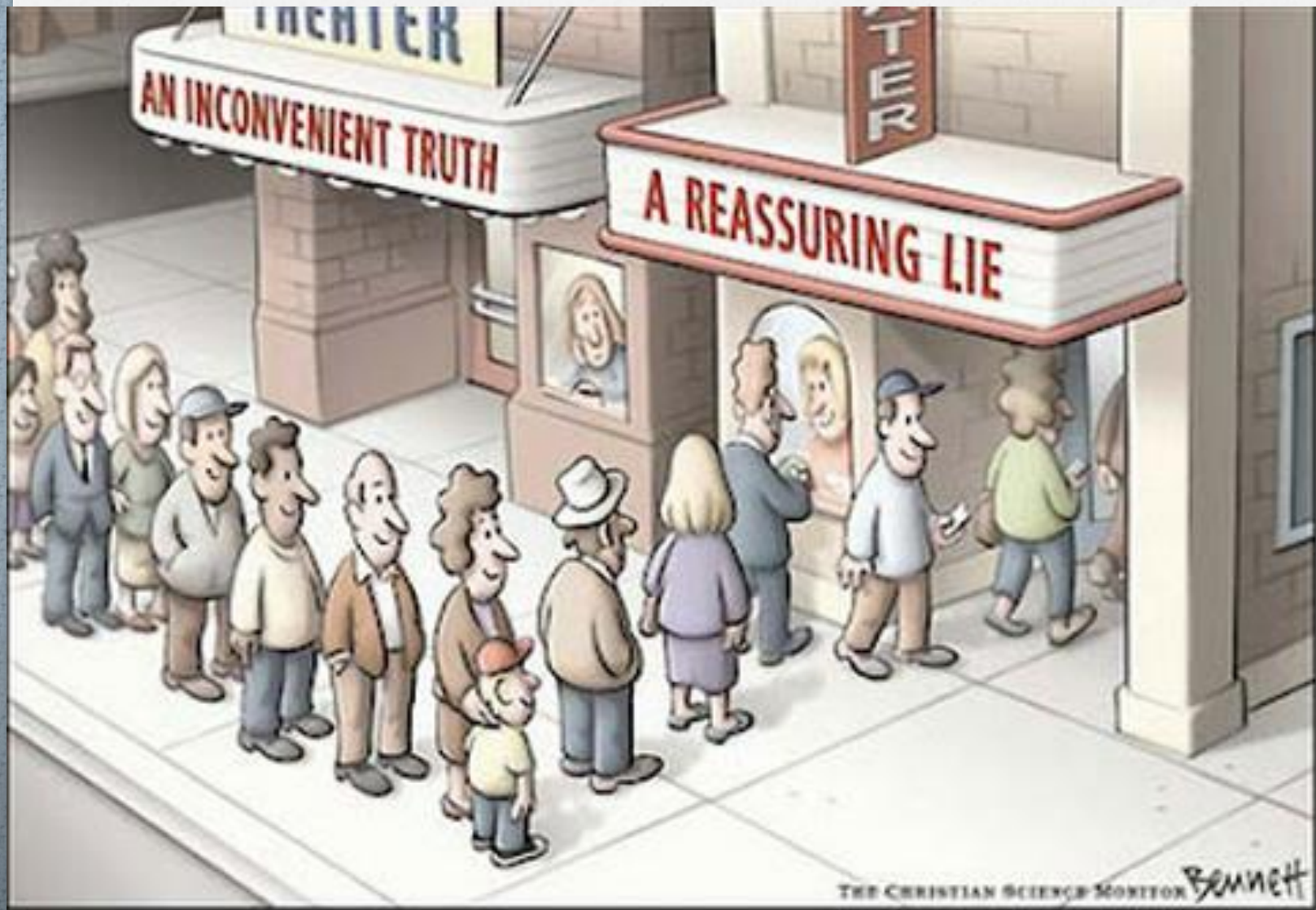


The Changing Face of Climate Adaptation in Canada

David McLaughlin
University of Waterloo
May 11, 2015





This is climate change?



This isn't climate change.



Actually, this is.

