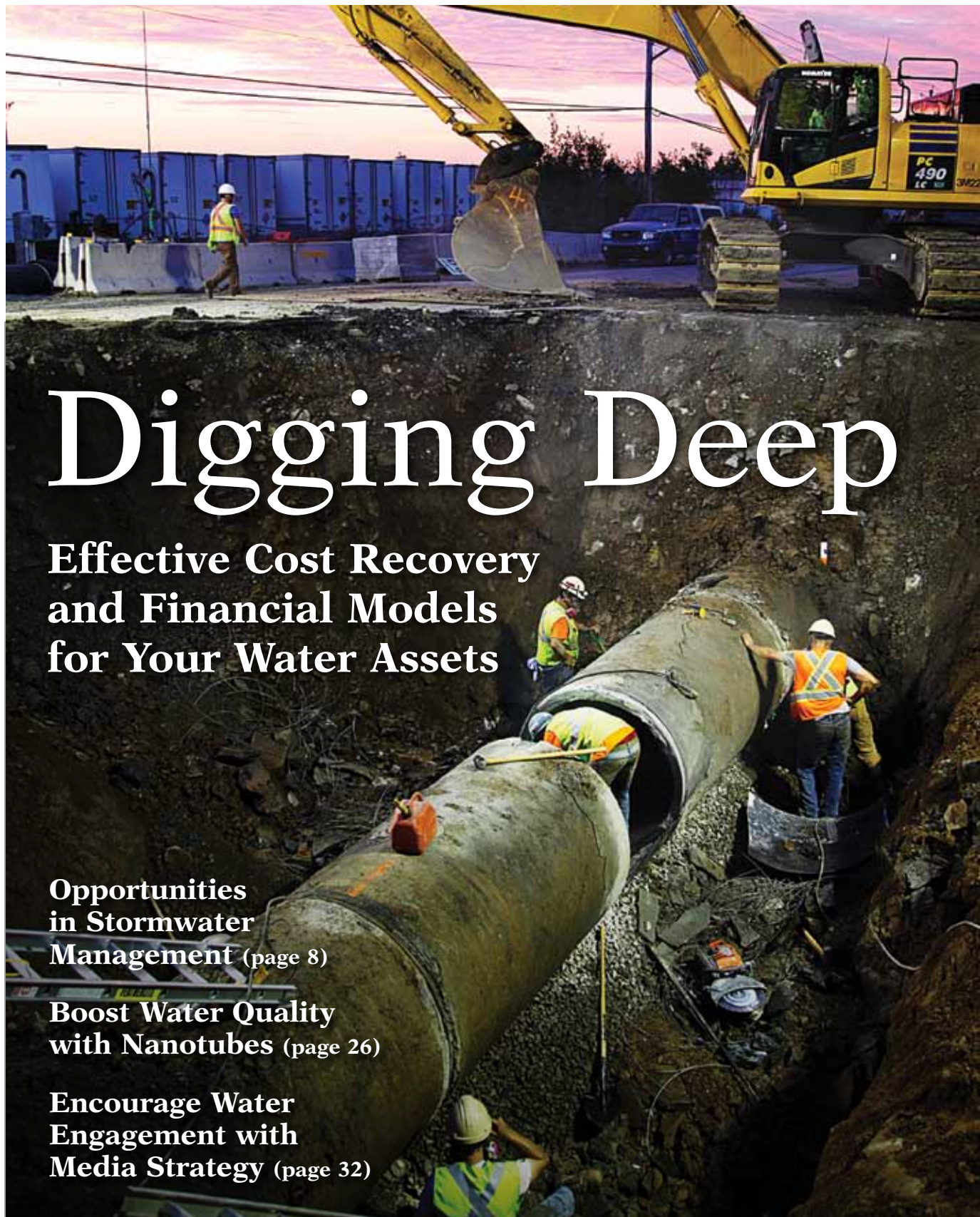


WATER CANADA



Digging Deep

**Effective Cost Recovery
and Financial Models
for Your Water Assets**

**Opportunities
in Stormwater
Management (page 8)**

**Boost Water Quality
with Nanotubes (page 26)**

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Engagement with
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A Love of Water in Common

BY RACHEL PHAN

WHEN WE DECIDED to relaunch the Water's Next national awards program, we were ambitious—too ambitious, I thought. Instead of simply doing what had been done in the past, we decided to run an awards gala dinner (*see page 40*) and added small but important details to help elevate the awards, like the beautiful 3D water droplet pins we commissioned from a local glassblower.

The Water's Next 2015 awards got off to an uncomfortably slow start. Nominations for the awards opened in October 2014, and by January, we had received only a handful of nominations. We had a very impressive group of 16 water experts for our selection committee, and I was afraid they'd only have a few candidates to judge.

But I never should have doubted the water community's passion and desire to encourage and recognize their colleagues doing innovative, groundbreaking work. Thanks to the help of respected water organizations across the country, the call to submit nominations was posted on social media outlets and shared through e-blasts. And it sparked a fire.

By the time nominations closed on January 29, 2015, we had received close to 90 nominations in total—and each candidate provided a compelling case on why they deserved to win. The quality of the candidates was so high that I can confirm the judges had a difficult time choosing winners in each category.

This comes as no surprise to me. In my 20 months as editor of Water Canada, I have continually been struck by the amazing work being done by Canadian water champions and leaders from coast to coast. Our Water's Next 2015 winners exemplified the relentless drive to change and improve the water culture in Canada. This drive has been present in every water professional I've met, and I am proud to have been a part of your world during my tenure here.

This is my last issue as editor of this publication, and I leave confident the state of water in Canada is in excellent hands. Aside from the incredible achievements of our eight winners, the biggest takeaway for me from this year's Water's Next gala dinner was the palpable sense of camaraderie between water professionals. There was no infighting, and no destructive sense of competition. Finalists hugged each other at night's end and talked about what more can be done.

That's what makes the Canadian water industry so special, and that's what I'll miss the most. You may be in different sectors and have different areas of expertise, but you share a common love of water and know significant change can only come through collaboration. I look forward to monitoring your work and seeing what more will be achieved.

Thank you for the welcome and for all the lessons. **WC**



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

**NATHANAEL COUPERUS**

Nathanael is a junior water resources engineer-in-training at Ainley Group.

PG 8

**NATALIJA FISHER**

Natalija is the director of strategic initiatives at RainGrid, a published author on water security, and an advisor to the Water Youth Network.

PG 8

**TRISH JOHNSON**

Trish is a member of the Ontario Onsite Wastewater Association (OOWA) board of directors and co-chair of the OOWA Government Relations Committee.

PG 12

ABOUT THE COVER

There are a number of ways utilities are dealing with declining user revenues. Halifax Water uses a mix of a flat operation fee topped off with a consumption fee (*see page 16*). In this photo, Halifax Water performs a major upgrade to a section of the Pockwock water transmission main on Kearney Lake Road. This capital upgrade will involve the replacement of approximately 1.7 kilometres of the 1.2-meter-diameter water transmission main.

Credit: Halifax Water/CIBC Ltd.

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Katherine Balpataky's first issue as editor will be November/December 2015.

Meet Our New Editor

AS WATER CANADA enters its 15th year of publication, I am delighted to assume the role of editor. I am honoured to be a part of this leading publication that connects the leaders and decision-makers of water management and stewardship in Canada. In my nine years working within the water sphere, I have observed how the magazine is well received among practitioners.

Water Canada's success reflects not only the diversity and quality of its contributors, but also the aspirations of Canada's water community. Its readers and contributors understand that water

is the entry point to many complex challenges that cannot be confronted in isolation. I hope to bring stories and voices to this publication that will inspire new ideas, dialogue, and collaborative opportunities.

On behalf of Water Canada, I thank my predecessor Rachel Phan for her editorial achievements.

I would be delighted to hear from you, the readers, about the emerging issues and solutions you wish to read about.

Contact me at katherine@watercanada.net

Watershed Groups Partner to Improve P.E.I. Waterways

The City of Charlottetown, Ellen's Creek Watershed Group Inc., and Wright's Creek Environmental Committee have completed the City of Charlottetown Brook Trout Conservation and Protection Plan, which city council formally adopted in August 2015.

The plan identifies key goals and objectives to improve the health of city streams and support the health of the city's brook trout population. The goals in the plan include reducing sedimentation, minimizing habitat fragmentation, improving water quality, and protecting water quantity. These goals will be achieved in partnership with watershed

groups and will involve changes to the city's planning practises and stormwater management.

"A healthy brook trout population is an excellent indicator of overall watershed and habitat health," said Darragh Mogan, chair of the Ellen's Creek Watershed Group. "This plan and the partnership that has been established between the watershed groups, the city, and the province will guide our shared efforts in creating a healthy urban watershed. It represents a major step in the creation of a long-term city-wide watershed plan."

The plan is available on the city's website at charlottetown.ca. —Staff

Online at
WATERCANADA.NET

Canada Bans Beads

A scientific review reveals plastic microbeads may have long-term effects on ecosystems. BY RAVEN-PAIGE WILKINSON

IN MARCH 2015, the NDP party proposed that microbeads be added to the list of toxic substances under the *Environmental Protection Act*, which the House of Commons approved in a unanimous decision in July 2015. Environment Canada also reported after a thorough scientific review that “the presence of microbeads in the environment may have long-term effects on biological diversity and ecosystems.” This has sparked further conversation about microbeads, and has brought it to the forefront of the list of federal government priorities.

Microbeads are tiny synthetic polymer particles, larger than 0.1 micrometer and smaller than five millimetres in diameter. Commonly used as exfoliants in cleansers, toothpaste, and lotion, microbeads are not harmful during topical use; however, once washed down the drain, these beads are often too small to be caught in water treatment filters. This potentially allows them to sink to the bottom of our rivers, lakes, and oceans, get eaten by fish, and make their way up the food chain and into our bodies. While there is no concrete proof that microbeads pose a threat to our health, University of Waterloo ecohydrology professor Philippe Van Cappellen told CBC’s *The Morning Edition* that the synthetic chemical compounds that can collect on the beads have been suggested “to be causing cancer or birth defects.”

