Workshop
The State of Infrastructure

Carleton UNIVERSITY
Canada's Capital University

Shawn Kenny, Ph.D., P.Eng.
Associate Professor

Department of Civil & Environmental Engineering
Faculty of Engineering & Design
shawn.kenny@carleton.ca
www.carleton.ca/cee/people/kenny-shawn

Workshop Theme

Asset management planning improves your knowledge of your assets, including their current condition and what needs to be done to effectively maintain these assets over their useful life. By knowing the state of the local infrastructure municipalities can

- determine climate impacts with respect to the maintenance and rehabilitation of municipal assets;
- provide better data to senior levels of government which can assist in their policy decisions; and
- integrate all of the pieces of an asset management plan into the local decision making process to demonstrate to the people who live in your community what we need and what we can afford.

Presentation Focus

- Asset Management
- State of Infrastructure
- Climate Change Effects
- Climate Change Integration

Asset Management & State of Infrastructure

Source: CNAM

What is Asset Management (AM)?

Realize Value from Assets

- Service delivery

Integrated & Coordinated Activities

- Across the organization
- Partnership with stakeholders

Deliberate Approach

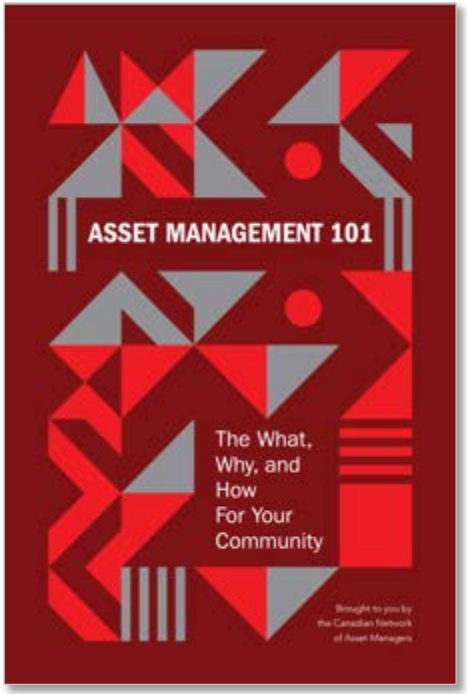
- Assess, plan, implement

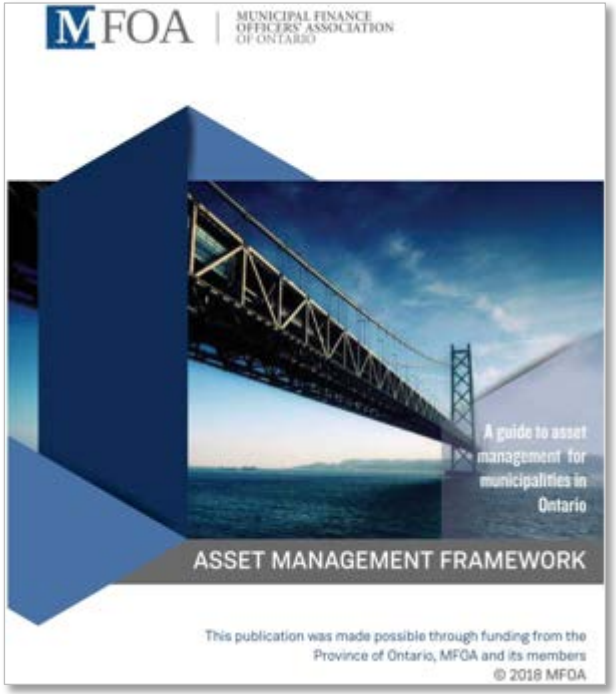
Informed Decision Making

- Balance resources with targeted outcomes & minimize risk exposure

Source: Asset Management British Columbia

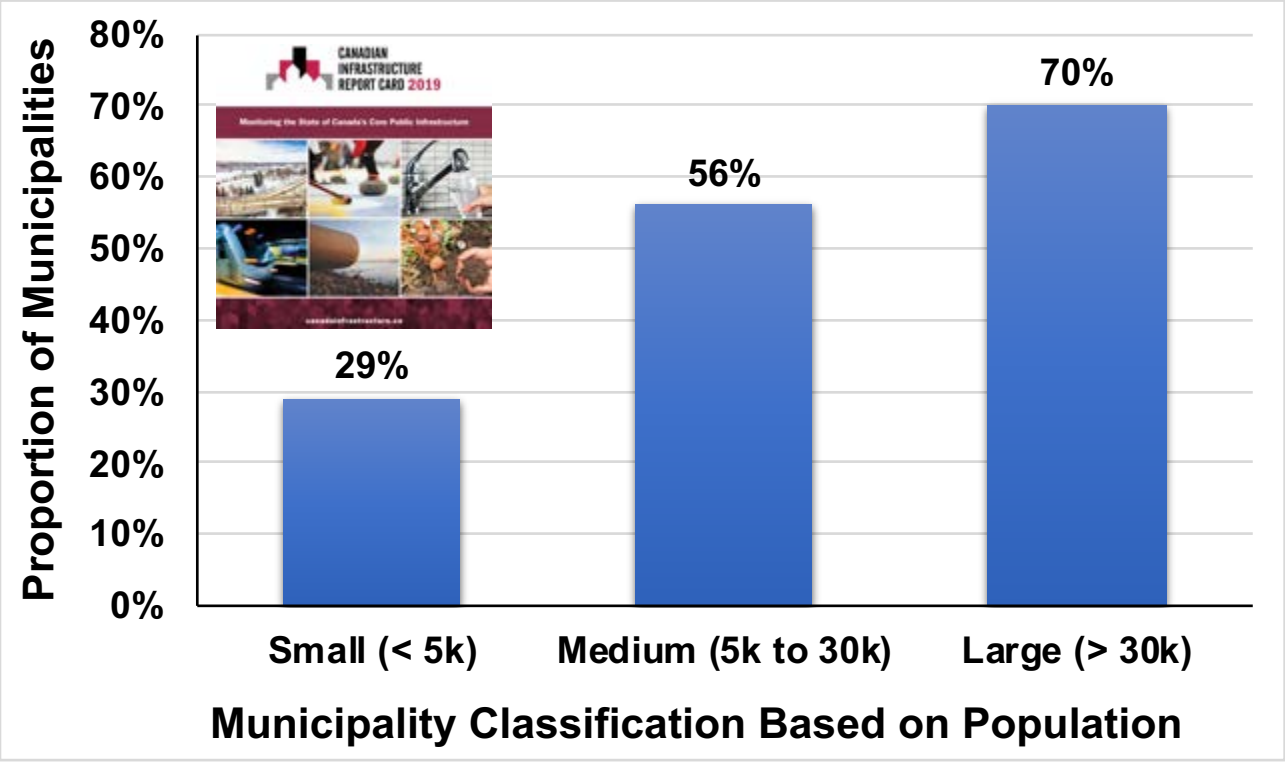
Asset Management Guidance





