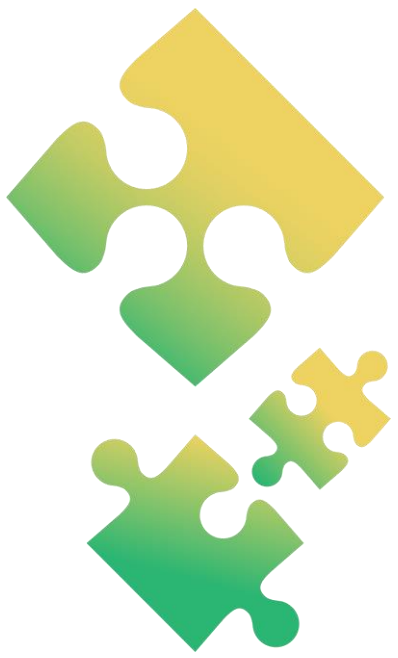


# Session 3: Integrating Climate Change and Risk

Tuesday, April 24, 2023

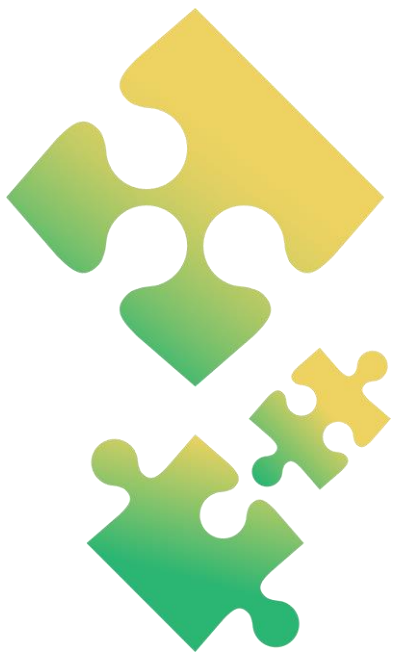


*This initiative is offered through the Municipal Asset Management Program, which is delivered by the Federation of Canadian Municipalities and funded by the Government of Canada.*



# Welcome!

Bernadette O'Connor, CNAM MAMP Steering Committee



# Welcome and Sharing of Check-in Themes

# Getting the Most Out of Workshops

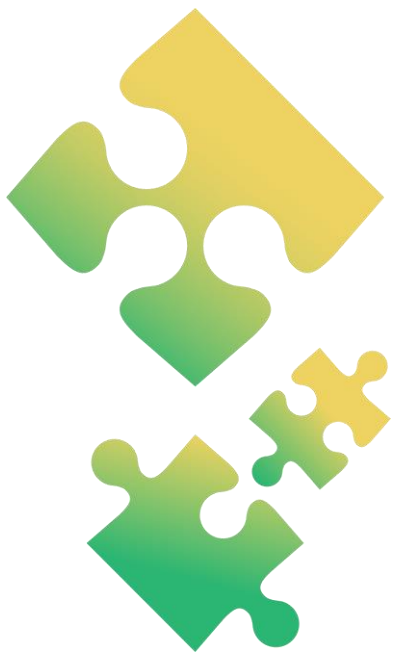
## Facilitators (That's Us!)

- Prepare a program in advance based on feedback provided by participants on what they want to work on
- Provide you a program of suggested “exercises”, “reps”, and modifications for you to participate to your best ability
- Group you with others that are of similar context and/or ability, to learn from your commonalities
- Group you with others that are of different context and/or ability, to learn from your differences
- Provide you with time and space to complete the “exercise” program, while being available for guidance or questions

# Getting the Most Out of Workshops

## Participants (That's You!)

- Provide feedback on what information is useful or not useful to you
- Learn how to use the resources and tools in these workshops and in your work
- Collaborate with other teams, learn from each other, and be open to the cohort process
- Share learnings from your own experience in asset management and climate action implementation
- Be open to perspectives and contexts different from your own and be prepared to challenge ways of thinking and doing things
- Get to know teams from other municipalities, engage in learning together and from one another and create relationships that can last beyond this training
- Play an active role in determining the best use of tailored check-in support



## Key Themes from Check-ins

A decorative vertical bar on the left side of the slide, composed of various colored puzzle pieces (green, yellow, and orange) arranged in a vertical sequence.

# What's Common

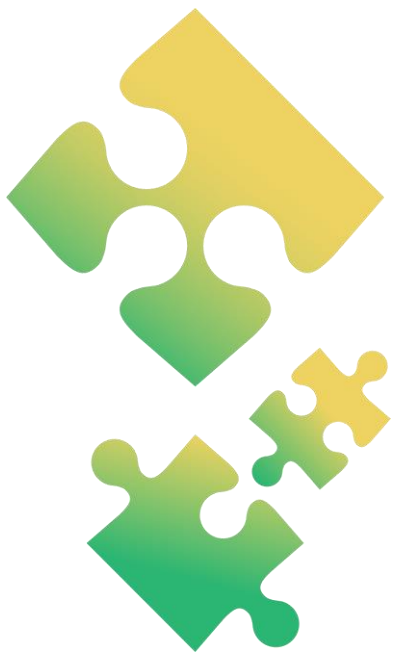
- Buy-in is SO important!
- Strong links to process over product
  - Not about the next big deliverable
- Sphere of concern vs. sphere of influence



# What's Different

- Kinds and scale of support that is helpful
- Next steps/entry points vary
  - Even in jurisdictions with common drivers for why





# Stage-Setting Refresh



# An Adaptive Approach to Complexity

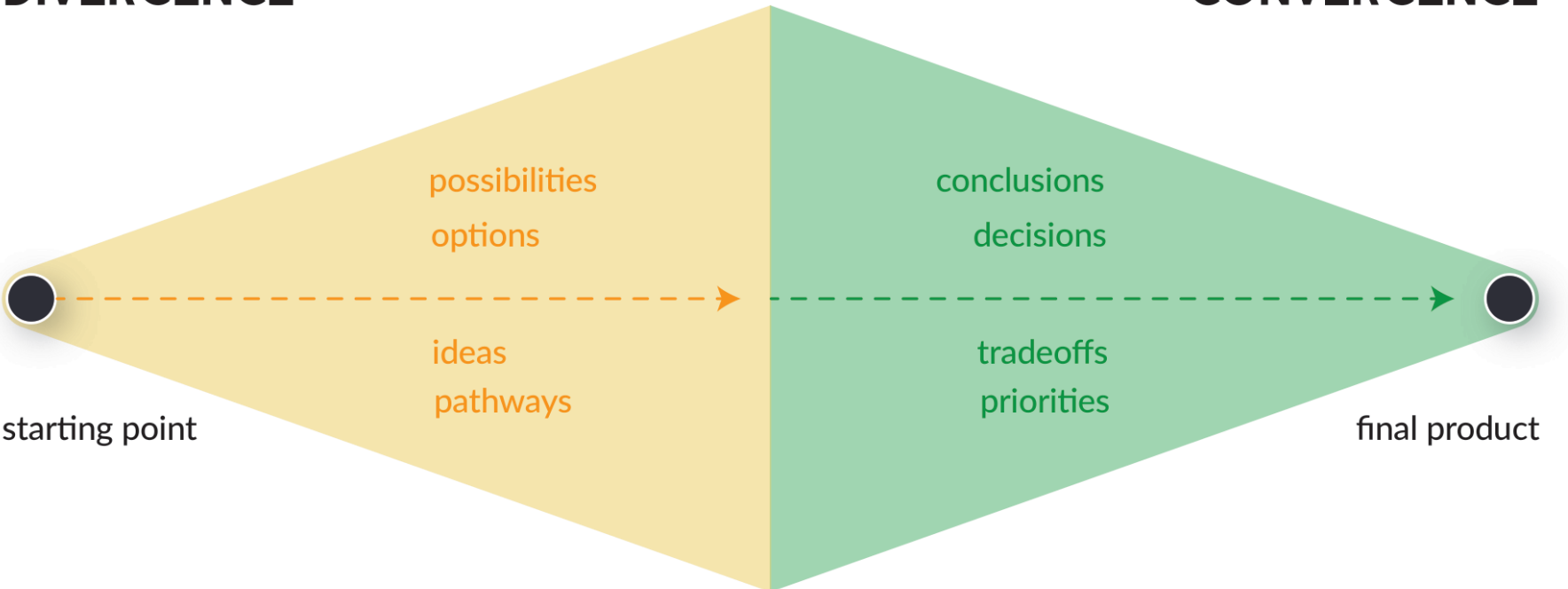
1. Acknowledge that the problem is complex
2. Identify and explore all the things you could do to address the problem
3. Make decisions between all the options to determine what you will do
4. Implement the option
5. Evaluate the outcomes and new information learned through implementation, identify any other information required
6. Go back to step 1 with additional information and a new outlook on the complex problem

... despite this being a step-by-step list, this is NOT a linear process!

