



MORRISON HERSHFIELD

**Climate Vulnerability and Risk Assessment:
Current Practice and Implications for
Environmental Assessment**

OAIA Conference – October 20, 2022

OVERVIEW



Climate Change

Climate Risk Assessment

Sustainability

Application Examples

Urgent Call for Action on Climate Change

- **Weather vs. Climate:**

- Weather is the changes we see and feel outside from day to day
- Climate is the usual atmospheric conditions of a place

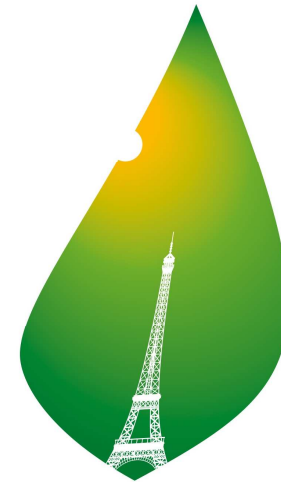
- **What is Climate Change?**

- A change in the usual atmospheric conditions over time



Urgent Call for Action on Climate Change

- Global Call for Action – 2015 Paris Agreement.
- Many agencies / authorities are declaring climate emergencies and taking significant action.
- Professional responsibility to account for and address climate change.



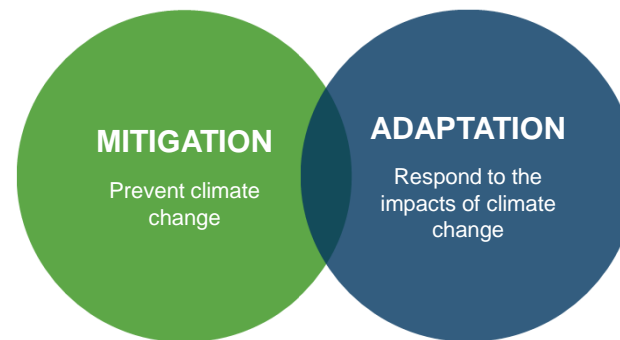
COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

PROVINCE OF ONTARIO GUIDANCE

The Ontario MECP expects proponents to take into account:

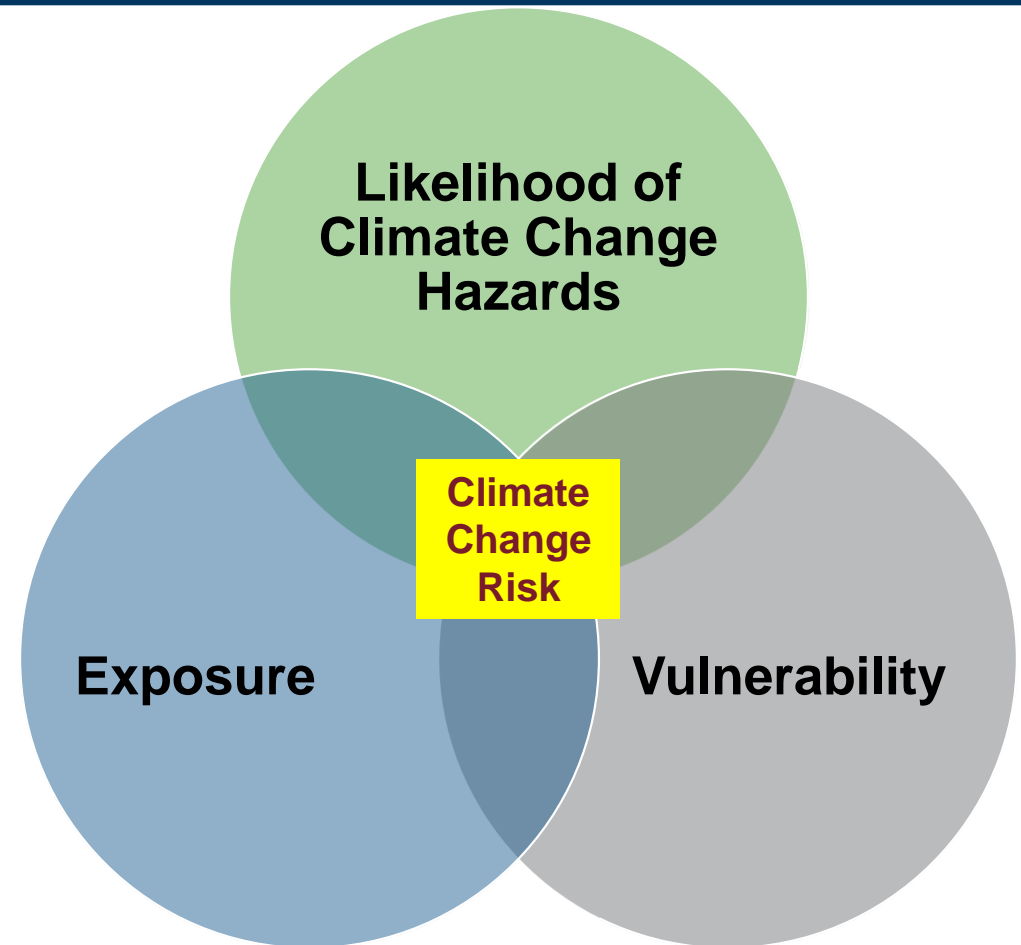
- “the project’s expected production of greenhouse gas emissions and impacts on carbon sinks (climate change mitigation)”
- “resilience or vulnerability of the undertaking to changing climatic conditions (climate change adaptation)”

