Are our Water Systems at Risk?

Assessing the Financial Sustainability of BC's Municipal Water and Sewer Systems

February 2015

BC Water & Waste Association

URBAN systems

BCWWA
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Acknowledgments

The BC Water & Waste Association (BCWWA) is a not-for-profit association representing over 4,700 water professionals who are responsible for ensuring safe, sustainable and secure water, sewer, and stormwater systems in British Columbia and the Yukon. The BCWWA's members include facility operators, utility managers, engineers, consultants, suppliers, government policy and enforcement staff, and researchers from across the BC and Yukon region.

The BCWWA gratefully acknowledges the support of the Government Finance Officers Association of BC (GFOABC); the Province of BC Ministry of Community, Sport and Cultural Development; and Urban Systems who have contributed to the creation of this report.

We would like to extend a special thank-you to John Weninger, Chair of BCWWA's Infrastructure Management committee for his leadership and time in producing this important financial sustainability analysis of BC's water and wastewater system assets. In his "day job", John is a principal with the Vancouver office of Urban Systems, an inter-disciplinary consulting firm that provides strategic planning, engineering, environmental science, and urban design services to both public and private sector clients throughout Western Canada.

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Executive Summary

Reliable water, sewer, and storm water systems are essential to public health, a clean environment, and a strong economy. But British Columbia's systems may be at risk – aging infrastructure, growth, strengthened regulations, seismic risk, and climate change are driving the need for significant upgrades and re-investment in the pipes, pumps, and equipment that are used to treat, deliver and remove water safely, for our homes and businesses. At the same time, fiscal restraint and public complacency impede the ability of local governments and water utilities to secure the financial resources required to sustain our water infrastructure assets.

The BC Water & Waste Association, together with Urban Systems, has assessed the financial capacity of BC's local governments to maintain, renew and replace our existing water and wastewater infrastructure.

The analysis uses 4 financial indicators, based on data from the 2013 audited financial statements for municipal governments in BC. The focus of the assessment is on existing infrastructure and current levels of service, addressing:

- Are BC municipalities financially well positioned to meet their existing water and wastewater infrastructure investment needs to maintain current levels of service?
- Are water and wastewater rates recovering the full cost of service, including infrastructure renewal and replacement?
- How much investment is needed to sustain our water and wastewater infrastructure?
- Are municipalities financially resilient to withstand sudden or unexpected changes in revenues or costs for water and wastewater systems?

The analysis does not include financial data for regional districts, improvement districts, or unincorporated areas, and does not consider the infrastructure investment required to meet new regulations introduced by senior levels of government, or upgrades to address growth or resilience for seismic or storm events.

Financial sustainability is a key principle for safeguarding water, sewer, and storm water systems so that they continue to protect public health and the environment, and contribute to economic development. It means having adequate funds to pay for the current cost of operating and maintaining our water and wastewater systems, and proactively planning to ensure there will be funds to eventually renew and replace systems as they come to the end of their useful life.

It is possible to meet BC's water infrastructure needs, for this generation and the generations that follow, by making sound choices today about priorities for existing tax dollars, and setting user rates so that they cover the full cost of operating, maintaining, and replacing systems.

This report is the first of a series of reports that will be used to evaluate trends in the financial position of BC's water and wastewater systems over time. It is intended to inform dialog among elected officials, utility managers, and the public about policies and priorities for infrastructure renewal and investment, and provides recommendations that are aimed at enhancing the fiscal sustainability of our water, sewer, and storm water systems, to ensure that our public water and wastewater systems continue to protect public health and the environment for generations to come.

Our assessment points to 4 concerns about the financial sustainability of our water and wastewater systems.

1. Water and sewer fees are not covering the full cost of services in many communities

To be financially sustainable, the revenues earned by a water or sewer system should cover the full cost of operating and maintaining the system, as well as accounting for the eventual replacement of the system as it ages and comes to the end of its useful life.

While some communities are financially well positioned to meet current and future service needs, water and sewer rates in the majority of BC municipalities do not generate sufficient revenues from fees to pay for the full cost of providing services. In order to reach full cost pricing in the worst cases, rates would need to nearly double to reach financial sustainability.

2. Communities are vulnerable

The majority of BC municipalities have not set aside sufficient reserve savings to provide a buffer against unexpected changes in water or sewer system operating costs or revenues. This means that some communities are vulnerable to unanticipated events, like sudden equipment failure or the impact of severe storm or seismic events that damage water or wastewater systems, which could cause unbudgeted expenses, loss of revenues, or sudden rate increases.

While emergency borrowing mechanisms exist for municipalities, they take time to implement, which means there could be reduced service levels or delays in re-instating services following an unexpected change.

3. Smaller systems have greater financial gaps

Smaller communities (with a population less than 10,000) have greater financial sustainability gaps in their water and wastewater systems than larger communities. Water and wastewater systems are capital-intensive; smaller communities do not have the benefit of "economies of scale", and so the costs of their systems are shared across a smaller base of users, which impacts their financial capacity.

4. Investment is required

As our water and wastewater systems approach the end of their useful life, investment will be required to renew and replace our current infrastructure. Approximately $13 billion would be required in BC in order to address the shortfall in current reserve savings, to replace water and wastewater infrastructure at the end of its useful life. To ensure an appropriate level of funding will be available when required, BC communities need to have pro-active long-range plans that address their infrastructure renewal and replacement needs. The estimated $13 billion investment does not include new infrastructure that may be needed to accommodate growing communities, or upgrades that communities may need to undertake to meet regulatory change, or upgrades to address resiliency for climate change or seismic events.

How did we get here?

The cumulative effect of decisions, policies, and actions over a long period of time have influenced the financial status of BC's water and wastewater systems. Some of these factors include reliance on government grant funding for capital projects, lack of asset management planning, deferral of maintenance and investment, urban sprawl, and a lack of public support for full cost pricing.

> "...the majority of BC municipalities do not generate sufficient revenues from fees to pay for the full cost of providing services."

What can be done?

Building financial sustainability will take time. While the financial risks to our water and wastewater systems are not immediate for all communities, it is important to make sound choices today about priorities for existing tax dollars, and setting rates so that they cover the full cost of operating, maintaining, and replacing systems.

1. Adjust water and wastewater rates to cover the full cost of service

All water and wastewater utilities in BC should implement water and wastewater rates that cover the full cost of these essential services. Full cost recovery means that revenues should be sufficient to cover the cost to service and operate the system in perpetuity. The cost of service includes expenses to operate, administer, maintain and repair the system, as well as the eventual replacement and renewal of infrastructure. In areas with limited resources, it may be appropriate to develop phased strategies to transition to full cost recovery.

While no one wants to pay higher fees or taxes, there is an inescapable reality that there is a real cost for the pipes, pumps, equipment, and people who operate and maintain our water and wastewater systems. If we aren't willing to pay for these essential systems, our health and prosperity will be at risk.

2. Develop and implement integrated asset management processes

All municipalities should develop integrated asset management processes that assess the state of their infrastructure, evaluate risks, and set priorities for investment in water and wastewater assets, linked to long-term financial plans that identify how these projects will be financed.

Integrated asset management processes enable communities to:

- optimize system performance;
- minimize potential of infrastructure failure that could result in increased economic, environmental and health risk;
- balance expenditures over the lifecycle of the asset and avoid unbudgeted costs;
- define consistent revenue sources to support full cost recovery of service;
- adapt systems to meet short, medium and long term service targets, planning goals, policies and regulations.

3. Rank water and wastewater renewal and replacement projects as top priorities for capital investment

Water and wastewater systems are critical assets for public health – clean water keeps us safe and healthy. In an environment where there are competing demands for scarce financial resources, community leaders must make difficult decisions. Renewal and replacement of our water and wastewater systems should be a top priority for municipal capital projects.

4. Adopt "smart growth" principles

Municipalities should adopt "smart growth" principles for their land development policies, to ensure the costs of development are well understood, and a funding plan is in place that includes funding for the life cycle of contributed assets from new development.

5. Foster collaboration among all levels of government

Collaborative and constructive relationships between local, provincial, and federal governments are essential as municipalities transition to fiscal self-reliance for our water and wastewater systems. The Province of BC and local governments can work together to evolve the current local government finance tools so that they better meet future financial needs. Senior governments also have a role to play in supporting compliance with changes in regulatory standards set by provincial and federal acts, so that all levels of government can collectively address the financial investments required for new infrastructure that result from regulatory changes.

Introduction

Reliable water, sewer, and storm water systems are essential to public health, a clean environment, and a strong economy. Close to 90% of BC residents depend on municipal water and wastewater services to run their homes and businesses (Environment Canada, 2011); this essential service is vital to our quality of life in BC.

Most of us don't think about the systems that prevent flooding in our homes and businesses when it rains; many of us take for granted that when we turn on our taps, fresh water will appear; and that it will disappear when we flush our toilets, do our dishes, have a shower or do our laundry.

But our water doesn't magically appear and disappear. It requires a complex network of people and infrastructure. Our water, sewer, and storm water systems include thousands of kilometers of pipes buried under our roads and sidewalks, large pumps that move water and wastewater through those pipes, and sophisticated equipment to treat water so that it is clean and healthy for drinking and safe to release to the environment.

Who is responsible for our water & wastewater systems?

There are thousands of water and wastewater systems in BC, ranging from wells and septic systems that serve single homeowners, to large and complex systems that serve many households and businesses. Some of these systems are owned and operated by governmental organization like municipalities, improvement districts, regional districts, and First Nations bands; others are owned and operated by private utilities, stratas, or individual homeowners.

Water resources are governed through several federal and provincial acts, including the recently adopted *BC Water Sustainability Act*, the *BC Drinking Water Protection Act*, the *BC Environmental Management Act*, and the *Federal Fisheries Act*. These Acts provide the framework for regulations that establish criteria for water quality and treatment.

How are our water & wastewater systems funded today?

There are 2 types of costs associated with water and wastewater systems – the "capital" costs to build the systems, and the "operating" costs to run and maintain the systems day-to-day.

Capital Costs

The capital costs to build, renew and replace our systems are typically funded primarily by taxpayers (through their property taxes, or through contributions from the provincial and federal governments that are funded through income or sales taxes) and by property developers.

