & Opportunities

What needs to be done to meet water and wastewater needs in First Nations communities. BY SIMRAN CHATTHA

“WE RECOGNIZE THAT more work needs to be done. There’s more work beyond eliminating drinking water advisories.”

When Nelson Ferguson, acting manager at Indigenous Services Canada (ISC), stood on the stage at the Assembly of First Nations’ (AFN) second annual National Water Symposium and Tradeshow, he recognized that the conversation surrounding ending boil water advisories had to be about more than just money.

Wage parity, training, and succession planning. Those issues need to be on the table as well.

Following his initial remarks, where he commented on the work that had been done by the federal government, Ferguson kicked off a discussion with the audience using the following questions:

- 1 What are the key components and best practices of well-managed water and wastewater systems? What tools, systems, and approaches do you find most useful? What can be the federal government’s role in supporting water system management?
- 2 What is your vision for water and wastewater in your First Nation for the medium term (between now and 2021)? What is your vision for water and wastewater in the longer-term (post-

2021)? How do you see the role of ISC in your vision?

3 How do you feel about the work we (First Nations, First Nation partners, and ISC) are doing? What have been some right actions? What changes are needed? How can we continue to work together to best support First Nations?

4 What are the challenges in recruiting and retaining water operators on reserve? What strategies can be used to recruit and retain qualified operators? How can we encourage populations like women and youth to enter the field?

Although not all of the questions were answered, some attendees shared their input on challenges they have experienced and observed with respect to recruiting and retaining operators. During the discussion, Ferguson and the attendees also shared some information about initiatives that are or will be undertaken to address some of the challenges faced by First Nations communities.

What are some challenges related to recruiting and retaining operators and how are they being addressed?

During the discussion, one attendee noted that wage parity is needed because there is a big difference between

what operators are being paid in First Nations communities (\$14 an hour) versus municipalities (\$35 an hour). On a related note, another attendee who is a water operator in a small First Nation community wondered how ISC determines pay scales since he also knows that provincial operators tend to make more than First Nations operators.

Ferguson mentioned that it is within the purview of First Nations to determine how much operators get paid. ISC recognizes that First Nations communities face challenges with recruiting and retaining operators since private companies and municipalities can pay more competitive salaries for the work that operators do. For this reason, ISC is working with AFN to determine the appropriate level of funding for operations and maintenance.

One of the operators who participated in the discussion also wondered whether small communities will be provided financial resources to hire additional staff and to pay operators who work overtime. He mentioned that he has accumulated a lot of overtime since he is the only operator in his community. However, the community does not have the money to pay him for the overtime or to have someone fill-in when he wants to take time off from work. At the end of the

attendees remarks, Ferguson mentioned that there are hub models that can enable operators to move around between communities to ensure that gaps are filled, at least temporarily.

Participants in the session also heard from Kalpana Solanki, chief executive officer of the Environmental Operators Certification Program (EOCP). She spoke about some challenges that First Nations, and non-First Nations, communities face with respect to retaining operators. The program found that operators often leave their jobs because of a lack of recognition and respect for the work they do. On this point, Ferguson recognized that there need to be more widespread acknowledgement about the work that is done by operators.

What's next?

One of the common points that came across through the discussion and Ferguson's presentation is that there are issues related to recruiting operators,

especially female operators.

Solanki has found that there is a huge shortage of operators in British Columbia and to some extent in Yukon as well. This is in part due to a lack of awareness about plant operations as a career option. When she is at conferences, Solanki has asked operators in the audience to stand up. Then, she has asked anyone who decided to become an operator when he or she left high school to remain standing. The last time Solanki did this exercise with 300 operators in the room, only one individual remained standing.

This is something that ISC recognizes as a challenge as well so it is doing some work with the Native Women's Association of Canada to better understand the challenges that operators, particularly women, face when they are trying to enter the field.

"We did a small study a little while ago and we found that only 7.5 per cent of operators on reserve are female [so] it is a very male dominated field," Ferguson

said. "Right now, we're working with the Native Women's Association of Canada to better understand what are the barriers that women face in terms of entering the field of water operations and what are the strategies to recruit more women to the field. We're hoping this information about increasing awareness amongst youth and females will help to alleviate some of these issues that we see in terms of retention and recruitment of new operators."

One thing is clear from this session at the AFN's National Water Symposium and Tradeshow: the format provided an important dialogue to occur between the attendees and a representative of the federal government about what more needs to happen to meet water and wastewater needs in First Nations communities. WC

Simran Chattha is the associate editor of Water Canada.

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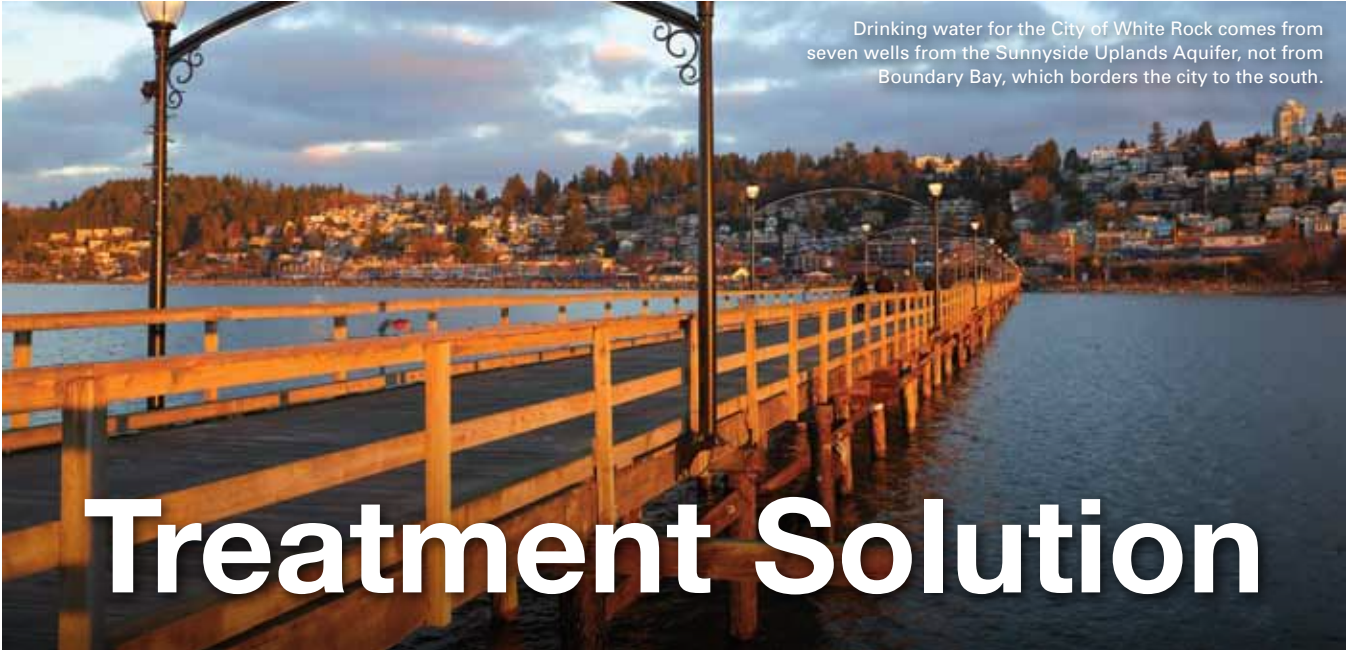
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Drinking water for the City of White Rock comes from seven wells from the Sunnyside Uplands Aquifer, not from Boundary Bay, which borders the city to the south.

