FINANCIAL SUSTAINABILITY IN ACTION

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Canadian Water Network
Igniting interest.
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Risk-based maintenance and renewal

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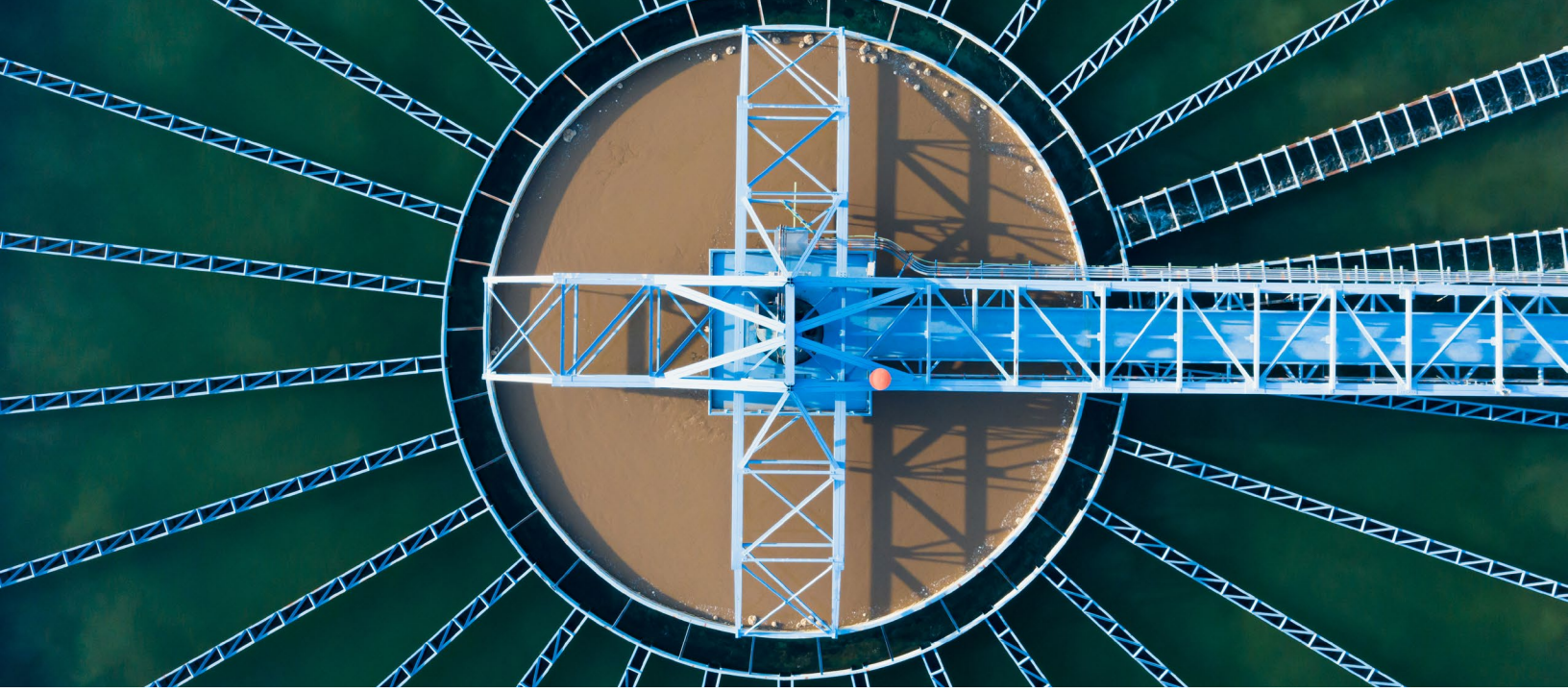

The challenge: Keeping up with repair and maintenance

Water utilities across Canada face mounting challenges as aging infrastructure reaches the end of its lifecycle. Immediate repair and replacement needs for water assets in Canada are estimated at $107 billion,[1] a figure that far exceeds available funding in most jurisdictions and forces hard choices about what to fix first. Historically, many utilities relied on age-based replacement schedules. Yet, assets are often failing before their nominal service life because of a number of factors including soil corrosivity, material and coating performance, pressure transients, installation and bedding quality, and external loads such as traffic, freeze–thaw, and flooding.[2,3]

