



# City of Toronto's Climate Change Risk Assessment



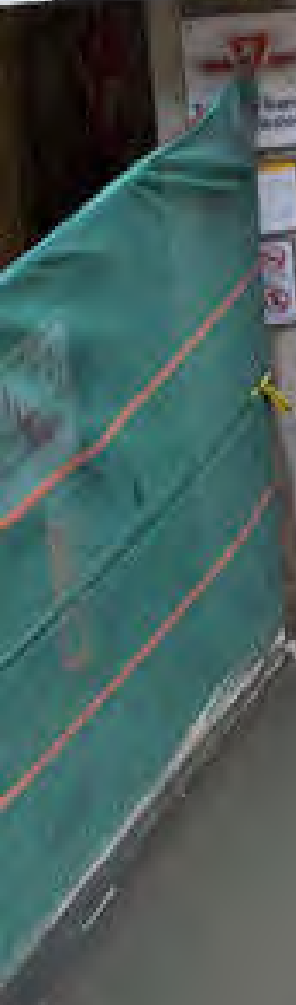
TAC 2013 – Winnipeg  
September 24, 2013





Louisiana or Toronto?

**Union**  
SUBWAY  
Entrance to Subway and Streetcars Only  
For access to PATH System, use East Walkway



200,000 transit riders affected





**2 High Pressure Gas Mains**

**Broken Water main**

**Broken Maintenance Hole**

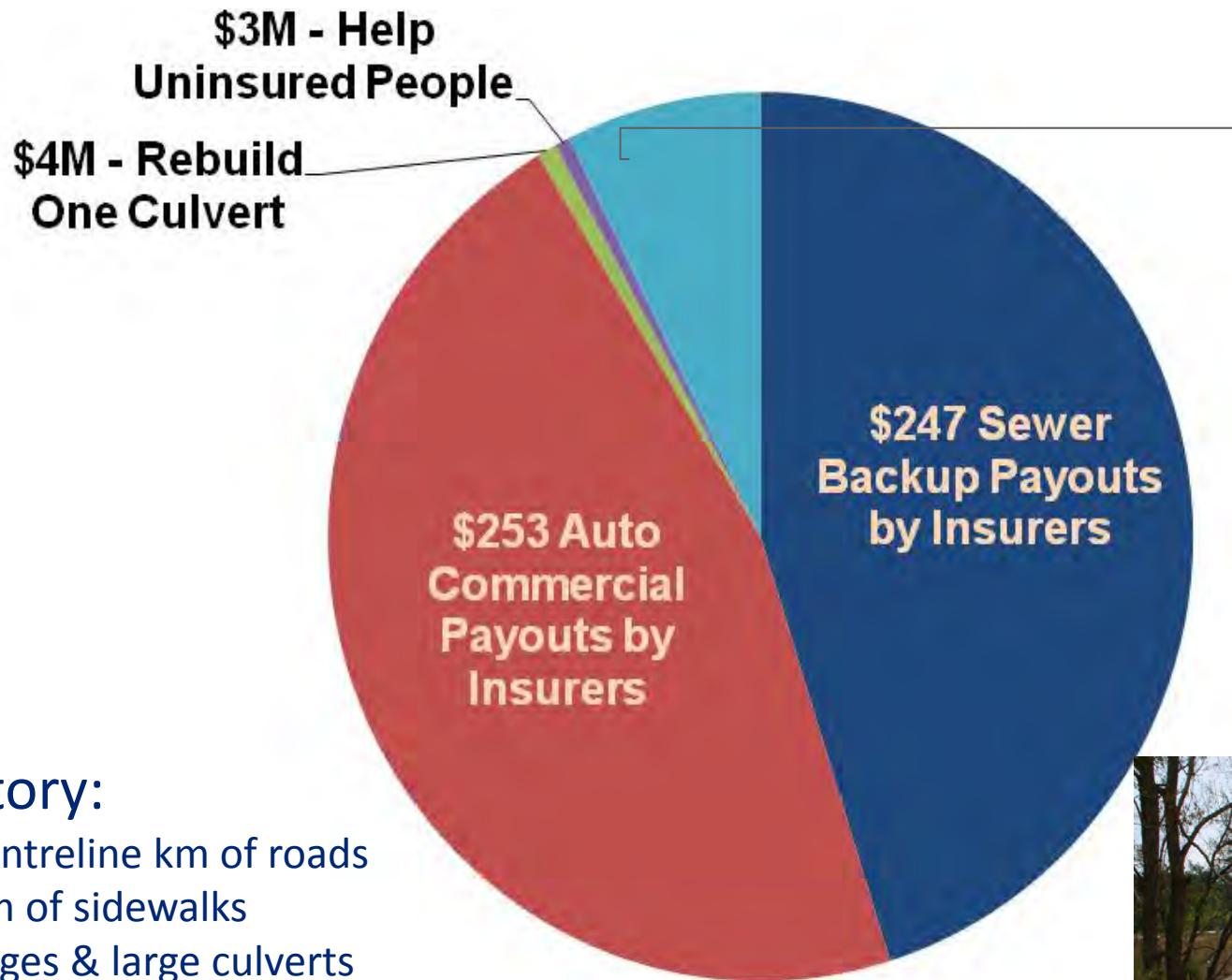
**Bell Canada cables**

**Bell Canada cables**

**Parks Path**

**Toronto Hydro and Telecom Cable**

# Toronto: August 2005 Storm



**\$40M Multi-Year Operating & Capital Expenditures to bring the City's Infrastructure back into Service**

## Inventory:

- 5,600 centreline km of roads
- 7,900 km of sidewalks
- 904 Bridges & large culverts
- 2,200 Traffic Signals