Treatment Solution

Working towards a solution for removing water contaminants in White Rock.

BY DR. SAAD JASIM

THE CITY OF WHITE ROCK purchased the water utility on October 30, 2015 from EPCOR Utilities Inc. Since taking ownership of the water utility, the city has continued to maintain the importance of quality assurance and has taken steps to ensure clean water is provided to the residents. The drinking water is obtained by seven wells from the Sunnyside Uplands Aquifer. The utility serves a population of approximately 20,000 people.

The quality of drinking water is of the utmost importance to the city, which is why regular water testing is conducted, and the city has taken steps to build a water treatment plant to remove arsenic and manganese, and hired in-house experts and consultants who have extensive experience. The city applied for infrastructure grants funding programs by the provincial and federal governments, which is not available to private organizations. The Government of Canada and the Province of British Columbia provided funding from the Clean Water and Wastewater Fund (CWWFA) to the City of White Rock for the “Arsenic and Manganese Water Treatment Project No. C40174”.

The City of White Rock collaborated with RES’AU-WaterNET, a research program funded by the Natural Sciences

and Engineering Research Council (NSERC) and a partnerships with several public and private organizations. The study was conducted using a mobile pilot plant that consisted of two treatment trains that involved oxidation, filtration, and adsorption stages. The source water was taken from wells 6 and 7 with levels of manganese and arsenic are 130-140 µg/L and 7-10 µg/L, respectively.

The objectives of the research focused on the evaluation of several treatment technologies, including technologies already available commercially such as filtration/oxidation, adsorption, biological filtration, and pre-oxidation with ozone. Pilot testing included the most promising technologies to evaluate their viabilities, both in terms of performance and economics. The research was conducted in close collaboration with the staff of the City of White Rock and involved RES’EAU’s partners who have extensive experience with groundwater treatment and quality.

A request for proposals for a Design Build for a Water Treatment Plant for the removal of arsenic and manganese. Colliers Project Leaders was contracted by the City of White Rock to assume the responsibility of the project management until project completion. Detailed

technical evaluation to the submitted proposals was conducted by the staff of the City of White Rock, KWL, and Colliers Project Leaders.

Based upon the outcome of the review teams’ analysis, it was recommended that the city select the NAC Constructors Ltd. and Associated Engineering Ltd team as the successful proponent.

The recommendation was presented to the City Council at its meeting on November 6, 2017. The City Council awarded NAC Constructors Ltd. the contract for the Design Build of the Water Treatment Plant.

Arsenic and manganese in water

Arsenic is one of the many chemicals for which Health Canada has set guidelines. The guideline has been established at 0.010 mg/L (10 µg/L), and will continue to be reviewed to reflect new treatment methods and new information on health risks as they become available. The guideline is based on lifetime exposure to arsenic from drinking water, and takes into consideration the ability to measure arsenic and to remove it from drinking water supplies (Health Canada, 2006).

The Guidelines for Canadian Drinking Water Quality includes an aesthetic

objective for manganese in drinking water with a value of 0.05 mg/L (50 µg/L). The presence of manganese in drinking water supplies may be objectionable for a number of reasons. At higher concentrations, manganese could have an impact in causing stains on laundry and leaves deposits on supply pipes in distribution system and in residential plumbing that may cause objectionable tastes water. The presence of manganese in water may lead to the accumulation of microbial growths in the distribution system. Even at concentrations below 0.05 mg/L, manganese may form coatings on water distribution pipes that may slough off as black precipitates (Health Canada, 1987).

The analysis for manganese levels in wells 1-7 at the City of White Rock indicated elevated arsenic and manganese concentrations.

The White Rock Water Treatment Plant (WTP) is designed to treat the city's existing groundwater supplies to remove naturally occurring manganese and arsenic to ensure that an improved drinking water quality is supplied to the residents that meets aesthetic objectives. The plant is built next to the Oxford Pumping Station. The water treatment plant process is multi-stage, and includes the following key treatment components:

- Pre-Oxidation of arsenic and manganese in the raw water supply using ozone.
- Removal of manganese using Greensand Plus media filters.
- Removal of arsenic using Bayoxide E33 media filters.

The treatment objectives of the White Rock WTP are to deliver drinking water meeting the following operational targets:

- Mn < 0.02 mg/L.
- As < 0.002 mg/L (95 per cent of time, 0.005 mg/L for five per cent of operation).

All other water quality parameters shall meet the objectives of the Guidelines for Canadian Drinking Water Quality (GCDWQ).