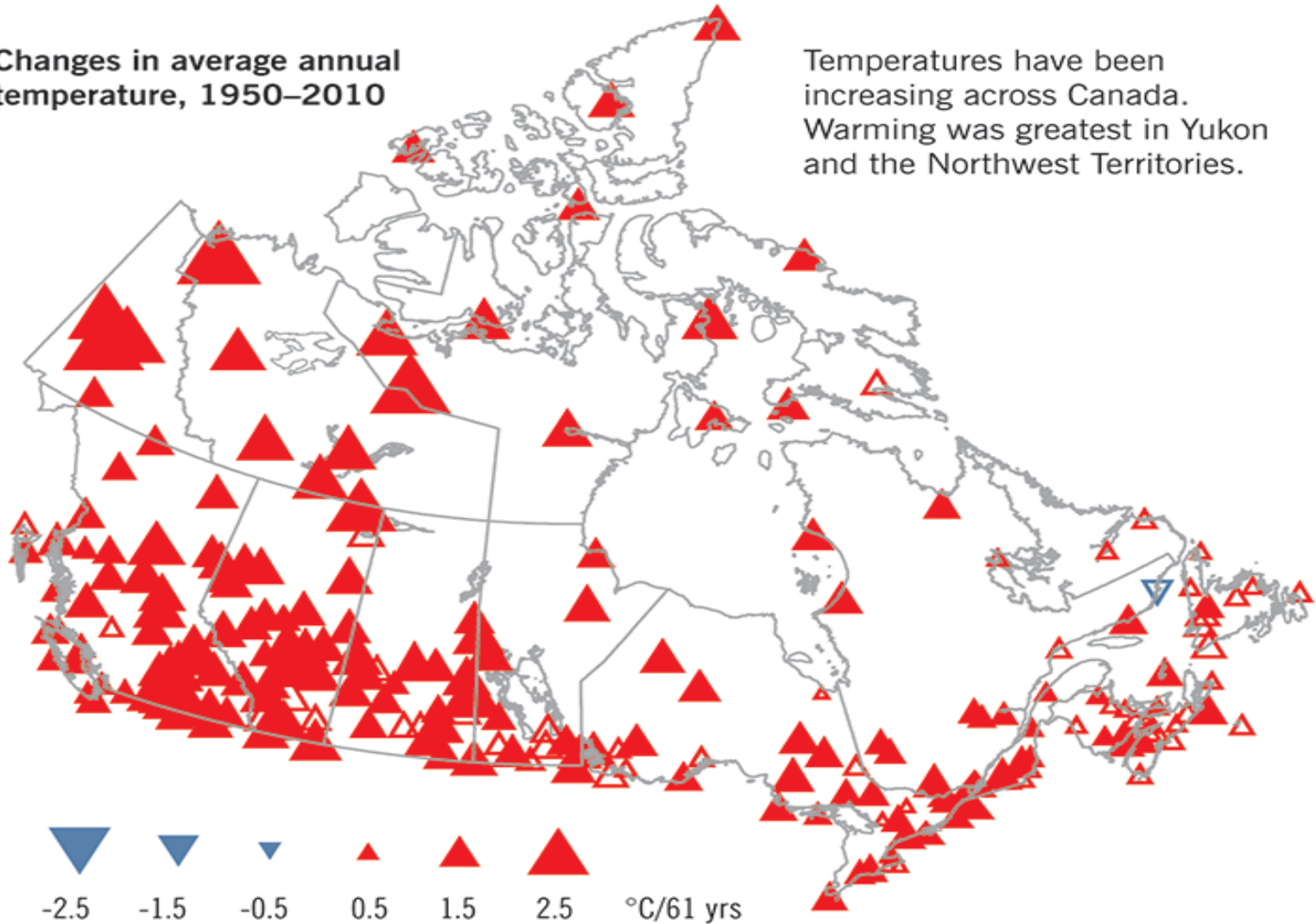


Mortality. Morbidity. Exposure. Hypothermia. High blood pressure. Heart attacks. Strokes. Physical injuries. Lacerations. Bruises. Wounds. Infections. Sprains. Orthopedic injuries. Electrical injuries. Burns. Chronic disease exacerbation. CO2 poisoning. Smoke inhalation. Dehydration. Heat stroke. Water-borne diseases. Food-borne diseases. Respiratory illness. Asthma. Infants. Children. Seniors. ER visits. Hospitalization. Loss of work & productivity. Poor. Rising sea levels & flooding. Coastal inundation. Homes destroyed or flooded. Roads impassable. Drought. Forest & wildfires. Timber supply impacts. Job losses. Communities idled. PTSD. Mental health. Food shortages. Air pollution air quality. Allergies. Freezing rain. Heavy rain. Motor vehicle accidents. Water contamination. Extreme weather & flooding. \$Billions\$