**\$13.5 Billion replacement**

**TOTAL  
Storm Cost  
\$547 Million**



# Why Manage Climate Change Risk

---

## Drivers

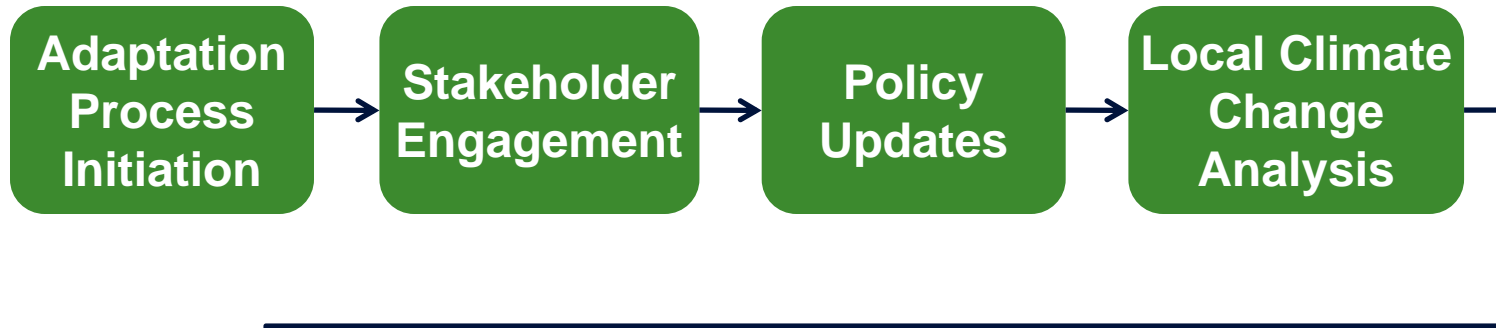
- Safety: avoid harm to citizens & staff;
- Customer Service;
- Cost avoidance:
  - damage from extreme weather
  - credit & insurance risk rating of City & taxpayers;
- Legal liability of organizations and individuals; and
- Evidence of due diligence

## Challenges

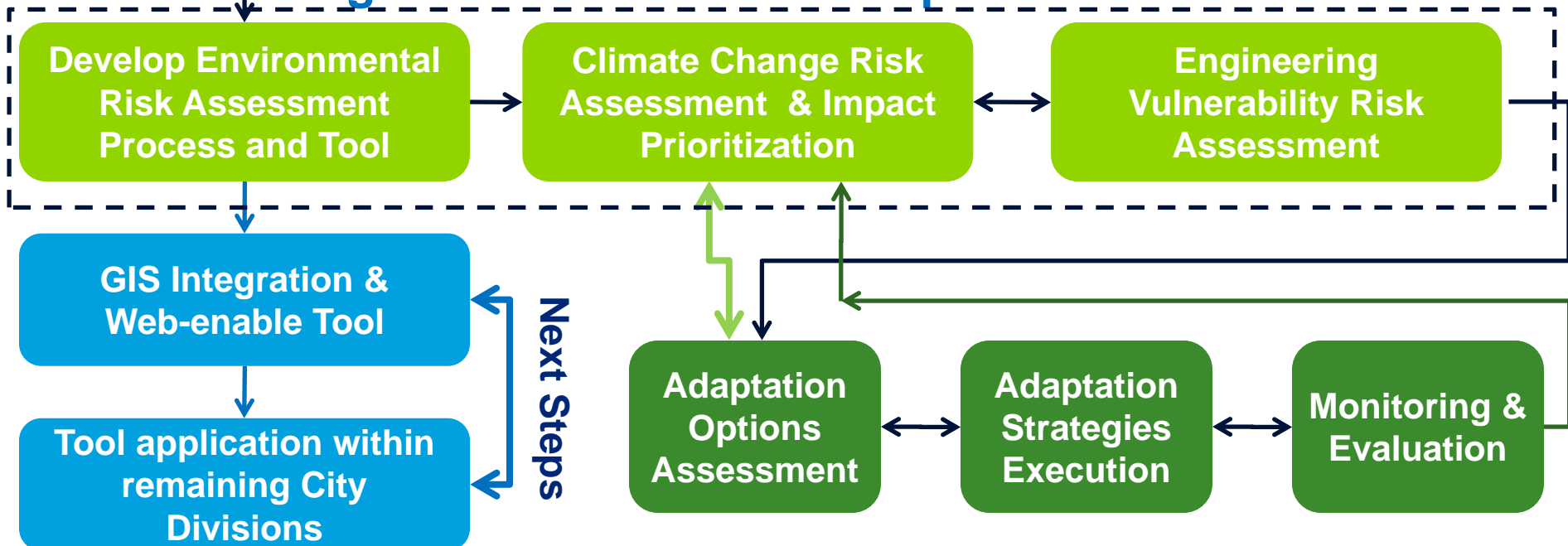
- Inadequate or outdated climate information;
- Existing design codes and standards may be less applicable;
- Procurement & contracting policies;
- Infrastructure turnover and age; and
- Consumer behaviour and public expectations

