

Environmental Extremes and the Role of Decision-makers in Facilitating Community Resilience



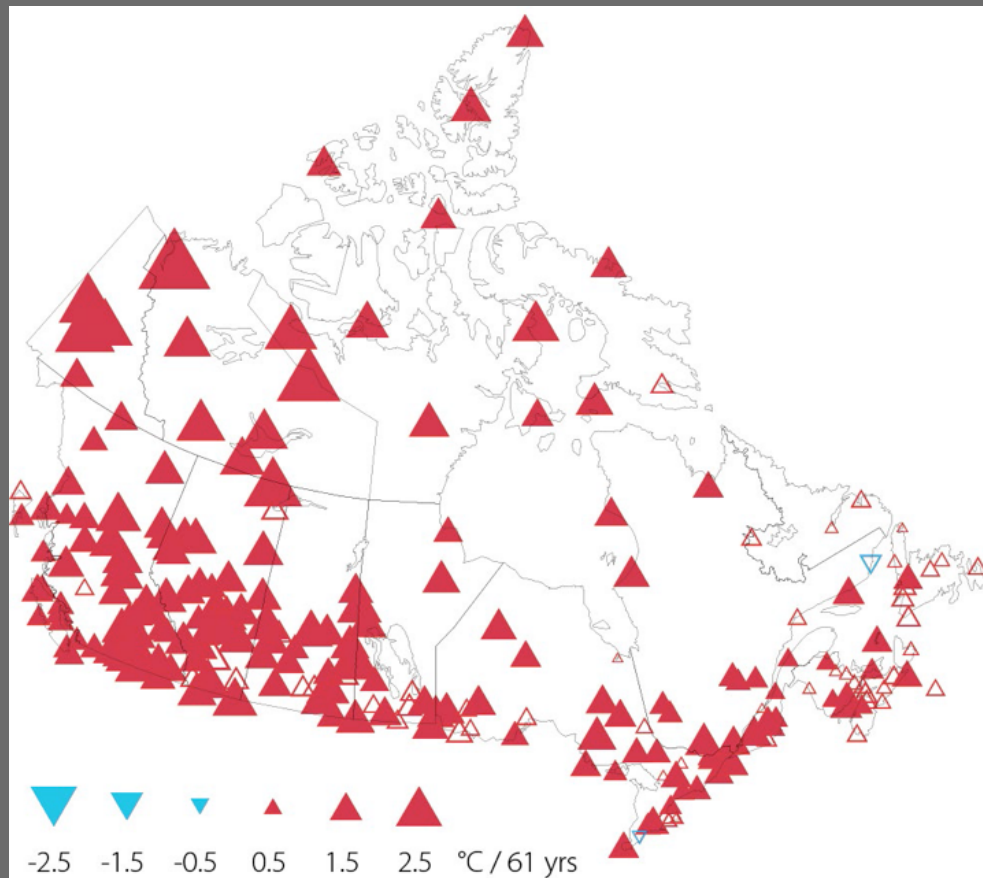
Emergency Management Stakeholder Summit
Centre for Applied Disaster and Emergency Management
Edmonton, Canada

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Dr. Jeff Birchall
University of Alberta, Canada

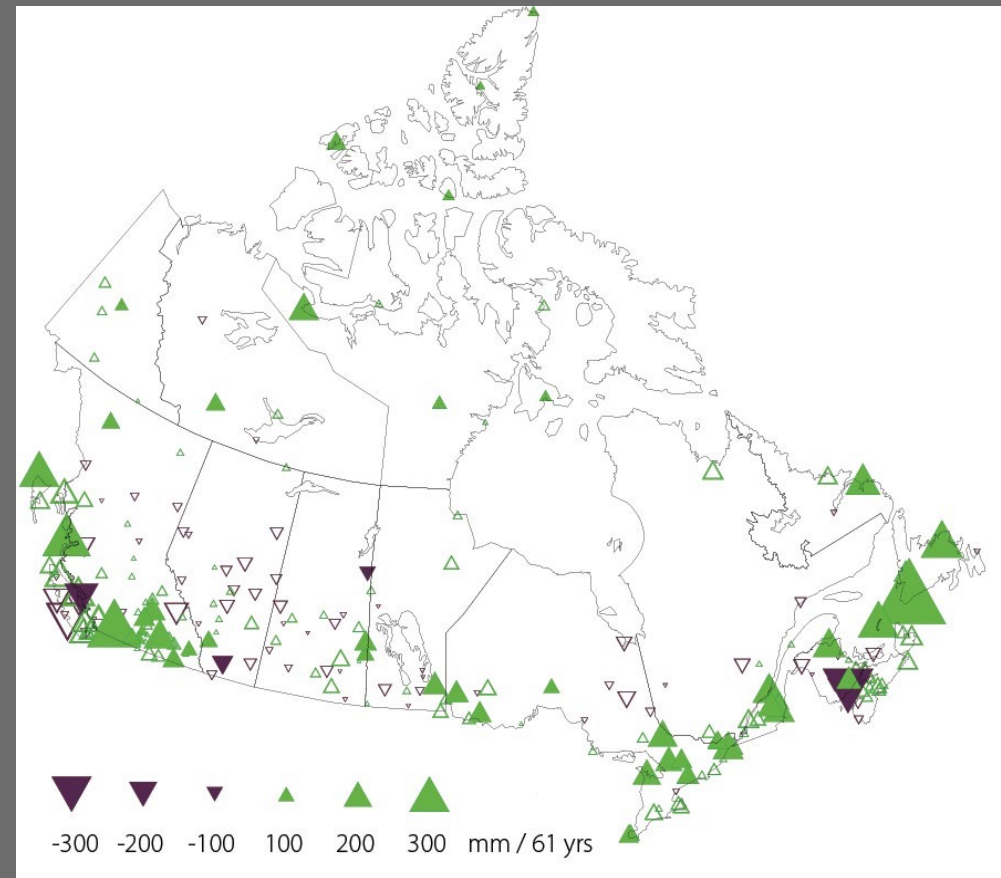
Impacts in Canada

Temperature



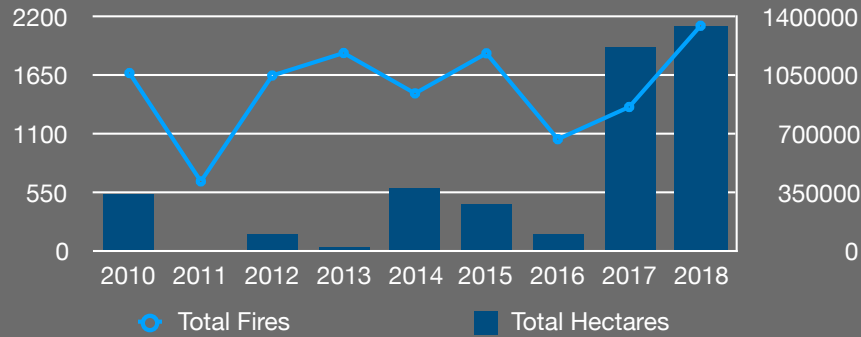
Trend in annual mean temperature for Canada from 1950-2010 (Red = upward trend; Blue = downward trend)