Temperature changes 1950-2010

Changes in average annual temperature, 1950-2010

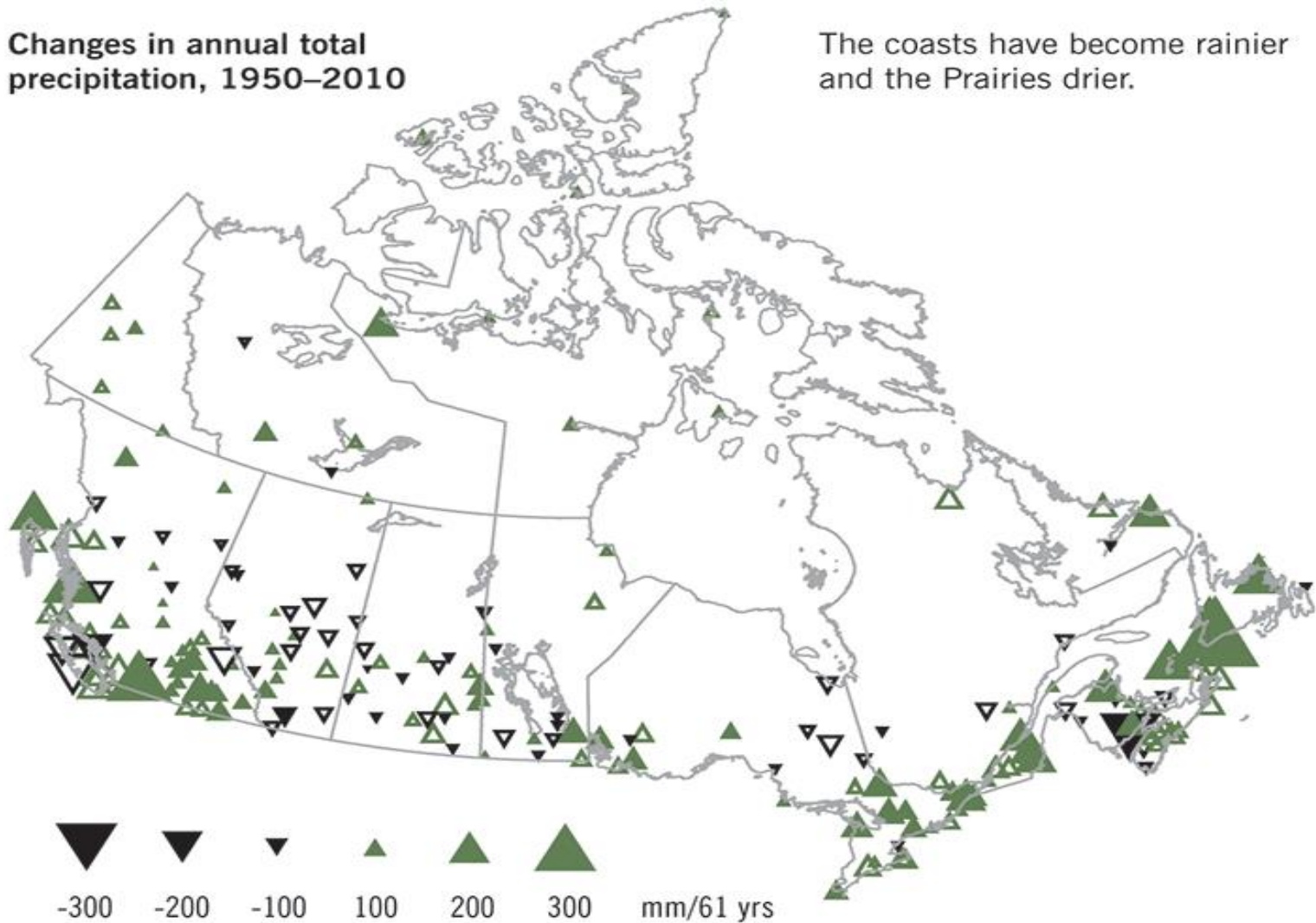
Temperatures have been increasing across Canada. Warming was greatest in Yukon and the Northwest Territories.