Ozone pre-oxidation

On-site generated ozone gas will be used to pre-oxidize the arsenic and manganese

in the raw water. The ozone will convert the arsenite form As(III) to the arsenate form As(V). It will also convert Mn(II) to Mn(IV). Both oxidized forms are more readily removable in downstream filtration and adsorption processes. Ozone is a strong oxidant, it will oxidize As(III) very rapidly, thus contact time generally is not a critical factor for optimizing arsenic removal.

Arsenic present in groundwater in As(III) form need to be oxidized to As(V). To have an optimum removal of As(III) which is neutrally charged, it should be oxidized to As(V) which is negatively charged. The use of a strong oxidant is an important factor to achieve arsenic removal.

Removing the manganese

Greensand Plus filter media (supplied by AdEdge Water Technologies) was selected for removing manganese from groundwater supplies of the City of White Rock (Sunnyside Aquifer). Greensand Plus manganese dioxide coated surface acts as a catalyst in the oxidation reduction reaction of manganese. The silica sand core of Greensand Plus allows it to withstand waters low concentrations in silica, TDS and hardness without breakdown. Greensand Plus is a proven technology for iron, manganese, hydrogen sulfide, arsenic and radium removal.

Removing the arsenic

Bayoxide E33 was selected for arsenic removal (also from AdEdge) following the research conducted by the City of White Rock and the Res'eau-WaterNet. The E33 media would provide significant reduction of total arsenic, including both arsenic (III) and arsenic (V).

It is also effective in reducing other heavy metals such as lead, antimony, and others. Developed in the mid-nineties, this ferric oxide-based product has been successfully used in hundreds of installations around the globe.

Note: As of press time, the new plant was nearing the completion of its commissioning phase before coming online. wc

Dr. Saad Jasim is the manager of utilities for the City of White Rock.

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Effective water management across the entire mining site will be evaluated as part of the new protocol introduced by MAC.

Mining Stewardship

New industry benchmark will promote sustainable water use. BY ANDREW MACKLIN

IN FEBRUARY, the Mining Association of Canada (MAC) released a Water Stewardship Protocol as part of its Towards Sustainable Mining (TSM) initiative. The protocol, built from a global framework released by the International Council on Minerals and Mining, works to establish industry best practices on water management.

“TSM’s new Water Stewardship Protocol will help our sector focus its leadership in water conservation not just as it relates to how mines manage their water use but on how we can contribute to broader watershed-scale stewardship,” said MAC President and CEO Pierre Gratton when the new protocol was released. “We understand that given the finite nature of water as a resource, our industry has an important role to play in its stewardship, and this Protocol gives our members the tools to do just that.”

The protocol signals a significant step forward for an industry that has been one of the biggest water polluters in the country. According to the Safe Drinking Water Foundation, “mining affects

fresh water through heavy use of water in processing ore, and through water pollution from discharged mine effluent and seepage from tailings and waste rock impoundments. Increasingly, human activities such as mining threaten the water sources on which we all depend. Water has been called “mining’s most common casualty” (James Lyon, interview, Mineral Policy Center, Washington DC).”

The protocol provides a tool for companies to measure their water stewardship based on four key performance indicators: water governance, operational water management, watershed-scale planning, and water reporting and performance indicators. In order for an individual mine to achieve good performance (Level A), “a facility must demonstrate that commitments and accountabilities related to water stewardship are in place and are consistent with the TSM Water Stewardship Framework. It also involves ensuring that that water-related plans and management systems are implemented, which includes preparation of a water

balance, a water monitoring program, and response and contingency plans for water-related risks and incidents.”

The new protocol commits mining operations (ones that are members of the MAC) to take specific actions, in accordance with the International Council of Mining and Metals (ICMM) Position Statement on Water Stewardship:

Apply strong and transparent corporate water governance

- Publicly disclose the company’s approach to water stewardship.
- Allocate clear responsibilities and accountabilities for water from board and corporate to site levels.
- Integrate water considerations in business planning including company strategy, life of asset, and investment planning.
- Publicly report company water performance, material risks, opportunities, and management response using consistent industry metrics and recognized approaches.



Doing Business with **Greater Transparency** at **Nestlé Waters Canada.**

Armed with endless choice and unprecedented access to information, consumers today are shopping with more than just price and value in mind. They want to know where products are made, who made them and what impact their purchases have on society. That's why more than ever before, openness and transparency need to be core principles of any business.

At Nestlé Waters Canada, we're proud of the way we do business and believe we have a good story to tell. But we also recognize that we haven't always done the best job of telling that story. As a first step in our journey toward greater transparency, we recently hosted two information sessions in the communities where we are permitted to take water—Erin and Aberfoyle, Ontario. Attendees were asked to submit their questions in person and online. No question was off limit and we answered each to the best of our ability. Questions ranged from water and environmental sustainability

to human resources and our operations overseas. But the issue that seemed to be top of mind for everyone was plastic waste.

It's our intention that every bottle we produce ends up in a recycling bin, not in our rivers or parks. We are also proud to say that our bottles are made of one hundred per cent recyclable, Canadian sourced PET. Once recycled, the plastic from our bottles has immense value, finding new life in products such as pens, clothing, automotive parts and more. That's why we don't consider our bottles 'single-use plastic', we know that the lifecycle of our bottles can be much longer if disposed of properly.

Over the years, Nestlé Waters Canada has made significant progress in reducing our impact on the natural environment. For example, our Aberfoyle bottling facility is now a zero-waste to landfill operation. But we also know that until each and every bottle we produce is

recycled, there's more work to be done.

In Canada, approximately seventy five per cent of plastic beverage containers are recycled, but we are committed to helping that number reach one hundred per cent. As a bottle producer in Ontario, we pay fifty per cent of the costs associated with recycling our bottles, but will pay one hundred per cent within 5 years. Through our industry associations, we work with municipal and provincial governments to improve recycling education programs and encourage more people to use their Blue Bins and recycling receptacles in public spaces. We've contributed more than \$1.5 million to Stewardship Ontario's Blue Box program and since 2005 we've reduced the amount of plastic in our five hundred millilitre bottles by forty per cent. By 2025, Nestlé Waters North America is working toward a bottle made of one hundred per cent recycled plastic and we're hoping to reach that milestone sooner here in Canada.