Municipalities in BC have the authority to establish development cost charge (DCC) bylaws that require property developers to contribute to the cost of new infrastructure required for their development. Developers seek to recover the costs of infrastructure construction from the buyers of the developed properties. The municipality typically assumes ownership of the infrastructure, which means that local taxpayers are responsible for paying for the associated operating and maintenance costs.

Operating Costs

The operation and maintenance of water and wastewater services have been funded through user fees, property or parcel taxes, or a combination. On average, BC households pay approximately $500 per year for water and sewer services - $270/year for water, and $230/year for sewer (Environment Canada, 2011).

What is the age and useful life of our water and wastewater infrastructure?

The pipes, pumps and equipment used in our water and wastewater systems can have a long lifespan. Lifespan is dependent on a number of factors, such as the type of materials used, maintenance, the amount of use, and the local environment.

Much of British Columbia's water and wastewater infrastructure was built more than 50 years ago, between the 1950s and 1970s in the economic boom that drove urban growth following the Second World War. As this infrastructure ages, it is approaching the end of its useful life. For example, 34% of BC residents are served by water pipes that are more than 50 years old, and an additional 6% of BC residents receive their water in mains reported to be more than 75 year old (Environment Canada, 2011).

Replacing these systems will be costly and disruptive. According to the *2012 Canadian Infrastructure Report Card*, more than $80-billion is required in Canada to replace aging water, wastewater, and storm water assets that are in "fair" to "very poor" condition across the country. An additional $91-billion is required to replace aging road infrastructure across the country (Felio, 2012).

With $32-billion in federal infrastructure funding available to municipalities through the Community Improvement Fund under the New Building Canada Plan there remains a potential municipal infrastructure funding deficit. This means that governments at all levels will need to make some difficult choices about where to allocate financial resources to protect critical public infrastructure. And whatever the level of government, there is ultimately only one source of funds – the "taxpayer".

Do BC residents value their water and wastewater services?

Despite the essential nature of water and wastewater services to our health, environment, and economy, the value of these services is not reflected in what most British Columbians pay. Overall, less than 0.5% of annual household spending is for water and wastewater services. By comparison, the average household spends 3% of its annual household income on gasoline, and 2% on telephone services (Statistics Canada, 2013).

According to a May 2014 survey of BC residents by Ipsos Reid, the majority of respondents indicated that they expect to pay less for clean drinking water than other utility services such as telephone, cable, and hydro, citing that clean water should only incur minimal charges. More than 50% of respondents had no idea how much they spend on water and wastewater services. This indicates a lack of public support to pay for the full cost of these essential services.

What is the purpose of this report?

The purpose of this report is to assess the financial capacity of BC's local governments to maintain and renew their water and wastewater infrastructure. The analysis uses 4 financial indicators, based on data from the 2013 audited financial statements for municipal governments in BC.

This report is the first of a series of annual reports that will be used to evaluate trends in the financial position of BC's water and wastewater systems over time. It is intended to inform dialog among elected officials, utility managers, and the public about policies and priorities for infrastructure renewal and investment, and provides recommendations that are aimed at enhancing the fiscal sustainability of our water, sewer, and storm water systems, to ensure that our public water and wastewater systems continue to protect public health and the environment for generations to come.

What Do We Mean by "Financial Sustainability"?

The BC Water & Waste Association (BCWWA) is the professional association representing the people responsible for ensuring safe, sustainable, and secure water, sewer and storm water systems in BC and the Yukon. The Association's 4,700 members include facility operators, engineers, utility managers, consultants, researchers and suppliers, from both the public and private sectors.

A May 2014 survey of BCWWA's members indicated that BC's water sector professionals are concerned about how to finance infrastructure renewal and replacement in an environment where there are fiscal constraints and a lack of public awareness about the state of water system assets.

Financial sustainability means having adequate funds to pay for the current cost of operating and maintaining our water and wastewater systems, and proactively planning to ensure there will be funds to eventually replace systems as they age and come to the end of their useful life. Financial sustainability is a key principle for safeguarding water, sewer, and storm water systems so that they continue to protect public health and the environment, and contribute to economic development.

It is possible to meet BC's water infrastructure needs, for this generation and the generations that follow, by making sound choices today about priorities for existing tax dollars, and setting user rates so that they cover the full cost of operating, maintaining, and replacing systems.

To make informed decisions, the public and elected officials need to understand the state of our current fiscal health, including:

Are BC municipalities financially well positioned to meet their existing water and wastewater infrastructure investment needs to maintain current levels of service?

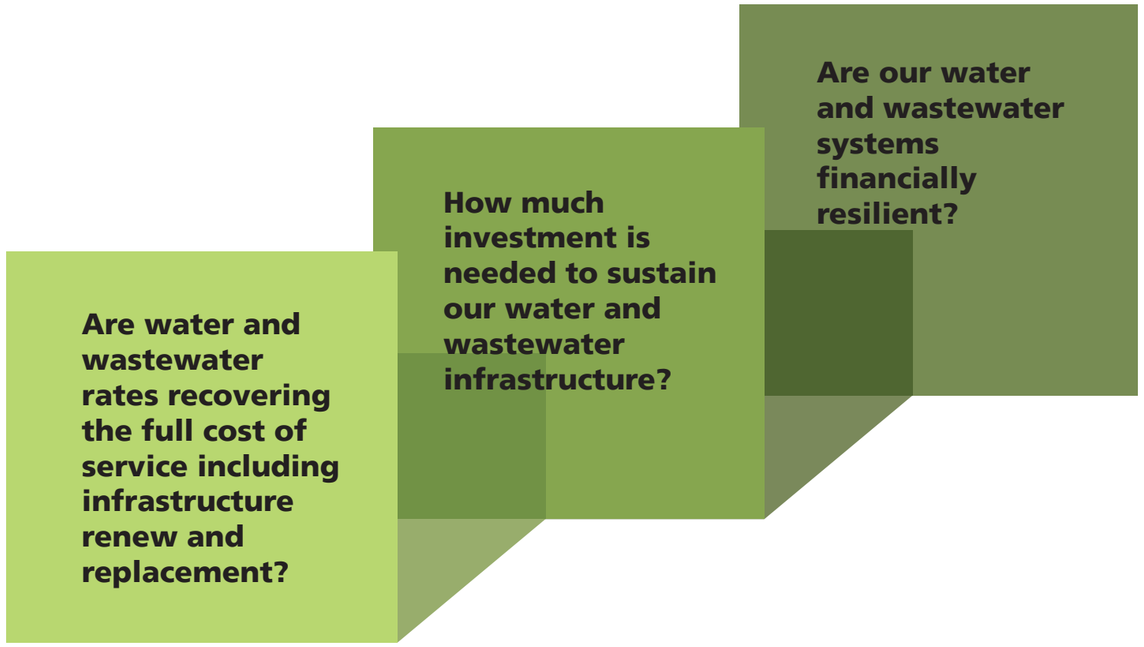
Are water and wastewater rates recovering the full cost of service, including infrastructure renewal and replacement?

How much investment is needed to sustain our water and wastewater infrastructure?

Are municipalities financially resilient to withstand sudden or unexpected changes in revenues or costs for water and wastewater systems?

This report provides a high-level picture of the state of financial sustainability of BC's water and wastewater systems.

> Financial sustainability is a key principle for safeguarding water, sewer, and stormwater systems so that they continue to protect public health and the environment, and contribute to economic development.



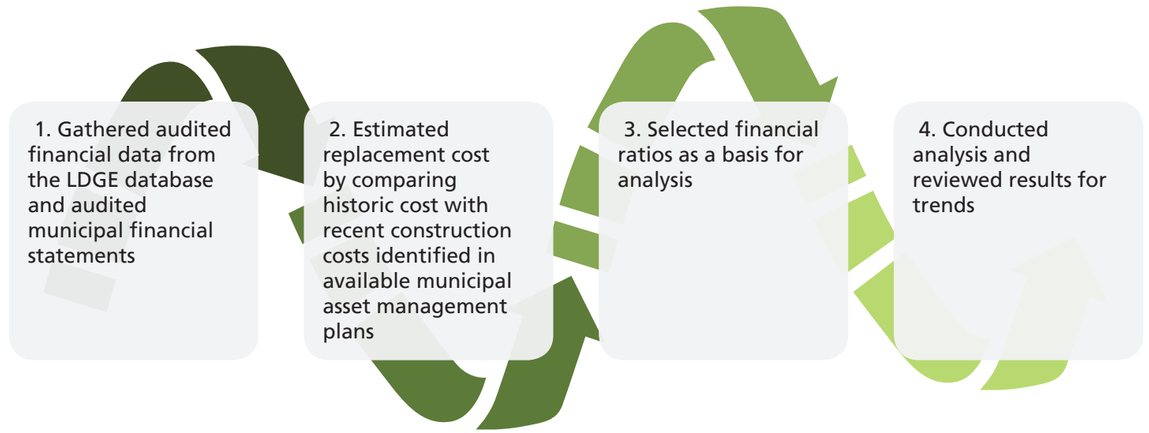
Methodology

On behalf of the BCWWA, Urban Systems conducted a financial ratio analysis using the 2013 audited financial statement data for water and wastewater assets, from municipalities in BC, with the aim of understanding if municipalities are financially well positioned to meet their infrastructure needs.

The analysis does not include financial data for regional districts, improvement districts, or unincorporated areas, and does not consider the infrastructure investment required to meet new regulations introduced by senior levels of government, nor enhancements to address growth or resilience for seismic and storm events. The focus of the analysis is on existing infrastructure and current levels of service.

Given that municipalities only began to include tangible capital assets (including water and wastewater infrastructure) on their financial statements as of 2009 in response to new accounting rules, this data is relatively new and to our knowledge, this is the first time this kind of analysis has been done at the provincial level. The methodology focused on using available data to identify high-level trends.

Urban Systems undertook 4 steps to assess the financial sustainability of BC's water and wastewater systems, outlined below.



