Flooding Crisis in Canada

A systems thinking approach of the inputs, system dynamics and outputs leading to the flooding crisis

> Bo Simango Ali Alfosool



Background

- -Flooding is the most prominent natural disaster in Canada
- -22% of residential properties are vulnerable to overland flooding
- -Wetlands occupy 16% of the country with over 8500 rivers and more than 2 million lakes cover Canada
- -With climate change, the frequency and severity of flooding is on the rise

Over the past 10 years:



>\$5 billion losses



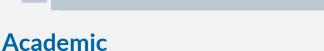
1.3 million affected (directly & indirectly)

Our research methods comprised:



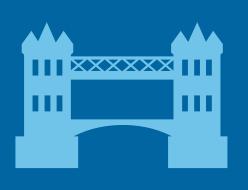
& cultural losses





72 Literature reviews Government - federal & provincial 15 Publications

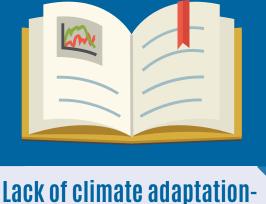
Interviews 40 Qualitative interviews Intergovernmental 5 Publications



Aging and vulnerable infrastructure

- 40% of roads and bridges in fair, poor or very poor condition
- 30% of water infrastructure in fair, poor or very poor condition.

Canadian Infrastructure Report Card (CIRC), Nov 2019



focused policies

will need to invest \$5.3 billion annually to mitigate the worst impacts of climate change"

"Canadian municipalities

Federation of Canadian Municipalities & Insurance Bureau of Canada report, Feb 2020



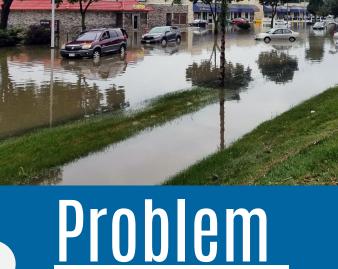
concerns

continued federal leadership to create a cohesive National Action Plan on Flooding"

"Canada needs

Insurance Bureau of Canada, Sep 2019





Landscape What are the top 3 challenges in Canada?

Stakeholders Map

Who are the stakeholders at the federal/provincial/territorial levels and what are the interrelationships?

Working Groups

Four core groups exist with frontline workers involved in:

- **Prevention/Mitigation**
- Response **Preparedness**
- Recovery

Advisory Committees

relationship between them: • Senior Officials Responsible for

Two groups exist with no reporting

- **Emergency Management** Canada's Platform for Disaster Risk
- **Reduction Advisory Committee**

F/P/T Ministries

The federal/provincial/territorial ministries have two main members:

- **Deputy Ministers** responsible for setting priorities & responsibilities
- Ministers act as links to the Premier's Office ensuring pubic safety & maintaining oversight of ministries' commitments

<u>Solutions</u>

Landscape

What solutions can solve

the current challenge?

*Emergency & disaster management policies are informed by opinions of each group starting from left to right



Infrastructure: Resilience

and detection



EM Framework report

focused Policy Planning

articulates core concepts that guide governments, to save lives, protect property and the economy, and preserve the environment

"Community-based initiatives that focus on mobilizing community assets to

Asset-Based Community

Development initiatives

enhance local resiliency and preparedness as done around the world"

infrastructure while integrating environmental protection, disaster prediction and concepts"

"Build more resilient

sustainable development

-Emergency Management

Framework for Canada:

Framework for Canada,

Institute

-Emergency Management e.g. Tamarack Institute, Coady International

Toward a resilient 2030

Gaps & Levers



Limited collaboration between stakeholders Enhance whole-of-society collaboration to improve understanding of risks, needs, resources,

capacities, and vulnerabilities incl. inter & intradepartmental groups



Limited capital injection

What is missing and what current efforts could be joined up or improved?