We want to thank everyone who attended our community information sessions in Erin and Aberfoyle, Ontario last month. For transcripts of the Q&A or any other information about our business, visit nestle-waters.ca





Manage water at operations effectively

- Maintain a water balance and understand how it relates to the cumulative impact of other users.
- Set context-relevant water targets or objectives for sites with material water-related risks.
- Proactively manage water quantity and quality to reduce potential socio-environmental impacts and realize opportunities.
- Ensure all employees have access to clean drinking water, gender-appropriate sanitation facilities, and hygiene at their workplace.

Collaborate to achieve responsible and sustainable water use

- Identify, evaluate, and respond to catchment-level water-related risks and opportunities.
- Identify and engage proactively and inclusively with stakeholders that may influence or be affected by a site’s water use and discharge.

- Actively engage on external water governance issues, with governments, local authorities, and other stakeholders, to support predictable, consistent, and effective regulation that underpins integrated water resource management.
- Support water stewardship initiatives that promote better water use, effective catchment management, and contribute to improved water security and sanitation.

This ushers in a new era of community consultation for the mining industry in Canada. Mining companies are expected to be responsible corporate citizens in terms of water stewardship, working with stakeholders within the watershed to identify risks, and determine the best ways to address them.

Evaluating stewardship

The evaluation of each of the TSM indicators begins with a self-assessment to begin the grading process. “Mining operations annually self-assess their performance against each of the TSM indicators. For each indicator, they assign a letter grade that reflects their performance ranging from Level C to Level AAA. These grades are made public in the annual TSM Progress Report for each facility.” There are several additional layers

of assessment that follow, including external verification, a CEO letter of assurance, and post-verification review.

As the first evaluations take place, it will be worth noting how the grading system lines up with both the mine performance, in terms of productivity and profitability, and how community stakeholders view the mine’s water stewardship. If mines can institute new measures for water stewardship, and continue to have a profitable operation, this will provide a model for future resource development from an environmental perspective.

With significant resource operations expected to open in the coming years, especially in Ontario and Quebec, the negative impacts to local watersheds will be substantially reduced with the implementation of this new protocol. The water industry will have an important role to play in the years ahead to ensure that these measures do, in fact, provide the level of water stewardship that has been desperately needed from one of the country’s worst polluters. wc

Andrew Macklin is the managing editor of Water Canada.



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Phosphorous Prevention



Best management practices in the farming industry, such as precision agriculture, can help mitigate the impact of phosphorous on nearby lakes and rivers.

Building an international campaign to curb phosphorous waste. BY ANDREW MACKLIN

DISPLACED PHOSPHOROUS is having a devastating impact on Canadian watersheds. Run-off of the chemical creates harmful algal blooms in our rivers and lakes, and can create dead zones in those same bodies of water.

In an effort to educate the public of the destructive impacts of phosphorous, the Sustainable Phosphorous Alliance is leading the charge to ensure that watersheds around the world through a new initiative.

Water Canada caught up with Sustainability Phosphorous Alliance Program Manager Matt Scholz to talk about the campaign:

Why is phosphorous important for us to discuss in relation to the water industry?

Not many people, including people who are quite familiar with water and water chemistry, realize how devastating and impactful a pollutant phosphorous can be. It's also an absolutely vital nutrient, so we can't live without it; it's in our bones and

our DNA. We get it entirely through our diets.

It's kind of a double-edged sword where, if it's well managed and well contained it's great for us. But if it's not very well managed and contained, it ends up running off the landscapes, coming out of the wastewater treatment plants, and delivered by other mechanisms to fresh water and sea water. It can cause algal blooms and nitrification in fresh water and in coastal environments. This has huge economic impacts, biodiversity impacts, and it has health impacts as well.

One of the things we've noticed is that there's not a lot of public awareness about these issues. It probably is the most important pollutant of fresh water, which is our most important commodity and natural resource.

What is the Phosphorous Sustainability Challenge?

It really is a platform which,

organizations big and small, public or private, can make public commitments to reduce our collective phosphorous footprint. And in that process, gain public recognition for the work they are doing. That the basis for the challenge.

Are there specific countries, states, or provinces that you are targeting with this initiative?

The phosphorous challenge itself is certainly a global issue, but we're focused right now strictly on the U.S. and Canada. We've had some conversations with European countries about extending the challenge over there, and we'll see what happens over time.

Part of the reason for focusing on the U.S. and Canada is that we want to ensure that we can give a certain amount of oversight to the claims that are being made. It will be a lot easier for someone to get away with a false claim who's making in China in Chinese, as an example, than it would be for something that is done on our home soil.

Who is the target audience for this campaign? What sector do you hope will rise to the challenge?

The problem cuts across a lot of different domains of activity. The value chain for phosphorous is very complex. Mining companies can have a part in this, fertilizer and feed production companies, water and wastewater treatment, stormwater management: all of these groups can have impacts.

If you're really looking at the big piece of the puzzle, certainly in our context, I think when you look at crop agriculture, animal agriculture, those are certainly big areas of interest for us. There's a lot of motivation in the wastewater treatment and stormwater management fields to tackle these problems as well.

What are some of the proactive measures these stakeholders can put in place to curb their phosphorous footprint?

There are improvements opportunities at every node of that value chain.

In agriculture, it will be things like instituting best management practices on farms, including doing things like incorporating the fertilizer rather than broadcasting it, installing buffer strips along fields. Precision agriculture is another one, making sure your delivering the exact right amount of fertilizer to the crop.

In animal agriculture it might be supplementing feeds with phytases which helps certain animals assimilate the phosphorous better so that not as much of it comes out in their waste.

At wastewater treatment plants, it might be precipitating the phosphorous with calcium phosphate or some other type of material that they can take it out of the water with.

Stormwater management it might be the use of permeable pavements so there's not as much run-off from the cities. Instituting pet waste laws so that people are actually cleaning up their pet waste so that it's not washing away into our waterways.

