



**Weathering the Storm:
Asset Management and Climate Change**

Participant Workbook

This initiative is offered through the Municipal Asset Management Program, which is delivered by the Federation of Canadian Municipalities and funded by the Government of Canada.

fcm.ca/assetmanagementprogram



About FCM

The Federation of Canadian Municipalities (FCM) is the national voice of municipal government. In leading the municipal movement, FCM works to align federal and local priorities, recognizing that strong hometowns make for a strong Canada.



About AUMA

Founded in 1905, the Alberta Urban Municipalities Association (AUMA) represents 269 urban municipalities including cities, towns, villages, summer villages, and specialized municipalities. AUMA works with federal and provincial governments and business and community stakeholders on a broad range of issues to strengthen the economic, social, cultural, and environmental vitality of its member municipalities.



About RMA

Rural Municipalities of Alberta (RMA) is an independent association representing Alberta's 69 counties and municipal districts. Since 1909, RMA has helped rural municipalities achieve strong, effective local government.

Table of Contents

WELCOME	1
USING THE WORKBOOK	2
LEARNING GOAL: ASSET MANAGEMENT REFRESH	3
MODULE 1 – IDENTIFY INFRASTRUCTURE AND SERVICE DELIVERY VULNERABILITIES	6
LEARNING GOAL: IDENTIFY HOW CLIMATE IS CHANGING	6
MODULE 2 – IDENTIFY HOW TO USE ASSET MANAGEMENT TO PRIORITIZE AND MANAGE VULNERABILITIES	17
LEARNING GOAL: KNOW THE BASICS OF ASSET MANAGEMENT AND THE CONNECTION TO CLIMATE CHANGE	17
LEARNING GOAL: IDENTIFY HOW ASSET MANAGEMENT IS USED TO IDENTIFY, PRIORITIZE, AND MANAGE CLIMATE CHANGE RISKS AND VULNERABILITIES . . .	19
LEARNING GOAL: IDENTIFY HOW ASSET MANAGEMENT IS USED TO SUPPORT CLIMATE CHANGE MITIGATION	21
YOU’VE MADE IT!	23
GLOSSARY	24
RESOURCES	25

Welcome

Welcome to *Weathering the Storm: Asset Management and Climate Change*! This course has been designed to equip you, as elected officials, with an understanding of the impacts of climate change on asset management and the ways through which asset management can support community goals related to climate change mitigation and adaptation.

Your feedback on this course is valuable to us and will help us adapt this course to better serve the needs of elected officials. Over the course of the day, we will ask you to share your questions, insights, and experiences. We will also be asking you to complete evaluation forms and we thank you in advance for your feedback.

Asset Management and Elected Officials

A few important points to get us started:

Asset management is the process of making decisions about using and caring for infrastructure to deliver services in a way that considers current and future needs, manages risks and opportunities, and makes the best use of resources.

Elected officials support asset management in their communities by being knowledgeable about good practice, supporting staff initiatives, making resources for asset management available, and asking the right questions when making decisions about infrastructure. However, there has been little training provided to elected officials to help them navigate their role in asset management.

This course was designed to provide you, as elected officials, with a foundation in asset management and climate change so that you know the connection between the two and how to consider this connection in your day-to-day decision-making as council.

Using the Workbook



Learning Goal

Specific learning outcome to be achieved.



Did You Know?

Interesting facts and insights on asset management.



Activity

Individual or group exercises designed to put learning into practice.



Resources

Additional reference materials and tools related to the topic. Web addresses for the resources can be found at the back of the workbook.



Glossary

Definitions of words and phrases used in the course material.



Reflection

A place to write your own reflections and insights on how you might apply a concept or idea to your own municipal circumstances.



LEARNING GOAL: **Asset Management Refresh**

Some of you may have taken the one-day introductory Asset Management for Elected Officials course and are already familiar with the asset management. For others, this may be new. To make sure we're all on the same page, let's review the key concepts of asset management.

A major component of municipal service delivery is taking care of the assets that make those services possible. An **asset**, also known as a tangible capital asset (TCA), is a physical component of a system that enables a service, or services, to be provided. For example, pipes are the assets that deliver water service to homes, roads and traffic lights are the assets that make transportation possible, and recreation centres are assets that allow recreation services to be provided to the community.

Asset management doesn't need to be restricted to engineered assets. Natural assets, such as aquifers, riparian areas, or wetlands can provide a significant role in delivering municipal services. Asset management processes can be applied to these natural assets, supporting the same end goal of sustainable service delivery.

Asset management is ultimately about **sustainable service delivery**: the process of ensuring that municipal services are delivered in a socially, economically, and environmentally responsible way, and that decisions today do not compromise the ability of future generations to meet their own service needs.

Municipalities have been managing assets for a long time. However, asset management is more than just managing assets.