Microbeads contribute to a larger microplastic issue. Lisa Erdle, a biologist with Ontario Streams, collaborated with Toronto Brigrant Inc. to monitor microplastics in Toronto and the Great Lakes. After

collecting 750-millilitre samples and sending them to the lab, the results were alarming. Every collected sample contained plastic fibers and beads, with some containing more than 100 pieces of visible microplastics. Further lab studies will be able to account for the particles that they cannot see, she said.

Governments across North America are concerned about the impact of microplastics on our water. States like Illinois, New Jersey, and California have passed legislation banning the production and sale of microbeads by 2018 and 2019. As well, large companies like Loblaws and Johnson and Johnson also intend to stop the production of these potentially harmful beads in the coming years.

“Banning microbeads from personal care products will help us to continue protecting the environment for present and future generations,” said Kellie Leitch, the federal Minister of Labour and Status of Women. “We will continue to take action to keep Canada’s lakes and rivers clean, and put the priorities of Canadians first.”

The Government of Canada is moving to address microbeads under Canada’s Chemicals Management Plan. Through this plan, the government has committed to address 4,300 chemicals by 2020 (and has considered more than 2,700 to date). The 2015 federal budget provides \$491.8 million over five years, beginning in 2016, to complete assessments of the remaining chemicals. **WC**

Raven-Paige Wilkinson is a communications assistant at Actual Media.



VIDEO: Los Angeles adds shade balls to its reservoir in an attempt to conserve water during their worst drought in more than a thousand years. bit.ly/balls0915



BLOG: Water Canada advisor James Sbrolla tells the story of 81 individuals from 29 countries who travelled to Antarctica to research, explore, and spark conversation about protecting the world’s last true wilderness. bit.ly/antarac0915



INTERVIEW: Eric Meliton of Partners in Project Green talks about a new stormwater charge set to be introduced in Mississauga, Ontario and his aim to create the biggest eco-business zone in the world. bit.ly/eric0915



Planning for Uncertainties

Canadian municipalities should see the opportunities in stormwater management—not the threats.

BY NATHANAEL COUPERUS AND NATALIJA FISHER

CITIES ACROSS CANADA are looking for solutions to reduce their vulnerabilities to infrastructure deficits, rapid urban growth, and climate change. Planning for uncertainties requires a diverse portfolio of solutions to decrease the quantity and improve the quality of stormwater entering local drainage basins.

Decentralized solutions

The stormwater community understands that climate change will exacerbate urban overland flooding and that low-impact development (LID) techniques are low-cost and less-intrusive options for managing stormwater. But is this message getting across to municipal engineers and asset management teams?

The shift to decentralized stormwater infrastructure is slowly but steadily gaining momentum according to Lincoln Kan, manager of environmental services

at the City of Mississauga. “Currently, we have two to three LID pilot projects. [...] Mississauga is fortunate because council is generally in favour of the change if there is a benefit and it makes economic sense for our situation.”

New financing tools

The City of Mississauga recently entered the growing list of cities across Canada—including West Vancouver, Surrey, Calgary, Edmonton, Regina, Winnipeg, London, Waterloo, Kitchener, and Markham, among others—that have introduced a stormwater or drainage fee.

Since stormwater managers often have to compete with tangible municipal services like policing, housing, and parks, the stormwater utility (or stormwater charge) establishes a dedicated municipal division that administers a fee to properties updating infrastructure

and building a resilient response to rising flood waters.

These municipalities are combating the increased costs of handling stormwater by seeking new financing tools and considering decentralized methods of managing water where it falls. The Mississauga stormwater charge, slated for 2016, will fund capital projects, operations, and maintenance to the stormwater management system, as well as future infrastructure repairs. Justifying new stormwater charges or levies is a challenge that must be embraced so investments are not mistaken for financial burdens.

“We are not as advanced as we need to be in terms of full-cost accounting for stormwater,” said Jonathan Grant, manager of research at WaterTAP. “Being able to calculate stormwater detention on site in real time would

inform more accurate price signals [and] drive further innovation.” Remaining optimistic, he added, “Ontario is home to a substantial group of emerging technology companies—from sensors to LID equipment—that will help measure and manage stormwater.”

Barriers to implementation

Flood and drought extremes have brought media and insurance industry attention to the necessity of protecting our water resources. The extra scrutiny has put pressure on the status quo and raised awareness about the role of LID in building resilience and reducing risk. However, awareness is still a long way from adoption.

Even with new funding mechanisms in place, there is no guarantee levies will be used to fund decentralized stormwater innovations, as opposed to being earmarked for replacing century-old infrastructure. Engineers tend toward methods and infrastructure that have stood the test of time as they are tasked

with keeping the public safe and keeping costs low. In this risk-averse environment, innovative new stormwater solutions face barriers to market entry. Barriers to implementation include: perceived operating cost; a lack of long-term performance data; and a general lack of knowledge about LID benefits among decision-makers, municipal staff, and property owners.

Hans Schreier, professor emeritus at the University of British Columbia, said he believes the early adopters are finally able to demonstrate success to the risk averse. “We are at the breaking point and saying, ‘Here, here, here engineers have done it.’ [Engineers] are not as liable as [they] thought and the reliability is better than [they] thought.”

Changes in the basic values of the industry are slower to come by than advances in science and technology. It is precisely this gap between stormwater advancements and perception that

successful investors can exploit. While advantageous on the one hand, the disconnect between the general public and decision-makers limits buy in and makes it harder to prioritize investing in

In this risk-averse environment, innovative new stormwater solutions face barriers to market entry.

stormwater infrastructure as opposed to aboveground municipal services.

Innovating in a system that is governed by risk aversion is a difficult task. Finding solutions to overcome the fear of change is something Christine Zimmer, manager of water protection and restoration at the Credit Valley Conservation Authority (CVCA) in Southern Ontario, has developed proficiency. The key to a shift seems not to be at the drawing desk but by engaging with partners and the public.

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The development of a stormwater program, utility, or charge is better implemented with intentional effort for transparency, education, collaboration, and creativity. “Creating an atmosphere of transparency is important,” Zimmer said. “After installing LID, customers need to know, ‘What was the bang for my buck?’ Long-term monitoring results will demonstrate that LID works and it will encourage others to adopt.

“A key to overcoming barriers is making sure that LID project objectives meet stakeholder needs and developing monitoring around those objectives,” she added. Her CVCA team worked closely with 75 partners and installed 60 LID sites over different land-use sectors to identify the barriers and the solutions to adopting LID on a broader scale. She pointed to roadside LID monitoring results, captured during an extreme storm, as compelling data that helped inform Mississauga council of the

effectiveness of LID in reducing the peak of storms.

Unfortunately, there is no out-of-the-box solution to setting up a stormwater utility. Public opinion, let alone geology, land use, and climate, vary across Canadian municipalities. One region’s stormwater solutions might not fit in another’s implementation context.

Looking ahead

Understanding threats and the change they demand is vital for cities to make smart choices about replacing stormwater infrastructure and reducing the risk of flooding. The CVCA has partnered with Canadian universities, the Institute of Catastrophic Loss Reduction (ICLR), and Engineers Canada to study how climate change influences municipal vulnerability. The forthcoming Infrastructure Performance and Risk Assessment guidance document will help municipalities make smart choices in addressing the \$160-billion

infrastructure deficit and building climate resilience.

By creating a flexible system, utilities can respond to storms and droughts, and be proactive in response to emergencies. Two factors are already making a business case for improving stormwater infrastructure: the frequency of extreme events and stormwater fees. Adopting new technologies, such as decentralized stormwater management infrastructure, will come down to a shift in attitudes.

Stormwater is a resource. Developing scalable stormwater solutions that move from threats to opportunities will require exactly that kind of thinking. **WC**

Nathanael Couperus is a junior water resources engineer-in-training at Ainley Group. Natalija Fisher is the director of strategic initiatives at RainGrid, a published author on water security, and an advisor to the Water Youth Network.

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Street Trees Tackle Stormwater

BY SHANE CARPANI

STREET TREES can be essential components to the management of stormwater in urban areas. Like their woodland forest equivalents, urban trees direct precipitation into the ground through trunk flow and absorb rainfall through their roots—making them an invaluable sustainability asset in the urban environment.

Urban planners and governmental officials are increasingly mandating that developers adopt a sustainable approach to urban drainage. The implementation of sustainable drainage systems is now demanded by authorities, from early site evaluations through to the completion of environmental impact assessments. Low-impact development (LID) can be implemented in a number of different settings, including urban cores and residential areas, as well as in transportation projects.

Trees also take up less space than other “green systems,” such as bio-filtration systems, rain gardens, and vegetative swales, so using street trees as an LID principle helps with space constraints faced by cities. And as part of their natural growth cycles, urban trees have been shown to significantly reduce rainwater nitrogen and other pollution loads in stormwater runoff. In addition, tree roots also penetrate through typically impermeable urban soil layers into more permeable zones, thus having the potential to further increase stormwater infiltration rates. And with the application of appropriate root management, urban landscape designers can ensure that tree root systems only spread to intended areas and avoid paved surfaces.

New techniques for designing and executing urban tree plantings in paved areas have the potential to lower maintenance costs, enhance stormwater management, and promote healthier and faster growing trees.

Shane Carpani is the creative director at GreenBlue Infrastructure Solutions.



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Geotube's winter operations greenhouse construction in October 2014.

Inset: The Perth geotube pad construction site view from the roof of the existing water treatment plant.

Call to Action

Canadian municipalities need more appropriate solutions than big pipes.

