

FLOOD-RESILIENT DESIGN GUIDELINES: NEW AND EXISTING COMMUNITIES IN CANADA



Infra 2018, Congrès Annuel du CERIU

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ON CLIMATE ADAPTATION

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1. Costs of extreme weather and flooding continue to rise
2. Examples of flood-resiliency guidelines and standards under development:
 - Homes
 - New communities
 - Existing communities
 - Commercial real estate
3. Natural infrastructure can be a strong complement to grey (built) infrastructure solutions for climate adaptation

CLIMATE CHANGE AND EXTREME WEATHER EVENTS ARE HERE TO STAY

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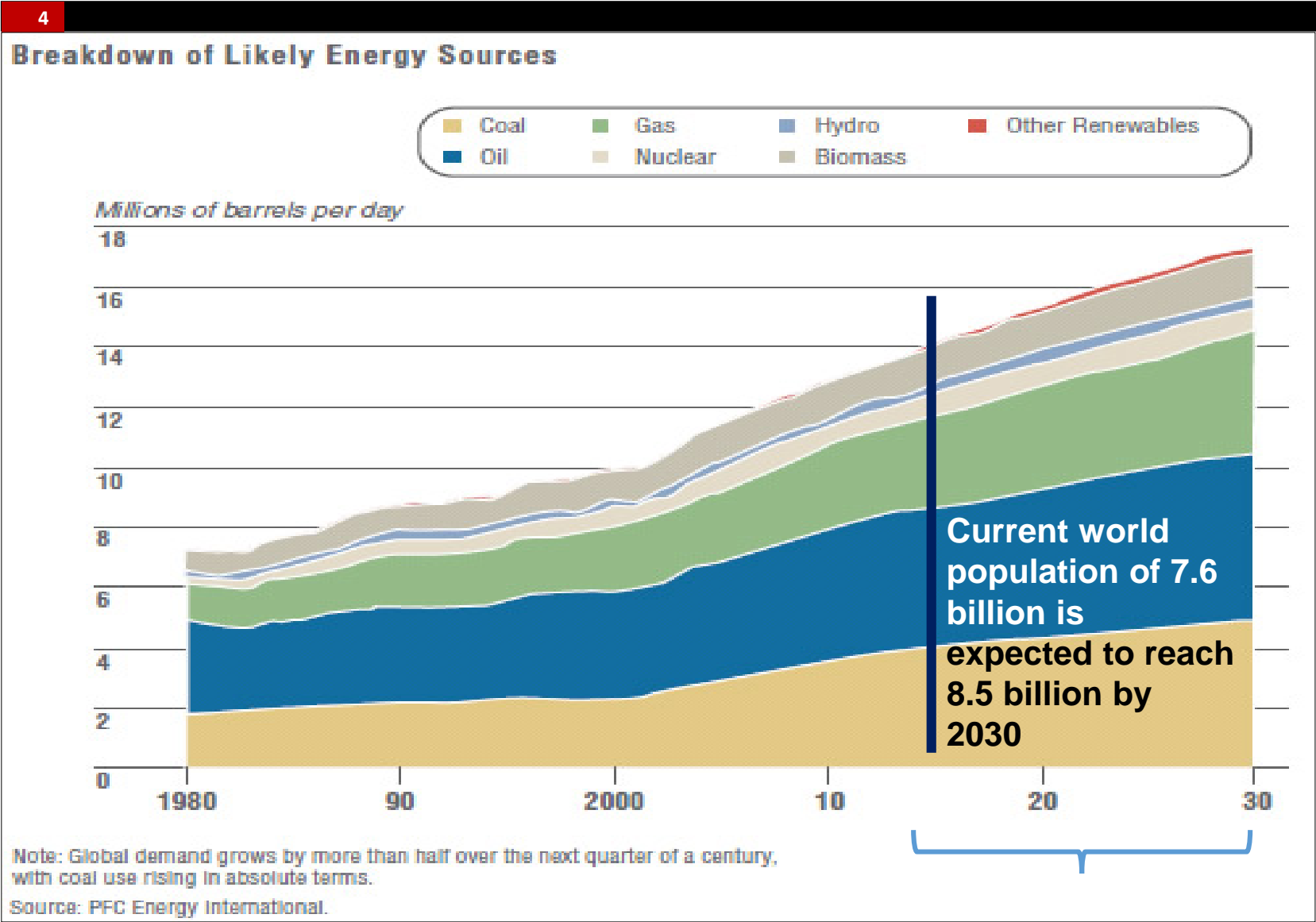
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“We are already seeing the consequences of global warming through more extreme weather, rising sea levels and diminishing Arctic sea ice, among other changes” - Panmao Zhai, Co-Chair of IPCC Working Group I

