



Minimum Requirements for Asset Management in Local Governments – Phase 2

DEPARTMENT OF ENVIRONMENT AND LOCAL GOVERNMENT

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Introduction

When New Brunswick's local governments signed Canada Community Building Fund (formerly Gax Tax Funding) agreements starting in 2014, they made a commitment to begin infrastructure related asset management planning.

An asset management plan is defined as a tactical plan for managing an organization's infrastructure and other assets to deliver an agreed standard of service. Asset management planning can lead to more informed decision making, improved management of risks and sustainable service delivery.

Building on the requirements presented in *Phase 1 of the Department of Environment and Local Government's (the Department) Guide to Asset Management Planning for Local Governments*, a second phase of requirements has been developed to further advance asset management practices of local governments in New Brunswick. The requirements are defined in each section to assist in the continued development and implementation of asset management planning.

This updated guide provides the new minimum content requirements for asset management plans. Where capacity exists, local governments are encouraged to implement best practices and expand on the information in their plans beyond what is required to increase the inherent benefits of asset management planning. The Department strongly encourages local governments to leverage the many asset management resources available from organizations such as the [Federation of Canadian Municipalities](#) or other Canadian local governments that have made significant strides in asset management. The Department is committed to advancing local government asset management planning in New Brunswick.

Asset Management Plan - <i>Minimum Requirements</i>		
Section	Phase 1	Phase 2
<u>1. Governance</u>	- Governance Statement - Governance Model (<i>processes</i>)	- Asset management policy in relation to other organizational governing documents - Policies and procedures for annual review and council approval
<u>2. Inventory of Assets</u>	A detailed inventory of all tangible capital assets	- Update inventory to include new information produced in phase 2 - A summary of current day replacement cost and condition rating by service category (state of the infrastructure)
<u>3. Condition Assessment</u>	- Identify core & high value assets as a minimum - Define condition rating scale	- Define condition assessment policy - Perform condition assessment for all assets
<u>4. Level of Service</u>	Description of services provided by the local government	- Definitions of target levels of service for each service category - Performance measures to track actual levels of service
<u>5. Climate Change</u>	List climate change risks (high level)	- Identification of Greenhouse gas (GHG) reduction opportunities - Evaluation of climate change vulnerabilities
<u>6. Risk Assessment</u>	Identify assets essential to delivering core services	- Definition of risk evaluation process - Consider risk mitigation and adaptation strategies for high-risk assets
<u>7. Cost Analysis</u>	Identify core and high value assets requiring renewal or replacement over the next 50 years with replacement cost estimates	Cost analysis for all existing and planned assets for the next 50 years
<u>8. Financial Planning</u>	Cash flow forecasts for core & high value assets	- Cash flow forecast for all assets - Funding sources for next 10 years - Key assumptions in cash flow forecasts - Strategies to manage funding gaps
<u>9. Priority Setting</u>	Identify key municipal priorities	Justification of municipal priorities using growth, climate change, maintenance costs, replacement costs, etc.

1. GOVERNANCE

Asset Management Plan Requirements

- 1 A governance statement that is approved by council that highlights the commitment to asset management planning. Alternatively, this is often referred to as the asset management policy.
- 1 A governance model that defines the different policies, procedures and roles related to asset management within the local government.
- 2 A description of how asset management policies relate to other governing documents, including but not limited to: budget process, operations and capital spending.
- 2 A procedure for periodic review with specific requirements on timelines and council approval.

1 Included in Phase 1

2 New to Phase 2 or revised from Phase 1

The governance section of the asset management plan can be viewed as a corporate asset management strategy. It should include a summary of all governing documents and how they fit within the local government's corporate structure. Depending on the corporate structure, there may be several documents that drive asset management planning.

A governance model must be included along with a governance statement which declares the commitment to asset management planning and makes it a corporate priority. The governance statement must reference the specific resolutions passed by council and acknowledge the need to appropriately resource the financial requirements. The governance model must include administrative procedures, a plan review schedule and a definition of the roles related to asset management within the local government.

For more information on governing documents, please refer to Appendix A.

2. INVENTORY OF ASSETS

Asset Management Plan Requirements

- 1 A detailed inventory of all tangible capital assets that includes condition rating, climate risks, replacement cost, renewal cost and major operational costs where applicable.
- 2 A summary of current day replacement cost and condition rating by service category (also known as the state of the infrastructure)

1 Included in Phase 1

2 New to Phase 2 or revised from Phase 1

Each local government must provide a detailed inventory of all tangible capital assets as per recommendations in the *CPA Canada Public Sector Accounting Board (PSAB) Handbook* Section 3150 – Tangible Capital Assets (PS 3150). It is preferable that the asset inventory aligns with the types of services provided. Assets may be grouped by alternative methods tailored to each local government’s administrative needs, provided that the inventory is current and maintained per the local government’s asset management governance model. The Department encourages local governments to develop and maintain one inventory that addresses both PSAB and asset management needs.

A state of the infrastructure report describes the community’s asset portfolio and provides a snapshot of the inventory, age, valuation, condition and remaining life of the assets in the inventory by service and asset type. Local governments must include a summary of the asset inventory that includes, at a minimum, the total replacement value of the asset portfolio broken down by major service category and an overview of the condition rating broken down by major service. This information helps organizations estimate when renewals are likely to be needed to maintain asset functions and reduce the risk of service disruptions.

See Appendix B for examples of inventories and how to develop this section of the plan.

3. CONDITION ASSESSMENT

Asset Management Plan Requirements

- ☐ 1 Define a condition rating scale.
- ☐ 2 Define a condition assessment procedure. Indicate the methodology used as it varies from asset class, asset criticality and stage of infrastructure lifecycle.
- ☐ 2 Perform condition assessment for all assets.

☐ 1 Included in Phase 1

☐ 2 New to Phase 2 or revised from Phase 1

A key component of establishing an effective asset management plan is knowing the condition of existing assets. Local governments are required to complete a condition assessment for all assets. Ideally, asset condition ratings are represented in numerical scales and integrated into the asset inventory.

There are various condition assessment tools and scales available. Local governments can select the condition assessment method suitable for each asset class. The Department requires local governments to define the condition assessment procedure. For example, the condition assessment procedure defines if certain asset conditions are determined by age and material or by visual inspection, or if the methodology for condition assessment changes as assets age.

Reliable and consistent condition information enables local governments to confidently rely on the asset management plan as a decision-making tool. Defining the procedure helps communicate the reliability of the data being collected.

For examples of condition assessment procedures, various methodologies and different rating scales, please see Appendix C.

4. LEVEL OF SERVICE

Asset Management Plan Requirements

- ☐ 1 A description of services provided by local governments.
- ☐ 2 A description of the target levels of service for each service category.
- ☐ 2 Performance measures to track actual levels of service.

- ☐ 1 Included in Phase 1
- ☐ 2 New to Phase 2 or revised from Phase 1

The purpose of an asset management plan is to enable local governments to manage infrastructure to deliver sustainable services to residents and other customers. Services impact the quality of life for citizens and dictate the assets required to support said services. The level of service is the indication of the quality, function and capacity of the service being provided. Level of service frameworks help local governments better understand what the community is receiving and how effective they are at delivering the associated services.