Asset management is a systematic, organized, and integrated approach:

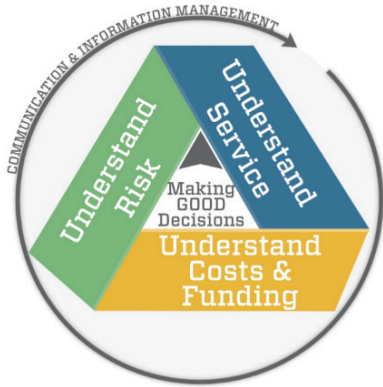
“The process of making decisions about the use and care of infrastructure to deliver services in a way that considers current and future needs, manages risks and opportunities and makes the best use of resources”

(Building Community Resilience Through Asset Management: A Handbook & Toolkit for Alberta Municipalities).

The key emphasis here is “making decisions”, as it is through decision-making that asset management is implemented. Asset management is about using systems and processes to balance cost, risk, and level of service to make informed decisions that make sense for your community in the long run. Asset management is not just for large communities. All municipalities make decisions about their assets. The systems and processes don't need to be extensively detailed or expensive; you can start where you are. Your municipality likely already uses processes for things like planning and budgeting. Asset management is about updating those processes to ensure they systematically consider the right kind of information and take a long-term perspective.

Asset Management and Decision-Making

It is the role of council to make decisions and set direction. Making decisions in a municipal context requires thinking about trade-offs between service, risk, and cost. While it is not the role of councillors to prepare information about service, risk, and cost trade-offs, it is their role to incorporate an **asset management lens** and request information from staff to understand these trade-offs and support sound decision-making.



Source: Building Community Resilience Through Asset Management: A Handbook and Toolkit for Alberta Municipalities

The table below identifies some of the main considerations in service, risk, and cost. We will explore some of these in more depth later in the course.

Service, Risk, and Cost Considerations

Service	Risk	Cost
<ul style="list-style-type: none"> Types of services Who benefits or doesn't benefit from a particular service The current and desired level of service Regulatory requirements Service demands 	<ul style="list-style-type: none"> Events that would have an undesirable impact on services Asset risk describes the risk of an asset failing to perform the way you need it to deliver a service Strategic risk describes a change that would affect your ability to achieve municipal objectives Risk management strategies 	<ul style="list-style-type: none"> Replacement and capital costs Operating and maintenance costs Revenue sources Partnerships



Glossary

Asset | Also known as a tangible capital asset (TCA), a physical component of a system that enables a service, or services, to be provided.

Asset management | A process of making decisions about how infrastructure is used and cared for in a way that manages current and future needs, considers risks and opportunities, and makes the best use of resources.

Asset management lens | Integrating asset management practices into decision-making. Specifically, thinking about what information is available, what additional information is needed, what trade-offs are being made, and what are the community's long-term goals and needs.

Asset risk | The risk of an asset failing to perform the way you need it to (e.g., a pipe bursts).

Risk | The relationship between the likelihood of an event happening and the consequences of that event.

Strategic risk | The risk of a change occurring that impedes your ability to achieve your overarching strategic goals (e.g., hot, dry conditions put pressure on your ability to provide water service).

Sustainable service delivery | Ensuring that municipal services are delivered in a socially, economically, and environmentally responsible way, and that decisions today do not compromise the ability of future generations to meet their own service needs.

Module 1 – Identify Infrastructure and Service Delivery Vulnerabilities

After completing this module, participants will achieve the following learning goals:

- Identify how climate is changing
- Identify vulnerabilities in infrastructure and risks to service delivery

LEARNING GOAL: Identify How Climate Is Changing

TERMINOLOGY

Depending on your background, you may be familiar with climate change terminology already. But for those who don't deal with climate change in daily work, this section will provide an overview of key concepts.

Weather is what we experience day-to-day.

Climate is the trend in weather patterns over a longer period – generally over decades but can be over centuries or longer.

Climate change refers to changes in the mean/or in the variability of weather patterns that persist over long periods of time. When we talk about “climate change” in the present context, we are generally referring to changes that are “attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”.¹

The human factors that are most directly attributed to climate change are increases in the concentration of greenhouse gas (GHG), in particular carbon dioxide, methane, and nitrous oxide. Concentrations have been increasing from the industrial revolution to now through emissions from fossil fuels used in industry, transportation, and domestic energy use, as well as animal production and other agricultural activities.

The climate also changes for reasons unrelated to human activity, such as volcanic eruptions, changes in solar energy, and natural fluctuations in GHG concentrations.² However, when you hear “climate change” in the news or in your work, generally what is being referred to is human-influenced climate change.

EXPECTED CLIMATE CHANGE IMPACTS IN ALBERTA

Climate change will impact different areas and industries in Alberta in different ways. Generally, expected climate change impacts include higher temperatures, more frequent droughts and floods, and more extreme weather events. However, specific impacts – such as when a drought may occur and how severe it is – are largely unpredictable. Like any major or persistent weather event, the impacts of climate change require long-term thinking, advanced preparation, and contingency planning.



