FINANCIAL SUSTAINABILITY IN ACTION

NOVEMBER 2026



Canadian Water Network
Igniting interest.
Inspiring action.

Urban densification

ABOUT THE AUTHOR

Nancy Goucher
Manager, Municipal Water Consortium
Canadian Water Network (CWN)

ACKNOWLEDGMENTS

The author gratefully acknowledges the contributions of all those involved in this work. We especially thank staff from EPCOR for reviewing this case study and providing valuable feedback that enhanced its quality and rigour.

This case study was made possible through funding and support from Housing, Infrastructure and Communities Canada.

FUNDED BY

Housing, Infrastructure and Communities Canada
Logement, Infrastructures et Collectivités Canada

Canada



The challenge: Dealing with sprawl

Sprawl is expensive for municipal water utilities. Low-density growth requires long networks of mains and pumping stations to serve relatively few customers, which raises capital and lifecycle costs while diluting the rate base. These inefficiencies make it harder for utilities to maintain financial sustainability while meeting service obligations.

Canada's first National Infrastructure Assessment (NIA)[1] underscores this challenge. It recommends that municipalities "make the most of our existing built and natural infrastructure before building new" and "prioritize building through density over suburban sprawl" to keep housing-enabling systems affordable. When cities concentrate growth in serviced areas, the same pipe footprint can serve more households, lowering the average service cost per connection and deferring expensive extensions.

Overview: How densification supports financial sustainability

Densification supports financial sustainability when paired with integrated planning. Key actions include maximizing services from existing infrastructure, managing demand to avoid costly expansion, and investing in projects that deliver multiple benefits. Concentrating growth allows utilities to serve more customers with the same or only modestly upgraded network footprint, improving efficiency, reducing average service costs per household and optimizing asset utilization. Leveraging existing systems before building new not only improves infrastructure efficiency but also reduces long term costs.[1]

In Canada, the largest inefficiencies arise from low-density suburban growth. This is where about 67 percent of Canadians live.[2] Suburban sprawl requires long networks of pipes, pumping stations and treatment capacity to serve relatively few customers per kilometre, significantly raising both capital and lifecycle costs. While rural areas represent a smaller portion of the population (17.8 percent),[3] extending municipal drinking water or wastewater networks to dispersed rural homes can also be costly and inefficient. Municipalities sometimes consider extending service to

households on private wells and septic systems in hopes of expanding their tax base. However, evidence shows this strategy may not be financially prudent.

Research by the National Ground Water Association[4] finds that rural extensions serving small numbers of remote households are often far more expensive than maintaining or upgrading decentralized systems once construction, operations, and maintenance are considered. Although studies such as those from the Urban Institute[5] note that expanding centralized wastewater systems to low-density rural areas can result in high per-household costs and limited economic return, these outcomes are situational and can depend on broader growth patterns. At the same time, smaller or remote communities may lack the technical expertise, staffing, or operational capacity required to safely manage decentralized treatment works. This is an important factor that can make regional or centralized systems more reliable and protective of public health.

Together, these examples reinforce the same lesson: concentrating growth within already serviced areas is the most financially prudent path. Concentrating growth enables utilities to maximize the capacity of existing systems, avoid costly expansions, and focus investment where it yields long-term value. Both suburban sprawl and rural extensions can introduce high per-household costs, but the largest systemwide inefficiencies come from low-density suburban growth because of the sheer number of residents living in these areas. Encouraging compact, infill development helps municipalities reduce infrastructure burdens, improve asset utilization and support more sustainable financial planning.

Economic benefits

The economic case for densification is compelling. Higher population density can reduce the cost to deliver infrastructure services per household due to economies of scale. For example, a Regional Municipality of Halifax study found that households in:

- Low-density suburban areas of about 40 people per hectare cost $3,462 per hectare annually to service
- Middle-density areas, where the population is about 89 people per hectare, cost $2,170 per ha annually to service.
- High-density urban areas, for areas with about 228 people per hectare, cost just $1,416 per hectare to service.