1. Data availability and collection

The 2013 financial information for 162 BC municipalities was accessed using the provincial Local Government Data Entry System (LGDE) database. The following data was reviewed for each municipality:

- Community population
- Non-financial assets costs
- Water and wastewater infrastructure reserve funds
  - » Note: Reserves may be designated by the municipality for a specific purpose; available data did not specify purpose (i.e., whether reserves were operating, capital renewal, emergency, or other)
- Annual Revenue from water and wastewater service charges / user fees (and other sale of services)
- Annual water and wastewater operating expenses
- Annual depreciation expense based on historical cost of the asset
- Interest / foreign exchange on debt

Further data on accumulated depreciation since time of purchase, based on historical costs of the asset, was collected directly from municipal financial statements, as this information was not available for the water and wastewater utility separately in the LGDE database. Audited financial statements were available for 107 of 162 BC municipalities. The infrastructure deficit per capita financial ratio is based on a sample size of 107 municipalities. All other financial ratios used in this report have a sample size of 162 municipalities.

Under accounting rule PSAB 3150, municipalities report the amortization of their tangible capital assets. Amortization and depreciation are interchangeable terms when referencing tangible assets, and depreciation is the preferred terminology used in this report. Depreciation is based on the theoretical useful life of an asset, as determined by a municipality.

Financial statement data was used because it is readily available, audited, and useful for developing a high-level understanding of the financial health of water systems in BC. As municipal asset management practices continue to advance, additional data may become available that may improve the future analysis and corresponding conclusions.

2. Estimate of Replacement Value

Municipalities are required to record the value of their tangible assets based on the historical (i.e.: original) cost, and then depreciate the value of the asset over its anticipated useful life.

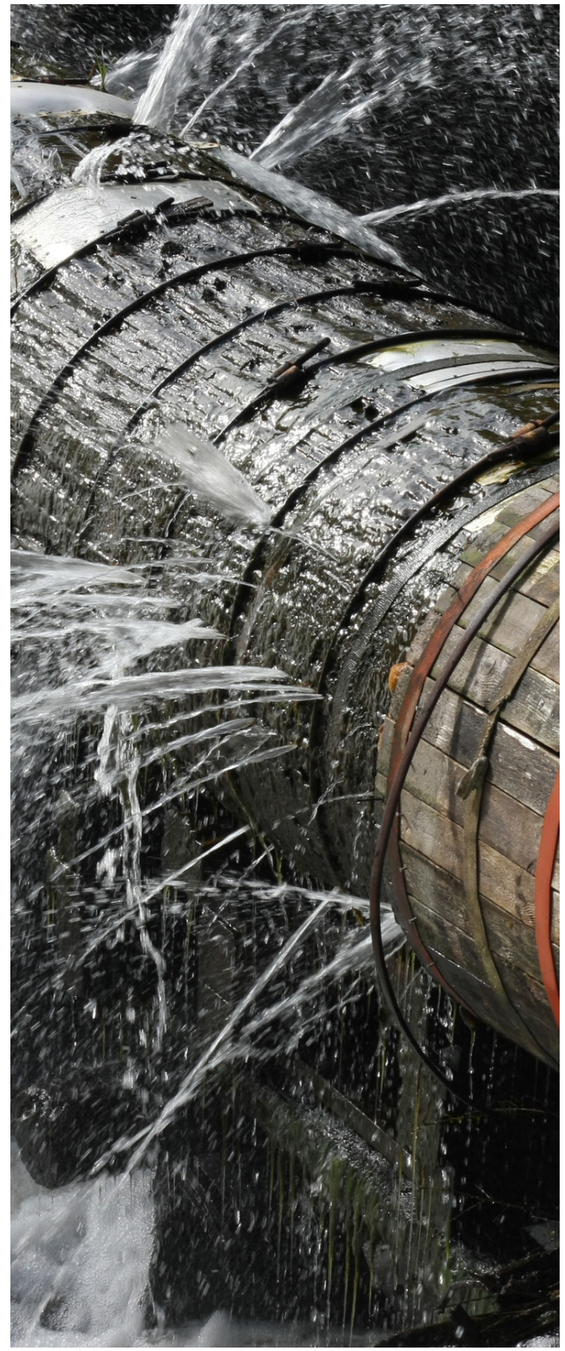
Take, for example, a water system asset that originally cost $1 million with a useful life of 50 years that has been in service for 20 years. The financial statements would show the original cost of the asset as $1 million. Annual depreciation would be recorded as an expense of $20,000 ($1 million divided by 50 years – i.e.: the useful life of the asset). Accumulated depreciation after 20 years of use would be reported on the financial statements as $400,000 (annual depreciation of $20,000, multiplied by 20 years).

While the current Canadian accounting rules require this "historical cost" method of accounting, it does not reflect the replacement cost of the asset, because of the impact of inflation over the 20 years since the asset was built or purchased. A water system that cost $1 million 20 years ago will cost considerably more than $1 million when it requires replacement at the end of its 50 year useful life.

In order to adjust for the impact of inflation in our analysis, an inflation adjustment factor was applied to the historical costs. A cost inflation factor of 2 was determined to be suitable, based on a comparison of historical cost to replacement cost, obtained from data in seven recent asset management projects in BC that assessed the replacement cost of water and wastewater assets. In those projects, replacement costs were estimated to be between 2 to 3 times higher than original costs.

By using a factor of 2 in our analysis, we have used a conservative estimate of replacement cost; actual costs may be higher, depending on the age and condition of the infrastructure. For more information, please see Appendices 1 and 2.

Replacement cost is used as the basis for calculating "replacement value depreciation" in the Operating Surplus ratio, and the Infrastructure Deficit per Capita Ratio as outlined below, in order to adjust depreciation based on historic costs for the impact of inflation.



3. Indicators of Financial Sustainability

A set of financial sustainability indicators were used to guide analysis and evaluate if BC municipalities are financially well positioned to meet their water and wastewater infrastructure investment needs. The indicators were selected based on a review of best practices in other jurisdictions, available information, and advice from knowledgeable professionals in the asset management field.

The Australian Infrastructure Financial Management Guidelines (AIMFG) are guidelines for linking the technical and financial management of infrastructure, and are a basis for many of the world's leading asset management processes (Institute of Public Works Engineering Australasia, 2012). AIMF guidelines, available municipal water and wastewater data from the LDGE database, and audited financial statements were used as a frame for conversation with industry experts to identify the indicators for analysis that would be most relevant and useful for BC's water and wastewater systems. The analysis is based on the 4 financial indicators outlined below.

4. Analysis and Use of Quartiles

The indicator ratios were calculated for each community individually, and then sorted into lower quartile, median, upper quartile, and by community population to identify potential trends. Appendix 3 shows a list of municipalities included in each population group.

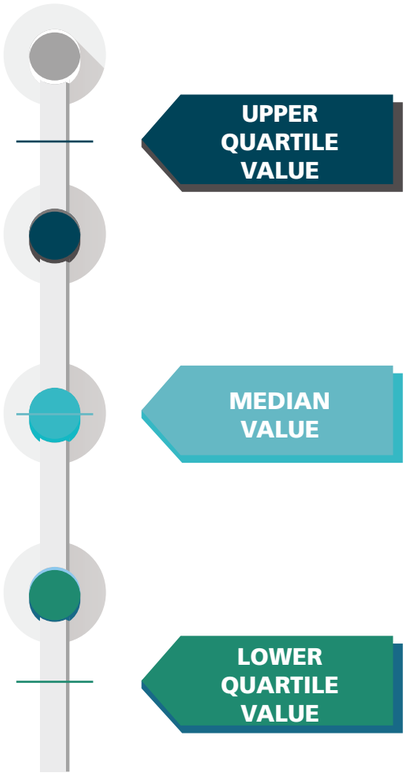
The quartile values are determined in 2 steps:

- First, results were grouped by community population, as population is often correlated to the level of complexity of the water system and the resources available to manage it.
- Second, for each community population grouping, we ranked the ratio results from highest to lowest, and the quartiles were established. The upper quartile value is the mid-point of the top 25% of communities (i.e.: the communities that have the "best" results); the lower quartile is the mid-value of the bottom 25% of communities (i.e.: the communities that have the "worst" results). The median value is the mid-point between the highest and lowest ratio value within a population grouping.

The median of the financial ratio results is represented rather than the average, because an average value can be skewed by unusually high or low data points.

By presenting the numbers as median, upper and lower quartile values, individual communities can conduct their own financial analysis of their water and wastewater systems, and measure if the financial sustainability of their systems fall in the top 25%, mid-value, or lower 25% of provincial values.

Quartile values



Financial Sustainability Results

Financial Indicator #1: Operating Surplus Ratio

Do Current Rates Cover the Full Cost of BC's Water Systems?

The operating surplus ratio indicates whether water and wastewater rates cover the full cost to operate and sustain the system, including renewal and replacement of existing infrastructure.

$$\text{Operating Surplus Ratio} = \frac{\text{(Revenue – Operating Expenses)}}{\text{Revenue}}$$

Where:

- Revenue includes funds generated from the sale of services, user fees, and charges. Revenue excludes development cost charges (DCCs)
- Operating expenses include all operating and maintenance costs, replacement value depreciation, and interest on debt.

The charts on the following page show the ratio results for BC municipalities, by size.

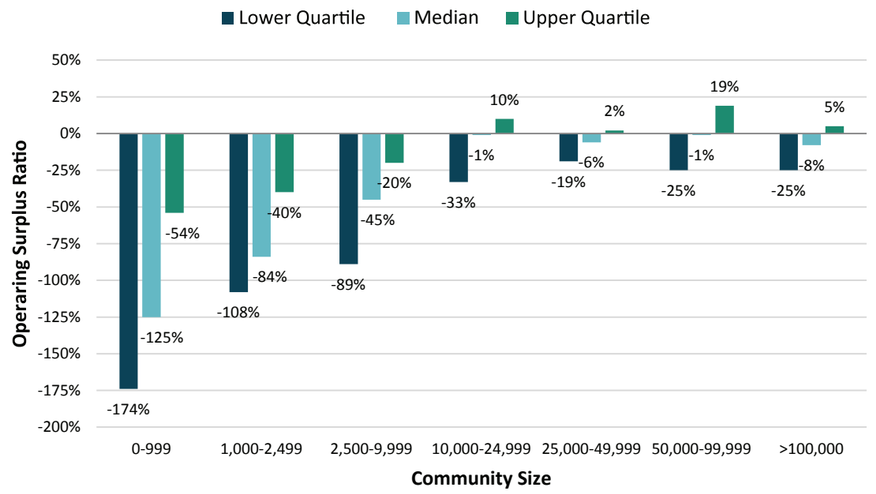
An operating surplus ratio of **zero or greater** indicates that rates charged for water and wastewater services are sufficient to fully recover the annual cost to operate and maintain existing water and wastewater infrastructure, including an annual allocation for the eventual renewal and replacement of infrastructure. Full cost recovery is one of the essential elements of achieving good financial standing and sustainable service delivery.