(Source: Guide: Considering Climate Change in the EA Process, MOECC, December 2017)



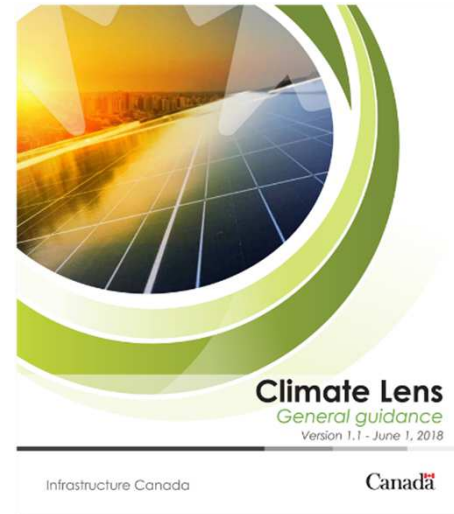
CLIMATE CHANGE ADAPTATION PLANNING

- **What is Climate Adaptation Planning?**
 - Minimize impacts for various performance response factors
 - Identify / address vulnerabilities
 - Reduce recovery time and costs
- **Why should you prepare a Resilience Plan?**
 - No 'one-size fits all' approach
 - Each organization has to contend with specific climate change issues and unique design and condition characteristics



Assessment Process

- Multiple frameworks for conducting a climate risk assessment:
 - ISO 31000 & 31010 – Risk Management
 - PIEVC Protocol
 - Infrastructure Canada Climate Lens General Guidance
- All follow similar steps to assess risks



Assessment Process – *Define Project*

- Define project and boundary conditions for assessment
 - What infrastructure assets (existing and planned) will be assessed?
 - What is the time horizon being considered?
 - What is the geographic area being considered?



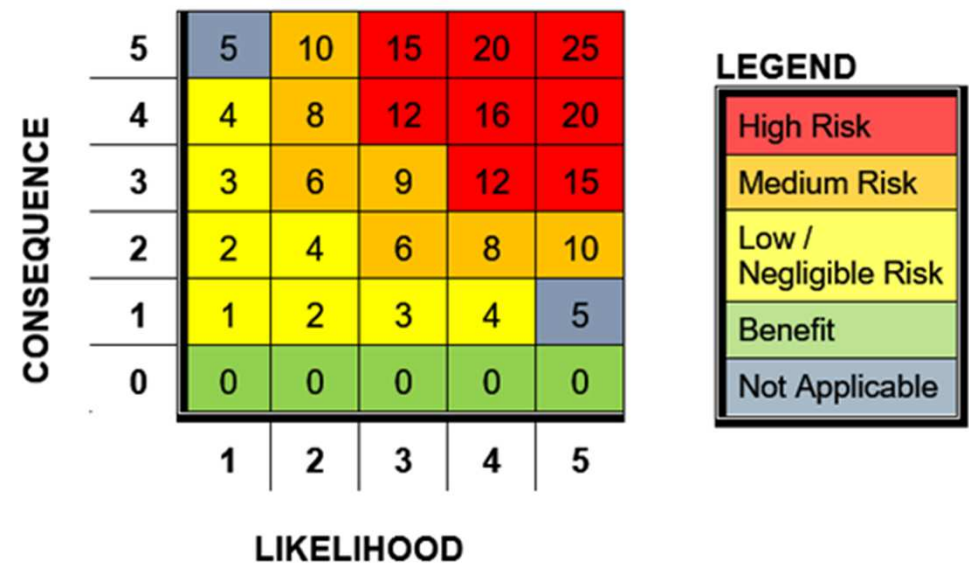
Assessment Process – *Gather Data*

- Collect and review data regarding infrastructure assets
 - Design drawings
 - Condition assessments
- Collect climate data and projections



