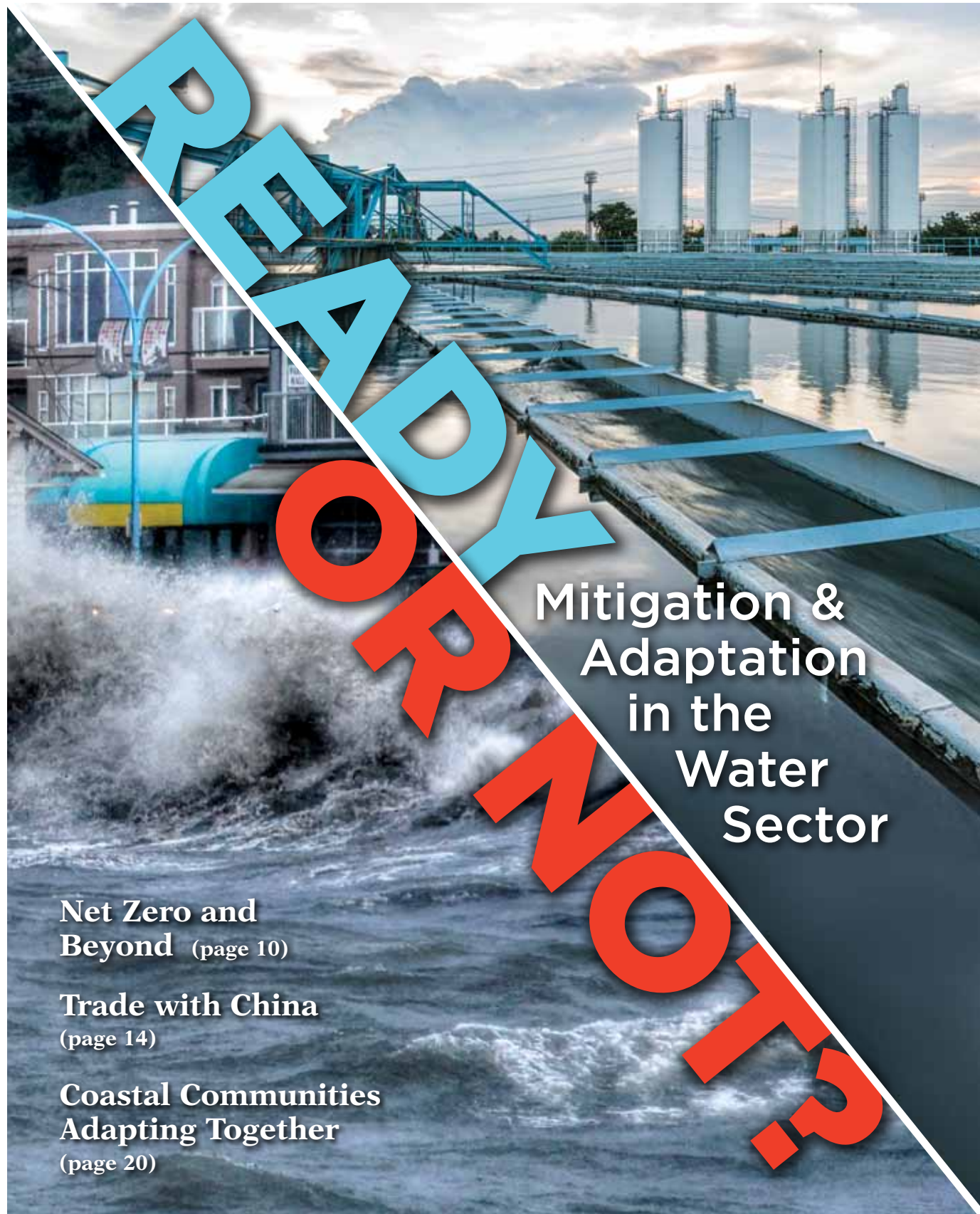


WATER CANADA



Mitigation & Adaptation in the Water Sector

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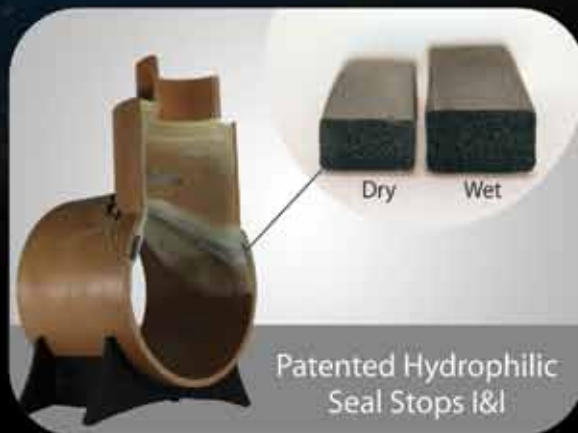
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Your Community Water Partners



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OCWA and IBM are working together to provide First Nations communities with water systems support. If you would like to learn more and get involved, please contact John Kingsbury at Cell: 647-291-3942



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Exciting Times in Water Management

BY KATHERINE BALPATAKY

LAST MONTH, my publisher and friend Todd Latham travelled with his family to the Florida Everglades on a family vacation. He told me that he had always wanted to experience the Everglades and that he wanted his children to experience them, too, "before they're under water." It's true that the Everglades, like many low-lying coastal areas, will most certainly be submerged by encroaching seas in the next 50 years. I think that most of us have a bucket list of locations that we would like to visit—further amplified in urgency by the expectant transformations due to a changing climate.

While the capital P policy-makers shape Canada's carbon pricing regime and adaptation priorities, Water Canada readers are literally writing the rules of adaptation and re-inventing water management. Nowhere is the climate felt more clearly than through water. In fact, 95 per cent of all hazards associated with climate change are water related—more severe storms, more rapid flooding, and more frequent and intense droughts. It's as if the hydrologic cycle was a sleeping giant, woken up early by the rising temperatures, and now she is cranky.

But we are learning how to appease the giant, or at least, deal with her mood swings, through science; Canada has invested \$77.8 million in the Global Water Futures research partnership—the largest university-led water research program ever funded. Launched in 2016, the GWF's sole mission is to prepare Canadians for the water-related threats of climate change.

On page 20, we learn how the federal Coastal Management Working Group of the Adaptation Platform and ESSA Technologies are taking notes on how Canada's coastal communities are adapting to changes, in order to accelerate our learning and provide strategic advice on future investments.

Lest we forget to mitigate! On page 10, we shine a light on two examples of water utilities that are transforming energy systems (and provisions) through water treatment. In Vancouver and Arhaus, Denmark, municipalities are innovating to close the loop on energy use and feed it back into the grid. Then, on page 28, Hank Venema speaks of the market potential in linking climate policy and infrastructure policy with climate resilience to attract international capital. Hank's experiences in Manitoba prove that it's possible to improve water quality, reduce flooding, harness clean energy sources, and grow the economy. Giddy up.

Outside of the water box or bubble (take your pick), global powers and foreign policies are shifting in a major way. The instability caused by one protectionist American President, the shock of Brexit, speculation about the forthcoming French election, as well as China-North Korea-American relations, et cetera, et cetera present heightened tensions and new barriers for exporters of our growing cleantech market. And yet, the world spins on. Those companies that don't mind living a little dangerously (see page 14, China) could reap huge successes, growing Canada's water brand in the global economy for the benefit of all.

May you live in interesting times. **WC**



All back issues of Water Canada are available for download at library.actualmedia.ca

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**LAPO CALAMAI**

Lapo is the director of catastrophic risk and economic analysis, Insurance Bureau of Canada.
PG 8

**MEAGAN HINTER**

Meagan is a communications specialist with the Global Institute for Water Security, University of Saskatchewan.
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**MARY TRUDEAU**

Mary is the principal with Envirings Inc.
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ABOUT THE COVER

(Ready) Municipal water treatment plants are fighting and adapting to climate change by achieving net-zero energy use, feeding green energy back into the grid, and becoming flood resilient.

(or Not) This image of thrashing seas, as captured by Bill Hawke on March 10, 2016, shows how 100 kilometre per hour winds and the resultant storm surge closed portions of the shoreline in White Rock, B.C. Flooding from storm surges, caused by an abnormal rise of sea water due to storms, is one of the vulnerabilities identified in a new national report on Canada's coastal resilience (see page 22).

NEXT ISSUE: JULY/AUGUST

- **Water's Next Award recipients**
- **Art in water management**
- **National plumbing codes**

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Credit: Halifax Water



A plan for the redevelopment of the Cogswell Interchange.

Old Technology, New Sustainability

Halifax takes steps to mandate wastewater energy reuse.

By Todd Westcott

HALIFAX is making use of an old technology, the district energy system (DES), to implement a sustainable energy solution for its Cogswell Interchange redevelopment, reusing thermal energy from a nearby wastewater treatment facility. Treated effluent will be piped underground to individual buildings for space heating, domestic hot water heating, and air conditioning providing a low-cost, green source of energy via heat exchange from the Harbour Solutions Wastewater Treatment Facility. On February 21st, the Halifax regional council approved a motion to implement the DES in the Cogswell Redevelopment Area. They went further, too, and endorsed a new mandate to take advantage of energy reuse wherever possible within the municipality. Carl Yates, general manager at Halifax Water, said of the decision, "I thought that was very positive to look to the future."

DES is tried and proven in Canada and beyond. According to the feasibility study, the DES is significantly cheaper than other energy sources at \$35.60 per megawatt hour (gas hydronic heating, the next cheapest, is \$59.47 per megawatt hour) and provides a more consistent pricing structure, as compared to the conventional energy

market, based on 2016 fuel costs. It's also an environmentally friendly option, emitting 0.166 tonnes of carbon dioxide equivalent per megawatt hour, while gas hydronic heating emits 0.212 per unit, again the next most efficient.

To implement the mandatory DES for Cogswell and other areas, the city's charter has to be changed, which requires provincial approval. Yates said, "[The DES] is something that would fit with the province's policies on energy, and in particular, with where the federal government is going; this is an area that's going to get attention from all levels of government."

Halifax Water completed two earlier studies in 2010—one for the Mill Cove wastewater treatment plant, and the other in Halifax. The most recent feasibility study in 2016 evaluated the potential at Halifax and Cogswell sites.

"We think it is our best opportunity to start with a totally new development under the municipality," said Yates. "Once they have their legislative amendments, I think it puts us in a very good spot for a sustainable framework." **WC**



Todd Westcott is Water Canada's content and marketing manager.



Atlantic Treatment

Company from P.E.I. provides low-energy wastewater option for Algerian companies. BY KATHERINE BALPATAKY

IN THE HEART of the oil and gas fields of Algeria, North Africa, a Prince Edward Island-based company has installed a new wastewater treatment solution that promises to be the most energy efficient packaged solution on the market.

In March 2016, Island Water Technologies (IWT) delivered and installed its REGEN-plus packaged wastewater treatment solution to the headquarters of RedMed Group—a company that provides accommodation, security, office space, and communication technologies to energy companies in Algeria. RedMed required a mobile wastewater treatment solutions for remote work camps—typically fly-in communities of anywhere between 40 and 1,000 workers. The company had previously relied on hauling sewage out by truck to the regional treatment plant, and had been doing so for 15 years. The first installation would go into their own headquarters and base camp, which provides office space and year-round lodgings for a population of about 300 employees.

IWT determined that an enhanced biological fixed-film treatment process that combined an optimized aeration delivery system with low-energy requirements and no chemical use was the best bet. Given the remote locations of most camps, the wastewater system

needed to be simple to operate, easy to install, and have a low-energy footprint. Once the unit arrived from Montague, P.E.I., the IWT team members provided on-site training for management and maintenance professionals.

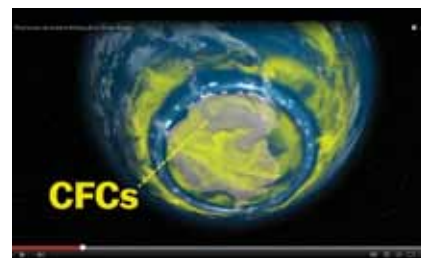
“Significant cost savings will be realized over the life-time of the infrastructure,” said Patrick Kiely, founder and CEO of IWT. “With an elimination in haulage costs and reduced costs associated with irrigation; and the environmental benefits associated with eliminating the constant transport of wastewater through the facilities, and the energy efficient treatment and re-use of the water on-site. We estimate that the operator will save about 90 per cent of the energy costs associated with traditional packaged wastewater treatment systems.”

To ensure that it would be the most energy efficient on the market, IWT carried out a review of existing systems and identified the energy cost for treating wastewater, identifying that MBR and MBBR solutions—especially in packaged plants—are very energy intensive. “We continually assess our energy consumption and compare to competitor products,” he said. WC

Katherine Balpataky is Water Canada’s editor.

FRONT

Online at
WATERCANADA.NET



VIDEO: Winning communications: water and climate change.

bit.ly/MotivateCC



NEWS: Metro Vancouver launches unflushables campaign. bit.ly/UnFlush



NEWS: Alberta and China sign landmark trade agreement for water quality. bit.ly/AltaChin

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A photograph of a flooded road. In the foreground, a dark asphalt road with a yellow dashed line runs along the bottom right. A large, dark log floats in the murky, brown floodwater. In the background, a line of green trees stands in the water under a grey, overcast sky.

Road to Resilience

The need for a national strategy to address flood risk. BY LAPO CALAMAI

WHEN WATER CANADA published a story on the top seven water stories for 2016, the authors highlighted the federal government's commitment to new funds for water infrastructure, as well as research suggesting that Canadian governments and homeowners are not adequately prepared for the flooding caused by climate change. While progress has been made, there is still work to do to prepare the country for the increase in water-related disasters.