Priority setting therefore needs to go beyond age and incorporate criticality (consequence of failure) and observed or estimated condition (likelihood of failure). Done well, this targets dollars to the highest risk assets and reduces emergency events. Done poorly, or skipped due to budget pressure, utilities drift into reactive mode, where a focus on maintenance activities prevents planned renewal. Field diagnostics and condition assessment can be costly and disruptive, but guidance from the Federation of Canadian Municipalities[4] notes that these activities can avoid premature replacements and focus resources on deteriorated segments most likely to fail. Multi-utility analyses show that soil corrosivity and material or vintage are strong predictors of break rates, which age alone cannot capture.[5]

Compounding these pressures, constrained budgets and competing priorities often push utilities into a reactive posture. Emergency repairs surge, consuming operating and capital budgets and perpetuating cycles of deferred maintenance. Even when condition data are available, many organizations lack the analytical capacity and the risk and asset integrity processes needed to reliably identify, monitor, and mitigate critical risks. As a result, data may not translate into timely action. Planned work is further eroded as crews are repeatedly diverted to urgent repairs.[3,5]

Overview: Repair and maintenance depend on risk-based asset management planning

To manage large, complex, and long-lived water systems effectively, utilities need a repair and maintenance strategy grounded in risk-based asset management planning. As described above, aging infrastructure, premature pipe failures, and persistent budget pressures make reactive maintenance unsustainable. A risk-based approach provides the structure needed to break this cycle by ensuring that the highest-risk, highest-impact assets are addressed first.[3,5]

A central tool for doing this is the Asset Management Plan (AMP), a disciplined, long-term framework for maintaining service reliability while minimizing lifecycle costs. An AMP links asset condition, criticality, performance data, and financial realities into a single, coordinated plan. When designed as a risk-based process, the AMP does more than catalogue assets: it actively guides annual budgets, maintenance schedules, inspection programs, and capital investment decisions. This ensures that operational activities are aligned with system-wide risk priorities rather than age-based assumptions alone or short-term budget constraints.[3]

Risk-based AMPs also strengthen accountability by making decisions transparent and evidence-based. They clarify which assets pose the greatest likelihood and consequence of failure, what interventions are needed, and when investments must be made to prevent service disruptions. This, in turn, helps utilities justify inspection and condition assessment activities and shows why proactive spending is necessary to avoid higher emergency costs later.[3]

Financial sustainability depends on robust rate-setting and cost-of-service processes that translate the AMP into a funding plan that supports reliable service. When integrated with risk-based AMPs, these processes help ensure that revenues are sufficient, capital is targeted to the highest risk assets, and emergency expenditures do not crowd out proactive renewal.[3,5]

Municipal examples

Squamish, British Columbia

About the District of Squamish

The District of Squamish in British Columbia provides water and wastewater services to a growing community of approximately 29,000 residents. Its water system includes 15 pressure zones, nine storage reservoirs, and more than 146 kilometers of watermains. The community's primary drinking water source is a groundwater supply, supported by two additional surface water sources at Mashiter Creek and the Stawamus River, which provide operational flexibility and resilience during periods of high demand or supply disruption.[6]

The District of Squamish renews asbestos-cement (AC) watermains using a risk-based method embedded in its 2024 Water Master Plan Update. In this framework, risk for reinvestment planning is calculated as the consequence of failure multiplied by the probability of failure. For each AC watermain segment, planners assign a probability-of-failure score (reflecting the updated age rating and other condition indicators) and a consequence-of-failure score (customers impacted, service criticality, and related impacts). Those two scores are multiplied to produce a segment-level risk score. Segments that land in the upper bands of the risk matrix are classified as high risk and are prioritized for earlier renewal ahead of lower-risk mains.[6]



What does this mean in practice? Most AC mains are now medium or high risk, and are prioritized for replacement within 15 years. By deferring low-risk AC renewals by 15 years (beginning those in 2041), the plan concentrates spending on the mains that matter most. It budgets $43.9 million from 2025 to 2040 to replace 26 kilometers of higher-risk mains. The plan also commits to regular reviews at least every five years so priorities stay aligned with evolving conditions and service objectives.[6]

Lesson: A documented, score-based risk method, paired with scheduled AMP reviews, enables strategic deferrals without compromising safety and preserves capital for the most consequential work.