Assessment Process – *Assess Risk*

- Identify interactions between assets and climatic events
- Determine probability of climatic event
- Assess risk based on consequence and likelihood of events
- Conduct additional analysis as required



Assessment Process – *Reporting / Actions*

- Develop recommendations to address risks
- Consider near, medium and longer term actions
- Implement, monitor and update the assessment



ENVISION - 64 Credits in 5 Categories



Quality of Life

14 Credits

Wellbeing, Mobility, Community



Leadership

12 Credits

Collaboration, Planning, Economy



Resource Allocation

14 Credits

Materials, Energy, Water



Natural World

14 Credits

Siting, Conservation, Ecology

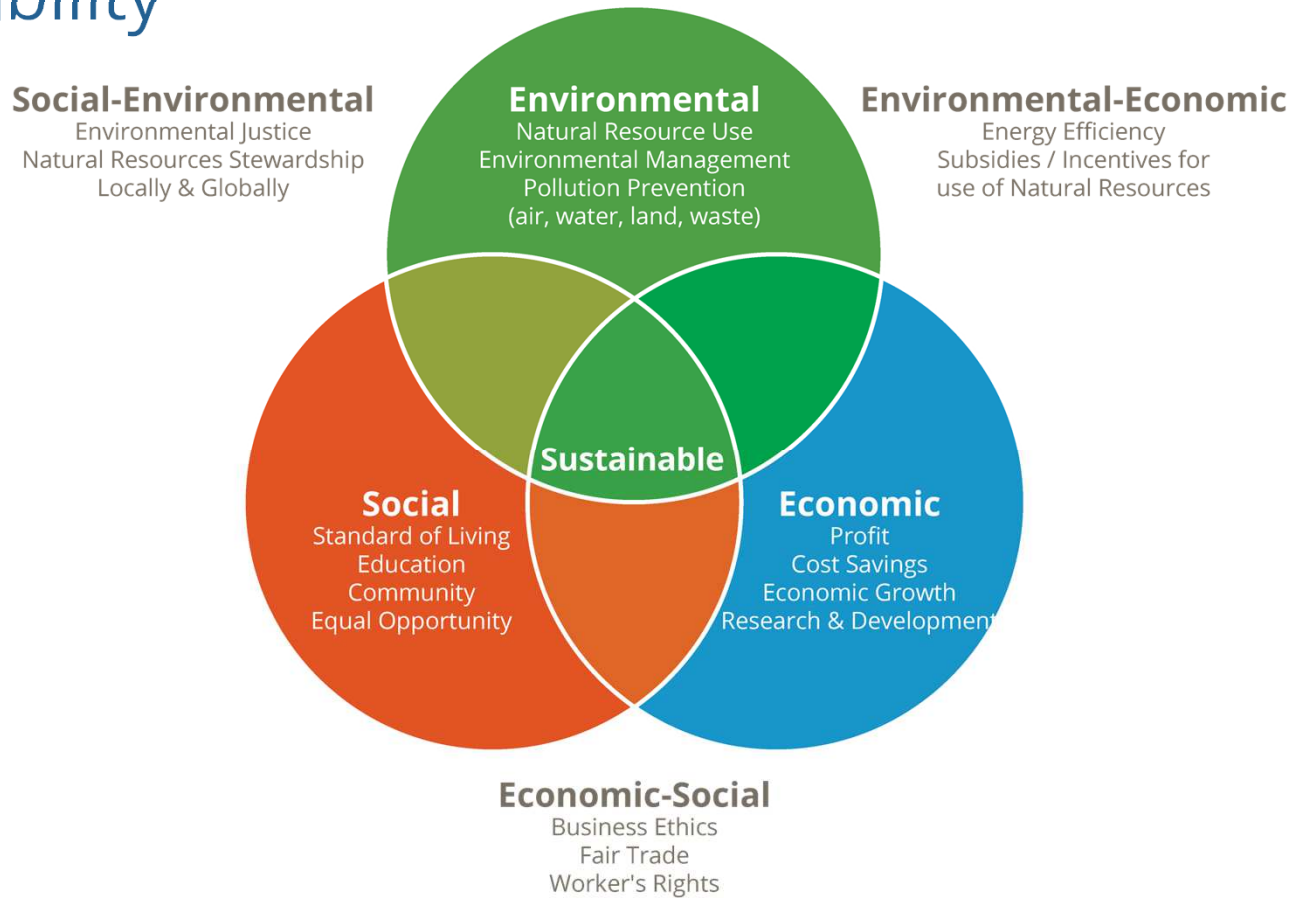


Climate & Resilience

10 Credits

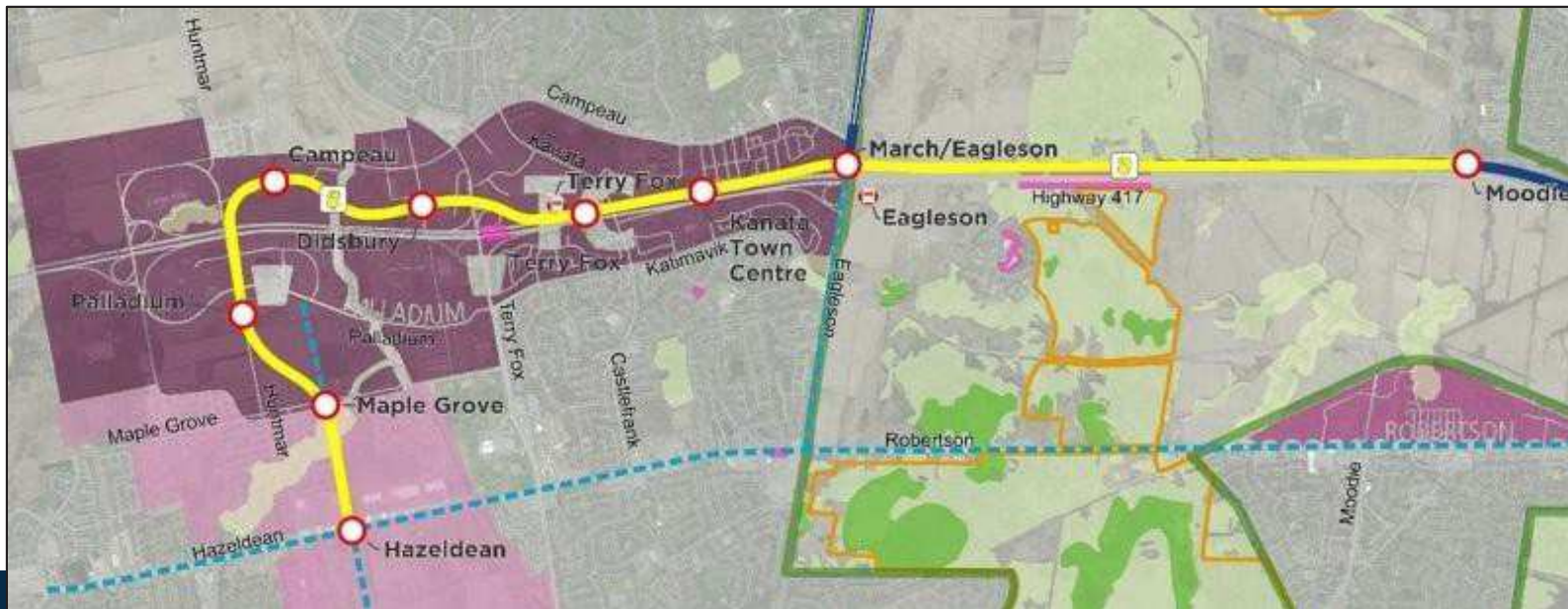
Emissions, Resilience

Sustainability



KANATA LRT PROJECT LOCATION

- Confederation Line (Stage 1) in operation
- Stage 2 Extension of Confederation Line West to Moodie and Baseline Stations is proceeding
- Future Stage 3 to extend LRT service further west