An operating surplus ratio of **less than zero** indicates that the annual costs of providing water and wastewater service are not being covered through water or wastewater rates charged to customers; the ratio value identifies the percentage value that rates would need to increase. For example, a ratio value of -25% indicates that rates would need to increase by 25% in order for revenues to cover expenses, including replacement costs. A ratio of less than zero may indicate that these costs are being covered through other revenue sources (i.e. property tax) or that the replacement value of the infrastructure is not being fully funded.

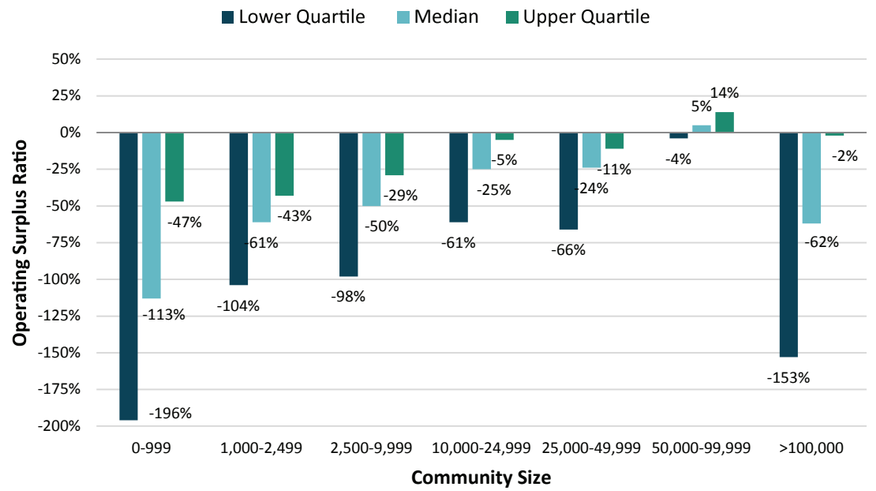
What do the results tell us?

- The majority of BC municipalities are charging annual water and wastewater rates below the full cost required to operate, maintain, and replace the systems.
- The greatest gap between revenue and operating expenses is seen in smaller municipalities (<10,000) for both water and wastewater systems. In small communities, with a few exceptions even the upper quartile or "best" municipalities are not covering full operating expenses.
- If replacement value depreciation costs of existing infrastructure are excluded from operating expenses, 27% of water systems and 38% of wastewater systems are still not covering their annual operating costs through their current water and wastewater rates.
- These results indicate that water and wastewater operations are likely being subsidized by other revenue sources such as property tax, and/or annual allocations for replacement costs are being deferred.
- The percentage increase in rates required to reach full cost recovery is significant for the majority of municipalities, requiring rate increases that are nearly double the current rates in the worst cases.

Financial Indicator #1: Operating Surplus Ratio - Water Systems



Financial Indicator #1: Operating Surplus Ratio – Sewer Systems



Financial Indicator #2: Reserves to Operating Expense Ratio

Are BC municipalities financially ready for unexpected costs or failures?

The reserves to operating expense ratio provides an indication of short-term resilience to unexpected changes in revenues or costs, such as those that might occur due to unpredictable events like storms or equipment failure.

$$\text{Reserves to Operating Expense Ratio} = \frac{\text{Reserves}}{\text{Cash Operating Expenses}}$$

Where:

- Reserves include both restricted and unrestricted reserves for water and wastewater, but exclude development cost charge reserves (DCCs)
- Cash operating expenses include all cash-based costs to operate and maintain the system, including interest on debt. Operating expenses do not include depreciation, as this is considered to be a "non-cash" expense.

With the exception of reserves required under the Local Government Act, local governments have flexibility in what reserves are designated for and how funds are spent. There is significant diversity among local governments in the types of reserves held, and available data does not specify if reserves are designated through a local bylaw to capital replacement or are available to cover operational expenses.

However, there are some ways of estimating if reserves are helping municipalities prepare for infrastructure investment needs. For small communities, the American Water Works Association (AWWA) recommends a minimum of 12.5% (one eighth) of annual operating and maintenance costs be reserved as cash or liquid assets that can be used to buffer unexpected changes in revenues or operating costs from year to year (AWWA, 2012).

A reserves to operating expenses ratio of 12.5% or greater means that the reserve savings are considered to be adequate to buffer against unexpected changes in revenues or operating costs from year to year.

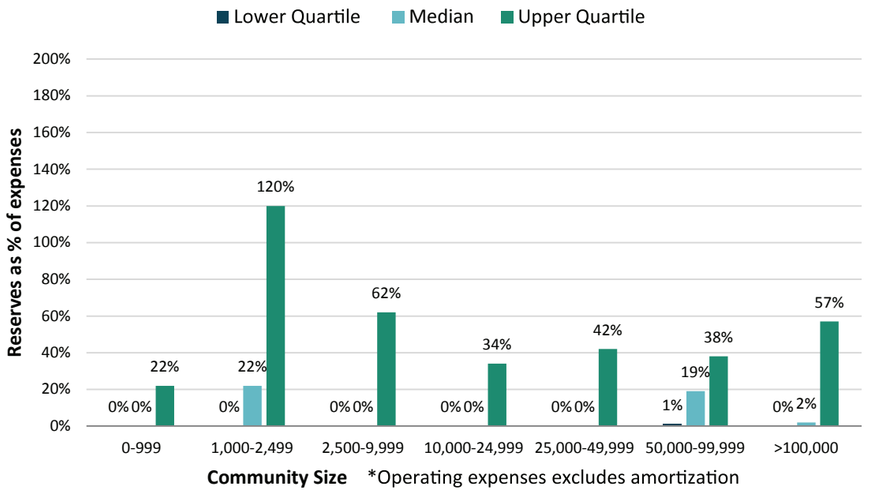
A reserves to operating expense ratio below 12.5% indicates that a community may be vulnerable to unexpected revenue shortfalls or unanticipated expenses, and as a result may have difficulty delivering the expected level of service or recovering from change when an unexpected event occurs.

The appropriate reserve size will vary by municipality and is dependent on specific local conditions, such as condition of infrastructure, financial policies regarding borrowing, borrowing capacity, and asset management plans.

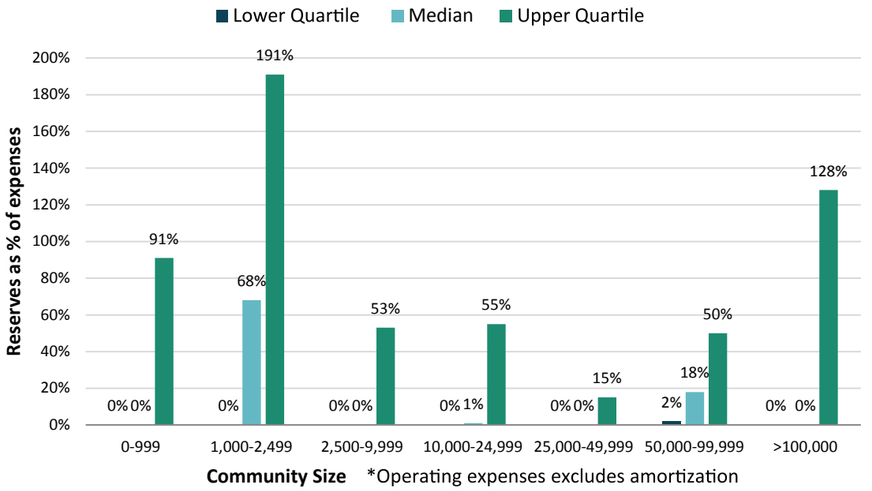
What do the results tell us?

- Across all community size groups, there are water and wastewater systems with no reserves in place, indicating that many communities are vulnerable to unexpected costs or changes in revenue.
- Municipalities with no reserves or low reserves may be vulnerable when there are abrupt changes in expenses (for example, from asset failure, an emergency situation, etc.); however, the appropriate size of the reserve depends on local context.
- There is little connection between size of municipality and the reserves as a percentage of expenses.
- Most municipalities do not hold sufficient reserves to fund substantial infrastructure renewal and replacement.

Financial Indicator #2: Reserves to Operating Expense Ratio - Water Systems



Financial Indicator #2: Reserves to Operating Expense Ratio – Sewer Systems



Financial Indicator #3: Infrastructure Deficit

Do Municipalities Have Enough Reserve Savings to Replace BC's Existing Systems?

A. Infrastructure Deficit Per Capita

Infrastructure deficit per capita is an indicator of the shortfall in current reserve savings, to replace water and wastewater infrastructure at the end of its useful life.

$$\text{Infrastructure Deficit Per Capita} = \frac{\text{(Replacement Cost Accumulated Depreciation – Reserves)}}{\text{Population}}$$

Where:

- Replacement cost accumulated depreciation is the inflation adjusted accumulated depreciation.
- Reserves are funds specifically set aside by the municipality to fund water and wastewater system costs. Reserves include both statutory and general reserves held by the municipality for water and wastewater systems, but exclude development cost charges (DCCs).
- Population is based on the 2013 population estimate for the municipality.

The infrastructure deficit per capita provides an estimate of the unfunded infrastructure investment need per capita. It is based on the theoretical useful life of the water or wastewater asset, its current level of depreciation, less any reserve saving put aside for asset renewal.

Some assets may provide service beyond their estimated useful life, and some may not live up to their useful life. For this reason, infrastructure deficit can be considered an indicator of risk. A higher deficit indicates a higher likelihood of assets failing, and a higher consequence (financial cost) of replacing them. The accuracy of a municipality's infrastructure deficit can be significantly improved through completing an asset management plan.

