

SUSTAINABILITY
AT MCGILL



Climate Resilience: Make it Personal

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MForum

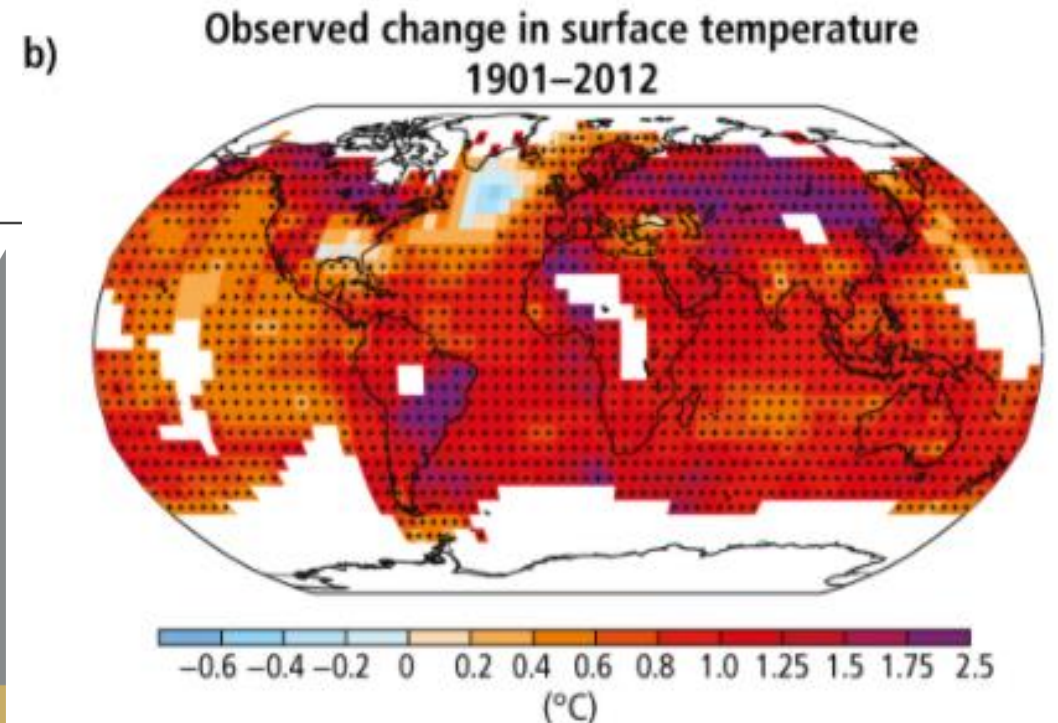
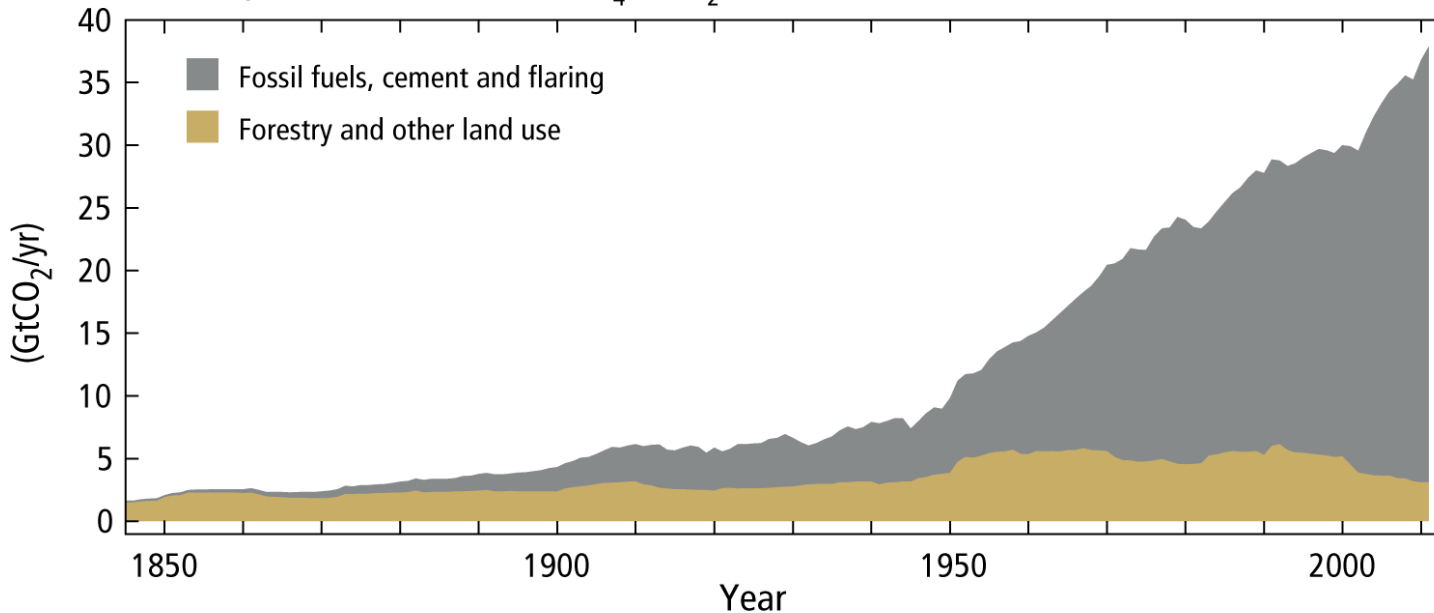
March 28, 2018