In-Place Asset Management Plans

2019 CIRC National Perspective



Source: canadainfrastructure.ca

Ontario

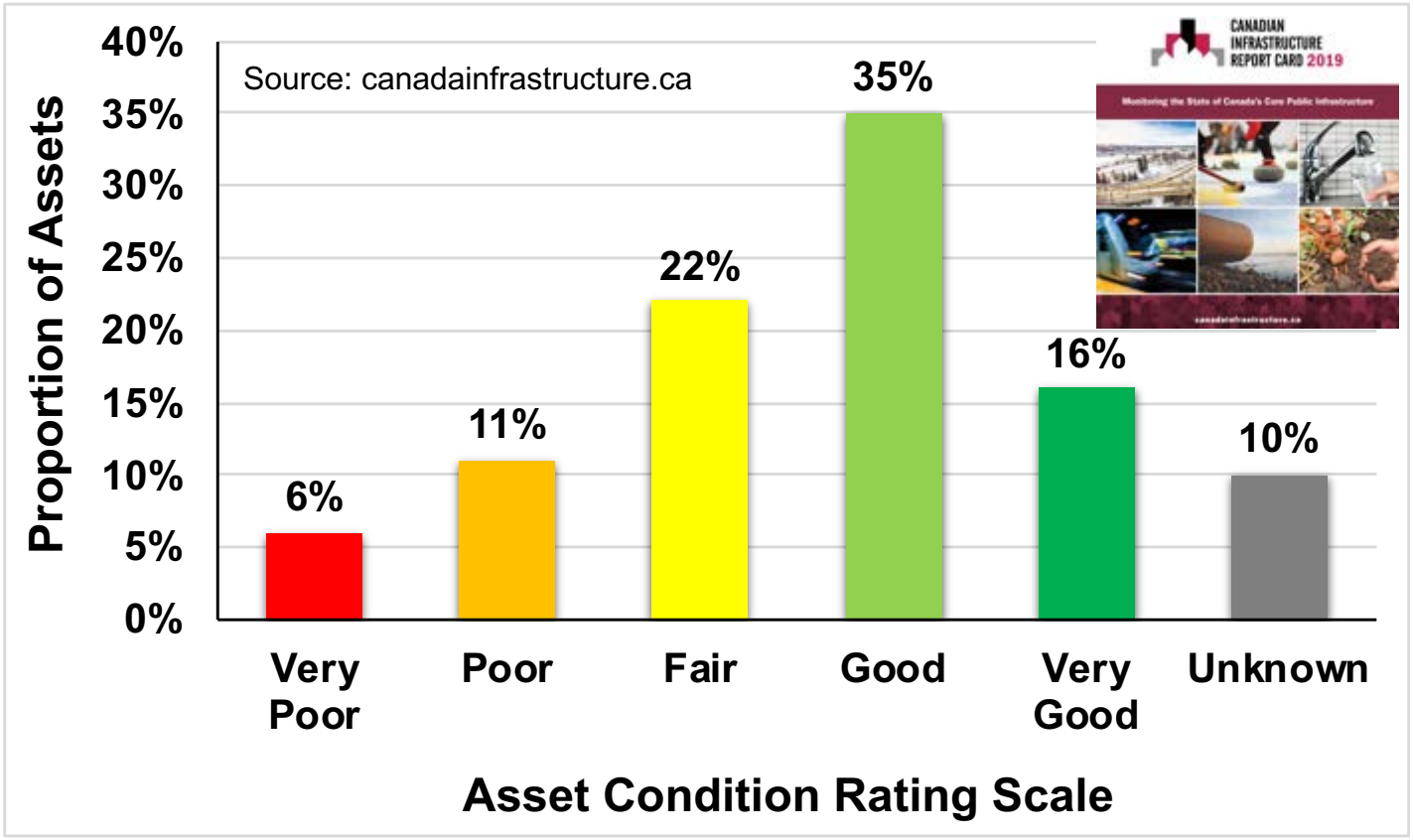
In-Place

- 2016 >95%

Phased approach

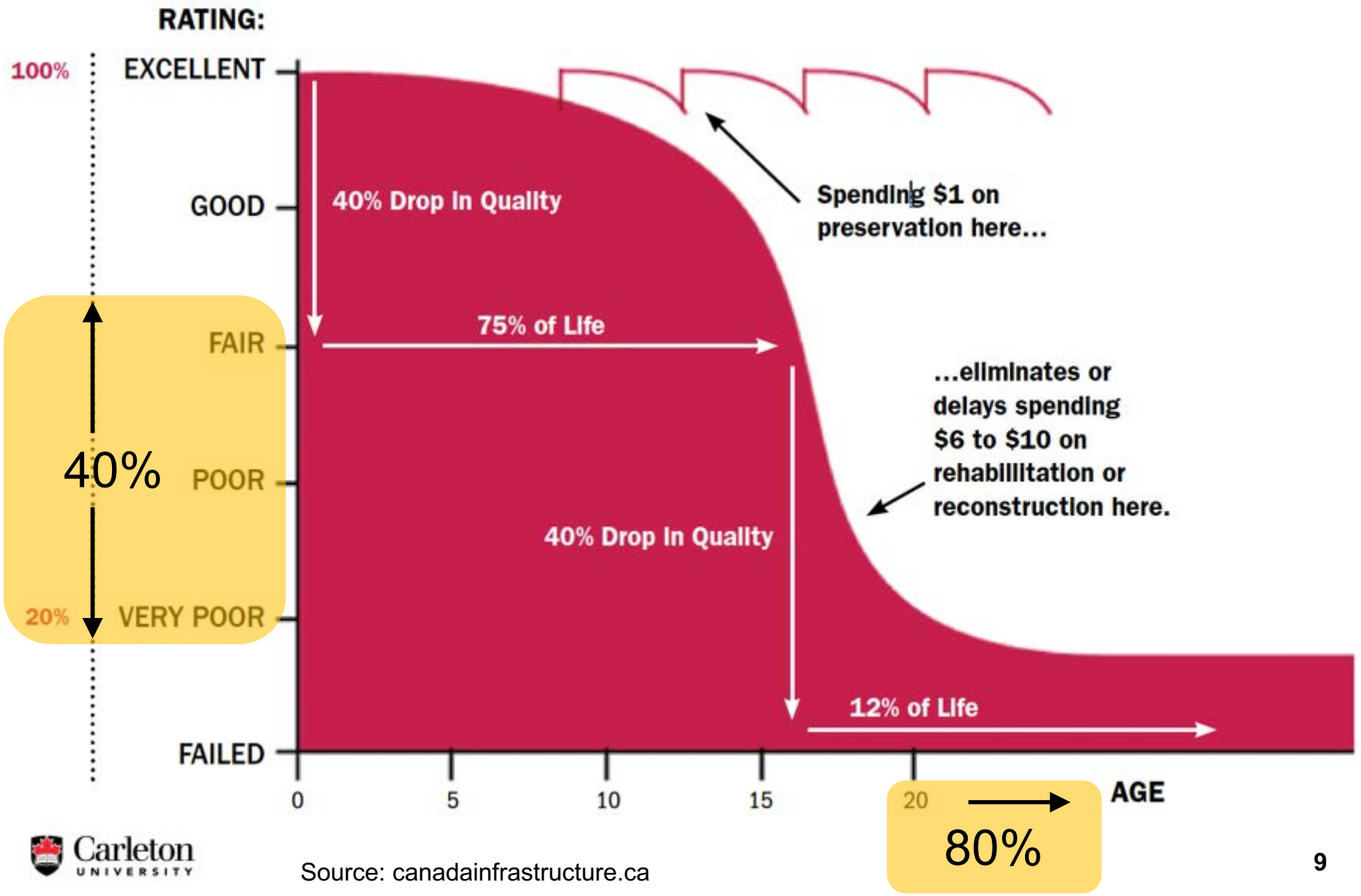
- O. Reg. 588/17
- Core assets by July 1, 2021

Overall Asset Condition for Roads – 2019 CIRC



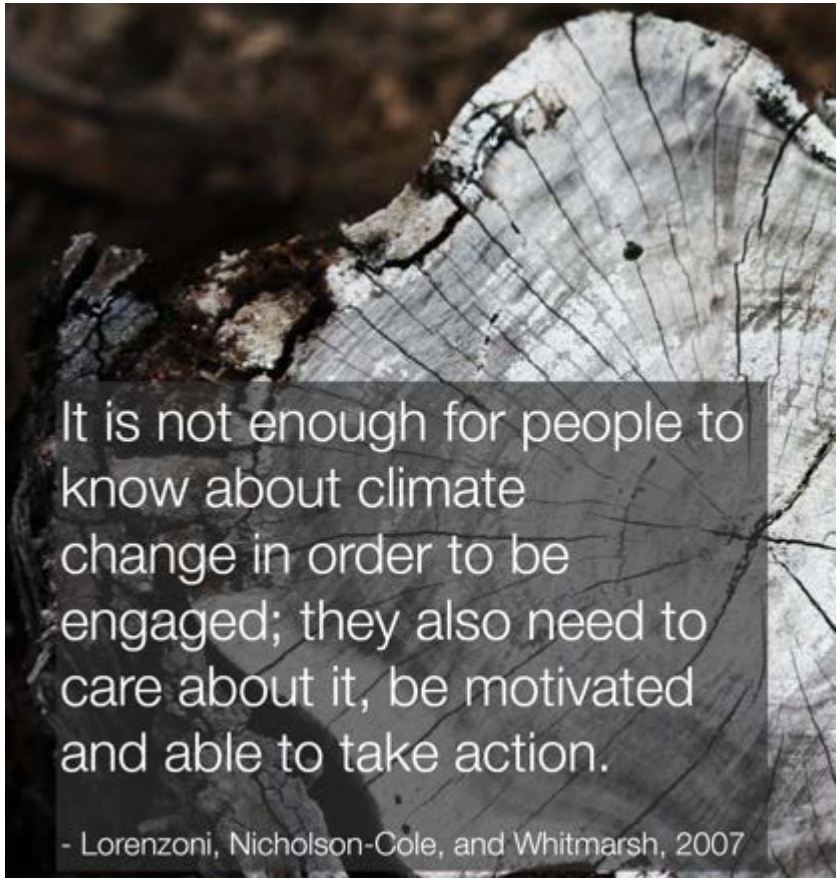
- 40% assets less than adequate (347,538 km)
- 80% assets >20 years old

Generalized Road Asset Deterioration Curve



Source: canadainfrastructure.ca

Climate Change Effects



Climate Change & Threshold Limits

inside climate news

Climate Tipping Points Are Closer Than We Think, Scientists Warn

From melting ice caps to dying forests and thawing permafrost, the risk of 'abrupt and irreversible changes' is much higher than thought just a few years ago.