# An Adaptive Approach to Complexity

**DIVERGENCE**

**CONVERGENCE**



Original illustration posted in Building a Second Brain, Creativity, Flow, Workflow on May 16, 2022 by Tiago Forte



# Team Resilience Through Complexity

- Adaptive approach takes energy and resolve
- Challenging to bring others along that are not part of process, but are interested in outcomes
- There will always be a “Messy Middle”
  - Next steps are not clear
  - Feels like team has experienced a setback(s)

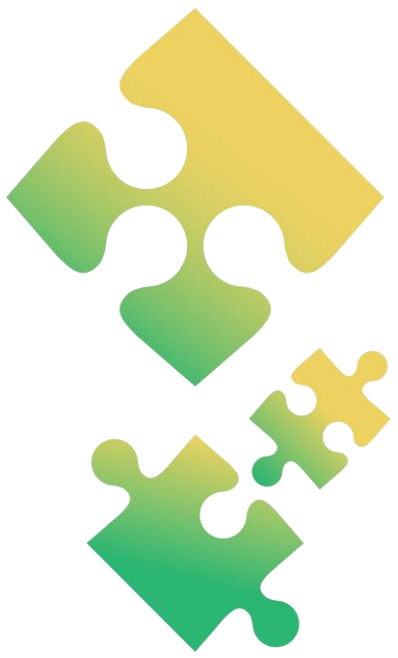
# “The Messy Middle”



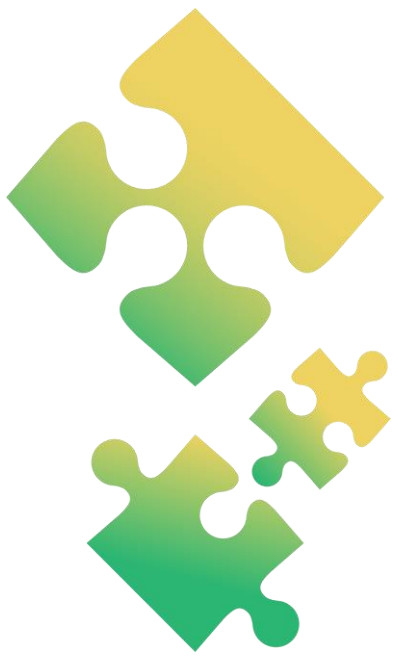
A decorative vertical bar on the left side of the slide, composed of various colored puzzle pieces (green, yellow, and orange) arranged in a vertical sequence.

# Approach to Workshop 3

- Increased time to learn from each other
- Less time in teams
- Opportunity for you to have input on breakout room groups



# Module A: Learning From Each Other



# BREAKOUT DISCUSSION

Please reference your workbook for questions and space to record what you're learning.





# Module B: Climate Change and Risk Management



## LEARNING GOALS:

After completing this module, you will be able to:

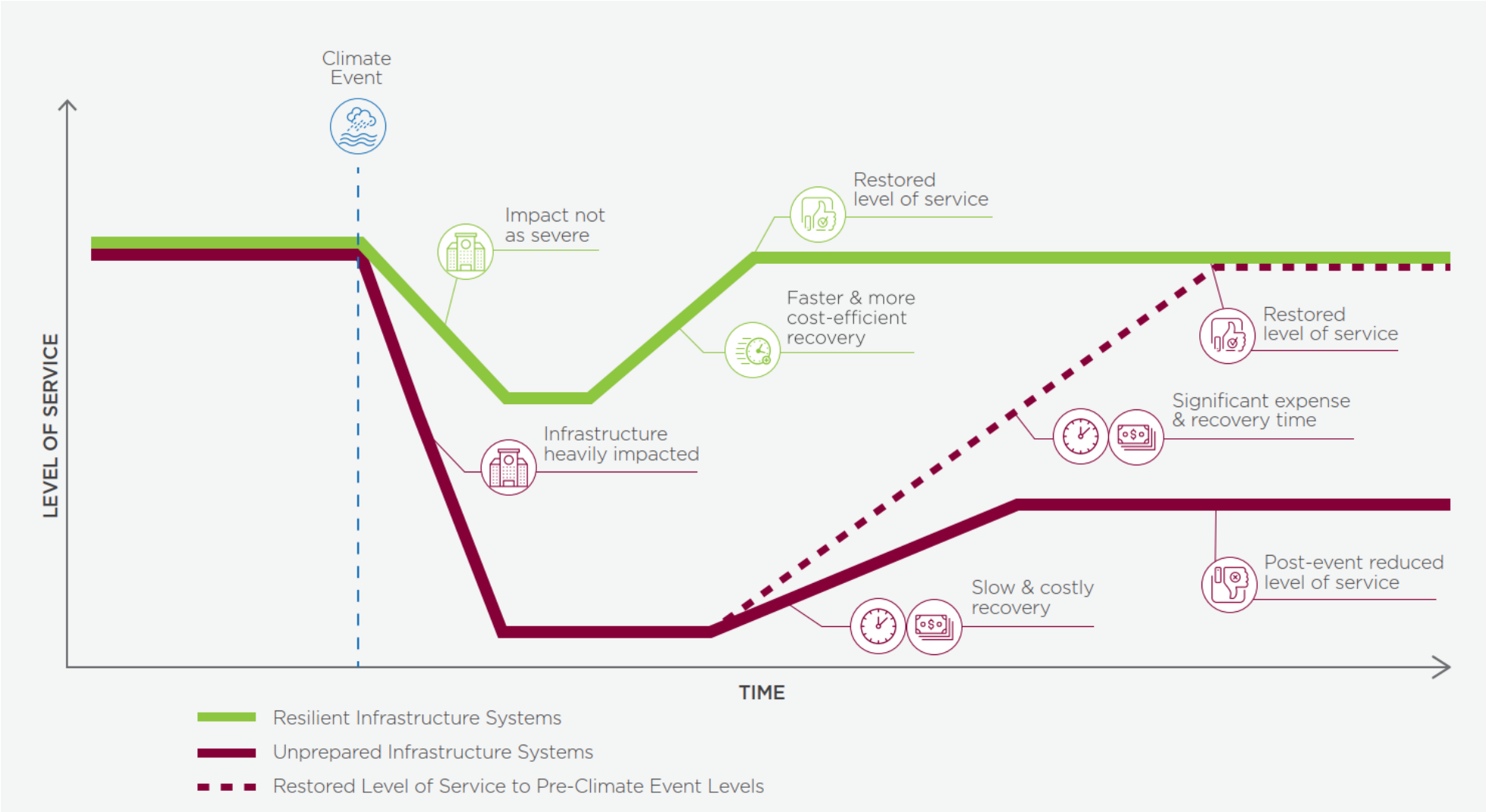
- Identify the steps in risk management and understand the purpose of each step.
- Identify how to integrate climate risk into asset management processes.
- Evaluate available tools and resources to choose what is best suited to your needs.
- Identify lessons learned from other organizations to inform your team and organization's approach.