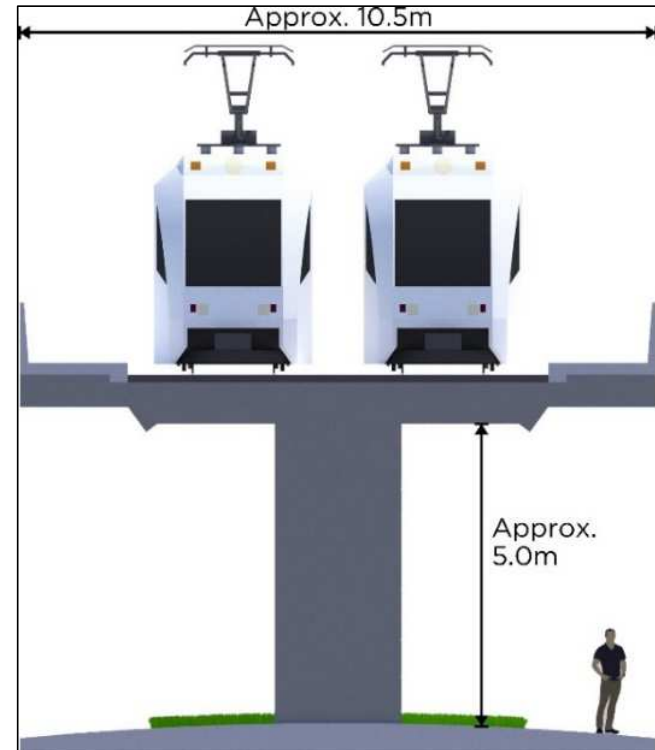
City of Ottawa - Kanata LRT EA Study – Climate Assessment

Adaptation:

- Vulnerability Assessment included identification of climate risk hazards based on RCP4.5 and RCP8.5 projections
- Risks and their severity were identified for each project component

Mitigation:

- Carbon Footprint Assessment



INITIAL RISK ASSESSMENT

ID #	Infrastructure Components	Climate Change Factors					
		<i>Average Temp.</i>	<i>Extreme Heat</i>	<i>Annual Rain</i>	<i>Extreme Rain</i>	<i>Freezing Rain</i>	<i>Extreme Wind</i>
1	Track / Guideway (Incl. Ballast and Drainage)	Green	Yellow	Green	Red	Yellow	Green
2	Bridges - Underpasses / Overpasses	Green	Green	Green	Yellow	Green	Green
3	Bridges / Culverts - Over Water	Green	Green	Green	Red	Green	Green
4	Retaining Structures	Green	Green	Green	Green	Green	Green
5	Overhead Contact / Catenary Systems (*)	Green	Yellow	Green	Green	Red	Yellow

KANATA LRT EA - POTENTIAL VULNERABILITIES

Potential higher levels of Vulnerability / Risk are shown at right:



ID #	Infrastructure Components	<i>Extreme Rain</i>
1	Track / Guideway (Incl. Ballast and Drainage)	
3	Bridges / Culverts - Over Water	
7	Power Supply (Substations) Ground Level and Underground *	
ID #	Infrastructure Components	<i>Freezing Rain</i>
5	Overhead Contact / Catenary Systems (*)	

LESSONS LEARNED

- First application of the provincial climate change guidance to a City of Ottawa transportation EA study.
- Workshops were effective for broad engagement.
- The process helped raise awareness.
- Commitments were captured in the EA study.



BACKGROUND

- Mushkegowuk Council Highway 11 to James Bay All-Season Road Feasibility Study



CLIMATE FACTORS / PROJECTIONS

Climate Projections based on:

- Historical Average, 1980-2010, from Moosonee Meteorological Station
- 2050 and 2080 horizons

Initial Climate Change Variables:

- Average and extreme temperature
- Average and extreme rainfall
- Snowfall
- Freeze/thaw cycles



POTENTIAL VULNERABILITIES

CLIMATE FACTORS	POTENTIAL CLIMATE IMPACTS
Freeze-thaw cycles	<ul style="list-style-type: none">• Road deformation, shearing, deterioration
Warming and thawing of permafrost	<ul style="list-style-type: none">• Ground settlement, slope instability
Dry forest conditions	<ul style="list-style-type: none">• User Safety - Forest Fires



ACKNOWLEDGEMENTS

- The Kanata LRT EA Study was presented with the approval of the City of Ottawa. Parsons was the prime consultant.
- The James Bay ASR Study was presented with the approval of the Mushkegowuk Council.





THANK YOU

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