Agree on government-backed, national flood insurance program, invest in new infrastructure projects where deficiencies exist, household vulnerability & water damage awareness programs



Limited community-based adaptive capacity

Promote, fund and foster proactive, self-directed asset-based community development initiatives that focus on mobilizing community assets to enhance preparedness & response efforts

APPENDIX

Problem Landscape						
Factor	Major issues	Facts & Examples	Impacts			
Environment	Large hydrological, catchment & watershed areas	Mean precipitation across Canada increasing by about 12%	Increased runoff			
	Inadequate drainage system	In southern Ontario, 72% of the original wetlands have been lost to development (e.g., agriculture, urban sprawl and other land conversion)	Reduced infiltration capacity			
	Poor spatial planning - 80% of Canadians living in urban areas	In Alberta, approximately 64% of the original wetlands in settled areas no longer exist.	Poor water retention			
Technology	Limited flood warning system	Agencies use inventory planning with no real-time resource location feedback e.g. Microsoft Dynamics AX	Reactive planning, response and recovery efforts			
	Lack of efficient decision support systems – alerts, predictive resource planning and real-time monitoring	Federal Flood Mapping Guidelines exist but no advance flood mapping technologies exist that provide real-time and predictive visibility of flooding threats	Poor flooding risk visibility and monitoring			
	Lack of below ground wireless hydrological sensors					
Institutional & Socio-cultural	Limited disaster assistance	A 2017 study in Montreal that experienced flooding found that "almost 70% of respondents reported having suffered from anxiety, sleep disturbances or concentration problems since the floods.	Limited coordination between provincial agencies			
	Absence of provincial ties promoting knowledge	34% of Canadians are insured for overland flood coverage	Limited understanding of flood risk and transparency			
	transfer, information sharing, technical skills					
	Lack of community capital & social capacity	Of 2,300 homeowners surveyed, only 6% know that their home is in a designated flood risk area and only 21% believe that the risk of flooding will increase over the next 25 years.	Governance concerns			
	Loss of security, safety and increased stress		Ambiguous and overlapping roles, responsibilities			

Economic	Limited infrastructure capital investment	Average annual federal share of response and recovery costs has increased from \$10 million (1970-1995) to \$110 million (1996-2010) \$13 to \$360 million (2011-2016)	Loss of business and economic continuity
	Absence of low-cost national flood insurance program	Insurance payouts for flooding related catastrophic losses exceeded \$1 billion per year (2009-2017)	Damage to machinery and equipment, transport infrastructure and property
	Lack of overland flooding insurance offered by private insurers	Flood-related lawsuits involving homeowners, developers, local governments, provinces and private businesses are on the rise in Canada e.g. \$900 million Muskoka Class Action, 2016 (ongoing), \$950-million Anderson et al. v. Manitoba class action lawsuit, 2017 (ongoing)	Disruption to energy supply networks
	Flooding affects local and federal credit ratings		
	Land use and development increasing flooding vulnerability	1.7 million Canadian households (19% of Canada's population) at risk of river (fluvial) and surface water (pluvial) flooding	Inadequate infrastructure system
Infrastructure	Limited flood resilient infra planning and development	Canadians personally bear roughly \$600 million in flood-related losses every year.	Inadequate drainage system
	Flood control real-time monitoring & forecasting technologies		

		Solutions Landsca	pe			
Desired national outcome	Provincial, territorial and federal institutions and community-based disaster & emergency response team preparedness in Canada					
Strategic Out- comes - Local, provincial & federal levels	Provincial, territorial and federal institutions and emergency response teams organize lessons learned workshops and reporting framework	Encourage and facilitate reporting & collaboration between SOREM and Advisory councils. This supports accountability, transparency and whole-of-organization governance	Define common outcomes, establish join strategies Identify roles and responsibilities Establish compatible procedures, policies and cross-agency borders	Canadian public awareness and information sessions on disaster 8 emergency response practices and action plans		
Intermediate Outcomes	Provincial, territorial and federal institutions and community-based disaster & emergency response team preparedness in Canada					
Outputs	Joint provincial exercises Post incident reports Capability improvement plans	Promote and facilitate information sharing, consultations and awareness programs Develop governance structures, policies, strategies, guidelines and standards Define post-incident reporting framework and lessons learned	Develop panning standards, guides and best practices Plan multistakeholder engagement between infrastructure, prevention, mitigation, response and recovery teams/groups	Public awareness campaigns Outreach & awareness weeks		
Activities	Joint provincial exercises	Disaster & Emergency Management Policy & Planning	Strategic Coordination	Communications		
Local, provincial & federal initia- tives	Emergency Management Exercises	Disaster & Emergency Management Planning		Preparedness and Response		