Climate Change

“A change of climate, which is attributed directly or indirectly to human activity, that alters the composition of the global atmosphere and which is in addition to natural variability observed over comparable time periods” – UNFCCC

Global anthropogenic CO₂ emissions

Quantitative information of CH₄ and N₂O emission time series from 1850 to 1970 is limited



Key International Climate Science + Policy



United Nations

FCCC/CP/2015/L.9



Framework Convention on
Climate Change

Distr.: Limited
12 December 2015

Original: English

Conference of the Parties
Twenty-first session
Paris, 30 November to 11 December 2015

Agenda item 4(b)
Durban Platform for Enhanced Action (decision 1/CP.17)
Adoption of a protocol, another legal instrument, or an
agreed outcome with legal force under the Convention
applicable to all Parties

ADOPTION OF THE PARIS AGREEMENT

▶ Article 2 of the Paris Agreement:

- ▶ “Holding the increase in the global average temperature to **well below 2°C** above pre-industrial levels... **recognizing that this would significantly reduce the risks and impacts of climate change.**”



Climate Change Concepts

Greenhouse gas concentrations

Climate change

Increased ADAPTATION
leads to decreased
VULNERABILITY to RISKS
and increased CLIMATE
RESILIENCE

▶ **Mitigation:**
actions to
reduce the
CAUSE of
climate change
(aka GHGs)

▶ **Adaptation:**
actions to
identify
vulnerabilities
and then
prepare for
and lessen the
IMPACTS of
climate change



Climate Resilience

- ▶ Relatively new concept that moved from:
 - ▶ **Outdated idea of “ecological equilibrium”** (returning to a single prior state after a disruption)
 - ▶ **To... modern concept of a flexible system that can establish new baselines**
- ▶ Capacity for a socio-ecological system to:
 - ▶ **Absorb stresses and maintain function in the face of climate change impacts**
 - ▶ **Adapt, reorganize and evolve to improve long-term sustainability of the system**



Climate Change Impacts: Activity

In **pairs or groups of three**, take **5 minutes** to discuss:

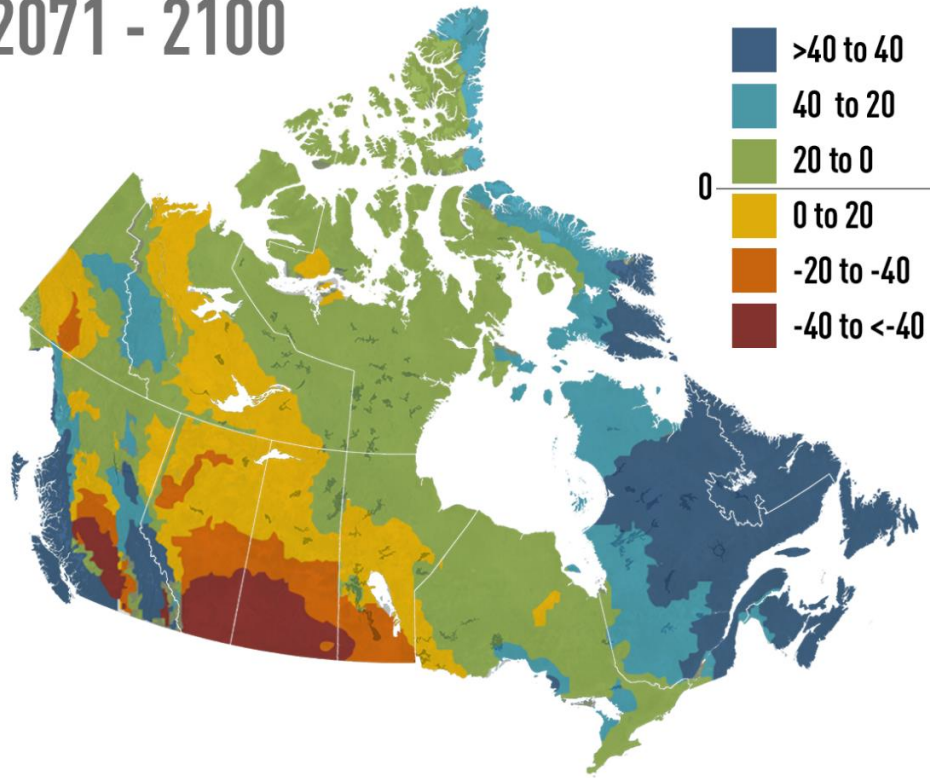
- ▶ Have you ever personally been affected by a climate change-related event or impact? What was the impact?
- ▶ Was it at home, at work, on vacation, somewhere else?
- ▶ What type of effect(s) did it have? Consider physical effects, health (including mental health) effects, financial impacts, future-planning, work...
- ▶ What actions did you take – or could you take – to adapt to this kind of effect in future?