The infrastructure deficit calculation takes into account an estimate of the cost to renew the water or wastewater asset today, less any savings (reserves) that may be set aside for renewal of the asset.

There is an **infrastructure surplus** if current reserves exceed the expected cost to replace the asset.

There is an **infrastructure deficit** if the expected cost to replace the asset is greater than the current reserves.

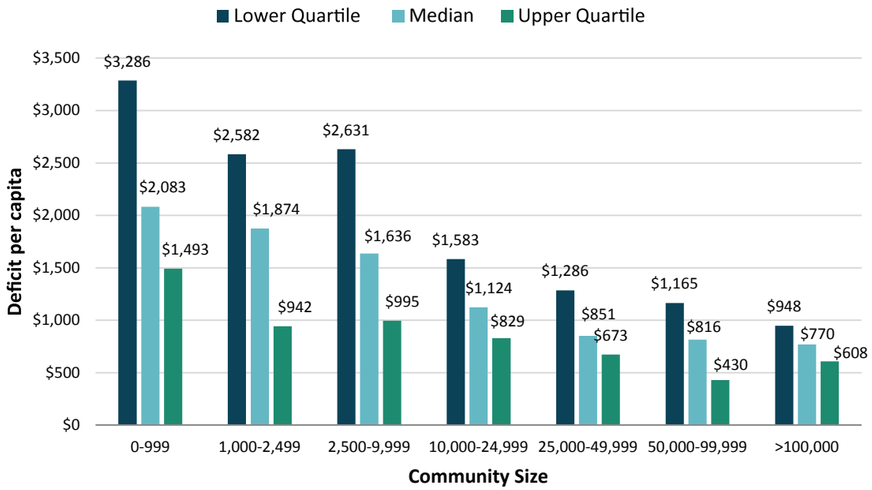
An infrastructure deficit due to a shortfall in reserves is not necessarily an indicator of poor fiscal management. Municipalities have several options to finance infrastructure renewal – it can be paid for from "savings" (i.e.: reserves that have been set aside for that purpose), or it can be paid for using debt to finance all or a portion of the construction cost when the asset is replaced.

Both strategies (use of reserve savings or debt financing) have merit and are equally valid means of accomplishing asset renewal. It is important, though, for a municipality to have a clear policy about which strategy it wishes to use for asset renewal, so that there is no sudden surprise when an asset reaches the end of its useful life.

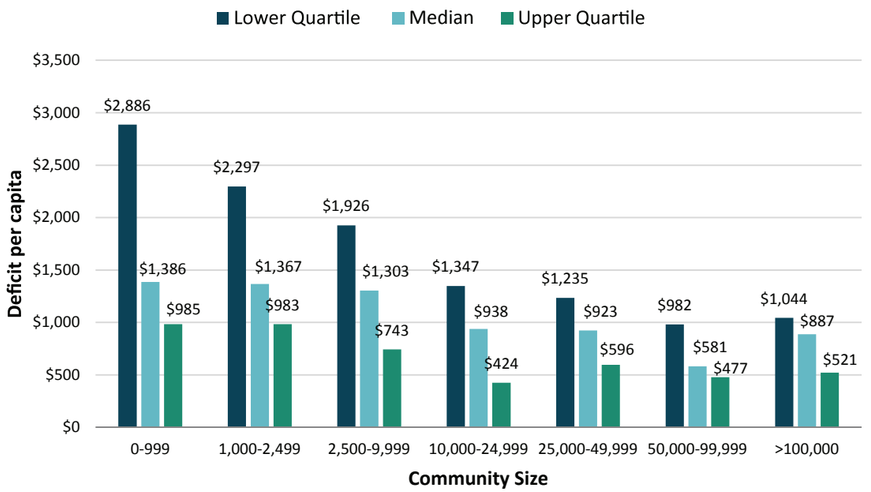
What do the results tell us?

- Smaller municipalities have the largest infrastructure deficit per capita.
- Deficit per capita is greater for water assets than wastewater assets.

Financial Indicator #3: Infrastructure Deficit Per Capita - Water Systems



Financial Indicator #3: Infrastructure Deficit Per Capita – Sewer Systems



B. BC's Infrastructure Deficit

An estimate of the overall water and wastewater infrastructure deficit for BC has been calculated, based on an estimated 2013 provincial population of 4,085,623[1] people as follows:

Table 2: Estimate of the overall municipal infrastructure deficit for BC

	Average per capita deficit	Estimated Total Deficit
Water	Est. $1,680	$ 6.8 Billion
Wastewater	Est. $1,550	$ 6.3 Billion
TOTAL	**Est. $3,230**	**$ 13.2 Billion**

The total deficit provides a broad indication of the amount of the additional money that would need to be saved today, in order to replace all water and sewer assets when they reach the end of their useful life. It represents an "unfunded liability" for infrastructure investment – that is, the amount by which investment requirements exceed the current funds available to pay for infrastructure renewal and replacement.

This is a conservative estimate of the unfunded infrastructure investment to renew and replace aging water and wastewater assets in BC. It does not include the cost to enhance existing systems to meet new regulatory requirements or expanded capacity.

What do the results tell us?

- BC communities have not set aside sufficient reserve funds to fully fund the eventual replacement of water and wastewater system assets.
- There is a need for communities to identify how they will finance the eventual replacement of their aging water and wastewater system assets.

Financial Indicator #4: Interest Cover Ratio

Do Municipalities Have the Ability to Finance Water System Replacements?

The interest cover ratio provides an indication of our capacity to finance system renewal using debt.

$$\text{Interest Cover Ratio} = \frac{\text{Interest Expense}}{\text{Revenues}}$$

Where:

- Interest expenses are the sum of all interest payments for debt servicing
- Revenues include all annual revenue from sale of water or sewer services, user fees, and charges (excluding DCCs)

The interest cover ratio indicates the proportion of revenues required to pay interest on debt.

Municipalities have varying financial policies with respect to borrowing, and varying tolerance for risk. There is no single recommended interest cover ratio, but it is important that municipalities make informed decisions about borrowing that also consider future costs for infrastructure renewal and replacement, and how these costs will be covered.

A **higher interest cover ratio** indicates that the municipality is using more debt to finance the cost of their water or sewer assets. Depending on the overall financial commitments of a community, a higher interest cover ratio may limit the municipality's ability to take on additional debt to finance asset renewal or replacement, and may indicate a greater vulnerability to increases in interest rates.

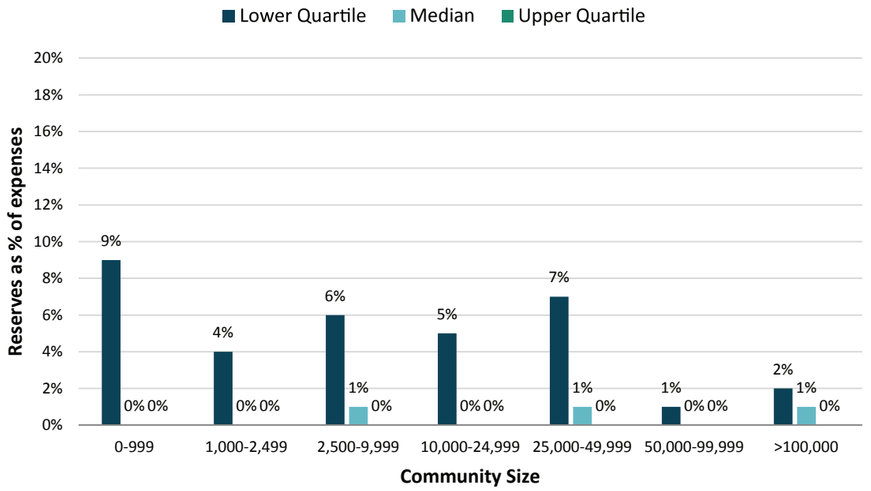
A **low interest cover ratio** indicates that a municipality is using less debt to finance the cost of their water or sewer assets. Depending on the overall financial commitments of a community, a lower interest cover ratio indicates that the municipality may have the financial capacity to use debt to finance asset renewal or replacement.

What do the results tell us?

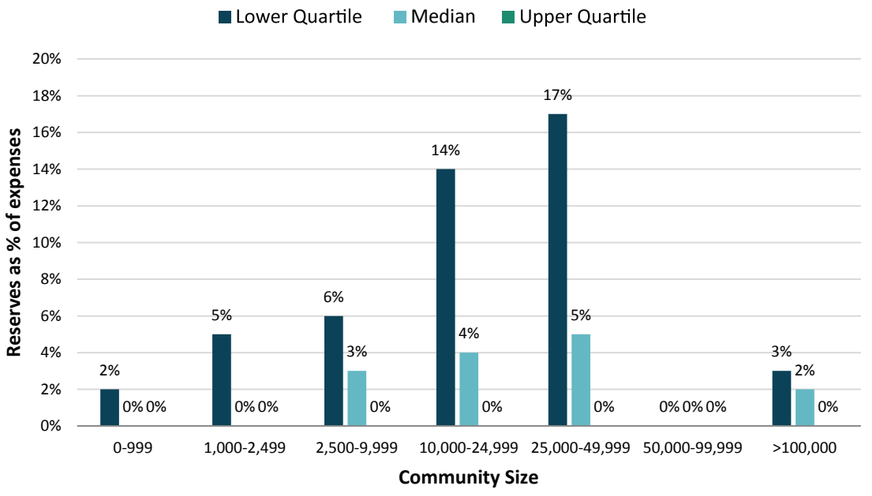
- Larger municipalities (>50,000) have a lower interest expense as a percentage of their revenues.
- Municipalities have greater debt servicing costs for wastewater systems than water systems.

[1] BC Stats population as reported in the LDGE database not inclusive of unincorporated areas

Financial Indicator #4: Interest Cover Ratio - Water Systems



Financial Indicator #4: Interest Cover Ratio - Sewer Systems



What Do The Results Tell Us?

1. Water and sewer fees are not covering the full cost of services in many communities

To be financially sustainable, the revenues earned by a water or wastewater system should cover the full cost of operating and maintaining the system, as well as accounting for the eventual replacement of the system as it comes to the end of its useful life.