# City of Toronto's Risk Management Framework

## Climate Change Adaptation Strategy



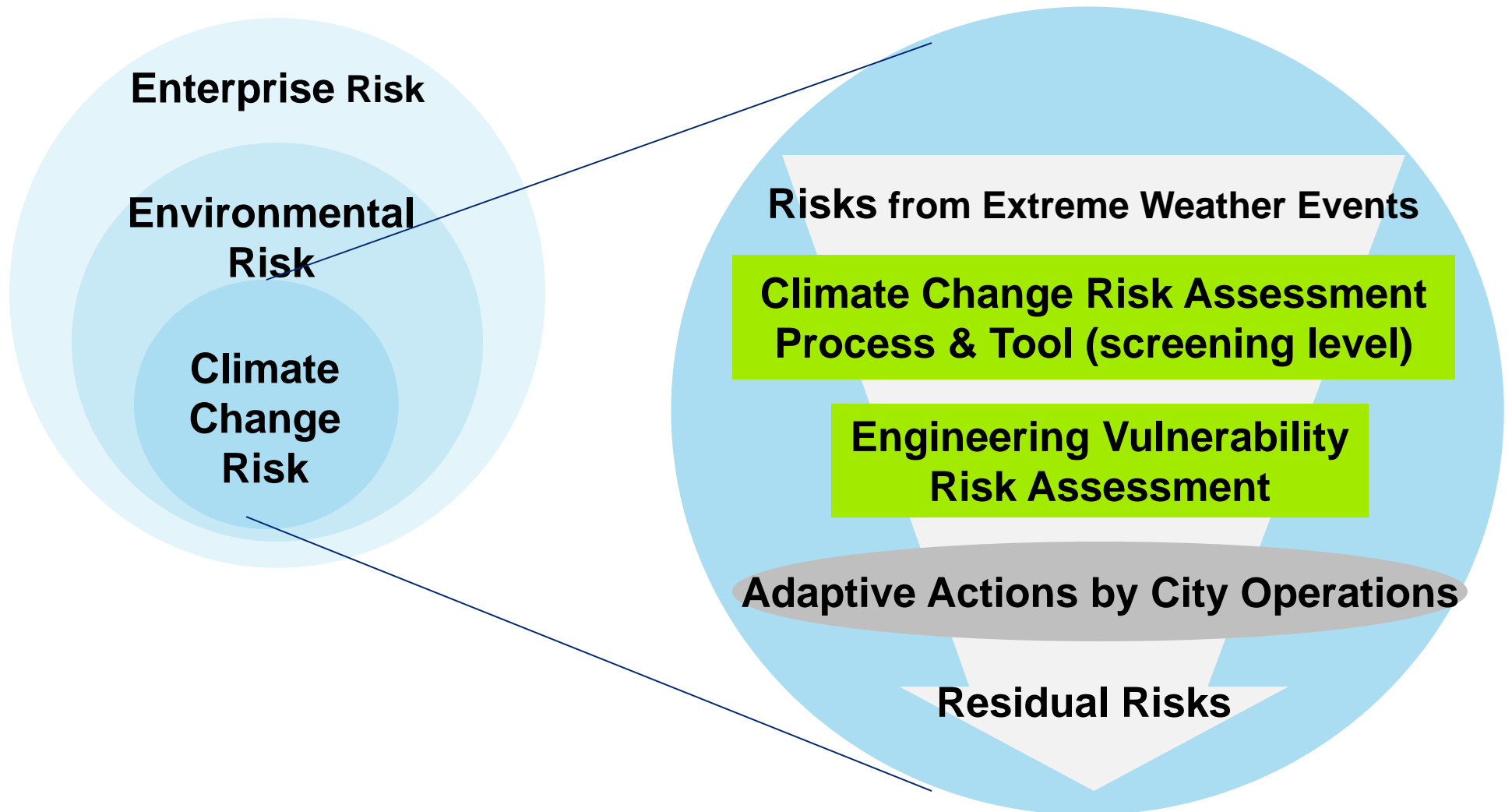
## Climate Change Risk Assessment Scope



# Project Scope and Objective

---

Scope - Climate change risk is a subset of environmental risk



Purpose of project - develop a process and tool for screening & prioritizing all environmental risks - first application climate change risks



# MS-ACCESS Enabled Risk Tool

**Welcome to the Environmental Risk Assessment Tool**

Welcome to the Environmental Risk Assessment Tool. The Environmental Risk Assessment Tool (ERAT) is a stand-alone management tool. The ERAT is a stand-alone management tool. The ERAT is a stand-alone management tool. The ERAT is a stand-alone management tool. The ERAT is a stand-alone management tool.