For several years the Insurance Bureau of Canada (IBC) and the property and casualty insurers it represents have been advocating for a national flood strategy to establish a strong flood-risk management culture and a more resilient Canada. It's a strategy that entails clear roles and responsibilities for the industry, consumers, and all levels of government. The goal is to ensure affordable financial recovery for victims of flood, while making Canadian communities more resilient to our changing climate.

Well established problem

Since 2008, Canadian insurers have seen payouts from natural disasters averaging about \$1.5 billion a year, up from an average of only \$400 million a year over the prior two decades. Governments are facing similar trends. The cost of taxpayer-funded disaster assistance due to floods has increased from about \$30 million a year in the 1970s to an average of \$600 million a year this past decade, and it's forecast to increase even more in the coming years.

Until recently, flood risk was compounded by the unavailability of residential flood insurance. Over the past two years though, following IBC and the industry's investment in up-to-date flood mapping technology, Canadian insurers have started to offer new products that cover floods. However, this is a long-term process, and it will take several years before affordable flood insurance is available for the majority of Canadians.

There are clear limits to what the private market alone can achieve. Experience from virtually every other jurisdiction suggests that there will always be a segment of the population for whom flood insurance will be either unavailable or unaffordable.

It's the economics of flood insurance at work. Decades of underinvestment in infrastructure, coupled with poor land-use planning, inadequate building standards, and deficient flood mapping have led to homes being built where they shouldn't be. Insurance is meant to protect consumers from the financial consequences of events that are largely unpredictable and uncertain—think fires and car accidents. But there is nothing uncertain about these homes flooding. They are located in high-risk areas known to flood on a predictable and regular basis, generating repeat financial losses. What's more, our changing climate means that severe, intense micro-



A road washed out following the 2013 Calgary, Alta. flood.

Insurance is meant to protect consumers from the financial consequences of events that are largely unpredictable and uncertain—think fires and car accidents. But there is nothing uncertain about these homes flooding.

bursts of rain now occur everywhere and more frequently, making areas previously thought to be at low-risk of flooding susceptible to severe pluvial flooding.

To address these issues and foster the development of a sustainable flood risk management culture, IBC is working with federal, provincial, and municipal governments to advocate for a national strategy to address flood risk. It's also working on the national strategy with organizations focused on flood-related issues such as the Intact Centre on Climate Adaptation, Ducks Unlimited, and the Institute for Catastrophic Loss Reduction. IBC's national flood strategy is underpinned by four pillars:

❶ Accurate, up-to-date national flood mapping, which needs to go beyond traditional floodplain mapping to cover urban (i.e. pluvial or stormwater) flooding, and better identify risk, not just hazards.

❷ Ongoing investment in engineered and natural flood defenses and sewer and stormwater infrastructure, which needs to be targeted in high-risk areas where the bulk of economic losses are concentrated.

❸ Effective land-use planning, zoning, and development controls to ensure that new developments are restricted in high-risk zones. While changes in policies and practices must be considered, strict enforcement is also critical.

❹ Coordination between public and private disaster compensation to ensure that government disaster assistance programs that provide ex-gratia payments to consumers do not create perverse incentives by discouraging consumers from mitigating their risks. This is particularly important in the case of high-risk properties, where public

disaster assistance—today—plays a predominant role in compensating consumers for flood losses.

The federal government has made positive moves in this direction by supplying new funding, creating the National Disaster Mitigation Program, and establishing several federal/provincial/territorial working groups as well as a national roundtable on residential flood insurance. Provincial governments have also recognized the urgent need for action. This awareness will encourage risk mitigation efforts and is key to creating the bedrock of public support that's needed if governments, and the insurance industry, are to build a solid national flood program. **wc**

Lapo Calamai is the director of catastrophe risk and economic analysis at the Insurance Bureau of Canada.



Mads Warming of Danfoss Inc. Warming is inside the Marselisborg Wastewater Treatment Plant in Aarhus, Denmark—the world's first city to power its water needs with sewage energy.

Inset: Fred Nenninger is the director of policy planning and analysis for Liquid Waste Services Metro Vancouver. He and his team are exploring new ways to generate energy from its liquid waste management facilities.

Chris Danvers

Chris Fred Nenninger

Net Zero and Beyond

A new water management paradigm aims to be energy-positive.

BY KATHERINE BALPATAKY

AS IF CONSISTENTLY topping world happiness surveys wasn't enough to make you wonder what they're doing right in Aarhus, Denmark, how about this? They've achieved a 134 per cent surplus in energy production from their wastewater treatment, serving 200,000 people. That's right. Aarhus—the second largest city in Denmark—is the first city in the world to transform its drinking water and wastewater system into a major community energy provider. By minimizing consumption throughout the whole water cycle—both drinking water and wastewater—and maximizing energy production from its wastewater facility, the Marselisborg Wastewater Treatment Plant now generates enough energy to cover its own operations and up to 130 per cent more (without wind or solar production).

"When we look back upon the last 20 years of water utility operations, the most significant improvement made

towards these energy achievements is 100 per cent reliance on the process control with sensors on every part of the system and the education of some very clever people in process control," said Mads Warming, global segment director of water and wastewater at Danfoss Power Electronics, which provides the technology for the Aarhus water utility. "We see that more than 50 per cent of the efficiencies that they have achieved are not because of a rebuild or investments in the infrastructure, but rather from process control of the system"

Warming explained that the Aarhus system includes 290 variable speed drives that optimize operations. But, most importantly, the process control system includes a fail-safe setting that will automatically revert the system to safe mode, a mode that makes water quality the operational priority, as defined by Mads's very clever people. "After that happens, the only way the

system can be returned to efficient levels is by the hand of the operator," said Warming. "The operators soon learn how to maintain each of the sensors for optimum performance."

Benchmarks to drive performance

Two key drivers that led Aarhus to pursue such an aggressive energy strategy for its water systems were that the system is operated by the private sector and that it is operated with key performance indicators (KPIs) that prioritize both energy efficiency and water quality. And now, the Danish government is working towards a completely energy neutral water sector for both its drinking water and wastewater systems nationally.

Back on home watersheds, Metro Vancouver has also prioritized energy performance in its wastewater operations, to meet commitments in its provincially approved Integrated Liquid

Waste and Resource Management Plan.

Fred Nenninger, the director of policy planning and analysis for Liquid Waste Services Metro Vancouver, said that the municipality has been recovering and utilizing biogas at its wastewater treatment plants since the 1960s, but the last five years have been the most aggressive in

Leadership at multiple levels is crucial to ensure that operators optimize water treatment systems with Viking opportunism.

terms of looking for opportunities to increase gas production. “We have really been examining the opportunities in the production of biogas—how can that be increased,” Nenninger said. “There are various substances such as fats, greases, and glycol that can be directly added to digesters.”

All of Metro Vancouver wastewater treatment plants capture biomethane for heat, and in some cases, generate electric power needed for the treatment plants. However, Liquid Waste Services’ greatest energy accomplishment to date is the \$13 million Biogas Project at Lulu Island Wastewater Treatment Plant in Richmond. At the Lulu plant, a surplus of biogas energy is purified with scrubbers for sale through the natural gas grid.

Nenninger said that decision about how to manage energy

opportunities is determined on a case-by-case basis for each treatment plant based purely on the business case. “When the price for green energy biogas reached the level where it made business sense, we started to have the discussion,” he said.

Because natural gas and electricity are cheap on the open market, the

business case is not always attractive. Still, the municipality is exploring all options, including lighting programs, High Efficiency Aeration, and through a Sustainability Innovation Fund and research partnerships, new technologies, such as genomics in anaerobic digestion optimization and microwave-enhanced, advanced oxidation sludge destruction. Nenninger believes that more of these kinds of opportunities will be pursued in Canada as provincial and federal climate policies are aligned. Warming supported this view, noting that leadership at multiple levels is crucial to ensure that the market drivers are in place, managers set the bar high, and operators optimize water treatment systems with Viking opportunism.

“It’s a question of taking a holistic view of the system,” Warming said. WC

Katherine Balpataky is Water Canada’s editor.



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Meteorological stations like this one at Marmot Creek near Canmore, Alta. gather data on indicators like snowpack depth, wind speed, and air and soil temperature. Data collected at sites like these are available for real-time viewing and will also feed into computer models for improved forecasting.

COURTESY OF SASKATCHEWAN GOVERNMENT

Data Driven

Developing advanced warning systems to help communities plan more effectively in an era of change. BY MEAGAN HINTHER

EXTREME FLOODING. Raging wildfires. Widespread drought. The last decade has been witness to many natural disasters that have left communities across Canada reeling and rebuilding.

The new Global Water Futures (GWF) research program at the University of Saskatchewan's Global Institute for Water Security was launched in 2016 with an aim to reduce the risk of such disasters by gaining advanced warning of extreme weather events.

"In Canada, we are facing unprecedented challenges when it comes to our water resources. Cold regions are really at the forefront of the effects of climate change," said John Pomeroy, Canada research chair in water resources and climate change and associate program director of the GWF program.

"To meet these challenges, we need tools that are going to help us adapt and manage risk much more effectively."

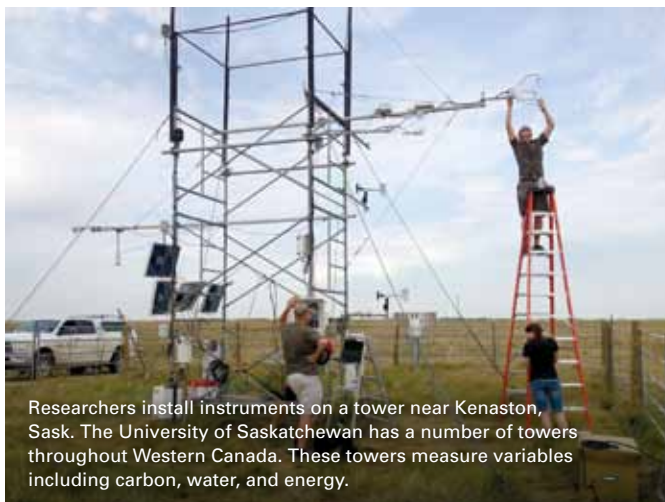
GWF is federally supported by the Canada First Research Excellence Fund and unites over 380 researchers from 18 Canadian universities. The University of Saskatchewan is leading the initiative, along with funding partners University of Waterloo, Laurier University, and McMaster University. More than \$140 million is committed to the program over seven years. Thirty-four industrial collaborators have offered their support and expertise.

"In addition to advanced warning systems, GWF will provide user groups with the tools they need to improve the management of water supplies and help design communities to reduce the risk of flooding."

Pomeroy explained that in order to have resilient communities, municipalities and industry will need improved access to data in real-time.

"For example, Edmonton's water utility, EPCOR, is quite interested in our program. They're worried about flooding; they're worried about water levels; and they're worried about drought. They're also worried about source water contamination that affects water treatment processes. By gaining access to real-time data on drivers, such as mountain snowpack levels and water quality indicators, they are able to tailor their operations and plan accordingly."

To help Canada deal with climate change impacts, GWF is supporting a nationally-coordinated water modelling strategy that will have the capability to



Researchers install instruments on a tower near Kenaston, Sask. The University of Saskatchewan has a number of towers throughout Western Canada. These towers measure variables including carbon, water, and energy.



The Global Water Futures program will help improve water quality and mitigate risks to human health and ecosystems through diagnostic tools.



John Pomeroy, associate program director, Global Water Futures and Canada research chair in water resources and climate change, pulls instrumentation up to the Marmot Creek field site near Canmore, Alta.

predict future water availability with a lot more accuracy and make such information publicly available.

"Something that might be very unlikely now, such as the closure of a junior water license in the oil sands to preserve downstream flows, might be a much more frequent occurrence in a changing

shared in such a way that it can be applied directly. Tools will begin rolling out at the end of 2020, and GWF will work with stakeholders to develop specialized apps and programs that condition the data specifically to a certain sector. User engagement will happen through decision-support tools that help stakeholders run through different planning scenarios and see how those decisions ultimately affect water resources.

"We will be conducting simulations where we examine

various scenarios for water supply, use, and management to suggest how some of the negativities of change could be mitigated. This allows us to explore various adaptation strategies for changing water resources under climate

change," Pomeroy said.

"We need to look at innovative solutions that will help us adapt to climate variability. For example, in California, they are considering storing more groundwater as a means to sustain water demand for irrigation with a more variable supply from the mountains. They are finding they can store much more groundwater compared to surface water."

Over the next seven years, GWF will dramatically improve Canada's resiliency to floods and droughts, increase the sustainability of water resources, and, perhaps most importantly, place water protection tools and information directly into the hands of stakeholders. **wc**

Meagan Hinthier is a communications specialist with the Global Institute for Water Security and the School of Environment and Sustainability at the University of Saskatchewan in Saskatoon.

We need to look at innovative solutions that will help us adapt to climate variability.

climate, and companies need to know that risk before they invest further in these projects," he explained.

GWF will have agreements with municipalities and others to make the data gathered widely available and



Hong Kong skyline at twilight.



Steel factory industry scene in China.



Chasing the Dragon

The potential for Canadian trade in China is tremendous, but a measured approach with well-matched partners is necessary.

BY JEFF SANFORD

THE GLOBAL TRADE ENVIRONMENT is undergoing an unexpected radical period of change. One of the first acts of the Trump White House was to remove the U.S. from the Trans-Pacific Partnership. With the U.S. out, China, which was not part of the original negotiations, stepped into the gap. This past March, the signatories of the TPP met in Vina del Mar, Chile, and Canadian officials, just months after signing the deal, found themselves renegotiating the TPP with China rather than the U.S. China's trade advances could lead to enormous opportunities for Canada's water cleantech sector.