While some communities are financially well positioned to meet current and future service needs, water and wastewater rates in the majority of BC municipalities do not generate sufficient revenues to pay for the full cost of providing services. In order to reach full cost pricing in the worst cases, rates would need to nearly double to reach financial sustainability

Some communities are using alternate forms of revenue such as property taxes or government grants to augment the finances of their water and wastewater systems. While this is a valid strategy to fund the systems, it can mask the true cost of the system from system users, and undermine the perceived "value" of these essential services. Research has shown that water and sewer rates based on full cost pricing can support sustainable water systems and drive water conservation (Rogers, De Silva, & Bhatia, 2002). Clearly outlining the connection between use and cost on utility bills can assist community leaders in communicating with residents and businesses about the level of service provided, and the value of those services (Goetz, 2014).

2. Communities are vulnerable

The majority of BC municipalities have not set aside sufficient reserve savings to provide a buffer against unexpected changes in water or sewer system operating costs or revenues. This means that some communities are vulnerable to unanticipated events, like sudden equipment failure or the impact of severe storm events that damage water or wastewater systems, which could cause unbudgeted expenses, loss of revenues, or sudden rate increases.

While emergency borrowing mechanisms exist for municipalities, they take time to implement, which means there could be reduced service levels or delays in re-instating services following an unexpected change.

3. Smaller systems have greater financial gaps

Smaller communities (with a population less than 10,000) have greater financial sustainability gaps in their water and wastewater systems than larger communities. Water and wastewater systems are capital-intensive; smaller communities do not have the benefit of "economies of scale", and so the costs of their systems are shared across a smaller base of users, which impacts their financial capacity.

4. Investment is required

As our water and wastewater systems approach the end of their useful life, investment will be required to renew and replace our current infrastructure. Approximately $13 billion would be required in BC in order to address the unfunded investment required to replace water and wastewater assets. To ensure that the appropriate level of funding will be available when systems meet the end of their useful life, BC communities need to have pro-active long-range plans that address their infrastructure renewal and replacement needs.

The estimated $13 billion investment is a conservative estimate that does not include new infrastructure that may be needed to accommodate growing communities, or upgrades that communities may need to undertake to meet regulatory change or to build resilience for seismic or storm events.

How Did We Get Here?

The cumulative effect of decisions, policies, and actions over a long period of time have influenced the financial status of BC's water and wastewater systems. Some of these factors include reliance on government grant funding for capital, lack of asset management planning, deferral of maintenance and investment, urban sprawl, and a lack of public support for full cost pricing.

Reliance on Government Grant Funding for Capital Investment

Many local governments in BC have become dependent on grants from senior levels of government to finance investment in water and wastewater infrastructure.

Much of British Columbia's water and wastewater infrastructure was built between the 1950s and 1970s, in the economic boom following the Second World War. Construction costs for water, sewer, and roads infrastructure were shared by federal, provincial/territorial and municipal governments – financed by taxpayers through revenue streams like property tax, income taxes and sales tax; in recent years, developers have contributed to the cost of infrastructure for new development, through development cost charges.

As the economic tide shifted in the late 1970s, government investment in new infrastructure dropped from an annual growth rate of 4.8% between 1961 and 1977, to 0.1% between 1978 and 2001 (Mirza S. , 2007).

In the past decade, federal funding for provincial, territorial, and municipal infrastructure has increased. Since 2001, through various granting programs the Federal Government has contributed $626 million, The Province of BC has invested $755 million, and BC's municipal governments have invested $697 million in funding toward municipal infrastructure projects, including water and wastewater projects (Ministry of Community, Sport and Cultural Development, 2012).

In 2014 the federal government signed a renewed Gas Tax agreement with the Union of BC Municipalities that will see approximately $1.3 billion in funding made available over the next ten years for municipal infrastructure projects. In addition, both the federal and provincial governments contributed $109 million each to the Small Communities Fund for municipal infrastructure projects in communities with a population of less than 100,000 people over the next ten years.

Some local governments have come to depend on grants from senior levels of government to help fund infrastructure renewal and replacement. In a 2014 survey of water and sewer utilities conducted by the Canadian Water & Wastewater Association (CWWA), 63% of utility respondents in BC indicated that "unpredictability of federal/provincial grant programs" are a threat to ensuring there will be sufficient financial resources for infrastructure renewal, which indicates that many municipalities are counting on continued senior government support (CWWA, 2014). This suggests that these communities have not structured their local funding mechanisms (through user fees or taxes) to allow the community to be self-sufficient.

While local governments may want to advocate for improvements to federal or provincial grant programs, this approach adds risk to the financial sustainability of our water and wastewater systems, as decisions about funding priorities for infrastructure replacement are not in local control.

And whatever the level of government, there is ultimately only one source of funds – the "taxpayer" – whether that taxpayer is paying through local user fees, property or parcel taxes, or federal/provincial/territorial income tax or sales tax.

Lack of Asset Management Planning

Although local communities have benefited from infrastructure investments by all levels of governments and developers, there has generally been a lack of planning for the eventual renewal and replacement of that infrastructure.

In BC, local governments are currently required to prepare 5 year capital plans. However, the useful life of water and wastewater assets can span from 5 to 100 years depending on the asset and system (Ministry of Community Services, 2008); a 5-year planning horizon does not adequately address the planning decisions for long-term assets.

Until 2009, municipalities were not required to record the value of their tangible assets in their financial statements. This meant that the financial statements did not reflect any depreciation of those assets, so there was no way for the financial statements to signal the eventual replacement of assets like water and wastewater systems.

In an effort to integrate budget priorities with municipal asset management plans, in 2009 the Public Sector Accounting Board (PSAB) introduced PSAB 3150, a new accounting standard that requires all municipal governments to include the historical value and accumulated depreciation of their tangible capital assets in their annual financial statements, including water and wastewater infrastructure assets. This information has built a better understanding about the state of water and wastewater infrastructure for elected officials, finance and technical staff.

Issues of this magnitude however, can be overwhelming in the absence of a clear and effective path forward. Integrated asset management is a process through which local governments define how they can meet their required levels of service in the most cost effective manner over the useful life of the asset. Internationally, water and wastewater utilities have been applying asset management practices for some time. In BC there seems to be a moderate level of awareness about asset management, and many communities are planning for the management of core assets. However, financing is often redirected due to changing priorities. (Asset Management BC, 2010).

Deferred Maintenance & Investment

Local governments in BC are required to have balanced operating budgets. In absence of long-term asset management plans or mechanisms to finance the growing responsibilities of local government, this has led to years of deferred maintenance as a means of delivering balanced annual operating budgets (Felio, 2012).

By 2007, deferred maintenance of water and wastewater infrastructure accumulated to a national infrastructure deficit of $31 billion in renewal and replacement costs of existing water and wastewater infrastructure, and an additional $56.6 billion in new water and wastewater infrastructure costs to meet population and regulatory demands (Mirza S. , 2007). According to the *Canadian Infrastructure Report Card*, the national water and waste water infrastructure deficit for infrastructure in "fair" to "very poor" condition increased to $80 billion as of 2012 (Felio, 2012).

Urban Sprawl

Development patterns have impacted the financial sustainability of public infrastructure. The suburban trend toward single detached homes on larger lots outside of urban centers resulted in an expansion of infrastructure systems to service outlying areas. However, the cost per capita to install and maintain water and wastewater infrastructure is a higher for low density development when compared to higher density development (Tomalty, 2007), which has paved the way for high infrastructure replacement costs.

Lack of Public Support for Full Cost Pricing

Despite the critical importance of water and wastewater systems to public health, a clean environment, and a strong economy, there is a lack of support from the public to pay for the full cost of operating, maintaining, and replacing these systems. A 2013 survey, conducted by RBC as part of their Canadian Water Attitudes initiative, indicated that less than one-quarter (23%) of British Columbians are willing to fund drinking water infrastructure upgrades through taxes or utility tolls (RBC Blue Water Project, 2014).

Low water and wastewater rates can foster a consumer culture of low perceived value for the service (Goetz, 2014), which impedes the ability of elected officials and utility managers to garner public support for re-investment in water infrastructure. A worn buried water main, or an aging piece of equipment at a wastewater treatment facility does not generate the same public attention as a pothole in a road, or a bridge in need of repair – it is a case of "out of sight, out of mind".

While no one wants to pay higher fees or taxes, there is an inescapable reality that there is a real cost for the pipes, pumps, equipment, and people who operate and maintain our water and wastewater systems. If we aren't willing to pay for these essential systems, our health and prosperity will be at risk.

What Can Be Done?

To ensure that BC's water and wastewater systems continue to protect public health and the environment and contribute to economic development for this generation and the generations that follow, communities must have adequate funds to pay for the current cost of operating and maintaining water and wastewater systems, and they must proactively plan to ensure there will be funds to eventually replace systems as they age and come to the end of their useful life.

Building financial sustainability will take time. While the financial risks to our water and wastewater systems are not immediate for all communities, it is important to make sound choices today about priorities for existing tax dollars, and setting rates so that they cover the full cost of operating, maintaining, and replacing systems.

The BCWWA recommends that communities review their individual financial sustainability indicators, and take the following steps to strengthen their financial capacity to meet current and future water and wastewater infrastructure needs:

1. Adjust water and wastewater rates to cover the full cost of service

All water and wastewater utilities in BC should implement water and wastewater rates that cover the full cost of these essential services. Full cost recovery means that revenues should be sufficient to cover the cost to service and operate the system in perpetuity. The cost of service includes expenses to operate, administer, maintain and repair the system, as well as the eventual replacement and renewal of infrastructure.

By pursuing full cost recovery, utilities can achieve greater financial independence and financial sustainability. In areas with limited resources, it may be appropriate to develop phased strategies to transition to full cost recovery.

This recommendation is consistent with best practices recommended by the Federation of Canadian Municipalities (FCM), the Canadian Water and Wastewater Association (CWWA), and the American Water Works Association (AWWA).

2. Develop and implement integrated asset management processes

All municipalities should develop integrated asset management processes that assess the state of their infrastructure, evaluate risks, and set priorities for investment in renewal and replacement of water and wastewater assets, linked to long-term financial plans that identify how these projects will be financed. Integrated asset management processes enable communities to:

- optimize system performance;
- minimize potential of infrastructure failure that could result in increased economic, environmental and health risk;
- balance expenditures over the lifecycle of the asset and avoid unbudgeted costs;
- define consistent revenue sources to support full cost recovery of service;
- adapt systems to meet short, medium and long term service targets, planning goals, policies and regulations.