And we can cut food waste at every node of that value chain: using everything that we grow in the agricultural setting, making sure that the food is delivered

Algal blooms, such as the one seen here from Lake Erie in 2015, will only get worse if the public is not educated on how they can help to reduce their phosphorous footprint.



efficiently at the retail level, and at our homes eating what we buy and composting.

Are there opportunities to incorporate new technology or best practices to mitigate phosphorous in wastewater and stormwater?

There are a bunch of technologies that can be used to mitigate this phosphorous pollution.

Part of it is diversion. With stormwater, it's making sure that water doesn't reach waterways in an unimpeded fashion. Perhaps there's some kind of a berm that can protect the water from the city, where it can at least be treated or settle. There are various technologies there. Also reducing the flow, because when you convert the land from a native landscape to a paved landscape, you tend to get a lot of run-off from the city. Finding ways to disrupt that flow, it lets the water infiltrate into the city rather than running off the city.

We have a member [...] who precipitates the phosphorous out of wastewater streams and recovers it. They can turn that into a high-value fertilizer product, so it's a nice example of how you can close the loop on phosphorous recycling.

One of the more traditional approaches (at the wastewater treatment plant) would be adding flocculants, things like ferris chloride, to wastewater streams to precipitate out the phosphates, although that's not as available for reuse then. But it's another

method of taking the phosphorous out.

If we don't curb our phosphorous output, what is the potential impact to our watersheds?

Biodiversity impacts for sure. What happens is we create dead zones, and all the fish and plants die in the waterways.

In terms of economic impacts, fisheries can no longer fish and recreating fishers can't go out and fish. It changes property values cause the lakefront property is now looking at a stinky algal bloom. It has been estimated that, in the U.S. at least, that the impacts are in the billions. That will only get worse.

And it will only get worse with climate change. We are expecting heavier flows over the land from heavier rainfall. And drying up lakes is going to concentrate phosphorous that is present.

So we have to plan for those climate impacts by being even more aggressive than we've been so far in tackling this problem. **wc**

Andrew Macklin is the managing editor of Water Canada.



To participate in the Phosphorous Sustainability Challenge, visit psustainabilitychallenge.org

Data isn't simply verified information. The source, the age of the information, and the quality of the sampling are just a few of the pieces of information to determine the data's context.



Building Context Around Water Data

Knowing the source of data and how it fits the water conversation. BY ALAN SHAPIRO

WHILE DATA IS A REPRESENTATION of reality, the stories we tell based on that data are products of interpretation. Practitioners often debate data collection and analysis methods to ensure that the data is the best possible reflection of the process being studied.

But once those discussions are settled, the context around the data takes on a dominant role, shaping how the data is interpreted by broader audiences. How is the data placed in space and time? What can it be compared to? How does it support or conflict with values and beliefs?

The story of water quantity

Let's use water quantity as an example. It's hard to miss the fact that Canada is blessed with abundant freshwater resources. A quick look at the introduction of any report or document on water resources in

Canada makes this fact quite clear:

- **NRCan:** "Probably no country in the world has as much of its surface area covered by freshwater as does Canada."
- **WWF-Canada:** "Canada's lakes, rivers, streams and wetlands, hold 20 per cent of the world's freshwater."
- **Fraser Institute:** "Canada is richly endowed with abundant freshwater resources."

Ending the narrative there would paint a picture of a nearly unlimited supply of water. This notion—the myth of water abundance—is one that dominated much of the conversation around water through the 19th and 20th centuries, and one that is still very much alive today.

But ending the story there fails to address the difference between renewable and non-renewable water resources. Much of the water around us reflects the legacy of the last ice age,

rather than sustainable water sources. On top of that, water supply is limited by geographic distribution, seasonal and multi-year variation, and water quality.

And, of course, the conversation isn't complete without consideration of human interactions and climate change, the dominant forces that define the current and future health of Canada's water resources.

This 12,000-year timeline—from ice age to climate change—must inform any current story of water resources in Canada. Removing any element of this timeline leads to a remarkably different interpretation of the opportunities and challenges that exist in the present.

Finding water data

Context becomes even more pronounced when we consider that there are few major sources of water data in Canada. Our geography is vast, our lakes and rivers many, and our

monitoring points relatively few.

The largest sources of environmental water quantity and quality data across Canada are federal and provincial monitoring networks. Others include universities, private sector organizations, non-profits, and community groups. Much of this information, particularly government data, is open access and can be examined and analyzed by any interested parties.

As a result, reports and analyses, whether written by researchers, think tanks, non-profit organizations, or governments, largely rely on the same data. Intuitively, we'd expect consistent conclusions across the board, but this is not the case.

For comparison, in its 2018 report, *Evaluating the State of Fresh Water in Canada*, the Fraser Institute stated: "Our analysis suggests that Canada has abundant water resources and that Canadians use only a small fraction of this massive resource." While, in WWF-Canada's *Watershed Reports: National Assessment of Canada's Freshwater Waters*, published in 2017, the organization concluded: "Of the 129 [out of 167] sub-watersheds with available data, 37 failed to receive a good score, mainly due to the impacts of dams... Data deficiency for hydrology is more prevalent in more remote areas."

While the two reports draw on data from the same sources, each conclusion offers a different context. Where the authors of the first report reach a positive conclusion, the conclusion of the latter report is less certain, pointing out gaps in what can be known.

The role of context

All data being equal, the scope we define and the context we construct around that scope shape the overall message. I could choose, for example, to zoom out and look at water flows in a large region, making the claim that Canada's Pacific Ocean watershed is in good health. However, this would completely ignore the fact that many sub-regions have faced severe summer droughts in recent years.

I could average seasonal low and high river flows into a single comfortable statistic, but that choice would ignore the aquatic ecosystems damaged by low

flows or the water users who experience water scarcity as a result.

Both of these averages are not only inaccurate but actively harmful if we use them to inform the public conversation around water resources or influence water policy. For this reason, context is of vital importance. For every analysis, there are best practices that define the relevant scope and statistics.

So what?

At the beginning of 2019, Canada is starting another chapter in our water story. Inevitably, we will see droughts in parts of Canada and floods in others. Spills will damage water quality in some communities, while restoration projects will improve ecosystem health in others. New data will be published, and new reports authored.