What about Quebec specifically?

CLIMATE MOISTURE INDEX

CONTINUED EMISSIONS INCREASES
2071 - 2100



CBC News

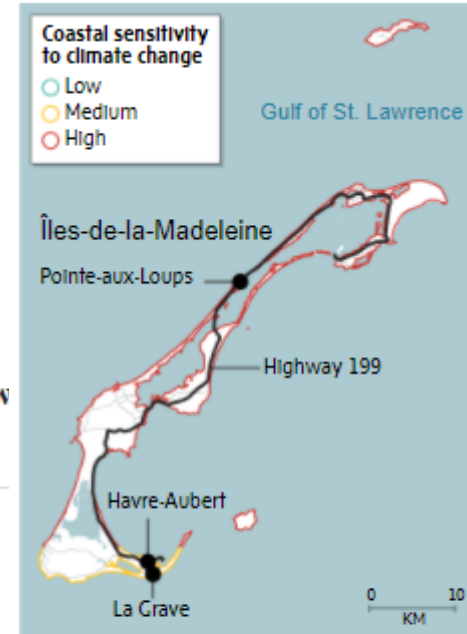
SOURCE: NRCan - CFS

Short on options, Îles-de-la-Madeleine residents make a strategic retreat from rising seas

On a Quebec archipelago, the Gulf of St. Lawrence is slowly devouring roads and threatening communities. But after expensive and ineffective battles against erosion, many locals are moving inland instead. **Matthew McClearn** reports in the second part of a Globe and Mail series

MATTHEW MCCLEARN
ÎLES-DE-LA-MADELEINE, QUE.
PUBLISHED MARCH 19, 2018

- ▶ What impacts will we face in Quebec?
- ▶ What vulnerabilities do we have?
- ▶ How can we adapt to increase our resilience?



MURAT YUKSELIR / THE GLOBE AND MAIL,
SOURCE: CANCOAST

PART 2: ÎLES-DE-LA-MADELEINE

Population: 12,010

Projected sea-level rise by 2100: 50 to 83 cm



What about Quebec specifically?

- ▶ What impacts will we face in Quebec?
- ▶ What vulnerabilities do we have?
- ▶ How can we adapt to increase our resilience?



Montreal was ill-prepared for spring flooding, city report shows

Outdated flood maps, emergency vehicles that were unusable because they had low floors, no inventory of city equipment and materials, not enough inspectors to check flooded homes, and a 911 system inundated with calls because the city help line went down for four hours.

Researchers say spring flooding is a reality of climate change

UQAM researchers Ursule Boyer-Villemare and Philippe Gachon say spring flooding is a reality of climate change. The two look to Europe for positive examples of how to counter the effects.



KATHRYN GREENAWAY, MONTREAL GAZETTE

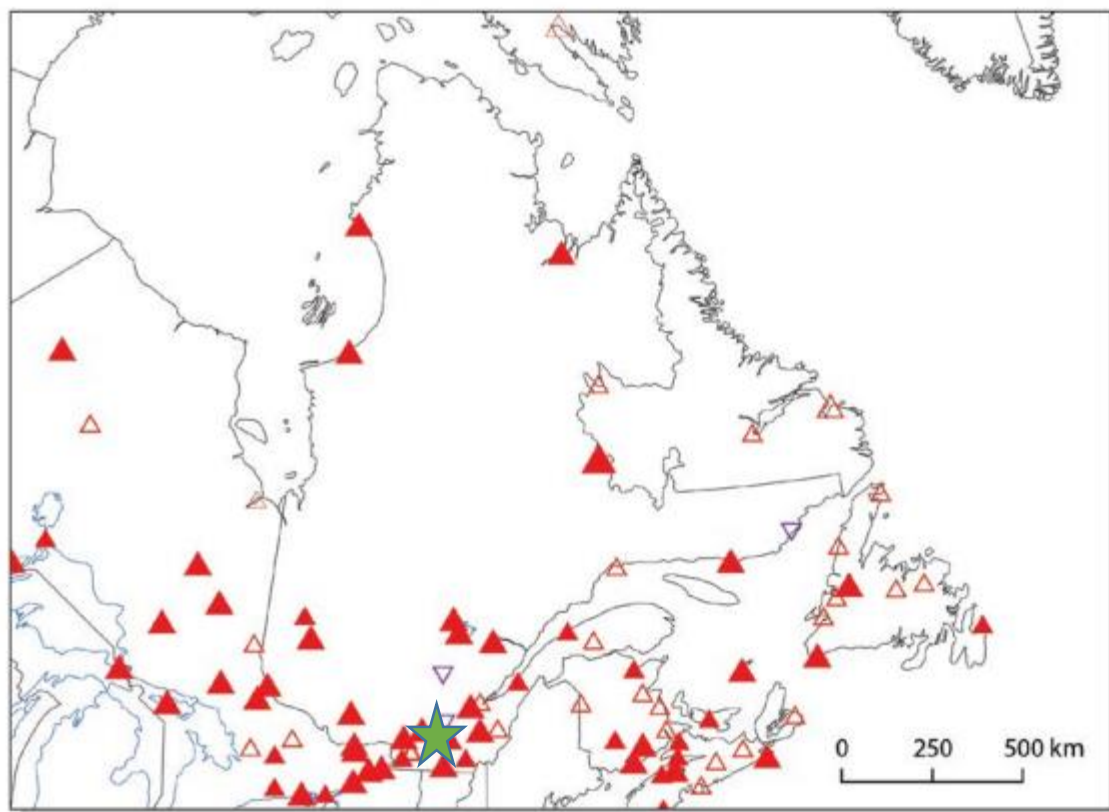
[More from Kathryn Greenaway, Montreal Gazette](#)