Target levels of service describe the quality of services a local government wishes to provide in each service area. They are typically defined through an iterative process that involves the consideration of the need or desire for the service, the cost to deliver the service and the risks associated with the target level of service. The difference in current levels of service and target levels of service are key drivers that influence asset management decisions related to asset growth, upgrade, renewal and maintenance, and financial sustainability. This process enables local governments to understand the capital and human resources required to deliver various levels of service.

To determine whether the target levels of service are being met, it is necessary to have levels of service that are measurable. It is beneficial to have target levels of service that are “SMART” (Specific, Measurable, Achievable, Realistic, Timebound). Local governments are also required to have a structure in place to measure and report on at least one performance measure per service category.

For examples of service categories, target levels of service, performance measure how to develop this section of the plan, see Appendix D.

5. CLIMATE CHANGE

Asset Management Plan Requirements

- ☐ 1 A high-level identification of climate risks affecting service delivery.
- ☐ 2 Evaluation of climate change vulnerabilities and prioritization of adaptation strategies.
- ☐ 2 Identify and evaluate greenhouse gas (GHG) reduction opportunities for all carbon emitting assets operated by the local governments.

☐ 1 Included in Phase 1

☐ 2 New to Phase 2 or revised from Phase 1

CLIMATE CHANGE ADAPTATION

The impacts of climate change are observable today and will continue to increase with time. The changes in precipitation patterns, temperature, sea levels, and the frequency and intensity of extreme weather events can have severe impact on infrastructure and threaten a local government's ability to deliver sustainable services.

It is important that the risks presented by climate change are identified and evaluated so local governments can adopt the appropriate adaptation strategies (e.g. maintenance of engineered and natural assets, timely asset upgrades or renewals, etc.) to improve the overall resilience of their asset systems. Within the asset management plan, local governments are required to demonstrate how the following four steps have been accomplished:

Step 1:

- Identify climate events and their likelihood of occurrence;

Step 2:

- Evaluate impact of climate events;

Step 3:

- Identify assets most vulnerable to climate change impacts; and

Step 4:

- Prioritize adaptation measures.

Many local governments are developing or have completed climate change adaptation plans. Identifying infrastructure-related vulnerabilities and adaptation strategies in the adaptation plans, and incorporating them into the asset management plan fulfills the adaptation requirements outlined in this guide.

GREENHOUSE GAS REDUCTION

The decisions about the way assets are designed, constructed, operated, maintained, and renewed or decommissioned represent some of the most substantial opportunities a local government has to reduce Greenhouse Gas (GHG) emissions and mitigate climate change.

It is important to mitigate climate change by taking a systematic approach in inventorying, prioritizing and implementing improvements that decarbonize operations and energy consumption to achieve GHG reductions. This can be accomplished through investments in clean energy solutions, more energy efficient assets, and enhanced carbon sinks. To incorporate GHG reduction within the asset management plan, local governments are required to demonstrate how the following four steps of GHG reduction have been accomplished.

Step 1:

- Estimate greenhouse gas emissions;

Step 2:

- Identify and assess GHG reduction opportunities;

Step 3:

- Prioritize and schedule reduction opportunities; and

Step 4:

- Monitor and report

For examples and more information on how to develop this section, see Appendix E.

6. RISK ASSESSMENT

Asset Management Plan Requirements

- 1 Identify assets essential to delivering core services.
- 2 Definition of the risk evaluation process that includes consequences and likelihood of failure for each asset.
- 2 Consider risk mitigation and adaptation strategies for high-risk assets and other identified risks to service delivery.

1 Included in Phase 1

2 New to Phase 2 or revised from Phase 1

Each local government must identify, evaluate and mitigate risks as an essential part of its asset management planning. Though several types of risk exist, the Department requires local governments to, at a minimum, focus on the risks to service delivery. Asset risks are scored based on two factors: the likelihood of a risk event occurring and the consequence of that risk event on service delivery.

Risk management involves identifying and assessing risks and planning ways to avoid, transfer or mitigate said risks. Risks can stem from various causes including, but not limited to: climate change, natural disasters and public safety threats. Even asset aging can represent a risk of failure. An asset can “fail” in several ways, such as catastrophic failure, failure to meet performance goals, failure to meet regulatory requirements, etc.

It is essential that local governments define their risk assessment process by determining how risks will be identified and prioritized and how they will be managed.

A risk assessment must:

- Ensure assets are given a likelihood of failure score (condition is often used as a proxy);
- Ensure assets are given a consequence score (criticality to service delivery is often used as a proxy); and
- Give assets a risk score.

Local governments are required to develop and evaluate mitigation and adaptation strategies for the highest identified risks.

For more information on risk assessments, including examples, see Appendix F.

7. COST ANALYSIS

Asset Management Plan Requirements

² Perform a cost analysis that includes acquisition, substantial maintenance and operation, renewal and replacements costs for all existing and planned assets over 50 years.

¹ Included in Phase 1

² New to Phase 2 or revised from Phase 1

It is essential that local governments have a detailed understanding of the costs associated with their asset portfolio to adequately plan for the required investments necessary to maintain or reach their target levels of service.

Costs to consider include:

- **Acquisition costs:** The costs associated with any planned purchases or new assets.
- **Substantial maintenance and operation costs:** Any costs associated with the operational upkeep of assets that represent a substantial expense to a local government. Local governments should define the threshold to include these expenses (materiality).
- **Renewal costs:** The costs of renewing assets in the projected year of the renewal. An example of such a cost might be street resurfacing. Local governments may wish to evaluate different intervention methods and perform a sensitivity analysis on costs with different renewal options, though this is not a requirement (e.g. street resurfacing vs reconstruction later).
- **Replacement costs:** The cost of replacing an asset in the projected replacement year. This figure should be determined by using current day estimates and a stated inflation rate to determine the future replacement cost. The projected replacement of an asset should consider any planned upgrades. For example, if it is known that a lane will be added to a street upon replacement, the cost of the projected replacement asset should be considered.
- **Decommissioning costs:** The costs of demolishing or removing assets from service.

For examples on performing a cost analysis, see Appendix G.

8. FINANCIAL PLANNING

Asset Management Plan Requirements

- ☐ 2 Produce a cash flow forecast for each asset class.
- ☐ 2 Identify funding sources over the next 10 years.
- ☐ 2 Clearly define key assumptions in cash flow forecast.
- ☐ 2 Identify strategies to manage funding gaps between cost analysis and the cashflow forecast.

☐ 1 Included in Phase 1

☐ 2 New to Phase 2 or revised from Phase 1

Financial planning is essential to ensuring the local government's financial capacity to deliver target levels of service. Effective long-term financial planning is iterative by nature and closely linked to the cost analysis as well as the target levels of service. Local governments must produce a cash flow forecast that identifies the intended funding sources that are anticipated over a 10-year period.

For each asset class the cost of operation, acquisition, renewal and replacement must be linked to an anticipated funding source such as operating fund, reserve fund, grants, long term capital borrowing or any other funding source. It is important to compare the current and future required investment levels to current and anticipated funding sources in order to identify infrastructure investment deficits. Where investment deficits exist, local governments must describe the strategy to minimize the funding gap (e.g. reduction in levels of service, increasing tax rates, or increasing acceptable risk levels).