Peak demand

China's domestic water crisis is no secret. The country is undergoing an

unprecedented economic evolution. Millions of former peasants have taken on a middle-class lifestyle. The effect on the country's water resources has been dramatic. The amount of wastewater discharged in China increased from an astounding 41.5 billion tonnes in 2000 to 68.5 billion tonnes in 2012. Not surprisingly, the country's watersheds are under pressure, with at least one-third of China's lakes and rivers unfit for human consumption, and 73 per cent of the watersheds facing medium-to-high pollution levels. Beyond that, surface waters are also subject to the runoff of fertilizers, pesticides, fungicides, and livestock waste in addition to point source pollution from textile, paper, and chemical manufacturing.

To address these challenges, the government has implemented an action plan that will divert a mighty flow of cash—US\$320 billion so far—into the water cleantech sector. If a free trade agreement can be struck between the Canadian and Chinese governments, it seems Canadian water companies are on course to tap into a huge market.

Wei Feng is North American regional director for Umore Consulting, a Chinese management consulting firm that specializes in facilitating cross-border partnerships in the cleantech sector. He discussed the new focus of the Chinese government on water issues. "According to China's 13th five-year plan, the nation is transforming from labour-intensive to technology- and knowledge-intensive, there is a huge demand for technologies," said Feng.

In the water sector, China's approach has focused on two areas of need: decentralized municipal wastewater treatment for rural households and large-scale watershed remediation due to heavy pollution of the rivers. According to Feng, projects typically take the form of a public-private partnership (P3), so companies can retain ownership stakes in projects over the entire lifecycle. "For a typical decentralized wastewater treatment project in a rural area, the government would package a few villages together and would tell the

Credit: Government of China



A young man covers his face as he walks to work near Chao Lake, China. The smell due to algae is hardly bearable in this area.

Credit: Qu Lianrong
Credit: Government of China

A red tide blows into Xiamen in China's Fujian Province. Red tides are nutrient-fueled blooms of phytoplankton that discolour water with their pigments. Several species are known to have toxic effects on marine life and pose a risk to human health through the consumption of exposed shellfish.

Credit: Government of China



Geese sully their feathers in green algae in Chao Lake, China in the Miao Wei village area. Photo taken in 2008.

engineering firms to cover the geological area. If you can provide a design to serve the individual villages in these three towns—say, a wastewater collection and treatment system for 1,000 households, and you can own and operate the facility, the government can pay you over 20 years,” he said. “Many state-owned environmental EPCs got orders over \$100 million in the last two years, but

they do not have a reliable technology nor a team to deliver the project, so they are seeking for collaboration with foreign companies.”

Business can be done through direct sales, licensing, or in conjunction with a [Chinese] partner. But as proof of feasibility, Feng said that the partner will typically require a company to set up a small-scale demonstration site

to prove the technology works in local conditions.

Céline Bak, president of Analytica Advisors, an Ottawa-based company that monitors and reports on Canada’s cleantech sector, agreed that there are huge opportunities in China. “There are literally trillions of dollars worth of opportunities in terms of the remediation challenges,” she said. However, Bak also warned that foreign companies need to be cautious. “You need to have a sophisticated partnering strategy. [...] The rule of law is improving in China, but it’s still tough to take people to court. You still need to be aware of where intellectual property (IP) is established, and where it will be housed. The need for a local partnership that can take a complementary approach to IP is important.”

Bak recommended that firms take advantage of the services offered by trade commissioners in Canadian embassies and consulates. “Trade commissioner services in China can provide local expertise. They’ll have locally-engaged sources. They will know the academic institutions and institutes to go through to get certification on project results,” said Bak. “So those offices are a good place to start. They are a great resource.”

Success vs. failure

Dr. Brent Wootton, director of Fleming College’s Centre for Alternative Wastewater Treatment, has been to China a dozen times as both a research consultant and as a part of government-run trade missions. He cautioned that those hoping to go to the Middle Kingdom temper excitement with a deeply pragmatic business plan.

“China has a history of bringing over westerners to help advise them on stuff. That’s a long tradition,” said Wootton. “There is an infinite number of ways a company can fail in China. You can be wine and dined and courted on trade missions when big leaders are involved. It can be very seductive.” Sometimes the initial excitement has trumped practical business decision-making. “It’s like some of these companies come up with a plan and then they throw it out the window.”



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The most common mistake said Wootton is that companies project their own culture onto the foreign market. "Executives will say that our attitude of cultural tolerance of difference is all that is required. 'We're Canadian. We're accepting and multi-cultural, so we're comfortable.' And while that is important, that's not enough. You have to have a pretty deep understanding of the culture," he said.

IP reservations

When it comes to identifying a business partner, business leaders should find a bonding model. "Creating solid dependencies is a good strategy. One example is to go into the market selling expertise and knowledge. Some say IP is the first concern. And companies will say, 'They promised me they won't steal IP.' But decide if the market is big enough that if you lose your IP it's not going to matter," said Wootton. Other companies will want to get paid up front in advance. "Go in saying, 'We're going to sell our product.' Understand that might put IP at risk. Maybe the model can be, 'They're going to make it. But they need to pay us to show them how to make it'. They're not going to make it without our expertise. Go down to that level of dependency."

That Canadian companies can be too protective of their IP is a notion Feng mentioned, as well. That Canadian companies can be too protective of their IP is a notion Feng mentioned, as well. "Many Canadian companies can be too protective of their intellectual property. [...] That attitude will stall your movement in the rapidly growing market in China. Our environmental market growth is very dependent on regulation

change; it only takes 2–5 years for a new market to establish from no players to fully saturate. Sometimes, you have to be willing to take a risk in exchange for the payoff."

Returning to the idea of a simple, pragmatic approach, Wootton suggested companies design a short, uncomplicated business plan. "Assume that you get two or three years of good business and that makes it worth it. That's what the pragmatic approach is about," he said. "Overly ambitious plans fall apart."

Another bit of advice he offered was to define exactly what it is each partner will do. "Create a sales strategy rubric of how you define success, and then really follow it. Ask specific questions. Formulate a test. Define the quality of sales leads and how a sales funnel will work. [...] and know how much money you can lose," he said. Wootton said that it is important that Canadian companies know when to get out of a business deal; too often, small companies make the mistake of sinking money into a transaction until it destroys them. "The ones that made it figured out the rules and parameters that determined success for them and stuck to that plan."

Still, for those that can figure this balance out, and learn to adapt to the Chinese market, the possibilities are attractive. Feng said, "There is a lot of money to be made for those who are willing to put in the time and effort." wc



Jeff Sanford is a Toronto-based freelance journalist.

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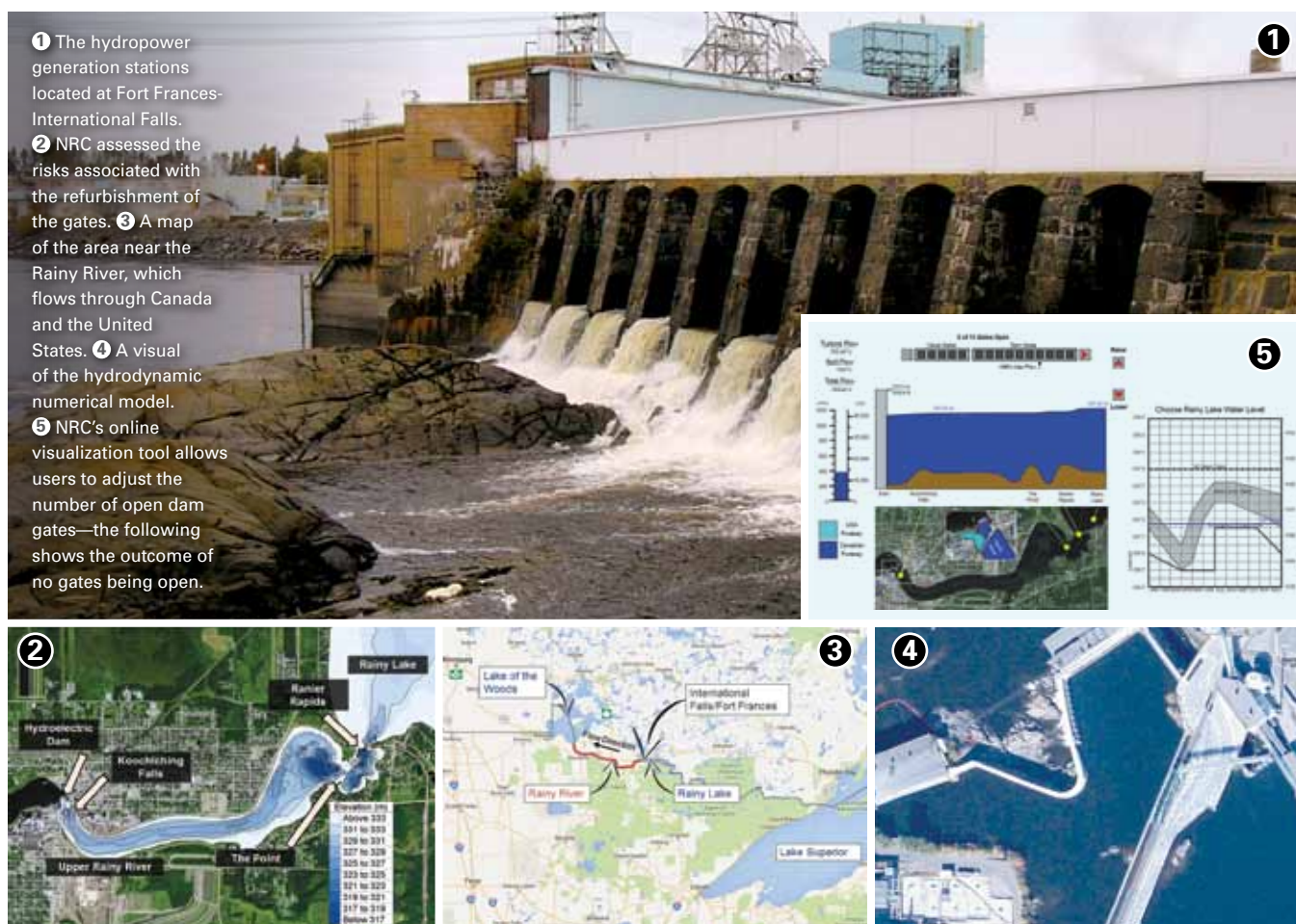
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Model Decisions

Along with its partners, the NRC is helping communities better prepare for floods and droughts. BY JULIEN COUSINEAU

ON DECEMBER 14, 2010, over 160 millimetres of rain poured down onto south and mid-western New Brunswick. More than 60 families lost their homes, others were displaced, and more than 120 roads were closed. It wasn't the first flood to affect the town of St-George following the construction of a dam on the Magaguadavic River in the early 1900s. It was the most expensive natural disaster in the province's history. The disaster caused residents to question how the dam's operation might have impacted upstream water levels and whether various hydraulic conditions might have contributed to the flood.

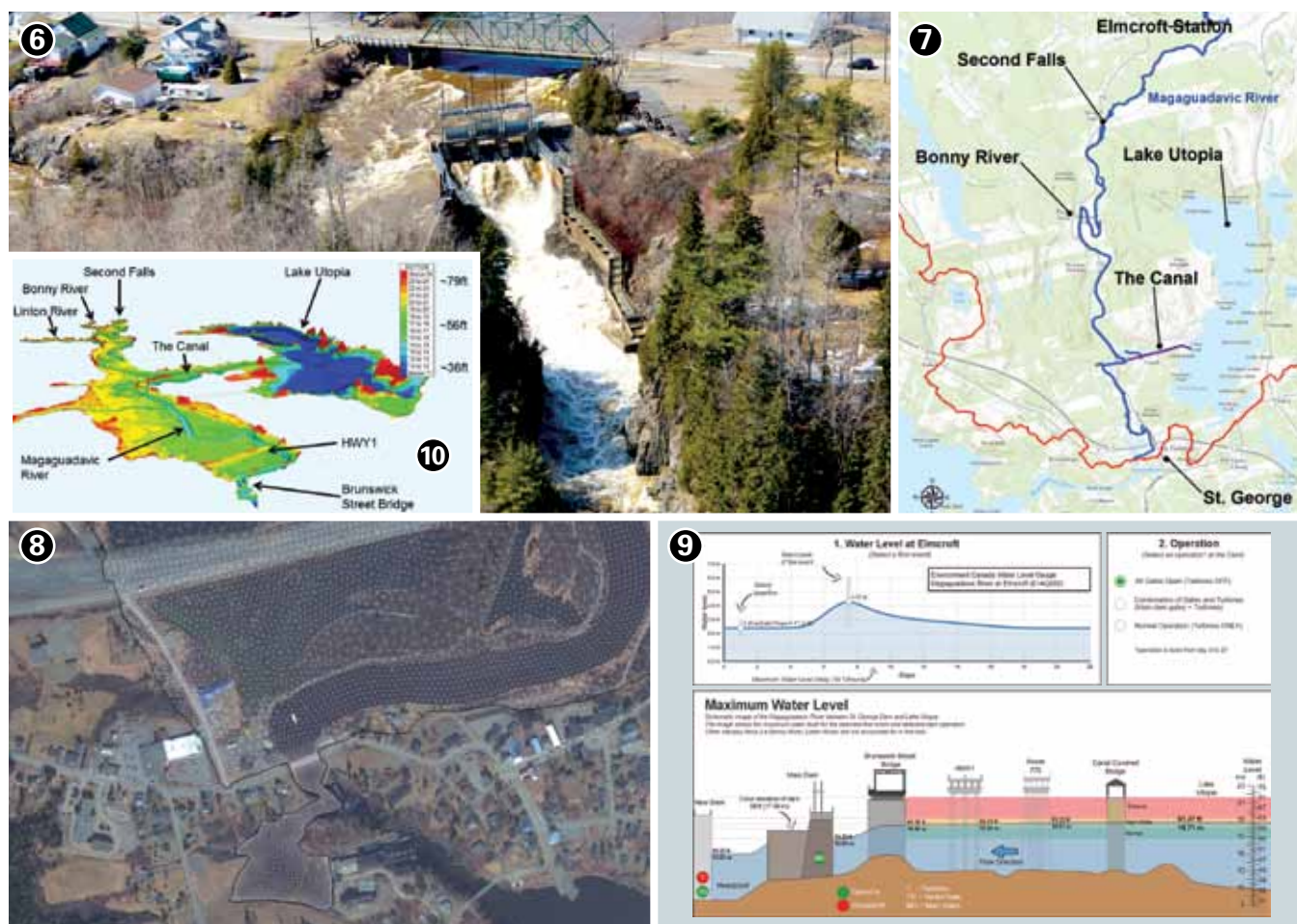
The dam's operator, J.D. Irving,

had originally commissioned a one-dimensional (1D) numerical modelling study to characterize the hydraulics of the river-dam system. In 2016, they decided to augment the study by commissioning the National Research Council (NRC) to investigate the relationship between dam operations and upstream water levels in the Magaguadavic River. So, the NRC's experts developed a detailed 2D hydrodynamic model of the river system to assist the dam operators in optimizing their operation protocols. Drawing on their history of developing online visualization tools, the NRC created a tool that can be used by the watershed's community members to predict water

levels for a range of critical scenarios, bridging the gap between technical expertise and public understanding