These costs included roads, drinking water and wastewater, libraries, fire, and police services.[5]

Other Canadian cities have reached similar conclusions. In a study commissioned by the City of Calgary, more compact development was estimated to save the city about a third in capital costs for roads, transit services, drinking water and wastewater, emergency response, recreation services and schools.

A growth strategy that balanced greenfield development and redevelopment of existing areas using the nodes and corridors approach was estimated to result in a 55 percent cost savings for drinking water and wastewater systems compared to a dispersed growth strategy. While they acknowledged that significant intensification could require upgrades to aging systems, the overall savings from avoiding dispersed growth would be substantial.[6]

Environmental advantages

Environmental benefits further strengthen the case for densification. Compact development reduces per capita energy use for pumping and treatment. In the United States, drinking water and wastewater plants account for 30 to 40 percent of municipal energy consumption. As much as 40 percent of operating costs for drinking water systems can be related to energy. Efficiency improvements through facility upgrades can save utilities 15 to 30 percent of these costs.[7]

Greenhouse gas emissions also decline as density increases. Research shows that for every 14-fold increase in population density, per capita emissions halve. This means that denser neighbourhoods can significantly reduce embodied emissions over time, contributing to climate goals while lowering operational costs.[8]



Policy and planning synergies

Finally, densification creates policy and planning synergies. It works best when land use, housing, and water utility plans are coordinated. Stronger cross-government alignment and data-driven decisions are easier to operationalize when growth is focused in fewer, better-instrumented districts. As the NIA emphasizes, integrated planning ensures that infrastructure investments deliver multiple benefits from financial resilience to environmental sustainability.[1]

Case study: EPCOR's approach to densification

About EPCOR

EPCOR Utilities Inc., headquartered in Edmonton, Alberta, is a municipal controlled corporation fully owned by the City of Edmonton. It operates water, wastewater, stormwater, electrical, and natural gas systems across multiple Canadian provinces and several U.S. states. In Edmonton, EPCOR provides water, wastewater, and stormwater services to over one million residents. It also supplies bulk water to over 90 communities surrounding Edmonton. As a for profit municipally controlled corporation, EPCOR can raise capital, own assets, and operate independently.

EPCOR operates two drinking water treatment plants in Edmonton. Wastewater from roughly 900,000 residents is collected and treated at the Gold Bar Wastewater Treatment Facility, which processes over 200,000 million litres annually. Edmonton's drainage system includes 3,757 kilometres of sanitary pipes, 280,138 wastewater service connections, 188,291 stormwater connections, 64,350 catch basins, 300 megaliters per day of wastewater treated, and 334 stormwater management facilities.[10]

Edmonton's 2024 zoning bylaw marked a significant shift toward a more equitable, climate-resilient, and livable city. By encouraging growth within existing boundaries rather than expanding outward, the city committed to the long-term vision of welcoming 600,000 new residents through redevelopment and infill. To support this vision, Edmonton simplified its zoning rules and introduced flexible zones that allow a wider range of housing forms in every neighbourhood. This policy change created the conditions for more compact and efficient urban development.[9]

Densification is expected to bring substantial benefits, but also new demands on Edmonton's drinking water, wastewater, and stormwater systems. To address changes in development patterns and built-form, EPCOR worked closely with the city and the development industry to adapt the utility's standards to the new zoning environment. This collaboration revealed that EPCOR needed to update its long-standing design assumptions for its drinking water, wastewater, and stormwater infrastructure. Historic standards had been shaped by years of greenfield expansion. They were not suited to infill areas and often resulted in oversized, expensive, and slow-to-deliver infrastructure. Maintaining these older approaches would undermine the affordability and speed that Edmonton was trying to achieve.[11]

EPCOR recognizes that infill development can be efficiently serviced using, in most cases, the infrastructure the city already has in the ground. Updated data and refined engineering approaches demonstrated that many existing drinking water, wastewater, and stormwater assets have significantly more usable capacity than previously assumed. In other words, infill does not typically require large pipe replacements or major expansions. Instead, development can be accommodated by just modernizing standards, improving information and using more tailored design approaches.

