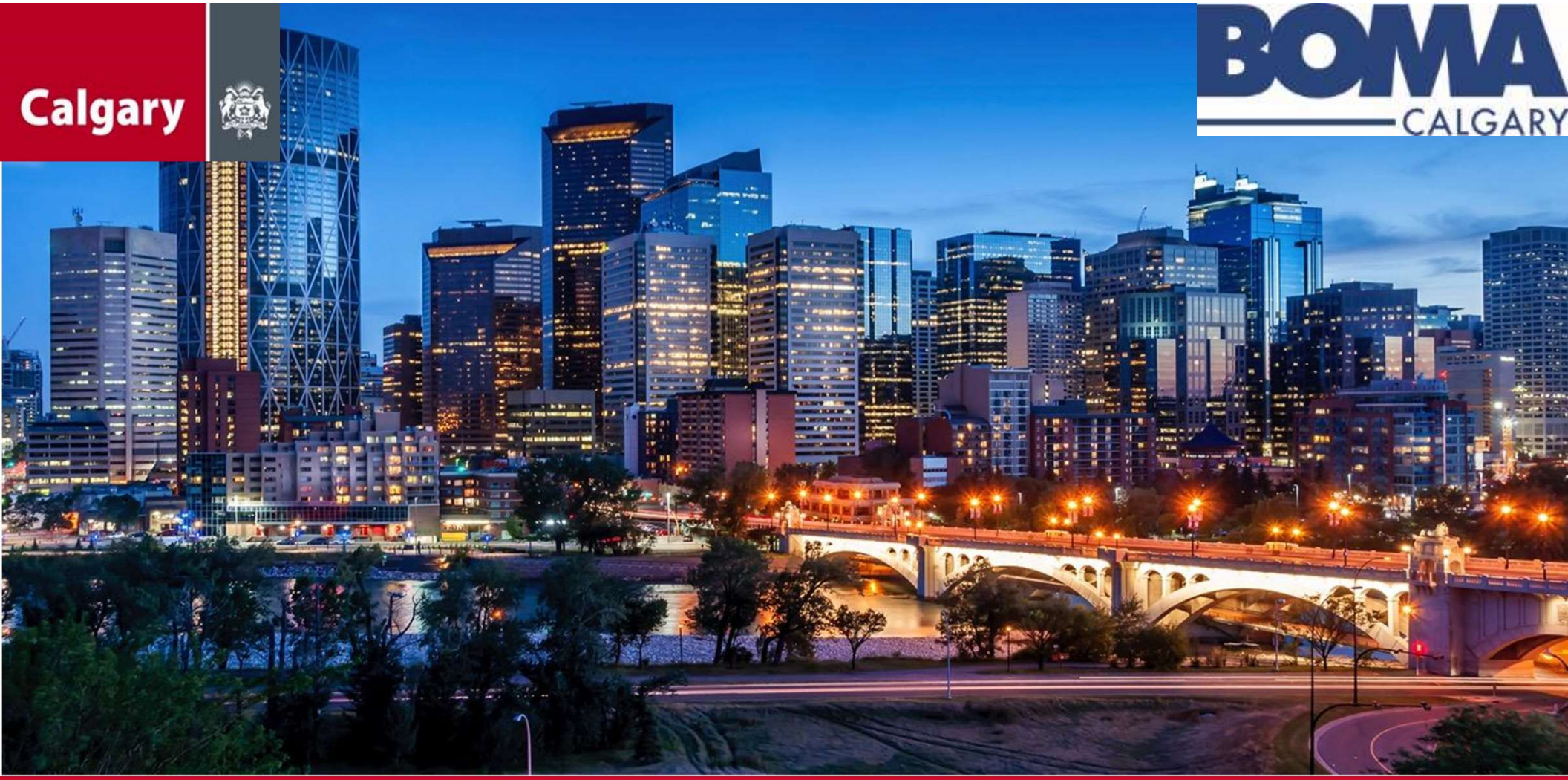

Climate Adaptation for Better Buildings: Climate Risk and Resilience Assessment

February 8, 2023

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Agenda

- Climate change is here
  - Summary of Calgary's 2022 Climate Strategy – Pathways to 2050
  - Reviewing Calgary's Key Climate Hazards
- Introduce Climate Risk and Resilience Assessments
  - How are we implementing this process for public infrastructure
  - How can this be applied for private buildings and commercial space