Precipitation



Annual total precipitation trends for 1950-2010 (Green = upward trend; Purple = downward trend)

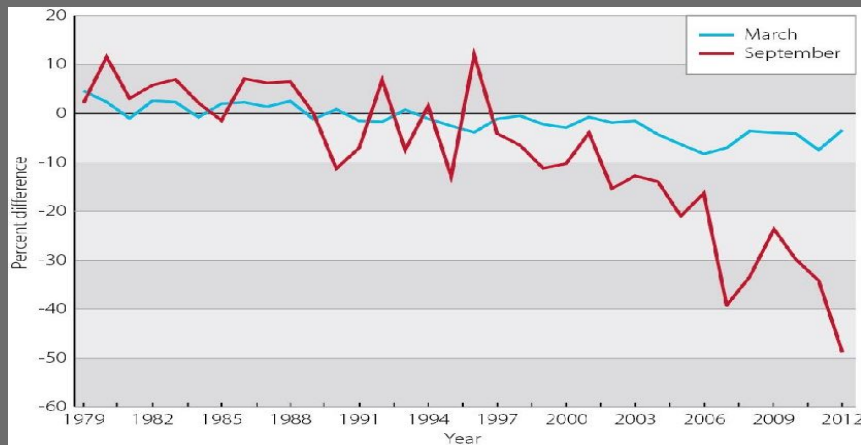
BC Wildfire



West coast

- Rise in wildfire occurrence + extent
- Rise in intense precipitation + overland flooding

Arctic Sea Ice

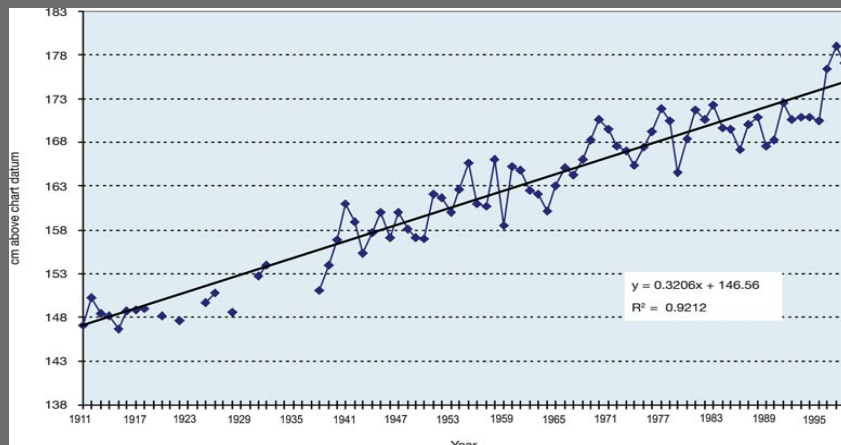


Trend in Arctic sea ice extent over period 1979-2012

North coast

- Reduction in sea ice extent
- Rise in permafrost thaw
- Increase in coastal erosion

Sea Level Rise



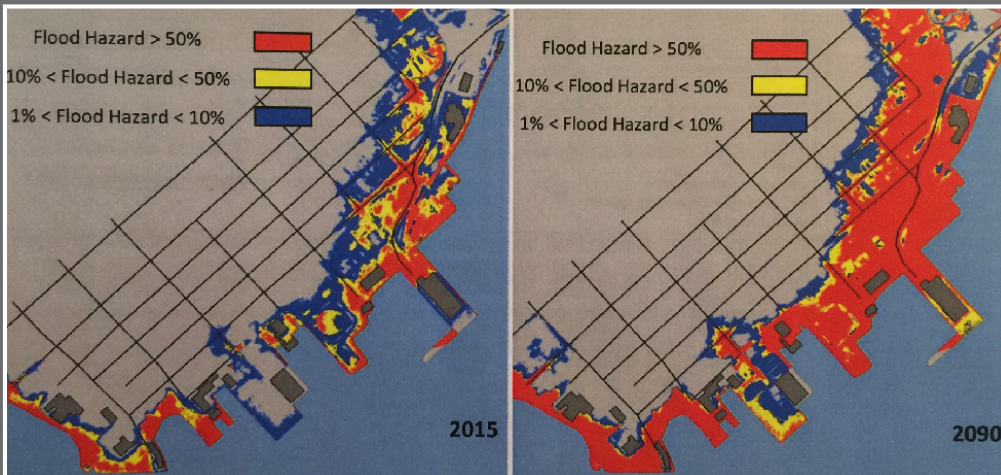
Annual mean water levels, Charlottetown, PE 1911- 1998

East coast

- Sea level rise
- Increase in intense precipitation + overland flooding
- Storm tracks moving northward

Compounding Factors

Development (vulnerable areas)



