

National Research Council Canada's Climate Resilient Buildings & Core Public Infrastructure Project

July 24th, 2017

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Climate Resilient Buildings & Core Public Infrastructure

Purpose:

To develop decision support tools, including **codes, guides and models** for the design of resilient new buildings and CPI and rehabilitation of existing buildings and CPI in key sectors to ensure that existing and future **climate change** and **extreme weather events** are addressed

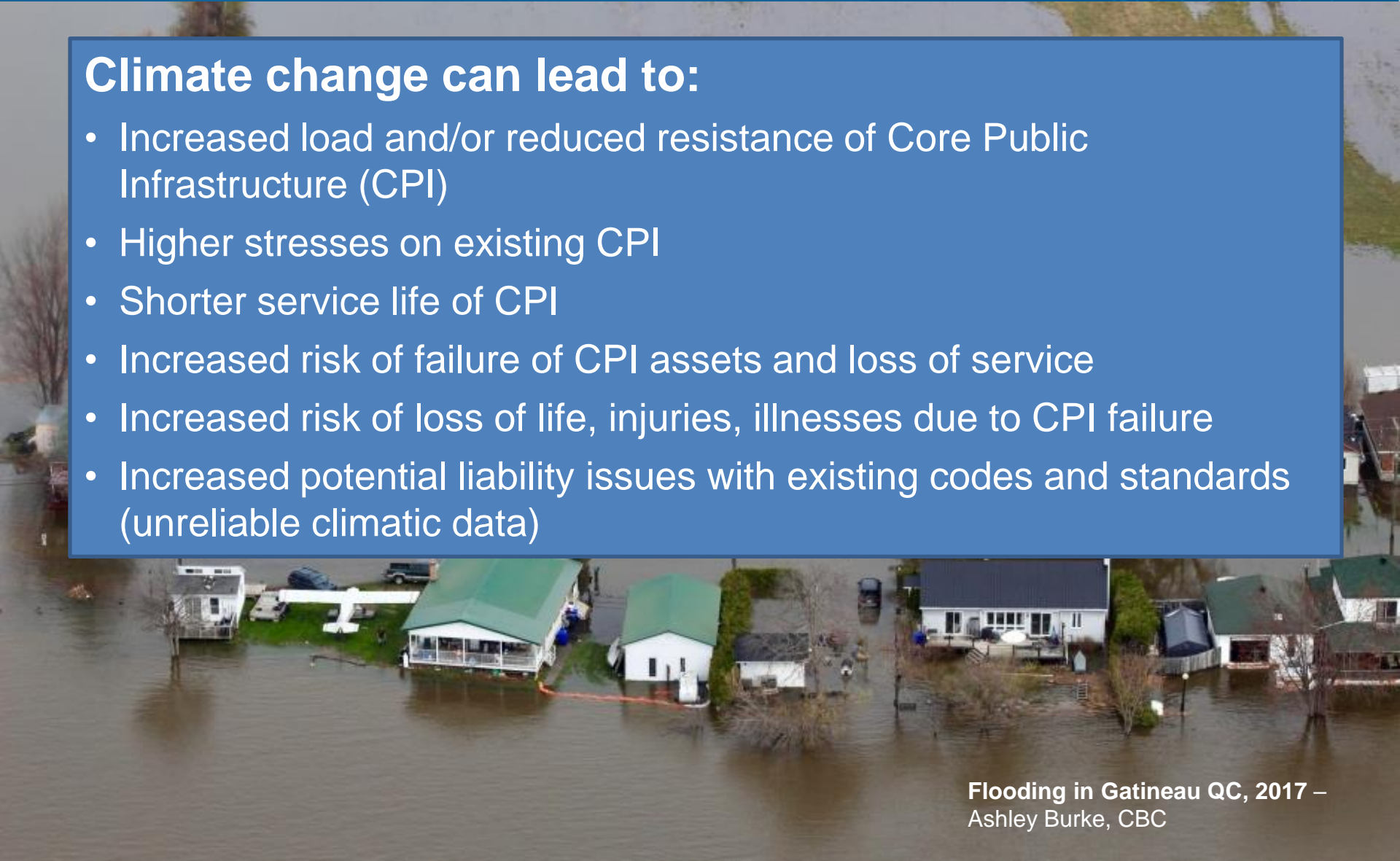
Project Overview

- Funding from Infrastructure Canada
- \$40M over 5 years
- Pan Canadian Framework on Clean Growth and Climate Change
- NRC expertise
 - Model Codes
 - Infrastructure
 - Building Science
- Environment and Climate Change Canada
 - Historical data
 - Climate modeling and projections