BY TRISH JOHNSON

IN A TIME OF CONCERNS over climate change, lower capital and operating costs, municipal belt-tightening, fewer capital grants, and increasing regulatory pressures, many Canadian municipalities need more appropriate solutions than “big pipes.” We in the wastewater community need to promote cost-effective, sustainable, and appropriate solutions for small towns and big cities alike through on-site and decentralized wastewater systems. These systems have been shown to consistently produce more cost-effective, sustainable solutions and offer lower carbon footprints.

We must recognize that on-site

services are no longer merely septic tanks. They now include advanced treatment units capable of nitrogen and phosphorous removal, efficient cluster systems, and so much more. More than a decade of research by the United States Environmental Protection Agency (EPA) has shown that decentralized alternatives are significantly more cost effective for non-core and rural areas than conventional systems. American examples of decentralized technologies and innovative systems abound and are rapidly growing, largely because their consideration is both required and promoted by policy in the United States.

In Canada, Aboriginal Affairs and Northern Development Canada's 2010 Decentralized Systems Protocol shows real promise for more cost-effective solutions for First Nations in Canada. However, now more than ever, leadership and facilitation of a clearer policy framework for decentralized solutions is needed at the provincial level, especially in environment and planning, to help small Canadian municipalities fully benefit from decentralized and on-site infrastructure.

Because of the many benefits of decentralized systems—such as cost-effectiveness, flexibility, ease of

operation, and lower life-cycle costs—some examples are beginning to appear in Canada. This is happening despite the lack of momentum or as strong of a decentralized policy focus as they have in the United States.

Innovative examples of decentralized systems can be found in a subdivision in Greely, Ontario, within the City of Ottawa boundary. Its on-site treatment system uses individual settling tanks and gravity flow to a nearby peat wetland, thus allowing higher density without contributing to peak loadings. It also doesn't necessitate costly pumping into the city's central system. Also in the City of Ottawa, the Carp Airport development will serve as a new model for cost-effectiveness in the future. An innovative system is now being planned there as the largest modular decentralized wastewater facility in Canada.

Wastewater professionals are fully aware that systems with short-term peak loads and few subscribers are costly and inefficient. That is why we must begin to use more on-site and decentralized systems, and let the economics speak for themselves. The evidence is so compelling that the EPA even provides a model and requires comparison of centralized, "fringe" (peri-urban), and decentralized systems for infrastructure grant eligibility. And when it comes to value for money, the EPA found that on-site and decentralized solutions frequently offer the most cost-effective environmental protection for rural, fringe, and dispersed populations.

In Ontario, we also know that, depending on local conditions, underground pipes and pumps represent about 75 per cent of total system costs, with only 25 per cent going toward actual treatment works. Environmental assessment estimates for a wastewater system in the small town of Lanark, Ontario revealed an even bigger premium for conveyance due to local bedrock. The preferred solution identified extremely high capital costs, resulting in unaffordable costs per service connection. Thus, despite the provincial share of funding made available years ago, no solution

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has been implemented, and Lanark remains a small town in need of a cost-effective solution. With such a small population, Lanark is a place that could benefit from decentralized options.

On the opposite side of the spectrum is Perth, Ontario—an example of a small town that has realized considerable savings by implementing an on-site dewatering and residue treatment

system for its water treatment plant. Savings have resulted from lower capital, operations, and maintenance costs. Additional savings have resulted from zero lost opportunity costs for development from flows that would have been directed to the sewage lagoon if the town was relying on conventional decantation and treatment, which would take up development capacity

for about 80 new homes, a substantial revenue stream.

When it comes to realizing the potential for on-site and decentralized systems, the technology is proven. It's imperative that small towns and policymakers begin to consider these solutions and overcome their preferences for the familiar. By not looking toward the more creative and cost-effective solution, municipalities make the choice to remain stuck in the old, expensive ways of the past.

It is interesting to note that several large American cities have been finding relief through decentralized solutions. In Boston, Massachusetts, Mobile, Alabama, and Los Angeles, California, new decentralized components serving older neighbourhoods have relieved pressure on overburdened systems and avoided much more costly conventional plant upgrades. This is an important form of economic "capacity mining" that has widespread potential in Canada.

In Canada, we need our collective leadership to come together and engage on this crucial issue. We need a call to action similar to the one issued in March by the American Society of Civil Engineers' committee on sustainability, which stated that the "current approaches, practices and standards do not address the full range of societal needs. [...] Therefore, we must work together with people who understand the issues and can develop practical solutions."

Unless we in Canada regroup and bring forth more sustainable standards, approvals, and methodologies, the environmental, energy, and economic pressures of protecting the future health, safety, and welfare of the public will overwhelm us. We must act now. WC



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Trish Johnson is a member of the Ontario Onsite Wastewater Association (OOWA) board of directors and co-chair of the OOWA Government Relations Committee. She is also the Senior Environmental Consultant and Small Solutions Strategy Advisor for R.V. Anderson Associates Ltd. in Ottawa.

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Eastern Passage Wastewater Treatment Facility construction; now under the management of Halifax Water due to its proven track record for revenue recovery.

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Cash-Strapped

As water-conserving technologies become more popular, how can utilities keep their budgets balanced? BY JAMES CARELESS

IT IS ESTIMATED THAT more than \$80 billion is needed to repair and replace Canada's aging drinking water, stormwater, and wastewater systems. Fifteen per cent of Canada's watermains and 20 per cent of our drinking water plants are in fair to very poor condition, while 30 per cent of the country's wastewater pipes and 40 per cent of our wastewater plants are in the same lamentable state.

This unnerving information comes from the Federation of Canadian Municipalities' (FCM) 2012 Canadian Infrastructure Report Card, and is also included in the Canadian Municipal Water Consortium's (CMWC) just-

released 2015 Canadian Municipal Water Priorities Report. The CMWC, managed by Canadian Water Network, is a nationwide collaboration of municipalities, utilities, industries, governments, academics, non-profits, NGOs, and watershed partners from across Canada accessing leading research for sustainable and resilient water management.

"To a large degree, municipal water management has been a victim of its own success," outlines the CMWC report. "The largely hidden nature of what goes into ensuring successful delivery

and management of community water supplies has resulted in difficulties ensuring that full costs of water

To a large degree, municipal water management has been a victim of its own success.

management are both recognized and financed. [...] Most municipalities face significant challenges from historic underfunding that leads to backlogs of infrastructure repair or replacement, while simultaneously facing greater system demands."

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Eastern Passage Wastewater Treatment Facility completed project. Halifax Water was given responsibility for the region's stormwater and wastewater in 2007, due to its track record for cost recovery.



Pockwock Pumping Station, a key part of Halifax Water's fully-funded water delivery system.



Halifax's Lake Major Water Supply plant under construction; part of the region's ongoing strategy to keep up with water demand.

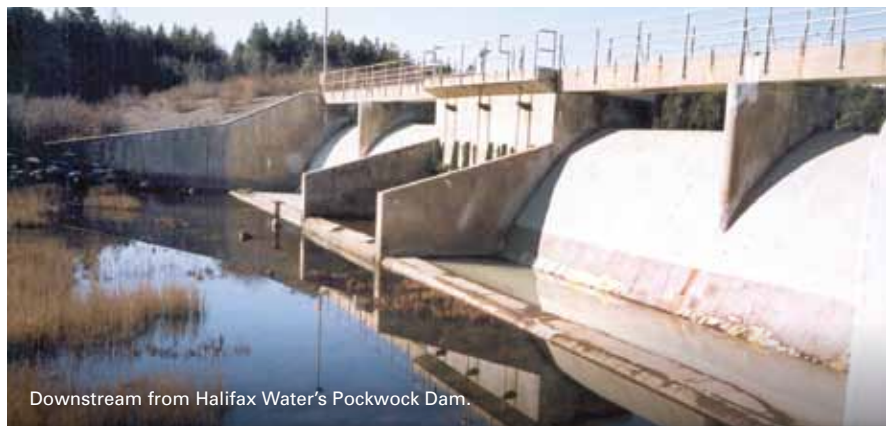
"Nearly half of the water jurisdictions who provided data for the 2012 FCM Report Card have limited knowledge about the condition of their buried infrastructure," said Bu Lam, the CMWC's research program manager. "Leaking pipes, for example, can create inefficiencies that will add to system costs. Not knowing the condition of infrastructure makes it very challenging to understand the costs associated with repair or replacement. However, Canadian municipalities and utilities are starting to take more advanced approaches to asset management and planning so that they can be better positioned to recover their costs."

Traditionally, Canadian water utilities have earned the money to maintain, repair, and upgrade their facilities through user fees. These are the water rates that are charged to each user

based on their water consumption. New watermains and sewers are typically covered by development charges. Unfortunately, the increasing adoption of water-conserving residential technologies such as low-flow toilets has substantially reduced per-household water usage. As a result, the amount of money each household has to pay to the utility has also decreased.

Ironically, utilities themselves have played a major role in promoting water conservation products to their subscribers, often aiding the transition with rebates and other financial reward programs. "Such conservation plans were well-meaning, but not well thought-out," said Steven Renzetti, professor of economics at Brock University and member of the Brock Environmental Sustainability Research Centre. "The utilities did not sufficiently reflect how

Credit: Halifax Water



Downstream from Halifax Water's Pockwock Dam.

Credit: Halifax Water



Halifax Water's Pockwock Dam, part of this utility's well-monetized infrastructure.

much residential water conservation would reduce their revenues and hurt their bottom lines."

Adding to the impact of water conservation is the loss of industrial customers due to the decline of manufacturing in Canada. When a plant closes, water usage in the community goes down—and so do water and wastewater revenues.

These two factors have certainly confronted the Region of Waterloo's water services agency, a southern Ontario water utility that wholesales water services to the cities of Cambridge, Kitchener, and Waterloo and the townships of North Dumfries, Wellesley, Wilmot, and Woolwich. "We have certainly seen declines in water consumption," said Nancy Kodousek, the Region of Waterloo's director of water services. "In our case, this is actually a benefit, because it has allowed us to delay building a \$1-billion direct pipeline

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from the Great Lakes from 2035 to beyond 2050.”