# Setting the Stage



- Managing service, risk, and cost are key to achieving the goal of AM: sustainable service delivery
- Climate change impacts all three
- Integrating climate considerations into asset management builds resilience
- In a resilient system, impacts will be less frequent or less significant, and recovery will happen more quickly
- Resilient infrastructure systems may still face disruptions, but impacts are minimized

# Service Resilience





# Risk at a Systems Level

- Risk management supports resilience by helping to focus on what matters most
- A simple formula (risk = impact X likelihood) becomes complex when we scale up to a systems-level
- Humans implicitly interact with risk from our own perspectives
- A risk management process is required to bring many perspectives together and align actions with what matters most



# Integrating Climate Risk in Asset Management

## WHAT WE WILL COVER

- Foundations of risk management, including steps in the process
- Practical applications of risk management to climate and AM
- *Integration* of climate risk and AM
- Time to discuss and learn from other participants
- Case studies of risk management in action

## WHAT WE WILL NOT COVER:

- Detailed guidance of how to implement each stage of risk management
- Time to complete a risk assessment

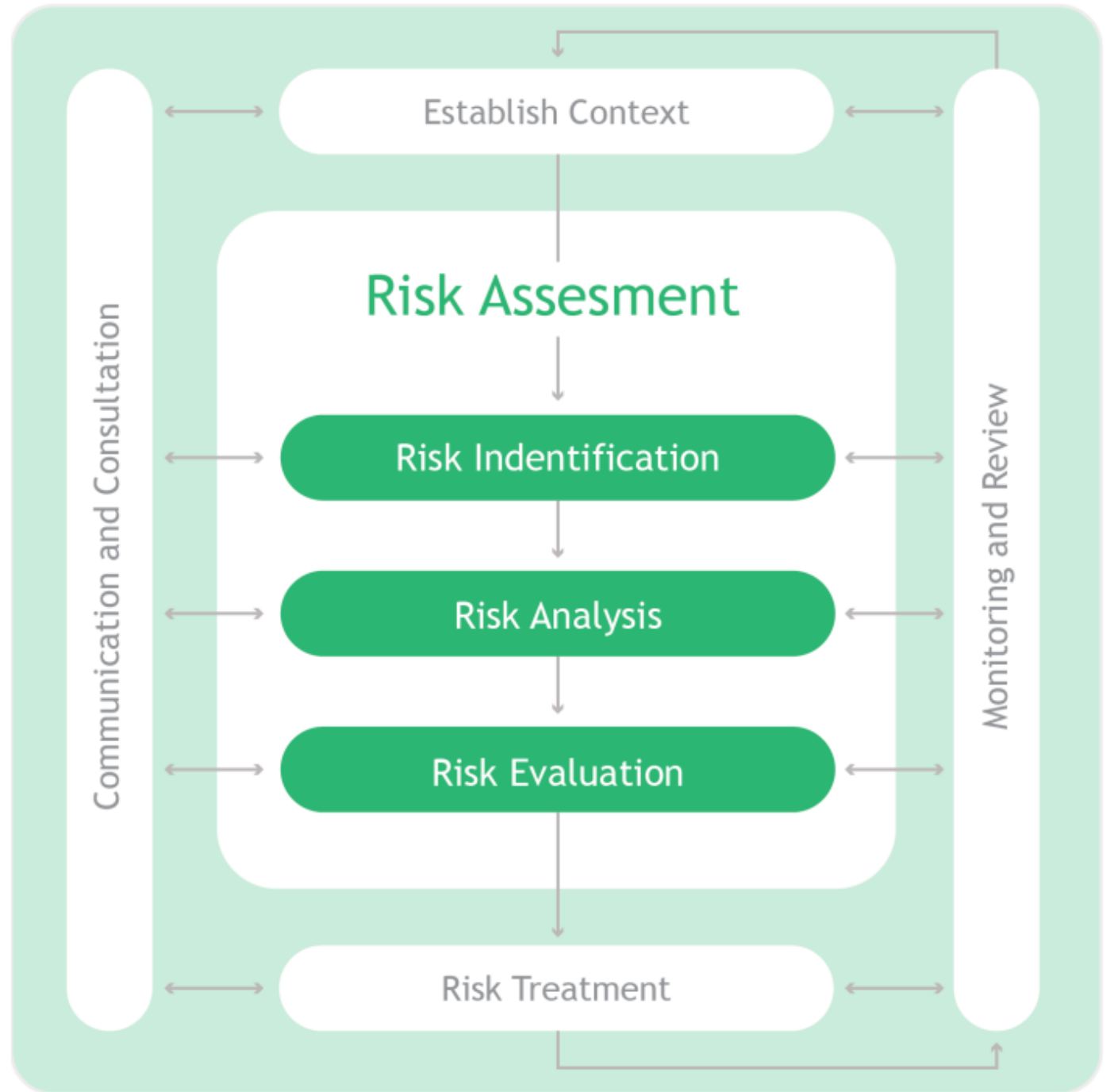
A vertical decorative bar on the left side of the slide, composed of several interlocking puzzle pieces in shades of green and yellow, arranged in a zig-zag pattern.

# Risk Management

- Ongoing process of continuous improvement
- Integrated with strategic planning, project management, operational decision-making
- Should align with community objectives
- In AM, risk management supports decision-making and resource allocation for reliable service delivery – including climate risk!



# Risk Management Process





# Integrating Climate Risk and Asset Management

## Climate Risk Assessment

What are the risks that climate hazards pose to service delivery and supporting infrastructure?

## Asset Risk Assessment

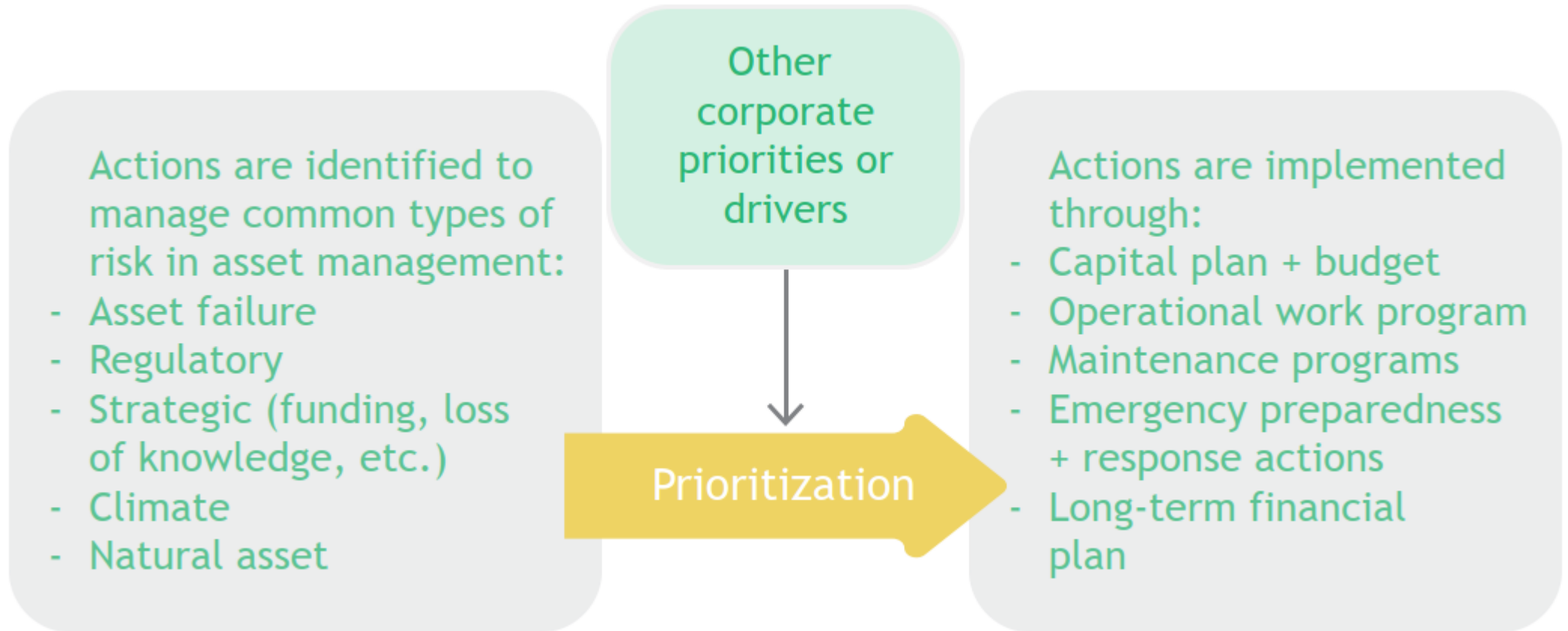
What are the risks that asset failure poses to service delivery?