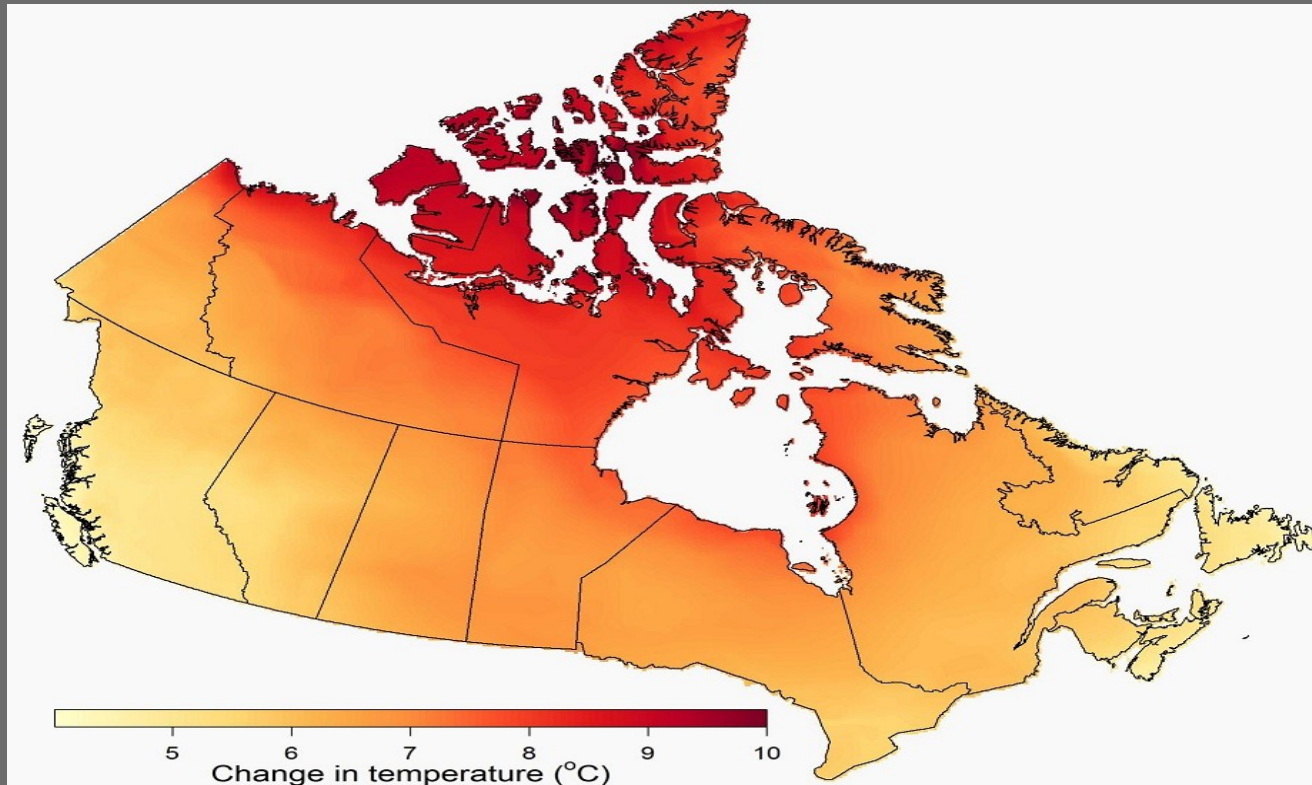
Lack of buy-in for action (impacts not bad enough; not our responsibility)



Lack of collaboration (amongst decision-makers; effective coordinated support)

Projections Moving Forward

Projected Annual Temperature Change by 2100



↓

Informed decision-making will be critical

- use of current science (appreciate the risk; justification)
- collaboration with key actors/ decision-makers

Today's Talk

My Research

geography, scale, focus



Theory

help frame the challenge (and solutions)



Role of Decision-makers

expert perspective/ collaboration



Research + Education

future decision-makers

1. My Research

Setting/ Context

- International focus on climate mitigation
 - facilitate low carbon economy (tax, ETS)
 - avoid dangerous climate change

BUT *emissions continue to rise*

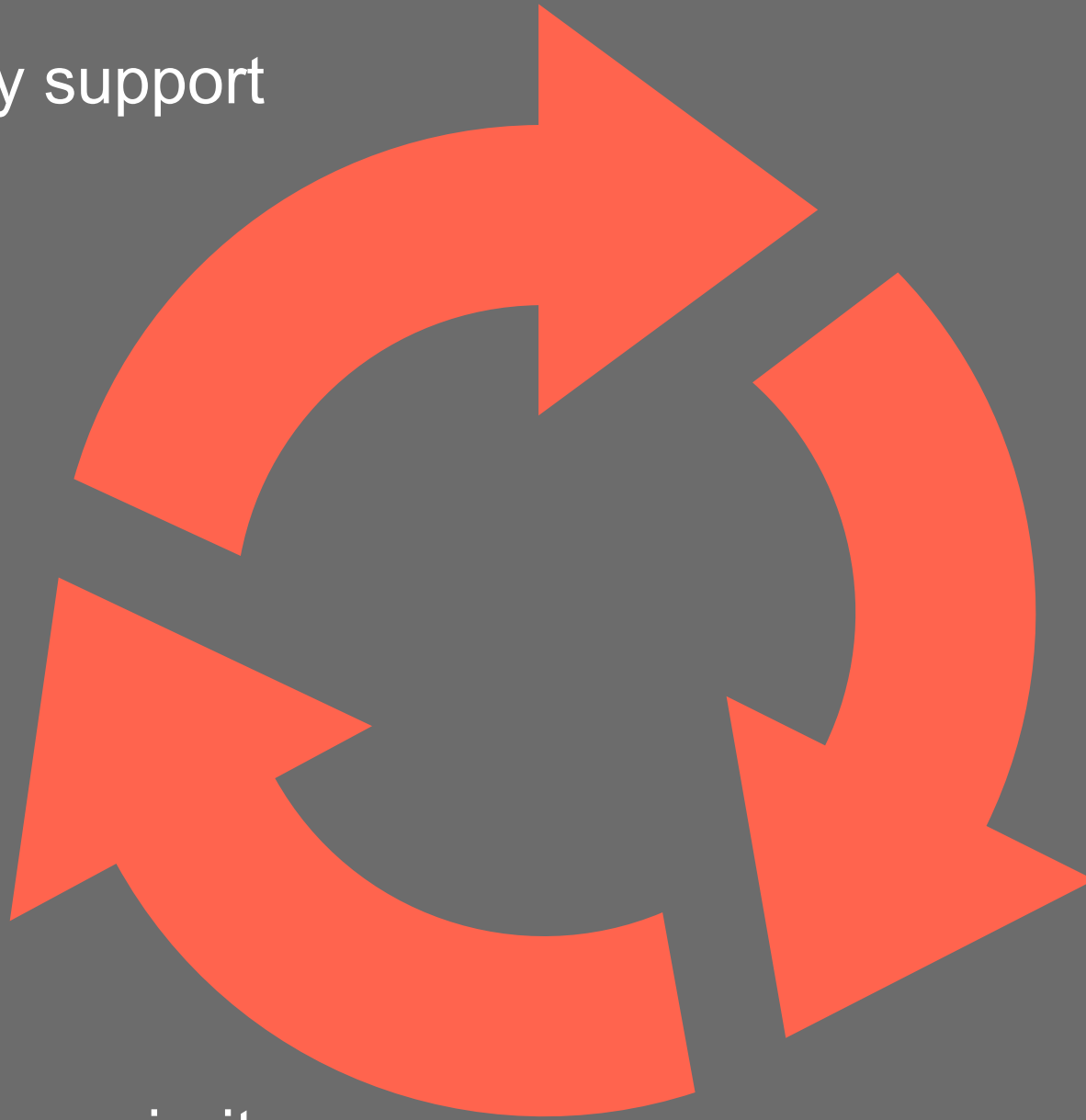
- Need to incorporate adaptation into policy
- Adaptation gaining ground in scholarship
 - barriers for action
 - larger cities, developed world
- Adaptation lagging in practice in local government

Why?