2022 Calgary Climate Strategy

Vision

Calgary is a resilient city and our decisions are guided by economic, social and climate resilience

Principles

- Innovation
- Equity and inclusiveness
- Integration
- Relevance
- Collective responsibility
- Commitment
- Indigenous knowledge and reconciliations

Goals

IMPROVE ENERGY USE AND REDUCE GREENHOUSE GAS EMISSIONS

Mitigation Plan

- Net zero homes and buildings
- Zero carbon energy transition
- Zero carbon neighbourhoods
- Consumption and waste
- Carbon removal
- Enabling actions

REDUCE CLIMATE RISK

Adaptation Plan

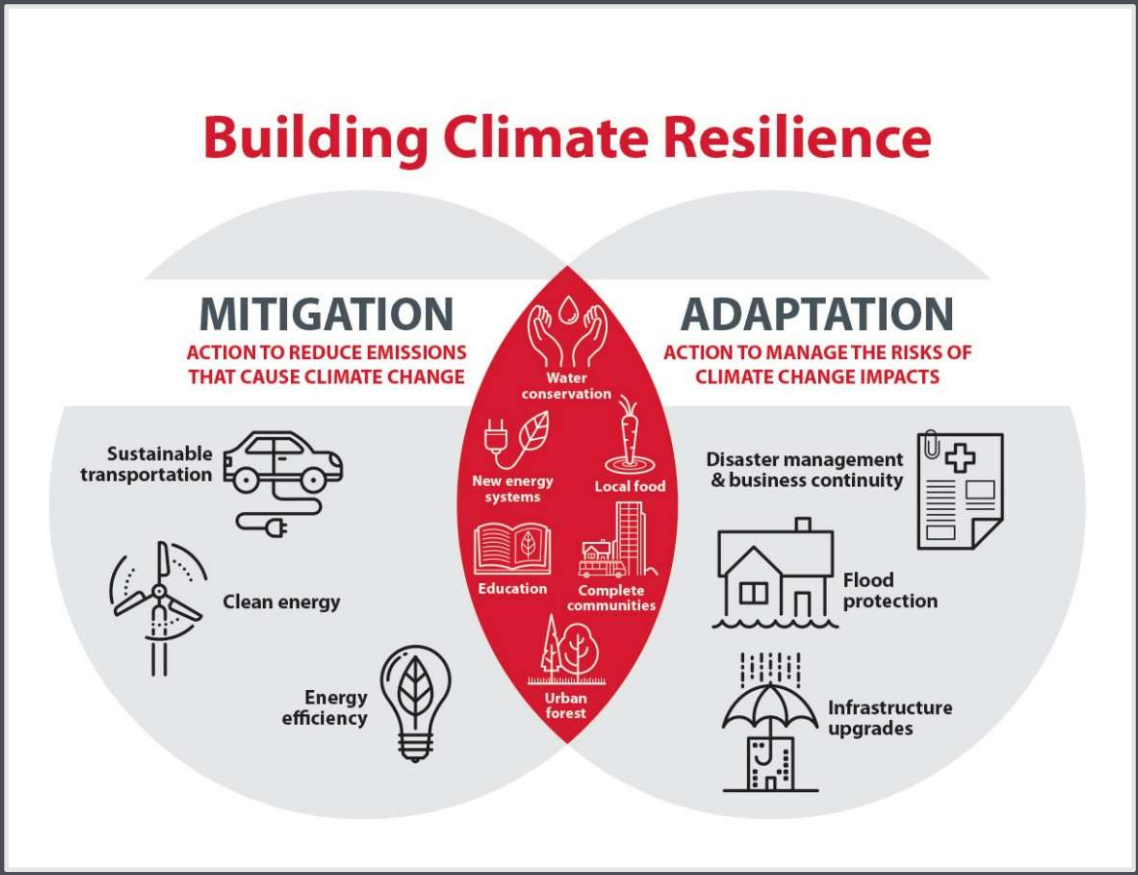
- People
- Built infrastructure
- Natural infrastructure
- Water