Published on: March 7, 2018 | Last Updated: March 11, 2018 3:25 PM EDT



Quebec Context: Temperature

Température moyenne à 2 m (ANN) : Tendence observée 1950 à 2011



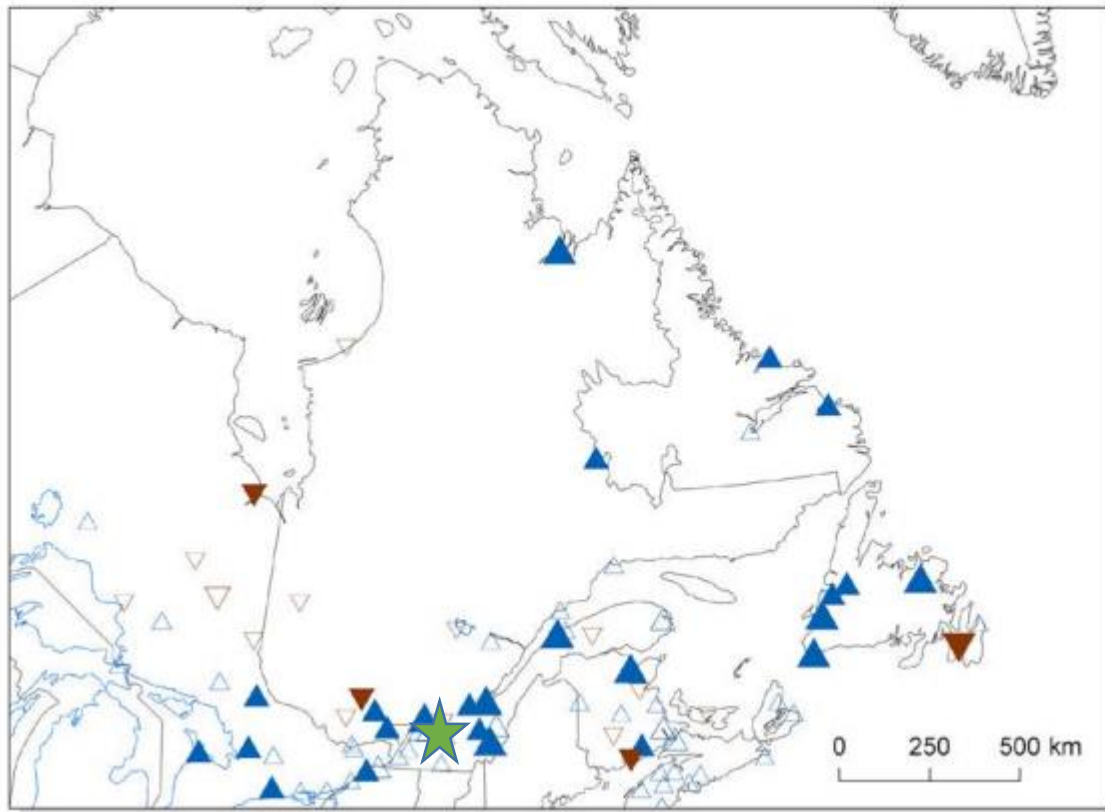
- ▶ Average temperatures in Quebec have increased 1°C – 3°C since 1950 (depends on where in QC)
- ▶ In future:

<p>HIGHER AVERAGE TEMPERATURES</p>	<p>Extended summer season</p> <ul style="list-style-type: none">↘ freeze-up and snowy periods↗ number of freeze-thaw cycles
<p>HEAT WAVES</p>	<ul style="list-style-type: none">↗ frequency and length



Quebec Context: Precipitation

Précipitations totales (ANN) : Tendance observée 1950 à 2011



% / 62 ans

- ▲ >20
- ▲ 11 - 20
- ▲ 1 - 10
- ▼ - 9 - 0
- ▼ -19 - -10
- ▼ <-20

▶ Spring and fall rainfall has increased in Southern QC since 1950

▶ In future:

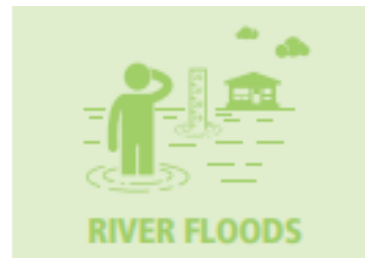


↗ frequency and intensity



↗ frequency of heavy snowfalls

↗ frequency of freezing rain



↗ spring river floods occurring earlier in the year



Quebec Context: Health

NUMBER OF REPORTED CASES OF LYME DISEASE AND WEST NILE FEVER CAUSED BY THE WEST NILE VIRUS (WNV) IN QUÉBEC SINCE 2002

PERIOD	NUMBER OF CASES REPORTED	
	Lyme disease*	West Nile fever**
2002 – 2003	Info not available	Approx. twenty per year
2004 – 2010	< 15 per year	< 5 per year
2011	32	42
2012	43	132
2013	141	32