Precipitation changes 1950-2010

Changes in annual total precipitation, 1950-2010

The coasts have become rainier and the Prairies drier.

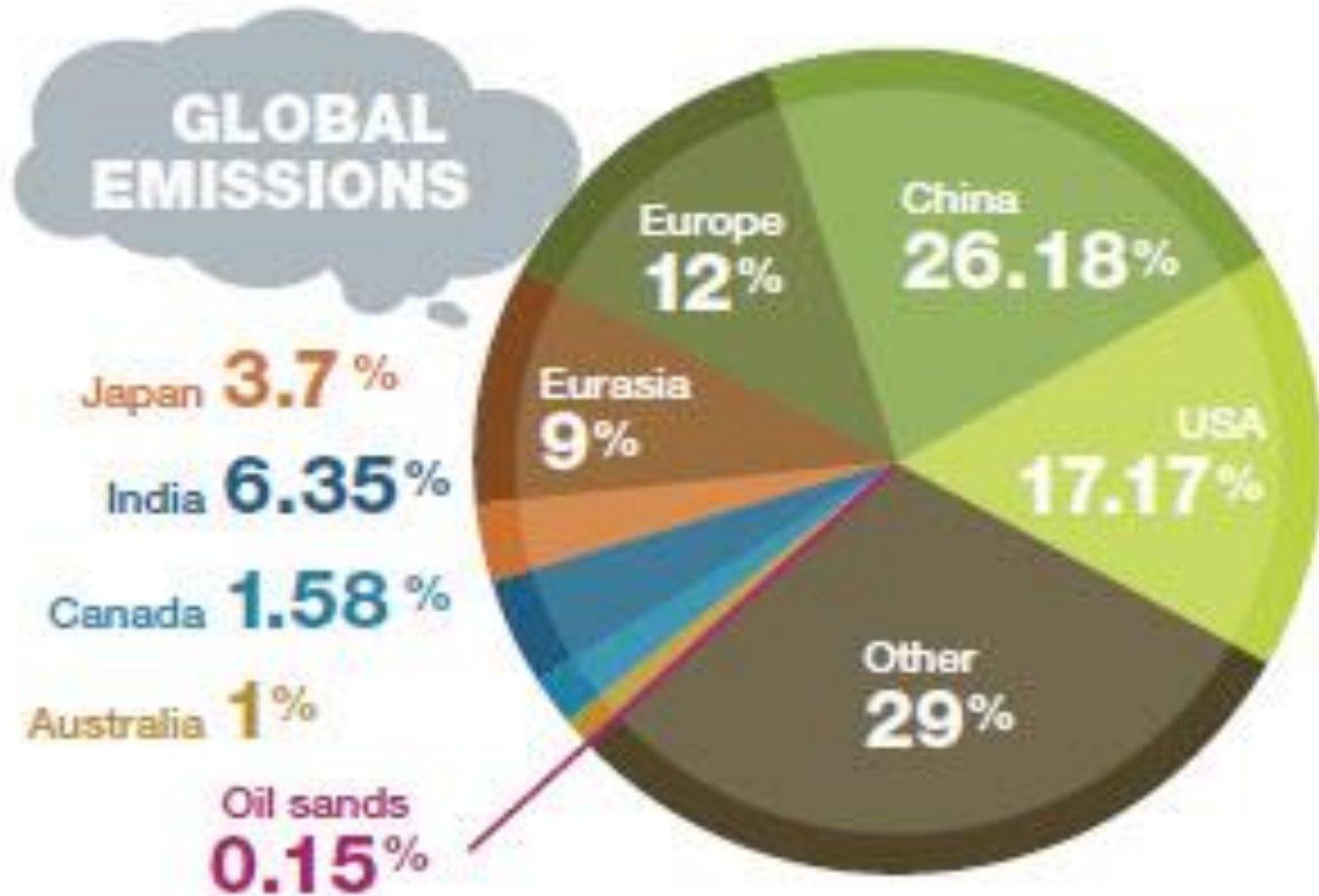