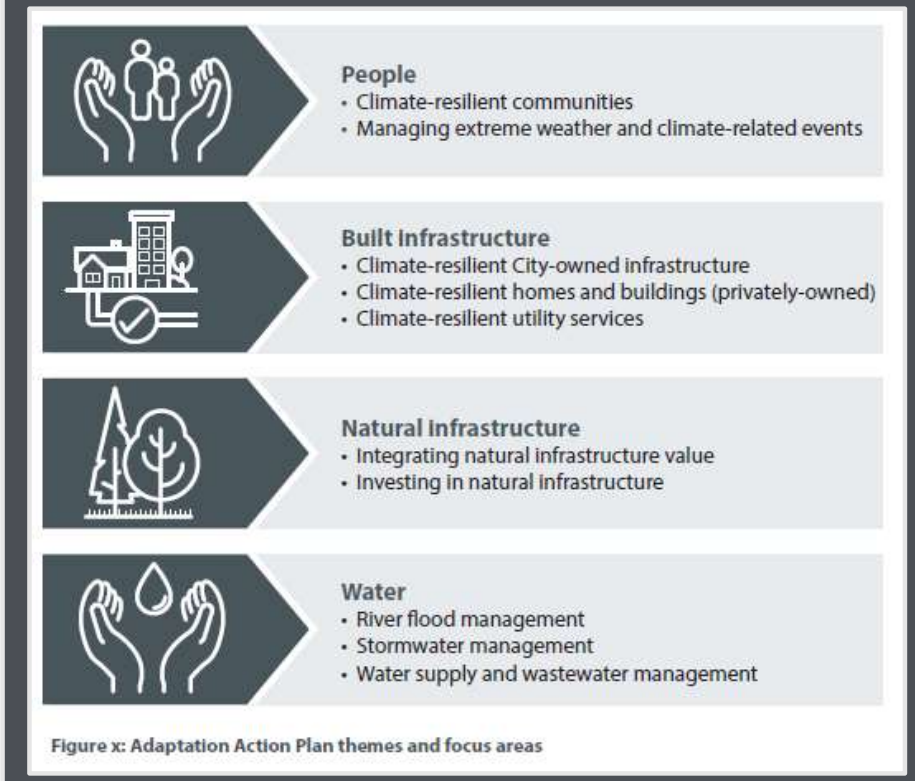
Implementation

- Integrated decision-making
- Community engagement
- Capacity building
- Readiness and timing
- Partnerships
- Funding
- Accountability and transparency

