



ACHIEVING SUSTAINABILITY & CLIMATE CHANGE ADAPTATION THROUGH ASSET MANAGEMENT

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Local governments own about 60 percent of infrastructure across Canada that include roads, potable water, stormwater and wastewater systems, recreation centres and fire halls, but only receive 8 cents on the tax dollar. The federal government receives 50 cents and provincial governments get 42 cents. Over one-third of these assets that comprise the backbone of services in our communities are reaching the end of their life cycle, are in fair to very poor condition, and need to be replaced. In 2007, the Federation of Canadian Municipalities (FCM) estimated a \$123 billion infrastructure deficit for local governments across Canada, to increase at a rate of \$5 billion per year. That deficit almost reaches \$200 billion when forecasted to 2017 (without inflation).

Climate change further challenges asset management as damages to infrastructure occurs three times more often today than 30 years ago with increased storms, floods, storm surges, extreme temperatures, droughts and forest fires. The trend also shows that this rate is accelerating to be five times more in 50 years. In Canada, the number of natural disasters requiring disaster financial assistance has increased nine-fold in the past 45 years. Reinvestment in infrastructure is needed to maintain essential community services that support Canada's high quality of life.

A sustainability and resilience strategy is needed by local governments, so that they can address vulnerabilities efficiently and effectively. The FCM initiated an asset management program in 2015, consisting of 12 municipalities from across Canada, called the Leadership in Asset Management Program (LAMP). LAMP enabled participating municipalities to strengthen their asset management capacity and integrate sustainability goals, by learning about and applying asset management best practices from around the world. Integrating sustainability goals into decision-making about infrastructure assets and services helps to secure the best environmental, economic and social value for communities. As part of the program, the 12 municipalities worked together to learn how to organize an integrated approach, set priorities and make informed decisions about their infrastructure investments. The LAMP reports, showcasing these best management practices, are expected to be released early next year. A French-speaking cohort is also underway.

The second cohort called Climate and Asset Management Network (CAMN) was launched this November with its first workshop held in Ottawa with 19 local governments selected from across Canada. CAMN's core function is to support local governments to embed asset management as a strategic, ongoing business process and fully align it with corporate strategic goals, including climate action and sustainability. Integrating climate analysis into specific aspects of asset management planning, such as levels of service, risk assessment and lifecycle management, will significantly increase local government resilience in both the short and long term. The CAMN local governments will develop new best practices in asset management, building in climate considerations and sustainability.

Asset management enables local governments to understand the risks associated with climate change and take measures to limit costs and strengthen the resiliency of infrastructure. A resilient community can manage changes, undesired events and financial shocks while continuing to deliver important services without introducing significant impacts to revenues or spending. Asset management is more than a plan; it's a process that can be polished and improved over time. The process is integrated from the strategic level to the operational and across all major local government functions. It's simply a better way to make decisions and key to maintaining and improving services in increasingly risky conditions.

A simple and effective asset management process has been developed over the past 10 years by Asset Management British Columbia (AMBC) called The Framework. The development of the Framework was led by the Union of British Columbia Municipalities in partnership with AMBC. Nicknamed "The Wheel", The Framework shows the basic elements of sustainable service delivery for local government, which are also aligned and supported by internationally accepted best practices such as *the International Infrastructure Management Manual* and *the ISO 55000 Standard for Asset Management*.

The Framework establishes a high-level, systematic approach to support local governments' progress towards service, asset and financial sustainability. People, Information, Assets, and Finances, shown in the middle are the foundations of asset management to be

utilized and integrated into each of the four steps. Assess is the first step, and involves determining: the inventory, assets and levels of service for each major asset category, and organizational capacity to undertake asset management as an ongoing corporate function. The second step is Plan, which consists of developing a policy, plan and strategy to integrate a municipality's next steps into a long-term financial plan. The third step is Implement, and involves incorporating a process to measure and report outcomes. The Wheel demonstrates that asset management is an ongoing, multi-faceted process, and not a linear plan with a fixed goal. It is not a game of perfect, but rather improves asset management practices and local government decision making with a goal of sustainable service delivery, serving both the needs of today and the future.