BY BOB BERWYN, INSIDECLIMATE NEWS

NOV 27, 2019

"What we're talking about is a point of no return, when we might actually lose control of this system," said Will Steffen, a coauthor of a paper released ahead of the annual UN climate summit. Credit: Ian Joughin/University of Washington APL Polar Science Center

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Recent Experience – Extreme Weather Events

Extreme Weather Events & Attribution

Source: https://www.ucsusa.org/global-warming/science-and-impacts/impacts/extreme-weather-climate-change

Extreme Weather:

What's climate change got to do with it?

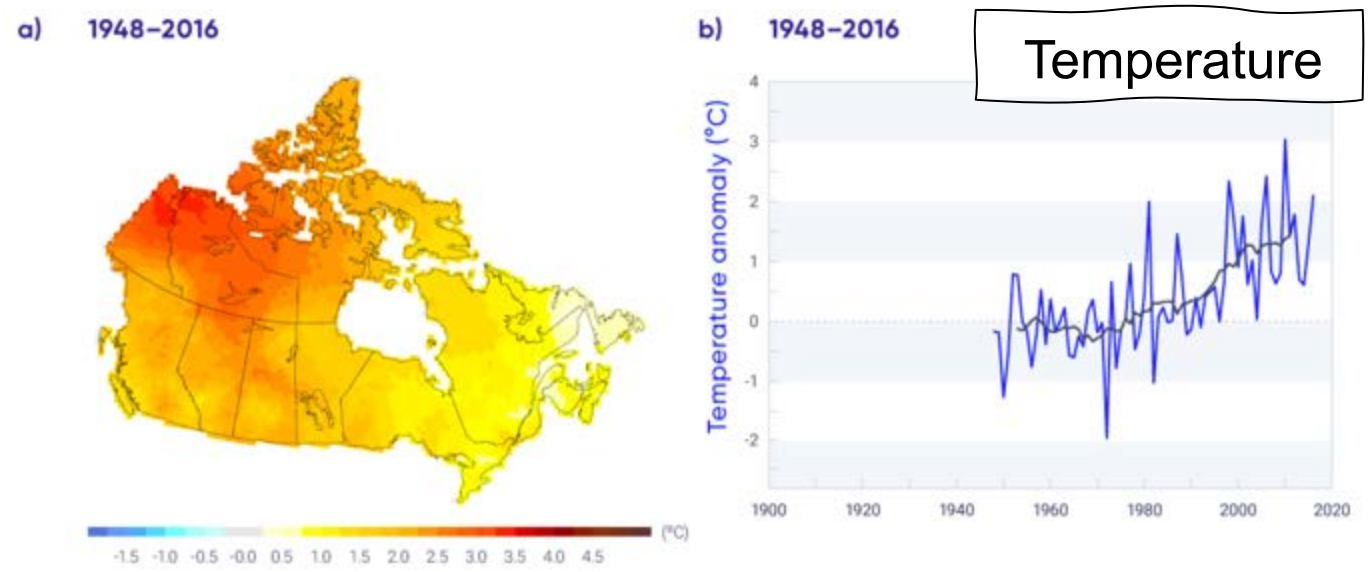
"As the climate has warmed over the years, a new pattern of more frequent and more intense weather events is unfolding in the U.S. and across the globe. Because of a rapidly advancing new area of science called 'event attribution,' we can now estimate how climate change increases the risk to society of some types of extreme events."

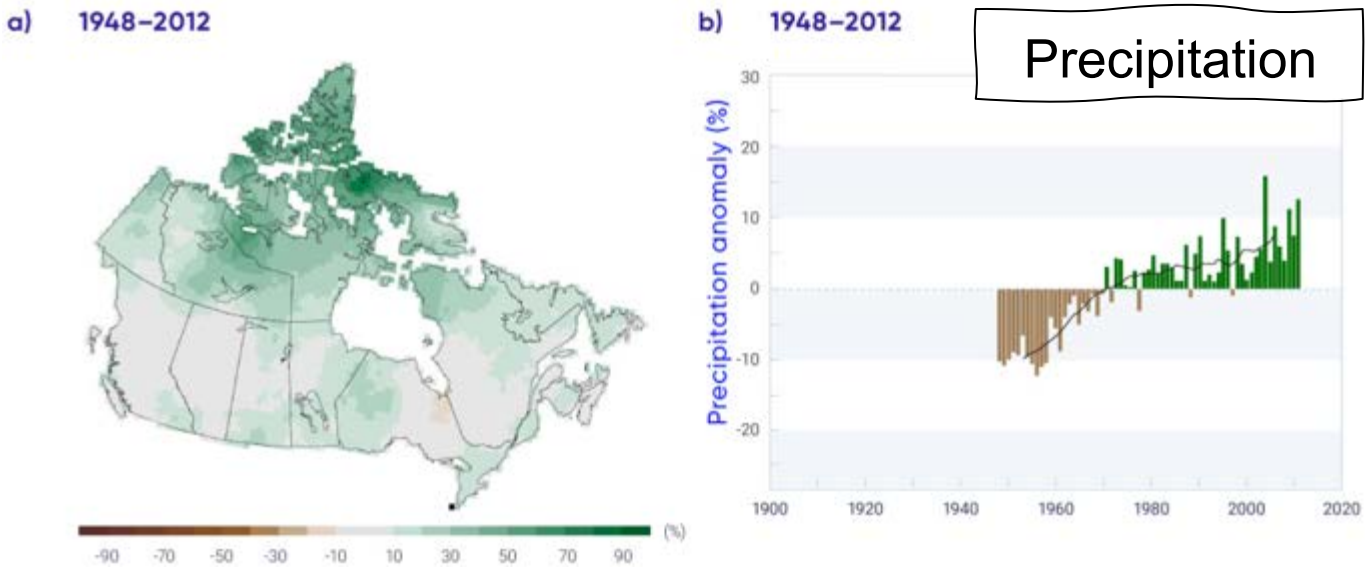
Marcia McNutt, President, National Academy of Sciences

Attribution?