For more information on financial planning, see Appendix H.

9. PRIORITY SETTING

Asset Management Plan Requirements

- ☐ 1 Identify municipal investment priorities.
 - ☐ 2 Include priority-setting process.
-
- ☐ 1 Included in Phase 1
 - ☐ 2 New to Phase 2 or revised from Phase 1

The decision-making process for prioritizing investments must be defined. Methods commonly used to evaluate priority setting options include net present value analysis, multi-criteria analysis and risk-based decision techniques. Local governments must describe the decision-making process used to evaluate and prioritize infrastructure investments.

By weighing levels of service, risk, condition, financial capacity and other factors important to the community, local governments will be able to identify investment priorities.

Local governments must demonstrate how the priority setting process was applied to create a list of short-term investment priorities.

For more information on Priority Setting please refer to Appendix I.

APPENDIX A - GOVERNANCE

It is understood that local governments have varying needs and as such, governing documents differ between organizations. Local governments providing many services with a large portfolio of assets (e.g. cities, towns) often have a strategy that guides the organization, a strategic asset management plan that integrates the asset management plan with the organizational strategy and other governing documents. The asset management plan is also closely linked to the operational requirements of each asset, often through an operational plan. These concepts are important for all local governments; however, smaller municipalities may benefit from consolidating certain plans to better fit the scale of their operations. For these local governments, the asset management plan may be all encompassing.

An example of how the asset management plan could be associated with other documents can be visualized in the figure below. In this example, the organization's strategic plan is approved by Council. The strategic plan sets corporate priorities that guide the organization. Financial planning, asset management planning and community planning are all driven by the overarching strategic plan. The financial, asset management and community plans are not developed in silos. They relate to each other, and changes in one may influence another. Operational plans and maintenance and replacement schedules are outputs that are derived from the asset management plan.

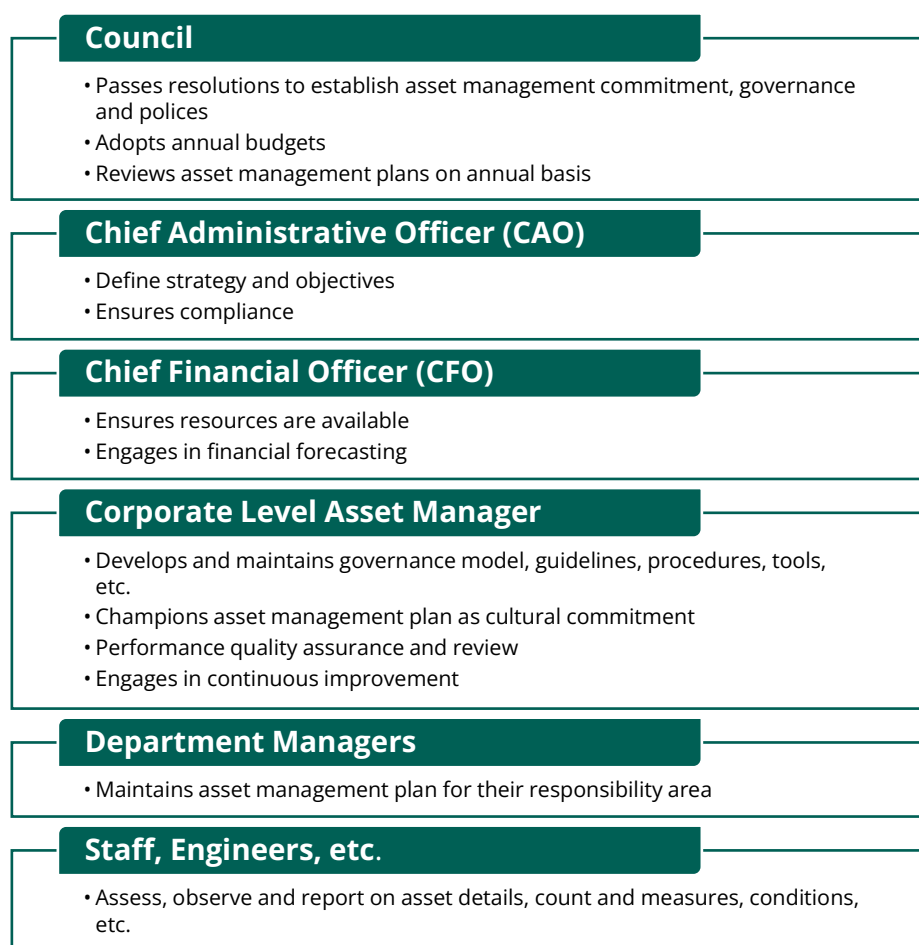
Figure 1 - Asset Management Strategy



This figure is not a checklist of required governing documents. Rather, it is an example of how asset management might be linked within an existing corporate structure.

The figure below is an example of the roles and responsibilities related to asset management within the organization. These roles can be broken down or spread around the organization as needed, depending on the size of the organization, the level of asset management engagement and staff resources available. Some local governments could have dedicated asset management offices, where others see one team or individual take on several roles.

Figure 2 - Roles and Responsibilities



APPENDIX B – INVENTORY OF ASSETS

Asset inventories identify the infrastructure assets owned by a local government, outline the individual components or segments of the asset, and document key data such as the location, age, size, remaining useful life, and current replacement cost. The Department encourages expansion of existing PSA3150 inventory as a basis for asset management planning. Below is an example of a portion of a tangible capital asset inventory based on templates made available for PSA3150 reporting.

MUNICIPAL BUILDINGS (Buildings, Equipment not capable of being moved, & Major improvements)															
ESSENTIAL INFORMATION															
Asset Name & #		Asset Component			Function		Description		Acquisition		Cost		Life		
Name	Nbr	1	2	3	Division	Dept.			Month	Year	Original	Repl	Useful	Rem.	
Police Station	1	Roof			Protective	Police	Tar & Gravel		May	2000	50,000	85,000	30	14	
		Heating/Ventilation						May	2000	25,000	34,000	20	4		
		Building					Brick	10,000 sq ft	May	2000	350,000	1,200,000	50	34	
Arena	2	Building			Parks & Rec		Steel Const	21,000 sq ft	Jun	1984	475,000	3,200,000	50	18	
		Roof					Steel Roof		April	2004	87,000		40	28	
		Ice Plant						Sep	2016	385,000		20	19		
ROADS and STREETS															
ESSENTIAL INFORMATION															
Asset Name & #		Asset Component			Function		Description		Acquisition		Cost		Life		
Name	Nbr	1	2	3	Division	Dept.	Lng (m)	Material	Month	Year	Cost	Basis	Useful	Rem.	
Wilson Ave	321	Base			Transport	Works	2500		Oct	1987	220,000	Historical C	30	1	
		Surface						2500	Pavement	May	1998	160,000		20	2
		Sidewalk						2500	Concrete	South sid	Jul	2005	265,000	15	4
		Curb						5000	Concrete	Jul	2005	115,000	15	4	
		Storm drains						2500	375mm Concr.	Oct	1987	340,000		40	11
Robinson Driv	322	Base			Transport	Works	800				1963	148,000		30	-23
		Surface						800	Chip Seal	Jun	1992	25,000		30	6
		Curb						400	Concrete	1 side	Jun	1992	4,000	20	-4
		Storm drains						800	375mm Concr.	Jun	1963	64,000		40	-13

The existing PSA3150 asset inventories could be expanded upon to include data fields that are relevant to the asset management planning requirements established by the Department including the new information required in Phase 2. Expanding existing inventories in this manner presents key benefits such as time efficiency and the consolidation of information. This avoids having to maintain multiple sets of data with repeated basic elements.