https://www.calgary.ca/environment/climate/climate-strategy.html

Climate Adaptation Action Plan





https://www.calgary.ca/environment/climate/climate-strategy.html

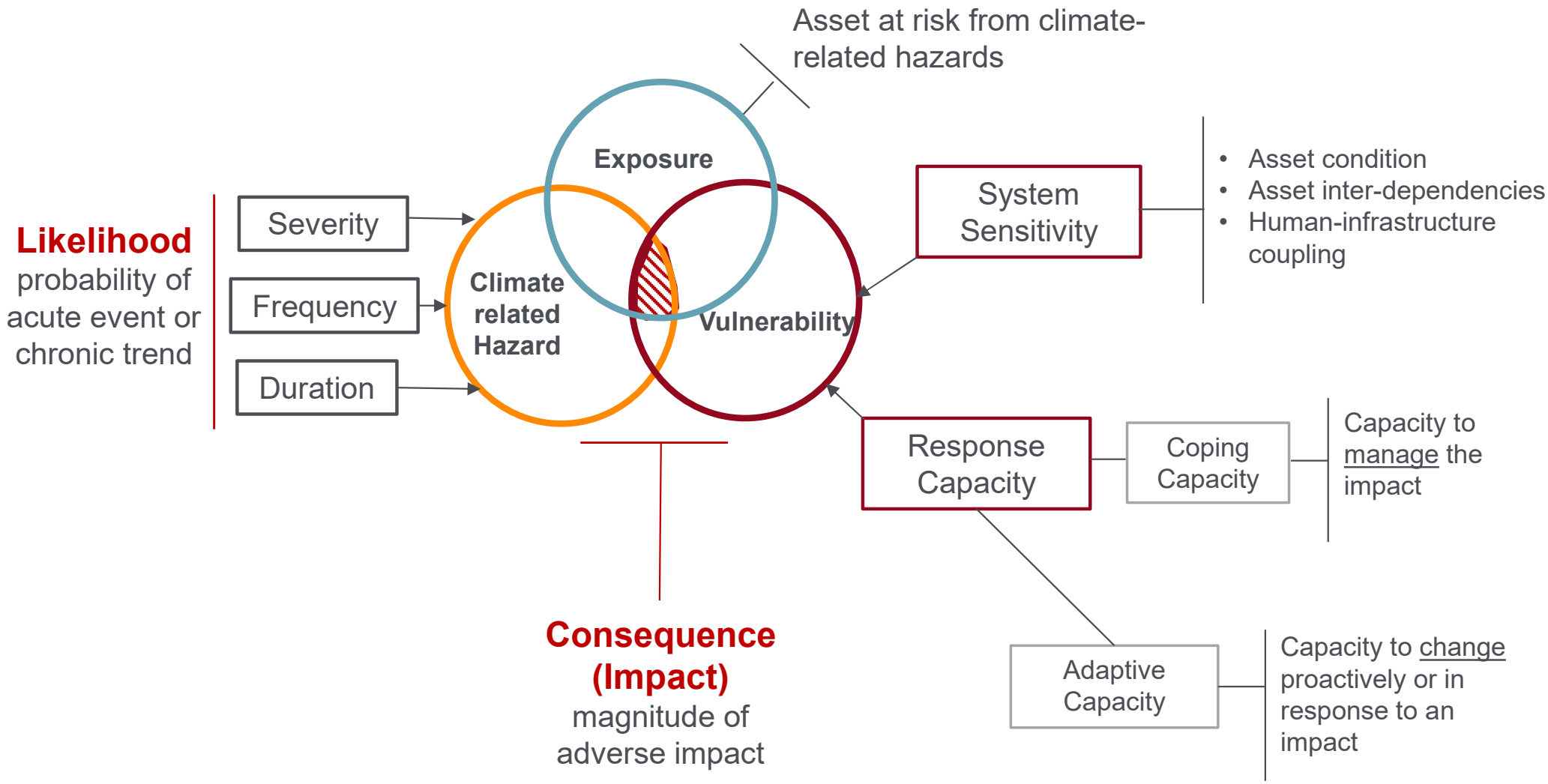
Theme: Built Infrastructure

Goal: Build climate-resilient infrastructure to reduce damage and service disruption from climate impacts.

Key Actions:

- Build capacity through education and training
- Complete Climate Risk and Resilience Assessments on public infrastructure
- Undertake financial analysis (cost-benefit analysis of climate adaptation)
- Integrate climate resilient design into corporate design guidelines
- Integrate climate risk and adaptation into the City's asset management tools
- Develop guidance for climate-resilient retrofits
- Incorporate climate adaptation throughout downtown planning

What is Climate Risk?



Climate Related Hazards

I. **Extreme Heat**

II. Drought

III. Shifting Seasons (higher average temperature

IV. Wildfires (more frequent and intense)

V. Severe Storms (SDHI, high winds, hail)

VI. Winter Storms

VII. River Flooding

- Climate data is <u>one step</u> in addressing climate risk – assessing interactions and implementing adaptation strategies comes next

Climate Hazard:

Increasing Temperatures and Extreme Heat

Summer Projections: Hotter, Drier and Longer

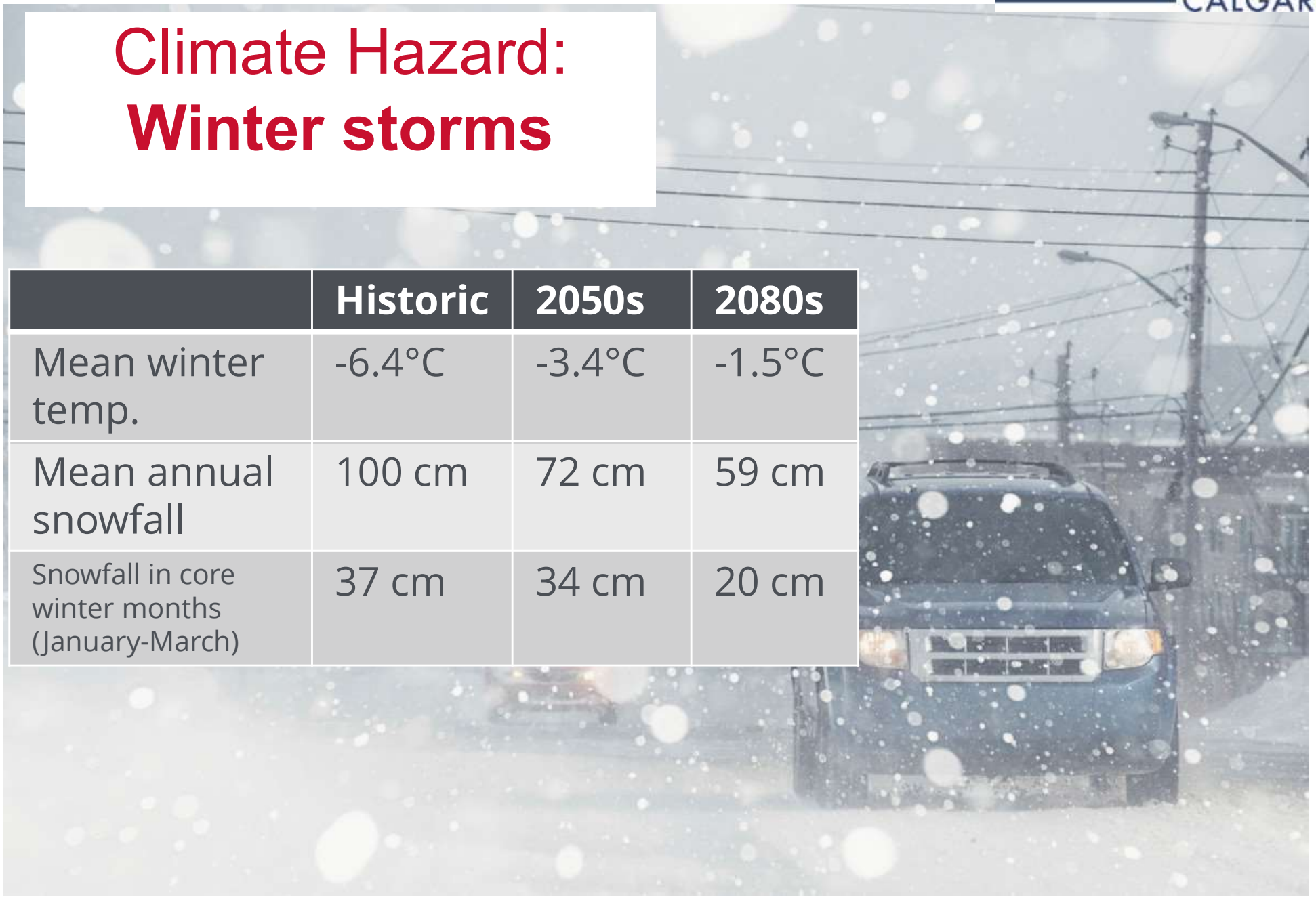
	Historic	2050s	2080s
Mean daily maximum temp.	21.4°C	25.1°C	27.8°C
Number of hot days (≥29°C)	6 days	28 days	49 days
Number of dry days*	37 days	50 days	58 days
July 2.5 % Design Temp	28.0°C	32.2°C	34.8°C

A construction worker stops to cool off in Washington, DC, during a heat wave last July.

***Dry day:** Considers the amount of precipitation received minus the losses from evapotranspiration

Climate Hazard: **Winter storms**

	Historic	2050s	2080s
Mean winter temp.	-6.4°C	-3.4°C	-1.5°C
Mean annual snowfall	100 cm	72 cm	59 cm
Snowfall in core winter months (January-March)	37 cm	34 cm	20 cm



Climate Hazard: **Shifting seasons**

	Historic (average)	2050s (median)	2080s (median)
Last Spring Frost	May 15	May 1	April 22
First Fall Frost	September 17	October 3	October 12

Climate Hazard: **Severe Storms; Hail**

Hail damage in northeast Calgary hits $1.2B, fourth most costly natural disaster in Canadian history