- ▶ Longer pollen season + ↑ air pollution from forest fires = ↑ allergy, respiratory and cardiovascular problems
- ▶ ↑ health impacts due to heat waves and urban heat islands
- ▶ Myriad of risks from increase in frequency and severity of extreme weather events
- ▶ Arrival/expansion of harmful species (e.g. ticks, WNV)



What factors influence resilience?

Factors related to VULNERABILITY and CAPACITY FOR ADAPTATION

- ▶ Scope and availability of resources (information, materials, experts)
- ▶ Citizen engagement & knowledge
- ▶ Type & involvement of governing bodies
- ▶ Economic status
- ▶ Geography and ecological context
- ▶ Demographics of population



Neighbourhood Vulnerabilities: Activity

Now we know about Quebec generally. But **which vulnerabilities and impacts apply to our specific neighbourhoods?** Please follow these instructions – requires some movement!

1. Find your neighbourhood/region on the next slide.
2. Note which impacts it is vulnerable to (there will be 0 – 3).
3. Write your neighbourhood on a sticky note, one per vulnerability
4. Stick the sticky note(s) onto the relevant poster(s) (e.g. Storms)
 - If your neighbourhood is listed but says “low” next to: place your sticky note on the “Low Vulnerability” poster
 - If your neighbourhood isn’t listed: place your sticky note on the “Unknown Vulnerability” poster