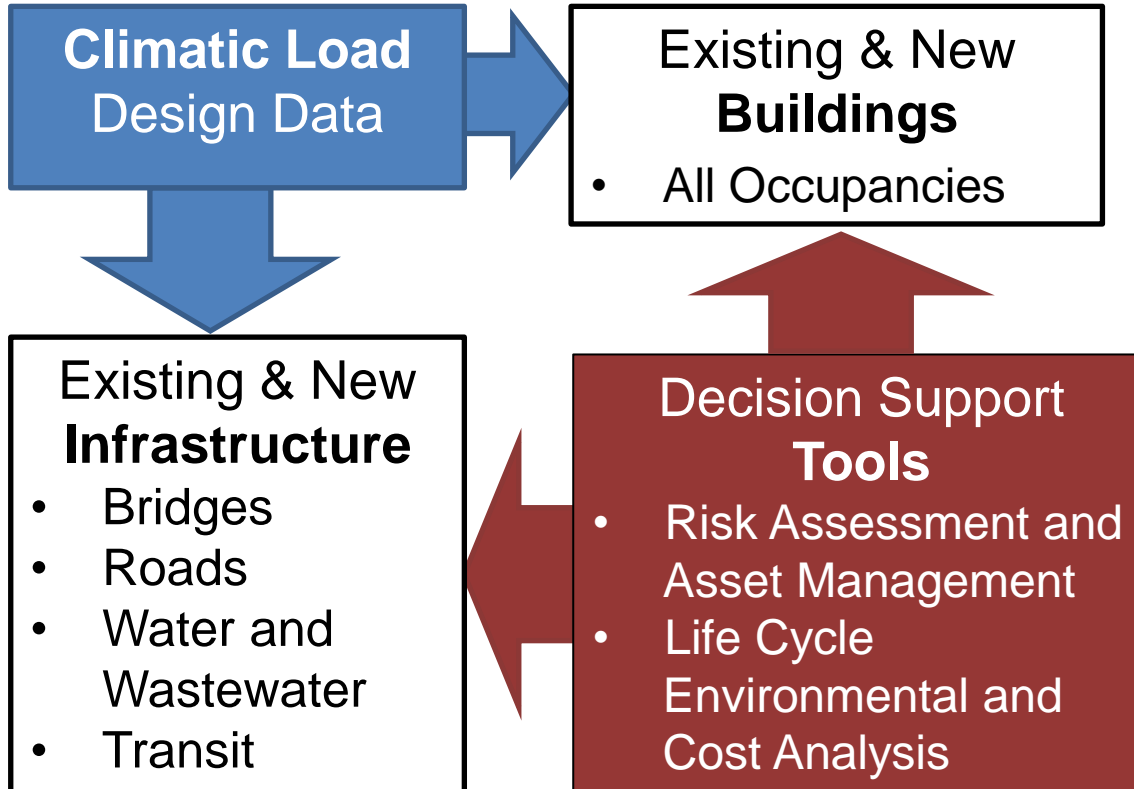
Background: Climate Change

Climate change can lead to:

- Increased load and/or reduced resistance of Core Public Infrastructure (CPI)
- Higher stresses on existing CPI
- Shorter service life of CPI
- Increased risk of failure of CPI assets and loss of service
- Increased risk of loss of life, injuries, illnesses due to CPI failure
- Increased potential liability issues with existing codes and standards (unreliable climatic data)