Identifying the cause of an observed change in terms of different forcing functions

Long-Term Annual Trends – Observed Changes

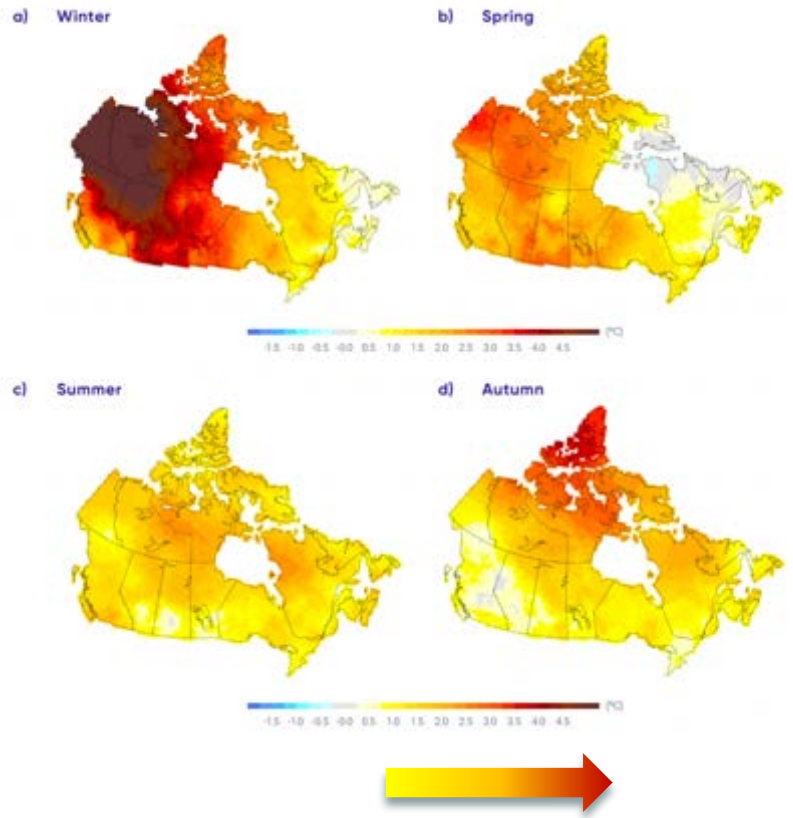




Source: Canada's Changing Climate Report, 2019
www.ChangingClimate.ca/CCCR2019

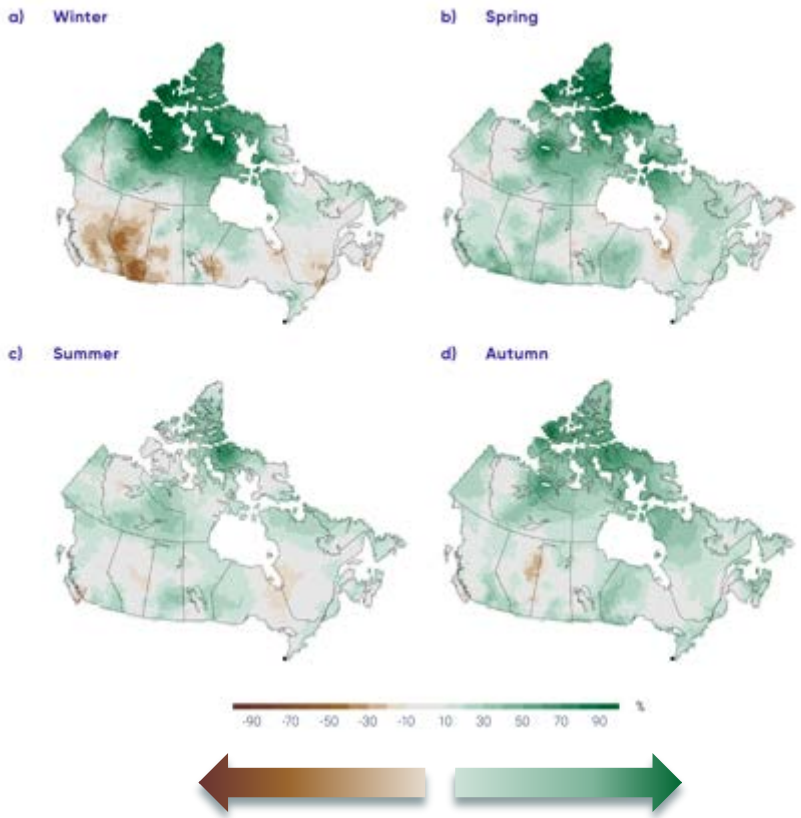
Long Term Seasonal Trends – Observed Changes

Temperature Change (1948-2016)



Generally National

Precipitation Change (1948-2016)



Regional

Source: Canada's Changing Climate Report, 2019 www.ChangingClimate.ca/CCCR2019

Provincial Outlook – Seasonal Trends

1948-2016 dataset

Temperature Change	2.0 ºC	1.5 ºC	1.1 ºC	1.0 ºC
Precipitation Change	5.2%	12.5%	8.6%	17.8%

Source: Canada's Changing Climate Report, 2019 www.ChangingClimate.ca/CCCR2019

Climate Change Integration

Research Project – Focus Area

Through a climate change lens:

Readiness Landscape

- assess, measure & plan for impact on infrastructure & asset management

Enhance Framework

- tools, standards & guidelines
- use by municipalities

Funding

Ontario

NSERC CRSNG

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Steering Committee

Ontario

Peterborough County
Our History - Your Future

Township of Douro-Dummer

City of Peterborough

Engaged Rural Ontario Municipalities

- Issues Explored
  - ① Integration of climate change considerations
  - ② Nature and extent of climate change considerations
  - ③ Characterization of infrastructure vulnerability
  - ④ Type, direction & significance of drivers & barriers