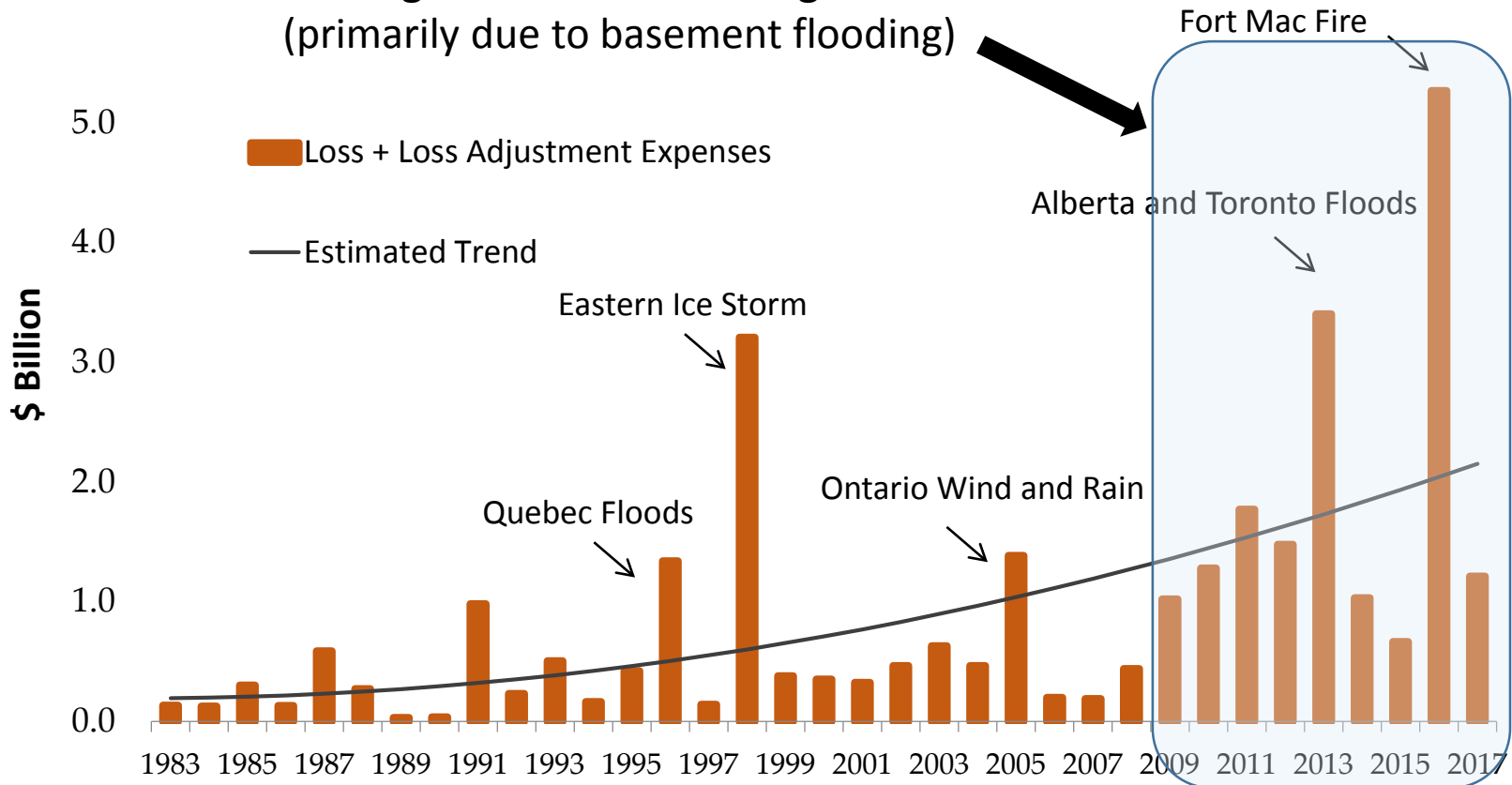
The world is unlikely to meet the 1.5°C target, extreme weather events are here to stay.