As observers and consumers of this and other environmental knowledge, we should all bring a critical eye to the table. We are, of course, bound to see the world through our own frames of reference and to filter information through our personal values and politics. Debate will follow. But no matter where we stand, we are all better off making our own, informed decisions on water issues.

So, in 2019, here are a few questions I urge you to ask as you consume water information:

- ❶ Who is the author and what is their frame of reference? Are they water scientists? economists? politicians?
- ❷ What is the source of the data? Can the data be accessed and analyses verified independently? Have other parties analysed the same data, and are the conclusions consistent?
- ❸ What is the context of the data? Is the data part of a bigger picture or trend, either spatially or temporally? How complete is the data?

And if in doubt, don't hesitate to reach out to a water expert for a second opinion. [wc](#)



Alan Shapiro is a Vancouver-based science communicator with a focus on water resources and environmental issues.

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STEVE COLE

The Great Lakes Protection Fund has announced that **Steve Cole** has joined its team as vice president of programs.

Cole will lead the Great Lakes Protection Fund's program team. In his role, Cole will build and manage the portfolio of new technologies, strategies, and financing tools that protect and enhance the health of the Great Lakes.

Cole brings experience in building new strategies, launching new products, and ensuring that customer needs are at the center of new initiatives. He has successfully created and managed new business lines from start-up to market leadership.

"We welcome Steve as a key member of our team," said **David Rankin**, executive director of the Great Lakes Protection Fund. "His depth of experience will further develop our programmatic strategy to take advantage of high-impact opportunities. With Steve's leadership, we will explore innovative ways to accomplish our mission and will more deeply engage with the Great Lakes community, the innovation community, and our funding partners."

Cole comes to the Great Lakes Protection Fund from his most recent role as a senior principal at Maven Wave Partners.



YUVBIR SINGH

SUEZ announced the appointment of **Yuvbir Singh** as CEO of the water technologies and solutions (WTS) Division.

Singh is a graduate of the University of Pune with a Bachelor of Engineering degree in electronics. He joined General Electric (GE) in 1995 and held various engineering, sales, and marketing roles.

Between 2004 and 2015, Singh

worked for GE Water where he gained extensive knowledge of the water industry, played an integral role in a series of transformative acquisitions, and ultimately led the engineered systems team. In 2015, Singh was promoted to vice president of the global locomotive business for GE Transportation, and as the vice president of equipment in 2018.

Singh will succeed **Heiner Markhoff**, who made the personal decision to step down as CEO, effective March 30, 2019.



JORGE GOMEZ

Xylem Inc. announced that **Jorge M. Gomez** has been elected to the company's board of directors.

Since 2018, Gomez has served as the chief financial officer of Cardinal Health, Inc., a provider of customized solutions for hospitals, health systems, pharmacies, ambulatory surgery centers, clinical laboratories, and physician offices worldwide.

In that role, Gomez is responsible for all financial activities across the enterprise including financial strategy, operational finance, external reporting, investor relations, tax strategy and planning, and capital deployment.



SAM CUNNINGHAM

The Great Lakes and St. Lawrence Cities Initiative (GLSLCI), a binational group of mayors and leaders on the Great Lakes and St. Lawrence River, welcomes **Sam Cunningham**, mayor of Waukegan, Illinois.

Mayor Cunningham joins mayors and leaders from the U.S. and Canada in their efforts to protect drinking water and build their economies on one of the most important sources of freshwater in the world.

The health of Lake Michigan is key to the City of Waukegan and beyond. "We look forward to working with Mayor Cunningham, who in the short time we have known each other, has brought new ideas to examine," said **John Dickert**, president and CEO of GLSLCI. "The Mayor has a strong vision of how to build a better city and economy utilizing this precious resource."



SIMON LANGAN

Simon Langan, director of the water program at the International Institute for Applied Systems Analysis (IIASA), will be leaving in May 2019 to start a new position as director of data analytics and country manager at the International Water Management Institute (IWMI) in Sri Lanka.

Langan has been a part of IIASA since 2016. Since that time, he has played a role in the development and success of the Water Program, which assisted and developed work with the Uganda government and the Lake Victoria Basin Commission on the Water Futures and Solutions (WFaS) initiative.

"I have had a fantastic time at IIASA. It has been a privilege to work as part of a team focused on identifying both issue and potential solution options for improved water management of global and large, trans-boundary river systems," Langan said.

Langan holds a doctoral degree in land use and water quality from the University of St. Andrews in the United Kingdom (UK).



BRUNO SARDA

CDP has announced that **Bruno Sarda** is joining its team as the new president of CDP North America. At CDP North America, Sarda will enhance CDP's work to

engage with companies, investors, cities, states, and regions in the United States (U.S.) and Canada to support their transition to sustainability initiatives.

"Bruno is a highly regarded leader in sustainable business and energy, with a clear track record of accomplishments," said **Paul Simpson**, chief executive officer of CDP. "Having disclosed to CDP in the past as well as been a supply chain member and set a science-based target, he is familiar with the position that the seven-thousand-plus corporate disclosers are in every year when they go through the rigorous process of environmental reporting through our platform."

Sarda joined CDP after nearly a decade of leadership in the field of corporate sustainability.



Deborah McGregor of the Whitefish River First Nation.



Former Ontario Premier Bob Rae.



Kelsey Leonard of the Shinnecock Nation in New York, who currently studies at McMaster University, delivers her perspective on the Indigenous water crisis.

World Water Day Waterloo Ont.

The Water Institute at the University of Waterloo held a full day of activities to commemorate World Water Day on March 22nd.

The event began with a thoughtful discussion of First Nations leaders on exploring solutions to the Indigenous water crisis in Canada. **Deborah McGregor**, from the Whitefish River First Nation on Manitoulin, is an associate professor at Osgoode Hall Law School at York University. In her remarks, she suggested that one of the greatest challenges is that current funding commitments from the federal government don't address the root

issue surrounding the water crisis: the fact that the water itself is no longer drinkable without being treated first. More needs to be done to tackle the issue of water drinkability, and directly combatting the issues that make water from our streams, lakes, and rivers no longer safe to drink.