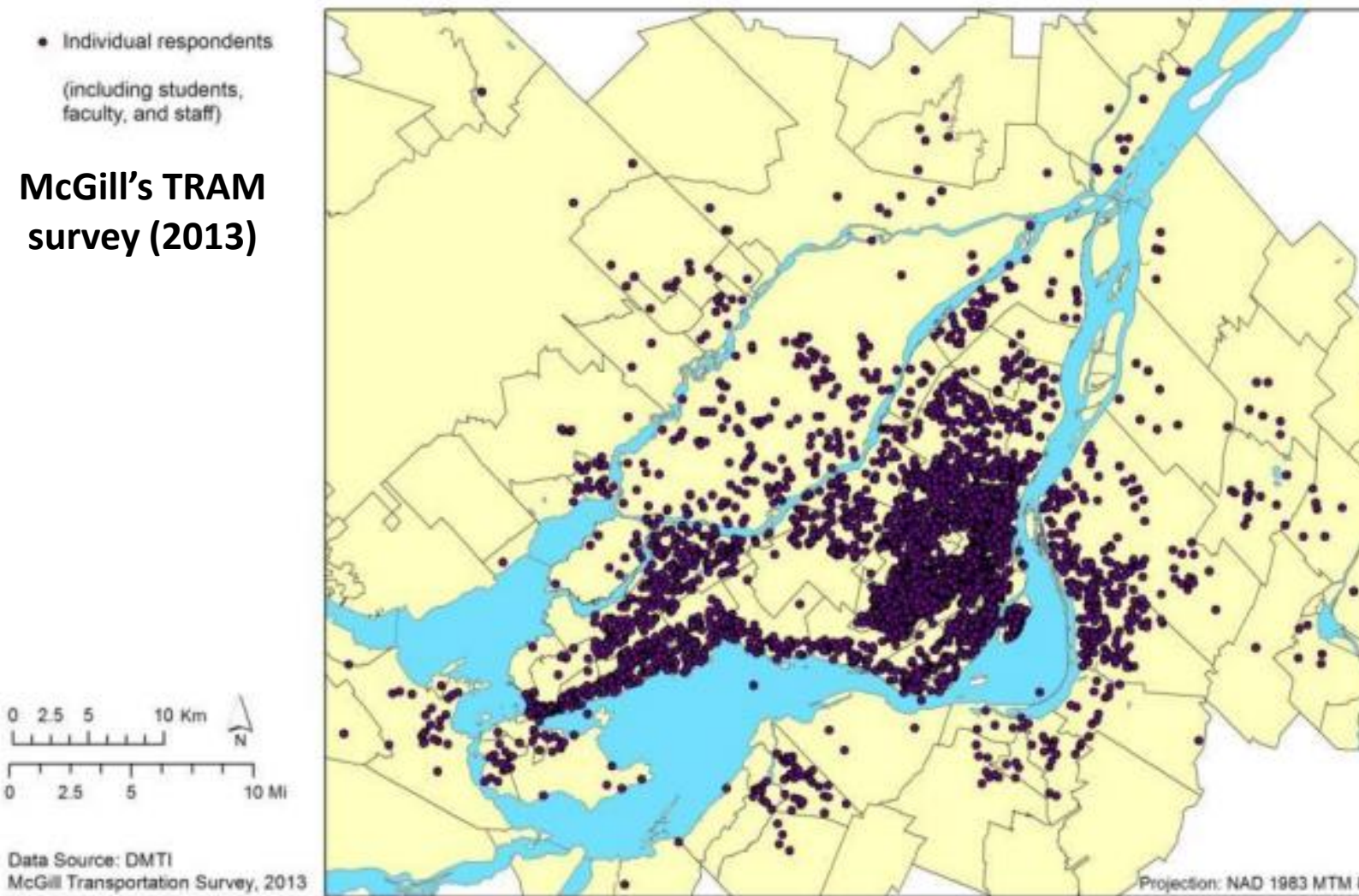


Neighbourhood Vulnerabilities: Activity

- ▶ Ahuntsic-Cartierville: floods, heavy rains
- ▶ Anjou: low
- ▶ Baie d'Urfe/Beaconsfield: low
- ▶ Brossard/La Prairie: heat waves
- ▶ CDN/NDG: drought, heavy rains
- ▶ Cote-Saint-Luc/Hampstead: heavy rains
- ▶ DDO/Kirkland: low
- ▶ Dorval: low
- ▶ Ile-Bizard/Saint-Genevieve: floods
- ▶ Lachine: low
- ▶ LaSalle: heat waves, drought
- ▶ Laval: urban heat islands
- ▶ Longueuil: urban heat islands
- ▶ Montreal Est: low
- ▶ Montreal Nord: heat waves, floods
- ▶ Montreal Ouest: low
- ▶ Mont Royal/Plateau/Ville Marie: heat waves, storms, heavy rains
- ▶ Mercier-HoMa: drought, heat waves
- ▶ Notre-Dame-de-l'Île Perrot: floods
- ▶ Outremont: low
- ▶ Parc Ex-Villeray-Saint M: storms, heavy rains, heat waves
- ▶ Pierrefonds-Roxboro: floods
- ▶ Pointe-Claire: low
- ▶ Riviere-des-Prairies-Pointe-aux-Trem: floods
- ▶ Rosemont-La Petite Patrie: heavy rains
- ▶ St-Anne-de-Bellevue/Senneville: floods
- ▶ Saint-Leonard: heavy rains, heat waves
- ▶ Saint-Laurent: heavy rains
- ▶ Sud-Ouest: heavy rains, heat waves
- ▶ Verdun: heavy rains
- ▶ Westmount: low