**1. Establish the Context**

**2. Risk Identification**

**3. Risk Analysis**

**Step 2. Risk Identification**

2.1 Identify Risk Sources    2.2 Identify Vulnerabilities and Controls    2.3 Identify Risks

Official Risk Sources	
Weather	Extreme Cold
Weather	Extreme Drought
Weather	Extreme Freezing Rain
Weather	Extreme Heat
Weather	Extreme Humidity
Weather	Extreme Rain
Weather	Extreme Snow
Weather	Extreme Wind

Risk Sources for this Assessment		
Environmental	Oil Spill	Adverse
Weather	Extreme Cold	Official
Weather	Extreme Drought	Official
Weather	Extreme Freezing Rain	Official
Weather	Extreme Heat	Official
Weather	Extreme Humidity	Official

**Step 3. Risk Analysis**

3.1 Estimate Consequence and Likelihood    3.2 Calculate Risk Rating

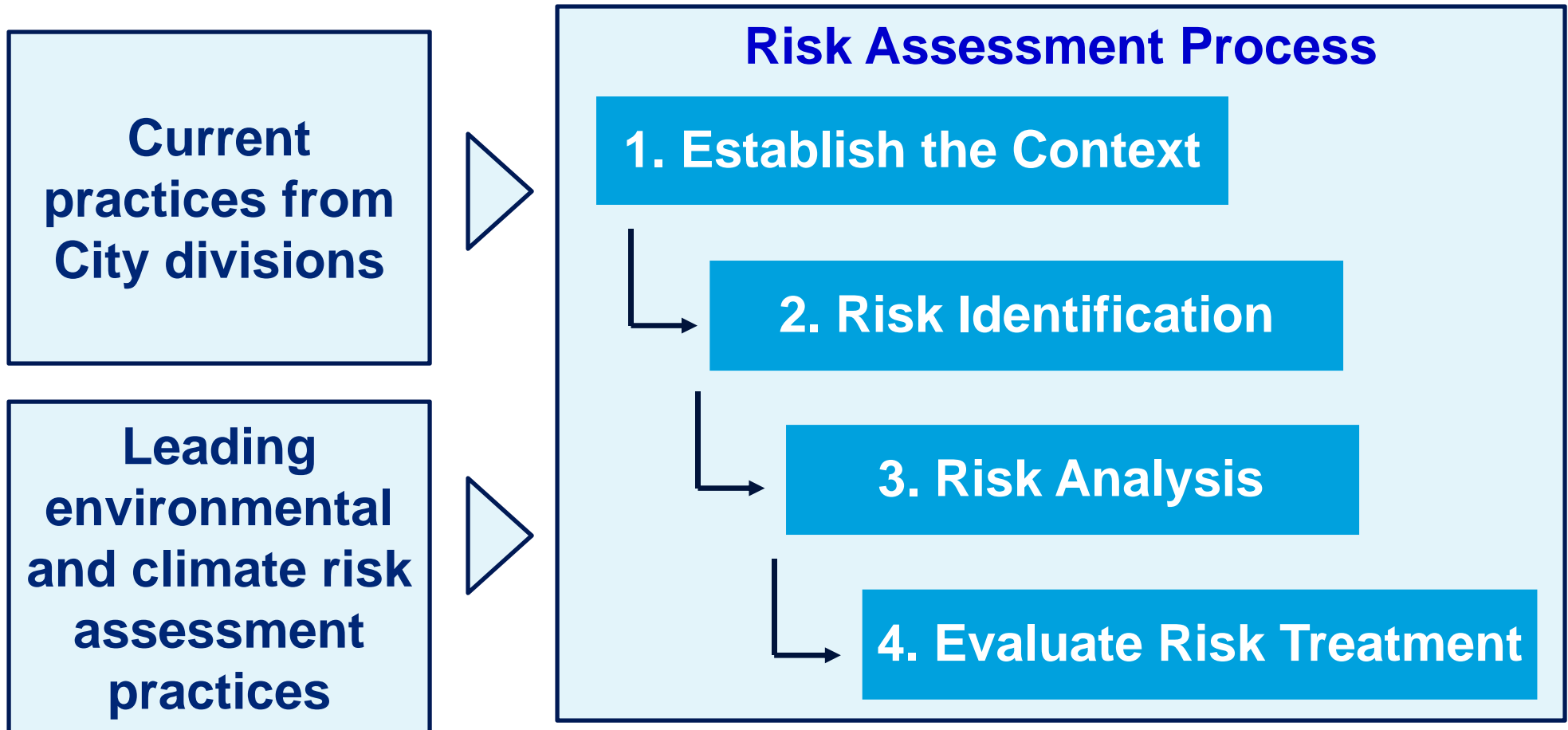
Asset	Risk Scenario	Time Horiz.	Assets	Finance	Logistics	Processes	Services
Under Major Roads	Weather, Extreme Rain, Official: Flooding, Infrastructure Damage	2 Year	High	Medium	High	Medium	Extreme
Under Major Roads	Weather, Extreme Rain, Official: Flooding, Infrastructure Damage	2003	Medium	Low	Low	Low	Low
Under Major Roads	Weather, Extreme Rain, Official: Flooding, Infrastructure Damage	2000	Low	Extreme	Medium	High	High
Under Major Roads	Environmental, Oil Spill, Adverse: road closure, ...	1 Year	Medium	Low	Medium	Medium	Medium
Under Major Roads	Environmental, Oil Spill, Adverse: road closure, ...	2002	Medium	Medium	Medium	High	Medium
Under Major Roads	Environmental, Oil Spill, Adverse: road closure, ...	2050	Low	Low	Low	Low	Low
Under Major Roads	Weather, Extreme Cold, Official: Health Problems, ...	1 Year	High	Medium	High	High	Extreme
Under Major Roads	Weather, Extreme Cold, Official: Health Problems, ...	2003	Low	Low	Low	Medium	Medium
Under Major Roads	Weather, Extreme Cold, Official: Health Problems, ...	2080	High	High	Medium	High	High
Under Major Roads	Weather, Extreme Rain, Official: Flooding, Infrastructure Damage	2 Year	High	Medium	Low	Low	High
Under Major Roads	Weather, Extreme Rain, Official: Flooding, Infrastructure Damage	2003	Medium	Medium	High	Extreme	Medium
Under Major Roads	Weather, Extreme Rain, Official: Flooding, Infrastructure Damage	2080	Medium	Extreme	Extreme	High	Medium