Jason Herring, Amanda Stephenson
Jul 09, 2020 • Last Updated 2 months ago • 4 minute read

Aftermath of June 13, 2020, hailstorm in Saddle Ridge in northeast Calgary. The photo was taken 10 days after the event. PHOTO BY AZIN GHAFFARI/POSTMEDIA

Code minimum: Your home isn't built for extreme weather

Canada's building codes are out of date, inconsistent and ill-prepared for climate change

By Kathryn Blaze Baum and Tu Thanh Ha

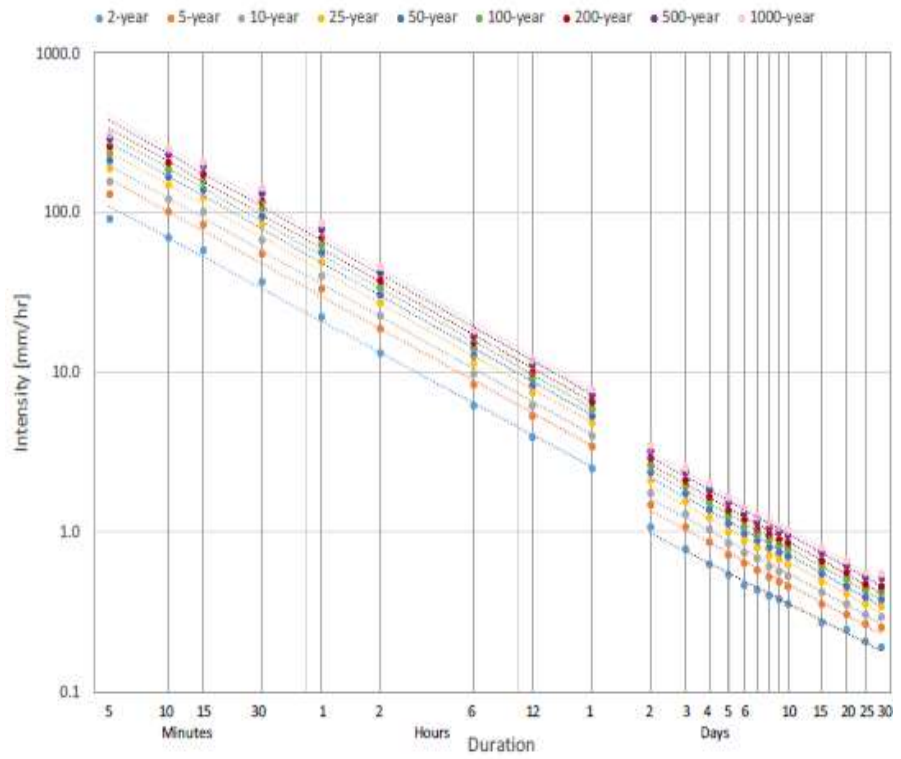
Climate Hazard:
Sever Storms; Short-Duration, High Intensity Storms

Heavy storm brings power outages, road closures and localized flooding to Calgary