The day also featured the Water Institute RBC Distinguished Lecture, which was delivered by former Ontario Premier **Bob Rae**. Rae's discussion focused on what the challenge of clean water and around the world tells us about our country, our planet, and ourselves. In his remarks, he talked

about the fact that treating waste and water are less issues of a technical nature, but more issues of a social and political nature. The way we approach these issues from a social and political perspective dictate our success in effectively treating water for everyone to be able to safely drink it. On the First Nations issue, he said that "we have, in effect, a third world in our own country," one that does not have the basic needs met by the government that the rest of the country does.

For more information on World Water Day at the Water Institute, visit uwaterloo.ca/world-water-day.



Steven Peck, president of Green Roofs for Healthy Cities



DIALOG's Craig Applegath discusses how to adapt future building and site design for the impacts of climate change.



Former Environmental Commissioner of Ontario Dianne Saxe.

Grey-to-Green Conference Toronto, Ont.

What would \$1 billion for green infrastructure do for Canada? That question was posed by Green Roofs for Healthy Cities president **Steven Peck** at the organization's annual Grey-to-Green conference in Ontario.

Delivering keynote remarks alongside former Environmental Commissioner of Ontario **Dianne Saxe** and DIALOG founding principal **Craig Applegath**, Peck noted that record investments in infrastructure across Canada have focused more on the grey with little mention of the green. He noted approximately \$280 billion in current funding commitments to infrastructure development in Canada,

but little to none is pointed directly at creating green infrastructure.

Climate change is increasing the need for a broader green infrastructure conversation. According to Saxe, up to 10 per cent of Canadian properties could soon find themselves too high a flood risk for public insurance. Should that become a reality, cities will have to play a role in protecting homes from significant damage, something that can be accomplished, to an extent, through the development of green infrastructure assets.

An important element beginning to emerge that can help the green

infrastructure investment discussion is social prescribing. According to Toronto and Region Conservation Authority senior landscape architect **Sheila Boudreau**, who spoke as part of a presentation on Toronto's potential green infrastructure network, social prescribing involves the role of nature in improving personal health. That leads to the development of parkland, rooftop gardens, and other green infrastructure systems that allow people to connect with nature as part of a healthy lifestyle, especially in our urban cores.

For more information on Green Roofs for Healthy Cities, visit greenroofs.org.



OOWA board member Trish Johnson.



The expo at the OOWA Convention featured many of the newest technologies available to the onsite wastewater industry.



Discussing the role of communal systems for wastewater infrastructure development in Ontario.

OOWA Annual Convention Huntsville, Ont.

The Ontario Onsite Wastewater Association (OOWA) welcomed around 200 attendees to its annual convention and expo, held this year at the Deerhurst Resort in Muskoka.

Celebrating its 20th year, the event focused on looking back and moving forward, appreciating what the industry has already accomplished with an eye towards the future. The insightful retrospect included comments from several past presidents, speculating on what the next 20 years of the industry will look like, as well as a handful of talks on the history of things like policy and governance, commercial wastewater systems, and tertiary treatment.

One of the key conversations about the industry's future centered on how to enable communal systems in Ontario.

Board member **Trish Johnson** provided an overview of the opportunities and challenges with communal systems, with the glaring one being the fact that there are currently no specific policies currently in place to support this in Ontario. The approval for decentralized systems in Ontario is held within a policy struck in 1995, but no updates to this policy have taken place in the past 24 years. This is something that the OOWA is working on as an organization.

A case study presented on the issue provided a glimpse as to why communal systems can play a role in the future of wastewater infrastructure development. **Joe Gallivan**, director of planning and economic development for the County of Frontenac, discussed how some of

the smaller communities could expand their population with a new wastewater solution in place, as much of the septic infrastructure is in need of upgrade or replacement. There are communities in the county that are within a 45-minute driving distance of Kingston, Ont., which would provide a commutable picturesque-small-town alternative to living within the city.

Gallivan hired WSP Canada Inc. to provide a financial plan comparing the cost of a proposed communal system to the cost of a septic or well system. This same business case can be used by other municipalities that have the potential for residential growth, but lack the current wastewater infrastructure to do so.

For more information on the OOWA, visit oowa.org.



Joseph Gemin from AECOM.



Michelle Albert, director of water and wastewater at WSP Canada.



Akeel Ali, an asset management advisor at GHD.

Water Environment Association of Ontario Conference Toronto, Ont.

Asset management and climate change are two hot topics currently being discussed in the context of municipal infrastructure, according to **Akeel Ali**, an asset management advisor at GHD.

Ali spoke about the link between the topics during the Water Environment Association of Ontario's (WEAO) annual conference on April 15, 2019.

"In December 2017, Ontario's Ministry of Infrastructure introduced an asset management planning regulation, which acts as a prescription for every municipality to have asset management plans by the

year 2024," said Ali. "In addition [to this], in a couple of months, every municipality needs to have a strategic asset management policy in place."

"One of the things that the regulation touches on, which people write down but don't really act on, is that each municipality needs to include the commitment and actions that may be required to address vulnerabilities to climate change," he added.

During his presentation, Ali provided recommendations to help municipalities address the regulation and develop a defensible capital program for

climate change adaptation. One of the recommendations he provided was to set levels of service targets.

"Setting your levels of service targets is really the first step to operationalizing a policy such as the asset management policy. Levels of service are in essence that we use as key drivers to influence decisions," Ali said. "Some examples of levels of service targets that other people across Canada are tracking include: frequency of sewer backups, number and volume of combine sewer overflows per annum, [and] relative contribution of I&I in sewer systems."



Christina Copeland, senior manager for water security at CDP.



Briana Gunn, Environmental Affairs Director for Newmont Mining Corporation.



Rogerio Pilotto, senior investment officer at the International Finance Corporation.

Water in Mining Conference Toronto, Ont.

What is the state of play for catalyzing water security in the mining sector?

This was the key question that **Christina Copeland**, senior manager for water security at CDP, explored during the Water in Mining conference. The event took place from April 9 to 10, 2019.