- Lack of community or political will
 - ideological factors?; disbelief in climate change
- Lack of senior management buy-in for action
 - impacts not bad enough; challenge for future
- Other pressing local priorities
 - economic development/ growth; social services (eg. low cost housing)
- Other responsibilities downloaded from higher government
- Lack of local capacity
 - personnel, finances, knowledge (science)

Community support

Political will



Administrative priority

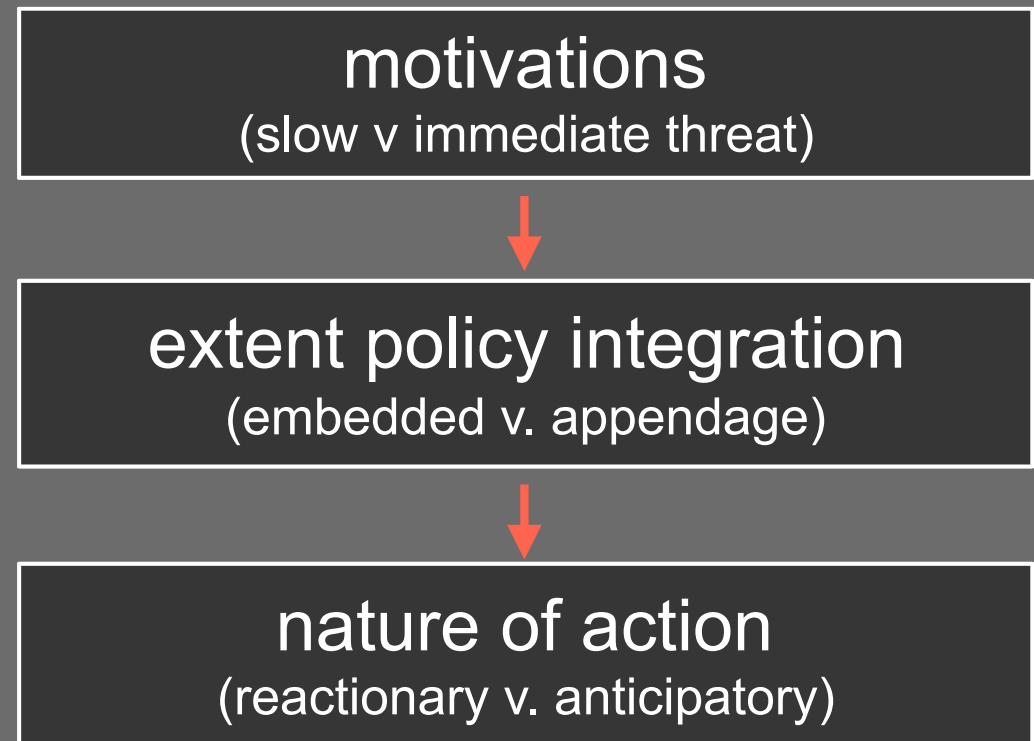
- (policy/ action)

My Interests

OBJECTIVE

- Gain insight into local government preparedness for climate variability

Better understand...:





GEOGRAPHY: coastal + big river communities

- Canada, Alaska, New Zealand

SCALE: local gov. (municipalities, regional districts)

WHO: key actors/ decision-makers

- planners, engineers, CAOs, sustainability coordinators, elected officials, economic development managers, emergency management leaders

WHAT: strategic planning documents

- official community plans, climate action strategies, hazard mitigation plans, zoning + regulations

What I Do...

Site assessment



Key actor interviews



Strategic document analysis

1. Site assessment

- Get a sense of the physical + spatial geography
- **Walk around community**
- Consider location of assets and infrastructure
- Think about seasons
- Think about actual/ potential climate risk

DAWSON YK	WHITEHORSE YK	VICTORIA BC	FREDERICTON NB	CAPE BRETON NS
<ul style="list-style-type: none">• permafrost thaw• weak ice bridge• threat of wildfire	<ul style="list-style-type: none">• increased snow load• rising water table	<ul style="list-style-type: none">• sea level rise• storm surge	<ul style="list-style-type: none">• flooding• quick spring melts• intense precip.	<ul style="list-style-type: none">• coastal erosion• intense Atlantic storms
<ul style="list-style-type: none">• dyke failure• isolation• heritage	<ul style="list-style-type: none">• low-lying core• hospital on other side of the river• isolation	<ul style="list-style-type: none">• major urban centre• shoreline armouring	<ul style="list-style-type: none">• core close to river• major roads at risk	<ul style="list-style-type: none">• bank instability• low tax base

Nome, Alaska





Impacts...

Reduced sea ice + stronger storms

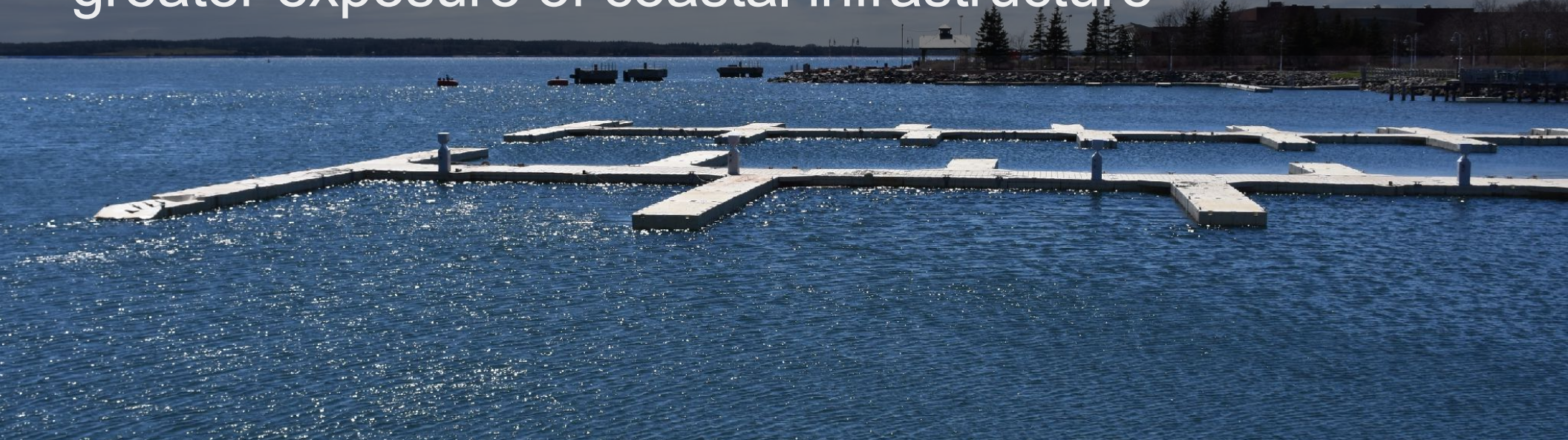
- = more open water
- = less shore-fast ice (serves as breakwater)
- = greater exposure of coastal infrastructure
- = coastal flooding in core
- = road washouts (cut off from outlying communities)

Charlottetown, Prince Edward Is

Sea-level rise + increased storm activity

= greater coastal erosion + bank instability

= greater exposure of coastal infrastructure



- = flooding of low-lying private property
- = risk to shoreline development



2. Key actor interviews

- Occur in person, on site
- Expert impressions, based on lived experiences
- No need to understand science of climate change
- Talk about how climate affects their work
- Discuss actual/ potential climate risk (changed through time?)
- Multiple key actors (triangulation)

3. Strategic document analysis

- How climate actually features in policy
- Sheds light on level of priority
- Demonstrates extent (embedded?) and nature (reactionary?) of climate thinking
- Serves to triangulate key actor testimony
- Puts in context of scholarship (is the community out date?)

