



The Municipal Adaptation and Resiliency Service (MARS)

Webinar 5

Building Code & Land Use Planning in a Changing Climate



1 MARS WEBINAR SERIES

MARS TRAINING SERIES OVERVIEW



9 webinars

- Webinar 1: Introduction to Municipal Climate Adaptation and Climate Projections for Great Lakes Region
- Webinar 2: Portal tour
- Webinar 3: Financial and Legal Implications of Climate Change for Municipalities
- Webinar 4: Transportation Infrastructure

Webinar recordings stored on MARS Community of Practice (CoP) Portal:

<https://www.ccadaptation.ca/en/mars>

SECTOR SPECIFIC WEBINARS (5-8) OVERVIEW



- Webinar 5 – Building Infrastructure and land use planning, **Today**
Guest Speakers: Brian Kyle, Chair, PIEVC, XTN ltd
Barb Hodgins, Town of Ajax

- Webinar 6 – Vulnerable Populations, **March 6th**
Guest Speaker: Karina Richters, City of Windsor

- Webinar 7 – Urban Natural Systems, **March 20th**
Guest Speaker: TBD

- Webinar 8 – Water / waste water / storm water, **March 27th**
Guest Speaker: John Nemeth, Region of Peel

- Webinar 9- (Not sector specific), Communication and Collaboration, **April 10th**
Guest Speaker: Dr. David Pearson, Laurentian University

Webinar 5 Overview



1. MARS Training Series Overview
2. Introduction, Kevin Behan, Clean Air Partnership
2. **A)** Impacts of climate change and extreme weather on municipal building infrastructure
B) Presentation by: **Brian Kyle**, Chair of the PIEVC Buildings Expert Working Group
3. **A)** City land-use planning in a changing climate
B) Presentation by: **Barb Hodgins**, Senior Policy Planner, Town of Ajax
4. Resources
5. Portal discussion

2 Municipal Building Infrastructure and Land Use Planning in a Changing Climate



MUNICIPAL INFRASTRUCTURE IN A CHANGING CLIMATE



- Exposure to weather extremes not accounted for in original design; construction occurred on assumption that past climate extremes will represent future conditions
- Shorter life span and reduced performance
- Increase in maintenance and operating costs
- Disruption to municipal operations and public safety compromised
- Severe and unanticipated economic losses because of damaged or overwhelmed infrastructure
- Climate related risks further aggravated by:
 - Aged infrastructure that has exceeded normal service life
 - Frequent co-location and interdependency
 - Decline in public spending
 - Ballooning populations

Precipitation/ flooding – Building effects



Increase in the severity and frequency of:

- Uncontrolled moisture accumulation in structural materials, reducing building structural integrity through mechanical, chemical and biological degradation
- Deterioration of exterior building facades
- Premature weathering of input materials (i.e.: wood decay and metal corrosion)
- Adverse impacts on effectiveness of thermal insulation
- Efflorescence, fractures and spalling of foundations and masonry systems



Snow and Ice Variability - Buildings



Increase in the severity and frequency of:

- Facility power outages, loss of electric heat sources
- Challenges to design safety margins; building structure collapse due to increased in snow pack, wet snow
- Accelerated freeze thaw cycles causing:
 - Premature aging of porous materials, (i.e.: stone, brick masonry and mortar)
 - Water damage from ice-damming on roofs
 - Break-up of bonded materials and facades
 - Challenges to concrete integrity