The effectiveness of an asset management plan is closely tied to the quality and structure of the asset inventory. A well-organized inventory divides assets into logical segments and components to support accurate planning and decision-making. Asset segments or components should represent manageable portions of infrastructure that are likely to be replaced simultaneously and at similar costs. While there are no strict rules for segmentation, assets with similar construction timing, materials, and life expectancy can be grouped into practical units. For example: Roads may be segmented block by block, and sanitary sewers may be divided from manhole to manhole.

APPENDIX C – CONDITION ASSESSMENT

An example of a simple five-point rating model is:

Simple Condition Rating Model	
Rank	Description of Condition
1	Very Good Condition Only normal maintenance required
2	Minor Defects Only Minor maintenance required (<10% of asset)
3	Maintenance Required to Return to Accepted Level of Service Significant maintenance required (10-20% of asset)
4	Requires Renewal Significant renewal/upgrade required (20-40% of asset)
5	Requires Replacement Over 50% of asset requires replacement

An example of a rating system based on useful (or service) life:

Condition Rating Using Estimated Service Life		
Rank	% ESL Remaining	
1	Very Good	80-100%
2	Good	60-79%
3	Fair	40-59%
4	Poor	20-39%
5	Very Poor	< 20%

An example of the rating methodology and procedure summary for a given asset class:

Asset Class: Water Line		
Asset	Methodology	Procedure
Service laterals	Age and material	Linear deterioration based on material lifespan.
Water mains	Age and material	Deterioration curve for materials.
Distribution Lines < 30 years old	Age and material	Deterioration curve for materials.
Distribution Lines > 30 years old	Acoustic inspection	Acoustic inspection at 10-year intervals or as deemed necessary.

APPENDIX D – LEVEL OF SERVICE

Examples of some categories of services and the specific services within those categories follow.



Local governments are required to quantify these services by defining the appropriate level of service for every asset class and developing corresponding performance measures. It is possible to have multiple performance measures in place, particularly when a service is viewed from different perspectives. For example, a local government could identify performance measures that represent the end user experience and/or the regulatory requirements (i.e. customer experience vs technical). It is at the discretion of the local government to decide what service levels to track. In the example below, the local government is meeting the expected performance for 2 of the 3 performance measures associated with reliable access to drinking water (i.e. Breaks/100KMs and % of breaks addressed within 24h).

The table below demonstrates how different performance measures can be applied to individual asset classes within a common municipal service category (reliable access to drinking water)

Drinking Water Distribution				
Service Provided	Asset Class	Performance Measure	Expected Performance	Actual Performance
Reliable access to drinking water	Transmission Line	Breaks/100KMs	<1/year	.25/year
Reliable access to drinking water	Distribution Line	Interruptions>24h	<2/year	3
Reliable access to drinking water	Service Lateral	% of breaks addressed within 24h	90%	95%

APPENDIX E – CLIMATE CHANGE

CLIMATE CHANGE ADAPTATION

This section will provide a methodology (which includes some examples throughout) that intends to help guide local governments through the climate risk analysis process. The results should then be integrated into the asset management plan to better inform local governments' decision-making processes and further build climate change adaptive capacity and climate resiliency.

To incorporate climate change adaptation within the asset management plan, local governments are required to demonstrate how the following four steps have been accomplished:

Step 1:

- Identify climate events and their likelihood of occurrence;

Step 2:

- Evaluate impact of climate events;

Step 3:

- Identify assets most vulnerable to climate change impacts; and

Step 4:

- Prioritize adaptation measures.

Many local governments are developing or have completed Climate Change Adaptation Plans. Incorporating the infrastructure-related vulnerabilities and adaptation strategies identified in these adaptation plans in the asset management plan meet the adaptation requirements contained in this guide. Please note that the results should be integrated into **Section 6 - Risk Assessment**.

Step 1: Identify climate events and their likelihood of occurrence

Local governments must identify and evaluate climate events that are likely to impact assets or services. To most accurately identify the important climate events in a region, results should be based on past historical events and historical climate data as well as incorporate future projected climate events and projected climate data. Local governments are also asked to look ahead and estimate the frequency of projected climate events and how they may impact their respective community. These climate events and impacts can be organized and presented to demonstrate and prioritize the climate risks within their local government.

The following figure provides an example of an effective way to organize different types of climate events and the likelihood of occurrences that could impact local governments.

Likelihood	Very Low	Low	Medium	High
Type of Climate Event				
Significant single event; or	Not likely to occur in period	Likely to occur once between 30-50 years	Likely to occur once between 10-30 years	Likely to occur once or more in a decade
i.e. flood			X	
i.e. ice storm				X
On-going/Cumulative occurrence	Not likely to become critical	Likely to become critical in 30-50 years	Likely to become critical in 10-30 years	Likely to become critical in less than a decade
i.e. sea-level rise		X		
i.e. shoreline erosion	X			

Note: The type of events and range of likelihoods should be modified to best represent projected local climate events.

Step 2: Evaluate potential impacts of climate events

After identifying the climate events that could affect the community, local governments must estimate the associated climate-induced impacts on their municipal services (Section 2). When considering climate-induced impacts, it is recommended that local governments consider how climate change will impact assets and associated services.

For example, could the climate change event:

- Degrade asset condition due to wear and tear?
- Contribute to assets failing prior to expected end of service life?
- Increase maintenance costs and requirements?
- Increase system stresses or loads (i.e. extreme temperatures, extreme rain, extreme winds, extreme snow, etc.)?
- Increase potential of fire, flooding, and/or erosion?
- Increase potential of power/communication outages & interruptions?
- Increase potential for system failure due to current and projected climate conditions?

The next figure contains an example of this part of the climate change risk analysis.