Bringing the data together...

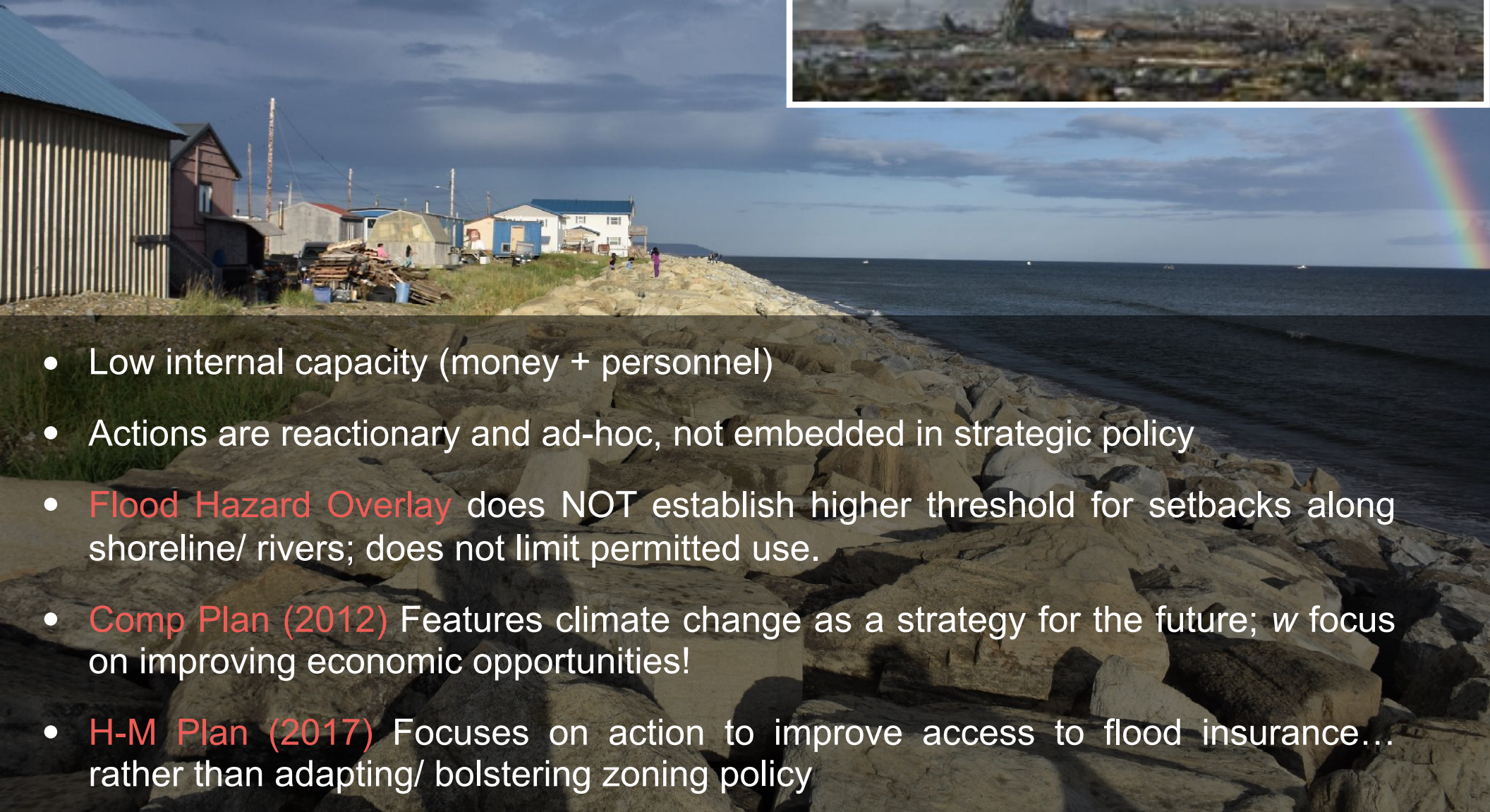
site + interviews (~7) + documents + scholarship



- Sense of level of priority
- Insight into decision-dynamics for climate thinking
- Sheds light on barriers for action (are policies the problem? Is it leadership?)
- Sense of actual vulnerability to climate change
- The nuances leading to risk
- How to improve community resilience
- How to share best practices (between case study communities)