160 Respondents

- 47% Single-Tier
- 50% Lower-Tier
- 3% Upper-Tier

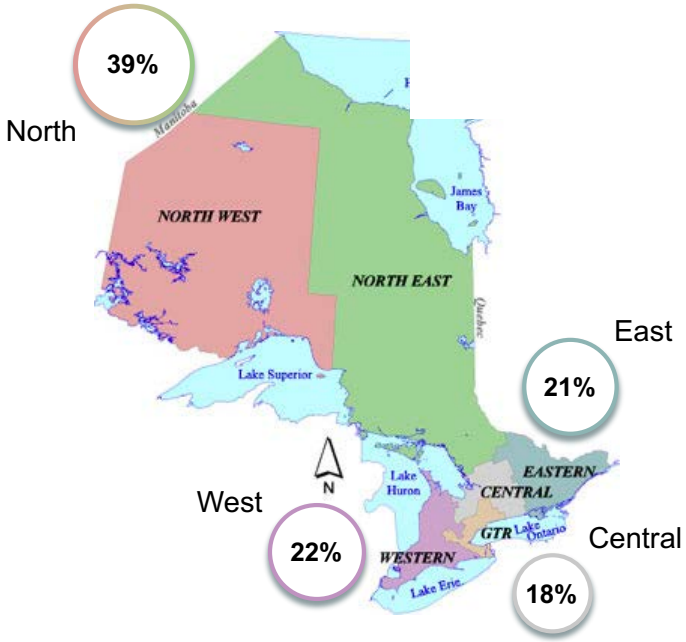
Municipality Characteristics

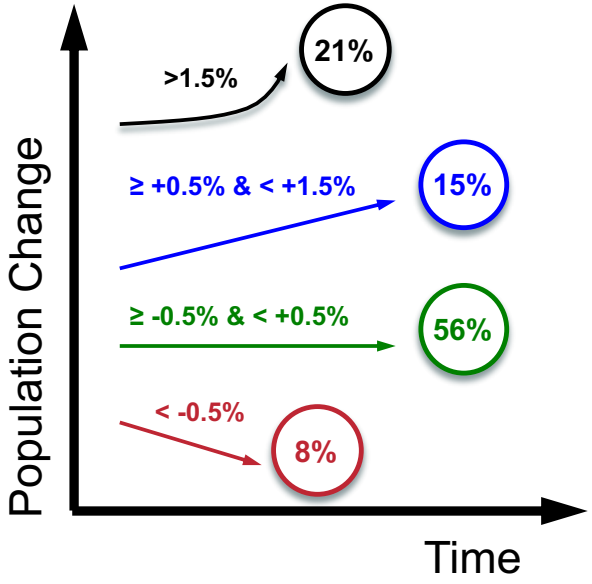
Demographics
- Population*
- Geographic location
- Growth trends

*Rural municipality defined as
- ≤ 100,000 people
- ≤ 100 people/km^2

89% ≤ 25,000

11% > 25,000





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Considerations for Climate Change Integration


Source: Canadian Press/Winston Neutel

Have the asset management plans integrated climate change considerations?

77% No

Moderating factors?

77% No Sustainability Plans or Future Study

66% Lack of Public Engagement


Source: Toronto.com

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Key Drivers – Questionnaire Rating Outcomes

Financial Management

Council Leadership

Drivers

Federal Government

Provincial Government

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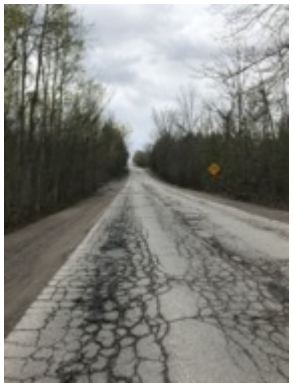
Key Barriers – Questionnaire Rating Outcomes

Valuation

Organizational Capacity

Financial Plan, Policies & Capacity



Asset Condition Assessment

Levels of Service – Climate Change Lens

Landscape

- Community (customer) expectations
- Services currently being provided
- Assets used to provide service

Pathway

- Strategic & technical levels of service
- Performance measures (KPIs)
- Lifecycle cost & risk assessment

Other Factors

- Legislative (e.g. standards, regulations)
- Organizational (e.g. governance, policy, plan)
- Other (e.g. technology, climate change)