For utilities not as fortunate as the Region of Waterloo, there are a number of ways to deal with declining user revenues. The most popular option is to replace the current usage-only fee with a mix of a flat operation fee—because

Ironically, utilities themselves have played a major role in promoting water conservation products to their subscribers.

most of the costs in providing water and waste facilities are fixed, no matter how much water is carried—topped off with a consumption fee.

This model is used in Halifax where Halifax Water, the region’s utility, operates under a full-cost recovery model mandated by the Nova Scotia Utility and Review Board, a quasi-

judicial provincial regulator. “We’ve been required to cover all of our drinking water costs through our rates since 1945,” said Carl Yates, Halifax Water’s general manager. “This model has worked so well that the Halifax municipality gave us the responsibility for handling the region’s wastewater and stormwater systems in 2007 to get its infrastructure deficit under control and operated in a sustainable manner.”

Water utilities can also improve their revenues by modernizing their water meter systems with accurate, networked metering technology. According to Jason Bethke, the president and CEO of Fathom, “You would be amazed how many utilities have subscribers whose meters are under-reporting their consumption, and in some cases not reading it at all.”

Wastewater operators could also

consider recycling biosolids into government-approved fertilizer that could be sold instead of paying to dump the waste in a landfill. “This extra money helps their budgets while the recycling of biosolids helps the environment,” said Kevin Litwiller, the director of business development at Lystek International.

Taken as a whole, these approaches could help Canada’s water utilities manage their infrastructure deficits. But even with these changes, \$80 billion will be difficult for cash-strapped municipal governments to afford. As a result, the federal and provincial governments will likely have to step in if Canada’s water infrastructure is to be fully and properly restored. **wc**



James Careless is a freelance writer based in Ottawa.

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Get Smart



Solving the age-old dilemma of limited budgets and aging infrastructure with smart modernization strategies for water and wastewater operators. **BY PAM MACGILLIVRAY**

WATER AND WASTEWATER OPERATORS across Canada are facing a challenging business environment. As with managers across many industries, they are being asked to do more with increasingly scarce resources.

Ignoring technology investments is a mistake. Smart technologies can create greater efficiencies, which is a large part of the solution for communities looking to provide affordable quality water and wastewater services. Smart technologies can help optimize operations and repairs to physical infrastructure, preserve the knowledge of a retiring workforce, and boost the overall energy efficiency of plants. The key is to have a plan that quantifies the return on investment (ROI) in a staged implementation.

Trying times

Municipal water and wastewater infrastructures across the country are in dire need of repairs and replacement. Postponing necessary infrastructure upgrades will only end up costing communities more in the long run as they will be scrambling to manage major leaks and repairs at the same time as needing to coordinate the

implementation of necessary upgrades. The BC Water & Waste Association recently released a report stating that communities in British Columbia will require at least \$13 billion in additional investments to replace water and wastewater systems.

Some Canadian municipalities are also facing water scarcity, a problem that risks becoming more prevalent as climate change continues to affect rainfall quantity and increase the risk of drought and flooding in many areas. Affected municipalities are already under pressure to use the water they have more efficiently, and they will likely be under even more pressure as their populations continue to grow.

Communities also have to deal with an aging workforce. Not enough new operators are being trained to run the plants, and this shortfall will be felt most keenly in plants with unreliable equipment. Municipalities need solid strategies to ensure they don't lose knowledge.

Getting smart

Given the challenges in acquiring funds to properly maintain infrastructure, facilities often wait until equipment

fails before replacing it—but the long-term costs significantly outweigh the perceived short-term benefits.

Getting smart about modernizing infrastructure starts with a thorough audit of existing systems. This will enable managers to identify the “quick wins” from the upgrades that will take longer to show ROI. Armed with this information, managers will be better positioned to come up with a plan to implement relatively inexpensive solutions—like software modelling upgrades—as well as larger capital expenditures that qualify for efficiency rebate programs. But crucial to any smart modernization strategy is multi-year budget planning with multiple planned stages of investment; projects with a longer ROI will only justify themselves after a few years of operation and often require investments across different areas of the system. By breaking projects down into multiple stages at an acceptable pace of investment, smart modernization strategies can be brought within reach of the communities who need them.

Investing in smart technology is also key to improving plant performance and capitalizing on potential savings from increased efficiencies. Whether applying

these technologies to pumps, pressure monitors, or flow equipment, today's devices are able to generate data that can help operators manage infrastructure more efficiently, limit rip-and-replace upgrades, and help municipalities get the most out of their budgets. This expanded visibility is important as we train fewer operators to manage ever-larger systems.

Tying it all together

Examining metrics like water flow or pump performance is old news. Wastewater operators have been able to collect this information for decades, but the data often resides in disparate and isolated systems, which limits operators' abilities to draw useful analyses from it. With smart water systems, stakeholders would be better able to draw informed correlations and analyses from the data in real time and in context.

Smart water systems deploy software suites that combine data from multiple sources and present it in a way that makes it valuable to stakeholders. For

example, sharing data between power monitoring and operations can facilitate better scheduling and allow managers to capitalize on time-of-day savings. Other examples include asset management information, which can be used for both maintenance and capital expenditure planning; and information from the energy efficiency of drives, which can be used for predictive maintenance as well.

Smart water systems can also help facilitate the creation of a well-designed system that optimizes operations, maximizes water quality, reduces the number of service interruptions, maintains consistent water pressure, and does so reliably over time. Smart water systems can also help extend equipment life spans by yielding data that can help managers determine optimal usage levels. The efficiencies gained as a result could allow managers to capitalize on savings from optimizing the system's energy consumption (such as scheduling filter backwash during non-peak electrical times) and from

participating in electrical utility rebate programs. Because these software solutions are relatively inexpensive to implement and flexible in their scale, prevention of a single critical downtime event can often justify the overall cost of a project.

There is no doubt that it's a challenging time. Water and wastewater treatment are critical processes in our communities, and it is imperative municipalities ensure the longevity of these systems. Staged modernization is one way to future-proof these systems. It addresses the most critical aspects of the plants, ensuring high water quality and long-term availability while maximizing investment dollars and minimizing downtime due to upgrade projects. **wc**



Pam MacGillivray is the segment manager for water and wastewater with Schneider Electric Canada.



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Turning the Page on Filtration

Eliminating water-borne bacteria with pages from the Drinkable Book could save lives.

BY ANDRÉ VOSHART

HUMAN CONSUMPTION of bacterially contaminated water causes millions of deaths each year throughout the world—primarily among children. While studying the material properties of paper as a graduate student, Theresa Dankovich discovered and developed an inexpensive, simple and easily transportable nanotechnology-based method to purify drinking water. She calls it The Drinkable Book, and each page is impregnated with bacteria-killing metal nanoparticles.

Dankovich—who earned her doctorate at Montreal's McGill University—explained her technology and revealed new results of recent field tests conducted in Africa and Bangladesh at the 250th National Meeting & Exposition of the American Chemical Society in August.

Although silver and similar metals have been known for centuries to have the ability to kill bacteria, no one had put them into paper to purify drinking water, Dankovich noted. While at McGill, she found that sheets of thick filter paper embedded with silver nanoparticles could do just that, eliminating a variety of microorganisms, including bacteria and some viruses. (*Read our coverage on the innovation from 2011 at bit.ly/waterbook2011*)

She continued her research at the University of Virginia's Center for Global Health, expanding the repertoire of embedded nanoparticles to include ones made of inexpensive copper. She also began field investigations of water purification applications in Limpopo, South Africa, as well as northern Ghana, Haiti, and Kenya.

"In Africa, we wanted to see if the

filters would work on 'real water,' not water purposely contaminated in the lab," she said. "One day, while we were filtering lightly contaminated water from an irrigation canal, nearby workers directed us to a ditch next to an elementary school, where raw sewage had been dumped. We found millions of bacteria; it was a challenging sample.

"But even with highly contaminated water sources like that one, we can achieve 99.9 percent purity with our silver and copper-nanoparticle paper, bringing bacteria levels comparable to those of U.S. drinking water," Dankovich added. "Some silver and copper will leach from the nanoparticle-coated paper, but the amount lost into the water is within minimal values and well below Environmental Protection Agency and World Health Organization drinking water limits for metals."

Last year, she formed a non-profit company, pAge Drinking Paper, which has developed a product that is essentially a book composed of pages embedded with silver nanoparticles. Printed on each page is information on water safety both in English and the language spoken by those living where the filter is to be used. Each page can be removed and slid into a special holding device in which water is poured through and filtered. A page can clean up to 100 liters of water—so a book can filter one person's water needs for four years.

Now a post-doctoral researcher at Carnegie Mellon University, Dankovich is further developing the technology and conducting more field studies in rural communities. In June, she teamed up with International Enterprises—



Dankovich pours contaminated pond water into a funnel containing an antimicrobial filter paper to obtain clean drinking water in a rural area of Bangladesh.



Bangladesh, an international non-profit, in a field trial to explore commercialization of the silver nanoparticle paper filter for household water treatment.

She is also connecting her chemistry expertise with industrial designers at the University of Cincinnati and with environmental engineers at Carnegie Mellon. "We have a bunch of designs, and we are trying to trim them down and keep them simple," she said.

"Along with applications, our biggest current focus is to scale up, going from a lab bench experiment to a manufactured product. We have to go from 'cool chemistry' to something everyone can understand and use."

Dankovich acknowledges funding from Natural Sciences and Engineering Research Council of Canada, along with iDE-Bangladesh, Carnegie Mellon University, WATERisLIFE, and the NIH Fogarty International Center. **wc**



André Voshart is the associate editor of Water Canada.