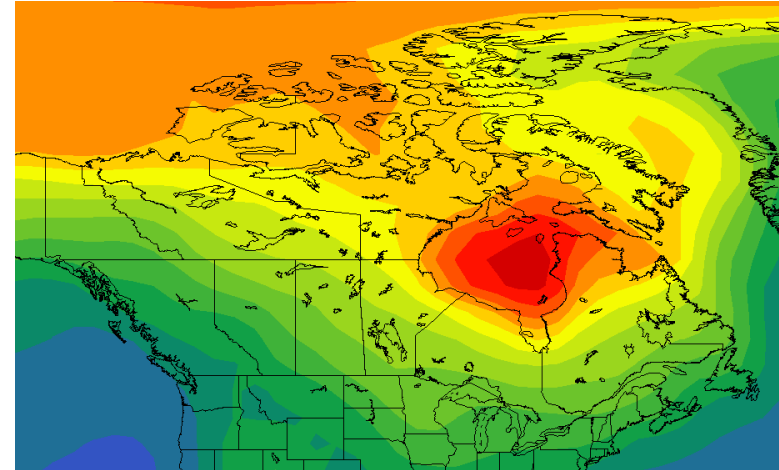
Priority Areas



Climatic Loads

Scope and Key Deliverables

- Projected climate data
- Climate extremes: temperature, precipitation, wind & flood
- Accounting for uncertainties in climate models & scenarios and in performance of Buildings & CPI



Sample map of winter temperature change - ECCC

Key Deliverables

- Development of new climatic data for Canada's National Building Code (NBC), and approach for implementation
- Development of new climate data and loads for Canadian Highway Bridge Design Code
- Development of extreme data

Buildings

Scope and Key Deliverables

- New Build and Retrofit
- Residential, Commercial, Institutional, Industrial



Fort McMurray Wildfire, 2016 - Terry Reith, CBC

Key Deliverables

- Climate change provisions for structural design of buildings for implementation in the Canadian National Building Code (NBC)
- Code-ready National Guide for Wildland Urban Interface design
- Guidelines for preventing the overheating of buildings (with Health Canada)
- Design guide for roof resilience to extreme wind conditions
- NBC provisions for flooding resilience
- Guidelines for retrofit of existing building envelope

Bridges

Scope and Key Deliverables

- Urban and rural bridges
- All highway classes
- New and existing



Ice jam damage to bridge, Torch River, Manitoba 2017
- Regional Municipality of Torch River

Key Deliverables

- Climate change provisions for bridge design for implementation in the 2024 Canadian Highway Bridge Design Code (CHBDC)
- Guidelines for climate change adaptation of existing bridges under changing climate hazards
- Climate change adaptation technologies including high performance concrete, and structural monitoring

New and Existing Roads

Scope and Key Deliverables

- Complete pavement structure – system and components (layers)
- Urban and rural roads
- Flexible (i.e. asphalt concrete) and rigid (i.e. Portland cement concrete) roads
- Existing and future roads



Washout of Highway and Railway, Peace River Country, B.C. 2016

- B.C. Ministry of Transportation and Infrastructure

Key Deliverables

- Guide for adaptation of existing roads to climate change (FY 20/21)
- Field trial of pervious concrete pavement

Water and Wastewater Infrastructure

Scope and Key Deliverables

- Water supply systems such as treatment plants and distribution networks
- Wastewater systems such as sanitary, storm and combined sewer networks



Effects of inadequate storm water drainage, Toronto 2013
- Frank Gunn, Canadian Press

Key Deliverables

- Guidelines for adaptation of existing stormwater systems to climate change

Rail Transit

Scope and Key Deliverables

- Urban rail transit systems: subways, street cars, light rail, Vancouver's Skytrain
- Fixed infrastructure only – no vehicles