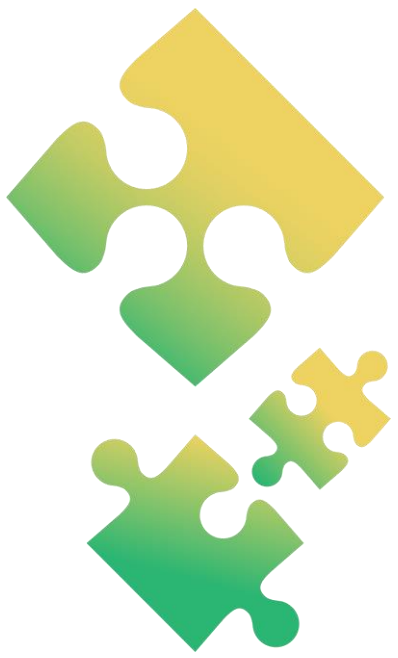
## Other Risk Assessments

Can include strategic risks, environmental risks, health and safety risks, social risks, etc.



# Prioritization Process





# **BREAKOUT DISCUSSION!**

Please reference your workbook for questions and space to record what you're learning.

# Climate and Risk Management

Step 1: Establish Context

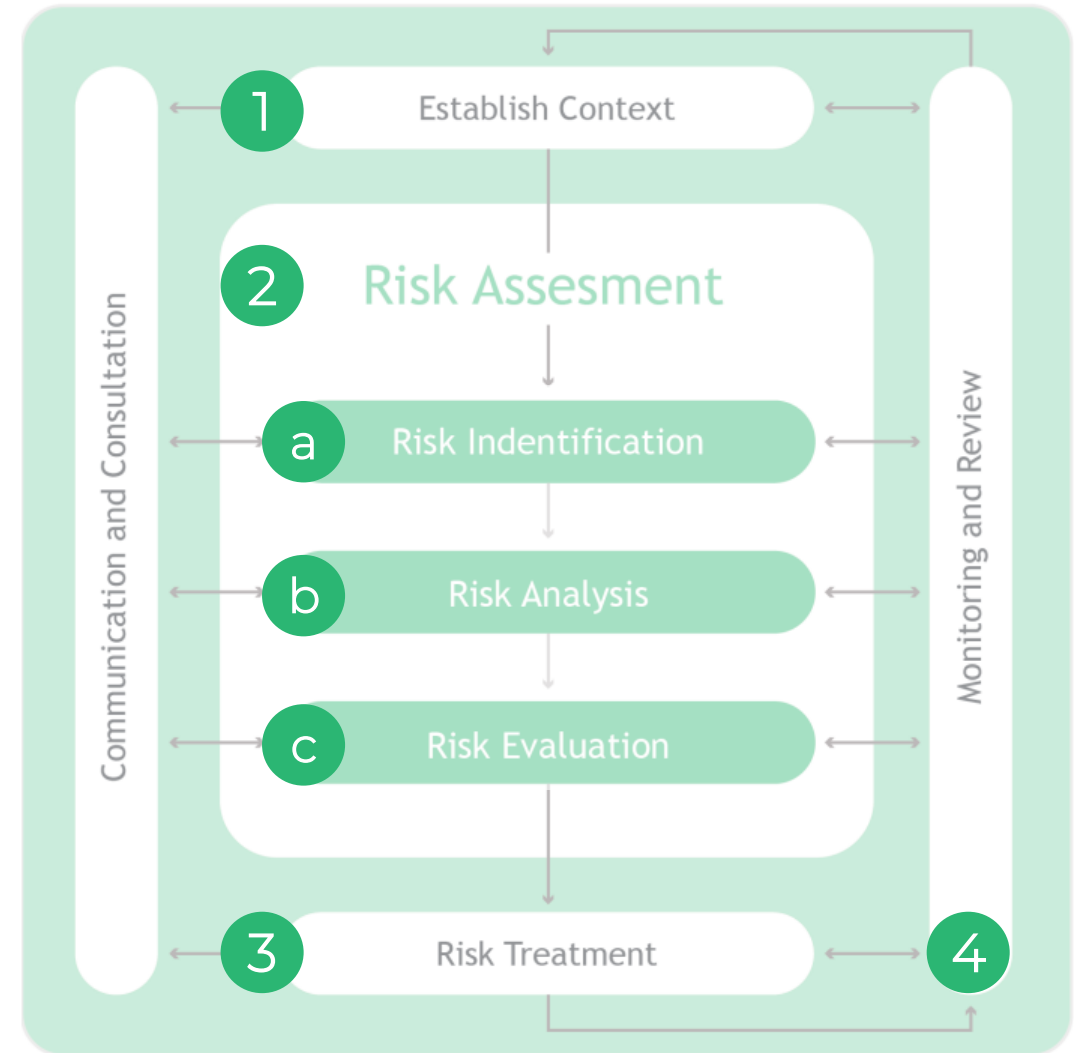
Step 2: Assess Risks

- a. Risk identification
- b. Risk analysis
- c. Risk evaluation

Step 3: Risk Treatment

- a. Identify actions
- b. Prioritize actions
- c. Implement actions

Step 4: Monitor and Review



# Our Approach to Discussion

1. Overview of key concepts

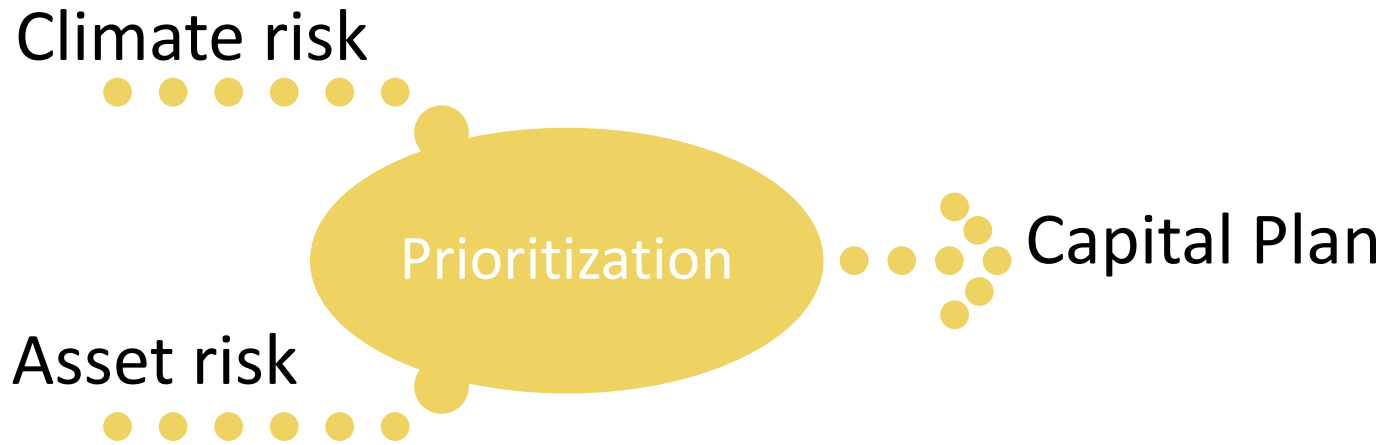


2. Practical example of climate and asset risk



3. Common pitfalls to watch out for

# Example: Case Study



CASE STUDY:

## City of Castlegar Asset Management and Climate Change Prioritization Framework

(Integrated Prioritization Framework)



# Step 1: Establish Context

Setting the stage enables appropriate and effective risk treatments:

- Establish clear objectives
- Determine what risks you are assessing
- Identify scope, context, and criteria



# Step 1: Establish Context

## Scope

- Boundaries for the assessment both physically and in time that guide the expected results.