**City of Toronto:**  
**Climate Change Risk Assessment**  
**User and Technical Manual**

Version Number: 1.0

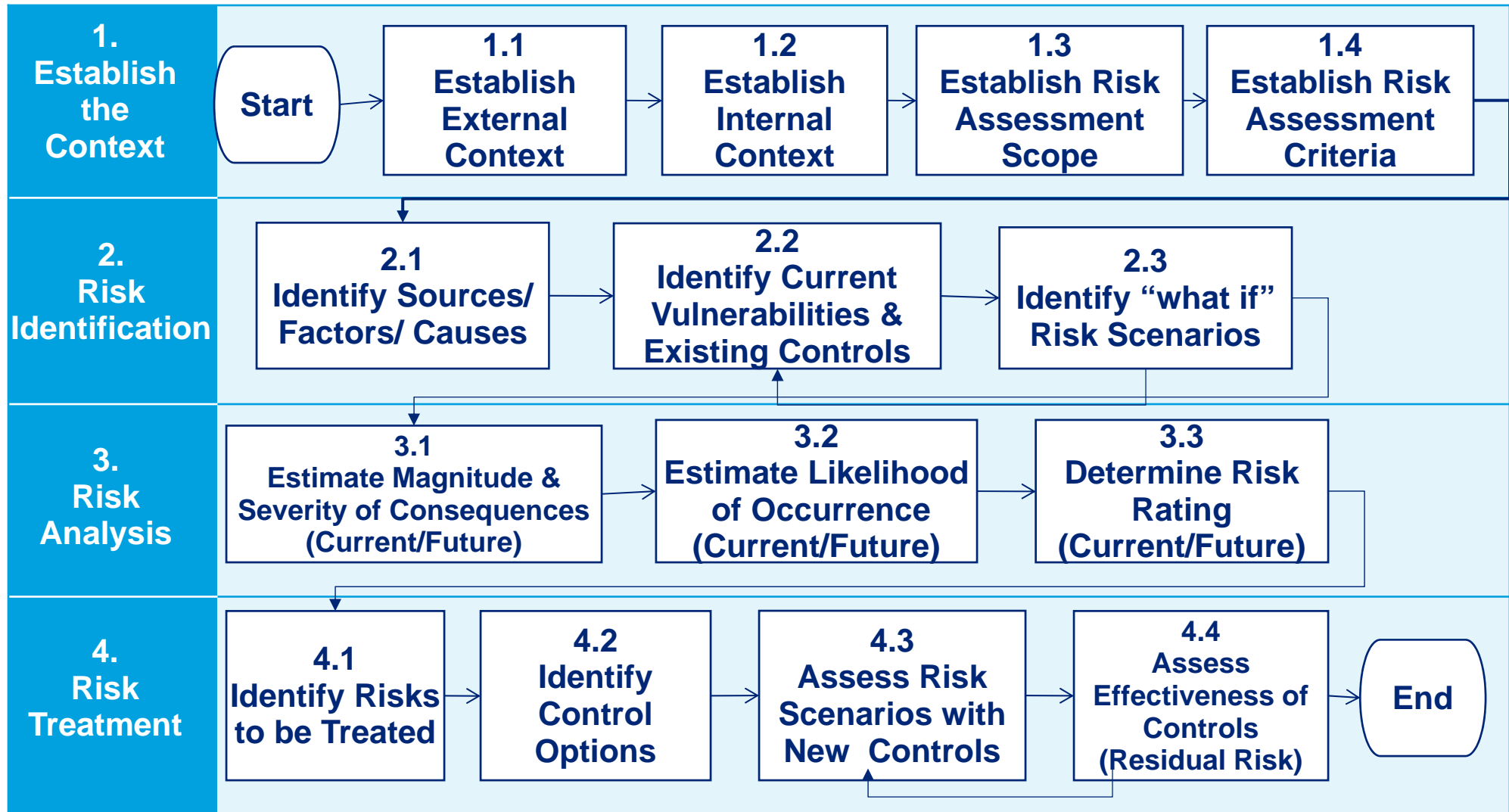
# Climate Change Risk Assessment (CCRA) Tool