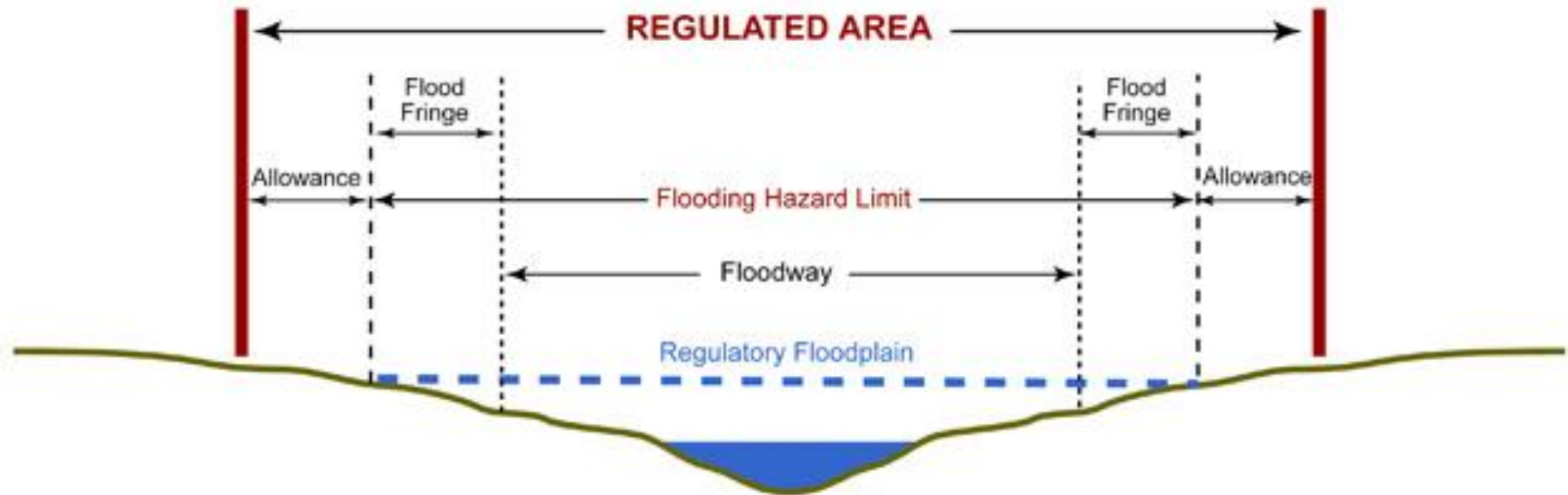


Precipitation/flooding/snow/ice Land Use Planning Considerations



- In land use planning, adaptation options area limited by the geographical location and scale of development
- Include policy statements in the development plan that commit to minimizing the effects of flooding
- Locate new developments away from high risk areas
- Ensure planning accounts for future flooding trends, designate such areas recreational or agricultural
- Use secondary plans as tools to ensure proper drainage
- Use zoning bylaws to ensure adequate greenspace

Planning Act and Conservation Authorities Act



Hotter, drier summers and heat waves– Building effects

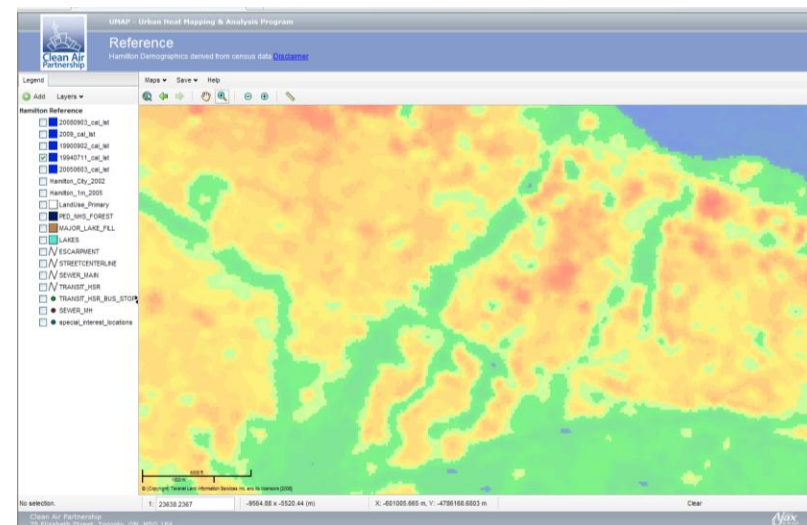


- Damage to building foundations due to ground shrinkage, drying out of clay
- Integrity of building structure compromised by lack of moisture in concrete
- Premature weathering of building materials
- HVAC systems unable to support facility demands, causing; thermal discomfort, increases in maintenance costs and energy consumption (GHG emissions)
- Increase in electrical transformer failure
- Increase in Solar UV radiation- alters dimensions of materials, cracks and fissures polymer-based materials, i.e.: vinyl cladding, window frames, sealants and gaskets
- Heat related risks exacerbated among vulnerable urban populations and residents high rise residential buildings

Hotter, drier summers and heat waves— Land use planning considerations



- Use soil surveys to inform development plans when deciding on land use designations
- Ensure agricultural designations in development plans account for changing soil conditions
- For rural developments, wells may not be possible for water provision, consider development plan policies that direct developments to existing centres with preexisting infrastructure
- Consider development plan policies to address risk of fire
- Use LANDSAT thermal imagery to map hot spots in your jurisdiction
- Use Official Plan policies to reduce urban heat islands
- Orientation of new developments



Wind & Tornadoes – Building effects



Increase in the severity and frequency of:

- Loss or failure of roof panels
- Facility power outages affecting electric heating and cooling sources
- Challenges to building envelope (exterior walls, foundations, roof, windows and doors)
- Deteriorated or damaged built infrastructure located in areas susceptible to high winds
- Land use consideration – use tornado mapping provided by Environment Canada when developing land use plans

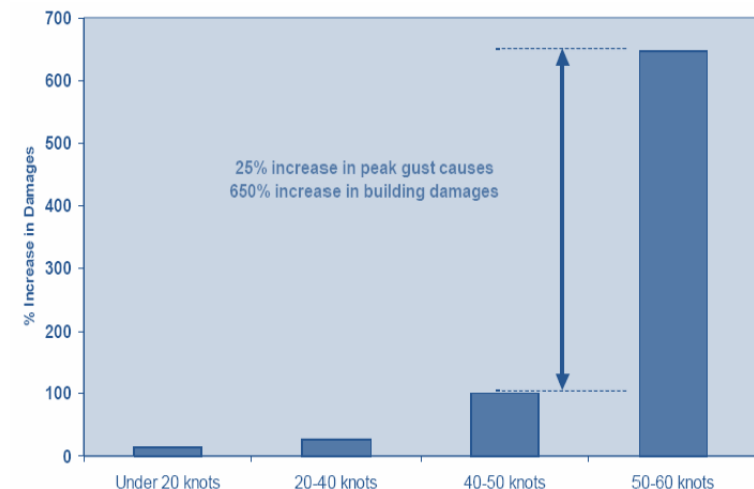


Fig. 2. Incremental building loss claims as a function of peak gust speed for Australia (Insurance Australia Group (IAG)).

Source: Coleman (2002)

4 Vulnerability of Building Infrastructure to Climate Change in the Ontario Great Lakes Region

Brian Kyle

- Chair of the Public Infrastructure Engineering Vulnerability Committee(PIEVC), Buildings Expert Working Group
- Director of Operations at XTN Sustainable Life-cycle Asset Management Consulting Ltd.

5 Integrating climate adaptation considerations into land-use planning in the Town of Ajax

Barb Hodgins

- Senior Policy Planner, Town of Ajax

Resources: Building Infrastructure



- Green Building and Climate Resilience: Understanding impacts and preparing for changing conditions
<http://www.usgbc.org/Docs/Archive/General/Docs18496.pdf>
- Weathering of Building Infrastructure and the Changing Climate: Adaptation Options
http://publications.gc.ca/collections/collection_2012/ec/En57-41-11-2007-eng.pdf
- Climate Change Vulnerability Assessment for Infrastructure Ontario: Case Study Report
[http://www.pievc.ca/e/casedocs/toronto_sw_ontario/Infrastructure_Ontario-PIEVC Case Study of Three Buildings final report.pdf](http://www.pievc.ca/e/casedocs/toronto_sw_ontario/Infrastructure_Ontario-PIEVC_Case_Study_of_Three_Buildings_final_report.pdf)
- Cities and Communities: The Changing Climate and Increasing Vulnerability of Infrastructure
http://projects.upei.ca/climate/files/2012/10/Book-5_Paper-19.pdf
- UNEP Buildings and Climate Change: Summary for Decision-Makers
<http://www.unep.org/sbci/pdfs/sbci-bccsummary.pdf>

Resources: Land Use Planning



- Climate Change Adaptation Planning: A Handbook for Small Canadian Communities
http://www.fcm.ca/Documents/tools/PCP/climate_change_adaptation_planning_handbook_for_small_canadian_communities_EN.pdf
- Manitoba Planning Resource Guide: Climate Adaptation through Land Use Planning
<http://www.gov.mb.ca/ia/plups/pdf/cca.pdf>
- A Guide for Incorporating Adaptation to Climate Change into Land Use Planning
https://www.iaia.org/IAIA-Climate-Symposium-DC/documents/Canada_CC_Land%20Use%20GuideNOV05.pdf?AspxAutoDetectCookieSupport=1
- Integrating Climate Change Adaptation into the Town of Ajax Official Plan
<http://www.cleanairpartnership.org/files/Ajax%20Final.pdf>
- CIP Policy on Climate Change
http://www.cip-icu.ca/_CMS/files/CIP%20Climate%20Change%20Policy_e.pdf
- CIP Planning for Climate Change Resource Library
http://planningforclimatechange.ca/wwwroot/dsp_Library.cfm

Webinar 6

Vulnerable Populations

March 6th 2014

Presentation by:

Karina Richters, City of Windsor

For more information, please visit:

<https://www.ccadaptation.ca/en/mars>