Type of Climate Event	Climate-induced Impacts	Potentially Vulnerable Assets
Flooding	• Building damage • Reduced service life and functionality of impacted road infrastructure • Soil instability, slope instability, ground movement, and erosion in flooded areas • Water-borne health effects from flooded waste water retention ponds and other pollution sources • Storm/waste water system capacity exceeded causing flooding • Drainage systems/dike failure • Flooded roads create accessibility problems	• Public/private buildings and property • Storm/Waste water system • Road network • Local streams, rivers, lakes, and parks • Dike system
Ice Storm	• Freezing rain/ice accumulation on Communication/Power lines leads to damage and failure • Frozen and inaccessible roads inhibit travel • Emergency response services interrupted and response time delayed • Ice accumulation damages urban and park trees • Increased risk of fall-related injuries	• Power/Energy systems • Communication network • Public roads • Emergency Response network • Road, trail, power and communication networks
Increased Temperatures	• Increased drought conditions decrease water availability and disrupt agricultural production and practices • Water quality issues • Increased risk of forest fires • Heat-island effect in urban centers • Increased risk of heat-related illnesses and fatalities • Increased demand on water resources • Increased demand on energy systems (i.e. cooling systems)	• Vulnerable people in community • Potable water supply • Parks and Private/Public property at risk to forest fire • Public buildings air exchange systems (i.e. schools, libraries, senior care homes, hospitals) • Agricultural crops
Sea-level rise	• Increased erosion impacting coastal areas • Water increasingly invading coastal areas impacting coastal infrastructure and private properties • More severe storms, heavy rains, and strong winds impacting coastal communities, damaging coastal infrastructure, and disrupting core services (i.e. power, communication, emergency response, transportation, etc.)	• Coastal-bound roads • Dikes, aboideaus, sand dunes • Power lines, communication lines, internet infrastructure • Private residences • Harbors, wharves, docks • Storm water infrastructure • Waste water infrastructure

Note: For the above table, the climate events, their associated impacts on local government assets, and the resulting vulnerabilities should represent the unique challenges each local government faces when considering climate change in their community.

Step 3: Identify assets most vulnerable to climate change

Having identified the climate events, their likelihood of occurrence, the potential impacts, and the vulnerabilities within the community, local governments must identify the specific assets most vulnerable to climate change. This can be achieved by applying a 'climate vulnerability rating' to help quantify the magnitude of impact on each asset. This rating is

meant to be flexible in its application and can be quantitative or qualitative depending on the methodology.

For example, a very robust climate change risk analysis process could follow the ISO 31000 Risk Management Framework. This process is employed within framework's such as [Engineers Canada's PIEVC Protocol](#) or [Infrastructure Canada's Federal Climate Lens](#). Alternatively, the process can be more qualitative and still provide valuable insight when considering climate change risk to local government assets. The results of this assessment should accurately capture the climate vulnerabilities in a way that enables them to be integrated into their overall [Risk Assessment](#) (Section 6).

Step 4: Prioritize adaptation measures

Once the most climate vulnerable assets have been identified, local governments must prioritize adaptation initiatives to limit the impacts of climate change on municipal assets. Local governments should include the climate vulnerability rating in the [Risk Assessment](#) (section 6) section of their asset management plan. This approach is preferred as it provides a consolidated risk assessment and simplifies the establishment of municipal priorities.

GREENHOUSE GAS REDUCTION

To incorporate GHG reduction within the asset management plan, local governments are required to demonstrate how the following four steps of GHG reduction have been accomplished.

Step 1:

- Estimate greenhouse gas emissions;

Step 2:

- Identify and assess GHG reduction opportunities;

Step 3:

- Prioritize and schedule reduction opportunities; and

Step 4:

- Monitor and report

Many municipal governments have already joined the Federation of Canadian Municipalities (FCM) Partners for Climate Protection (PCP) program; a national network of over 350 municipalities (2019) taking action on climate change by reducing GHG

emissions. Full implementation of this program meets the GHG reduction requirements contained in this guide.

Step 1: Estimate greenhouse gas emissions

Local governments must calculate, as a minimum, the existing annual GHG emissions based on fossil fuel energy consumption records (i.e. natural gas, propane, diesel, heating fuel, etc.) associated with each applicable asset.

There are many online tools to assist local governments in calculating asset-related GHG emissions. One such tool for managing building assets is [Energy Star Portfolio Manager](#), an online tool that allows users to measure and track energy and water consumption, as well as GHG emissions. This will be discussed further in Step 2. When calculating GHG emissions associated with mobile assets, local governments may wish to use [NRCan Vehicle Comparison Tool](#). This tool calculates the reduction in GHG emissions of up to 4 vehicles in comparison to a base vehicle.

Step 2: Identify and assess GHG reduction opportunities

Local governments must review emission sources and identify and assess GHG reduction opportunities. As mentioned above, the Energy Star Portfolio Manager is an online tool that allows local governments to benchmark and monitor the performance of one building or a whole portfolio of buildings in a secure online environment. Upon inputting building data, the tool produces a metrics summary, including an Energy Star Score this score which is a measure of how well the building is performing relative to similar buildings, when normalized for climate and operational characteristics. The tool also produces a Total GHG Emissions Intensity value based on the energy consumption of the property. Not only does it allow building owners and operators to monitor and track their progress, it also works as a benchmarking tool against buildings of similar size.

While there are many options that exist to reduce GHG emissions, there are three general categories: switching to cleaner or carbon-neutral fuels, increasing energy efficiency, and modifying practices and procedures to reflect best available energy management technologies and processes.

Examples of emission reduction measures that could be considered include, but are not limited to:

- Supporting low emission, and/or electric fleet and transportation opportunities.
- Optimizing building energy efficiency through investments in low emission equipment and establishing proper preventative maintenance standards that ensure equipment is in good working condition.

- Improving efficiency of assets through retrofits and incorporation of environmental standards into the planning and design phase.
- Implementation of best management practices and best available control technologies.
- Implementation of leak detection and repair programs.
- Implementation of on-site renewable energy.
- Assessing opportunities for fuel switching.
- Exploring heat and power recovery opportunities.

Following the identification of opportunities, local governments should assess the feasibility of each opportunity in terms of best available and economically achievable outcomes. Local governments should benchmark current asset performance against available technologies to aid in prioritization of opportunities.

Step 3: Prioritize and schedule reduction opportunities

The third step is to establish a plan of action by prioritizing each opportunity in a way that best reflects local governments' opportunities for implementation and timeline for required upgrades, replacements, additions, etc. Once this is completed, the plan will provide decision makers with the necessary information to reduce GHG emissions.

Step 4: Monitoring and reporting

To ensure successful investments, local governments should monitor the effectiveness of the implemented mitigation measures. This will allow local governments to track progress, implement remedial actions as necessary and address evolving climate change, technology, and policy knowledge.

Local governments should ensure accurate and consistent data reporting on GHG emissions as this is key to monitoring progress and helps to inform the development of GHG reduction programs and policies. This will also allow local governments to benchmark progress with other local governments within the province or elsewhere.

APPENDIX F – RISK ASSESSMENT

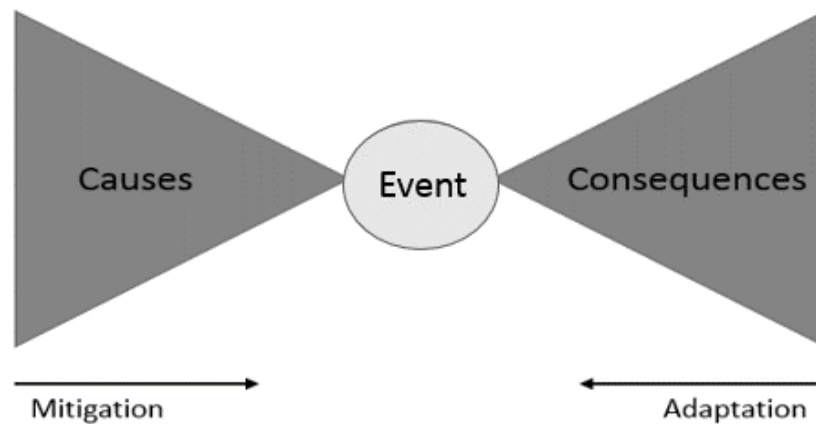
Local governments must evaluate the likelihood of a failure event as a first step in understanding risk. The second input in evaluating risk is the impact of failure on services. Local governments must describe the methodology used to determine the probability and impact of asset failure. Once the assets at highest risk have been identified, local governments should plan for the mitigation strategies to reduce the risk of failure and adaptation strategies to minimize consequences of failure.