## Context

- Directs the focus of the work internally or externally, and in many cases both (aka a blended approach)

## Criteria

- Creates conditions for achieving outcomes that are aligned with the values, objectives, and resources of the organization including risk tolerance and determining significance

# Step 1: Establish Context – CASE STUDY

	What does that look like for climate risk?	What does that look like for asset risk?
Scope	<ul style="list-style-type: none"> <li>• Capital planning for linear infrastructure replacement (i.e., roads, water, sanitary, drainage)</li> <li>• Whole City</li> <li>• Based on the asset inventory</li> </ul>	
	<ul style="list-style-type: none"> <li>• Local Climate Data</li> <li>• Local Climate Events</li> <li>• Time Frame (baseline, 2020s, 2050s)</li> <li>• Projected Climate Changes</li> </ul>	<ul style="list-style-type: none"> <li>• Approximate age</li> <li>• Estimated remaining life</li> <li>• Location</li> <li>• Asset condition (anecdotal)</li> </ul>
Context	<ul style="list-style-type: none"> <li>• External context (Climate)</li> </ul>	<ul style="list-style-type: none"> <li>• Internal context (mostly)</li> </ul>
Criteria	<ul style="list-style-type: none"> <li>• Likelihood of climate contributing to asset failure</li> <li>• Impact on service life of assets</li> </ul>	<ul style="list-style-type: none"> <li>• Likelihood Scoring Descriptions based on age or condition.</li> <li>• Failure Consequence Descriptions (financial, social, and environmental)</li> </ul>



# Consequence scoring

**Table 3** – *Failure Consequence Descriptions*

Type of Consequence	Potential Impacts	Factors Influencing the Magnitude of Impact
Financial	<ul style="list-style-type: none"><li>▪ cost to restore service</li><li>▪ third party liability</li></ul>	<ul style="list-style-type: none"><li>▪ road classification</li><li>▪ pipe size</li><li>▪ depth of pipe</li></ul>
Social	<ul style="list-style-type: none"><li>▪ service interruptions to downstream customers</li><li>▪ impacts to public health and safety (sewer assets in particular)</li></ul>	<ul style="list-style-type: none"><li>▪ road classification</li><li>▪ pipe size</li><li>▪ proximity to structures and type of structure</li></ul>
Environmental	<ul style="list-style-type: none"><li>▪ environmental contamination (sewer assets in particular)</li></ul>	<ul style="list-style-type: none"><li>▪ proximity to environmentally sensitive area and type of ESA</li></ul>

# Asset risk: likelihood scoring

**Table 2** - Likelihood Scoring Descriptions

Likelihood of Failure	Description	As Indicated by Condition Rating (if available)	As Indicated by Age (if condition data is unavailable)	Assigned LOF Score
Very Low	Unlikely in foreseeable future	excellent	Asset age is <75% of useful life	1
Low	20+ years	good	Asset age is >75% to <100% of useful life	2
Medium	10-20 years	fair	Asset age exceeds useful life by $\geq 0\%$ to <25%	3
High	5-10 years	poor	Asset age exceeds useful life by $\geq 25\%$ to <50%	4
Very High	<5 years	immediate attention	Asset age exceeds useful life by $\geq 50\%$	5

# Climate risk: likelihood scoring

**Table 4** – Failure Mechanism Likelihood Scoring Matrix

Sanitary Sewers / Forcemains		Climate Variables					
		temperature - average annual	precipitation - average annual	precipitation - high intensity (10Y; 15min)	precipitation - high intensity (100Y; 12 hr)	soil moisture - average annual	soil moisture content - annual fluctuation
baselines		1.8	897.9	48.0	4.0	567.8	94.1
baseline units		°C	mm	mm/hr	mm/hr	mm	mm
projected change (2050s) in baseline units		4.1	916.0	62.2	4.7	568.2	109.6
projected change (2050s) from baseline (%)		127%	2.0%	30%	18%	0.1%	16%
climate variable change likelihood		5	5	4	4	3	3
failure process	weighted likelihood	climate contribution to failure mechanism (-2 to +2)					
surface stormwater runoff	4.0	0.0	0.0	2.0	2.0	0.0	0.0
groundwater infiltration	0.4	-0.1	0.5	0.0	0.0	0.1	0.0
soil movement due to soil moisture change	0.8	0.0	0.0	0.0	0.0	0.1	1.0

A vertical decorative bar on the left side of the slide, composed of various puzzle pieces in shades of green and yellow, arranged in a zig-zag pattern.

# Common Pitfalls in Establishing Context

- Context is defined by one person or department
- Bias in consequence and likelihood definitions



# Step 2: Assess Risks

## Risk Identification

What risks could we consider?

## Risk analysis

What is the source of the risk, and what could affect likelihood and/or consequence?

Based on what we know about it, how does this risk rank in our likelihood and consequence evaluation framework?

## Risk evaluation

Compare risk level with risk tolerance

Explore needs and options for risk treatment

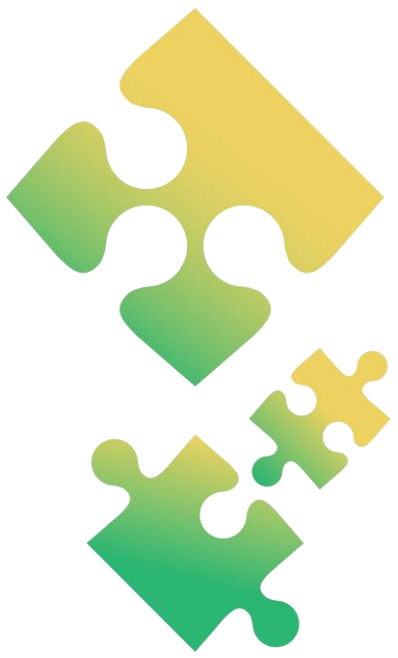
Can identify where further information is needed



# Risk Identification

What risks could we consider?

- Generate comprehensive list of risks within scope and context
- Explore combinations and secondary risks causing cumulative impacts
- Understand the limitations of the data and information you're using



## **BREAK!**

Hydrate / Have a Snack / Take a Walk / Check Your Emails / Order Groceries / Pat Your Pet / Take Bio Break / Eat Some Cheese / Gaze Out the Window / Caffeinate / Etc.



# Risk Analysis

What is the source of the risk, and what could affect likelihood and/or consequence?

- Consider consequences and likelihood
- Consider existing controls and their effectiveness
- Consider interdependence of risks and sources
- Highlight assumptions, uncertainty, and quality of information
- Analysis can be qualitative, semi-quantitative, or quantitative
- Input for making decisions when treatment options involve different types and levels of risk





# Risk Evaluation

Based on what we know about it, how does this risk rank in our likelihood and consequence evaluation framework?

- Decision-making support by ranking risks in evaluation frameworks.
- Guides discussion on risk treatments and options.
- Compares level of risk with risk tolerance.
- Informs adjustments to risk tolerance.
- Identifies need for further analysis to understand level of risk.

# Step 2: Assess Risk – CASE STUDY

	What does that look like for climate risk?	What does that look like for asset risk?
Risk Identification	<ul style="list-style-type: none"><li>• Failure processes (exposure and vulnerability assessment) and impacts to service life</li></ul>	<ul style="list-style-type: none"><li>• Condition and capacity assessment and connection to service life</li></ul>
Risk Analysis	<ul style="list-style-type: none"><li>• Likelihood of failure</li><li>• Consequence of failure</li><li>• Assignment of total risk scores</li></ul>	<ul style="list-style-type: none"><li>• Likelihood of failure</li><li>• Consequence of failure</li><li>• Assignment of total risk scores</li></ul>
Risk Evaluation	<ul style="list-style-type: none"><li>• Assets prioritized for replacement as either 1, 2, or 3 based on risk score</li></ul>	

# Step 2: Assess Risk – CASE STUDY

**Table 7 – Financial Impacts Summary**

Scenario	Drainage	Roadways	Water	Sanitary
<b>Asset Management Risk Assessment</b>				
# of Priority 1,2,3 Assets	248	223	495	202
Annual Replacement Cost	\$511,000	\$682,000	\$882,000	\$513,000
<b>Asset Management Risk Assessment + Climate Change</b>				
# of Priority 1,2,3 Assets	331	307	578	238
Annual Replacement Cost	\$573,000	\$786,000	\$1,030,000	\$518,000
Total Increase in Funding Needs	\$62,000	\$104,000	\$148,000	\$5,000



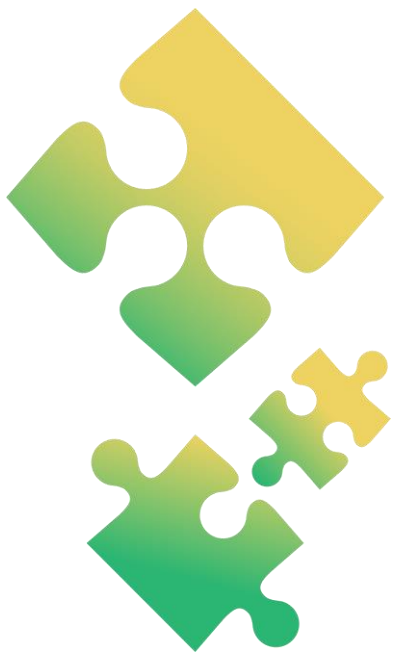
# Common Pitfalls in Assessing Risks

- Expectations of what a risk assessment will do
- Putting all time, effort, and financial resources into the risk assessment step
- Process is too complex, making it difficult to update or replicate
- Uncertainties of climate change
- A completed risk assessment feels like you've managed your risks