A history of water management tools

For years, the NRC's experts have been working closely with the water resources industry to develop online visualization tools. Two of these online tools are being used to address issues for the International Rainy-Lake of the Woods Watershed Board under the auspices of the International Joint Commission. Two of the dam operators that have taken advantage of these types of watershed planning tools are the St. George Dam on the Magaguadavic



⑥ The St. George Dam, N.B. ⑦ A map of the St. George area. ⑧ A numerical model was used to simulate the hydrodynamics (the movement of water) in the Magaguadavic River and the operations of the dam. TELEMAC-2D (T2D) solver was used to solve the flow equations using a mesh of ~300,000 triangular-shaped elements. ⑨ NRC's online interactive tool explains the relationship between the dam operations and the river system—the following example showing a peak flow event of 4.30 m with an all gates open scenario. ⑩ The bathymetry and topographic data of the St. George area.

River and the Fort Frances-International Falls Dam on the Rainy River.

Located in Fort Frances, Ont. on the Rainy River, the Fort Frances International hydroelectric dam was built in the early 1900s straddling the border between Ontario, Canada and Minnesota, USA. The river is a shared resource between the two jurisdictions for hydropower generation, water supply, navigation, recreation, and tourism. The IJC has been managing this relationship since 1912, and in 1917, the IJC recommended the creation of control boards for the level, range, and mode of the lake's operation.

In the past, flooding was a cause for concern in the surrounding communities of Fort-Frances. Community members believed that the dam was affecting the water levels upstream and having an impact

of the likelihood of flooding. In response to their concerns, the NRC was commissioned to examine the relationship between dam operations (i.e. the number of gates open) and the river and lake levels. The resulting studies showed that the dam had no control over the given discharge. It was natural constrictions upstream of the dam that were causing the river to flood. And although the results should have dispelled blame from the dam, the engineering calculations and figures were too difficult for the general public to understand. As such, an online visualization tool was developed. The animated tool allowed the public to play with simulations—adjusting the number of open dam gates—to see for themselves how the water level downstream of the dam, where they feared that flooding would result.

Making data easy to understand and implement

Both NRC tools are now helping local communities to better understand the relationship between dam operations and flows and levels throughout the river system. It's also helping them understand the flood-preventing limitations of dams. These interactive tools demonstrate the value of making research results accessible to citizens and can be easily replicated to address public concern in other situations where the stakeholders lack sufficient technical understanding. WC



Julien Cousineau is a research engineer at National Research Council of Canada.



Coastal Action

A strategy to unify Canada's coastal communities as they increase preparedness and resilience to climate change.

BY JIMENA EYZAGUIRRE, MARC NELITZ, NATASCIA TAMBURELLO, COLLEEN CRANMER, AND ERICA OLSON.

WE HAVE COME A LONG WAY in understanding how the impacts of climate change affect Canada's coasts and what to do about them. In 2004, the Government of Canada released an assessment report summarizing the latest science on climate change impacts and adaptation. When it came to coastal areas, impacts from sea level rise were prominent. The report surmised that adaptation to climate change would follow known strategies: protect, accommodate, and retreat. Recognizing that many of the physical and socio-economic impacts of climate change will

hit coasts hardest, Natural Resources Canada's 2016 science assessment of impacts and adaptation focused on Canada's marine coasts.

The Coastal Management Working Group of the Adaptation Platform and ESSA Technologies built on the 2016 assessment and completed a comprehensive review of the state of adaptation across Canada's three marine coasts and the region surrounding the Great Lakes and St. Lawrence River. Capturing over five years of activities, the 2017 review demonstrates that the range of climate change impacts observed or

expected are wide ranging, as are the actions necessary to adapt.

Identifying vulnerabilities

NRCan's assessment has acknowledged that the implications of climate change will be experienced in a diversity of ways across Canada. Although the vulnerabilities and opportunities of climate change vary regionally, some similarities across coastlines are apparent. Most coastal locations in Canada are experiencing an upward trend in temperatures and precipitation, although climate projections are variable.



Waves burst over a seawall near White Rock, B.C. in March 2016. Storm surges like this, caused by an abnormal rise of sea water due to storms, are one of the vulnerabilities identified in Natural Resources Canada's 2016 science assessment of impacts and adaptation focused on Canada's marine coasts.



SmartICE is a community-academic-government-industry partnership. Together, its partners are developing a near-realtime sea-ice monitoring and information-sharing system that blends Inuit Traditional Knowledge with state-of-the-art technology.



A screenshot from the Coastal Erosion Database.

These warming temperatures and shifts in precipitation patterns are leading to a cascade of biophysical, social, and economic impacts. Community infrastructure is at risk from increasing frequency and/or severity of extreme

Much of the action required to adapt in Canada's coastal regions remains in the research, assessment, and planning stages.

weather events, coastal flooding, erosion, and sea level rise. Warming water temperatures, changes in water quality, and acidification will affect the health, productivity, and habitats of wild and

cultured fish and shellfish resources. In turn, shifts in species' distribution will affect commercial and subsistence harvests and promote the spread of invasive species. Changes in the extent, thickness, concentration, and duration

of sea and lake ice will affect coastal activity and navigation, which may open up new opportunities in fishing, tourism, shipping, oil and gas, and mining. Conversely, the traditional livelihoods of small coastal communities could suffer from a decline in health, quantities of local species, and natural resources sensitive to changes in climate.

Despite these changes, much of the action required to adapt in Canada's coastal regions remains in the research, assessment, and planning stages. Still, there are many best practices that could be used to inform future actions to address vulnerabilities, and there are a number of creative and innovative approaches underway.

Visualization and communications tools

One of the common challenges of developing coastal community adaptation plans is communicating known information about vulnerabilities and their impacts to those in the community. Interactive visualization tools have a growing role in communicating about coastal

Map Legends



Most coastal locations in Canada are experiencing an upward trend in temperatures and precipitation, although climate projections are variable. These warming temperatures and shifts in precipitation patterns are leading to a cascade of biophysical, social, and economic impacts. This figure shows the documented types of coastal climate change impacts and actions to adapt in coastal Canada.

hazards exacerbated by climate change, such as erosion, and supporting land-use decisions. One example of an effective use of such a tool comes from the Government of New Brunswick, which has developed a web portal that includes a free interactive mapping tool

development near coastal areas and provides an updated snapshot of specific areas of interest.

A common challenge for coastal communities in the Arctic is the fact that freezing patterns are changing rapidly. Traditional knowledge, which

in the past has kept the residents of Nunatsiavut safe while travelling across the ice, is no longer as useful for predicting current and future environmental conditions. In

response to the need for new knowledge on changing ice conditions and to augment Inuit knowledge, the Sea-ice

Monitoring and Real-Time Information for Coastal Environments (SmartICE) program has partnered with Indigenous communities to collect sea-ice data to plan safer travel routes when the ice is freezing and thawing. Community members manage the data collected and create maps, so information is available in real-time using apps and social media. SmartICE pilot programs near Nain, Nunatsiavut (northern Labrador), and Pond Inlet, Nunavut, have helped community members and industry make decisions on sea-ice travel and shipping. The potential to expand SmartICE beyond its current pilot phase could involve selling data to shipping and mining industries through a social-enterprise model.

A common challenge in the Arctic is the fact that freezing patterns are changing rapidly.

to explore coastal erosion data. Access to spatial data through the GeoNB portal assists those who are planning

Strengthening coastal preparedness and resilience

Adapting to climate change is a process with no clear end point. The NRCan and ESSA review of actions that are being taken highlights some important progress made by affected communities and governments. And yet, it is clear that additional actions are needed. The authors offer three recommendations to strengthen future approaches:

1 Clarifying the problem

Reasons for adapting to climate change are varied. Adaptation can contribute to productive coastal ecosystems, resilient coastal development, healthy coastal people and communities, and strong coastal livelihoods and economies. At the same time, climate change impacts are rarely the only challenges affecting coastal communities. For adaptation activities to be effective, communities, governments, and industry need to specify their purpose, explicitly

acknowledge differences in how the problem is defined, and plan accordingly.

2 Building on emerging good practice

The experiences documented through this assessment that effective adaptation plans should include (i) programs and measures developed through collaboration and coordination mixing local actions with government leadership, (ii) widespread access to data, information, and tools of consistent types and quality, generated with users in mind, and (iii) the use of economics to make the case for building resilience in the first place.

3 Rebalancing government support for coastal adaptation

Governments have invested significantly in generating and sharing knowledge about climate projections, impacts, risks, and adaptation options as a way to encourage community and industry action. Tackling persistent barriers to planning for climate

change will require expanding the policy toolbox to include a mix of information, incentives, market mechanisms, disincentives, and regulations. wc



Jimena Eyzaguirre is a senior climate adaptation specialist, Marc Nelitz is a senior systems ecologist, Nataschia Tamburello and Erica Olson are systems ecologists, and Colleen Cranmer is a research assistant at ESSA Technologies Ltd.



Request a copy of the full report, **Adaptation Platform Coastal Management Working Group State of Play Report 2017**, at nrcan.adaptation.nrcan@canada.ca

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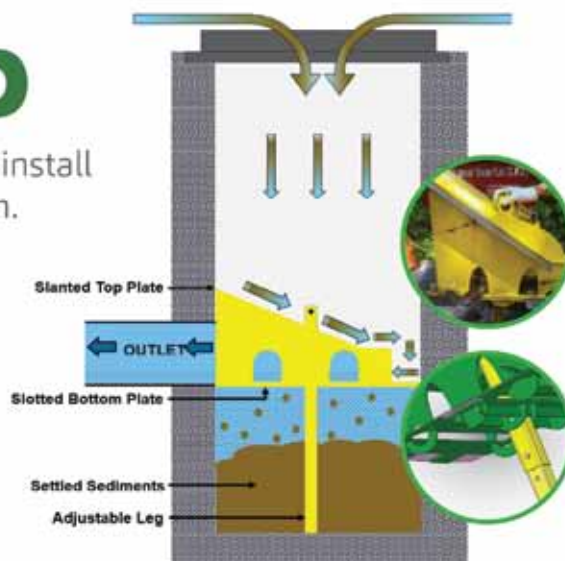
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The Canadian Water Research Society partnered with Gleneagles Elementary School and Jumpstart Preschool in West Vancouver, B.C. to educate the community about stormwater issues. Three teachers, two CWRS members, and a handful of volunteers took 25 children out to place yellow fish decals on nearby unmarked storm drains.



RBC employees participate in RBC Blue Water activations created to plant seedlings and create awareness about how to protect the local water they love.



RBC employees participate in Blue Water Makeovers helping clean up the shorelines near in areas where they live and work.

Blue Economy

RBC's landmark Blue Water Project has reached its ten-year mark—with much to celebrate.

BY KATHERINE BALPATACKY

WHEN THE ROYAL BANK OF CANADA launched its Blue Water Project in 2007, it is unlikely that they could have foreseen the transformational effects the program would have on water resources. But the vision to inject funds—now totalling \$49 million to charities and \$8.8 million to universities worldwide—has done nothing short of that.

Though the stated objectives to “protect water and restore urban waterways” and “help foster a culture of water stewardship,” were broad, the breadth and sophistication of the investments have enabled many water programs, policy initiatives, leaders, and partnerships to flourish in ways that would otherwise not have been possible. The Blue Water Project has invested in water with a holistic and long-term view, which is very rare in the Canadian funding landscape and is also critical for solving water challenges.

Merrel-Ann Phare, a lawyer and the executive director of the Centre for Indigenous Environmental Resources (CIER) said, “The things that they were funding spoke to the significance of the issues and yet, I remember thinking and wondering if anybody else could do this. It felt to me that this was an unusual space for a bank to be in.”

Phare was part of the original advisory council of water experts that was assembled by RBC to advise on the program. “RBC was very willing to move away from just the bricks and mortar kinds of projects into the ones that were going to be a little more difficult, but were potentially much more lasting in their impact.”

One such investment was with the government of the Northwest Territories’ water strategy, Northern Voices, Northern Waters. It was the first strategy in Canada, and possibly the world, that developed ecosystem-based objectives and thresholds that were set by working government-to-government with First Nations. Though RBC had no part in the decision-making process, they provided capacity for the meetings to occur and for the word to spread the word across Canada. “They helped to create greater

awareness about how innovative the strategy is and Canada-wide support for it,” Phare said. The GNWT strategy would later become a fundamental tool in bi-lateral negotiations with British Columbia and Alberta regarding the Mackenzie River Basin.