WORLD ENERGY SUPPLY: REMAINS LARGELY FOSSIL-FUELS BASED



COSTS OF EXTREME WEATHER: P&C CATASTROPHIC INSURABLE LOSSES (\$CAD)

Growing Uninsurable Housing Market (primarily due to basement flooding)



Loss + Loss Adjustment Expenses

\$2017 - total natural-catastrophe losses normalized by inflation and per-capita wealth accumulation

Courtesy: Insurance Bureau of Canada

Note: Cost to government and homeowners 3-4X that of private insurers.

Historic flooding hits British Columbia after record snowpack starts melting, Canada

Posted by TW on May 14, 2018 in categories [Featured articles](#), [Floods](#)



Southwestern Ontario's worst flooding in decades triggers an emergency, an evacuation and aggravation

Churchill residents reeling from rail closure after unprecedented flooding

By James Wilt in [News](#), [Energy](#) | June 13th 2017

CANADA

Alberta flooding sets records, prompts calls for action on climate change

Just inches of air left for two men rescued from flooded elevator



London sops up after record rains, historic flooding



THE LONDON FREE PRESS

Published on: February 22, 2018 | Last Updated: February 22, 2018 2:47 PM EST

Worst floods in New Brunswick history: how 2018 compares

Flooding a part of recorded history in the province for more than 300 years



Julia Wright · CBC News · Posted: Apr 30, 2018 5:41 PM AT | Last Updated: April 30

Manitoba floods leads province to declare state of emergency, seek help from military

Manitoba is declaring a provincial state of emergency and is asking the Canadian military to help fight a surge in flooding in Saskatchewan.



REPEATED FLOODING ELEVATES RISK OF MORTGAGE ARREARS

NEW GUIDELINES AND STANDARDS DRIVE CLIMATE ADAPTATION, FOR EXAMPLE: REAL ESTATE & FLOOD RESILIENCE

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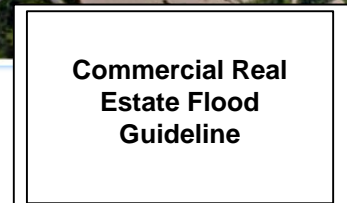
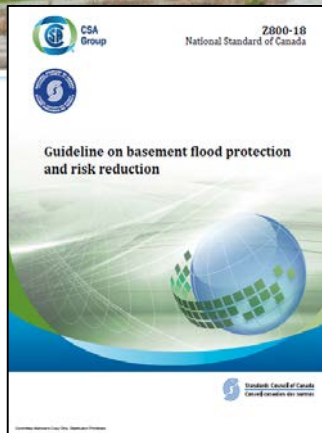
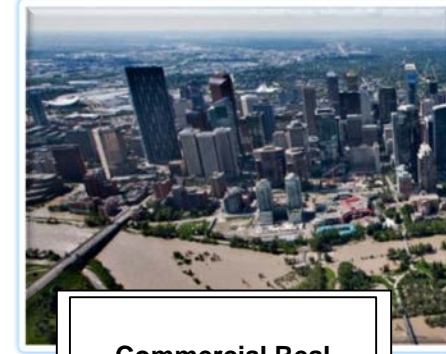
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Homes - Flood Protection Guideline

New Community Design Standard

Existing Community Retrofits Guideline

Commercial Real Estate Retrofits Guideline



New Standards Supported by:



... and experts across Canada, who contribute to research and standards development...

HOME FLOOD RISK ASSESSMENT COURSE

In-person: Sept. - Dec. 2018; Online: Jan. 2019

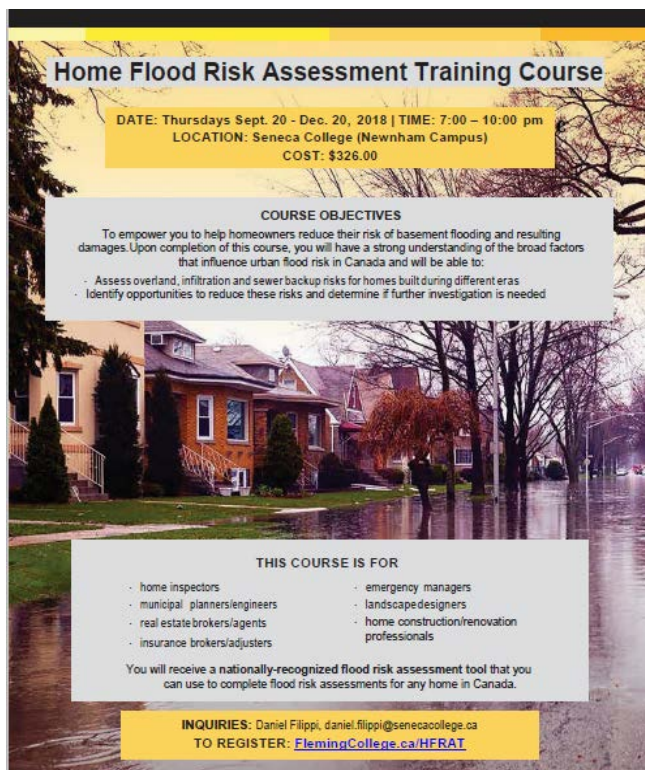
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40,000 certified home inspectors in Canada

