



SMART, STRATEGIC INVESTMENTS FOR URBAN WATER SUSTAINABILITY:

SEIZING CANADA'S INFRASTRUCTURE MOMENT



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Bringing together past political leaders, former officials with federal and provincial governments, and senior staff of respected research institutes and non-governmental organizations, FLOW has been working for over a decade to secure the health of Canada's fresh water. We convene leading thinkers, provide critical analysis and commentary, and engage with governments to advance progressive public policies and influence important decisions about the future of our most precious resource.



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CANADA'S INFRASTRUCTURE MOMENT

The Government of Canada is investing over \$180 billion in infrastructure over the coming decade.¹ Decisions about how these historic investments are made will play a critical role in shaping the future of Canadian cities and towns for the next half-century or longer. This “infrastructure moment” presents an unparalleled opportunity to advance efforts to build resilient and sustainable communities across the country.

Public opinion polling indicates that municipal water services are top of mind for Canadians when it comes to government infrastructure investments. According to RBC's 2016 Water Attitudes survey, Canadians believe that after health care infrastructure, water services should be the next top priority for government infrastructure funding.² The state of water services is also an increasingly important consideration for business and industry, factoring into decisions about where they make investments and locate operations that create jobs and economic growth.

Setting the course for the next generation of water infrastructure

Much of Canada's water, wastewater and stormwater infrastructure is over a half-century-old and in many cases, is much older. According to the 2016 Canadian Infrastructure Report Card, 29 percent of Canada's drinking water infrastructure and 35 percent of wastewater infrastructure is in fair to very poor condition.³ The backlog of repairs and upgrades amount to a water and wastewater infrastructure deficit estimated at \$88.5 billion.⁴ At the same time, demands on water, stormwater and wastewater services are on the rise as communities grow and climate change adds to stresses on infrastructure systems.

Addressing this infrastructure backlog and responding to new water needs is a critical public policy priority. But the opportunity presented by Canada's infrastructure moment is about more than repairing and rehabilitating ailing assets or digging out of a decades-long deficit. It is an opportunity to accelerate and scale up sustainable solutions to urban water management and to ensure water infrastructure will be safe and effective in the changing climate. And it is an opportunity to build up our clean water technology and services sector as a central pillar of the federal government's efforts to position Canada as a global innovation leader.

This report outlines three strategies to advance urban water sustainability and proposes a package of policy recommendations to guide infrastructure investments in ways that will increase the pace and scale of their implementation. With smart, strategic investments supported by a well-designed regulatory framework, the Government of Canada can play a leading role in addressing some of the country's most serious and systemic water issues, in ensuring communities are prepared for and flourishing in the context of a changing climate, and in positioning Canada to tap into the economic opportunity presented by the \$500 billion global water technology and services market.⁵ The report builds from a roundtable discussion with Canada's Minister of Infrastructure and Communities hosted by the Southern Ontario Water Consortium (SOWC), Water Technology Acceleration Project (WaterTAP) and the Ontario Clean Water Agency (OCWA) in June 2016. Recommendations from that event are available at: <https://sowc.ca/strategic-recommendations-for-infrastructure-funding/>.

Investing in Canada's infrastructure

The centrepiece of the federal government's 2016 budget – its first since coming to power in October 2015 – was a 10-year, \$120 billion infrastructure plan that is to be rolled out in two phases.⁶ Phase 1 of the *Investing in Canada Plan*, which focuses on short-term projects to rehabilitate and modernize infrastructure, includes a new Clean Water and Wastewater Fund that will invest \$2.0 billion over four years for immediate improvements to water distribution and treatment infrastructure.⁷

Phase 1 is intended to lay the foundations for longer-term, strategic infrastructure investments. Phase 2 – the details of which are still under development – holds the potential to be truly transformative in advancing water sustainability in communities across Canada. In November 2016, as part of its fall economic update, the Government of Canada announced additional funding that will increase total investment in infrastructure over the coming decade to over \$180 billion.⁸