¹ United Nations Framework Convention on Climate Change (UNFCCC), Article 1 – Definitions, 1992. http://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf

² Government of Canada, Causes of Climate Change, 2015. <https://www.canada.ca/en/environment-climate-change/services/climate-change/causes.html>

The following climate change impacts are anticipated for Alberta³:

- From year to year, agricultural production may see increased or reduced yield, depending on how changes to temperature and rainfall affect crops. Some areas may see their planting options expand with higher temperatures – for example, Ontario’s wine growing region may expand north with rising temperatures, while barley in Alberta is also expected to benefit from warmer temperatures and higher humidity.⁴ However, increased variability in temperatures and rainfall patterns may make it harder for farmers to build sustainable farming businesses.
- Increased temperature may affect biodiversity, particularly if habitats change or shift geographically. Ecosystem services to your community, such as water, may be severely affected by changes in rainfall patterns and increased drought, particularly if this is already a risk in your region.
- Higher temperatures and drier conditions are already linked to more frequent forest fires. When these occur close to human settlements, the cost of fire fighting, evacuation, infrastructure repair and replacement, and insurance premiums can be staggering.
- Although overall average temperatures over a long period of time (climate) are expected to increase, climate change may also cause periods of extreme low temperatures. Frequent freeze-thaw cycles can be very hard on infrastructure; for example, this leads to more frequent and larger potholes.
- Changes in temperature, precipitation, and the frequency of extreme weather events will also change the lifespan of your infrastructure, as events that fall outside of normal parameters occur more frequently. This will increase maintenance costs, as well as potentially lead to more frequent replacement, especially for assets such as roads. Changes in precipitation patterns may place different demands on drainage and flood protection infrastructure than what design parameters of the past allowed for.

LOCAL CLIMATE CHANGE INFORMATION

If you’re interested in finding out more about local climate change impacts for your community, there are a number of great resources that focus on Alberta and other prairie provinces:

- The Prairie Climate Centre provides information on both the causes and impacts of climate change, including regional carbon emission data, mapping on temperature and precipitation changes, and resources on adaptation.
- The Prairie Climate Atlas is a resource provided by the Prairie Climate Centre that maps climate change impacts across Alberta, Saskatchewan, and Manitoba, including by municipalities.

Web addresses for both resources can be found in the Resource section at the back of this workbook.

³ Alberta Government, “Climate Change in Alberta”, N.D. <https://www.alberta.ca/climate-change-alberta.aspx>

⁴ Marc Montgomery, “Climate Change and the Wine Industry, CBC, 2017. <http://www.rcinet.ca/en/2017/05/01/climate-change-and-the-wine-industry/>

Jennifer Pascoe, “How Barley is Expected to Benefit from Climate Change”, 2017. <https://www.ualberta.ca/science/science-news/2017/november/barley-crops-climate-change>

ACTION ON CLIMATE CHANGE

There are presently two streams of action to manage climate change. We will present them separately, and then identify some areas where they overlap.

Mitigation refers to efforts to reduce the contribution of human activities to climate change, primarily through reductions in greenhouse gas emissions. Mitigation may take the form of reducing certain activities (such as driving less) or adapting technology to use less energy (such as energy efficient lightbulbs or better home insulation). Though mitigation actions can take place at multiple levels and in different sectors, municipalities have been showing significant leadership in the following ways:

- Investing in green construction technologies when constructing new buildings (e.g., LEED-certified facilities).
- Tree planting, expanding the forest canopy, and preserving wetlands and peatlands to increase carbon sequestration (i.e., the process of removing carbon dioxide from the atmosphere).
- Investing in active transportation infrastructure, such as trails and paths, bike lanes, and public transit to support the use of lower-emission transportation options.
- Designing and constructing infrastructure that has lower energy requirements or uses lower-emission energy sources.

Adaptation refers to efforts to manage the impacts of climate change on human and natural systems. It occurs as a response to climate change to support the continuation of existing processes or activities. Adaptation efforts may help us continue to do the activities we do (e.g., maintaining a developed area in a floodplain that is at risk for increased flooding). They may help us preserve natural environments that are at risk (e.g., rehabilitating a riparian area to be more resilient to increased incidences of flooding). They may also have benefits (e.g., a rehabilitated riparian area may not only help respond to climate change impacts, but it may make the area more attractive and encourage more recreational activities in the area or attract developers to build homes nearby).

Adaptation efforts can also occur through a variety of means:

- Hard infrastructure investments, such as increasing capacity of stormwater infrastructure to cope with increased intensity of rainfall and flooding.
- Green infrastructure investments, such as increasing tree canopy to absorb greater rainfall and reduce urban heat island effect.
- Changes to operations and maintenance activities, such as increasing the frequency of culvert cleaning to reduce the likelihood of blockages.
- Planning and bylaws, such as restricting where development may occur due to increased risk of flooding.
- Public education and incentivization, such as encouraging residents to use less water during drier months.

The majority of adaptation efforts will have some relationship to assets and therefore to asset management.