Neighbourhood Vulnerabilities: Activity



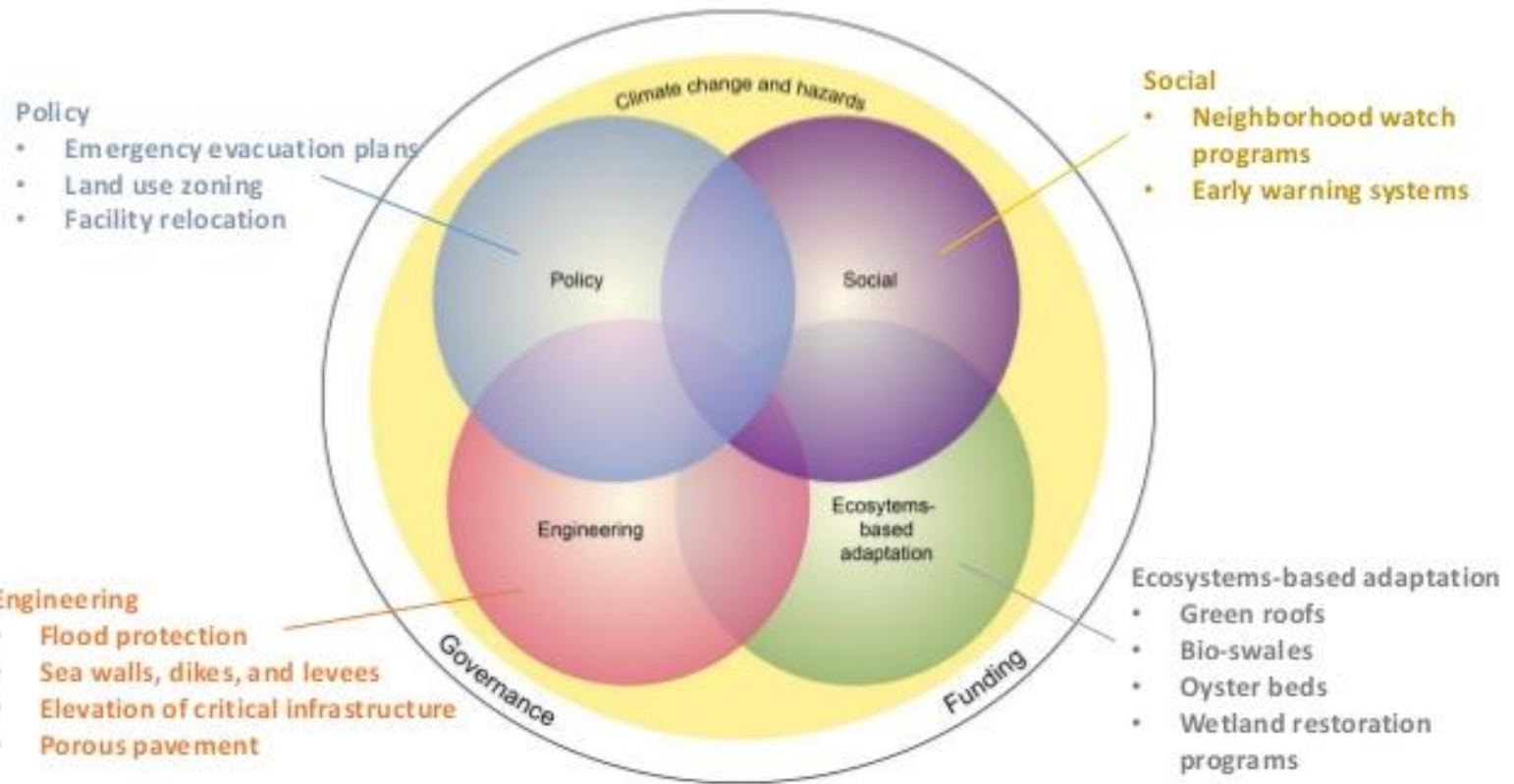
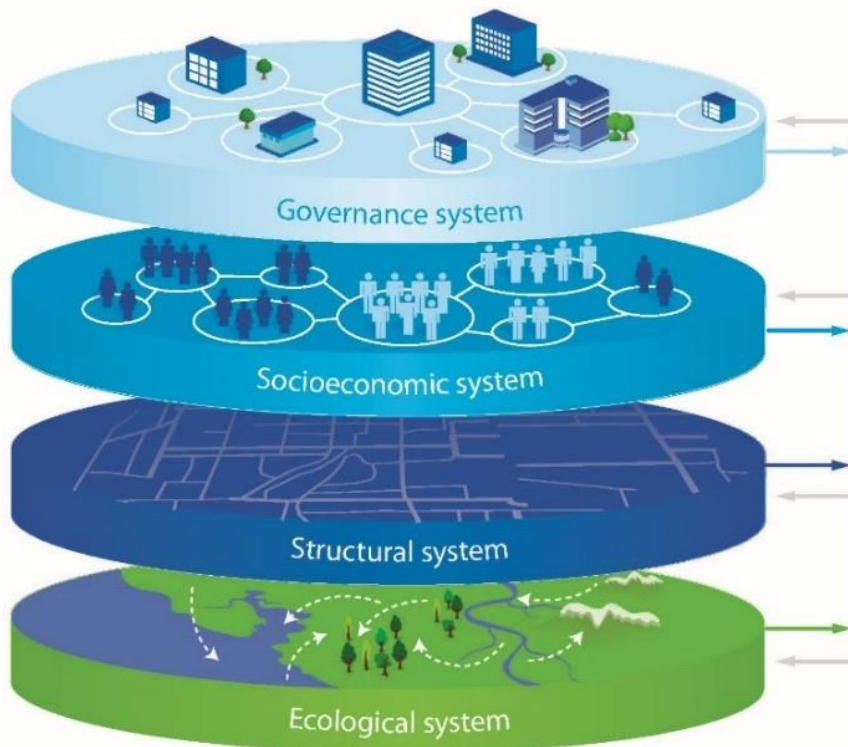
- ▶ Do the stated vulnerabilities match your experience?
- ▶ How did this activity make you feel? What if your vulnerabilities were “low”, or “unknown”?
- ▶ How can we use this info to inform adaptation strategies?

Figure 1: Spatial distribution of the home location of all survey respondents, including students, faculty and staff






Approaches to Resilience Action

What are other examples of resilience strategies in each of these categories?



Montreal Adaptation + Resilience Actions

1. Governance
2. Structural
3. Social
4. Ecological

 <p>HIGHER AVERAGE TEMPERATURES</p>	<ul style="list-style-type: none">– Protect biodiversity– Increase infrastructures' resilience to the freeze-thaw cycle– Adapt the slate of winter recreational activities and maintenance operations– Broaden the slate of summer recreational activities and maintenance operations– Control undesirable plant species
 <p>HEAVY RAINFALLS</p>	<ul style="list-style-type: none">– Harvest rainwater– Increase infrastructures' and buildings' resilience to runoff water– Minimize sealed surfaces– Ensure the capacity of stormwater and combined sewer systems– Increase and preserve tree and plant cover– Develop emergency measures for heavy rainfalls
 <p>HEAT WAVES</p>	<ul style="list-style-type: none">– Mitigate heat islands– Provide spaces for people to cool off and avoid exposure to oppressive heat (cooling islands)– Protect biodiversity against heat waves– Develop emergency measures for heat waves



Montreal Adaptation + Resilience Actions

1. Governance
2. Structural
3. Social
4. Ecological



DESTRUCTIVE STORMS

- Increase infrastructures' and buildings' resilience to wind and freezing rain
- Develop emergency measures in case of prolonged power outage (winter conditions)
- Increase plants' resilience to wind and freezing rain