Breadth and depth

It’s a common perception that water projects “aren’t sexy.” As well, water issues are often considered wicked problems, because of their complexity and the shifting nature of human values that determine what solutions are desired. Water monitoring data, sanitation, water literacy, First Nations water rights, the water-energy-food security nexus—these are all contentious and beastly problems. And most corporations steer clear of them, unless they are directly implicated. However, RBC recognized that water risks touch upon all aspects of their business. They are getting ahead of the problems with things like programs to develop conservation plans to reduce

pollution with farmers, skills development for First Nations water operators and support of other lenders and catalysts with a strong reputation, before most other financial institutions were thinking about these issues.

Richard Kyle Paisley, the director of Global Transboundary International Waters Governance Initiative at the University of British Columbia was the recipient of RBC funds for a project that worked with tribes and First Nations in Canada and the U.S. on the governance of the Columbia River. Paisley said, “If I may quote Baba Dioum, in the end we will conserve only what we love; we will love only what we understand; and we will understand only what we are taught. It’s important that somebody be doing this work [...] and of course, you can’t do anything without resources.” He noted, “We don’t have the tradition of philanthropy in Canada that they have in the U.S. We tend to think that everything is the government’s job.” The advantage

of the RBC funds is that they didn’t change course because of a change in leadership, which is often the case with government programs. That said, given that the ten-year project has reached its tenth year, RBC will be assessing the future direction of the program.

“There has been a hard line where foundations and ENGOs don’t do government business and government doesn’t let anybody get involved in their business, but I think with water, it’s an impossible wall. It limits what you can accomplish,” said Phare. “I think that RBC saw that. And while they still had some discomfort on how much to weigh in on policy-related issues, they took a really intelligent, brave risk in saying that we are going to forge into some really important issues. They are one of only a few funders that has ever thought of doing something like this.” WC

Katherine Balpataky is Water Canada’s editor.

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Green, the Colour of Resilience

The wisdom of green infrastructure for Manitoba's future.

BY HANK VENEMA

AS THE MANITOBA GOVERNMENT contemplates the shape and form of its carbon pricing and green plan, heeding the words of perhaps our greatest public intellectual might be prudent.

"We shape the tools then the tools shape us," said Marshal McLuhan, the Kelvin High School and University of Manitoba alumnus and eminent cultural theorist. He meant that the tools we create can be very useful, but still carry unintended negative consequences, so

the tool-maker's foresight and breadth of vision matter mightily.

McLuhan's reign—when he held court at his Centre for Culture and Technology at the University of Toronto from the early 1950s until 1979—coincided with mass consumption of automobiles and television. His observations on how these technologies were re-shaping society, the environment, and especially our psychology were profound. In Manitoba, it's been arguably the surveyor's rod and

the drainage dredge that have proved to be the most impactful technologies. The Dominion Land Survey (DLS), the largest integrated survey system in the world, began in 1871 to promote settlement via a quarter-section homesteading model. University of Alberta environmental historian (and former Winnipegger) Shannon Stunden Bower has documented the broader cultural and environmental implications of DLS—a settler culture devoted to an ethos of land improvement



This water retention site is used to reduce downstream flooding and capture nutrients.



A tractor harvests cattails in Pelly's Lake, Winnipeg. The cattails capture nutrients from water and soil, as well as carbon from the air, providing ecosystem services of bioremediation, habitat renewal, and GHG reductions. The bales of cattail hay can later be sold and used as a solid fuel source for heat production in solid fuel burners.



The IISD team uses a whole plant chambers to measure total GHG emissions, or cumulative greenhouse gases.

by clearing forest and bush and draining marsh and wetlands by constructing/developing/implementing/building an ever-more comprehensive drainage

the unintended consequences and vulnerabilities of the infrastructure networks that have grown up alongside the DLS are also occasionally exposed.

The logic for pricing carbon is that every jurisdiction must share the burden of reducing global climate risk. How carbon revenues should be optimally re-invested is an open question in environmental economics and the subject of recent public consultations.

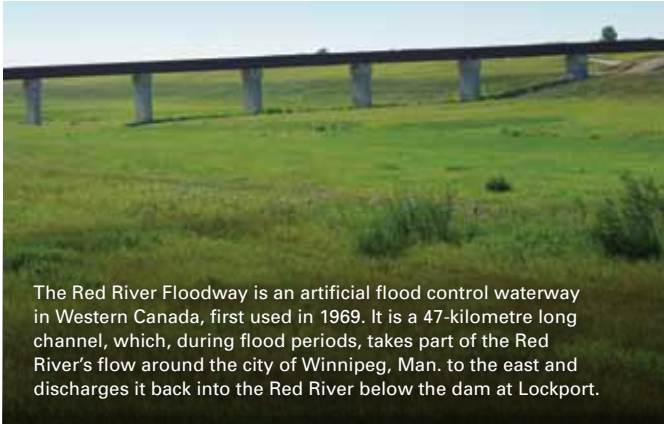
network. Of course, the benefits of DLS must be acknowledged. Agriculture has flourished in Manitoba for almost 150 years and remains a fundamental pillar of Manitoba's economy. However,

In the aftermath of the 1930s dust bowl, the Prairie Farm Rehabilitation Administration was established by the federal government to repair much of the damage wrought, notably by planting

trees and by building small-scale water retention projects peppered across all three Prairie provinces. More recently, the 2011 Assiniboine River flood revealed other vulnerabilities—over \$1 billion dollars of damage to rural infrastructure. Section roads, highways, culverts, and bridges were blown apart from a climate shock on a heavily DLS modified landscape that was not designed to store water. And then, within a few months, much of southern Manitoba experienced an agricultural drought. Some sections of land were under both flood and drought insurance claims that year, and we are still dealing with the catastrophic economic impacts of 2011.

Financing resilience

Though 2011 was declared a one-in-300-year event at the time, that's very unlikely to be the case. The best available climate



The Red River Floodway is an artificial flood control waterway in Western Canada, first used in 1969. It is a 47-kilometre long channel, which, during flood periods, takes part of the Red River's flow around the city of Winnipeg, Man. to the east and discharges it back into the Red River below the dam at Lockport.



The Alternative Land Use Services (ALUS) program worked with a farmer in the Little Saskatchewan River Conservation District in Man. to establish a buffer zone between the wetland and the cropped land.



A water retention pond on Carl Classen's farm in La Salle Redboine Conservation District collects water from the tile drain outlets. Such ponds can help to keep water and nutrients on the land while reducing water stress during times of drought.

science for the region, assembled by the Prairie Climate Atlas, projects a much higher frequency oscillation between flood and drought conditions. Deeper ditches and more tile drainage do not take these risks off the table; they merely transmit flood risk downstream and largely exacerbate drought risk.

The provincial sales tax increase was justified as necessary to construct the infrastructure needed to de-risk us from more 2011-type events. Of the major infrastructure projects in the queue for federal and provincial co-funding, none take a nickel of 2011-type climate risk off the table, nor do they address the converse risk—drought. The climate and infrastructure policy narratives in Manitoba should be better connected. The logic for pricing carbon is that every jurisdiction must share the burden of reducing global climate risk. How carbon

revenues should be optimally re-invested is an open question in environmental economics and the subject of recent public consultations. The logic for re-investing at least part of our carbon revenues in our own risk reduction should be pretty obvious, particularly when it can leverage infrastructure investment with high economic multipliers that broaden the tax base.

What solutions look like

International capital markets that have identified the problem are looking for solutions, and Manitoba needs to be at the table. In April, Globe Capital hosted a conference in Toronto attended by four federal cabinet

ministers. The conference addressed how to unlock an estimated \$90 trillion dollars in global investment to fund infrastructure that de-carbonizes and climate-proof our

In Manitoba, we're increasingly confident that we know what the solutions look like—they're decentralized and truly green infrastructure.

economies. In Manitoba, we're increasingly confident that we know what the solutions look like—they're decentralized and truly green infrastructure.

Since 2012, the International Institute for Sustainable Development has collaborated with the LaSalle-Redboine Conservation District to manage a multi-functional water retention project known as Pelly's Lake near Holland, Man. Originally conceived to mitigate flood and drought risk, research led by IISD's Dr. Richard Grosshans demonstrated harvesting emergent plants for high-value biomaterial and bioenergy and to intercept and recycle phosphorus that would otherwise foul Lake Winnipeg. Richard's team also confirmed that harvesting from the site enhances its ability to absorb greenhouse gases, while improving habitat conditions. Pelly's Lake creates a stack of risk reduction, economic, and environmental benefits that make it a compelling investment. Moreover, it achieves all the environmental objectives the Manitoba Government has prioritized through the proposed Alternative Land Use Services (ALUS) program. The only issue is that hundreds of Pelly's Lakes will be needed across the province. But they're out there and will only occupy a small fraction of the agricultural landscape, turning some of our least productive land into super-productive risk management nodes. There are no more Winnipeg Floodways to build, and even if there were, such conventional infrastructure spends wouldn't provide the co-benefits that make the green infrastructure and cleantech investment option the best one for long-term economic development.

Fundamentally, climate policy and infrastructure policy should be linked, and the jurisdictions that do so with foresight, sophistication, and resilience in mind will (sustainably) rocket to the top of the investment queue. Let's shape these tools wisely, for they will shape us for the century to come. WC



Henry "Hank" Venema is the director of planning with the Prairie Climate Centre and the International Institute for Sustainable Development (IISD). Venema is the chair of the 2017 Canadian Water Summit.



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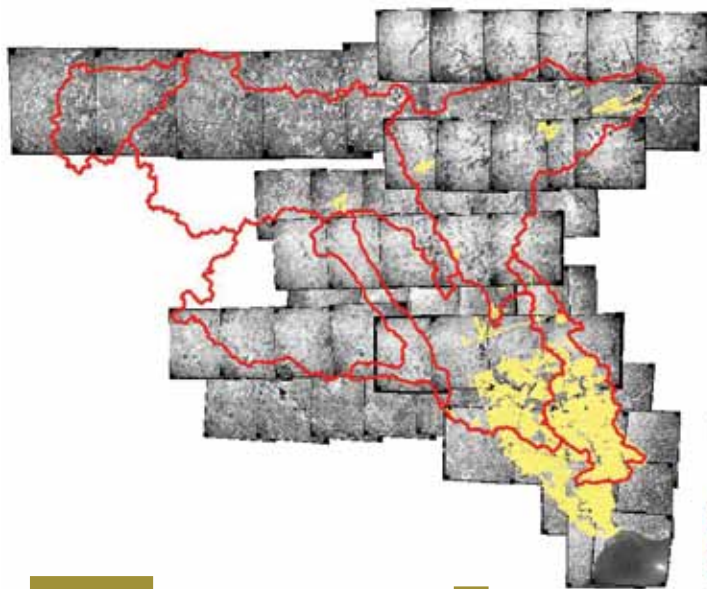
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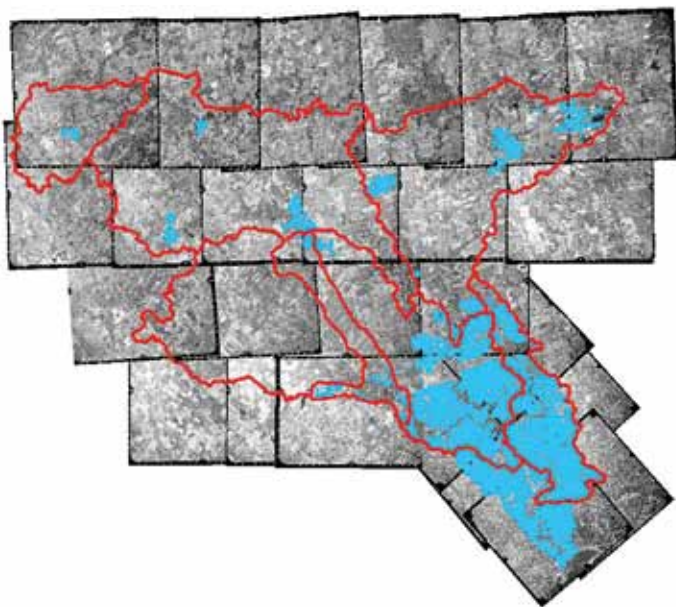
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Left: The Humber watershed was four per cent urban in 1969.

Bottom: The Humber watershed was nine per cent urban in 1988.



All credits: Mary Trudeau, 2016

Fast Flows

Climate change is not the whole urban story. BY MARY TRUDEAU

CHANGING ATMOSPHERIC TEMPERATURES

are forcing changes in the water cycle—higher evaporation rates, more frequent and intense rainstorms, and less precipitation as snow. Together these changes mean precipitation patterns, and the corresponding flow responses in rivers, have become less predictable. In the language of water science, there has been a loss of hydrologic stationarity due to climate change. Traditionally, engineered urban stormwater infrastructure has been designed on the basis of previously predictive intensity-duration-frequency (IDF) precipitation statistics. The jury is still out on what should replace the IDF curves of the past to design the stormwater infrastructure of the future.