Adaptation efforts may be necessary, but it is important to understand that they are not always purely beneficial or benign to the environment or human contribution to climate change. Especially when the situation calls for an immediate intervention, adaptation efforts may prioritize human settlements over the natural environment. For example, in high risk coastal communities, breakwaters may be used to cope with storm surges, however, these disrupt natural processes. Adaptation efforts may also be a major contributor to greenhouse gas emissions. For example, human adaptation to hotter temperatures may be to increase the use of air conditioners, which use more energy. Adaptation requires considering a number of trade-offs between the service that is wanted, the cost, and risks associated.

Adaptation has many impacts on infrastructure assets and how we plan for them. Because of this, the majority of this course will focus on climate change adaptation. Asset management provides a helpful framework for making decisions about adaptation.



Did You Know?

The Municipal Climate Change Action Centre (MCCAC) is an organization dedicated to helping Alberta municipalities reduce their greenhouse gas emissions and improve energy efficiency. Check out the Resource section at the back of this workbook for their web address.



Glossary

Weather | The state of the atmosphere that we experience day-to-day.

Climate | The trend in weather patterns over a longer period – generally over decades but can be over centuries or longer.

Climate change | Changes in the mean/or in the variability of weather patterns that persist over long periods of times. These changes are attributed directly or indirectly to human activities that affect the composition of the global atmosphere.

Mitigation | Efforts to reduce the contribution of human activities to climate change, primarily through reductions in greenhouse gas emissions.

Adaptation | Efforts to manage the impacts of climate change on human and natural systems. It occurs as a response to climate change to support the continuation of existing processes or activities.

Activity

How has climate change impacted your community already?

How might climate change impact your community in the future? Consider both broad community impacts, and impacts to your infrastructure and municipal services.





LEARNING GOAL: Identify Vulnerabilities in Infrastructure and Risks to Service Delivery

As stewards of sustainable service delivery, council has an important role in understanding high-level risks to infrastructure and service delivery and providing direction to staff so these risks can be appropriately managed. This includes risks related to climate change.

Thinking about the ways that climate change will affect infrastructure and service delivery requires an understanding of two concepts: vulnerability and risk. We use these terms everyday, however, it is helpful to define them to understand what we mean when it comes to climate change.

Vulnerability describes the inability of a system to cope with the effects of climate change. It describes the character of the system, whether that is a natural system, such as an ecosystem, or a human-made system, such as a piece of infrastructure or a whole city. For example, a stormwater pipe built for a particular intensity and duration range of rainfall events is vulnerable to failure if a rainfall event outside of this range occurs because it may not be able to cope with a larger event than it was designed for.

Risk describes the relationship between the likelihood of an event happening and the consequences of that event.

- **Asset risk** describes the risk of an asset failing to perform the way that is needed to deliver a service. For example, if a rainfall event outside of normal range occurs, a single stormwater pipe is at a high risk if this event is likely to occur and the consequences are serious, such as causing major local flooding that causes significant damages to property.
- **Strategic risk** describes a change that would affect your ability to achieve municipal objectives. For example, a major rainfall event that overwhelms a community's stormwater system and causes major flooding will require shifting resources to cope with the emergency and may result in other strategic priorities not receiving resources.

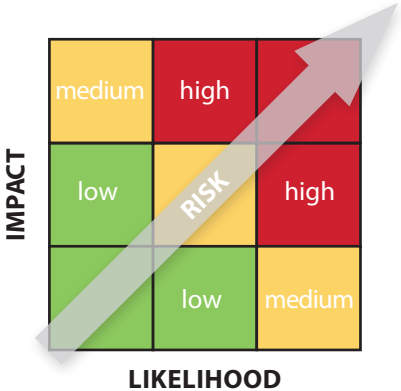
To illustrate vulnerability and risk, consider the following examples:

- A road may be at risk of flooding and washout with a certain sized storm due to the design of the culvert. The culvert is a point of vulnerability, because a large event storm will inundate the culvert and flood the road. However, the risk is managed by implementing a program to check and clean the culvert of debris every week.
- Increasing temperatures and changing rainfall patterns may lead to more frequent or longer-lasting drought in a particular community. In this community, the water system, including water source, was not designed to cope with drought conditions. The system is therefore vulnerable to the effects of drought and the community may face water shortages. The system is at risk of water shortages the longer drought conditions persist.

Climate change is affecting our expectations about the impact and likelihood of certain events. This is particularly relevant for natural disasters like flooding and forest fires and how municipalities plan their infrastructure to cope with them.

The image below shows a simple way for considering a risk. When assessing asset or strategic risks, climate change can impact both the consequence and likelihood of certain outcomes.

As an example, consider a municipality experiencing changes in rainfall patterns. Rain falls less frequently, but when it does, it falls more intensely with more rain in a shorter period of time. The drainage infrastructure was not designed to deal with such intense rain events, and so the likelihood of flooding increases. The increased intensity of rain also increases the severity of the flooding, meaning that the consequences of flooding are higher. An increase in both the likelihood and the consequence of an event leads to a significant increase in the overall risk.