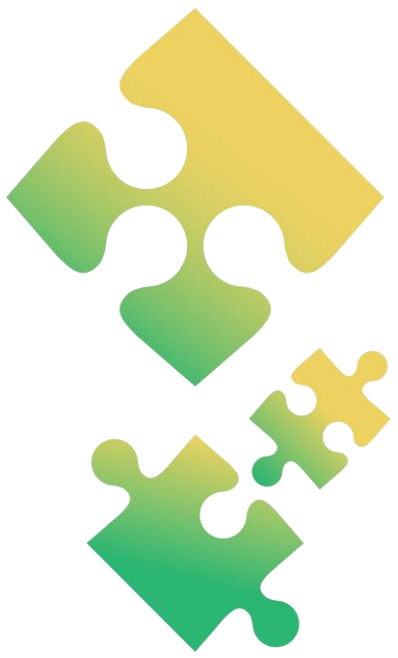
# Resources to help you

- PIEVC Catalogue of resources
- Building Adaptive and Resilient Communities (BARC), ICLEI Canada
- CCME's Guidance on Good Practices in Climate Change Risk Assessment



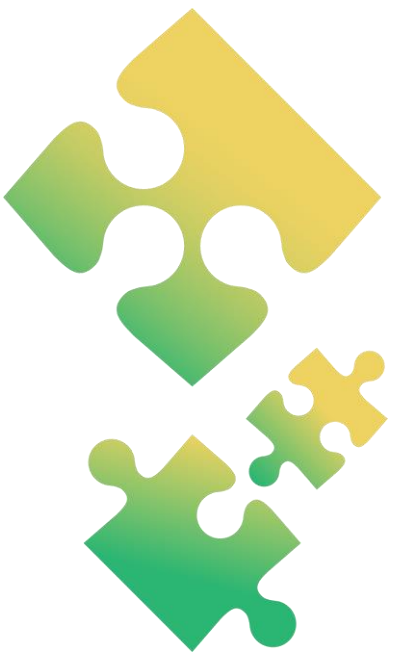
# **BREAKOUT DISCUSSION!**

Please reference your workbook for questions and space to record what you're learning.



**You've made it!**

Congrats! This concludes Day 1 of Workshop 3.



# Session 3 (Part 2): Integrating Climate Change and Risk

Wednesday, April 25, 2023



*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.*



# Our Approach to Discussion

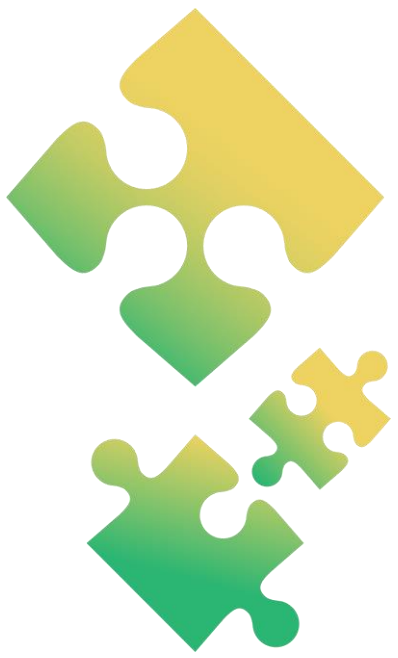
1. Overview of key concepts



2. Practical example of climate and asset risk



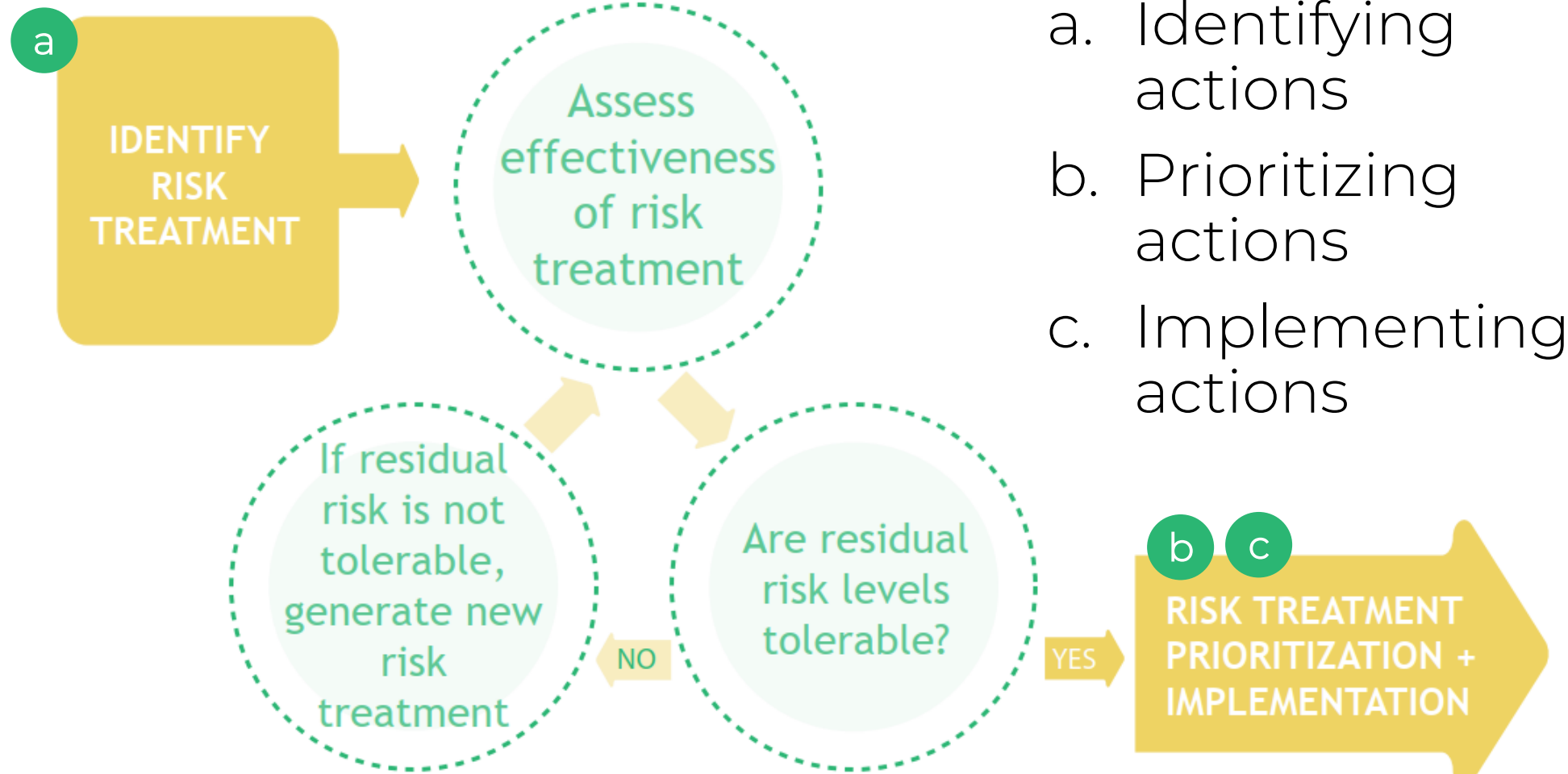
3. Common pitfalls to watch out for



# BREAKOUT DISCUSSION!

Team coffee time

# Step 3: Risk Treatment



- a. Identifying actions
- b. Prioritizing actions
- c. Implementing actions



# Identifying Actions

Risk Treatment Option	EXAMPLE
Avoiding the risk (cease activity that gives rise to the risk)	Choosing not to redevelop properties in the floodplain.
Removing the hazard (risk source)	Decommissioning a playground that is identified as high risk due to poor condition.
Changing the likelihood	Renewing assets to improve condition and decrease likelihood of failure.
Changing the consequences	Adding a secondary road access to a remote or isolated community in case of emergency evacuation.
Sharing the risk with another party or parties (contracts, risk financing)	Joining a regional commission.
Retaining the risk by informed decision	Adopting a “run to failure” philosophy for select assets.