EPCOR was well positioned to respond because its One Water approach provided a strong foundation for adapting to the new zoning bylaw. One Water is an integrated method for managing drinking water, wastewater, and stormwater in a way that supports long-term resilience, efficient use of resources, and the needs of both communities and ecosystems. By bringing these teams together into a single planning group, EPCOR fostered holistic thinking, improved data sharing, and more coordinated decision-making. Seeing the entire water cycle as a connected system helped identify solutions that delivered multiple benefits at once. The approach also encouraged adaptive and innovative practices, including natural infrastructure that eases pressure on existing assets and strengthens climate resilience. These strategies align particularly well with denser urban environments, where compact form enhances their effectiveness.[11]

Using a collaborative process with the city and developers, EPCOR modernized its design standards to better support density. For example, water demand standards were updated to reflect the water efficiency of modern fixtures and appliances. Fire flow standards were updated to address changes in sprinkler systems and modern building practices. New stormwater approaches were introduced through EPCOR's Stormwater Integrated Resource Plan, which encourages the use of natural infrastructure to slow runoff and reduce pressure on the drainage network. As part of this work, EPCOR gained a more detailed understanding of water use, fire flow availability, and stormwater runoff conditions in redevelopment areas. These insights allow for more accurate, right-sized designs that avoid unnecessary infrastructure replacements.[11]

The result is a more flexible planning process that aligns with Edmonton's densification goals. Developers now have clearer and more predictable guidance when pursuing infill projects. EPCOR can evaluate infrastructure needs more quickly, which helps keep development moving. Updated standards allow the city and EPCOR to make better use of existing drinking water, wastewater and stormwater assets, allowing the utility to add capacity where necessary through targeted, surgical interventions rather than major system expansions.[11]



The financial benefits are significant. Infrastructure to support sprawling development is expensive to build and maintain because it requires long networks of pipes, deeper mains, larger conveyance systems and additional pumping or treatment capacity across dispersed areas. In contrast, compact neighbourhoods use infrastructure more efficiently. By aligning its standards with a denser urban form and shifting toward integrated stormwater management, EPCOR estimates that it avoided $600 million over 25 years in sanitary infrastructure trunk upgrades.[12] Natural and integrated systems perform best in infill areas with smaller catchments and shared services, while the grey infrastructure alternative assumed a continuation of low-density expansion that would have required substantial new construction.[11]

The story is not only about avoided costs. EPCOR's approach produced meaningful co-benefits. Updated standards support faster housing approvals, which contribute to affordability. Natural infrastructure improves stormwater management, reduces flood risk, treats runoff and contributes to climate adaptation. Strong collaboration among the utility, the city and developers has strengthened relationships and created a foundation for ongoing innovation.[11]

Importantly, this work shows how policy shifts toward densification can unlock financial and environmental gains when utilities are prepared to adapt. Edmonton's land use strategy created the opportunity, and EPCOR's One Water approach, openness to collaboration, and willingness to modernize standards made it possible to capture the benefits.[11]

Ultimately, while Edmonton's land use strategy created the opportunity, it was EPCOR's One Water approach, willingness to revisit old assumptions, and commitment to efficient use of existing assets that made it possible to capture the financial, environmental, and operational benefits of densification. This work demonstrates that with modernized standards, accurate data and integrated planning, utilities can provide reliable, resilient service to growing populations while relying almost entirely on existing infrastructure in infill areas.



Key takeaways

- **Use densification to reduce service delivery costs.** Plan for compact development so more customers share the same network footprint. This lowers per-household capital, operating, and lifecycle costs.
- **Maximize existing assets through compact growth.** Leverage higher-density development to defer major infrastructure expansions by improving capacity management and applying right-sized design approaches.
- **Modernize design standards to avoid costly overbuilding.** Update fire-flow requirements, demand assumptions, and runoff criteria to reflect current realities to prevent overdesign, reduce unnecessary capital spending, and accelerate project delivery.
- **Adopt integrated stormwater solutions in dense areas.** Shift from traditional grey infrastructure to integrated and nature-based stormwater approaches to improve performance and reduce long-term costs, especially where density supports system efficiencies.
- **Apply a One Water approach to strengthen decisions.** Integrate drinking water, wastewater, and stormwater planning to identify multi-benefit projects, capture system-wide efficiencies, and optimize capital investment.
- **Align policy frameworks to enable modern utility planning.** Coordinate zoning reforms with progressive utility planning to unlock financial, operational, and resilience benefits that arise when densification and utility modernization work together.
- **Reinforce densification and utility sustainability as mutually supportive goals.** Promote compact growth to reduce long-term infrastructure costs and use adaptive utility planning to ensure densification can proceed without creating unsustainable service burdens.