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CLEAN WATER INNOVATION BOOSTING ECONOMIC DEVELOPMENT IN KAWARTHA LAKES

Home to more than 250 lakes and rivers, including several kilometers of the Trent Severn Waterway, Kawartha Lakes is turning to water innovation to help support agriculture, tourism and everyday living across the community.

A single tier municipality Kawartha Lakes absorbed six wastewater treatment facilities and 21 water treatment facilities during amalgamation nearly 15 years ago. Today 73,000 people call Kawartha Lakes home with several thousand more seasonal residents visiting every year.

Tourism and agriculture are two of the top economic drivers in Kawartha Lakes and both rely heavily on the availability of clean, safe water.

Recognizing the impact and important role water plays in the community, officials are developing key partnerships and strengthening networks to find new and innovative ways to enhance its ability to manage water and wastewater.

In 2012 the City's Economic Development department began working on the Water Research and Innovation Network project.

"Fostering strong networks, relationships and partnerships has been the key to success for the program," explained Kawartha Lakes Mayor Andy Letham. "Clean water is vital to our municipality and is a huge economic driver. By attracting and working with new and emerging technologies we are able to benefit our residents, businesses and visitors."

Working with companies such as H2Flow, Noble Purification and WCI Environmental Solutions, Kawartha Lakes has facilitated a number of pilot projects that are improving recreational water quality, wastewater treatment, storm water management and shoreline restoration.

"Working with specialists in the water sector we are able to provide companies an opportunity to pilot or demonstrate their innovation," said Numair Uppal, Economic Development project manager. "Those companies benefit by gaining access to municipal testing sites, and Kawartha Lakes benefits from the positive impact of the technology."

Earlier this year Kawartha Lakes successfully secured an Environmental Compliance Approval (ECA) from the Ministry of Environment and Climate Change which will help facilitate even faster implementation of new technologies.

The ECA includes a Limited Operational Flexibility (LOF) clause, providing limited operational flexibility to make changes to defined aspects of the sewage works within an operational envelope, for the Lindsay Waste Pollution Control Plant. This allows the facility to host pilot projects to help increase efficiency and serve as a demonstration site for new technology.

To learn more about water innovation in Kawartha Lakes visit advantagekawarthalakes.ca or contact Numair Uppal by e-mail nuppal@city.kawarthalakes.on.ca or telephone 1-705-324-9411 extension 1270.



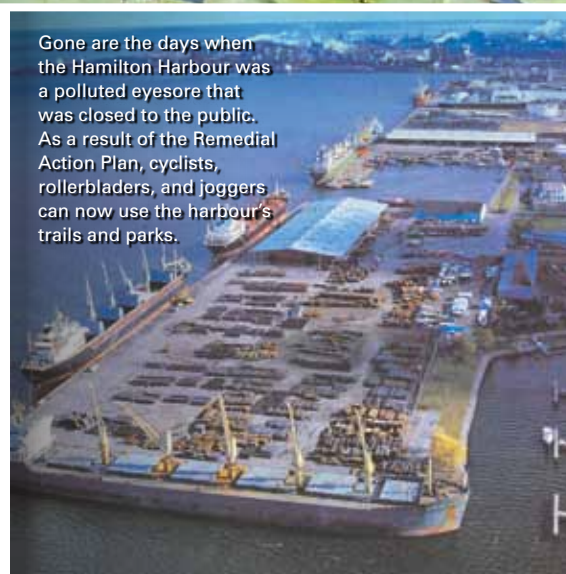
The transformation of Cootes Paradise Marsh from polluted pond to healthy ecosystem at the Royal Botanical Gardens attracts nature and tourism dollars to Hamilton's economy.

Cootes Paradise Marsh

Uncovering a Paradise

Exploring the economic benefits of rehabilitating a watershed and cleaning up a city's waterfront.

BY MARIO CARR



Gone are the days when the Hamilton Harbour was a polluted eyesore that was closed to the public. As a result of the Remedial Action Plan, cyclists, rollerbladers, and joggers can now use the harbour's trails and parks.

City of Hamilton

A STRONG ECONOMY needs a healthy watershed. One municipality that understands this all too well is Hamilton, Ontario.

Clean-up projects to reverse more than a century of abuse along Hamilton's Lake Ontario shorelines are attracting wildlife, people, and dollars to the city, which has helped to boost the local economy. For example, waterfront properties in Hamilton have doubled in value from 2003 to 2013.

This is just the start. Hamilton plans to develop its 42-acre waterfront with a \$600-million private sector investment

to build 1,200 to 1,600 residential units and 16,000 square metres of commercial space. Growth in the local economy in the form of wages, services, and supplies is anticipated to be huge.

Up until the 1990s, the waterfront surrounding Hamilton Harbour was fenced and off limits to the public. The city has since turned it into a series of parks for everyone to enjoy. Now the community and tourists are enjoying a trail system that links 28 per cent of the harbour waterfront with green spaces, restaurants, and shops. Future plans will restore public access to 35 per cent of the shoreline.

"Now we're at a tipping point for large-scale commercial and residential developments because of the investments we've made in public space," said Chris Phillips, the City of Hamilton's planning and economic development department senior advisor. "It's estimated the build out will generate \$7 million to \$10 million a year in net new property taxes on land that today achieves next to nothing."

Phillips added that, "Council has committed \$60 million over the next four years to bring the area up to development-ready status. The notion is that we will pay for that back with taxes and uplift.

The taxes I'm talking about are solely related to the development. There will also be a spill-off factor of value increases in the broader neighbourhood."

Prior to pollution laws, industrial waste was dumped directly into the harbour. The harbour also received discharges from three wastewater treatment plants and runoff from urban areas. Over the years, sediment contaminated by metals, polychlorinated biphenyls, and other hazardous chemicals have accumulated in the harbour.

Because of this ecological damage, Hamilton Harbour was one of 43 Areas of Concern identified by the Great Lakes Water Quality Agreement between Canada and the United States. A document called the Remedial Action Plan was created in 1992, laying out a plan to systematically undo the years of abuse and clean the harbour.

A community not-for-profit group called the Bay Area Restoration Council was formed in the '90s to promote clean-up projects and to monitor and assess the implementation of the plan by governments, organizations, and the private sector.

Major accomplishments so far include upgrades to the Skyway and Woodward wastewater treatment plants, and a \$20.6-million rehabilitation of Windermere Basin. In 2013, a 25-hectare plot of industrial land was reclaimed, restoring a local ecosystem and providing natural wildlife areas and parklands for recreational use.

It's anticipated the harbour will be delisted as an Area of Concern by 2020. When this happens, there could be close to a billion-dollar benefit to the local economy according to a 2007 York University study called the Bensim Report.

Residents are already seeing the efforts of the Remedial Action Plan. Before this clean-up started, Hamilton's shorelines were an ecological disaster, with rotting fish and dirty-smelling water. Rather than a place to avoid, it is now attracting tourists, residents, and businesses.

"It's improved the image of the city overall, and you're seeing a lot more people and businesses locating here," said Sandi Stride, CEO of Sustainable Hamilton. "I think cleaning up the harbour has a strong ripple effect

throughout the whole area. It has brought a lot more tourism [and] opened up recreation opportunities for people to experience the water first. The waterfront is an important part of our city."

Paradise rediscovered

Hamilton's Royal Botanical Gardens has also done wonders to revitalize its portion of Lake Ontario shoreline in the Cootes Paradise Marsh. The work is bringing back fish populations and aquatic and terrestrial life while increasing the number of visitors who are stimulating the local economy.

Named after an 18th-century British naval officer, Captain Thomas Coot, the marsh was once known for its abundant wildlife. For the next two centuries, wildlife decreased and the marsh turned into a dark brown polluted pond. The cause of the mess was improperly treated sewage, invasive carp destroying river channels, and land-use changes creating massive erosion. Since 1949, attempts were made to revitalize the marsh without any luck.

During the '90s, volunteers planted 50,000 aquatic plants in the hopes of rehabilitating the marsh, which was almost barren of any vegetation. Then something happened.

"Changes started to be noticed from degraded to actually getting better," said Tys Theysmeyer, the Royal Botanical Gardens' head of natural areas. "The quality of the water is getting better. It has a way to go, but it's going in the right direction.

"We've opened up a whole new batch of educational programs and experiences that we didn't have before. In the last year, canoeing has taken off with 30 new programs. It's very popular now."

People are also buying canoes because there's now a local place to paddle.

"This year, we had a big biodiversity festival and a birding festival. These are things that didn't occur before," Theysmeyer said. "It's becoming the place to go if you want to experience some life and water." wc



Mario Carr is a Burlington, Ontario-based public relations consultant who also writes about science and nature.

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Scientists at Tsinghua University in China use IBM's World Community Grid to discover conditions for moving water through carbon nanotubes.

Through the Tube

Carbon nanotubes have the potential to dramatically improve water quality and better manage the world's water woes. BY JEAN-FRANCOIS BARSOUM AND SOPHIA TU

WATER IS ESSENTIAL for life on our planet, but for many, it's an increasingly scarce resource. According to the World Water Council, 1.1 billion people currently live without access to clean drinking water. In

January of this year, the World Economic Forum said a water crisis is the No. 1 global risk based on impact to society (as a measure of devastation), and the No. 8 global risk based on likelihood

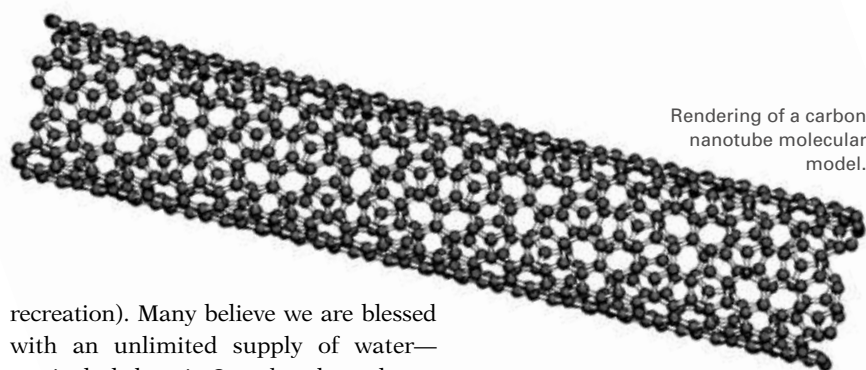
(likelihood of occurring within 10 years).