THREE STRATEGIES TO TRANSFORM URBAN WATER MANAGEMENT

Canadian communities are making significant progress on water sustainably. Across the country, cities and towns are shifting emphasis from large-scale infrastructure expansion projects toward approaches that focus on making the most of existing assets by applying innovative technologies and practices. They are realizing the benefits of these approaches in providing safe drinking water and improving wastewater treatment, building resilience to climate change, reducing energy use and greenhouse gas emissions, saving money and taking steps toward financial self-sufficiency, and in protecting the health of rivers, lakes and groundwater.

Three key strategies lie at the heart of shifting the approach to urban water management: 1) getting the most out of existing assets; 2) investing in living green infrastructure; and, 3) accelerating uptake of innovative technologies and practices. By aligning infrastructure investments and regulations around these three strategies, the federal government can play a transformative role in helping Canadian communities seize the opportunities and realize the benefits of urban water sustainability.

Persistent problems and emerging challenges

Canada is often seen as a country of vast, pristine waters. While our thousands of lakes and rivers are the envy of the world, Canadians are not immune to water problems. On a per capita basis, Canada records five times as many cases of waterborne disease outbreaks as the United States, and more than twice as many as in the United Kingdom. Some 2000 boil water advisories are in place across the country at any given time, and for those living in First Nations communities the odds that tap water may be unsafe are nearly one in three.⁹ Concern is also mounting over emerging pollutants such as endocrine disrupting chemicals turning up in our water – contaminants that conventional water and wastewater treatment systems cannot effectively remove.

The changing climate will continue to make water management more challenging and complex for communities across the country. Increasingly frequent and intense floods are causing billions of dollars in damage, impacting people and their homes, communities, infrastructure and economies. Repairing the damage cause by floods like the ones that occurred in Toronto and Calgary in 2013 cost municipalities billions of dollars. Storm events – even relatively minor ones – are also a concern for public health and the environment. In many communities, when stormwater systems become overloaded, untreated water from combined or sanitary sewers is discharged into local water bodies that are sources of municipal water supply and valued recreation areas. More frequent rain storms also wash contaminants and nutrients off the land into nearby waters.

Getting the most out of existing assets

Maximizing the performance and productivity of existing infrastructure is typically the most sustainable and cost-effective means for municipalities to increase the quality of water and wastewater services. Through a combination of performance-based asset management, comprehensive water efficiency and conservation programs, and optimization of wastewater facilities, communities can delay – and in many cases eliminate – the need for costly new infrastructure while at the same time reducing energy consumption, lowering greenhouse gas emissions, saving money on operating costs, and moving toward financial self-sufficiency.

Performance-based asset management planning provides a framework for communities to assess the long-term adequacy of existing infrastructure, identify opportunities to maximize its potential, and set targets for key performance indicators including water use, effluent quality, energy consumption and greenhouse gas emissions. Wastewater optimization and comprehensive water conservation and efficiency programs are key tools for implementing asset management plans and meeting performance targets. By reducing and better managing water demands and achieving high quality wastewater effluent with existing assets, these measures can save significant money in avoided or deferred infrastructure.

Ideas in action

The City of Calgary is implementing a long-term water management plan with the goal of accommodating a projected population growth of 50 percent by 2033 through water conservation and efficiency measures that are projected to reduce total water demand by 33 percent.¹⁰

The Region of Durham undertook a water conservation and efficiency field trial that reduced water use by 22 percent, electricity by 13 percent and gas by 10 percent. Reductions in water use resulted in annual greenhouse gas reductions of 11 percent or 1.2 tonnes per household.¹¹

As part of a watershed-wide wastewater optimization program in the Grand River watershed, Haldimand County deferred more than \$10 million in capital infrastructure by assessing and harnessing the full potential of existing assets.¹²