Both the condition assessment and climate change sections should be incorporated when determining likelihood and impact of failure. When defining the risk evaluation process, the link to these sections should be made clear.

Local governments may decide to rate the consequences and likelihood of failure for every asset. In this case, local governments must define the scale used to complete this exercise. Risk, in this example, is the product of likelihood and impact of failure. By comparing calculated risk levels versus acceptable risk levels, local governments will be able to identify assets at highest risk. For these assets, local government should consider how to mitigate the impact of an asset failing or minimize the likelihood of failure. The figure below illustrates these principals.

Likelihood	High	Medium Risk	High Risk	High Risk
	Medium	Low Risk	Medium Risk	High Risk
	Low	Low Risk	Low Risk	Medium Risk
		Low	Medium	High
		Impact		

An example of a method used to identify risk mitigation/adaptation options is the Bowtie Method, as illustrated by the figure below. In this method failure events are in the centre of the “bowtie.” The left side represents factors that cause the event. The right side represents the consequences. Mitigation strategies help limit causes while adaptation strategies minimize consequences of a failure event. This exercise should consider the highest risk assets, determine the causes and consequences of failure and develop mitigation and adaption strategies to ensure an acceptable level of risk is achieved. It is possible that the identified strategies are already in place or that new actions need to be taken (ex. replacement parts, operational procedures, etc.).



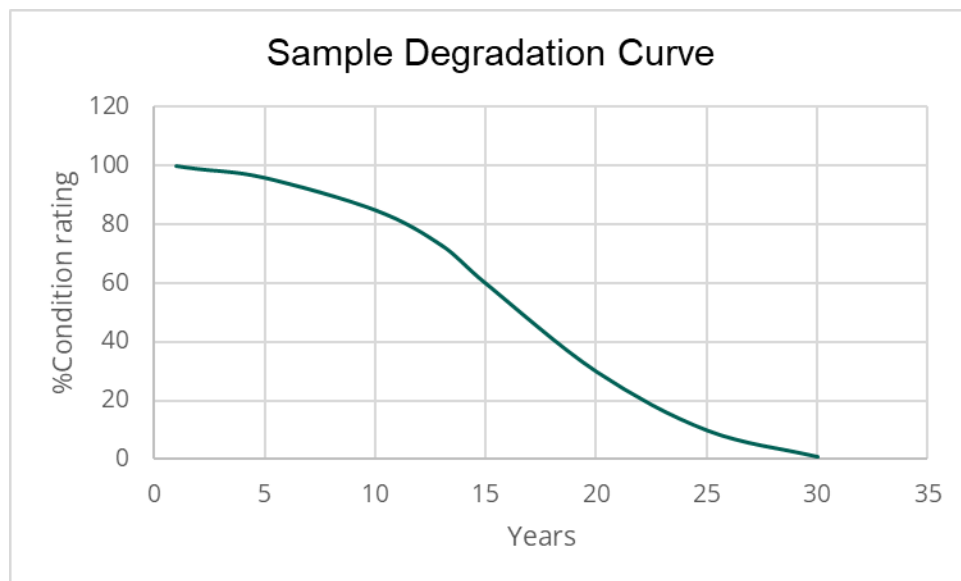
APPENDIX G – COST ANALYSIS

The following is a simple example which uses a randomized dataset to help demonstrate the key principles of performing a cost analysis.

The first step is to determine the lifespan of each asset in the asset inventory. The lifespan of an asset is affected by deterioration and the desired level of service. The figure below is a sample road inventory:

Asset	Class	Year of Installation	Minimum Acceptable Condition Rating	Current Replacement Value
Road 1	Collector	2000	30%	\$ 500,000
Road 2	Arterial	2001	60%	\$ 1,000,000
Road 3	Collector	2002	30%	\$ 750,000
Road 4	Arterial	2003	60%	\$ 1,250,000
Road 5	Collector	2004	30%	\$ 250,000

Roads 2 and 4 are arterial roads. The organization's target level of service identified for this class of road is to remain above 60% condition rating. The target for the other three roads is to remain above 30% condition rating. Using the sample degradation curve shown below we can determine lifespans for these assets.

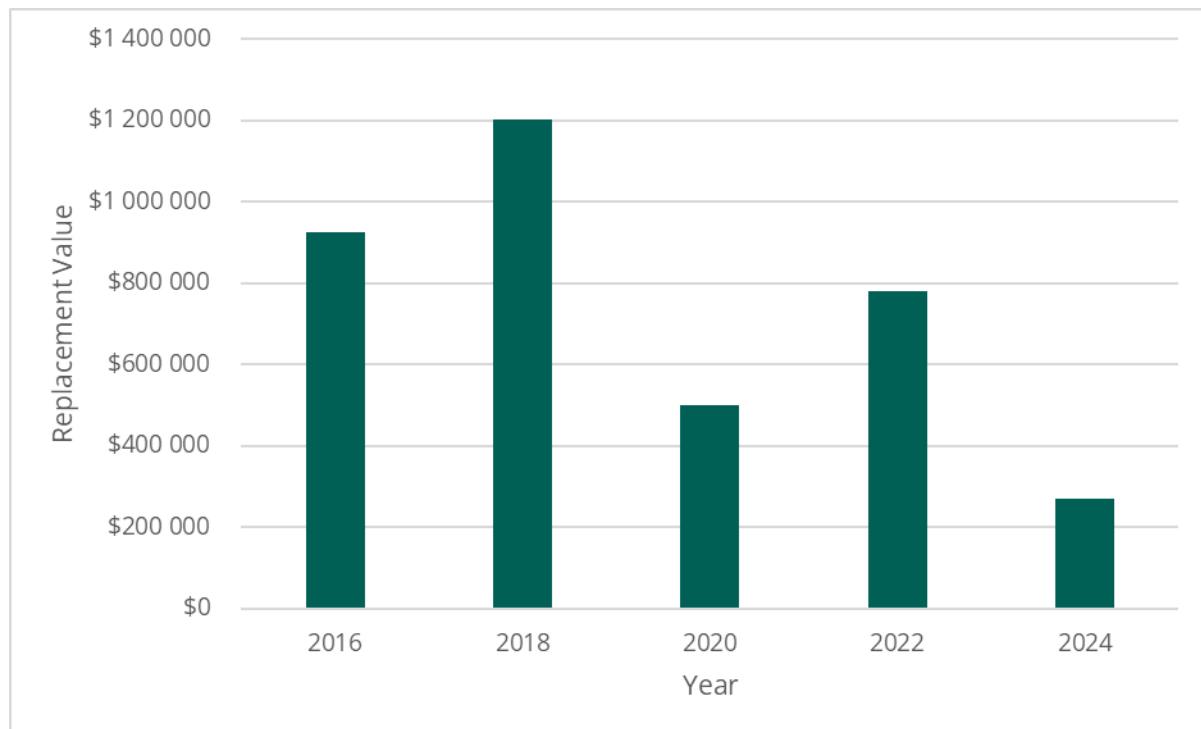


This deterioration curve shows that the condition rating is reduced to 60 % after 15 years and is reduced to 30 % after 20 years. With the life spans of roads established, the replacement year can easily be projected. To determine replacement cost in the projected replacement year, inflation is added to current replacement cost. In this example a 2% inflation rate is applied.