During her presentation, Copeland summarized some of the key findings from CDP's 2018 global water report titled *Treading Water: Corporate Responses to Rising Water Challenges*.

Currently, 50 mineral extraction companies are reporting their water-related information through CDP. By disclosing, companies can compare themselves to other companies within

the sector. The information provided by companies to CDP can also be used for cross-sector benchmarking.

Some of the key findings from the report are summarized below:

- 88 per cent of mineral extraction companies that reported to CDP are measuring and monitoring their water.
- 59 per cent of the total companies that disclosed their water-related information to CDP are regularly measuring and monitoring their water.
- 72 per cent of mineral extraction companies that reported to CDP conduct comprehensive risk assessments.
- 62 per cent of the total companies that disclosed to CDP conduct

comprehensive risk assessments.

- 47 per cent of mineral extraction companies that reported to CDP integrate water into their governance mechanisms.
- 40 per cent of the total companies that disclosed to CDP integrate water into their governance mechanisms.
- 16 per cent of mineral extraction companies that reported to CDP have set water targets or goals.
- 29 per cent of the total companies that disclosed to CDP have set water targets or goals.

According to Copeland, investors are paying more attention to water use in the mining sector and they are asking for this information from companies.



Sakshi Saini, water resources specialist at Credit Valley Conservation.



Matt Wilson from the City of Kitchener's stormwater utility.



About 700 individuals attended the TRIECA conference hosted by TRCA and IECA.

TRIECA Toronto, Ont.

Degraded water quality, increased stream temperatures, and erosion along watercourses—these are just some of the impacts that urbanization has on the environment, according to **Matt Wilson**, who works at the City of Kitchener's stormwater utility.

On March 21, Wilson presented at TRIECA on the impacts of urbanization and the City of Kitchener's advancement in integrated stormwater management. The event is organized annually by the Toronto and Region Conservation Authority (TRCA) and the Canadian Chapter of the International Erosion Control Association (IECA).

Wilson started off his presentation by highlighting some of the impacts that urbanization has on environment. "We really see a continuum of impacts. As our watersheds and subwatersheds become more impervious, we see a decrease in stream health," he said.

"Is it really possible to build a watershed or subwatershed with greater than 60 per cent imperviousness?" Wilson asked. "No matter how much stormwater infrastructure you put on it, we really don't know if we can bring that stream health back. That's a question mark for the future."

Although the City of Kitchener doesn't have all the answers, it's doing what it

can to protect the local environment through its stormwater utility. According to Wilson, the city passed a Stormwater Charges By-Law in 2010, which enables it to bill property owners a stormwater rate that's based on the amount of impervious area on their property.

The City of Kitchener also has a stormwater master plan that was approved for public lands in 2016. According to Wilson, the master plan considered local factors and developed a plan around them. For example, 80 per cent of the region is dependent on groundwater so the plan developed stormwater infiltration constraint areas to protect the region's groundwater.

A police car is stranded in the flooded parking lot of Calgary's oldest curling club during the 2013 flood.



The Politics of Climate Change

BY ANDREW MACKLIN

IT WAS LATE APRIL, and our team was working to put together this very issue in time to meet our press deadline. I tried to figure out how to fill this space and realized that I had not yet read the news that day. I grabbed my phone and clicked on a variety of news apps to find out what I had missed across Canada so far that day.

I read through the headlines and, in most parts of the country, climate-related news dominated the top stories: blizzard conditions closing highways in Alberta, a forest fire now under control in Saskatchewan, preparations for potential flooding in the nation's capital, a dike burst causing thousands in Quebec to be evacuated, armed forces heading to Bracebridge to battle rising floodwaters, and water levels continuing to rise along the St. John River.

If ever there was a time when the impacts of climate change were on full display for Canadians, this was that time. And while it may not have been in the collective conversation as much as the Alberta flood or the Montreal ice storm, there may not have been a time where severe weather has been discussed more in our country. Few conversations

went more than a few minutes without weather, snow, or flooding being mentioned. And I'm not sure we have ever seen national newscasts have more individual stories on weather events happening in this country.

How do we turn this into a case for further investment in climate resilience across Canada? How do we turn these environmental tragedies into a call-for-action?

It's a fine line between messaging that sounds like it is trying to capitalize on tragedy, and messaging that it is promoting a climate resilience agenda. Say something the wrong way, and the naysayers will bellow to the world that the environmental lobby, which will include every affiliated stakeholder in that same broad stroke, is trying to play politics and a time where people have lost everything.

Then how do we skirt the fine line?

A great place to start is by promoting solutions. When we look at the communities impacted by these events, can we provide those in the positions of creating policy and governance with

the courses of action to be taken to prevent future devastation? Of course, those proposed solutions would then be met with the next important question to answer: what is the cost? And will that cost be less than the cost of the damage done to the communities by these climate-related weather events.

Now, thanks to data being produced by the insurance industry, we are starting to be able to strengthen the business case. Take the 2013 Alberta flood as an example. The estimate property damage was approximately \$5 billion. The proposed Springbank Off-stream Reservoir, which would significantly reduce property damage by a similar weather event to that of 2013, is to be built at an estimated cost of \$432 million. That's less than 10 per cent of the cost of the property damage done in 2013.

At a time when extreme weather is at the forefront of our national dialogue, we need to work collectively to present the case for further investment in climate resilience. **wc**

Andrew Macklin is the managing editor of Water Canada.



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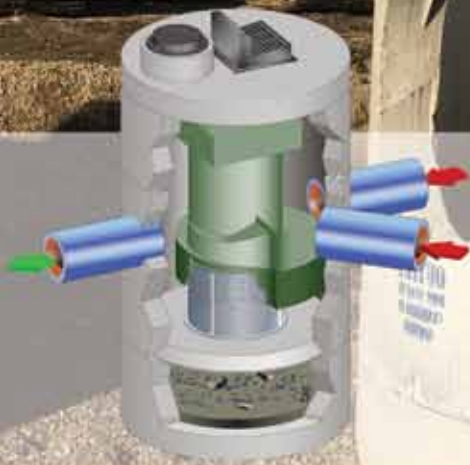
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