In British Columbia, Asset Management BC has established a framework and supporting programming to help local governments move toward service, asset and financial sustainability for all municipal infrastructure assets.¹³

Investing in living green infrastructure

Communities are increasingly turning to living green infrastructure - including both natural assets such as healthy, functioning urban streams and forests and human-designed elements like constructed wetlands, retention ponds and bioswales - as strategies for building resilience to climate change. By slowing down runoff and absorbing or retaining pollutants, living green infrastructure helps to buffer the impacts of high intensity precipitation events by mitigating damaging flood waters and reducing pollution reaching rivers, lakes and oceans. Living green infrastructure brings a broader range of benefits including enhanced wildlife habitat and biodiversity, carbon sequestration, groundwater recharge and creation of community spaces for recreation and other uses.¹⁴

Research points to significant economic benefits for communities turning to living green infrastructure solutions. Compared to traditional infrastructure, green infrastructure solutions that perform at an equivalent or higher level are estimated to be 5 to 30 percent less costly to construct and about 25 percent less costly to maintain over their life cycle.¹⁵ By taking pressure off of existing and overtaxed grey infrastructure, living green infrastructure helps to delay or eliminate the need for large capital projects. Further, living green infrastructure tends to increase in value over time as trees get bigger and wetlands and forests become more productive, whereas the value of grey infrastructure depreciates over time. Given the accelerating adoption of living green infrastructure solutions there is a case to be made for capturing natural capital in municipal asset management programs.

Integration of living green infrastructure into urban water management needs to be considered in the broader context of community planning for climate change adaptation. As extreme weather events become more common and severe, there is a need to move beyond typical safety margins for infrastructure design that are based on historic trends because they are no longer reliable indicators of future conditions.. Mainstreaming climate resilience into infrastructure planning will require solutions to be designed to withstand and be efficient under climate conditions expected in the 2040 to 2050 timeframe.

Ideas in Action

As part of its Citywide Integrated Rainwater Management Plan, Vancouver City Council committed to a target of capturing and treating 90 percent of average annual rainfall by implementing green infrastructure design guidelines on public and private property.¹⁶

In New York City, construction of bioswales designed to reduce the amount of water flowing through the sewage and stormwater treatment systems is projected to result in annual savings of \$35 million.¹⁷

In October 2015, the White House issued a memorandum directing all federal agencies to incorporate the value of natural, or “green,” infrastructure and ecosystem services into planning and decision-making.¹⁸

The European Union includes green infrastructure as a solution to reaching its 2020 biodiversity goal, recognizing that in addition to biodiversity gains, green infrastructure will also produce benefits including improved flood mitigation and water filtration.¹⁹

Accelerating uptake of innovative technologies and practices

World leaders in urban water sustainability are setting and working toward bold, visionary targets for nutrient recovery, water reuse, carbon neutrality and net zero energy consumption. By partnering with technology and service innovators, municipalities are implementing solutions to turn wastewater into resource and revenue streams. Treating waste streams as resource recovery opportunities rather than disposal problems opens the potential to apply technologies and practices to reclaim and reuse wastewater, generate energy, and recover valuable nutrients such as nitrogen and phosphorus.

Exploring and implementing such approaches is just beginning in Canada. Cash-strapped municipalities are often deterred by concerns and costs associated with being early-adopters or by return on investment timelines that can be too long for municipal councils to support.²⁰ The Government of Canada's historic infrastructure investments present a unique opportunity to create conditions for success by establishing financial incentives and regulatory rules that accelerate the development and implementation of innovative technologies and solutions. By creating such conditions, the federal government can support communities in saving money and developing new revenue streams from energy generation and resource recovery while boosting Canada's growing clean water technology and services sector.