OLIVIA CONDON Updated: June 28, 2019

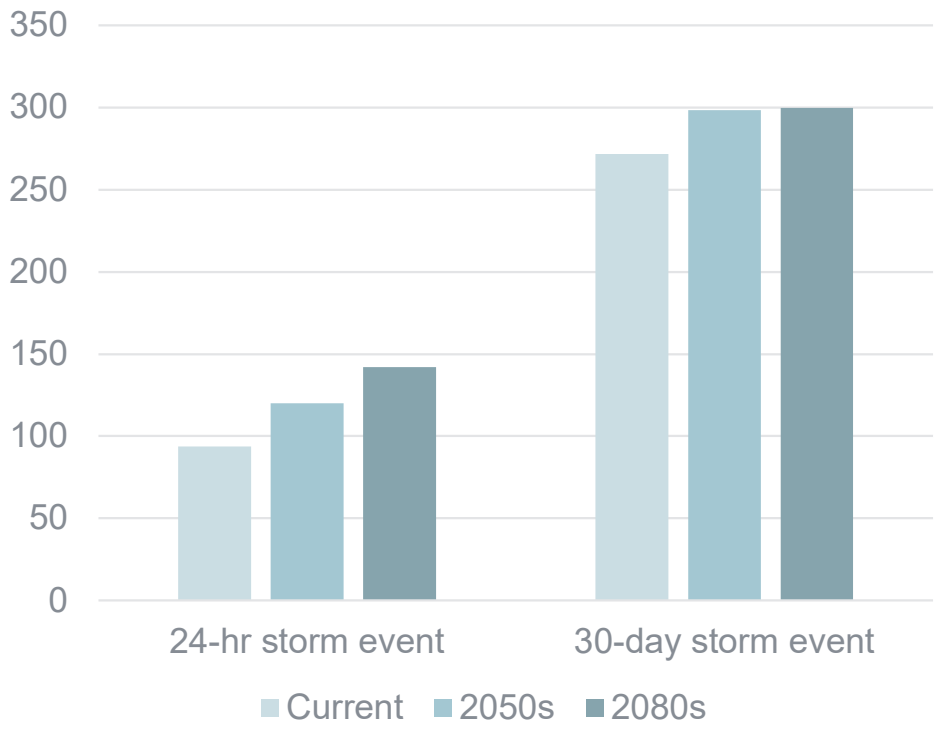
Intensity, Duration, Frequency (IDF) Curves

Precipitation event	2050s	2080s
Short duration	28% ↑	52% ↑
Mid- duration	10-15% ↑	10-20% ↑

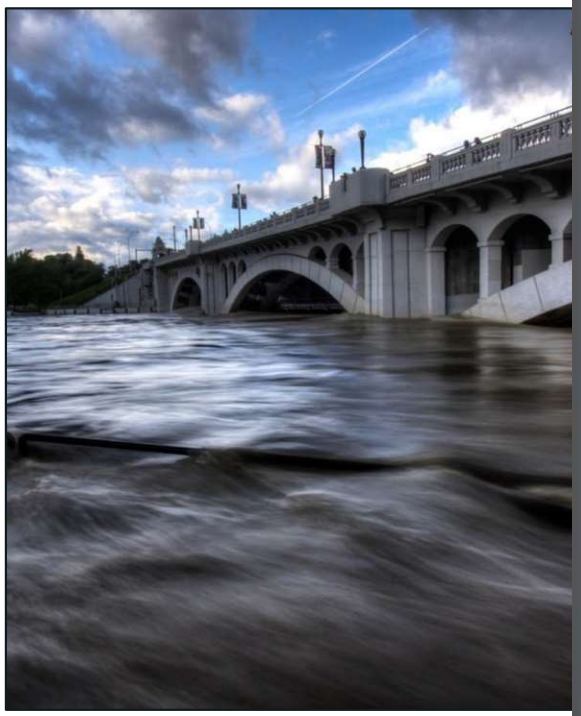


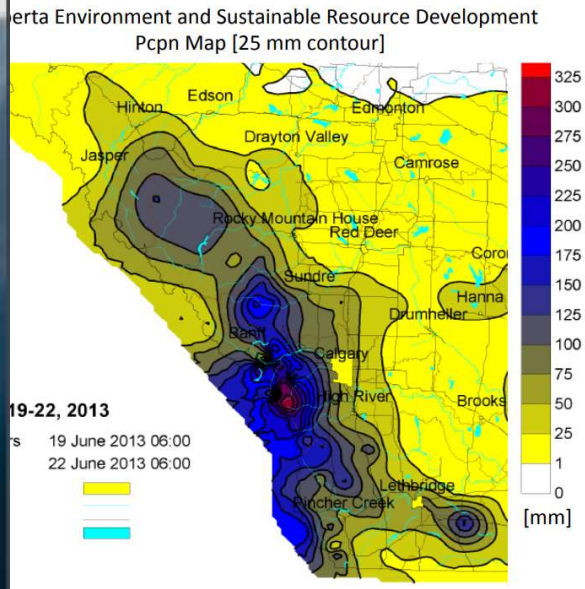
2080s climate projected IDF curve for Calgary

Example of climate projected rainfall volume totals



Climate Hazard: **River Flooding**





https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2019/09/UoW-ICCA-Ahead-of-the-Storm-Flood-Resilience-Guide-English.pdf

Why should BOMA be interested in climate adaptation?