Every community is different, how they react is different

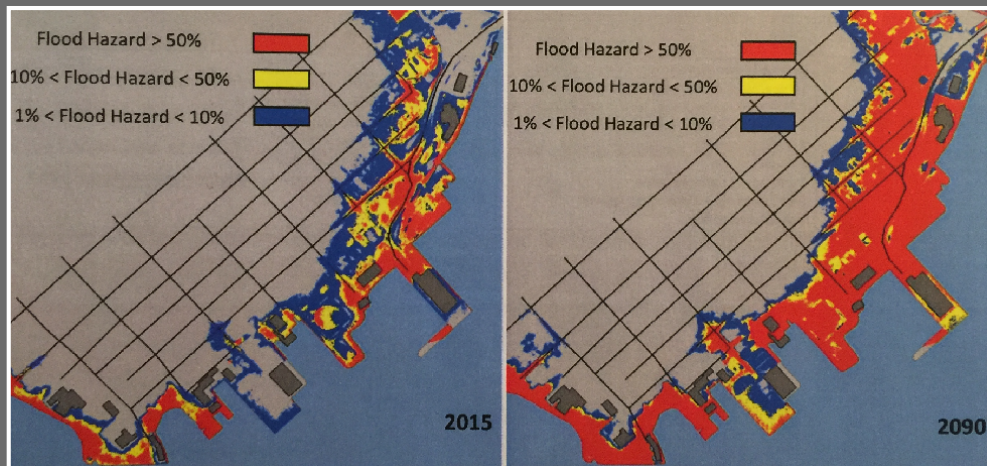
Nome, Alaska



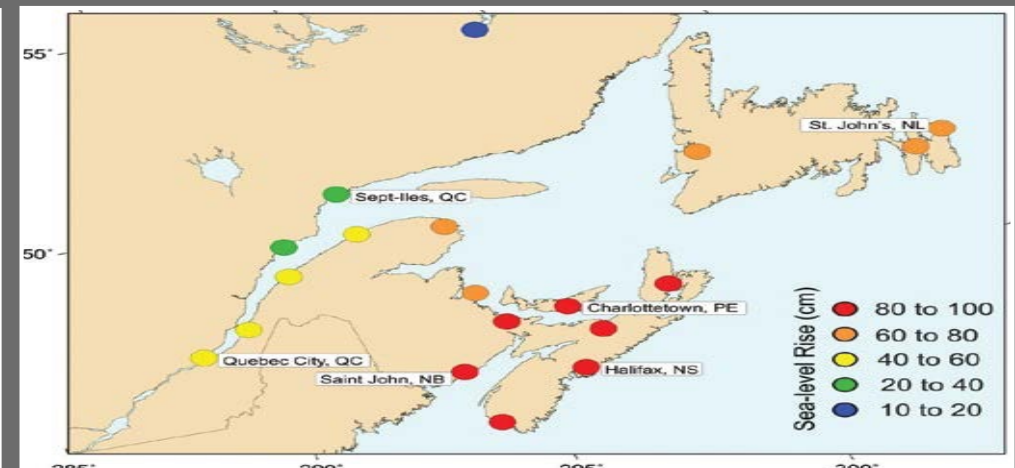
- Low internal capacity (money + personnel)
- Actions are reactionary and ad-hoc, not embedded in strategic policy
- **Flood Hazard Overlay** does NOT establish higher threshold for setbacks along shoreline/ rivers; does not limit permitted use.
- **Comp Plan (2012)** Features climate change as a strategy for the future; w focus on improving economic opportunities!
- **H-M Plan (2017)** Focuses on action to improve access to flood insurance... rather than adapting/ bolstering zoning policy

Charlottetown, Prince Edward Is

- Understand the importance of climate change (but focused on mitigation)
- Council sees **problem as slow moving**; wait and see approach
- City relies on province when it comes to climate change science (risk)
- Has voluntary guidelines re. SLR; has been involved in studying SLR issues for more than a decade
- Charlottetown Waterfront Assessment (2016) identified flood hazards
- **YET**: Official Plan (amended in 2019) makes **NO** reference to 'climate change'



Projections of flood hazard in 2015 + 2090



Projections of relative sea level rise by 2100

2. Theory

The purpose of a theoretical lens

- Provides a conceptual view of how relationships among several factors are important to the research objectives
- Frames insights from findings (organizes them)

Why is this important to local decision-makers?

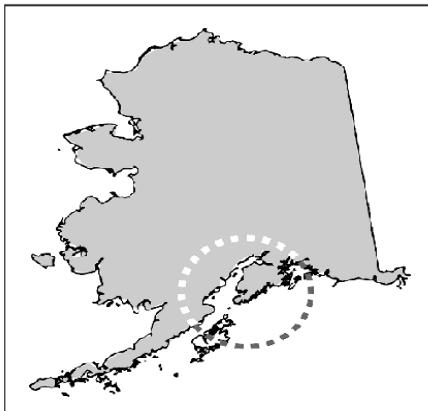
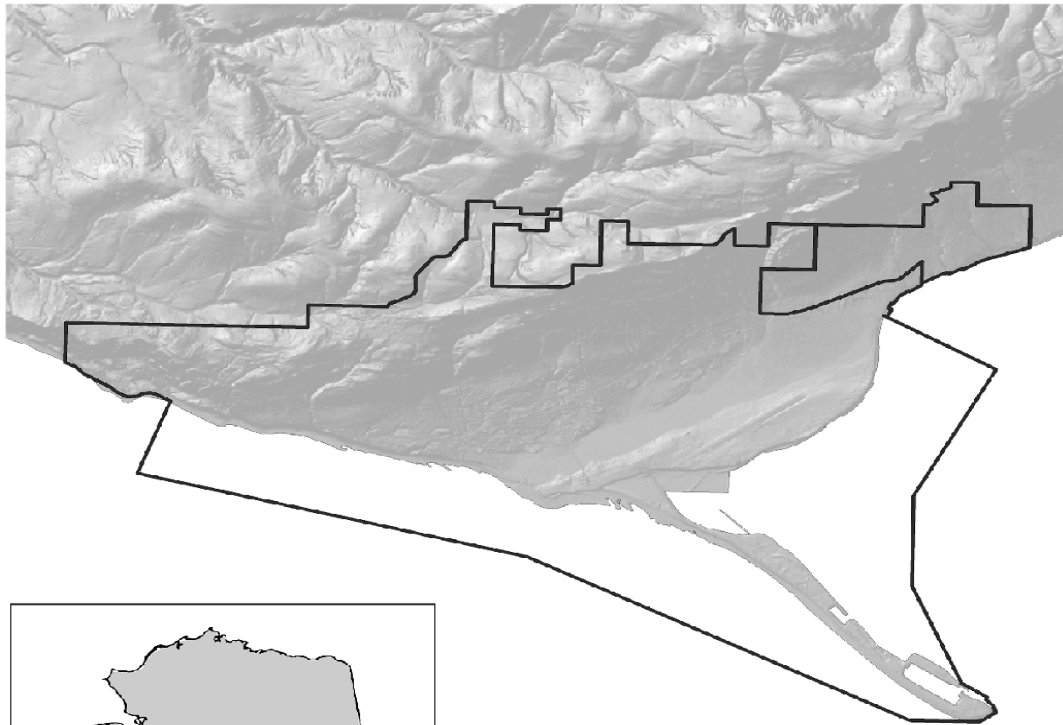
- Helps understand + manage complex challenges
- Helps bolster arguments; craft compelling lines of thought
- Helps to identify specifics barriers +/- or strengths
- Helps prioritize actions; plot strategic planning
- Creates transparency and facilitates replicability

Homer, Alaska

Evolutionary Governance



City of Homer, Alaska



LEGEND

 City of Homer Boundary

0 0.5 1 2 3 4 Kilometers



- *Relationship* between actors + institutions
- *Connection* between power + knowledge
- *Challenges* of path + dependencies

SINCE 1949-2016: mean seasonal temp. has *risen*:

- 4C in winter; 2C in summer
- Projected increase a further 2-4C

Key Risks

- Spit and harbour exposure
 - increase in intensity + occurrence of *storm surges*
- Bluff erosion/ slumping
 - increase in intensity + occurrence of *precipitation*

Spit + harbour exposure



- Narrow gravel bar
- 7.4km long; 7m above sea level (highest point)
- Range of assets locate on Spit
- **Extensive flooding + shoreline erosion + waves over-top seawall**
 - Sterling Highway gets undercut during storms + blocked w debris (cuts off Spit)
 - Foundations of buildings become undermined/ collapse
 - Lifespan of infrastructure (pipes, boardwalks) decreased

Bluff erosion/ slumping



- Highly erodible soil (ground very wet; not bedrock)
- Bluffs have shallow-root vegetation
- Private property rights entrenched (city has limited control)
 - Homes build close too bluff edge (views)
- **Erosion + slumping + rock falls made worse by:**
 - Increase in impervious surfaces + rain on snow events
 - Increased wave-action

1. Relationship between actors + institutions

ACTORS: those that participate in community governance
eg. elected official, decision-maker, planner etc.