Ideas in action

When the town of Perth was required by the Ontario Ministry of Environment to treat residual water from its drinking water filtration processes it looked to an innovative Geotube[®] solution provided by Bishop Water Technologies. By investing \$800,000 in this approach the town realized a savings of 60 to 70 percent when compared to conventional solutions.²¹

By turning to an innovative solution developed by Ostara Nutrient Recovery Technologies, the City of Edmonton is recovering nutrients from wastewater at its Gold Bar treatment plant to produce a commercial fertilizer called Crystal Green[®]. It is expected that the capital expenditure for the project will be recovered in five years through lower maintenance costs and sales of the fertilizer product.²²

The wastewater facility in Gloversville-Johnstown, New York generates 90% of its energy needs by processing biosolids from the treatment process and local dairy wastes. The solution saves \$500,000 a year in energy costs and nets \$750,000 a year in revenue from fees it collects for accepting waste from dairy producers.²³

POLICY RECOMMENDATIONS: CREATING THE CONDITIONS FOR TRANSFORMATIVE CHANGE

This section proposes recommendations for the Government of Canada to align fiscal policy and regulatory regimes behind the strategies for urban water sustainability discussed above. Organized under three themes: 1) project assessment criteria to ensure smart, strategic investments; 2) dedicated funding for urban water sustainability; and, 3) wastewater regulations for the 21st century, the recommendations should be seen as an integrated policy package rather than a list of possible actions. Implemented in a coordinated manner, these recommendations can play a critical role in creating the conditions to accelerate and scale up urban water sustainability across the country.

Project assessment criteria to ensure smart, strategic investments

The federal government can maximize the impact of its historic investments by including specific criteria that prioritize and promote sustainability, resilience and innovation in infrastructure funding programs. These criteria should be prerequisites to be met by communities before any major infrastructure investment will be considered, and should be incorporated into funding agreements for approved projects.

Investments in major water and wastewater infrastructure projects should be conditional on the following criteria:

1. **Plans and programs to maximize existing infrastructure assets.** Municipalities should be required to have in place performance-based asset management, wastewater optimization and comprehensive water conservation and efficiency programs. Proponents should be required to demonstrate the extent to which the capacity of existing assets can be stretched and optimized to minimize, delay or eliminate the need for new or expanded treatment facilities.
2. **Targets for and tracking of key performance indicators.** Municipalities should be required to track and report progress against targets for key performance indicators including greenhouse gas emissions, energy consumption, and financial performance indicators such as operating costs as well as water use, wastewater effluent quality, water contamination from storm sewers and number of combined sewer overflow events.
3. **Climate change adaptation planning.** Infrastructure funding programs should be designed to reflect the context of a changing climate and encourage communities to build resilience to extreme weather events by prioritizing technologies and approaches that are flexible and adaptable over time. Proposals should be screened to ensure proposed infrastructure projects are designed to withstand and be efficient under future climate conditions.
4. **Incorporation of innovative solutions and living green infrastructure.** Requiring municipalities to integrate living green infrastructure and consider innovative, non-traditional technologies and practices into the planning and design phases of infrastructure projects will ensure that communities are exploring and capitalizing on the related economic, environmental and social benefits.

Dedicated funding for urban water sustainability

Tight budgets and a limited capacity to raise funds through taxation pose barriers to municipalities' ability to adopt new approaches and non-traditional solutions to water management. As part of its infrastructure investments over the next decade, the federal government should create dedicated funding streams to support municipalities in exploring, developing and implementing strategies for urban water sustainability. Such support will be particularly important for small municipalities with limited expertise and resources. Creating dedicated funding streams will stretch the overall impact of federal investments by supporting communities to implement solutions that defer or eliminate the need for new or expanded infrastructure. Such investments will have spin-off effects for Canada's clean water technology sector, providing incentives for municipalities to consider new and emerging technologies and practices.