Australia 2013 – Australian Transport Safety Board

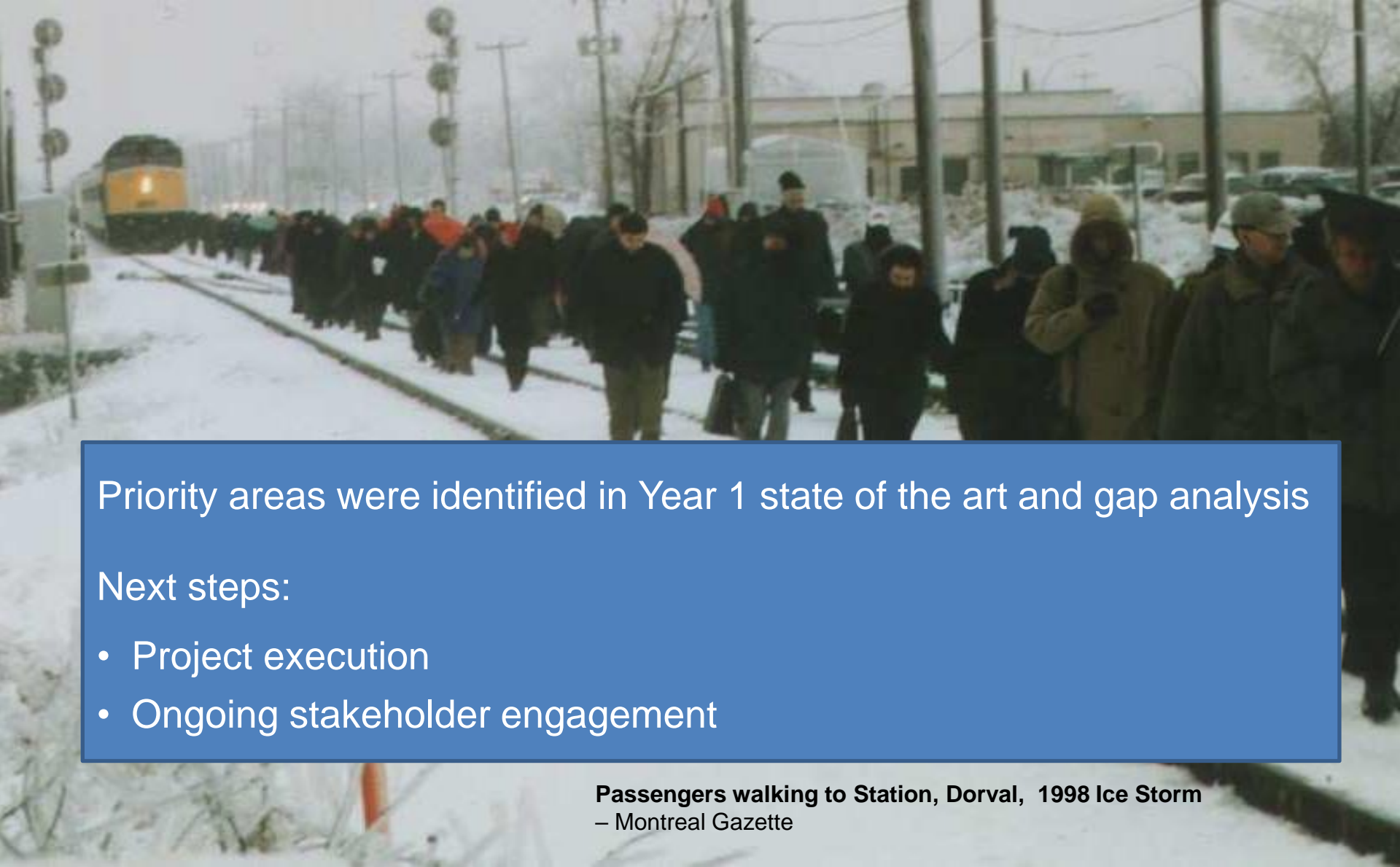


Toronto Flood 2013 – Winston Neutel Canadian Press

Key Deliverables

- Guidelines for adapting underground rail systems to prevent flooding
- Guidelines for improved track design and monitoring protocols
- Guidelines for long-term monitoring of transit tunnels, electrical equipment assemblies and other non-track transit infrastructure
- Decision support protocols for transit owners to justify investment in climate change adaptation

Next steps



Priority areas were identified in Year 1 state of the art and gap analysis

Next steps:

- Project execution
- Ongoing stakeholder engagement

Passengers walking to Station, Dorval, 1998 Ice Storm
– Montreal Gazette