Municipal asset management is an integrated approach that considers planning, finance, engineering and operational needs, to effectively manage existing and new infrastructure, maximize benefits, reduce risks and provide satisfactory levels of service. Asset management is a tool that can be used to inform budget decisions that consider infrastructure investment needs over a long-term horizon.

Asset management is in a nascent stage among many local governments in BC; however, there is growing interest in asset management practices. Asset Management BC provides a forum for municipal managers to share best practices in asset management, and there is growing awareness about asset management processes among finance and technical staff.

Municipalities have several incentives to adopt asset management practices. In 2014, the Union of British Columbia Municipalities (UBCM), and federal and provincial governments formed a tri-party agreement to administer BC's portion of the 10 year Gas Tax fund. Under the agreement, BC municipalities must demonstrate that they are adopting asset management processes, in order to be eligible for Gas Tax funding for infrastructure projects. Specific funding and capacity support tools are also being made available under the Gas Tax agreement for communities who need to initiate or advance their integrated asset management processes.

This incentive to adopt asset management practices is being further encouraged by the Province of BC, through the Ministry of Community, Sport & Cultural Development (MCSCD), with funding to support communities in initiating asset management processes. Increasingly, MCSCD grant program assessment criteria are focusing on "how" local governments are managing their assets, rather than "what" is being applied for, taking into account a municipality's ability to demonstrate effective asset management practices (Asset Management BC, 2014).

These are positive and necessary steps to ensure that critical infrastructure, such as water and wastewater systems, receive the appropriate level of funding to sustain the assets and meet public health and environmental safety expectations of BC residents.

3. Rank water and wastewater renewal projects as top priorities for capital investment

Water and wastewater systems are critical assets for public health – clean water keeps us safe and healthy. In an environment where there are competing demands for scarce financial resources, community leaders must make difficult decisions. Renewal of our water and wastewater systems must be a top priority for municipal capital projects.

Our water and wastewater infrastructure is in need of upgrades, renewals and replacement. Community leaders, including elected officials and municipal managers, have a responsibility to future generations to ensure needed investments are made to continue the delivery of clean, safe drinking water to our taps and the collection and treatment of wastewater from our homes and businesses. Consistent and gradual replacement and upgrades will ensure the continued reliability and safety of our water and wastewater assets.

4. Adopt "smart growth" principles

Municipalities should adopt "smart growth" principles for their land development policies, to ensure the costs of development are well understood, and a funding plan is in place that includes funding for the life cycle of contributed assets from new development (U.S. EPA, 2011).

5. Foster collaboration among all levels of government

Collaborative and constructive relationships between local, provincial, and federal governments are essential as municipalities transition to fiscal self-reliance for our water and wastewater systems.

According to the Union of BC Municipalities (UBCM), future infrastructure upgrades are by far the most important financial issue facing communities. Their *Strong Fiscal Futures* discussion paper suggests ways that the Province of BC and local governments can work together to evolve the current local government finance tools so that they better meet future financial needs (UBCM, 2013).

Senior governments also have a role to play in supporting compliance with changes in regulatory standards set by provincial and federal Acts. For example, recent changes to wastewater effluent regulations are requiring significant investment in new treatment processes. Because local governments could not have anticipated these regulatory changes and planned for their costs, there should be a mechanism for local, provincial, and federal governments to collectively address the financial investments required for new infrastructure that result from these changes.

Conclusion

Every municipality in BC has a unique local context for its financial policies, tolerance for risk, age and condition of infrastructure, and plans for the future; so, this report is not intended to draw specific conclusions about any one community. Instead, it is intended to inform dialog among elected officials, utility managers, and the public about policies and priorities for infrastructure renewal and investment, and provides recommendations that are aimed at enhancing the fiscal sustainability of our water, sewer, and storm water systems, to ensure that our public water and wastewater systems continue to protect public health and the environment for generations to come.

References

Asset Management BC. (2010). The State of Asset Management in British Columbia. Local Government Asset Management Working Group.

Asset Management BC. (2014). Asset Management Newsletter - Twelfth Edition. Local Government Asset Management Working Group.

AWWA. (2012). Principles of Water Rates, Fees, and Charges, Sixth Edition. American Water Works Association.

BCWWA. (2011). Position Statement Infrastructure Funding. BC Water and Waste Association.

BCWWA. (2013). Position Statement Water Service Rate Setting.

BCWWA. (2014). Asset Management Position Statement. BC Water and Waste Association.

CWWA. (2014). Survey of Water and Sewer Utilities. Canadian Water Works Association.

Environment Canada. (2011). 2011 Municipal Water Pricing Report: Municipal Water Pricing 2009 Statistics. Government of Canada.

Environment Canada. (2011). 2011 Municipal Water Use Report: Municipal Water Use 2009 Statistics. Government of Canada.

Felio, G. (2012). The Canadian Infrastructure Report Card Volume 1: 2012 Municipal Roads and Water Systems.

Goetz, M. (2014). Communicating Water's Value: Talking Points, Tips and Strategies. American Water Works Association.

Institute of Public Works Engineering Australasia. (2012). Australian Infrastructure Financial Management Guidelines.

Ministry of Community Services. (2008). Guide to the Amortization of Tangible Capital Assets. Local Government Infrastructure and Finance Division, Province of BC.

Ministry of Community, Sport and Cultural Development. (2012). Municipal Revenue Sources Review Local Government Grants Inventory. Province of British Columbia.

Mirza, S. (2007). Danger Ahead: The Coming Collapse of Canada's Municipal Infrastructure. Federation of Canadian Municipalities.

RBC Blue Water Project. (2014). 2014 RBC Canadian Water Attitudes Study. Royal Bank of Canada.

Rogers, P., De Silva, R., & Bhatia, R. (2002). Water is an economic good: How to Use Prices to Promote Equity, Efficiency, and Sustainability. Water Policy, 4, 1-17.

Statistics Canada. (2013). Survey of Household Spending. Government of Canada.

Tomalty, R. (2007). Innovative Infrastructure Financing Mechanisms for Smart Growth. Smart Growth B.C.

U.S. EPA. (2011). Smart growth: A Guide to Developing and Implementing Greenhouse Gas Reduction Programs. United States Environmental Protection Agency.

UBCM. (2013). Strong Fiscal Futures a Blueprint for Strengthening BC Local Finance Systems. Union of British Columbia Municipalities.

Terminology

Water systems – systems that supply, treat, and distribute drinking water to homes and businesses

Sewer systems – systems that collect and treat used water from toilets and drains

Storm water – systems that collect and treat surface run-off from rain or snow-melt

Wastewater – a general term that describes sewer and storm water systems

Development Cost Charges (DCCs) – fees charged to developers of property to finance new infrastructure costs associated with their development. Developers then recover the costs of infrastructure construction from the buyers of the developed properties. The municipality typically assumes ownership of the infrastructure, which means that local taxpayers are responsible for paying for the associated operating and maintenance costs through user fees, property taxes, or a combination of fees and taxes.

Appendix 1: Replacement costs of infrastructure

Replacement Costs

Two of the four financial indicators utilized in this study are affected by inflation;

- Operating Surplus Ratio
- Deficit Per Capita

It is important to consider how inflation can cause the results of each financial indicator above to be misinterpreted. Essentially, when inflation is not accounted for, communities appear to be in a better financial position than they are because their assets are valued at their historical cost, and not cost of replacement or fair market cost. Historical costs are used in municipal financial statements because accounting is transaction based, and historical costs do not change and can therefore be audited. Historical costs however, need to be adjusted for inflation in order to budget for asset renewal and replacement.

For example: A community that owns one well, installed 20 years ago that is at the end of its useful life. They wish to calculate the operating ratio (revenues/expenses) to determine if their water rates will cover the cost to replace the well. They have the following yearly revenues and expenses:

Revenues

- $17,000 (annual user fees collected)

Expenses

- $10,000 annual **Operating & Maintenance** Expense
- $1000 annual **Interest** Expense
- $5,000 annual **depreciation cost** of well (Original cost $100,000, 20 years ago)
  - » **Total annual expense:** $16,000

They calculate their operating ratio (revenue - operating expense/revenue) and determine it to be 6% which appears to be sufficient because the ratio is greater than 0 (revenues are greater than expenses). Since the well is now nearing the end of its life (2014) the community decides to get a preliminary engineering study completed to determine what they must do to rebuild the well. The study concludes that the well must be replaced and that it will cost $200,000 instead of $100,000 to build the same well because of inflated construction costs. Now the community notices that its operating surplus ratio drops to -24%. This is just one of the many examples of how inflation can affect the financial indicators which can cause data to be misinterpreted.

In this study, historical costs reported in municipal financial statements were inflated to current construction costs. Since it is not realistic to calculate the current construction cost for every community at this time, it is important to determine a systematic and representative approach to inflate the costs. To determine an appropriate inflation factor, 7 communities that had both current and historical costs available were used to determine the average factor of inflation. The communities and their respective inflation factors are summarized in Table 3 on the following page.

Table 3: Inflation Factor Table

Water Systems				
Community	**Year**	**Replacement Value**	**Historical Cost**	**Ratio**
1	2010	$111,713,000	$31,418,674	3.6
2	2013	$350,913,865	$107,076,188	3.3
3	2012	$32,302,000	$13,086,501	2.5
4	2012	$45,715,000	$21,833,235	2.1
5	2011	$27,200,000	$7,446,626	3.7
6	2013	$26,192,000	$8,681,704	3.0
7	2013	$98,778,000	$28,468,177	3.5
			Average	**3.1**

Wastewater Systems				
Community	**Year**	**Replacement Value**	**Historical Cost**	**Ratio**
1	2010	$22,294,031	$14,803,391	1.5
2	2013	$238,076,014	$63,424,042	3.8
3	2013	$227,648,000	$96,169,000	2.4
4	2012	$27,660,000	$9,497,914	2.9
5	2012	$24,347,000	$18,966,501	1.3
6	2011	$25,994,000	$7,798,885	3.3
7	2013	$111,787,000	$62,750,634	1.8
			Average	**2.4**

As shown above, an average inflation factor for water and wastewater assets was calculated to be 3.1 and 2.4 respectively based on the sample group. Although 3.1 and 2.4 seem to be acceptable inflation factors for each utility based on the results, it was determined that a cost inflation factor of 2 would be appropriate to use because it is a more conservative factor that would not overestimate the financial status of BC's infrastructure. In order to understand the effect inflation has on the financial indicators the median, upper, and lower quartiles were compared for different inflation factors. A detailed explanation is provided in **Appendix 2.**

Appendix 2: Sensitivity Analysis

As mentioned in Appendix 1, two of the four financial indicators affected by inflation include:

- Deficit Per Capita
- Operating Surplus Ratio

It is apparent that calculating the financial indicators using historical costs would make communities appear to be in a better financial position than they are, but the question is, by how much are the results affected?