Ottawa Context

Transportation Network

- $10B road infrastructure
- 6,000+ km road assets
- 35 km LRT track

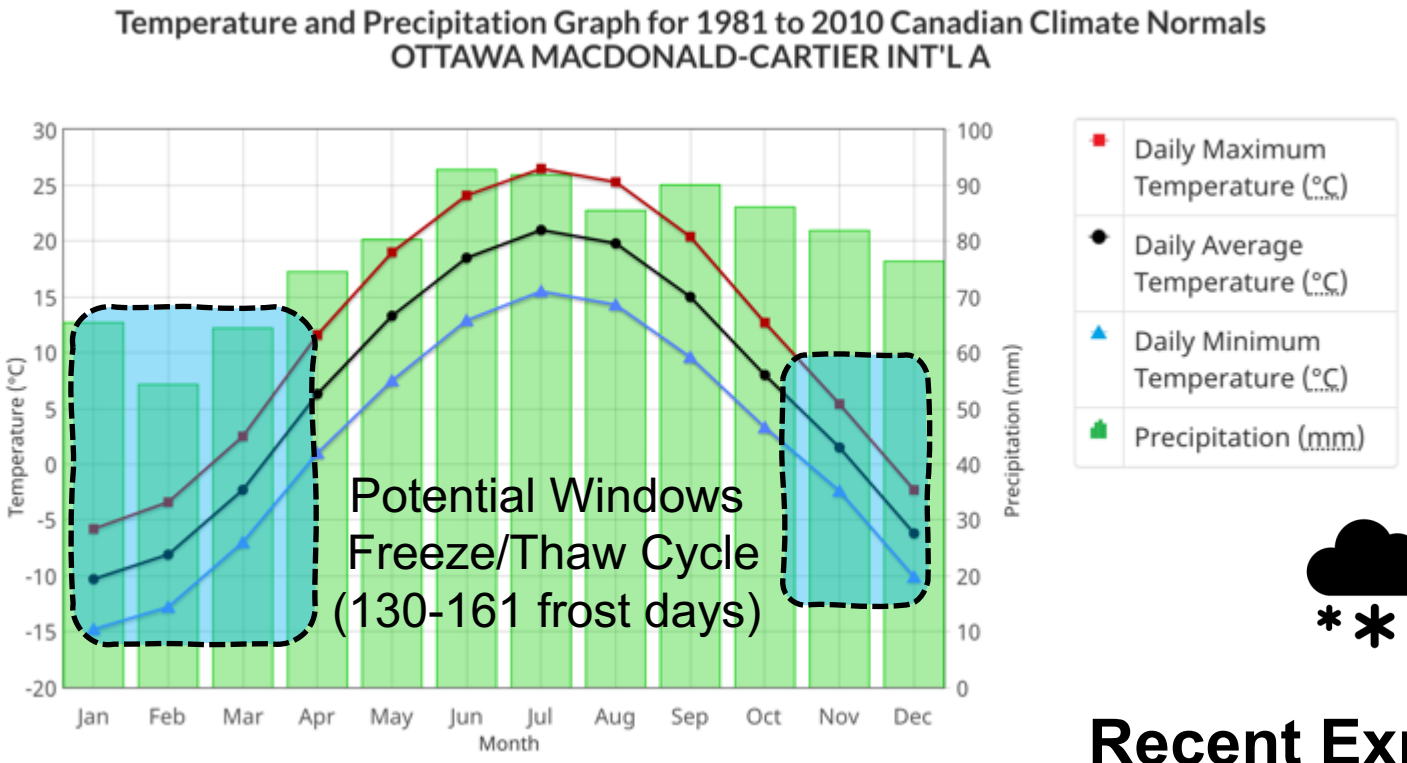
Infrastructure Gap

- $70M 2017
- Commit $9.8M/yr (2019)
- Close gap in 2026

2020 Budget

- Infrastructure spending
  - $151M (+18%)
- Winter operations
  - $78.3M (+7%)
- Pothole repair
  - $9.8M (+7%)

Driving Force – Climate & Weather Patterns



Source: Environment & Natural Resources Canada

Recent Experience (2018/19 Winter)

- 1.5x 20-year average
- 312 cm snow
- 103 hr freezing rain

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Motivation, Expectations & Perceptions

On average City of Ottawa crews fill around 250,000 potholes each year

Ottawa

Pothole claims almost quadrupled since 2015

Source: CBC

'This is a trend going the wrong way,' says councillor

Joanne Chianello · CBC News · Posted: Dec 04, 2017 5:00 AM ET | Last Updated: December 4, 2017

Extreme weather conditions last winter led to the creation of more than 150,000 potholes. (CBC)

March 2019

OTTAWAMATTERS.com powered by 1310 NEWS

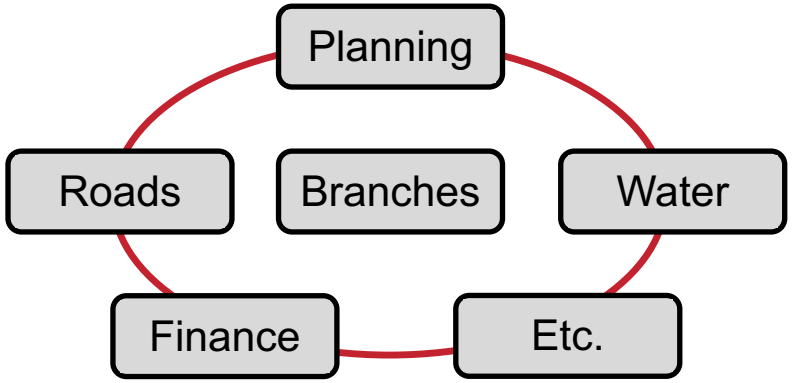
"In my 28-plus-year career in the City of Ottawa, I have to say this probably is the worst ice year I've seen in my career," said Luc Gagne, Director of Roads.

"We are simply in the worst conditions," Gagne added. "We are [5 C] during the day and [-5 C] at night, with the freeze-thaw cycle making it very difficult."

Changes to Service Delivery & Levels

- Technology
  (e.g. high-performance cold-patch)
- Standards
  (e.g. enhanced O. Reg 239/02 thresholds)
- Logistics
  (e.g. free night parking – storms)
- Mobility
  (e.g. more frequent sidewalk clearing)
- Proactive Management
  (e.g. catch basins/potholes)
- Service Area Restructuring
  (e.g. community type, infrastructure & geography)
- Improved Engagement
  (e.g. web portals, communications)