Seneca
Because it matters.

Fleming College | 50 YEARS



Home Flood Risk Assessment Training Course

DATE: Thursdays Sept. 20 - Dec. 20, 2018 | TIME: 7:00 - 10:00 pm
LOCATION: Seneca College (Newnham Campus)
COST: \$326.00

COURSE OBJECTIVES

To empower you to help homeowners reduce their risk of basement flooding and resulting damages. Upon completion of this course, you will have a strong understanding of the broad factors that influence urban flood risk in Canada and will be able to:

- Assess overland, infiltration and sewer backup risks for homes built during different eras
- Identify opportunities to reduce these risks and determine if further investigation is needed

THIS COURSE IS FOR

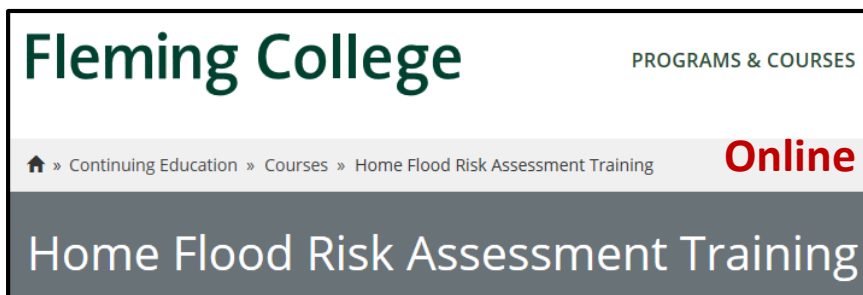
- home inspectors
- municipal planners/engineers
- real estate brokers/agents
- insurance brokers/adjusters
- emergency managers
- landscape designers
- home construction/renovation professionals

You will receive a nationally-recognized flood risk assessment tool that you can use to complete flood risk assessments for any home in Canada.

INQUIRIES: Daniel Filippi, daniel.filippi@senecacollege.ca
TO REGISTER: FlemingCollege.ca/HFRAT



In-person Cohort – Seneca College
Toronto (Sept. 2018)



Fleming College PROGRAMS & COURSES

Home » Continuing Education » Courses » Home Flood Risk Assessment Training **Online**

Home Flood Risk Assessment Training

- **Next** – insurance brokers, real estate agents, mortgage brokers

FLOOD RESILIENCY STANDARD FOR NEW COMMUNITIES

Purpose: develop a standard for flood-resilient new community design for low-rise residential developments in Canada.

Benefit: homes located in communities certified to be flood-resilient are subject to lower flood risk and thus, are predisposed to benefit from lower flood insurance premiums.

Status: under development by CSA Group (publication in October 2019).