SERVICE DELIVERY AND CLIMATE CHANGE

The examples below illustrate how climate change is impacting infrastructure vulnerability and increasing risk to service delivery. It is important to note that a municipality may select multiple adaptation options, and that options will have different strengths/weaknesses and achieve different objectives. Some may be operational solutions, others might be capital projects. Some will be better suited for the short-term, and others better for the long-term. Some options will reduce the likelihood of the risk, and other options may be designed to reduce the consequence. Municipalities may choose to implement a suite of adaptation actions, rather than just rely on one action.

Climate Change Impact	Vulnerability	Risk	Examples of the Range of Adaptation Options
Changes to rainfall patterns, extreme rainfall events	The existing drainage and flood infrastructure is vulnerable to failure if a rainfall event exceeds the design standards it was built to. With climate change, rainfall events may exceed historic norms, leading to asset failure and flooding.	Climate change may make rainfall events beyond historic norms more likely, making it more likely that flooding will occur. The consequences of flooding will depend on severity but will likely influence road infrastructure, disrupt transportation, and damage property. Flooding often creates a cascading negative impact.	<ul style="list-style-type: none"> Increasing clearing of drains Rehabilitating streams and ponds that serve stormwater functions Building larger pipes Not allowing development in floodplains

Climate Change Impact	Vulnerability	Risk	Examples of the Range of Adaptation Options
Hotter temperatures and drier conditions	Forests are more vulnerable to fires with hotter, drier conditions.	Higher temperatures and drier conditions make it more likely that forest fires will occur and can increase the duration and spread of forest fires. Communities near forest fires are at risk of damage to their ground infrastructure, having their roads cut off, and fire protection service and infrastructure being overwhelmed.	<ul style="list-style-type: none"> • Clearing forested areas near human settlements • Not allowing development near high-risk forested areas • Emergency and evacuation plans in place
Drought conditions	A community's water supply and water system may be vulnerable to being depleted under drought conditions.	The community is at risk of water shortages under drought conditions.	<ul style="list-style-type: none"> • Public education on water reductions • Enforce water restrictions • Ship water from elsewhere
Temperature fluctuations	The material used for roads may not be able to withstand rapid fluctuations in temperature and may be vulnerable to damage.	Roads are at risk of damage from temperature fluctuations. Potholes and cracks, when left alone, can lead to greater road damage and significantly reduce the life-span of the road and increase the costs of repair. They may also damage cars, slow down traffic, and interrupt transportation networks.	<ul style="list-style-type: none"> • Using new materials for roads • Increasing frequency of inspections and repairs of minor cracks

Climate Change Impact	Vulnerability	Risk	Examples of the Range of Adaptation Options
Extreme temperatures	A natural gas system is vulnerable to interruption under extreme temperatures.	A community is at risk of homes being without heat due to extreme temperatures interrupting natural gas flows.	<ul style="list-style-type: none"> Using natural gas trucks to feed the system when there are interruptions Changing the community's heat source Preparing emergency shelters for times when home heat is interrupted

Glossary

Asset risk | The risk of an asset failing to perform the way you need it to (e.g., a pipe bursts).

Risk | The relationship between the likelihood of an event happening and the consequences of that event.

Strategic risk | The risk of a change occurring that impedes a municipality's ability to achieve its overarching strategic goals (e.g., hot, dry conditions put pressure on the ability to provide water service).

Vulnerability | The inability of a system to cope with the effects of climate change. It describes the character of the system, whether that is a natural system, such as an ecosystem, or a human-made system, such as a piece of infrastructure or a whole city.





Activity

Consider the following scenario:

A community is located close to large forested areas. The risk of forest fires is high in years where temperatures are high and there is little rainfall. Climate change is expected to make this area of the province hotter and drier in summer months. Last year, a forest fire forced a subdivision on the edge of town to evacuate. Luckily, winds changed, and fire fighters were able to get the fire under control before it spread.

What are the potential infrastructure vulnerabilities in this community? What are the potential service delivery risks?

What are possible adaptation actions for the community?

Reflection

What types of actions has your community taken to identify and respond to risks and vulnerabilities associated with climate change?



Module 2 – Identify How to Use Asset Management to Prioritize and Manage Vulnerabilities

After completing this module, participants will achieve the following learning goals:

- Know the basics of asset management and the connection to climate change
- Identify how asset management is used to identify, prioritize, and manage climate change risks and vulnerabilities
- Identify how asset management is used to support climate change mitigation



LEARNING GOAL: Know the Basics of Asset Management and the Connection to Climate Change

Asset management is the “process of making decisions about the use and care of infrastructure to deliver services in a way that considers current and future needs, manages risks and opportunities and makes the best use of resources” (Munis 101). The key emphasis here for council is “making decisions”. Asset management is about using systems and processes to balance cost, risk, and level of service to make decisions that make sense for your community in the long run. Asset management requires a systematic, organized, and integrated approach.