A vertical decorative bar on the left side of the slide, composed of several interlocking puzzle pieces in shades of green and yellow, arranged in a zig-zag pattern.

# Identifying Actions

Other considerations in selecting risk treatments may include:

- Organizational strategic goals
- Levels of service (current and target)
- Human and financial resources to implement the action
- Scale of impact
- Value for money



# Step 3: Risk treatment – CASE STUDY

## Identifying actions:

- Focus of the study was to inform capital planning for asset replacement
- Actions to treat risks were primarily asset replacement/renewal
- Additional actions were identified to treat risks, e.g.:
  - Revise design and construction standards
  - Increase and focus maintenance activities



# Common Pitfalls in Identifying Actions

- Overlooking actions that may be contradictory
- Scoping risk management actions too narrowly and missing opportunities for co-benefits
- Overlooking risks because there is an assumption nothing can be done



# Prioritizing Actions

- Not enough resources available to tackle all risks at once
- Highest risk does not always mean highest priority
- Done through capital planning, master planning, or asset management planning



# Prioritizing Actions

## Flexibility v. Rigidity

- Keep in mind how much flexibility you require to adapt to changing factors
- More considerations for prioritizing actions means more effort to update priorities
- Detailed action plans can become out of date quickly
- Benefits and drawbacks on both ends of the spectrum

**SIMPLE & FLEXIBLE:** Actions to mitigate climate and asset risks are prioritized based on risk levels.

**DETAILED & RIGID:** The more lenses you integrate the more rigid your priority actions are.

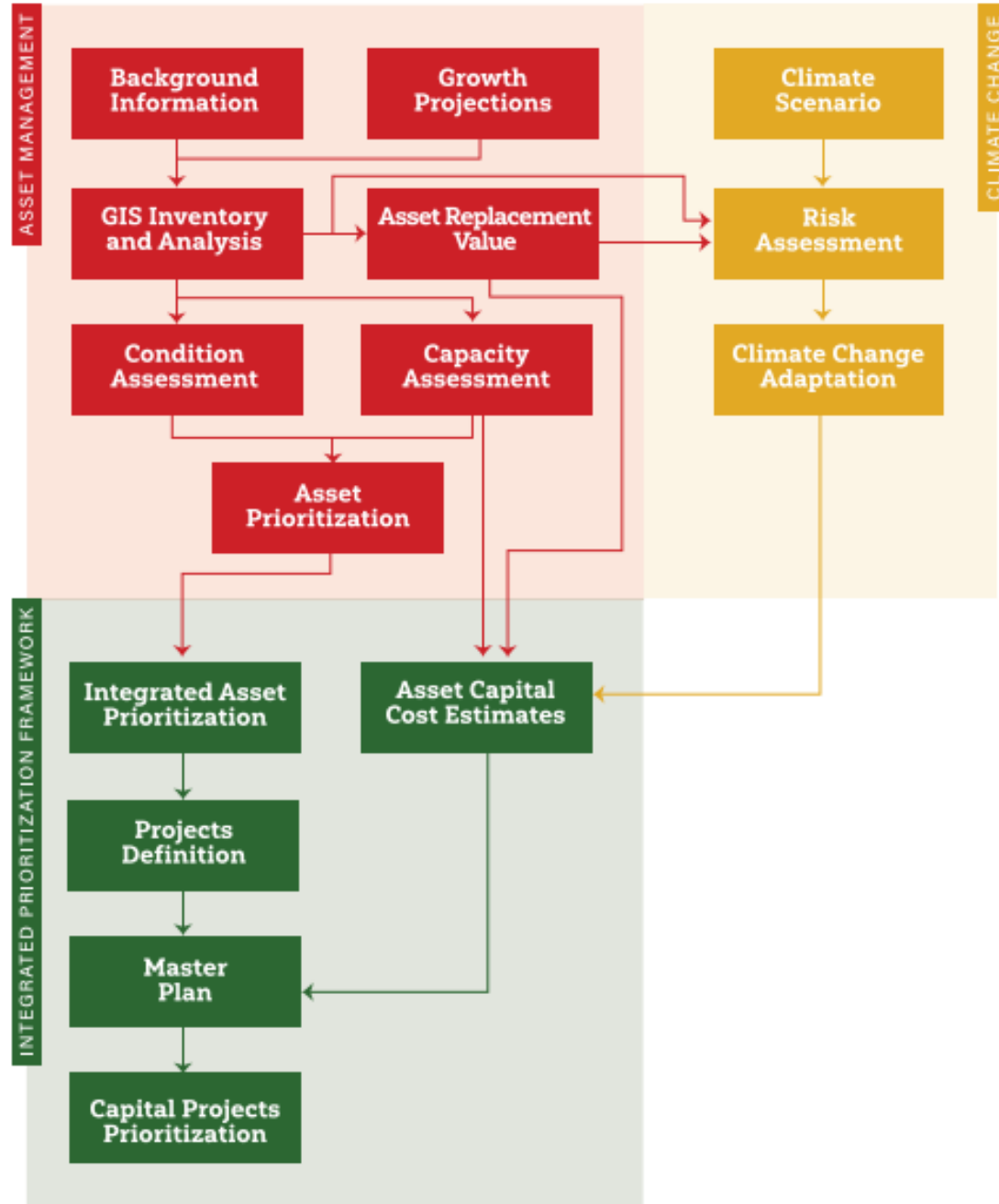


# Step 3: Risk treatment – CASE STUDY

## Prioritizing actions:

- Risk assessment results used to inform capital planning
- Focus on high priority (P1) assets based on affordability limits
  - Existing condition and capacity were primary drivers for near-term pipe projects
- Increase roads maintenance
- Determine strategy to address funding gap

Figure 3 - General Asset Management & Climate Change Integration Process



A vertical decorative bar on the left side of the slide, composed of several interlocking puzzle pieces in shades of green and yellow, arranged in a zig-zag pattern.

# Common Pitfalls in Prioritizing Actions

- Making the prioritization process too onerous or complicated
- Developing a prioritization process/framework that is out of alignment with community goals



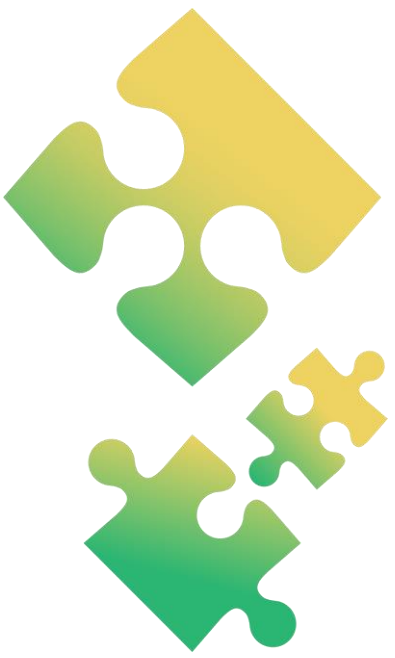
# Implement Actions

- Requires organizational buy-in and conviction at all levels
- Key considerations:
  - What does success look like?
  - Communicate with everyone



# Common Pitfalls in Implementing Actions

- Misaligned expectations of what successful implementation means
- Insufficient communication about the decision-making process that resulted in the implementation



# BREAKOUT DISCUSSION!

Please reference your workbook for questions and space to record what you're learning.



## Step 4: Monitor and Review

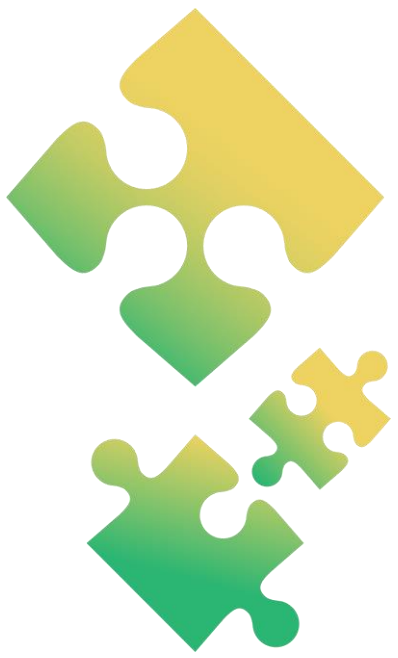
- Risk changes over time and requires continuous review and monitoring
- This supports continuous improvement to ensure risk treatment is customized and effective
- Two levels of monitoring:
  - Monitoring and identifying changes in risk levels
  - Reviewing the framework itself for its effectiveness
- Results should be incorporated into reporting and communication activities.