CANADA-WIDE COSTS OF CLIMATE CHANGE

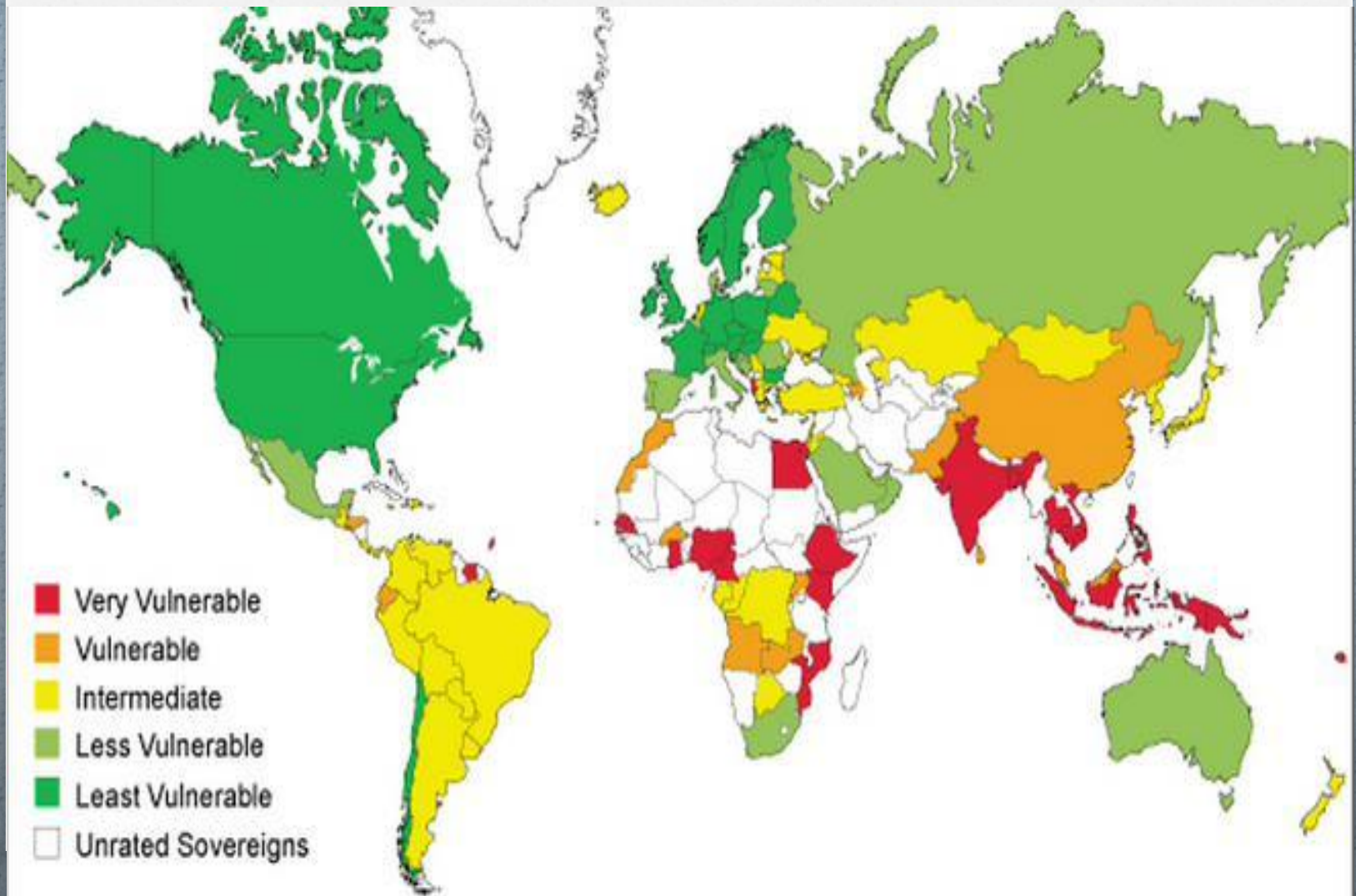
// CHAPTER 2.0



We're not the problem...



Canada not as vulnerable.