Not only do we use water to drink, we use it to grow our food, support our industries, and provide energy and transportation (not to mention for fun and

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Rendering of a carbon nanotube molecular model.

recreation). Many believe we are blessed with an unlimited supply of water—particularly here in Canada, where almost nine per cent of the country's total area is covered by freshwater. However, this summer's headlines concerning water rationing and drought conditions across much of Western Canada indicate that this country is by no means immune to water stress.

The World Economic Forum said a water crisis is the No. 1 global risk based on impact to society.

As water reserves dwindle, having secure access to clean drinking water is an increasingly critical challenge. Thanks to a recent breakthrough, published in the *Nature Nanotechnology* journal, researchers have discovered a phenomenon whereby the use of carbon nanotubes have the potential to dramatically improve water quality and better manage the world's water challenges.

Water is purified when it moves through small membrane pores. The challenge with this method is that it often requires a great deal of energy, which leads to higher energy costs. To optimize water filtration, efficient membranes that produce lower energy is crucial. Advanced technologies can

provide more detail about how water flows through nanotubes and create greater possibilities to improve future water filters and water quality.

Carbon nanotubes have been theorized as a potential filtration material, but until now, scientists have been puzzled by unexpected effects observed when water moves through them. Using the massive computational power of IBM's World Community Grid, a team of international researchers were able to

resolve the mystery and determined that, under certain conditions, the natural, random thermal vibrations of atoms in nanotubes—tiny, hollow structures made of a material related to the graphite in pencils—could have a significant effect on the water.

The researchers discovered that these vibrations, called phonons, could enhance the rate of water diffusion by more than 300 per cent as a result of reduced friction. This discovery could aid in the design of more efficient filtration materials, which would translate into a decrease in the energy consumption used to produce potable water, leading to dramatically lower costs for water and less impact on our environment.

The applications for these findings have the potential to improve water filtration technology and make seawater desalinization more efficient and affordable. They can also lead to a better understanding of how chemicals and drugs pass through tiny channels in human cell walls, potentially leading to improvements in medicines. This discovery might also help improve a process that creates energy when freshwater and saltwater are mixed—an environmentally friendly process known as osmotic power—where the cost of the membrane has been an obstacle to commercialization.

The lack of clean drinking water is one of the biggest challenges facing the world today. It's a health and safety issue, and indeed, a question of life and death. This recent breakthrough has the potential to contribute to the search for new approaches to remediate water and better manage the looming water dilemma.

One of the key messages from the World Water Forum is "water is everybody's business." After all, none of us are immune to water challenges. This isn't just a matter of convenience: more than a million people die every year from diseases caused by unclean water. With ever-increasing population growth and climate change, the problem is only expected to get worse. It's time to find smarter solutions. WC



Jean-Francois Barsoum is a senior consultant at IBM Smarter Cities. Sophia Tu is a manager for World Community Grid, a philanthropic initiative of IBM Citizenship.

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An artist rendering of the planned cloudburst boulevard.



The July 2011 flooding of Copenhagen.

Cloudburst Mitigation

Canada could learn some lessons from Denmark about climate change adaptation.

BY MARTIN VILHELMOSEN

THE WORLD IS FACING many severe issues, such as climate change, pollution, droughts, and floods—and these problems are not limited to specific regions. As a result, it is imperative countries learn from each other through best practices and success stories.

From August 2010 to August 2011, the City of Copenhagen—the capital of Denmark—was hit by three devastating cloudbursts in a 12-month period. Major roads and other infrastructure were flooded. The total damage from the most destructive of the three events cost Copenhagen more than €800 million (or \$1.18 billion). As a consequence, the city decided it had to do something to protect the city from future damage.

An initial economic analysis indicated the cost of doing nothing would triple in 100 years due to climate change affecting weather patterns, so the city decided to implement the Cloudburst Management Masterplan 2012 for the protection of the city against future events.

The plan

The cloudburst master plan is based on a few simple principles, the main one being to keep the water on the surface and control it rather than making large expensive pipes underground. New infrastructure will be used for separating rainwater from smaller events to take the load off the sewers and wastewater treatment plants. From a socioeconomic perspective, this proved more feasible compared to conventional pipes, underground retention volumes, and a completely new separate system.

Cloudburst streets collect and transport the water away from the vulnerable areas. Retention streets are typically located a bit upstream from a low-lying vulnerable area and retain the water through the large storage volumes created. Adjacent to the cloudburst streets, areas with secondary streets will be transformed

into green streets with swales or permeable pavements that retain the water in the area, and to some extent, infiltrate it, thus helping to recharge the groundwater aquifers. Central retention will be created in public spaces like parks and parking zones. In areas where the water simply cannot be handled on terrain, large underground cloudburst tunnels up to three metres in diameter will be built instead of cloudburst streets.

The master plan intends to create synergy for the city as a whole, achieved by using water-sensitive solutions to increase the overall livability of the city, with the water on the terrain used as a resource in the city space. The benefits are many, such as increased recreational value from the upgrading of parks and meeting places, improved microclimate, and synergy with traffic planning.

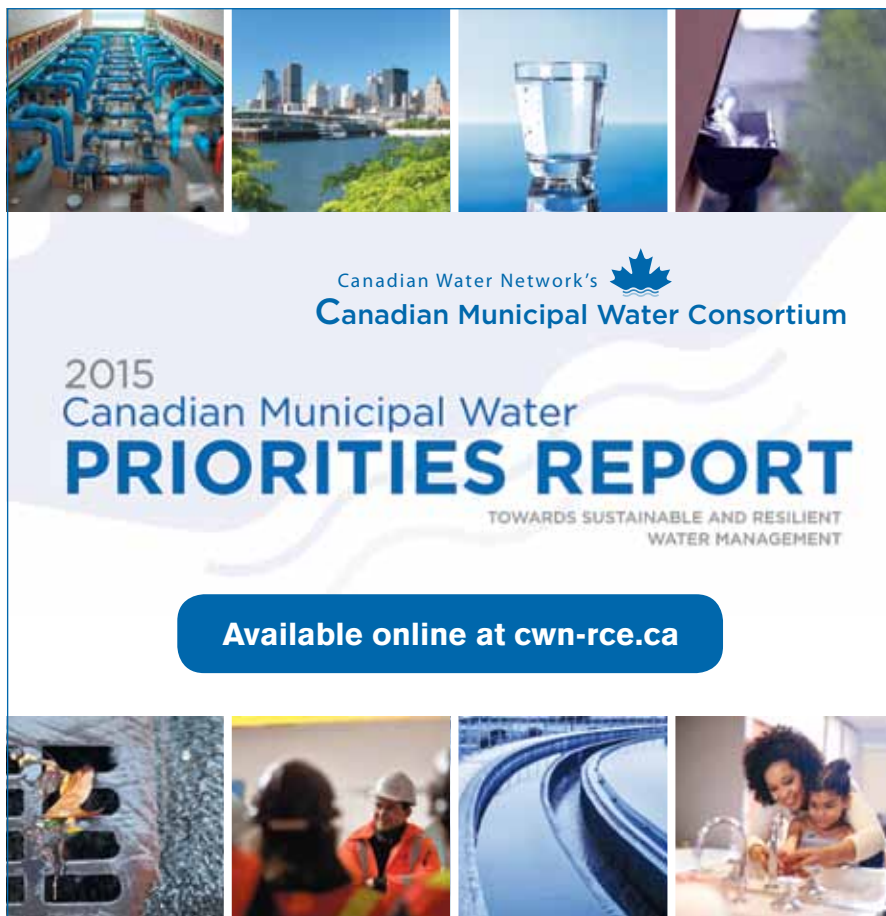
More specifically, the concept is to retain the water in the higher-lying areas of the city and slowly release it when the peak of the storm has passed. In addition, the plan aims to create robust solutions that drain the low-lying areas. Where possible, the water should be handled locally. An extensive hydro-geological assessment of the whole city was conducted to identify the effects of infiltration on the groundwater table.


Detailing the vision

Copenhagen has been divided into eight areas, and a concretization plan for each of those catchments has been developed. Ramboll group prepared four of the eight concretization plans with detailed illustrations of how cloudburst streets, retention streets, and green streets can be designed, and how these solutions support the overall goal of the city to increase livability.

Multifunctional spaces are key elements in the concretization plans, such as parks and playgrounds that can be flooded during heavy rainfall but in dry weather serve as recreational spaces.

In one example of a multifunctional space on a cloudburst boulevard (see illustration on page 28), the boulevard is wide enough to have a substantial retention volume in order to both store the water and transport it away.



Canadian Water Network's 
Canadian Municipal Water Consortium

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As it stands currently, the street is a traditional boulevard with a green strip in the middle, which is common all over the world. The green strip is elevated a bit and has no other function than adding some green space to the city and providing space for the citizens to walk the dog. During cloudbursts, the water is likely to run from the green area and onto the street. The whole road profile is sloping toward the buildings and does nothing to prevent the cellars under the houses from flooding.

The vision Ramboll created for this boulevard is to change the whole road profile to a V-shaped profile, creating a large retention volume in the lowered green area in the centre of the profile. When it rains, the water can run away from the houses and the street into the green area. The capacity of the urban river created during cloudbursts can carry up to 3.3 cubic metres of water per square metre. During normal rain and dry weather, the lowered green strip can

serve recreational purposes.