Urban influence

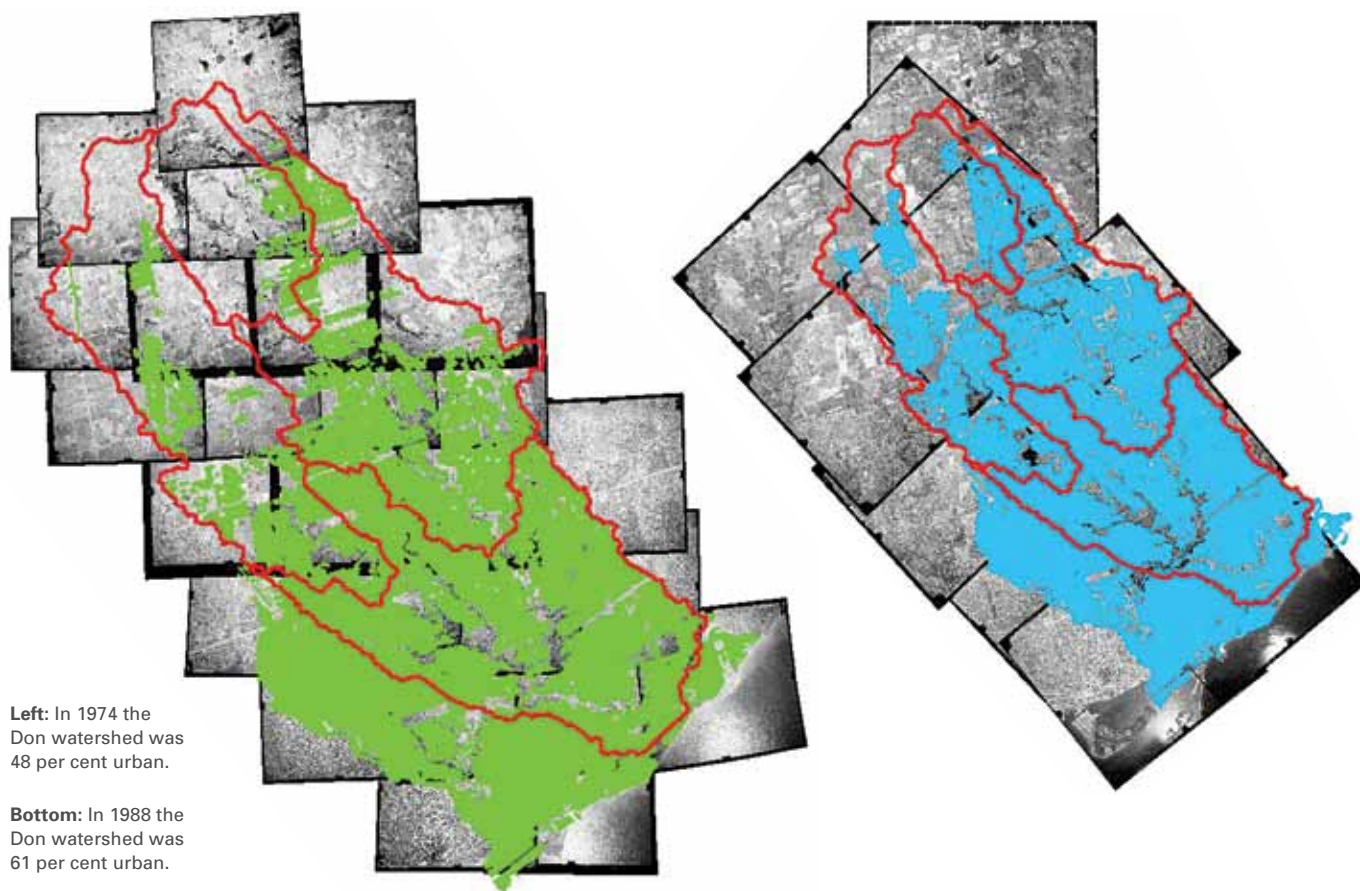
Long before climate change was recognized as a formidable agent of hydrologic change, urbanization

was incrementally changing flows in urbanizing watersheds. Over a 42-year period between 1969 and 2010, during the rain-fed season after snow melt and before freeze-up, total flows in Toronto's Don River (at Todmorden) and Humber River (at Weston) increased about 45 per cent. During this period, there were no statistically detectable trends in rainfall*. We can't blame climate change for this one.

Why the dramatic increase in volume? Stated simply, as urban Toronto expanded, the rainwater had nowhere else to go but straight to the river. Paved roads and parking lots, storm sewers designed for the purpose, and drains from impervious roofs transfer water very efficiently from the sky straight into watercourses. Nature, on the other hand, is not as efficient with its water flows. In a natural watershed, many raindrops never make it to the ground. Instead,

they are taken up on leaf surfaces and by thirsty vegetation, to be released later through evapotranspiration. Also, the soil around healthy vegetation has the capacity to temporarily hold water in air spaces around root systems. These temporary storage pockets gradually transfer water to longer-term storage reservoirs within groundwater aquifers, where it is cleaned by natural filtration, kept cool, and eventually released into watercourses as baseflow to support aquatic life. However, impervious paved surfaces block the access of rain to soil layers. In city environments, the loss of vegetation also comes with an associated loss of water storage capacity. Overall, city surfaces hold less water and transfer less water to groundwater aquifers—changes that come with compromised benefits of a natural water cycle.

With these changes to the natural flow regime, peak flows have increased



steadily between 1969 and 2010, and the variability of flows doubled in the Don and were five times higher in the Humber. Ironically, storm sewer systems intended to reduce flooding risk can contribute to flood risk if the cumulative downstream effects are not properly considered.

Stormwater system design has changed dramatically since 1969, but the embedded historic infrastructure is still a dominant feature of older urban

others are viewed as untested, some may have higher capital investment costs or unknown maintenance requirements. No single solution will solve the dilemma of changed urban flow patterns, but LID is one of the tools in the box.

While climate change has been tagged for the loss of hydrologic stationarity, in reality, urbanizing landscapes were already altering water flows. In watersheds that are expected to continue to urbanize, the effects of urbanization must be added to the effects of climate change. If they are not, it is possible that future flooding risk will be underestimated.

Climate change is not the whole urban water story: urbanization fundamentally changes watershed hydrology. It's time for an all-out effort to incorporate LID into new and existing neighbourhoods, concurrently with strategies to deal with increased peak flows from both climate-induced trends and highly efficient

engineered infrastructure. In a future with an altered water cycle, it will be essential to control the urbanization effect on hydrology. We can't control the weather, but we can—with political will—control land development and associated stormwater measures. **WC**

**This study was based on Environment Canada flow data, available in 15-minute increments and rainfall in one-hour increments, from 1969 to 2010 inclusive. To estimate the per cent urban area on a watershed basis, historic aerial photographs were purchased from Natural Resources Canada and digitized by GIS specialists at Carleton University. Literature sources were also available for some urban extent estimates. Results are published in the Journal of Hydrology.*

In a future with an altered water cycle, it will be essential to control the urbanization effect on hydrology.

areas. Currently, many battles are being waged across Canada to champion the implementation of low impact development (LID) stormwater measures, which are intended to mimic natural water storage processes. Much has been published about the merits of LID, but some measures take up developable land,

Mary Trudeau, P.Eng. is the principal with Envirings Inc. She recently completed a PhD at Carleton University related to hydrology and aquatic biodiversity in urbanizing watersheds in Ontario.

Grit removal is an essential element of preliminary treatment. When a digester gets overwhelmed with grit, it must be shut down for manual removal, which is expensive and time consuming.

True Grit

Applying science to improve adaptation strategies related to climate change and grit removal. BY MARCIA SHERONY

TREATMENT PLANT operators know from bitter experience that wastewater grit can be an unseen menace that stalks their downstream processes and hinders their ability to optimize operational effectiveness. Applying robust science is the only way to know how grit behaves in wastewater and thereby design an effective removal system. Accurately predicting grit loads and particle characteristics in the incoming flow would be challenging enough for any operator, even without weather and soil fluctuations. As the impacts of climate change evolve, it will become ever more important to understanding and anticipate grit behavior to ensure resilience in water treatment.

In Calgary, grit removal is a

particularly important aspect of the treatment process because of the city's location and topography. First, the city is situated on the confluence of the Bow and Elbow Rivers. Warm, dry summers produce wind-blown dust and sand. Adding to the instability, the heavy ice and snow of Prairie winters are frequently interrupted by warm Chinook winds, resulting in rapid thaws that can leave the streets awash with runoff and sand used in winter road safety. As well, although much of Calgary's sewer system is sanitary sewer, significant portions of the old sewers are combined stormwater and sanitary systems. The confluence of raw sewage and highway runoff leads to high concentrations of grit in the city's wastewater.

The volume and concentrations of grit entering Calgary's sewer networks can reasonably be expected to increase with climate change, especially with intensifying periods of high rainfall. In dry weather too, grit settles in the sewers, grit particles get coated in organics and fats, oils, and grease (FOG), and are re-suspended at high flows. Our studies have shown that during these first flush conditions, when the flow rate increases fourfold, the grit load can rise by a factor of 40.

Grit characterization

Achieving a climate-resilient grit removal design starts with determining both the size distribution and composition of incoming grit particles to determine their

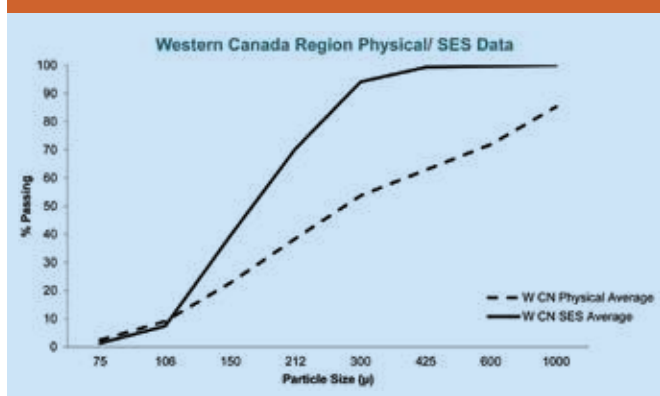


The grit removal system is suitable for pretreatment for membrane bioreactor and other advanced treatment processes.



The HeadCell grit removal system from Hydro International is based on the principles of advanced grit management.

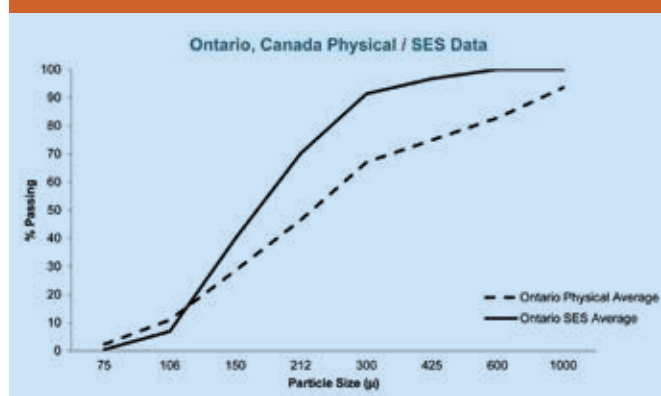
Western Canada Regional Grit Gradation



	% Passing								
	75	106	150	212	300	425	600	1000	
W Canada Physical Average	2.5	9.1	22.8	38.6	53.8	62.9	72.0	85.3	Physical
W Canada SES Average	1.3	7.4	39.5	70.4	94.1	99.3	99.7	100.0	SES

The above tables show the per cent of grit passing through various sieve sizes based on physical size (unshaded) and Sand Equivalent size (SES) (shaded). SES provides the settling velocity distribution of the grit particles.

Ontario, Canada Grit Gradation



	% Passing								
	75	106	150	212	300	425	600	1000	
Ontario Physical Average	2.3	11.0	28.5	46.6	67.0	74.9	82.8	93.5	Physical
Ontario SES Average	0.5	6.9	39.9	70.3	91.3	96.7	100.0	100.0	SES

behaviour. Unfortunately, conventional design standards falsely target grit that is larger than 210 microns and the particles are assumed to be perfect spheres of silica sand with a 2.65 specific gravity (SG). In reality, grit particles are not spheres, and they do not settle as such. Most grit is smaller and lighter than the standard against which conventional equipment is designed, and grit is missed and passes downstream as a result. As well, the impacts of lighter materials such as soil, FOG, and organic matter that agglomerate around the grit are an important consideration.

To establish more easily comparable data, Hydro International has accumulated settling velocity data on grit from over 120 locations, and

converted the physical particle data to a Sand Equivalent Size (SES). This information was used to develop the regional North American Grit Gradation Data Sets—including for Ontario and Western Canada. With these data sets, Hydro International has provided a more reliable means of estimating settling velocity.

Of course, no two plants are ever the same, and so a grit characterization study is always highly recommended before embarking on a design. At the City of Calgary's Bonnybrook Wastewater Treatment Plant, the world's largest advanced grit management system was installed in 2015 to combat a range of climate-specific nuisance solids. The pre-design study found that the existing

grit system was removing only 26 to 29 per cent of the influent grit. Virtually all the influent grit had a settling velocity lower than a 212-micron sphere of silica sand, the conventional design point for which the original plant was designed. Drawing on this data, the new system was designed to meet both peak and normal flow specification of removing 95 per cent of all grit. Calgary is ready for the next flood and the grit that flows from extreme weather events. WC



Marcia Sherony is sales director with Hydro Americas Wastewater.



Planning to adapt to climate change? Initiatives, programs, tools, and guidelines to support your initiatives.

BY GUY FÉLIO

SEVERE WEATHER and climate uncertainty represent risks to the safety of engineered systems and the public in Canada and around the world. In this context, an increasing number of utilities and organizations that provide public services address climate change adaptation as part of our primary mandate—protection of the public interest, which includes life, health, property, economic interests, and the environment.

In recent years, many senior governments and municipalities have initiated climate change adaptation efforts, and so has the Canadian Water and Wastewater Association (CWWA) through its National Climate Change Committee. Established in 2012, the committee's mandate includes:

1 Monitoring the development of legislation and government programs in Canada (federally, provincially, and inter-provincially) related to climate change, and providing input to senior governments on the water and wastewater industry's perspectives (for example, the committee provided

feedback on behalf of the industry on the Federal Sustainable Development Strategy);

2 Presenting the key issues regarding climate change to Canadian municipalities by:

- Facilitating a national dialogue on the potential and expected impacts of climate change;
- Developing position papers pertaining to climate change impacts on water resources with an emphasis on municipal management of water; and
- Raising awareness and knowledge among Canadian municipalities on climate change issues and possible strategies to encourage them to take reasonable action by:

3 Developing a resource databank of relevant research, data, best practices, and links to related organizations and agencies; and

4 Coordinating relevant events, such as workshops and forums to share information, educate members, and encourage further dialogue.