The figure below summarises the projected replacement year and replacement cost.

Asset	Year of Installation	Current Replacement Value	Life Span	Replacement Year	Replacement Cost
Road 1	2000	\$ 500,000	20	2020	\$ 500,000
Road 2	2001	\$ 1,000,000	15	2016	\$ 923,845
Road 3	2002	\$ 750,000	20	2022	\$ 780,300
Road 4	2003	\$ 1,250,000	15	2018	\$ 1,201,460
Road 5	2004	\$ 250,000	20	2024	\$ 270,608

Once the projected replacement years and costs are known, the replacement costs for the road inventory can be plotted by year as seen in the following graph.

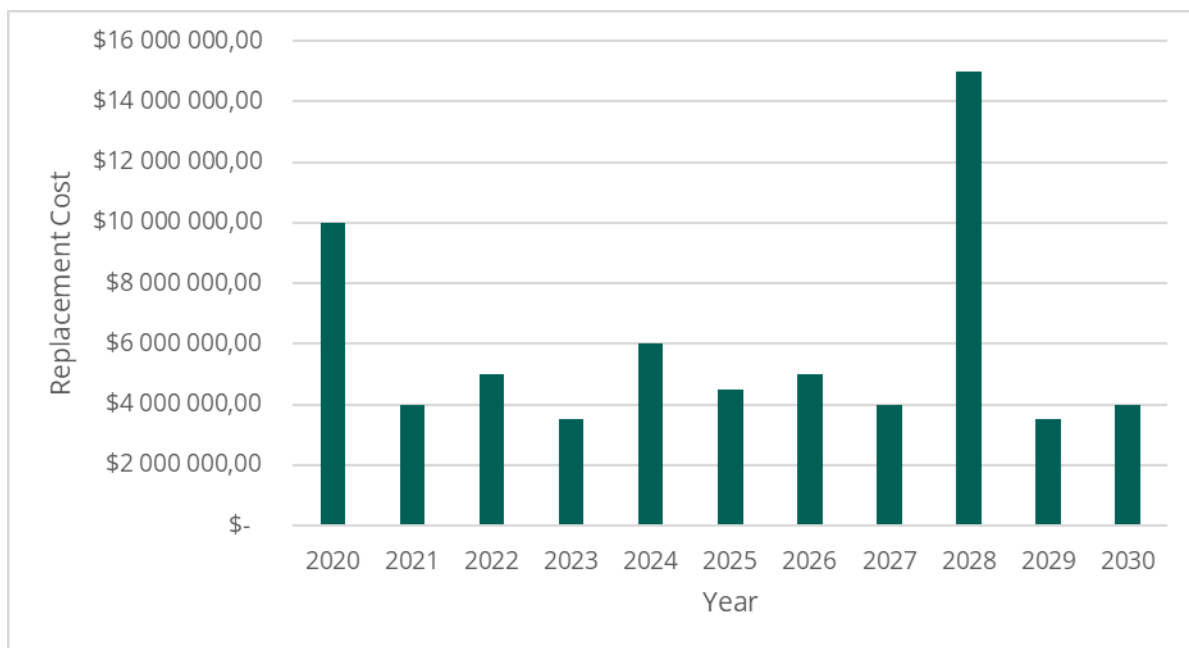


Applying these concepts to an entire asset inventory (municipal buildings, water distribution and wastewater collection networks, etc.) will result in a schedule of anticipated replacement costs for entities over a given period of time.

APPENDIX H – FINANCIAL PLANNING

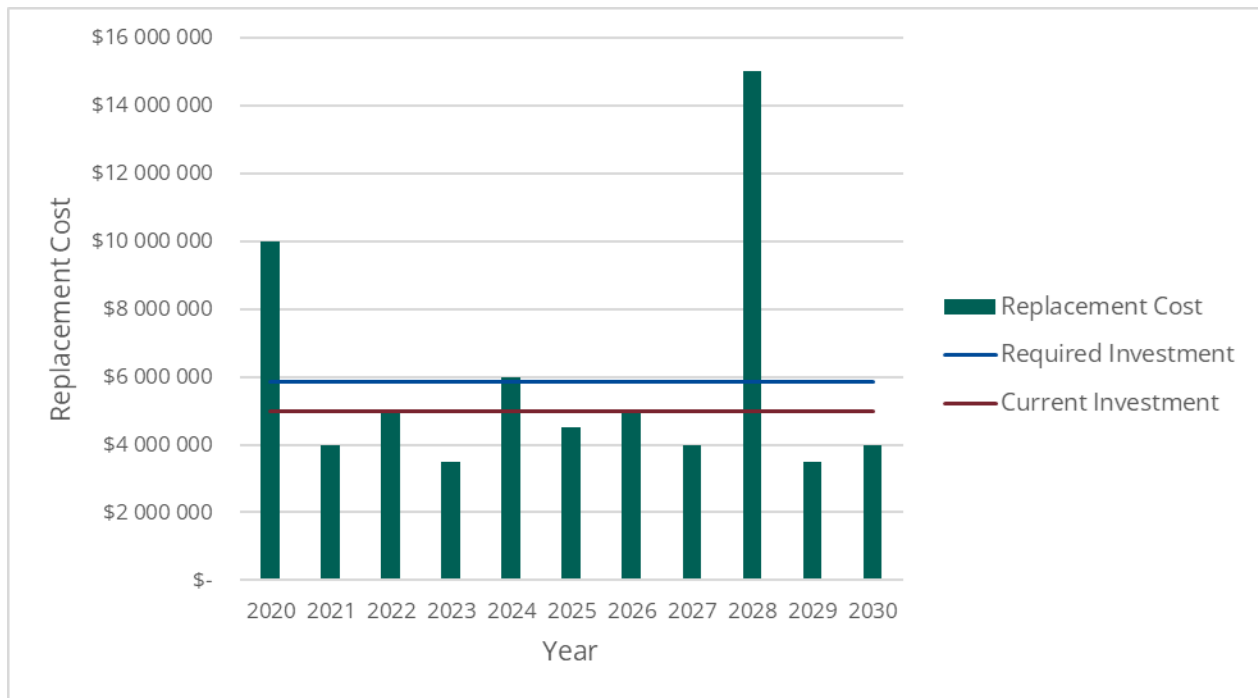
After completing a cost analysis for all relevant municipal infrastructure categories (see Appendix G for details), the resulting cash flow forecast will need to be closely analysed to ensure the required investments can be made. In a perfect world, municipal reserve funds would provide funding to invest the requirement amounts in each year as predicted by the cash flow forecast. In reality, however, some financial planning needs to take place to ensure adequate investments are being made.