North Red Deer, Alberta

About the North Red Deer Water Services Commission

The North Red Deer River Water Services Commission provides regional drinking water services to a mix of growing urban and rural communities in central Alberta, including the Town of Blackfalds, the City of Lacombe, Lacombe County, the Town of Ponoka, and Ponoka County. It operates as a regional water utility governed by a five member board representing each partner municipality. The Commission conveys potable water from the City of Red Deer through a 50-kilometre transmission line to its member communities. Its system consists of regional transmission infrastructure operated under contract by the City of Lacombe, supported by dedicated operational and administrative staff.[7,8]

The North Red Deer River Water Services Commission embeds risk assessment in daily asset management, using a qualitative risk rating scale (high, medium, and low) and an impact–frequency matrix to highlight components where failure would cause significant service disruption. Operational actions, such as targeted valve replacements and preparedness measures, are informed by that risk view. Importantly, the Commission also maintains a dedicated reserve to fund urgent high-risk repairs so emergencies do not destabilize longer-term renewal plans. This model illustrates how combining risk analysis with financial safeguards can help utilities manage emergencies effectively while preserving resources for proactive maintenance.[7]

Lesson: Combining a simple, transparent risk matrix with a repair reserve creates the flexibility to manage emergencies without sacrificing proactive, plan driven work.

Metro Vancouver, British Columbia

About Metro Vancouver

Metro Vancouver provides water services to nearly three million residents across the highly urbanized Greater Vancouver region through two separate legal entities, the Greater Vancouver Water District (GVWD) for drinking water and the Greater Vancouver Sewerage and Drainage District (GVS&DD) for wastewater. The drinking water system draws from three protected watershed areas (Capilano, Seymour, and Coquitlam) and stores source water in three main reservoirs and three supplemental alpine reservoirs supplied by rainfall and snowmelt. Water is then treated, tested, and distributed through a regional network that includes five supply dams, two treatment plants, 19 pump stations, and an extensive system of reservoirs and transmission mains, enabling reliable, high quality drinking water service across the region.[9]

Metro Vancouver employs a risk-based approach to assess the state of its water infrastructure assets, focusing on balancing performance, risk, and cost. This method allows for a comprehensive evaluation of both built and natural assets such as dams, treatment plants, and water supply areas.
By utilizing clearly defined performance metrics and assessing the likelihood of asset failure, Metro Vancouver can prioritize maintenance and renewal activities based on the criticality and condition of these assets. The framework emphasizes the importance of systematic data collection, risk assessment, and the integration of management strategies that consider both the economic and environmental impacts of asset performance and potential failures.[10]

This risk-based methodology ultimately leads to improved management practices, cost savings, and financial sustainability. By focusing resources on high-criticality assets and employing innovative solutions and technologies, Metro Vancouver can optimize the lifecycle value of its water infrastructure while minimizing risks to service delivery. The systematic review of asset performance data allows for evidence-based decision-making, ensuring that investments are strategically aligned with future needs, including capacity increases and environmental stewardship. Through regular updates to AMPs and ongoing monitoring, the organization can effectively manage risks, reduce lifecycle costs, and enhance service reliability for its customers.[10]

Key takeaways

- **Prioritize high-risk assets to reduce costs.** Focus capital and maintenance efforts on the assets that pose the greatest risk and strategically defer low-risk replacements to make the most of limited budgets.
- **Build decisions on strong asset management practices.** Collect accurate condition data and apply lifecycle analysis to ensure prioritization is evidence-based and supports long-term system reliability.
- **Maintain dedicated reserves to stabilize funding.** Establish and protect reserve funds so emergency needs can be addressed without disrupting long-term financial or capital plans.
- **Ensure adequate staffing and capacity.** Provide the resources, training, and expertise required to consistently apply asset management best practices across the organization.
- **Use adaptive planning to stay aligned with risk.** Conduct regular reviews of asset performance and emerging conditions to update priorities and keep plans aligned with evolving risks.

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