- Financial costs and disruption are increasing due to the impacts of climate hazards
- Concerns about unaffordable or unavailable insurance, with rising deductibles
- Concerns about how climate change may be increasing property damage, and therefore costs, to operators.

Key drivers for property owners and operators

- Meeting EH&S (Environmental, Health and Safety) regulatory requirements
    - EH&S is “Good Business”
- Maximizing return on investment by
    - Minimizing life cycle expenditures;
    - Minimizing risk of damage;
    - Retaining tenants;
    - Maintaining reputation, and
    - Maximizing attractiveness of a property
- Protecting your assets!

Managing Climate-related impacts

How can we manage climate-related impacts?

- First, we need to know what they are, or may be

So, do a risk assessment…

What is a Climate Risk and Resilience Assessment?

- Standardized risk management approach (ISO 14001)
- Considers the specific **climate hazards**
- **Impacts** to the asset, the natural environment, and human well being
- Considers construction and functional **life span**
- **Financial** considerations
- Opportunities to reduce risk, reduce long-term cost, and **build resilience**
- Develops an asset **specific risk score**

- **PIEVC Program – Institute for Catastrophic Loss Reduction and the Climate Risk Institute https://pievc.ca/**

When should a Climate Risk and Resilience Assessment by completed ?

Recommended Thresholds:

- **Value:** >$10 million
- **Criticality:** Asset provides a critical service
- **Vulnerability:** Asset serves a vulnerable population
- **Opportunity:** Significant opportunity to reduce climate risk to vulnerable systems
- **Lifespan:** Asset is intended to function for > 30 years

Or – to protect your assets, your tenants, and investments!

Step 1: Define Asset and Establish Scope of Assessment

- **Overview and Location:** What is included? Where is it?

- **Asset under Assessment:** including all components, phasing, and interactions with the external environment
  - Built assets
  - Human wellbeing – construction, occupants, operators
  - Natural environment

- **Assessment Timescale:** what is the anticipated life span of the building?

Step 2: Identify Climate Related Hazards

- **Identify which hazards are relevant to the building. Add additional where necessary.**

Step 3: Identify Potential Climate Related Impacts

- **Identify which potential climate impacts may affect the building components;** built infrastructure, natural environment, and human wellbeing.

Climate hazard	Asset affected	Potential climate related impacts

Step 4 – Risk Analysis

Risk Classification	Rating	Description of Risk	Recommended Risk Treatment
Slight	1-2	• No permanent damage • No service disruption	**Tolerable:** risks do not require further consideration
Low	3, 4, 6	• Minor asset or system damage • Minor service disruption may occur • Minor repairs or restoration	**Monitor:** controls or coping strategies recommended
Medium	5, 7-9	• Limited damage to asset or system • Brief service disruption may occur • Minor repairs and some equipment replacement or restoration	**Requires some attention**: some controls required to reduce risk levels. Monitor risk for changes over time.
High	10-15	• May result in significant damage, loss, or require complete replacement • Lengthy service disruptions may occur	**Requires much attention:** high priority control measures required.
Extensive	20-25	• May result in significant damage, loss, or require complete replacement • Lengthy service disruptions may occur, alternate service delivery may be required	**Not acceptable:** significant controls required.

Step 5 - Resilience Recommendations

Risk Evaluation and Recommendations to Improve Resilience

- Incorporate resilience/adaptation measures into retrofits and renovations
- Management or response related resilience and recovery actions
- Measures that may be implemented at a future date

- What is your risk tolerance, as a building owner or operator? What kind of level of service disruption is acceptable, now, and in the future?

Adaptation measures may reduce risk across multiple systems, and at multiple timeframes

Step 6 – Cost Benefit / Return on Investment Analysis

Evaluate Recommendations for Climate Adaptation

- Develop a cost-benefit analysis to evaluate measures against the cost of damage, recovery, loss of service – including measures which can be achieved through operations and maintenance protocol

- Incorporate climate related risk in the asset risk register

Not just an Assessment Process!

Informs decision making

- Understanding the risks is a key first step to adapting and reducing risk
- New and existing buildings and sites

The intent is to build more resilient infrastructure, and thus a more resilient community.

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