The sample cashflow projection below shows the replacement costs for all assets, across all infrastructure categories chosen by a given municipality, projected for each year.



Note that the graph above has projected spikes in replacement costs in the year 2020 and 2028. There are many ways an organisation can address these spikes, including amortizing costs, utilizing reserves, delaying replacement by accepting greater risk, and undertaking preventative maintenance to increase asset lifespans (thereby delaying replacement). The graph below illustrates the required investment to meet all expected expenses as well as an imagined averaged yearly investment contribution. The difference between the two is known as the funding gap.

The following figure illustrates the annual projected replacement costs, the required investment level and the current investment level.



To address the funding gap, organisations should consider all options including those previously mentioned as well as reducing services or increasing revenue. Large funding gaps can lead to a snowballing infrastructure deficit that become increasingly difficult to manage. Financial planning for infrastructure investments enables local governments to deliver services at the desired level for the long term.

APPENDIX I – PRIORITY SETTING

Multi-Criteria Decision Analysis Example:

A local government is trying to decide which capital project should be selected. The asset management plan has identified priority projects based on condition and criticality of the service. (i.e. high-risk assets). To determine which project will be undertaken first, a decision-making framework is applied. In this example, a multi-criteria decision analysis (MCDA) is applied to the following projects:

- Culvert upgrades
- Lift station replacement
- Watermain replacement

The proposed projects impact the community in different ways. For the exercise to work effectively, criteria must be selected which represent the interest of all stakeholders.

For this example, the following selection criteria have been identified:

- Environmental impact
- Capital cost
- Operational savings
- Risk of budget overruns

With the selection criteria identified, the projects are rated against each criterion. This example uses a 1-5 rating scale where 5 is the best possible score. The sample scores are shown in the table below.

Criteria	Culvert Upgrades	Lift Station Replacement	Replace section of water main
Environmental impact	4	3	3
Capital cost	4	5	2
Operational savings	1	5	4
Risk of budget overruns	2	3	3

The next step is to weight the selection criteria. In this example, criteria with greater importance receive a greater value. The sample criteria weighting is shown in the table below.

Criteria	Weight
Environmental impact	40
Capital cost	20
Operational savings	30
Risk of budget overruns	10

Ultimately, the rating that projects received for each criterion is multiplied by the associated weight to give each project an overall score. The scores for this example are tabulated in the table below.

Criteria	Weight	Culvert Upgrades		Lift Station Replacement		Replace section of water main	
		Rating	Score	Rating	Score	Rating	Score
Environmental impact	40	4	160	3	120	3	120
Capital cost	20	4	80	5	100	2	40
Operational savings	30	1	30	5	150	4	120
Risk of budget overruns	10	2	20	3	30	3	30
Score			290*		400		310

*Calculation: $4 \times 40 + 4 \times 20 + 1 \times 30 + 2 \times 10 = 290$

When tabulated, the scores indicate that the lift station should be selected based on the criteria used to make the decision. For best results, the exercise should be completed by several members of the organisation and the results compared and discussed.

It is important to note that MCDA is only a tool; much of the value comes from analyzing scores, discussing score variances between team member, evaluating results and ultimately making to a decision that is in the best interest of the stakeholders.

APPENDIX J - LINKS

The table below is a list of resources to help in the development of an asset management plan.

Resource	Source	Link	Description
AM Getting Started Toolkit Workbook	Alberta Municipal Affairs	http://municipalaffairs.alberta.ca/documents/ms/2015-11-17_AM_toolkit_workbook.xlsx	An excel sheet with templates for inventory, levels of service, risk assessment, cost, etc. Includes detailed document review.
Asset Management for Sustainable Service Delivery: A BC Framework	Asset Management BC	https://www.assetmanagementbc.ca/framework/	Asset Management for Sustainable Service Delivery: A BC Framework (the Framework) establishes a high-level, systematic approach that supports local governments in moving toward service, asset and financial sustainability through an asset management process. The Framework addresses: 1. Why asset management is necessary. 2. What asset management is. 3. How asset management can be implemented.
Municipal Finance Officer's Association (MFOA) AM Resources Kit	Municipal Finance Officer's Association	https://www.mfoa.on.ca/MFOA/WebDocs/AM_Resources_Kit_2016.pdf	This Asset Management Resources Kit (AM Resources Kit) provides an easy “pocket guide” to key activities, tools, training and resources to help you develop, implement and optimize your municipality’s asset management plan.

Public Sector Accounting Handbook <i>Manuel de comptabilité de CPA Canada pour le secteur public</i>	Chartered Professional Accountants Canada <i>Comptables professionnels agréés du Canada</i>	https://www.cpacanada.ca/en/business-and-accounting-resources/cpa-canada-handbook-the-standards-and-guidance-collection/cpa-canada-public-sector-accounting-handbook	In addition to just reporting on tangible capital assets for accounting purposes, there are Statements of Recommended Practice as well as auditing standards to provide direction to auditors of statements that have asset management practices built into a Financial Discussion and Analysis.
International Standards for Asset Management (ISO 55000, 55001, 55002) <i>Normes internationales sur la gestion des actifs (ISO 55000, 55001, 55002)</i>		http://www.assetmanagementstandards.com/	• ISO 55000 provides an overview of the subject of asset management and the standard terms and definitions. • ISO 55001 is the requirements specification for an integrated, effective management system for asset management. • ISO 55002 provides guidance for the implementation of such a management system. • <i>La norme ISO 55000 donne un aperçu de la gestion des actifs et des termes et définitions standard.</i> • <i>La norme ISO 55001 précise les exigences relatives à un système de gestion des actifs intégré et efficace.</i> • <i>La norme ISO 55002 donne des orientations pour la mise en œuvre de ce système de gestion.</i>
AIMnet Solution	AIM Network	https://www.aimnetwork.ca/resources	A GIS-integrated asset management planning solution - free open-source software which includes infrastructure inventory, GIS integration and State of Infrastructure Reports. Developed by a community of users including municipal staff and consultants.

Asset Management Readiness Scale	FCM (MAMP) <i>FCM (PGAM)</i>	https://fcm.ca/en/resources/mamp/tool-asset-management-readiness-scale	Tool that guides municipalities in assessing their current asset management practices, and can serve as a structure for evaluating progress as they develop a strong asset management program and approach.
Starting the asset management conversation with your municipal council: A communication tool	FCM (MAMP) <i>FCM (PGAM)</i>	https://fcm.ca/en/resources/mamp/tool-starting-the-asset-management-conversation-in-your-municipality	Communication tool (powerpoint presentation template with speaking notes) that can be used by elected officials to communicate the value of asset management, and basic asset management concepts to their peers.
Why invest in AM video	FCM	https://fcm.ca/en/resources/mamp/video-why-invest-in-asset-management	An animated video that discusses how asset management can address many of the challenges faced by municipalities relating to service delivery through infrastructure.