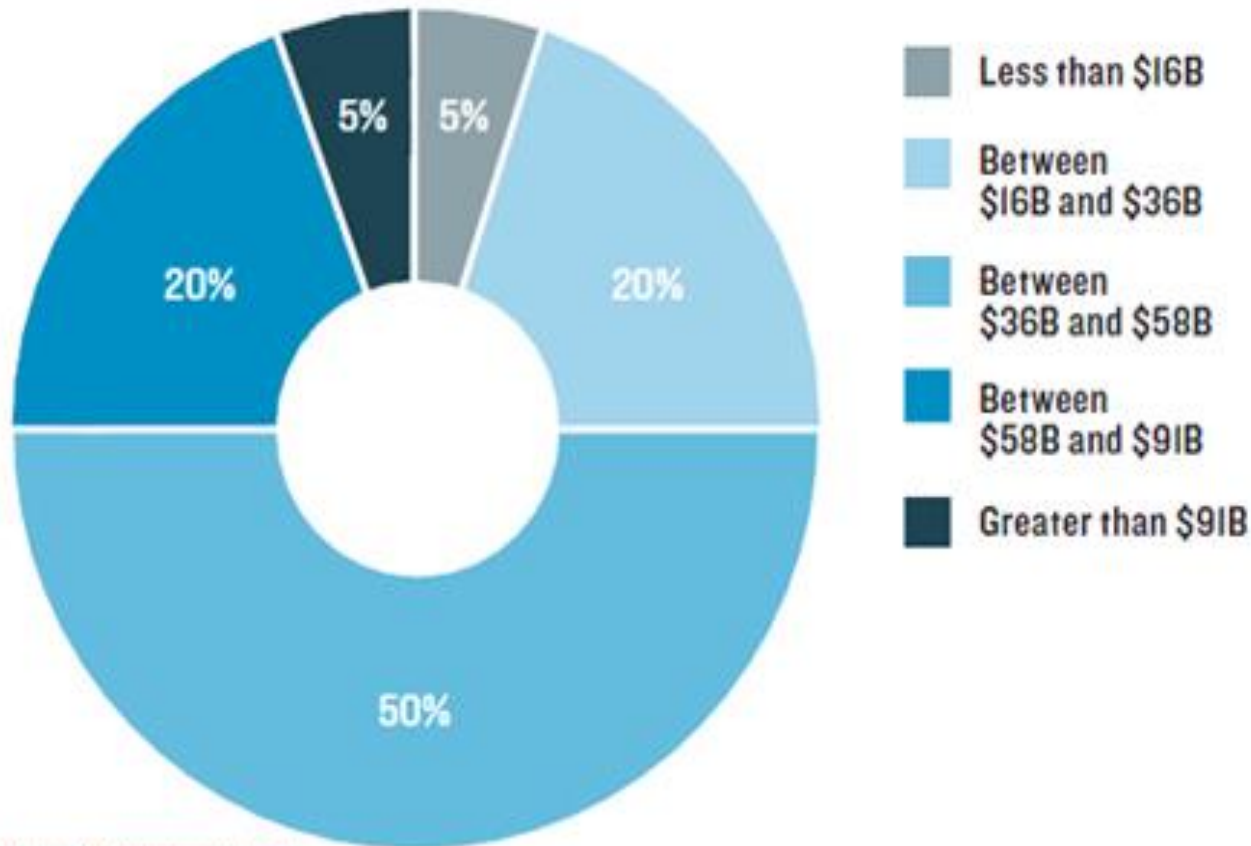
ANNUAL COSTS OF CLIMATE CHANGE, 2075

	- LOW CLIMATE CHANGE		+ HIGH CLIMATE CHANGE	
	SLOW GROWTH	RAPID GROWTH	SLOW GROWTH	RAPID GROWTH
AVERAGE ANNUAL COST	\$51B	\$149B	\$80B	\$221B
5% CHANCE OF ANNUAL COSTS REACHING AT LEAST	\$119B	\$350B	\$198B	\$546B
1% CHANCE OF ANNUAL COSTS REACHING AT LEAST	\$180B	\$525B	\$300B	\$820B