Central retention is also a key element in the plan. One of the more radical suggestions is to transform one of Copenhagen's three inner-city lakes, Saint Joergens Lake, into a beach park by lowering the water level in the lake. This creates a vast area for the collection of rainwater while also improving the recreational value of the city. The alternative would be to construct a gigantic and expensive cloudburst pipe to divert the expected half a million cubic metres of water away. The recreational solutions above ground will save approximately €134 million (\$197 million) compared to the construction of an underground stormwater pipe.

Benefits

A socioeconomic analysis was done for the master plan, and the result was that the benefit from this approach exceeds the costs of construction and maintenance. Even though the budget is

€1.3 billion (\$1.9 billion) over a 30-year investment period, the benefits from prevented flooding and reduced damages far exceed the investments. In 2015, several hundred projects were approved and tendering has already commenced.

The concretization plans help Copenhagen maintain its position as one of the most livable cities in the world. The city is a showcase for the importance of long-term city planning and holistic and sustainable solutions, as well as an example to follow for many other cities in the world that are facing the same issues. Adapting to climate change in this way is good business for cities because of the many socioeconomic benefits. **WC**



Martin Vilhelmsen is chief project manager for urban water management and climate adaptation at Ramboll.

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Canada Should Worry About Adaptation, Too



In the past, insurance claims and damages for extreme weather events have been roughly \$400 million per year. However, in recent years, these costs have increased rapidly and are now more than \$1 billion per year according to the Insurance Bureau Canada's 2014 fact book. The Toronto flood in July 2013 cost insurers more than \$850 million, and the devastating floods in Calgary in 2013 cost more than \$5 billion.

It's clear that we cannot afford the cost of doing nothing.

However, the costs of investing in cloudburst adaptation are also hard to finance. Canadian cities are limited in their income and many local governments rely on real-estate taxes and national government funding for their infrastructure investments. And no government grant is currently directed at "climate adaptation."

It's therefore paramount to look for ways to engage the private sector to attract funding and to work across departments to finance stormwater adaptation. Blue-green infrastructure creates places that handle water and are, at the same time, attractive public spaces.

Blue-green infrastructure helps increase the value of nearby real estate by as much as five per cent, which makes it interesting for real-estate developers to participate in adaptation investments. In order to attract private investors and work fully across departments to raise finances to avoid the cost of doing nothing, cities must understand the full benefits of doing something and capitalize on these benefits, as Copenhagen has done. *WC*

—Jonathan Leonardsen, Consultant, Ramboll



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Changing the Channel

An integrated media strategy
can support constructive local
water engagement.

BY MICHAEL AHERNE

IT'S A PERPLEXING PARADOX. How is it that water—the sustainer of life, our communities, and economy—is taken for granted by so many local leaders and citizens? Changing the channel on public attitudes is imperative, but not impossible, with an integrated media strategy.

The Closer to Home (C2H) Initiative was a one-time investment to promote safe drinking water and responsibly managed wastewater capacity across rural Alberta. Early design indicated a need to engage and educate local officials and citizens.

Engagement and education is being achieved in part through an ongoing provincial television public service announcement (PSA) campaign undertaken in partnership with Bell Media; a recent province-wide radio PSA campaign; and local, on-demand access to syndicated, royalty-free digital media assets via YouTube and archive.org.

Rural reality

Canada's rural reality is that water issues require novel, multi-faceted engagement. Many local officials handle water issues with platitudes rather than attitudes of diligent stewardship. Citizens reinforce this dynamic by taking water services for granted and focusing on more visible and expensive demands to smaller tax bases, such as road maintenance and state-of-the-art recreation facilities.

In rural Canada, some four million citizens also service their water needs through small private systems, such as water wells, cisterns, and septic systems. Multi-jurisdictions of First Nations and Métis settlements are often co-located in proximity to other rural municipalities.

Complicating matters is an infrastructure discourse increasingly dominated by a “big cities” agenda. There is risk of marginalization about water issues that's fuelled by diffused accountability and the perceived notions that there is little money and rural citizens don't matter.



Rick Deans, the senior manager of infrastructure for the Town of Cochrane, Alberta, on location in Cochrane at the Bow River during production of Conversation Pays Dividends video case and public service announcement.



Jenelle Saskiw, the mayor of Marwayne, Alberta and chair of the FCM Standing Committee on Municipal Infrastructure and Transportation Policy, stands on location for production of A Tale of Three Villages.

Integrated media design

Four key design elements influenced the integrated media strategy. One has been the work on rural attitudes toward local services that was advanced by former Alberta MLA Doug Griffiths and Ontario's Bruce Davidson, co-founder of Concerned Walkerton Citizens. In his book, *Thirteen Ways to Kill Your Community*, Griffiths wrote, “If you believe you can or can't, you're right.” He said the first way to kill a rural community is to ensure a low quality of drinking water. As for Davidson, he continues to share his experiences of the Walkerton tragedy to remind local leaders and citizens that water issues demand constant vigilance.

Secondly, the British Columbia auditor general has promoted the use of narrative to scale leadership for public services in the guide *Managing Knowledge*. Several rural Alberta communities have had “We believe we can” stories that are transferable. Scaling these narratives as lessons has taken the form of five five-minute video case studies (youtube.com/ouralbertawater). They include success stories about three villages cost-sharing a certified operator; rural succession planning and retention; practical rural municipal water conservation; full-cost accounting and asset management; and integrated watershed

management of a high-profile recreational lake.

A pre-production partnership with Bell Media's CTV2 resulted in the production of two-minute PSAs of the five rural case studies. Between December 2013 and July 2015, the two-minute PSAs have aired on Alberta television 785 times as a Bell Media in-kind contribution to the C2H Initiative, with the partnership extending to December 2017. The 10 segments were produced on location with a budget of \$75,000.

The third part of the integrated media strategy is to leverage radio. Five 30-second radio PSAs informed by insights about rural municipal and private small system issues were produced. Three broadcast partners provided the vehicle for a 1,200-spot province-wide radio campaign that ran from May to October 2014. Professional production of the five PSAs was less than \$2,000. The 2014 provincial radio campaign was \$40,000. The broadcast-quality, royalty-free PSA audio files remain available for use by Alberta municipalities as part of their local radio media budgets (bit.ly/AlbertaPSA).

An integrated media strategy should also consider how the evolution of cost-effective DVD production and Web 2.0 justified a prudent media investment of a one-time project. Media assets were distributed to mayors, reeves, and chief administrative officers of 380 rural municipalities and water commissions in a DVD product called Getting on the Right Track with Local Water and Wastewater Utilities. Web-accessible digital media assets are available for local use on websites and social media, including Facebook, YouTube, and Archive.org. Creative Commons licensing also supports intellectual property use at the local-community level by extending flexible rights to use the digital media.

Early insights and lessons

The integrated media strategy represents a different way of thinking about use of media and changing the channel on how Canadians are engaged and educated about vital water issues. The early implementation of the integrated media strategy has been well

received. But has it been effective? We don't know yet, and it would benefit from additional impact analysis. Stakeholders interested in advancing an evaluation of the strategy are welcome.

With the recent release of the Canadian Water and Wastewater Association's Public Attitudes Project report, as well as the trending from the annual RBC Canadian Water Attitudes Study, we can

expect continued adoption of creative media to support citizen engagement about water issues. WC



Michael Aherne is a certified management consultant with a policy and strategy practice and the co-founder of Alberta's C2H Initiative.

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Big Brother

Do local governments need a push to support
asset management? BY ROBERT HALLER

I AM MORE OF A local-government specialist than a water/wastewater specialist. My Masters in Public Administration is in local government (although focused mostly on post-Walkerton water policy). My real experience is 20 years as a municipal administrator working directly with elected councils. And as we all know, influencing decision making on a political level can be one our greatest challenges. Should councils be given a completely free hand, or is there a role for senior levels of government to nudge them in the right direction?

I recently participated in a sustainability planning session with several executive directors from various resource industry associations. In that session, we all agreed that you can make all the strategic plans and sustainability targets you like, but without a buy-in from your board of directors, those plans will go nowhere. Like all corporations, municipalities have a board—we just call them a council.

We all face infrastructure challenges across the country, but each situation will be different based on the age and size of the infrastructure, the local water resources and the tax base that will share the costs. The common factor for all is that it comes down to the locally elected Council to allocate the necessary funds and human resources, and to identify water and wastewater projects as priorities.

For the Canadian Water and Wastewater Association (CWWA), some of our key messaging around the infrastructure challenge has been on the importance of asset management and full-cost pricing. At the National Infrastructure Roundtables, CWWA called upon the federal government to set aside funds specifically for water/wastewater projects and suggested that, in order to be eligible for federal funding, a municipality must have an asset management program with a long-term renewal plan and an appropriate finance model. We even suggested that, with federal program support, municipalities

could soon be self-sufficient and no longer need to beg for federal funding. However, there was a definite reluctance by the federal government to set local priorities or attach many conditions to the flow of infrastructure grants.

CWWA is working on this conundrum from a few angles. We are developing a toolkit of resources to support our members, the utility leaders, in educating their councils on the need for water/wastewater renewal. We are also coordinating with the Value of Water Coalition to build public support for greater investment in our sector. Our recent publication, *Public Attitudes 2015*, supports local efforts in building public support.

While many municipalities are showing tremendous leadership in asset management and working toward long-term sustainability, many more are not willing, or not able, to allocate resources to asset management and infrastructure renewal planning. Is it time that provincial and federal authorities make this critical planning mandatory and commit the necessary financial resources to support and sustain these programs?

Some provinces have taken great strides in this direction. In Ontario, municipalities have required a drinking water licence that includes a viable financial plan. Other provinces have initiated accounting standards to initiate comparable asset management as a first step. Meanwhile, new legislation like British Columbia's *Water Sustainability Act* and Alberta's *Water for Life Strategy* is introducing elements to ensure the long-term viability of their water systems. We will take a more in-depth look at legislation across the country in the next issue. WC



Robert Haller is the executive director of the CWWA.