Asset management means focusing on things like:

- The purpose of your organization and how assets support community goals.
- Value, purpose, and long-term outcomes of assets.
- Managing risks and understanding the context of risks.
- Holistic approaches to budgeting.
- Collaboration across municipal service areas and with service partners.

The following are some of the key aspects of asset management:

- It is a process of continuous improvement, not a project that can be completed once.
- It requires a systematic approach.
- It takes a shift in mindset.
- It is focused on sustainable service delivery.

ASSET MANAGEMENT AND CLIMATE CHANGE

Considerations of climate change should be integrated directly into asset management processes. Climate change introduces new and increased risks to service delivery and has some important implications for asset management that need to be considered:

- Parameters for which an asset was built may no longer be adequate.
- Increased wear and tear on assets may lead to more imminent investment needs, or higher costs over the long run.
- Extreme weather events (e.g., storms, temperature extremes and fluctuations, floods, etc.) may destroy or damage assets well before they have reached the end of their expected useful life.
- A higher level of service or increased maintenance may need to be provided to deal with the impacts of climate change.

Asset management is a systematic approach to planning for the future and should take into consideration the impacts of climate change. Asset management is a mindset – a way of thinking about assets and service delivery within a broader context. It helps a community identify potential infrastructure weaknesses. In the event of an emergency or extreme weather event, it provides information to staff and first responders so they know of potential vulnerabilities and risks.

Because asset management is a process not a project, it lends itself well to coping with climate change as impacts, risks, and vulnerabilities continue to emerge. A major component of adapting to climate change is being able to adjust activities and investments over time as impacts emerge and change in urgency. We do not know everything we need to know about adapting to climate change. Finding solutions will require some experimentation and iterative learning (i.e. learning from doing). Asset management is a natural fit for climate change adaptation.

Asset management processes are an opportunity to consider climate change impacts and necessary adaptations alongside other strategic and asset risks in the community. Addressing climate change risks separately from other risks may lead to inefficient use of resources, duplication of effort, or unmanaged risks. For example, a municipality may have identified some risks to a few large culverts below major roads in the municipality. The culverts are aging and the bedding around the culverts are showing signs of erosion. Without considering climate change, the municipality may just replace the culverts with similar culverts. However, if extreme weather events from climate change are considered, the municipality may choose to replace the existing culverts with larger sized culverts. In this case, the municipality has now managed current and future risks with a single project and only incremental additional costs.

Asset management keeps the focus on service delivery in changing conditions. It helps you focus on your goals. Rather than getting swept up in how overwhelming climate change may be – especially when there are so many unknowns – asset management keeps the focus on what services your community delivers, and connects how some services (e.g., roads) are dependent on others (e.g., stormwater system capacity).

To reiterate, the role of elected officials is to make decisions and set direction. Councillors are not preparing information about service, risk, and cost trade-offs. However, part of making good decisions is asking the right questions of staff to make sure these trade-offs are considered. An **asset management lens** helps elected officials evaluate trade-offs and incorporate emerging information – for example, on climate change – where it's necessary.

Glossary

Asset management lens | Integrating asset management practices into decision-making. Specifically, thinking about what information is available, what additional information is needed, what trade-offs are being made, and what are the community's long-term goals and needs.



Elected officials can also ensure that their municipality is practicing asset management in a way that helps to identify and manage risks to service delivery related to climate change.



LEARNING GOAL: Identify How Asset Management is Used to Identify, Prioritize, and Manage Climate Change Risks and Vulnerabilities

Asset management processes and plans involve the identification and management of asset and strategic risks, as well as vulnerabilities. Risk management, like asset management, is an ongoing process. This aligns well with addressing climate change risks and vulnerabilities, because there are uncertainties related to climate change and so it is likely that the understanding of risk and vulnerabilities (and therefore mitigating actions) will evolve over time.

IDENTIFYING RISKS AND VULNERABILITIES

Risks related to climate change are just one of many risks that a municipality faces and should not be considered on their own. Targeted climate analysis may be required to identify these risks and vulnerabilities, but they should be reviewed together with other risks as part of a comprehensive risk assessment and risk management process. This ensures that all risks to service delivery are reviewed and prioritized together. Looking at climate change risks together with other asset and strategic risks may allow the identification of projects or responses that manage more than one risk. For example, a culvert that is in poor condition may be replaced with one that is a larger size to handle increased water flows and debris from changing climate.

Timeframe is important to consider when prioritizing risk management options. Some risks may be more immediate, whereas others may be expected to increase down the road. In the latter case, monitoring the risk may be the best solution so that the municipality has time to develop an appropriate response and can plan for the financial resources that will be required. In some cases, implementing a preventative measure will be much less costly than fixing a problem when it happens. In these cases, a municipality may decide to make an investment in preventing a risk before the level of the risk increases. For example, building flood protection infrastructure before flooding occurs will be significantly less expensive than cleaning up and repairing damages to all types of infrastructure after a flood.