- International benchmarking
- Process is based on ISO 31000 & aligns with ISO 14001

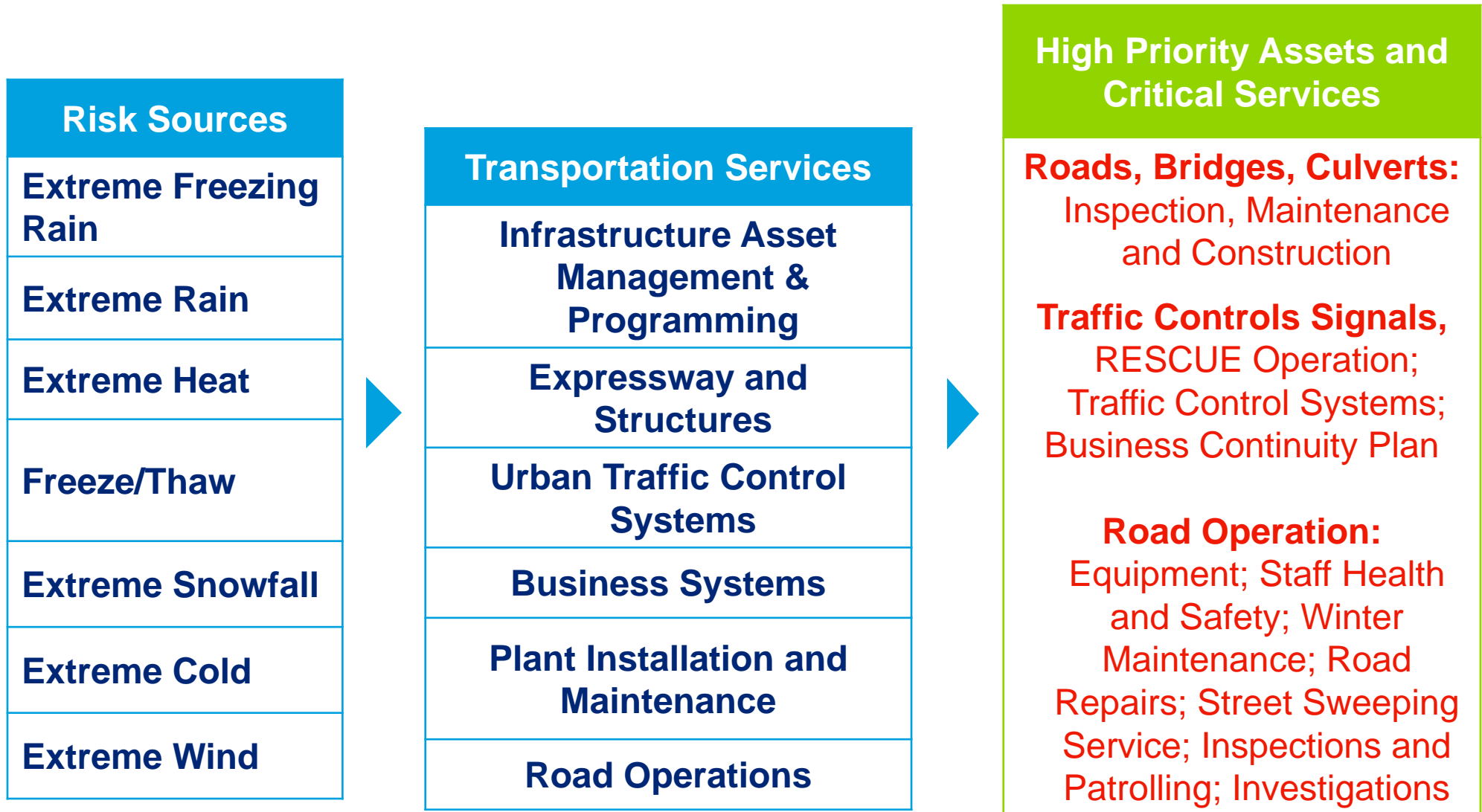


# Climate Change Risk Assessment (CCRA) Tool

The process comprises four (4) steps, each consisting 3-4 sub-steps



# Assets and Services Assessed



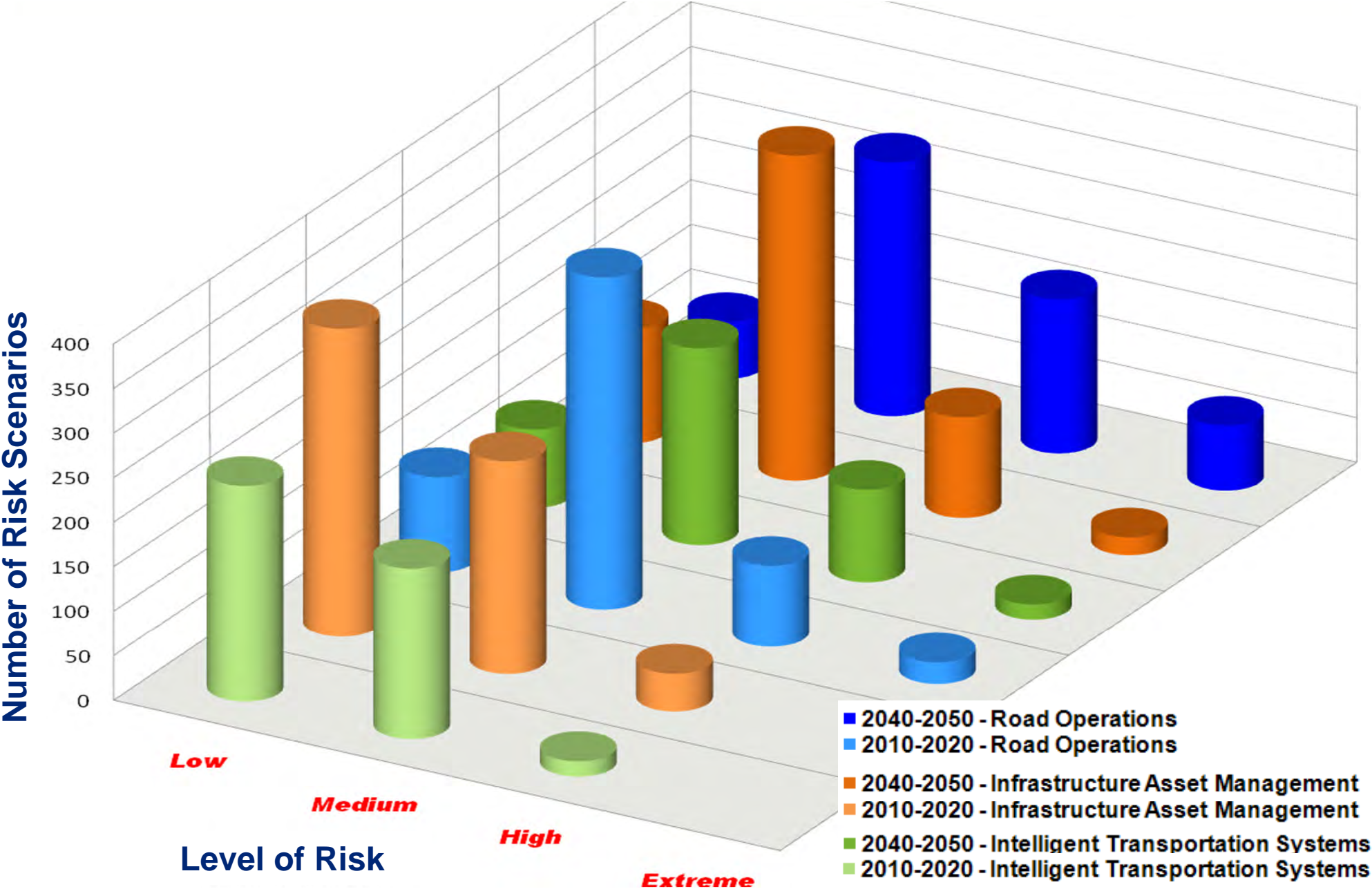


# Transportation Services – Level of Effort

---

- Over **95** high priority ASSETS and critical SERVICES reviewed;
- Performed risk analysis on **7** RISK SOURCES (i.e., climate events);
- Over **1700** RISK SCENARIOS for each of the following time periods **2010-2020** and **2040-2050**;
- **15** half-day RISK ASSESSMENT sessions and **3** half-day RISK TREATMENT sessions; and
- **100** FUTURE CONTROLS for mitigating risk identified and **60** CURRENT CONTROLS already in place.

# Transportation Services Overall Climate Change Risks Results



# Risk Tolerance Definitions – Recommended Text

Risk Level	Description
<p><b>Extreme</b></p>	<p>Primary or critical risks requiring immediate attention. They may have a high or low likelihood of occurrence, but their potential consequences are such that they must be treated as a high priority.</p> <p><b>Deputy City Manager involvement is essential. DCM to follow City protocol for notification of City Manager, Mayor or Council.</b></p>