In determining sustainable services, local governments should involve their communities in setting priorities, which includes understanding the trade-offs between available resources and desired services. Services come at a cost that are recovered primarily through user fees or general tax subsidies. If users do not pay the full cost of the service, then either all taxpayers fund the shortfall or deficits grow. Involving community members in the priority setting process quickly demonstrates to the public the difficulty in the decision making process. Asset management provides a process to balance costs, risk and levels of service, as well as guide investment decisions.

Within the AMBC Wheel or other asset management processes, climate change can be incorporated using the Public Infrastructure Engineering Vulnerability Committee (PIEVC) Protocol. The PIEVC created a protocol to assess the vulnerabilities of infrastructure to extreme weather events and climate change. It enables better planning and design of resilient infrastructure, crucial to Canada's safety and economy. Founded in 2005 and first used in 2007, the Protocol has been applied over 45 times across Canada and is available at no financial charge, through a license agreement with Engineers Canada. The case studies cover buildings, storm water/wastewater systems, roads, bridges, and water supply and management systems, and can be applied to any civil infrastructure.

The Protocol recognizes climate change, examines the impact of changing weather patterns on infrastructure, and calls for a shift in design data accordingly. Continuing to use inadequate historical data to design physical infrastructure systems makes assets more vulnerable to failure, threatening public services and safety. The Protocol includes a systematic review of historical climate information, which is used to project the nature, severity and probability of future climate changes and events for each individual infrastructure class or type. The adaptive capacity of each asset is then determined based on its design, operation and maintenance.

Finally, an estimate of the severity of climate impacts on the components of the infrastructure (i.e. deterioration, damage or destruction) is then conducted in order to identify higher risk components and the nature of the threat from the climate change impact. This information can be included in an asset management process. The case studies, available on the PIEVC website, exemplify various adaptations to increased frequency and magnitude of rain events on sewers; increased storm surges on coastal infrastructure, and; increased ice accretion and freeze-thaw cycles that accelerate wear and tear on roads and bridges.

Another Canadian case study that has integrated asset management, climate change and sustainability into municipal infrastructure planning, is the Dockside Green project in Victoria, BC. Dockside Green was a formerly contaminated, 15-acre site on the waterfront of the Upper Harbour, adjacent to the downtown. The City of Victoria partnered with a sus-

tainable developer to achieve the highest sustainability rating in the world under the Leadership in Energy and Environmental Design™ (LEED) for the first two phases of the development in 2008 and 2009. The development build-out is planned to have over 25 buildings, 2500 residents and 1.2 million square feet of live/work, hotel, retail, office and light industrial uses.

The project is served by two privately owned and operated district systems, one for wastewater and another for heat and hot water. The wastewater treatment plant treats wastewater to almost meet Canadian drinking water standards and reuses it on-site in greywater toilets, garden and planter irrigation and a constructed natural waterway. These processes along with low-flow fixtures reduces water consumption by approximately 80 percent.

The district's heat and hot water system originally ran on wood waste, but due to chronic supply shortages and the comparatively cheap cost of natural gas, the plant now runs entirely on natural gas. With further site development, the cost of running a full build-out capacity system will become more economical to return to a biomass feedstock. The average cost over nine years for heat and hot water in a 2 bedroom + den unit is \$16 per month, which is less than one-fifth of the conventional energy market cost. A passive solar design, fresh air ventilation and energy efficient appliances can further reduce energy use by about 50 percent than conventional buildings.

Strata Corporation regulations adopted by the provincial government in 2009 require all strata corporations, including Dockside Green to have 30-year capital maintenance and replacement plans, including an asset inventory, condition assessment and reserve funds. Because the district's two systems are privately owned and operated, the City of Victoria did not construct and does not have to operate, maintain or replace them. The sole client of the district systems is the strata corporation owners. Dockside Green is an interesting model in asset management that has achieved international recognition for its sustainability and response to climate change.

Asset management that incorporates sustainability and climate change adaptation improves decision making at the strategic and operational levels in local government. Three examples of best management practices of the AMBC Framework, PIEVC Protocol and Dockside Green project provide the tools and processes for local governments in Canada to follow. Coordinated and holistic approaches allow local governments to balance priorities and public spending, adapt to changing conditions and become resilient in meeting present and future needs. Asset management is a process – not a plan – that integrates all major operational and strategic functions to improve local government decision making.



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