PRIORITIZING AND MANAGING VULNERABILITIES AND RISKS

Managing asset vulnerabilities is part of planning and making appropriate investments in infrastructure. It requires considering a number of factors that are part of asset management:

- Understand risks and vulnerabilities, and how they impact your ability to deliver services.
- Consider how some infrastructure also protects other infrastructure, and how some adaptation strategies may have multiple benefits (co-benefits) that include adaptation to climate change but also help achieve other priorities, such as habitat rehabilitation, improved air quality, or attraction of businesses.
- Identify potential adaptation strategies and actions.
- Evaluate the reduction of risk/vulnerability vs. the cost of implementing the adaptation action.
- Prioritize activities based on return on investment (e.g., asset management approach), the availability of co-benefits.
- Prioritize investment based on anticipated timing of impacts/risk (additional climate change consideration) and how risks will change over time.
- Incorporate climate change considerations when considering the replacement or renewal of infrastructure for other reasons, or the construction of new assets.

Common strategies for managing risk related to climate change include improved roads operations and maintenance (O&M), improved drainage O&M, water use restrictions, etc. Not all strategies are capital projects, many of them are O&M solutions.

As communities must increasingly invest in adaptive and resilient infrastructure, asset management provides a way of thinking about these investments when there is uncertainty about the timeline and scale of impacts.

WHERE TO START

If your municipality has only just begun identifying risks related to climate change, a simple conversation with the right people in the room can be a very helpful and informative first step to take. This conversation will likely be between internal staff who have knowledge of infrastructure systems, the community, and finances. It may be expanded to include someone with expertise on local climate change impacts. This conversation should cover questions like the following:

- What are the expected impacts of climate change in our community (e.g., increased frequency and duration of drought, flooding, and/or forest fires)?
- How will these events impact our major infrastructure systems?
- What will be the impact on the services we provide?
- Are there some areas that are more vulnerable than others?
- What might we need to do to mitigate these risks and vulnerabilities?

Having this conversation is not the role of a council member; this will be done by staff. However, it is important for council to understand the key outcomes of this conversation and to provide direction on what types of risks are acceptable to the municipality over various timeframes, and what types are not. In some communities, conversations on climate change may begin through the encouragement or request of council. This is an opportunity for elected officials to provide leadership to staff and the community on learning about and taking action on climate change.

PEER LEARNING

Municipalities within the same region will often face the same climate change impacts, which may translate into similar infrastructure vulnerabilities and climate change risks. It may be practical for municipalities to collaborate with neighbouring communities to learn more about local impacts of climate change, identify infrastructure vulnerabilities, and develop strategies to address these vulnerabilities.

TOOLS FOR LOCAL GOVERNMENTS

There are some tools and processes available in Canada to help local governments address risks and vulnerabilities related to climate change:

- The Public Infrastructure Engineering Vulnerability Committee (PIEVC) from Engineers Canada offers a protocol for assessing climate change impacts.
- The Building Adaptive & Resilient Communities (BARC) Program from ICLEI Canada is a national program to support municipalities in responding to the impacts of climate change comprehensively.

You can learn more about these tools here by going to the websites identified in the resources section. It is the responsibility of staff to identify which tools are appropriate for your community's context and apply them.

Did You Know?

Not sure where your community is with climate adaptation? Check out FCM's Climate Adaptation Maturity Scale to find out how established your practices are today, and what types of actions you may need to be prepared for the future.





Activity

Consider the climate change impacts identified in earlier activities, and some potential ways of adapting to these impacts. For example,

- Drought and water shortages
- Hotter, drier conditions and forest fires
- Extreme weather events or changes in rainfall patterns and flooding
- Extreme temperature fluctuations and natural gas flow
- Extreme temperature fluctuations and road conditions
- Changes in rainfall and temperature patterns and farming

How might these adaptation actions align with other asset management activities or other infrastructure risks?

What are potential ways of adapting to these climate change impacts?

How might these adaptation actions align with, or impact, other asset management activities?

How would you prioritize competing risks?

Talk through what kind of information you would want to have to make this decision.

LEARNING GOAL: Identify How Asset Management is Used to Support Climate Change Mitigation



Identifying assets for renewal or replacement is the right opportunity to revisit how services are delivered. Incorporating climate change mitigation into your community’s services does not have to be a single, major action. In fact, it can be more meaningful to incorporate thinking on mitigation into regular processes. In concluding this course, we’re going to go through a number of scenarios and brainstorm how mitigation can be integrated into processes that a community may already have underway.

Activity

Consider the scenarios below. Discuss if there are opportunities to use less energy and reduce greenhouse gas emissions in the asset renewal and/or replacement process in each scenario.



Scenario 1

A community is considering options for renovating the recreation centre.

Scenario 2

A community is updating their Municipal Development Plan and trying to decide between different types of development scenarios. One of the major challenges is deciding whether to allow the community to expand outward or focus on infill.



Activity

Asset management is a process, and climate change responses should be integrated throughout.

What opportunities exist through the process of asset management to integrate climate change responses?

You've Made It!