INSTITUTIONS: legislation, policies, and tools that facilitate their integration and application
eg. Comprehensive Plan, Climate Action Plan

*...while **institutions** drive actions and the behaviour of actors, **actors** are responsible for creating/ maintaining the institutions.*

Institutions provide opportunity for anticipatory planning

- **BUT** when decision-makers fail to appreciate the situation, risk can be overlooked in planning process; recommendations for action become marginalized.

2. Connection between power and knowledge

POWER: influences decision making, shapes how leaders and decision-makers understand their role.

KNOWLEDGE: function of awareness for the variety of elements that affect community governance.

Climate adaptation planning is a function of power; for it to be a **priority**, those in power must accept the need to act.

*... **Knowledge** and understanding is important for **power** to facilitate effective governance.*

3. Challenges of path and goal dependencies

PATH and **GOAL** dependencies speak to historically imposed restrictions on governance.

- Restrictions can facilitate efficiency and provide focus;
- Restrictions can *also* limit outcomes moving forward; impede progress.

When a community selects a policy path to follow:

- Missed opportunities (blindspots) are sometimes created in the planning process
- Can influence planning actions.

Bringing it all together...

The need to include adaptation in long-term planning gaining ground with some city managers (ie. planners).

- Planners will caution about climate risks (community, leadership)

YET leadership in general maintain impacts are/ will be moderate.

- Some decision-makers cite uncertainty; want to hold off action
- Council includes members who question legitimacy of climate change in general

Difficult to gain a mandate for action on adaptation:

- Can't incorporate at earlier stages of community policy development
- NO momentum, falls off planning agenda in general

Key policy instruments only minimally discuss climate change:

- Climate Action Plan considered “a nice exercise,” BUT not a priority
- zoning codes lack necessary force to discourage/ prohibit development in vulnerable areas (will caution building on steep slopes)

Leadership gravitates towards policy focused on energy efficiency:

- \$ savings more palatable with Council and community
- Creates vulnerability (infrastructure along the Spit, properties above the bluffs)

Good news...

Research Reserve taking lead in pushing adaptation agenda

Intent on breaking dependancy (or strict focus) on mitigation:

- Planning public workshops (scenario planning; adaptation best practices)
- Working to increase general awareness around climate change + adaptation

Hopes efforts will facilitate buy-in from Council to include emphasis on adaptation in **new** Climate Action Plan.



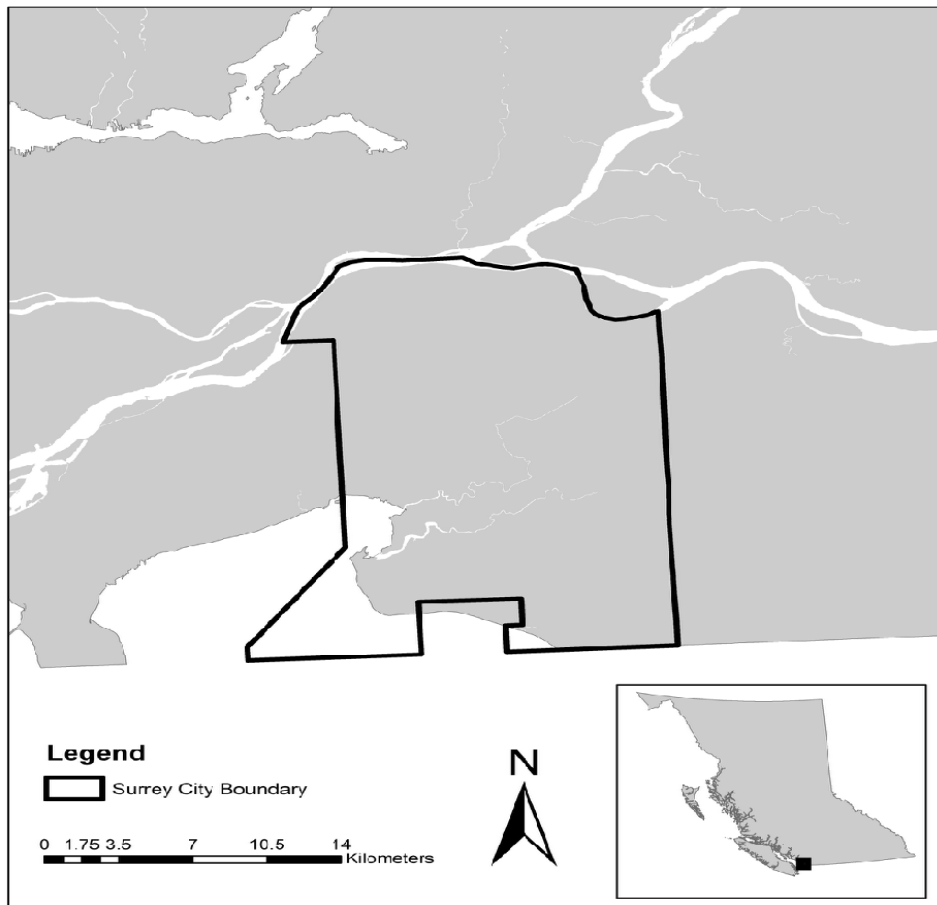
May promote integration of such thinking in long-term strategic planning:

- Expanding informal foreshore naturalization program
- Strengthening Homer Zoning Code
- Lowering asset density on the Spit

Surrey, British Columbia

Resilience

City of Surrey, British Columbia



Agents

- key actors, decision-makers

Institutions

- policies, plans, regulations

Systems

- ecosystems, infrastructure

1. Agents

- Progressive senior management and council
- Taken initiative to embed adaptation in strategic policy
- Adaptation a 'city philosophy'
- Collaboration between a range of actors (buy-in more likely)
- Supportive agents facilitate uptake in to key institutions

2. Institutions

- Integrated adaptation throughout planning frameworks
- Developed key guidance documents
 - Climate Adaptation Strategy
 - Sustainability Charter

3. Systems

Coastal ecosystems
highly susceptible to drought and SWI



Infrastructure adaptations
are ad-hoc (drought and SWI)



Dyking system
not adequate to cope w SLR and overland flooding

WHY?....