The federal government should create dedicated funding streams to support:

1. **Performance-based asset management, water conservation and efficiency and wastewater optimization.** Dedicated funding to support municipalities in implementing performance-based asset management, comprehensive water conservation and efficiency plans, and wastewater optimization programs can ensure priority is placed on maximizing existing assets over new or expanded infrastructure. Funding should support implementation of measures such as leak detection and repair and upgrades to optimize wastewater treatment, as well as investments in human resources to effectively plan and manage these efforts.
2. **Living green infrastructure.** Dedicated funding to support the planning and implementation of living green infrastructure solutions creates incentives for municipalities to invest in natural capital as an alternative or complement to traditional infrastructure solutions for stormwater management. Funding should also support research and pilot programs to incorporate natural capital into municipal asset management programs.
3. **Innovative technology uptake.** Dedicated funding for municipalities to explore and adopt innovative solutions can offset costs and allay concerns of early adopters and create incentives for municipalities to set targets around resource recovery, net-zero energy and greenhouse gas reductions.

Wastewater regulations for the 21st century

Well-designed environmental regulations play a critical role in stimulating the development and adoption of new technologies and practices that can dramatically improve efficiency in resource and energy use, minimize or eliminate pollution, and turn waste into valuable resources. Existing federal Wastewater Systems Effluent Regulations (WSER), established in 2012 under the *Fisheries Act*, set minimum standards for four "deleterious substances" that can be achieved through traditional secondary wastewater treatment technologies. As currently designed, the WSER provide little incentive for municipalities to develop, explore or adopt innovative and more sustainable solutions. Worse, they risk driving upgrades to hundreds of wastewater facilities across the country that sink capital into infrastructure that is unable to deal with emerging contaminants (e.g., endocrine disrupting chemicals) and is likely to be outdated within a decade.

The federal government should review and reform the existing WSER to:

- Mandate that all wastewater facilities implement optimization programs and incorporate performance targets and measures that are based on fully optimized treatment systems. Where over-enrichment of lakes and rivers with nutrients (i.e. eutrophication) is a problem, facilities should be required to incorporate nutrient removal technologies.
- Include a broader range of “deleterious substances” and include contingency planning for wastewater treatment systems that may have to be upgraded to deal with endocrine disrupting chemicals and other emerging contaminants that cannot be treated with traditional technologies.
- Move beyond minimum standards to include performance-based standards supported by tools such as effluent charges that promote and reward innovation and optimization.²⁴
- Introduce requirements that facilities set targets for nutrient recovery, water reuse, greenhouse gas reduction and net zero energy consumption.

WSER explained

The Wastewater Systems Effluent Regulations (WSER) set standards for four deleterious substances: carbonaceous biochemical oxygen demand, suspended solids, chlorine, and un-ionized ammonia. All wastewater systems with a daily effluent discharge capacity of 100 cubic meters or more are subject to the regulations, with exceptions in Northwest Territories, Nunavut, and northern parts of Quebec and Newfoundland and Labrador. Among the over 3500 wastewater treatment facilities in Canada an estimated 849 facilities - or 25 percent - will require upgrades to comply with the WSER.²⁵

FEDERAL LEADERSHIP FOR A SUSTAINABLE WATER FUTURE

The Government of Canada’s historic infrastructure investments present a once in a century opportunity to set the course for the next generation of urban water management. Investments that carry communities further down the traditional path of large-scale infrastructure expansion projects can lock municipalities into costly and energy-intensive systems - systems and expansions that, if taking a different view, may not be needed. Fuelling this out-dated approach risks creating new debt for future generations, increasing greenhouse gas emissions and placing more pressure on freshwater resources and ecosystems.

With smart, strategic investments and well-designed regulations, the federal government can create the conditions for truly transformative change. If aligned and implemented in a coordinated way, the strategies for urban water sustainability and recommendations for fiscal policy and regulatory reforms included in this report can usher in a new age of infrastructure - one that improves communities’ capacity to manage and treat water, reduces greenhouse gas emissions and builds resilience to climate change, moves municipalities toward financial self-sufficiency, and provides opportunities to grow Canada’s clean water sector.

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