Here you are at the end of the course. Thank you for joining us for what was hopefully a day of learning, good conversation, and shared insight among you and your colleagues. Remember, today is just a start. Together, we've laid the foundation, but we hope that you'll continue to learn, ask questions, and participate in other opportunities to expand your knowledge on the role of asset management in taking action on climate change. Throughout this book, and at the back, you can find the glossary and a list of resources if you ever need to reference something you learned in this course.

ASSET MANAGEMENT MINDSET

If you got anything out of today, we hope that it was an understanding of how an asset management mindset can support you in your role as an elected official and steward of community well-being. If you're ever stuck, start by asking yourself some questions:

- Do we have the information we need to make a decision?
- Have trade-offs between cost, risk, and service been considered?
- Are we focusing on service delivery?
- What are the long-term implications?
- Have all the relevant disciplines been properly engaged in this decision (e.g., planning, engineering, public works, finance, etc.)?
- Are we thinking about both short- and long-term needs?

CONTINUING TO LEARN

This course is part of a series of courses for elected officials offered by AUMA and RMA. This series of courses goes deeper into specific topics related to asset management and include the following five courses:

- *Boring Until It's Broken: Engaging the Public in Infrastructure Asset Management*
- *Risk: How Asset Management Can Help*
- *"I want a Five-Star Experience for a Two-Star Price: Setting and Communicating Levels of Service*
- *It's Got Teeth but Doesn't Bite: Developing and Implementing an Effective Asset Management Policy*
- *Weathering the Storm: Asset Management and Climate Change*

Please contact AUMA or RMA to find out more about these courses.

Glossary



Adaptation | Efforts to manage the impacts of climate change on human and natural systems. It occurs as a response to climate change to support the continuation of existing processes or activities.

Asset | Also known as a tangible capital asset (TCA), a physical component of a system that enables a service, or services, to be provided.

Asset management | A process of making decisions about how infrastructure is used and cared for in a way that manages current and future needs, considers risks and opportunities, and makes the best use of resources.

Asset management lens | Integrating asset management practices into decision-making. Specifically, thinking about what information is available, what additional information is needed, what trade-offs are being made, and what are the community's long-term goals and needs.

Asset risk | The risk of an asset failing to perform the way you need it to (e.g., a pipe bursts).

Climate | The trend in weather patterns over a longer period—generally over decades but can be over centuries or longer.

Climate change | Changes in the mean/or in the variability of weather patterns that persist over long periods of times. These changes are attributed directly or indirectly to human activities that affect the composition of the global atmosphere.

Mitigation | Efforts to reduce the contribution of human activities to climate change, primarily through reductions in greenhouse gas emissions.

Risk | The relationship between the likelihood of an event happening and the consequences of that event.

Strategic risk | The risk of a change occurring that impedes a municipality's ability to achieve its overarching strategic goals (e.g., hot, dry conditions put pressure on the ability to provide water service).

Sustainable service delivery | Ensuring that municipal services are delivered in a socially, economically, and environmentally responsible way, and that decisions today do not compromise the ability of future generations to meet their own service needs.

Vulnerability | The inability of a system to cope with the effects of climate change. It describes the character of the system, whether that is a natural system, such as an ecosystem, or a human-made system, such as a piece of infrastructure or a whole city.

Weather | The state of the atmosphere that we experience day-to-day.



Resources

RMA – Asset Management for Municipalities in Alberta

<http://www.aamdc.com/images/AAMDC%20-%20AM%20Report%20-%20Final%20-%20Web%20Version.pdf>

FCM – Building Sustainable and Resilient Communities with Asset Management: An Introduction for Municipal Leaders

<https://fcm.ca/Documents/tools/MAMP/Guide-Building-Sustainable-and-Resilient-Communities-with-Asset-Management-EN.pdf>

Government of Alberta – Alberta Handbook and Toolkit

<http://www.municipalaffairs.alberta.ca/asset-management>

ICLEI – Building Adaptive & Resilient Communities (BARC)

<http://www.icleicanada.org/programs/adaptation/barc>

ICLEI – Leadership and Legacy: Handbook for Local Elected Officials on Climate Change

http://www.icleicanada.org/files/elected_officials_handbook_final_sm.pdf

IISD – Climate Change Adaptation and Canadian Infrastructure: A Review of the Literature

http://www.iisd.org/pdf/2013/adaptation_can_infrastructure.pdf

Municipal Climate Change Action Centre (MCCAC)

<http://www.mccac.ca/about-us/mandate-and-governance>

PIEVC – Adapting to Climate Change: Canada’s First National Engineering Vulnerability Assessment of Public Infrastructure

https://pievc.ca/sites/default/files/adapting_to_climate_change_report_final.pdf

Prairie Climate Atlas

<http://climateatlas.ca/atlas.html>

Prairie Climate Centre

<http://prairieclimatecentre.ca/>

FCM - Climate Adaptation Maturity Scale

https://fcm.ca/Documents/tools/MCIP/MCIP_Climate_Adaptation_Maturity_Scale_EN.pdf