Standards Council of Canada
Conseil canadien des normes



CSA
Group



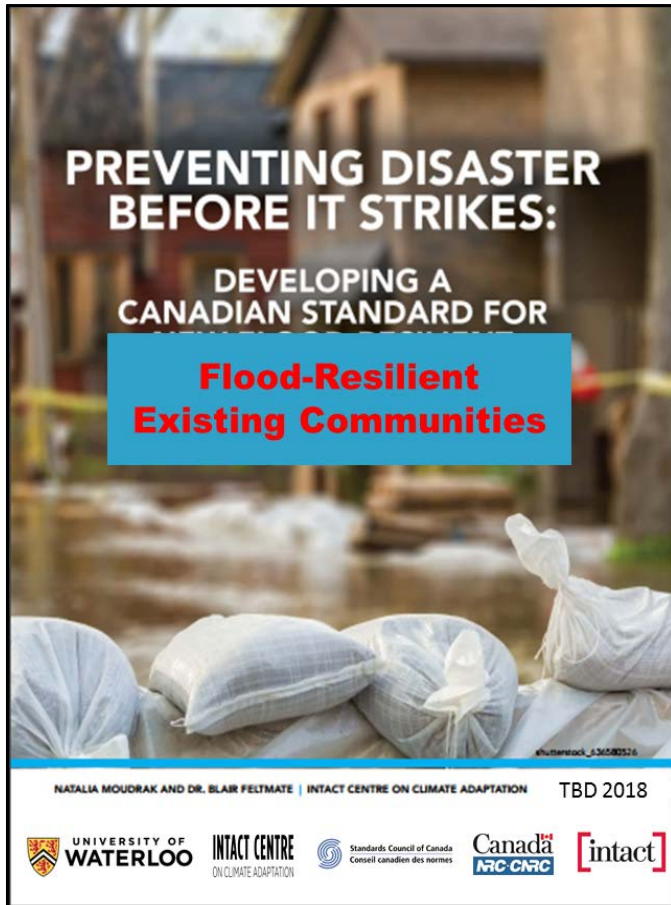
The seed document for the standard is based on Intact Centre report, *Preventing Disaster Before It Strikes*, which outlines 20 best practices for flood-resilient new community design:

www.intactcentreclimateadaptation.ca/wp-content/uploads/2017/10/Preventing-Disaster-Before-it-Strikes.pdf

FLOOD RESILIENCY GUIDELINE FOR EXISTING COMMUNITIES

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Purpose: develop a guideline for retrofitting existing communities in Canada to be more flood-resilient.

Benefit: high-level flood risk screening framework will help prioritize flood-resiliency efforts, best practices will guide impactful flood risk reduction action.

Status: under development by the Intact Centre (target publication Q1 2019).



Standards Council of Canada
Conseil canadien des normes

National Research Council Canada



FLOOD RESILIENCY GUIDELINE FOR EXISTING COMMUNITIES: PRIORITIZATION FRAMEWORK

A flood **hazard** and **vulnerability** screening framework can help identify the most problematic areas within existing communities:

- **Age of development:** in the absence of major retrofits, older areas in Canada (e.g., pre-1970's) are typically more flood-prone, compared to newly-built subdivisions;
- **History of flooding:** in absence of major retrofits, where municipal records (e.g., flood reports) indicate that repeated floods have occurred, these areas may be the most flood-prone;
- **Design standards:** areas where community design standards were less stringent (e.g., permitting development in the floodplain) are typically at a higher risk of flooding;
- **Proximity to the floodplain:** areas located closer to the floodplain are typically at a higher risk of flooding;
- **Topography:** lower-lying areas are typically at a higher risk of flooding;
- **Land use changes and intensification rates:** areas where significant urbanization and growth has occurred, and where natural capacity to absorb rain water was diminished (e.g., as a result of wetland loss), are at a higher risk of flooding; and
- **Sewer system types:** areas with combined sewer systems (CSS) (e.g., systems that carry sanitary and storm water in one pipe), or partially-separated sewers, compared to fully separated systems, are typically more flood prone.
- **Vulnerability exposure:** presence of critical infrastructure, vulnerable populations

FLOOD RESILIENCY GUIDELINE FOR COMMERCIAL REAL ESTATE (CRE)

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Purpose: develop a guideline for retrofitting existing CRE properties in Canada to become more flood-resilient.

Benefit: short list of **highly actionable best practices** will guide flood risk reduction action by CRE property owners and managers, inform benchmarking activities.

Status: under development by the Intact Centre (stakeholder consultation and data gathering).



*"Water damage is now the leading cause of personal property claims. Over the last 10 years, water losses for personal property claims have doubled to 40% (of \$ paid in losses). There are a number of improvements that Canadians can take to better protect their homes and communities against water damage. **By taking these steps, Canadians could lower their annual premiums - anywhere from 5 to 15%.** Those who live in municipalities who make climate resilient infrastructure a priority could also benefit from more affordable premiums, higher coverage limits and enhanced insurance coverage."*