Need for Integrated (Holistic) Network Approach



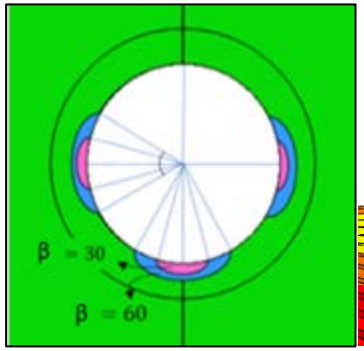

Source: Andrew Foote, CBC

Potential Climate Change Influence

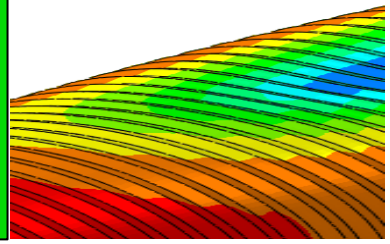
Frost heave action & freeze/thaw cycles

Winter flood risk

Damage due to culvert or water main (CI) failure



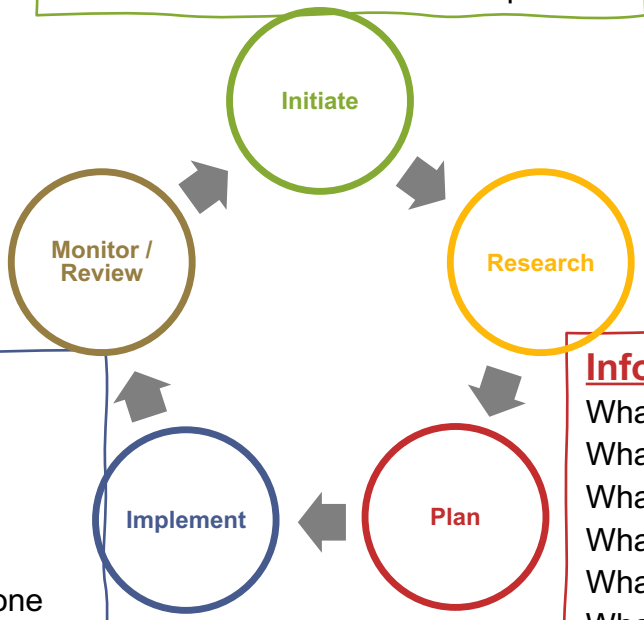
Soil Erosion &
Metal Corrosion Defects



Supporting Climate Change Integration*

Current Landscape
Who is involved?
What is the mandate? engagement?
What is our understanding, data, knowledge, tools & capabilities?
What are the hazards? is the exposure?

Priorities & Significance
What matters?
What is significant?
What is the desired level of service?
What are the vulnerabilities?
What is the climate risk?



Continuous Improvement
How is it going?
Are you monitoring the progress or effectiveness (e.g. with respect to changes in climate risk, achievement of objectives, progression towards decision points)?
Are you engaged with stakeholders?
Do you need to enhance, refine or change your plan?

Call to Action
How do we do it?
What are the implementation tools?
Are you engaged with the council, staff & community?
Have you checked your compass, milestone marker & watch?
Are you aligned with moderators (e.g. changes in municipal plans, codes/standards, polices, regulations)?

Informed Decision Making
What can we do?
What is the vision & mission?
What are the strategies?
What are the goals & objectives?
What are the drivers & constraints?
What are the options & action plans?
What are the adaptation pathways?
What are the implementation strategies?
What are the signals (early warnings), decision points (triggers) & metrics (thresholds)?

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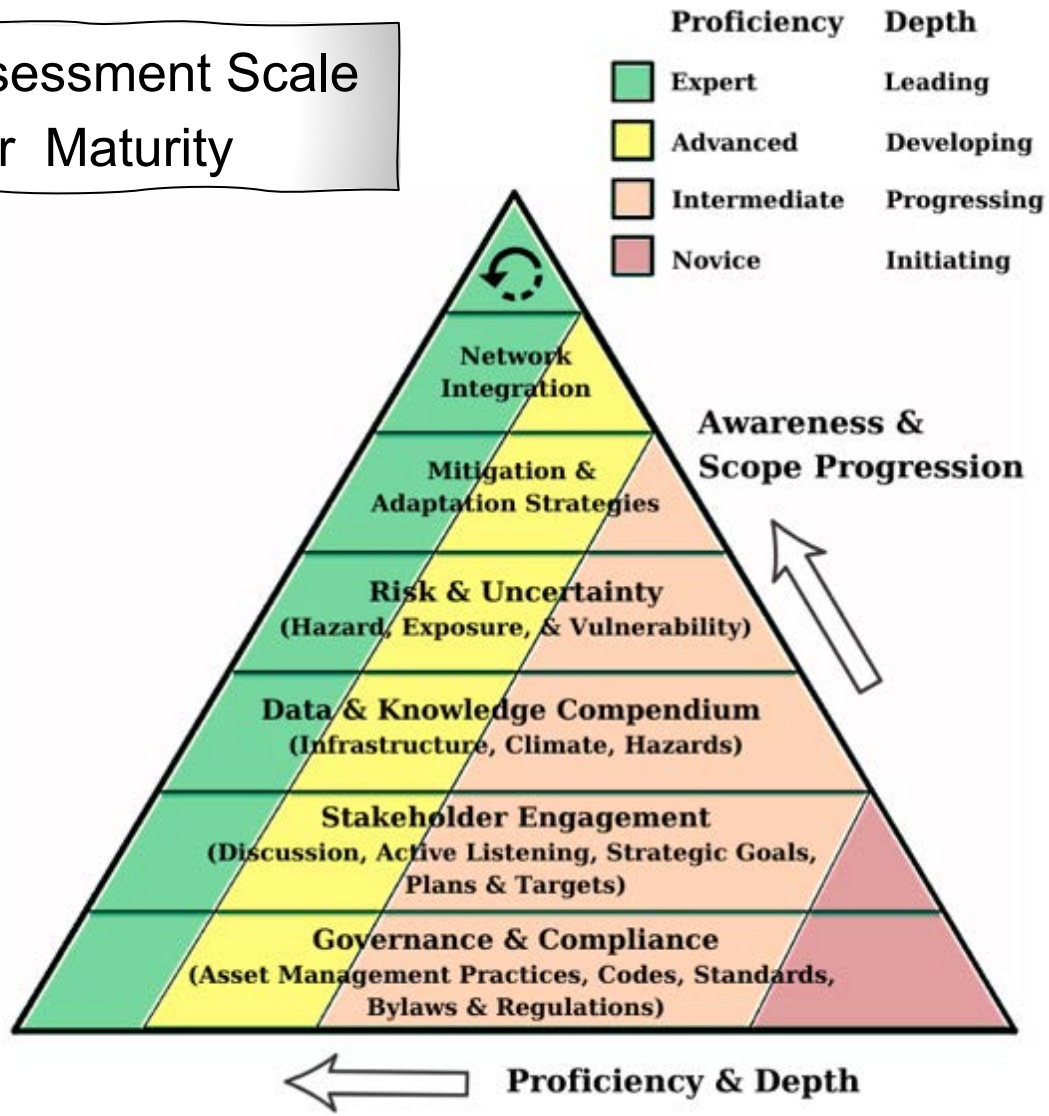
* Framework adapted from ICLEI BARC Tool (https://icleicanada.org/)

Supporting Climate Change Integration

Possible Self-Assessment Scale on Progression or Maturity



Thank you! Any Questions?