References

1. Canadian Infrastructure Council. (2025). National infrastructure assessment report 1: Building foundations for tomorrow: Assessing housing-enabling infrastructure across Canada. https://canadianinfrastructurecouncil.ca/national-infrastructure-assessment

2. Hill Notes. (2025, July 2). Mapping Canada's urban and rural landscape. https://hillnotes.ca/2025/07/02/mapping-canadas-urban-and-rural-landscape/

3. National Ground Water Association. (2021). Cost Comparisons of Local Groundwater Sources to Regional Waterlines. https://www.ngwa.org/docs/default-source/default-document-library/2024-white-papers/gw-vs-pipeline_final_5_12_21.pdf

4. Urban Institute. (2024). Connecting wastewater infrastructure and rural economic development. https://www.urban.org/sites/default/files/2024-02/Connecting_Wastewater_Infrastructure_and_Rural_Economic_Development.pdf

5. Stantec Consulting Ltd., & Gardner Pinfold Consultants Inc. (2013, April). Quantifying the costs and benefits of alternative growth scenarios: Halifax Regional Municipality, Nova Scotia: Final report. Halifax Regional Municipality. https://www.halifax.ca/sites/default/files/documents/about-the-city/regional-community-planning/HRMGrowthScenariosFinalReportJuly82013.pdf

6. City of Calgary. (2009, April 2). The implications of alternative growth patterns on infrastructure costs (Plan It Calgary study). https://www.calgary.ca/content/dam/www/engage/documents/next20/Implications-of-Alternative-Growth-Patterns-on-Infrastructure-Costs.pdf

7. U.S. Environmental Protection Agency. (2025, June 9). Energy efficiency for water utilities. https://www.epa.gov/sustainable-water-infrastructure/energy-efficiency-water-utilities

8. School of Cities, University of Toronto. (2025, February). Water infrastructure renewal policies. https://schoolofcities.utoronto.ca/wp-content/uploads/2025/04/Water-Infrastructure-Renewal-Policies_Feb-2025_FINAL.pdf

9. City of Edmonton. (2020). The city plan. https://www.edmonton.ca/sites/default/files/public-files/City_Plan_FINAL.pdf

10. EPCOR. (n.d.). Water and wastewater treatment. https://www.epcor.com/ca/en/ab/edmonton/operations/water-wastewater/water-wastewater-treatment.html

11. Ancel, S., & Zarski, H. (2024). Design standards modernization: A collaborative approach to optimize infrastructure design. Infrastructure Reports, 64(1), 11–13. https://www.cip-icu.ca/learning-hub/plan-canada-issue-water/

12. Syvixay, J. (2025, October 22). A flow of new ideas: How EPCOR uncovered $600M in savings. Taproot Edmonton. https://edmonton.taproot.news/ads/2025/10/22/a-flow-of-new-ideas-how-epcor-uncovered-600m-in-savings

Further reading

1. Canadian Infrastructure Council. (2025). National infrastructure assessment report 1: Building foundations for tomorrow: Assessing housing-enabling infrastructure across Canada. https://canadianinfrastructurecouncil.ca/national-infrastructure-assessment

2. School of Cities, University of Toronto. (2025, February). Water infrastructure renewal policies. https://schoolofcities.utoronto.ca/wp-content/uploads/2025/04/Water-Infrastructure-Renewal-Policies_Feb-2025_FINAL.pdf

3. Ancel, S., & Zarski, H. (2024). Design standards modernization: A collaborative approach to optimize infrastructure design. Infrastructure Reports, 64(1), 11–13. https://www.cip-icu.ca/learning-hub/plan-canada-issue-water/