<p><b>High</b></p>	<p>These risks are classed as significant. They may have high or low likelihood of occurrence, but their potential consequences are sufficiently serious to warrant appropriate consideration.</p> <p>Senior management involvement (e.g. <b>Division Head</b>) is essential. The Deputy City Manager should be informed.</p>
<p><b>Medium</b></p>	<p>These risks are less significant, but may cause upset and inconvenience in the short-term.</p> <p><b>Operations Management should ensure that preventive controls and mitigation plans are established and maintained, and risks are re-assessed at appropriate intervals.</b> The Division Head should be informed.</p>
<p><b>Low</b></p>	<p>These risks are both unlikely to occur and not significant in their impact.</p> <p>Risks should be managed by routine procedures. <b>Employees and contractors should be made aware of risks.</b></p>

# **Benefits of a Climate Change Risk Assessment**

- Identifies nature and severity of risks to assets and services;
- Identifies most obvious vulnerabilities and short and long term adaptation measures that are practical and achievable;
- Identifies areas where more detailed engineering vulnerability analysis is required;
- Identifies opportunities for new designs, retrofitting and rehabilitation;
- Operationalization of climate change;
- Assists in the development of an Adaptation Strategy;
- Ensures consistency and accountability – **due diligence** through a structured, documented approach; and
- Provides a mechanism for communicating climate change risk.