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APPOINTED



Ernie Hui

The Government of Alberta has appointed **Ernie Hui** to a new special advisory role on water quality. He has held a variety of senior leadership roles in the Alberta Public Service, including CEO of environmental monitoring; deputy minister of environment and water; and most recently, deputy minister of seniors.



David Haig

Ottawa-based BluMetric Environmental Inc. has appointed **David Haig** as president and COO, providing oversight of business development and operations. BluMetric delivers solutions to complex environmental issues, including contaminated site remediation, water resource management, industrial hygiene, and design-build and pre-engineered product solutions to industrial and commercial water and wastewater treatment needs.



Howie Honeyman

GreenCentre Canada has announced the appointing of **C. Howie Honeyman** as CEO of Forward Water Technologies. Since October 2012, he has worked as the CTO of GreenCentre, where he oversaw its technical and commercial activities. Forward Water is revolutionizing fresh water production through an inexpensive, low-energy desalination approach that uses switchable salt to purify water.

MOVED

Fibracast Inc. held a groundbreaking ceremony in July at the site of its future Hamilton, Ontario-based advanced manufacturing facility, which will produce its patented FibrePlate hybrid membrane for advanced water treatment and reuse. Fibracast—a member of the Anaergia group of companies—is a leader in the research, development, and manufacturing of advanced membrane technologies for water and wastewater treatment.



MANTech continues to expand its business. The firm has moved into a 13,000-square-foot facility with dedicated office, laboratory, training, manufacturing, R&D, and warehouse spaces. President and CEO **Robert Menegotto** said the new building “allows us to meet increasing demand delivering water analysis solutions that are green, fast, and high quality while lowering the cost per sample.”



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BC Minister of Environment Mary Polak delivers the morning plenary address and speaks about the Water Sustainability Act, among other key environmental issues in the province.



Jessica Bratty of GEMM Dialogues and Theresa Fresco of Fraser Basin Council (FBC) on the left flank Judith Guichon, Lieutenant Governor of British Columbia, with Lynn Kriwoken of the BC Ministry of Environment and Steve Litke of FBC.



Water Brothers Tyler and Alex Mifflin bring their award-winning TV program to the stage.



David Main of AECOM and BCWWA (with microphone) asks a question during one of the many extended Q&A sessions.



L-R: Tanya McQueen, BCWWA; Shona Robinson, UBC; and Jennifer Crosby, Metro Vancouver take a break in the tradeshow area.

Canadian Water Summit 2015 Vancouver, BC

There was tap water on the tables for the 157 delegates who gathered for the sixth annual Canadian Water Summit on June 25th. The summit, located in Vancouver for the very first time, was focused on exploring the energy of water through water technology hubs, public attitudes toward water; and the intersections between water, natural resources, and the food and beverage industry. The day included panels on water clusters and collaboration, the water-energy nexus, and efforts to engage the public on water issues.

British Columbia's Environment Minister **Mary Polak** helped start the day by delivering the morning address. She expressed a genuine commitment to involving communities in water management through the province's new *Water Sustainability Act*. "You cannot escape water issues when you live in British Columbia," she said. "We're dealing with water all the time."

One highlight of the day was the luncheon keynote by TVO's *The Water Brothers*, **Alex and Tyler Mifflin**, who entertained the crowd with videos from their award-winning television programme.

The water-energy nexus breakout session brought together **James Fatouhi** of BlueTech Research, **Matt Horne** of Pembina Institute, **Matt Kennedy** of Innergex, and **Deborah Harford** of ACT to discuss natural resources, mining, and gas intersections, as well as electricity, water use, and utilities.

Anna Warwick Sears of the Okanagan Basin Water Board moderated a session on the water-land nexus, which explored ways Canadians can balance the protection of our fish, communities, farming, and waterways. The panel featured **Ted van der Gulik** of the Irrigation Industry of B.C., **Fin Donnelly** of the Rivershed Society of B.C., and **Jordan Point** of the First Nations

Fisheries Council of B.C.

The final breakout session of the day revolved around the evolution of the complex water-food nexus. Moderated by the Toronto and Region Conservation Authority's **Eric Meliton**, the session included remarks from BLOOM Centre for Sustainability's **Kevin Jones**, Molson Coors Canada's **Andres Palma**, and B.C. Greenhouse Growers' Association's **Linda Delli Santi**. Each speaker provided attendees with an overview of the ways their respective organizations make smart water stewardship decisions.

In her welcoming remarks, the summit's chair **Margaret Catley-Carlson** asked a question that stayed with delegates throughout the day: "How are we ever going to develop innovation if we're afraid of making a mistake?"

For more photos of the 2015 event, or to find out more about CWS 2016 in Toronto, visit watersummit.ca.

Water's Next 2015 Awards Gala Dinner Vancouver, BC



Madjid Mohseni of UBC accepts his award in the academia category.



Gala dinner guests enjoy wild Pacific salmon and an energetic awards program led by emcee Fred Keating.

The inaugural Water's Next awards gala dinner took place on June 25th in Vancouver, following the 2015 Canadian Water Summit. A sold-out crowd of 125 industry professionals and their loved ones attended the three-course dinner at the Westin Bayshore hotel to find out who won the eight coveted Water's Next awards (*Winners' profiles can be found online at WatersNext.ca*).

"We hope that this first ever Water's Next awards gala dinner will inspire you and encourage you to continue doing

your excellent, important work," said **Rachel Phan**, editor of Water Canada, in her introductory remarks. "Thank you for attending the gala and helping us honour and celebrate our winners and finalists. You helped make the Water's Next relaunch an incredible success."

Fred Keating was the emcee for the evening, cracking jokes in between courses. Finally, during the award presentation portion of the evening, selected sponsors presented the eight winners with personalized plaques and one-of-a-kind

glass Water's Next award pins.

Along with the celebration of the eight winners, attendees were able to network with their peers, sharing success stories and ideas over dinner, while also discussing the themes of the Canadian Water Summit. After the evening's award festivities finished, attendees continued their celebrations well into the night.

For more photos of the inaugural Water's Next awards gala dinner, or to find out how you can get involved in next year's event, go to WatersNext.ca.

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Municipal Priorities

Effective water financing and recovery is key to sustainable communities.

BY BERNADETTE CONANT



IN CANADA, water touches every facet of our lives, connecting our economy, our ecosystems, and the health of our communities. Addressing each of these areas through a water lens can lead to integrated approaches to achieving more sustainable and resilient communities.

Sustainable communities depend on effective and transparent financing structures that recover costs, particularly for infrastructure. According to the Federation of Canadian Municipalities' Infrastructure Report Card, almost half of Canadian municipalities that participated in their survey have no data on the condition of their buried infrastructure. How sustainable can we be if Canadians don't know where investments are most needed? Fully understanding the state of our infrastructure is a critical stepping stone to developing the right financing models to pay for the water systems that depend on that infrastructure, along with other water-related costs. Doing so will achieve more resilient and sustainable communities in Canada, both now and in the future.

The largely hidden nature of what goes into ensuring successful delivery and management of community water supplies has resulted in difficulties ensuring the full costs of water management are both recognized and financed. Paired with a growing backlog of maintenance and aging infrastructure issues, increased demands from population growth and a legacy of inadequate water pricing has led to over-extended, underfunded systems.

The 2015 Canadian Municipal Water

Priorities Report, released by Canadian Water Network's Canadian Municipal Water Consortium, emphasizes that more robust and effective full-cost recovery and financing models for water management can be achieved by assessing a broader inventory of options and approaches. Expanding and detailing the inventory will help Canadian cities have a better understanding of the different financing models being applied in Canada and their relative merits.

When it comes to water pricing, taking a step back from current trends in order to assess the options and paths available is integral. We have to get it right and develop financially sustainable municipal water systems that account for the full suite of costs to provide services so generations after us don't inherit a huge bill for upgrades and renewals. It's time we have the foresight to look at long-term solutions rather than short-term gains.

Increased transparency and effective communication about full-cost recovery and financing with customers is another key component to the water financing puzzle. According to the RBC Water Attitudes Survey, one in 10 Canadians thinks water systems in their community require major investment, and 46 per cent of Canadians have no knowledge about the condition of water treatment systems. By bridging the gap between rate structures and clearly communicating

the full costs to customers—along with addressing affordability issues with strategies like lifeline rates for low-income customers, seasonal surcharges, and peak-load pricing—municipalities are moving one step closer to increased levels of support for the value of local water systems.

The good news is that Canadian municipalities are making headway in

Fully understanding the state of our infrastructure is a critical stepping stone to developing the right financing models to pay for the water systems that depend on that infrastructure.

water pricing and financing, as well as communicating with their customers. Robust and effective full-cost recovery and financing models, paired with increased transparency and effective communication with the public, will lead to sustainable communities that will thrive as they finance, operate, maintain, and improve their water infrastructure. **wc**

Bernadette Conant is the CEO of the Canadian Water Network.



To download the 2015 Canadian Municipal Water Priorities Report, go to bit.ly/CWN2015.

Once he reduced his energy costs by 55% after installing a VFD, savings in other parts of his business went into overdrive.

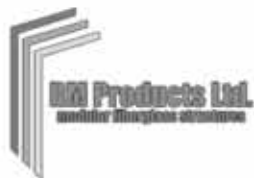
Once you start seeing the benefits from our incentives for installing premium efficiency motors and VFDs, you'll want to look into making other parts of your facility like lighting, HVAC and compressed air systems more efficient too. When you do, you'll be joining thousands of organizations across Ontario who are already enjoying the savings that our programs deliver.

Take a look at their stories and our incentives at saveonenergy.ca/business





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Booth 4880 at WEFTEC 2015
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As the global demand for clean water grows, system operators and environmental managers are looking for sustainable solutions – and they're finding them in Ontario, Canada.

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