CWWA works with other organizations that provide or support water and wastewater services in Canada. The initiatives and programs of these organizations will certainly help utilities in planning and implementing adaptation to future climate changes. For example, in February 2017, the Federation of Canadian Municipalities launched its Municipalities for Climate Innovation Program (MCIP), a five-year, \$75-million program funded by the federal government that helps municipalities prepare for, and adapt to, climate change, and to reduce emissions of greenhouse gases. The MCIP aims to maximize the impacts of new federal investments in municipal infrastructure.

In many instances, considerations of climate change impacts may not be considered in water or wastewater projects since acts, regulations, or standards may not require it. This landscape is, however, changing. For example, the Government of Ontario issued in August 2016 a draft guideline,

companion to the environmental assessment program's Codes of Practice that sets out the ministry's expectations for considering climate change in the preparation, execution, and documentation of environmental assessment studies and processes.

Other jurisdictions may have or plan to develop similar policies and guidelines.

For the practitioner, the question of climate change risks to the infrastructure used to provide water and wastewater services is therefore about the tools that can be used for this assessment.

At last year's National Conference in Toronto, the CWWA Climate Change Committee partnered with Engineers Canada to conduct a workshop on one of these tools: The Public Infrastructure Engineering Vulnerability Committee (PIEVC) protocol for the vulnerability assessment of infrastructure to climate change. The protocol was developed in 2007 and has been revised and revised over the last 10 years, mainly through lessons learned from the application of

this methodology to more than 40 risk assessments across Canada.

Considering climate change risks to potable water and wastewater services, and developing adaptation plans to support the resilience of Canadian communities, is therefore becoming within reach for many utilities. The committee continues to work with our members and stakeholders in support of programs to assist communities in developing their plans. The committee will also continue to advise on policy and regulatory frameworks, programs for technical staff, and to ensure those tasked with developing the plans have access to the necessary tools. WC



Guy Félio is a senior advisor for asset management solutions and infrastructure resilience at Stantec

Consulting Ltd. He is a member of the CWWA Climate Change Committee.

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JOHN
DICKERT

The Board of Directors of the Great Lakes and St. Lawrence Cities Initiative (Cities Initiative) has announced that **John Dickert** has been selected to lead the organization as the new president and CAO. Dickert will succeed David Ullrich. Ulrich will step down from his position this summer as executive director after fourteen years and will continue as a senior advisor to the Cities Initiative. Currently serving as the mayor of Racine, Wisconsin, Dickert brings decades of experience in local, state, and federal government relations, strategy, fundraising, and coalition building. He announced on March 27 that he would be stepping down as mayor after eight years of service to the city. "I am thrilled to step into this position with the Cities Initiative and work with a dynamic coalition of 128 other mayors to ensure the voice of local government is a part of Great Lakes and St. Lawrence decision making," said Dickert.

KULVINDER S.
DHILLON

Halifax Water has appointed Mr. **Kulvinder S. Dhillon**, MBA, P.Eng., FEC to the new position of dispute resolution officer (DRO). **Carl Yates**, general manager for Halifax Water said that Halifax Water, which is regulated by the Nova Scotia Utility and Review Board (NSUARB), received an order to appoint a DRO as part of an application to amend the utility's stormwater cost of service methodology. The refined methodology uses stormwater surface runoff from impervious areas as the determinant for the service rate.

"With the new fees in place, we began to receive complaints from some disgruntled customers. The NSUARB also received their share of complaints, so they came back to us with direction to set up a dedicated dispute resolution office," said Yates. "We were looking for someone who possessed skills as an administrator, in customer service, dispute resolution, and who could provide the technical rigor required of this job. Based on all

these requirements, Mr. Dhillon was the best overall fit."

Amendments to the HRWC rules and regulations to facilitate the appointment of this position were approved in November 2016 and a recruitment process was conducted by an external agency. The DRO is not an employee of Halifax Water or the Nova Scotia Utility and Review Board and will independently and objectively review customer complaints that the utility is unable to resolve.



Trojan Technologies turns 40. In 1977, entrepreneur **Hank Vander Laan** purchased a small metal tool box company in London, Ont. He saw potential in the the patent for a UV treatment system for homeowners' well water. Since then, the company has grown to be a global leader in water treatment with over 200 offices in 90 countries and more than 250 patents granted or pending.

WAYNE
GALLIHER

Wayne Galliher has secured the position of division manager of Water Services at the City of Guelph. Galliher, who has worked for the city since 2007, has been acting in the role since August 2016. Over his 10 years with the City, Galliher has led the growth and success in customer service improvements and water conservation and efficiency. Notable highlights include developing the 2009 Water Conservation and Efficiency Strategy, leading the review of and changes to the Outside Water Use Program and Bylaw, instituting the Frozen Water Pipe Policy, and establishing the City's internal leak detection program.

Galliher's leadership has contributed to over \$30 million in net savings from

deferred infrastructure projects and related operating costs that the City would otherwise have needed to incur in supplying the Guelph community with drinking water.

"We need to continue to champion responsible water use in Guelph, from our residents and our businesses as well as in our City operations," said **Peter Busatto**, general manager of Environmental Services. "Under Wayne's leadership, water efficiency and customer service will continue to be a priority as the exceptional staff at Water Services continue to deliver safe, reliable water to our community every day."

JEREMY
KRAEMER

The Centre for Alternative Wastewater Treatment (CAWT) is pleased to announce that **Jeremy Kraemer**, Ph.D, P.Eng., has been appointed as director. Dr. Kraemer comes to the CAWT from a global infrastructure engineering and operations firm where he most recently managed the design and delivery of a \$125 million nutrient removal wastewater treatment plant upgrade. For more than ten years, Jeremy has also served in key leadership roles with the Water Environment Association of Ontario (WEAO).

MAVIS
CLI-MICHAUD

The Hon. **Carolyn Bennett**, Minister of Indigenous Affairs, has appointed **Mavis Cli-Michaud** as chair of the Mackenzie Valley Land and Water Board (MVLWB). Cli-Michaud's appointment is for a three-year period. The MVLWB is responsible for issuing land and water authorizations for transboundary applications, ensuring consistent application of land and water management throughout the Mackenzie Valley.



More news items can be found at watercanada.net/topics/news

AWARDED



Thouheed Abdul Gaffoor, CEO of EMAGIN, made the winning pitch at the competition.

A company that uses artificial intelligence to help make water utilities safer and more efficient was among the grand-prize winners at the Velocity Fund Finals held at the University of Waterloo in Ontario. The Velocity Fund competition showcases 10 startups as they pitch projects for a chance to win one of four \$25,000 prizes and space in one of Velocity's workspaces.

EMAGIN leverages artificial intelligence to help water utilities proactively manage their infrastructure in real time. The company aims to make cities adaptive and resilient, responding to the challenges of urbanization,

climate change, and resource scarcity. The technology enables utilities to better adjust under emergency scenarios by using AI to learn about historical events and predict outcomes. "Velocity has been instrumental in supporting us and giving us the mentorship and connections to grow as a business," said **Mohamad Vedut**, another co-founder and a graduate of software engineering at the University of Ontario Institute of Technology.

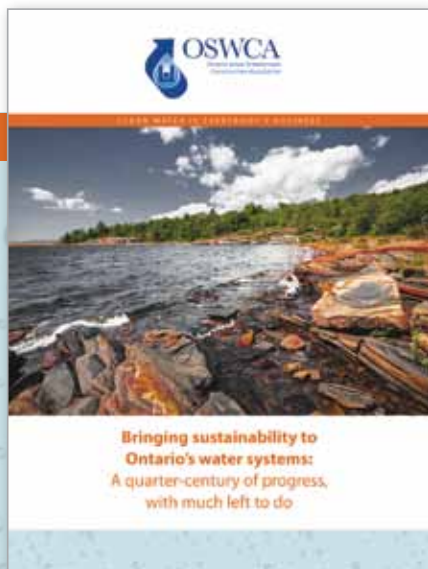


Ryerson Urban Water (RUW)'s manager of research and partnerships, **Angela Murphy**, was recognized with an award for Excellence in Client Service at Ryerson's recent water mixer in Toronto, Ontario. "A big reason I enjoy working

at Ryerson is because of its diversity, inclusion, and employee recognition," said RUW executive director **Nick Reid**. "Last fall, I obtained five letters of support from internal and external stakeholders to nominate Murphy for an award recognizing Excellence in Client Service. The letters all echoed a glowing sentiment perhaps best expressed through a letter received from **Anne van Leeuwen**, Consul General of the Kingdom of the Netherlands. Reid offered his congratulations and presented Ms. Murphy with the Consul General's original framed letter, which read:

"The dedication that Ms. Murphy displays in professional matters extends to every activity she undertakes with an enthusiasm that is inspiring to all that work with her. Her social conscience together with her creative and effective approach makes it a pleasure to work with her in the secure knowledge that the expected goals will be achieved in a timely manner [...] I can think of no one more deserving of this award than Ms. Murphy."

REPORT CALLS FOR REGIONALIZATION OF SMALL WATER SYSTEMS



On the success of achieving government sponsored water and wastewater funding, the Ontario Sewer and Watermain Construction Association (OSWCA) has now focused their message on regionalization.

This was one of the key recommendations from their report, released in 2016.

CLEAN WATER IS EVERYBODY'S BUSINESS



To download a copy of the report, visit bit.ly/OSWCA2016WaterStudy

oswca.org

All photos: Sarah Johnston



Cleis Neveau addresses Commissioners and participants at the IJC's March 2nd public meeting in Sault Ste. Marie, Ontario.



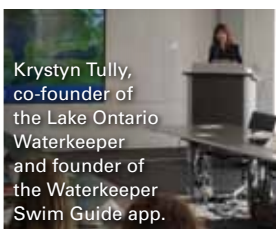
IJC U.S. Chair Lana Pollack welcomes participants to the Buffalo public meeting on March 28th at the studios of WBFO-WNED.

IJC Public Meetings about Great Lakes Water Quality Various Locations

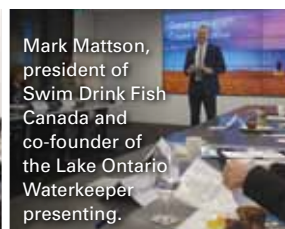
More than 700 people in six locations across the Great Lakes Basin attended public meetings over the month of March to tell the International Joint Commission (IJC) how they feel about the health of the Great Lakes. The IJC held the meetings to obtain input on progress by Canada and the United States in accomplishing the goals of the Great Lakes Water Quality Agreement, and to receive input on its own draft assessment report on the two countries' progress. Meetings included presentations from

local experts on key topics relevant to that community, public comment sessions, and roundtable or breakout group discussions at three locations. Citizens brought up a wide range of topics, from safe and affordable drinking water to nuclear plant waste and storage, agricultural runoff and harmful algal blooms, and beach closings. Meetings were held in Sault Ste. Marie, Sarnia, and St. Catharines, Ont.; Detroit, MI; Toledo, OH; and Buffalo, NY. *For more information about the meetings, visit ijc.org.*

All photos: Anna Mason



Krystyn Tully, co-founder of the Lake Ontario Waterkeeper and founder of the Waterkeeper Swim Guide app.



Mark Mattson, president of Swim Drink Fish Canada and co-founder of the Lake Ontario Waterkeeper presenting.

(L-R): Marlaire Koehler, Waterfront Regeneration Trust; Lara Ellis, Alternative Land Use Strategies; Stephanie Smith, Alliance for the Great Lakes; Reneta Kraft, Buffalo Niagara RIVERKEEPER; Anna Illycky, Ontario Ministry of Tourism, Culture and Sport.

Great Lakes Coast Initiative Roundtable Toronto, Ont.

On March 22nd, the U.S. Consulate in partnership with the Lake Ontario Waterkeeper and Waterfront Regeneration Trust/Great Lakes Waterfront Trail hosted a roundtable workshop to explore opportunities to develop a web-based app that would connect Great Lakes recreational users across the entire basin. Approximately 30 leaders working in water quality, Great Lakes restoration, recreation, tourism, and governance participated from the 58th floor of the offices of Miller Thomson LLP in the financial district in Toronto, with a stunning view of Lake Ontario.

Mark Mattson, president of Swim Drink Fish Canada told a story of how his organization got involved in Lake Ontario issues and how important recreational uses of the lake are in capturing the hearts and minds of the general population regarding water issues. **Krystyn Tully**, co-founder of the Lake Ontario Waterkeeper, told the group about the global success of the Waterkeeper

Swim Guide app—a smartphone app, launched in 2011, that monitors the water quality of more than 7,000 beaches across North America, the Baja Peninsula, and New Zealand based on aggregated data contributed by local waterkeepers.

The former mayor of Toronto, founder, and founding chair of the Waterfront Regeneration Trust/Great Lakes Waterfront Trail, the Honourable **David Crombie**, presented on the current and future vision for the waterfront trail. Crombie was highly optimistic about the opportunity to develop an app that would overlay the waterfront trail and allow trail users to know where they can partake in various recreational activities.

Juan Alsace, the Consul General, with the U.S. Consulate General Toronto, spoke of how their 2016 roundtable, organized in partnership with Water Canada, WaterTap, CleanTech North, and GreenCentres Canada was the catalyst for the partnership.



Fred Keating



Jennifer Keller, CH2M

All photos: Anna Mason



Anthony Neumann of Exova won for best costume at the WaterTech 'Get your GEEK on' reception.



Sandra Postel

The 10th Annual WaterTech Symposium

Banff, Alta.