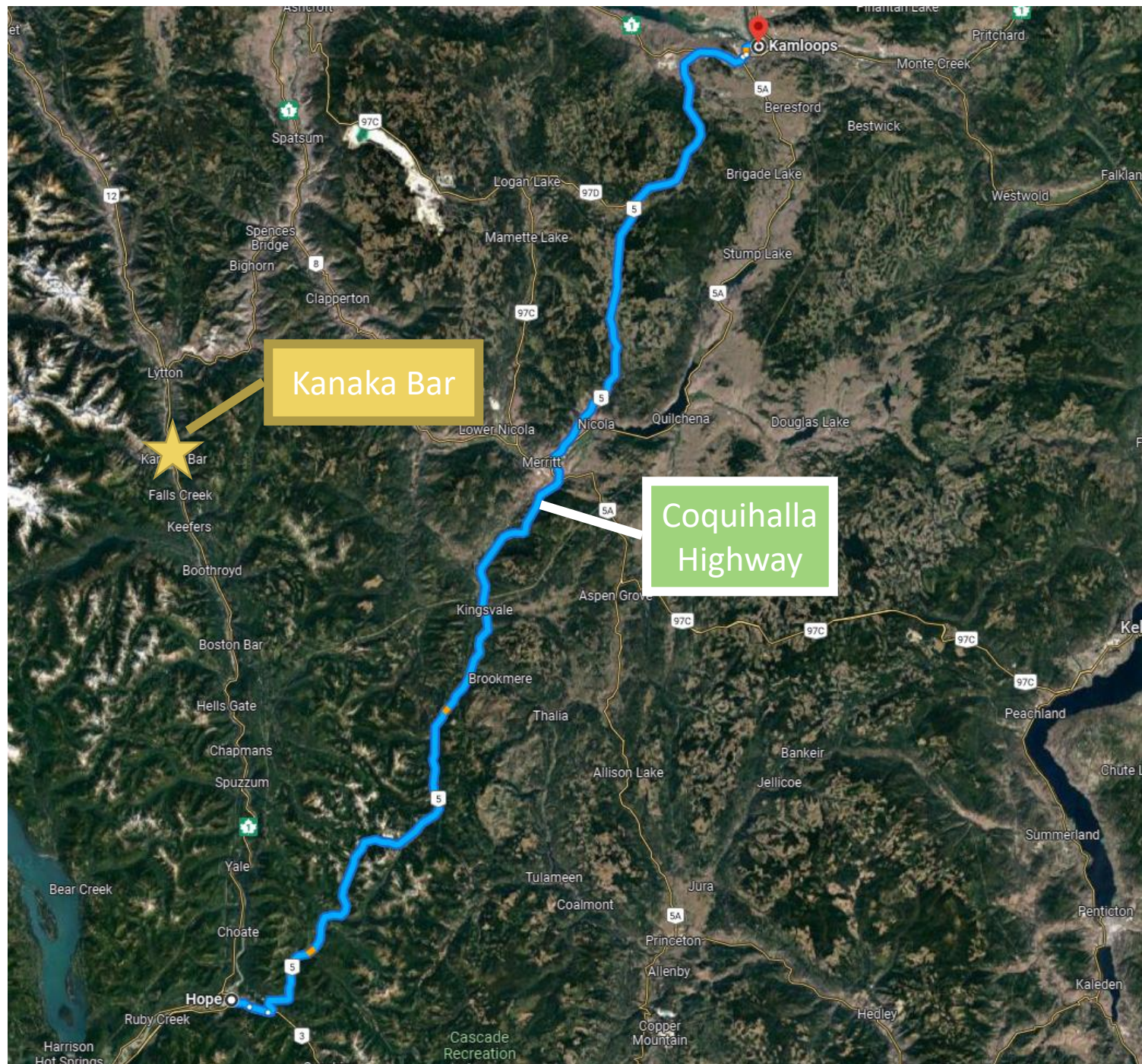
# Common Pitfalls in Monitoring and Reviewing

- ... not monitoring!
- Not communicating the results of monitoring to stakeholders



# Case Study: A Tale of Two Risk Assessments





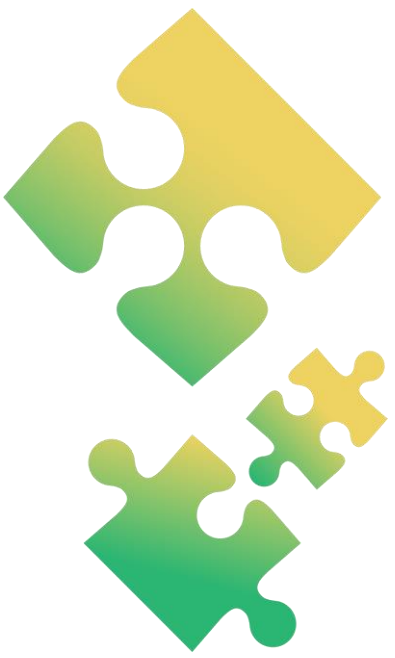




[New photos of Coquihalla Highway flood damage released | Globalnews.ca](https://www.globalnews.ca)



[december-2021.pdf \(kanakabarband.ca\)](https://www.kanakabarband.ca)



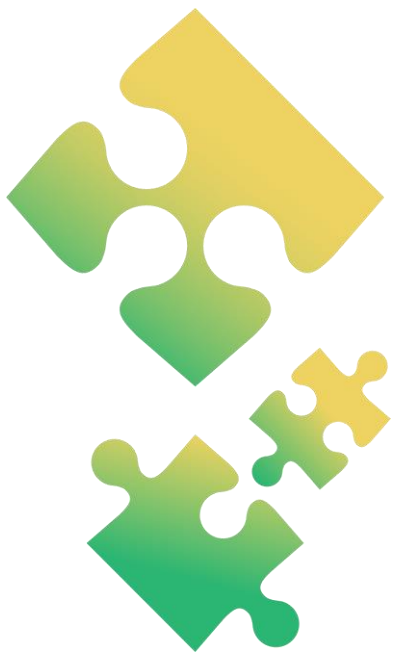
# TEAM DISCUSSION!

Please reference your workbook for questions and space to record what you're learning.



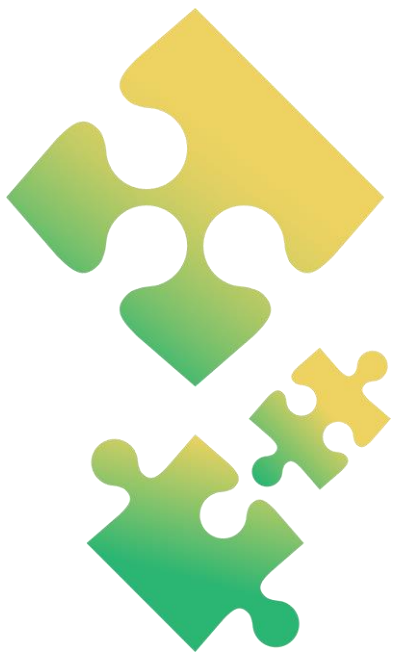
# Communicating / Consulting and Risk Management

- Communicating about risk management is inherent to ongoing continuous improvement in AM
- Spend time making sure everyone involved understands the terms used in the same way
- Build an understanding of the elements of the process that are unique to your context
- Communicate with others about the value of risk management as a process
- Make it meaningful to different roles and perspectives



# **BREAKOUT DISCUSSION!**

Please reference your workbook for questions and space to record what you're learning.



# You've made it!

Congrats! This concludes Workshop 3.





# What's Next?

- Continued check-in support
  - Additional small group check-ins over the summer
- Development of case studies
  - Incremental steps are still steps!
- Workshop #4
  - September 2023
- Thinking beyond the cohort