Lack of committal language within strategic documents

- Hard to translate action into granular scale outcomes, or specific policies/regulations

Highlights....

- Disconnect between adaptation in theory and practice
- To implement goals/ policies in practice, NEED strong institutions.
- MUST have committal and prescriptive language, *which* translates into *specific* policies, bylaws and regulations.

3. Role of Decision-makers

Nome:

- Adaptation slowly gaining traction w decision-makers
- Lack of internal capacity
- Efforts driven by economic opportunities (not adaptation)

Charlottetown:

- Decision-makers believe must take CC seriously
 - focus on mitigation
- Awareness is increasing, but no tangible actions (policy)
- Council see CC as a slow moving problem
 - wait and see approach
 - no mandate for action

Homer:

- Adaptation planning slowly gaining traction
 - CC thinking not embedded in policy
- Awareness is high, but not a priority at this stage
- Outside actors (Research Reserve) facilitating shift in thinking!

Surrey:

- Buy-in for CC is high (council, senior managers)
- Policies for action exist
- BUT policies lack committal language
 - so implementation is lagging

So what is the role of decision-makers?

In general

- Educated on affects of climate change
 - how this can influence their area of responsibility
- Active participants in civic administration - be involved
 - participate on strategic committees, and share their experience
- Open to new ways of thinking
 - different perspectives can enrich the decision making process and the outcomes

Leadership need to...

- Open minded: to risk, science, change in thinking
- Encourage contribution of expert actors
 - planners, emergency management
- Incorporate expert perspectives from the start
 - policy process
 - emergency management
- Know how to facilitate effective collaborations
 - ie. between different levels of government, with NGO (aid)
- Empower decision-makers
 - to be involved
 - to be accountable
 - to be heard (to make a contribution)

4. Research + Education

This topic and scale of interest is gaining momentum!

UArctic Thematic Research Network

Local-scale Planning, Climate Change and Resilience

- started out w 9 members;
- defended in Stockholm, now 33 members

PURPOSE:

- explore how communities experience climate change
- explore governance structures around adaptation
- facilitates local expertise + collaboration

MOOC

Arctic Resilience - Community Planning and Development

- set to launch Fall 2020

Ryerson University

Special course on climate resilience and planning

- 2008-2012: 12/y;
- 2013-2016: 20/y;
- 2017-2019: 40/y, with 20+ waitlist

Climate Adaptation + Resilience Lab (CARL)

- grows every year!
- graduate students
- volunteer researchers (professionals)
- *People want to know how they can be part of the solution*



Study on role of planners and climate change

- 19 communities; 83 decision-makers
- how to better educate planners
- how to prepare for multi-stakeholder engagement

Master in Urban and Regional Planning, U. Alberta

- Students join from a variety of disciplines;
 - *want to learn how to develop more resilient communities (social, economic, enviro)*
- Every year at least **1/3** join CARL
 - resilience planning in permafrost zones
 - **planning for wildfire mitigation and response**
 - climate risk to heritage
 - **coastal naturalization v. hard structures**
 - **designing coastal park to buffer storm surges**
 - how climate change affects vulnerable populations
 - how decision-maker mindset can hinder effective action on CC
 - **urban design and attributes of resilience** (modularity, redundancy etc.)

climate change is complex

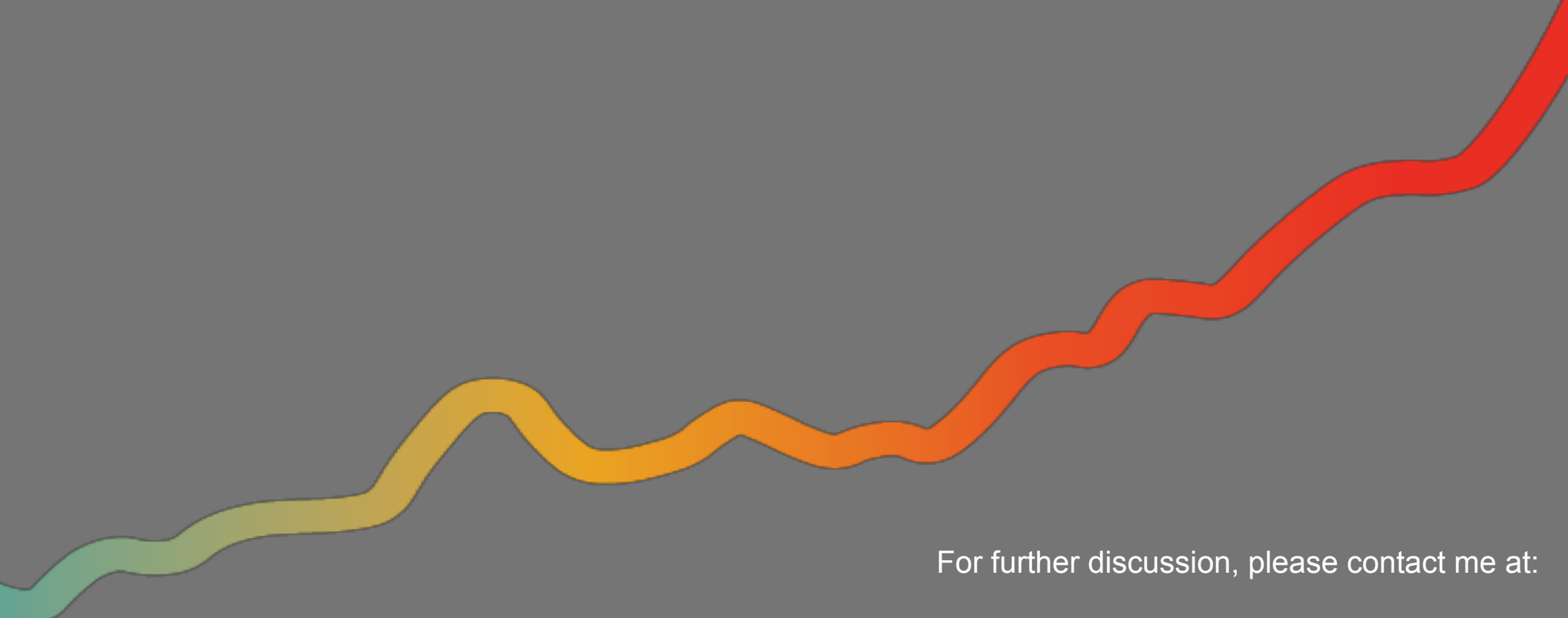


environmental extreme will continue

BUT

resilience can occur if decision-makers work together
(planners, politicians, CAOs, emergency management)

Thanks for your time!



For further discussion, please contact me at:

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