The tenth annual WaterTech Symposium, held in Banff, Alta., was hosted by the Environmental Services Association of Alberta (ESAA). One of the many highlights of the conference was the opening keynote by **Sandra Postel**, director and founder of the Global Water Policy Project. Postel is a co-creator of Change the Course, a freshwater conservation and restoration campaign that has attracted the attention of business and mainstream media. Postel noted that "stationary is dead," given that climate change is now undermining the basic assumptions that have historically facilitated management of water supplies, demands, and risks.

Over 40 technical presentations were made across a diverse range of topics including groundwater resources, water testing protocols, oil and gas exploration impacts, and urban stormwater. At the conclusion of WaterTech 2017, ESAA announced that WaterTech would become EnviroTech in April 2018 and include water themes as well as other environmental topics. *More details can be found online at esaa.org.*



Nick Reid, Rick VanSant, WaterTAP board chair, Angela Murphy, and Peter Gallant, WaterTAP

Ryerson Urban Water Mixer Toronto, Ont.

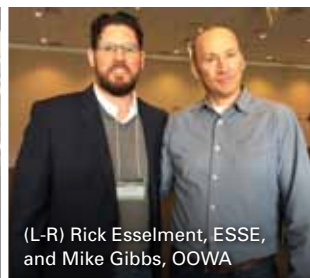
Establishing collaborations between multi-disciplinary university researchers and water technology sector professionals is key in developing real-world water solutions. Ryerson Urban Water (RUW) and Ryerson's Office of the Vice President, Research and Innovation hosted a mixer to share expertise, build bridges, and foster a culture of partnership toward potential advancements in the field.

On April 5th, the mixer welcomed Ryerson researchers as well as government and industry experts within the water landscape. Ryerson researchers presented their work and ongoing research programs. A networking reception followed where industry and government stakeholders described their various interests, challenges, and opportunities for collaboration. The researchers spoke on multi-disciplinary topics including innovative water quality testing methods, wetlands remediation, green roof technologies, impacts of urban pollution on watersheds and of acoustic pollution on water bodies, hydrology and flow efficiency in urban water systems, and integrated urban water management strategies.

The event was attended by approximately one-hundred participants including industry, provincial and municipal organizations, conservation authorities, non-profits, and funding agencies.



The OOWA hosted a lively exhibition floor.



(L-R) Rick Esselment, ESSE, and Mike Gibbs, OOWA



Derk Maat and Bill Waters of SciCorp.

Ontario Onsite Water Association Annual Convention & Expo Niagara Falls, Ont.

The theme for OOWA's 18th Annual Convention & Expo was Treatment, Optimization and Service and was held at the Scotiabank Convention Centre in Niagara Falls, Mar 25th-27. This year's keynote speakers **Dave Gustafson**, University of Minnesota; Eric Casey, National Onsite Wastewater Recycling Association; and **Peter Gallant**, WaterTAP, addressed critical aspects of the convention's theme while highlighting the industry's exciting future. The first day of the convention provided three streams of technical training for over 60 of OOWA members who are dedicated to

ongoing education and skills development. The breakout sessions featured technical presentations, case studies, and panel discussions regarding onsite system design, emerging decentralized technologies, and the industry's new CAN/BNQ 3680-600 standard for advanced treatment units. One of the main take away messages from this year's convention was that our industry is leading the way in establishing exceptional standards for itself and that it has the knowledge, expertise, and solutions to help address current infrastructure challenges in rural and peri-urban Ontario. Close to 400 people attended.



Freshwater scientists, policy-makers, and communications people at the IISD launch.



IISD, Experimental Lakes Area Research Launch Toronto, Ont.

Following several years of unrest related to budget cuts and the potential loss of long-term data sets, the world-class science conducted at the Experimental Lakes Area, now the International Institute of Sustainable Development-ELA (IISD-ELA), is in full swing once again. At a time of growing populations and a rapidly changing climate, the IISD is responding to nations' needs for science to respond to challenges to their fresh water. These include the impacts of agricultural runoff, contaminants such as selenium and, the effects of climate change on freshwater.

On April 10th, a small group of freshwater research supporters met with members of the IISD board and research team to hear about what the next field season has in

store. Specifically, participants heard **Vince Palace**, the new chief research scientist, and **Matthew McCandless**, executive director, speak about new research priorities. In the room were **Nicola Crawhill**, Westbrook Public Affairs, formerly with the Cities Initiative; **Sara Rang**, Ontario Ministry of Environment and Climate Change; **Douglas Wright**, The Great Lakes Project; and **Carolyn DuBois**, the Gordon Foundation.

IISD-ELA is an exceptional natural laboratory comprised of 58 small lakes and their watersheds set aside for scientific research. IISD's independent, evidence-based approach to the development of policy recommendations and tools complements the facility's strong scientific foundation.



University of Toronto Students and young professionals networking.



Tracy Patterson of Freeman Associated speaks to a member of the audience.



The team behind the TRCA LID planning tool incl. Golder Associates.

TRIECA Brampton, Ont.

The decisions made around green infrastructure over the next decade will play a significant role in the degree to which Canadian communities are resilient to the effects of climate change. Stormwater and low-impact development will also be key to address the uncertainty of the effects of climate change.

The Toronto and Region Conservation Authority (TRCA) and the Canadian

Chapter of the International Erosion Control Association (IECA)'s annual TRIECA event is moving the practice in that direction. On March 22nd, the event kicked off in Brampton, Ontario, with over 500 attending. Sharing the latest technological innovations, case study findings, and academic research, the conference brought together leading experts and influencers in the field.

The conference included two full days of concurrent speaker sessions with renowned speakers from across North America and an industry tradeshow profiling a wide variety of leading solutions providers.

TRIECA 2018 will take place on March 21st and 22nd, 2018, at the Pearson Convention Center in Brampton, Ontario.



(L-R): de Gaspé Beaubien Foundation leaders and management: Claude Perras, Anne von Finckenstein, Sandro Di Cori, Claudia Ribeiro, and Philippe IV de Gaspé Beaubien.



Roy Brouwer, The Water Institute, Chris Mallon, IBM Canada, and Claude Perras, de Gaspé Beaubien Foundation.



The University of Waterloo Aboriginal Students Association delivered the welcome message.

Aquahacking for Lake Erie Waterloo, Ont.

In celebration of World Water Day, the Water Institute at the University of Waterloo and the de Gaspé Beaubien Foundation announced a three-year partnership that will combine water research and technology to address threats to Canada's water resources. AquaHacking 2017 Challenge is a five-month hackathon that challenges water students, hackers, and engineers to build technology tackling issues related to Lake Erie: a Great Lake that organizers say is crucial to sustaining local economies, communities, and the environment.

"AquaHacking is a multi-generational, multi-sector, and multi-stakeholder movement that aims to conserve the Great Lakes and the Saint Lawrence and to foster the quality and responsible use of these waters," said **Claude Perras**, executive director of the de Gaspé Beaubien Foundation.

Five winning teams at the AquaHacking

2017 Challenge will share \$75,000, and the top three teams will earn spots at local incubator and accelerator programs to scale their ideas. A panel of judges will select the winners at The Role of Water Innovation in the Blue Economy, an international water research conference taking place in the Waterloo region this September.

Foundation. "Partnerships like this one are important to our mission of championing emerging cleantech innovation and entrepreneurship while bringing together stakeholders from multiple sectors, jurisdictions, and generations to develop integrated strategies for water policy and governance," he said.

In October 2016, the de Gaspé Beaubien Foundation hosted AquaHacking in Montreal, where teams developed tech to address issues like climate change adaptation, spills, and overflows in the St. Lawrence River. The

Water Institute and de Gaspé Beaubien Foundation partnership will bring similar AquaHacking challenges to Waterloo in 2018 and 2019.

"The University of Waterloo has been engaged in water research and entrepreneurship throughout its 60-year history," said Roy Brouwer, executive director of the Water Institute at Waterloo. "We are thrilled to partner with the de Gaspé Beaubien Foundation to challenge our students and to tap into Waterloo Region's thriving tech community to develop new, innovative solutions. We thank the Foundation for their continued leadership in protecting fragile water resources."

March 29th saw the official kick-off the AquaHacking 2017 hacking challenge with an information session held from 4:30 to 6:30pm at the University of Waterloo. Over 80 potential hacking challenge competitors attended.



Mark Mattson (Waterkeeper & Host) addresses the more than 400 Waterkeeper Gala guests.



Julia Johnston & Edward Burtynsky (artist) take in the live art auction



(L-R) Hannah Georgas, Sarah Harmer, and Bahamas each took turns playing one of their songs.

6th Annual Waterkeeper Gala Toronto, Ont.

Restoring swimmable, drinkable, fishable water in the Great Lakes region was the theme of the 6th annual Waterkeeper Gala held at the Canadian Broadcasting Centre in Toronto on April 20th. More than 400 philanthropists, business leaders, athletes, art collectors, and water lovers sipped Stratus wine as they celebrated art and water, with live performances by Bahamas (**Afie Jurvanen**), **Hannah Georgas**, and **Sarah Harmer** and a touching address by businessman **Kenneth Irving**. Other special guests included filmmaker, **Les "Survivorman" Stroud**; retired major league pitcher, **Bill Lee**; and Canadian

Music Hall of Fame member, **Tom Cochrane**. Author/musician, **Dave Bidini**; media executive, **Denise Donlon**; auctioneer, **Stephen Ranger**; and musician, **Sarah Harmer** were introduced as 2017 Swim Drink Fish Ambassadors.

Host and Waterkeeper **Mark Mattson** shared a moving story about Marilyn Bell's iconic solo swim across Lake Ontario and her conviction that it takes hard work and a team to achieve anything of great significance. Co-founder and VP **Krystyn Tully** said, "The very best in the field are partnering with the Swim Drink Fish community this year. This

is especially important on the Great Lakes, where we face immense water quality challenges and habitat loss—with funding and protection threatened like we have never seen before. The Great Lakes are at a crossroads and their future is in our hands."

Auctioneer and Waddington's Auction House VP **Stephen Ranger** auctioned sensational live art auction featured works by artists such as **Barbara Cole**, **James Lahey**, **Michael Adamson**, **Edward Burtynsky**. The event raised more than \$550,000 for swimmable, drinkable, fishable water.

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The North Carolina Museum of Art Pond Project demonstrates how stormwater runoff can be captured into bioretention terraces and wetland in a beautiful space that is enjoyed by the public.

Future by Design

It is an exciting time to work in water. BY BOB SANDFORD

WHAT WE ARE experiencing is that much of our urban infrastructure causes more problems than it solves.

As Cynthia Barnett noted in her book *Rain: An Natural and Cultural History*, we need to advance new forms of restoration hydrology to save our cement suffocated cities and surrounding waters from the great greasy pulses of fecal slime and poison that washes off our urban centres after each heavy rain. In the face of more extreme weather events in the future, we are going to need additional infrastructure—we're going to need rain barrels, green roofs, stormwater parks, cisterns, and solutions that can, in addition perhaps, function like city art as they do in places like Seattle. We've got a ways to go, but it's exciting.

Restoration hydrology can be viewed as an important element of urban

adaptation to climate disruption. It can also improve the quality of the communities where we live.

I think that we are starting to wake up to what wasted water is costing us. We are beginning to realize that we have accepted and encouraged wasteful water use as a social norm and that there is an enormous cost to support infrastructure that is over-built. And there is an enormous cost that goes with supporting this wasteful norm.

We are discovering that we cannot afford to maintain and replace the over-built infrastructure which supports that waste, and that it increases the likelihood of public health disasters. We have also realized that we waste enormous amounts of energy in treating and moving water to where it can be wasted. The energy we are wasting by wasting water is accelerating climate

change; which is starting to cause enormous damage to the infrastructure that we cannot afford to maintain and replace.

It's an easy vicious circle to break. In addition to improving engineering solutions, investment must be shifted to restoration of upland watersheds with the goal of being able to use the forces of nature to help build more efficiently integrated water infrastructure that operates and maintains itself.

So, I think there is an exciting future in this. **wc**

Bob Sandford is the EPCOR Chair for Water and Climate Security at the United Nations University Institute for Water, Environment and Health. This statement is an excerpt of an online discussion co-moderated by Sandford and hosted by RBC in March 2017.

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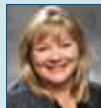
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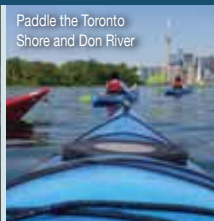
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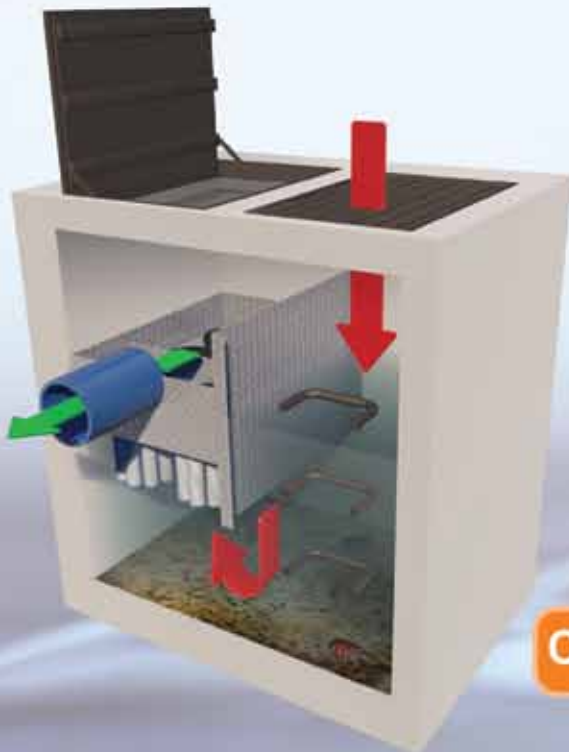
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