Intact Financial Corporation, 2017

NATURAL INFRASTRUCTURE CAN BE EFFECTIVE FOR CLIMATE ADAPTATION

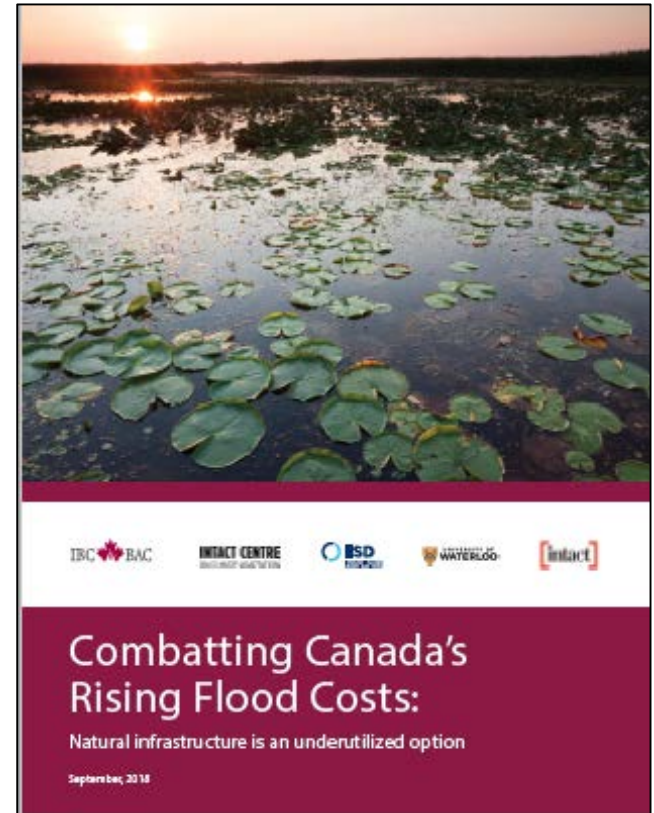
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A framework was developed for assessing the business case of natural infrastructure for climate adaptation.

Key finding: natural infrastructure can be a strong complement to grey (built) infrastructure for climate adaptation (e.g., flood/drought attenuation), but it's essential to quantify its total economic value for an informed investment analysis.

IBC  **BAC** | Insurance Bureau of Canada
Bureau d'assurance du Canada



 **IISD**
International Institute for
Sustainable Development

 **Prairie
Climate Centre**
From Risk to Resilience

CALCULATING THE BENEFITS OF NATURAL INFRASTRUCTURE

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Naturally occurring **wetlands** in Waterloo, ON reduce flood damage costs to buildings in Uptown Waterloo by \$51M (Intact Centre, 2016)

Naturally occurring **ponds** in the coastal town of Gibsons, BC provide \$3.5M - \$4M of stormwater storage services annually (MNAI, 2018)

An **engineered wetland** in Manitoba is valued at \$3.7M for the flood reduction, water quality improvement, carbon sequestration and other benefits it provides (IISD, 2017)



TOTAL ECONOMIC VALUE ASSESSMENT NATURAL VS GREY INFRASTRUCTURE

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Costs (examples)	Costs	NI	Grey
Pre-Construction			
• Baseline data collection		X	X
• Stakeholder consultation		X	X
• Site identification		X	X
• Assessment of design alternatives		X	X
• Detailed engineering design of selected alternative		X	X
• Land acquisition		X	X
• Environmental assessment		X	X
• Permitting and legal fees		X	X
• Development of construction specifications		X	X
• Development of monitoring program and key performance indicators (KPIs)		X	X
Construction			
• Site preparation		X	X
• Site construction		X	X
Post-construction			
• Infrastructure maintenance activities		X	X
• Infrastructure condition assessment		X	X
• Monitoring against KPIs		X	X
• Evaluation and reporting		X	X
• Carbon cost over project life cycle			X
Administrative			
• Project management and oversight			
Benefits (Example)	Benefits	NI	Grey
• Storm water storage		X	X
• Water quality		X	
• Habitat creation / improvement		X	
• Microclimate stabilization (e.g., urban heat island reduction)		X	
• Air filtration		X	
• Recreational amenity and aesthetic services		X	
• Energy savings		X	
• Carbon savings		X	

A comprehensive assessment of the financial, environmental and social costs and benefits (i.e., a total economic value [TEV] assessment) is required to illuminate otherwise uncaptured benefits of natural infrastructure projects.

- Water quality improvement
- Habitat creation
- Urban heat island reduction
- Air filtration
- Recreational amenity
- Aesthetic services
- Carbon sequestration



GENERAL “RULE OF THUMB” FOR NATURAL INFRASTRUCTURE

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In order of preference, the most cost-effective means to utilize natural infrastructure for climate adaptation is to:

1. retain what you have;
2. restore what you’ve lost; and
3. build what you must.

Thank You!  **@ICCA_Canada**