In order to determine the magnitude of the effect, each financial indicator was calculated by inflating the historical construction cost by a factor of 2 and 3 to determine how sensitive the indicator is to changes in cost. For example: if an operating surplus ratio of 0.1 is calculated based on historical cost and then an operating surplus ratio of 0.11 is calculated when the historical cost is inflated by 2, this would illustrate that the ratio is 10% sensitive when costs are doubled. This approach was applied to all communities and the data was graphically summarized.

The median, upper, and lower quartiles were calculated for each financial indicator affected by inflation to determine its effects on the results.

Figure 2a below displays the results of how inflation affects the deficit per capita financial indicator.

Figure 2a: Effects of Inflation on the Deficit per Capita Financial Indicator

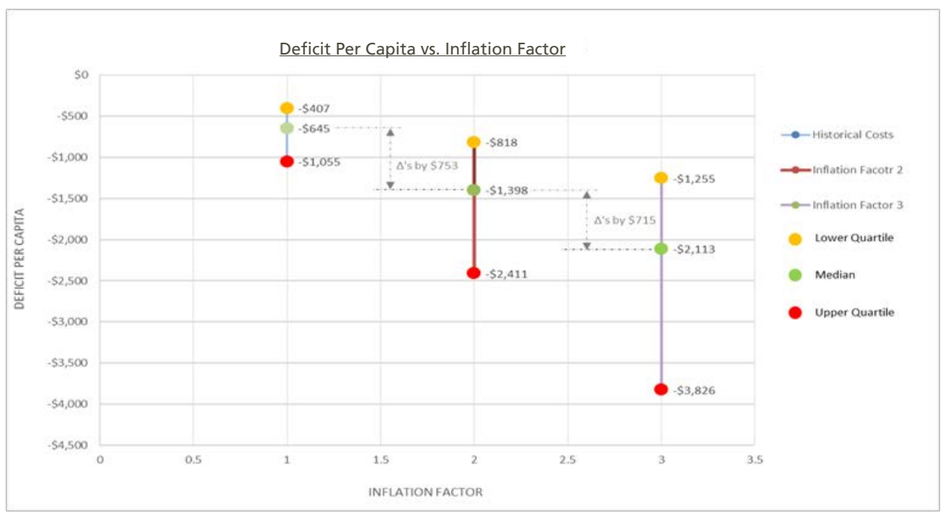


Figure 2b below displays the results and how inflation affects the operating ratio financial indicator.

Figure 2b: Effects of Inflation on the Deficit Per Capita

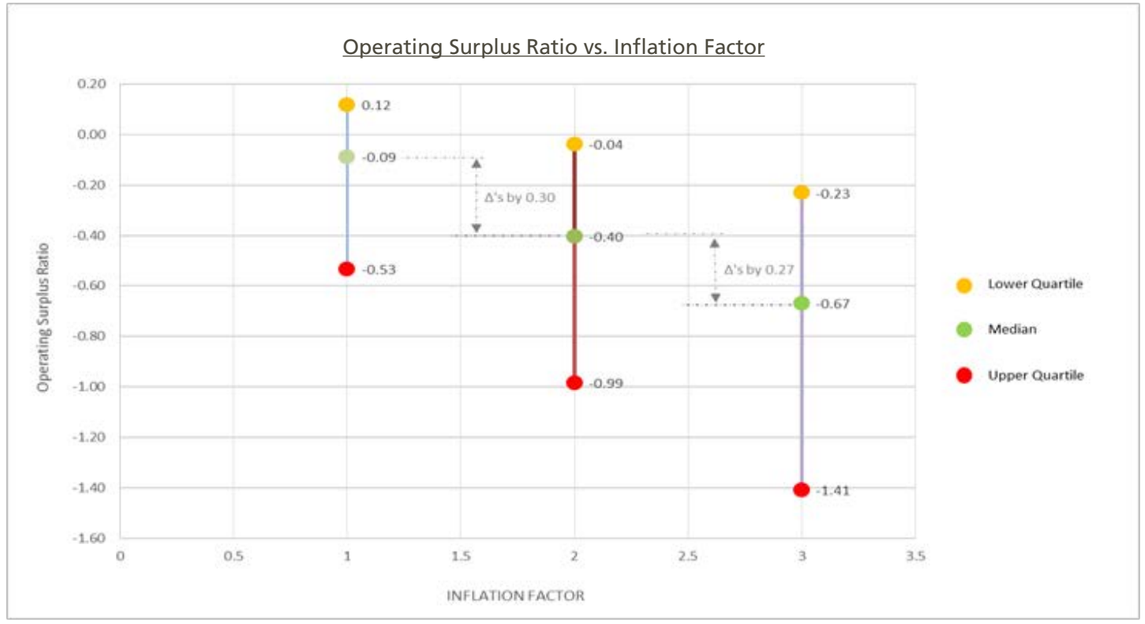


Figure 2b illustrates two main points:

1. When historical construction costs are doubled, the operating surplus median increased by 0.30. This means that 50% of the communities would experience a change in their operating surplus ratio of 0.3 or less. Therefore, using historical costs would make communities appear to be operating more efficiently than they actually are.
2. When costs are inflated from 2 times the historical costs to 3 times the historical costs, the operating surplus ratio median changes by 0.27. This means that 50% of the communities would experience a change in their operating surplus ratio of 0.27 or less. Since current construction costs are approximately double the historical costs, this comparison helps illustrate how the operating ratio might change if current construction costs were to fluctuate.

Appendix 3: Municipalities by Population Group

100,000 residents or more

Abbotsford
Burnaby
Coquitlam
Delta
Kelowna
Township of Langley
Richmond
Saanich
Surrey
Vancouver

50,000 to 99,999 residents

Chilliwack
Kamloops
Maple Ridge
Nanaimo
New Westminster
City of North Vancouver
District of North Vancouver
Port Coquitlam
Prince George
Victoria

25,000 to 49,999 residents

Campbell River
Langford
City of Langley
Mission
North Cowichan
Penticton
Port Moody
Vernon
West Kelowna
West Vancouver

10,000 to 24,999 residents

Central Saanich
Coldstream
Colwood
Comox
Courtenay
Cranbrook
Dawson Creek
Esquimalt
Fort St. John
Lake Country
North Saanich
Oak Bay
Parksville
Pitt Meadows
Port Alberni
Powell River
Prince Rupert
Salmon Arm
Sidney
Sooke
Squamish
Summerland
Terrace
View Royal
Whistler
White Rock
Williams Lake

2,500 to 9,999 residents

Armstrong
Bowen Island
Castlegar
Chetwynd
Creston
Cumberland
Duncan
Elkford
Enderby
Fernie
Gibsons
Golden
Grand Forks
Hope
Houston
Invermere
Kent
Kimberley
Kitimat
Ladysmith
Lake Cowichan
Lantzville
Mackenzie
Merritt
Metchosin
Nelson
Northern Rockies
Oliver
Osoyoos
Peachland
Pemberton
Port Hardy
Port McNeill
Princeton
Qualicum Beach
Quesnel
Revelstoke

2,500 to 9,999 residents (Continued)

Rossland
Sechelt Indian Government
Smithers
Spallumcheen
Sparwood
Trail
Tumbler Ridge
Vanderhoof

1,000 to 2,499 residents

100 Mile House
Anmore
Ashcroft
Barriere
Burns Lake
Cache Creek
Chase
Clearwater
Fort St. James
Fraser Lake
Fruitvale
Gold River
Harrison Hot Springs
Highlands
Hudson's Hope
Kaslo
Keremeos
Lillooet
Lions Bay
Logan Lake
Lumby
Montrose
Nakusp
Salmo
Sicamous
Taylor
Telkwa
Tofino
Ucluelet
Valemount
Warfield

Less than 1,000 residents

Alert Bay
Belcarra
Canal Flats
Clinton
Granisle
Greenwood
Hazelton
Jumbo Glacier
Lytton
Masset
McBride
Midway
New Denver
New Hazelton
Port Alice
Port Clements
Port Edward
Pouce Coupe
Queen Charlotte
Radium Hot Springs
Sayward
Sechelt
Silverton
Slocan
Stewart
Sun Peaks
Tahsis
Wells
Zeballos

About the Authors

John Weninger

John Weninger is a Principal with Urban Systems and is the current Chair of the BCWWA Infrastructure Management Committee. John consults to communities across BC and Alberta in the areas of Asset Management and Sustainable Infrastructure Funding. John has a Bachelor's degree in Mechanical Engineering from the University of British Columbia and an MBA from Queen's University in Kingston Ontario. John is based in Vancouver, BC.

Tanja McQueen

Tanja McQueen joined the BC Water & Waste Association as Chief Executive Officer in July 2013, bringing two decades of experience in both public and private sector roles. Tanja has provided executive leadership for strategic planning and business strategy, operations management and performance improvement, marketing and communications, investor relations, and business development. She holds a Bachelor's degree in accounting and an MBA in marketing from the Schulich School of Business in Toronto.

Kimberley Armour

Kimberley Armour is BCWWA's Research Specialist. Kimberley has been working in the environmental sector for government and non-profit organizations for the past ten years. With a Bachelor of Science in Biology, and Master of Arts in Environmental Education and Communication, Kimberley has focused her career on environmental policy and planning, education, research, restoration and stewardship. Kimberley joined the BCWWA in 2014 as the Research Specialist and is developing the organization's research program to support informed decision making about water services.

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