DROUGHT

- Ensure the quality and quantity of drinking water
- Increase infrastructures' and buildings' resilience to soil drying
- Increase plants' resilience to drought



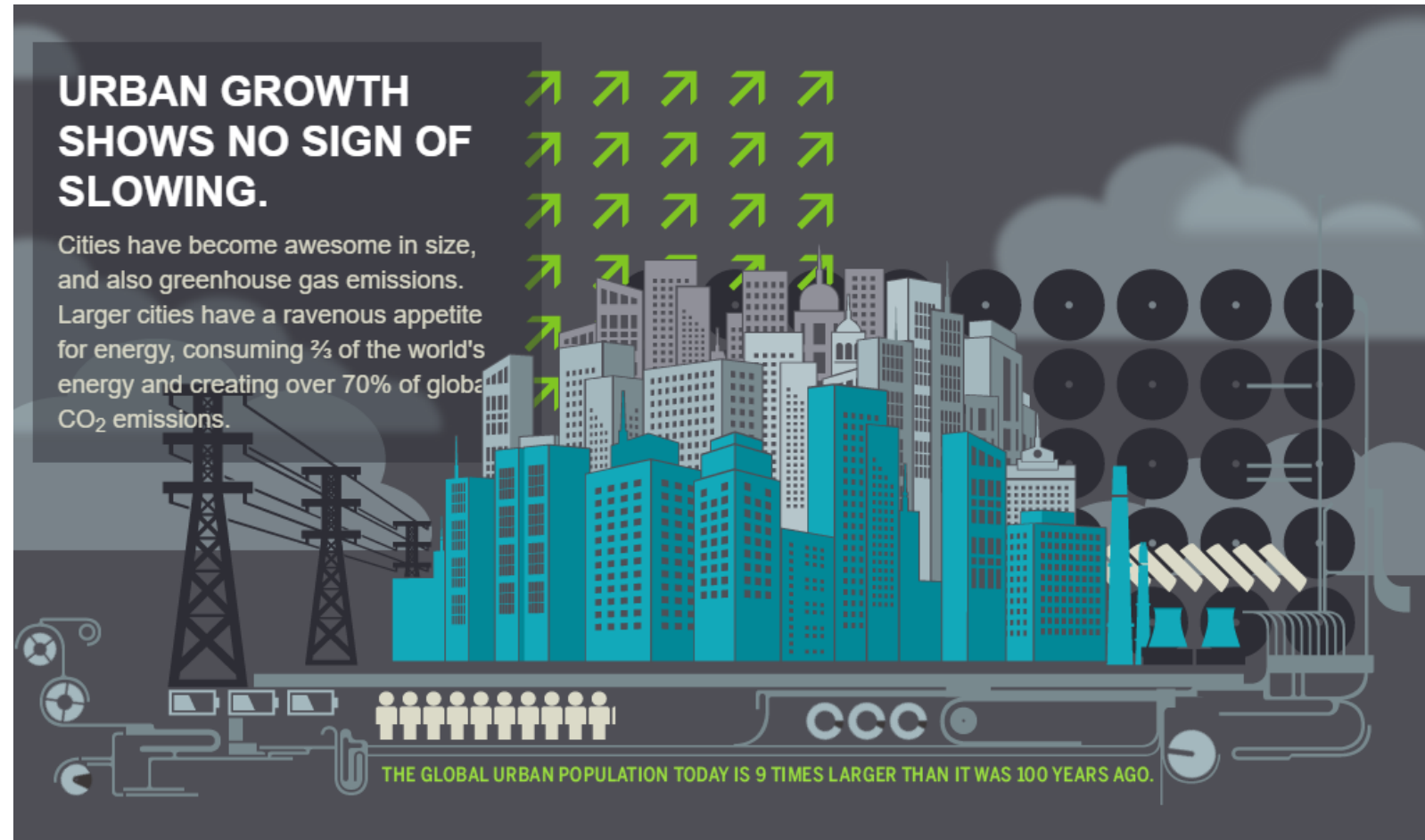
RIVER FLOODS

- Increase infrastructures' and buildings' resilience to river floods
- Develop emergency measures for flood-prone areas
- Increase the stability of river banks facing erosion



Emerging Trends in Climate Resilience

1. Emphasis on individual and community-level knowledge and action
2. Cities are at the forefront!
3. Importance of natural or “green” infrastructure
4. Climate adaptation and resilience concerns will transform development



Climate Resilience Resources

Understanding your impacts and vulnerabilities

- Global Footprint Calculator or “Oroeco” app
- Montreal’s “Climate change adaptation plan for the Montreal Urban Agglomeration” (2017)
 - Ask your city for a risk and adaptation plan!
- Ouranos’ “Towards Adaptation” report (2015)
- C40 Cities Climate Leadership Group

Taking action in your everyday life and in your community!

- UN’s “Lazy Person’s Guide to Saving the World”
- **Phone apps:**
 - Seafood Watch (sust seafood)
 - HowGood (sust food)
 - iHuerting (urban gardening)
 - JoinIn (community engagement)
- **At McGill:** Sustainable Workplace Certification, Sustainable Events Certification, SPF, Staff Sust. Network



THANK YOU



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