# Communicating Risk is Important!

---

## Benefits:

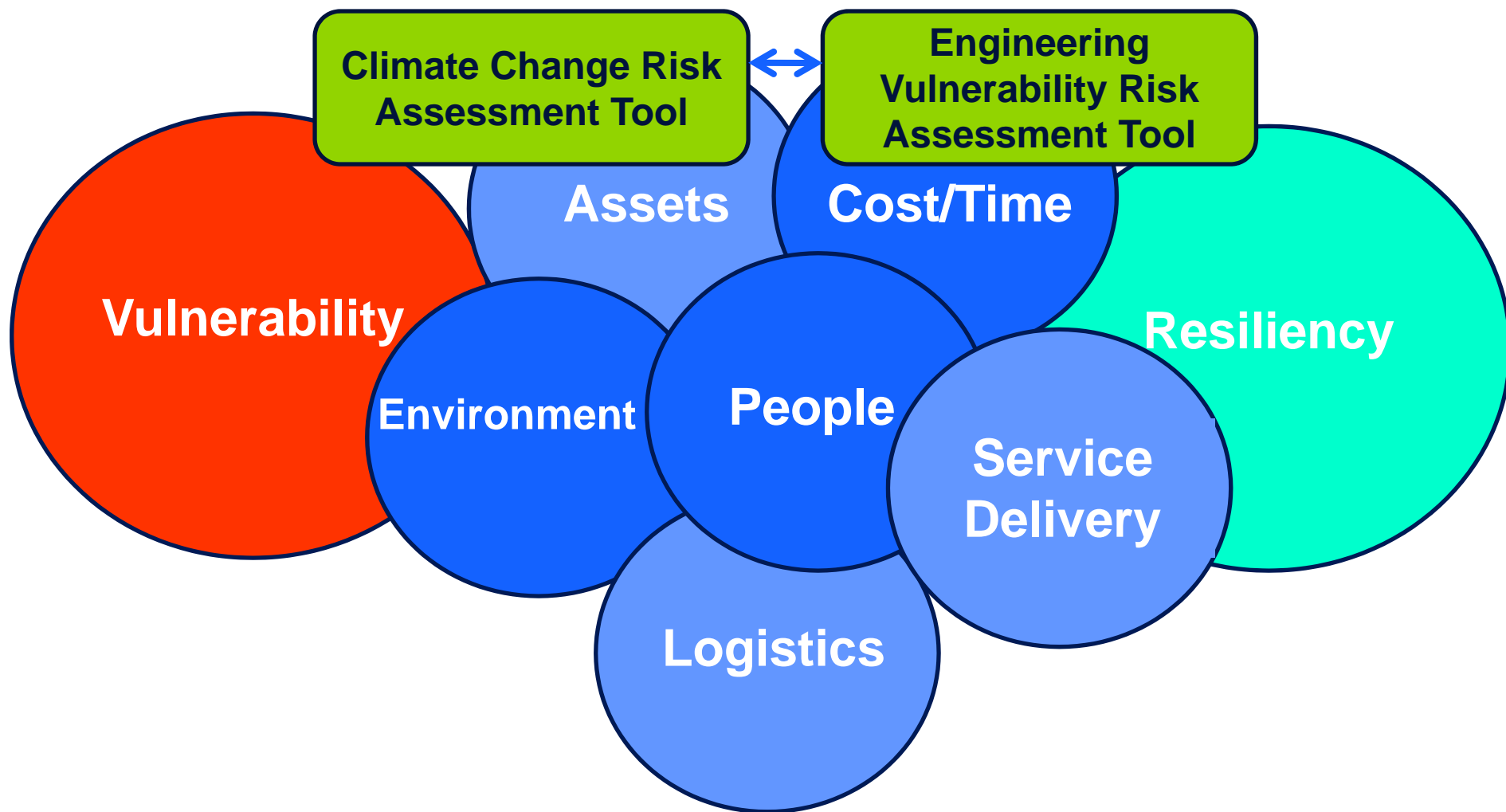
- Shared understanding, goals and informed decisions;
- Builds trust and reduces misconceptions; and
- Public Education and Awareness.

## Not communicating risk can lead to:

- Inappropriate allocation of funds/resources;
- Ineffective management of risks across the organization;
- Staff exposed to legal liability;
- Loss of management credibility;
- Diversion of management attention from important to less important problems; and
- Conflicts with stakeholders.

# Beyond the Storm – Path to Adaptation

---



# Thank You

**Nazzareno Capano, P.Eng.**  
Manager, Operational Planning & Policy  
Transportation Services Division  
416-392-7766  
ncapano@toronto.ca



**Beyond the Storm**



**Building Resilience**