\$ (2008), UNDISCOUNTED

DISTRIBUTION OF COSTS OF CLIMATE CHANGE IN HIGH CLIMATE CHANGE-RAPID GROWTH SCENARIO, 2050

PERCENTAGE LIKELIHOOD OF DIFFERENT ANNUAL COSTS OF CLIMATE CHANGE

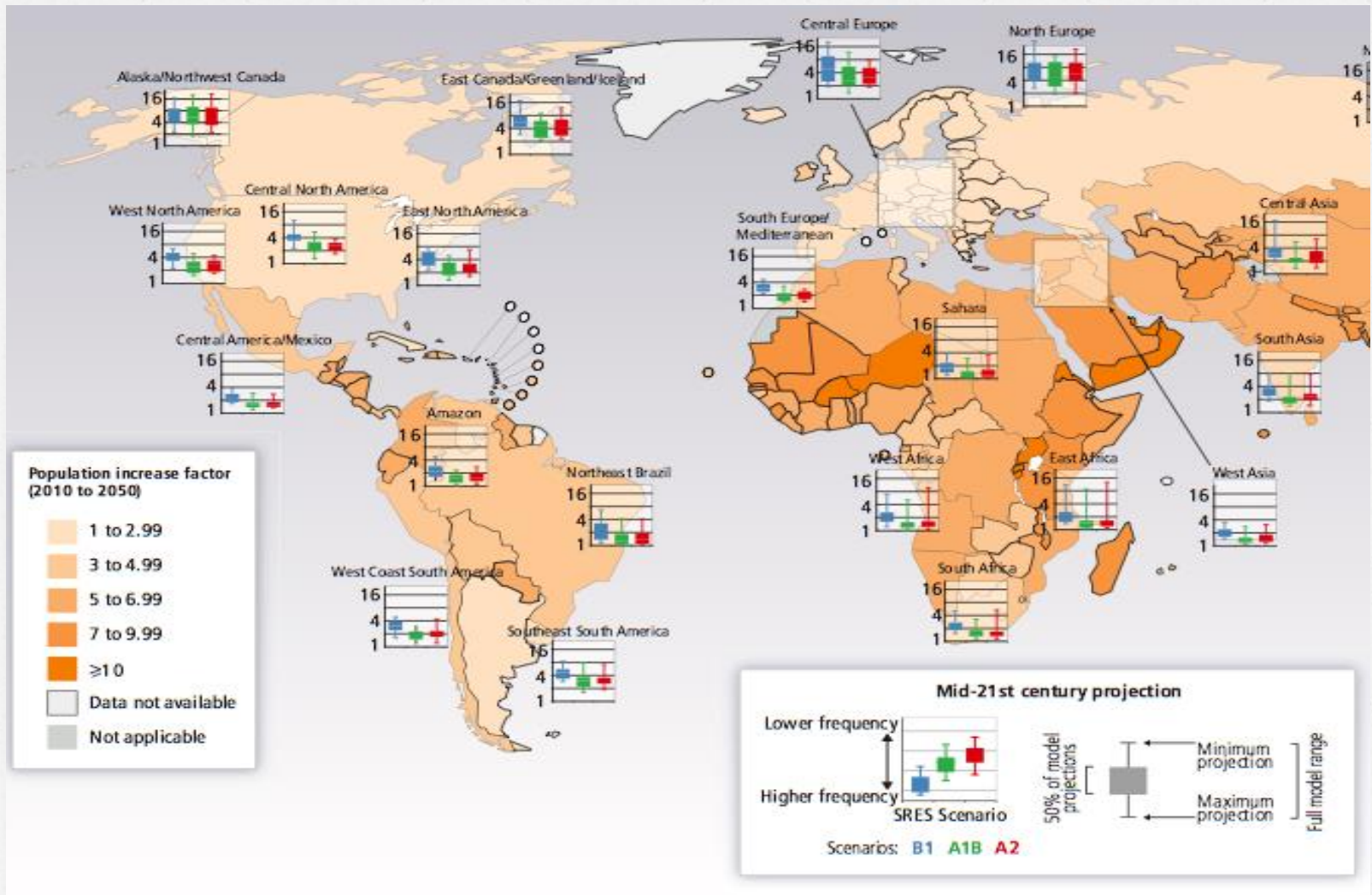


\$ (2008), UNDISCOUNTED

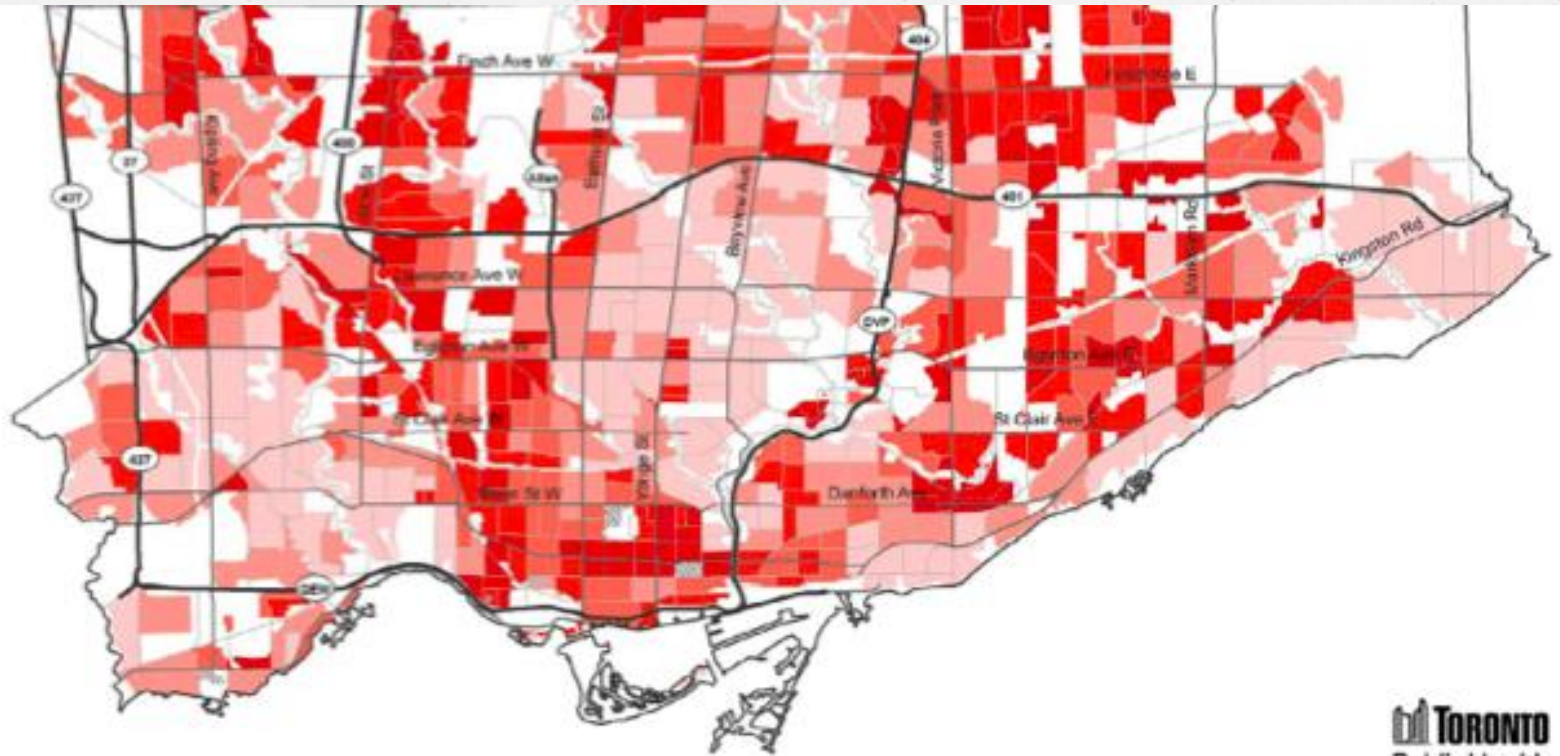
HUMAN HEALTH



IPCC - Population & Heat Increase Vulnerability



Vulnerability to Heat in Toronto



Toronto
Public Health

Heat vulnerability index by census tract (general population)



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Data sources: City of Toronto; CSDS; Statistics Canada, IntelliHealth, NRCan
(see full report for source files, licenses, and restrictions)

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DEATHS ATTRIBUTABLE TO HEAT AND AIR QUALITY IMPACTS FROM CLIMATE CHANGE AS A PROPORTION OF OVERALL DEATHS

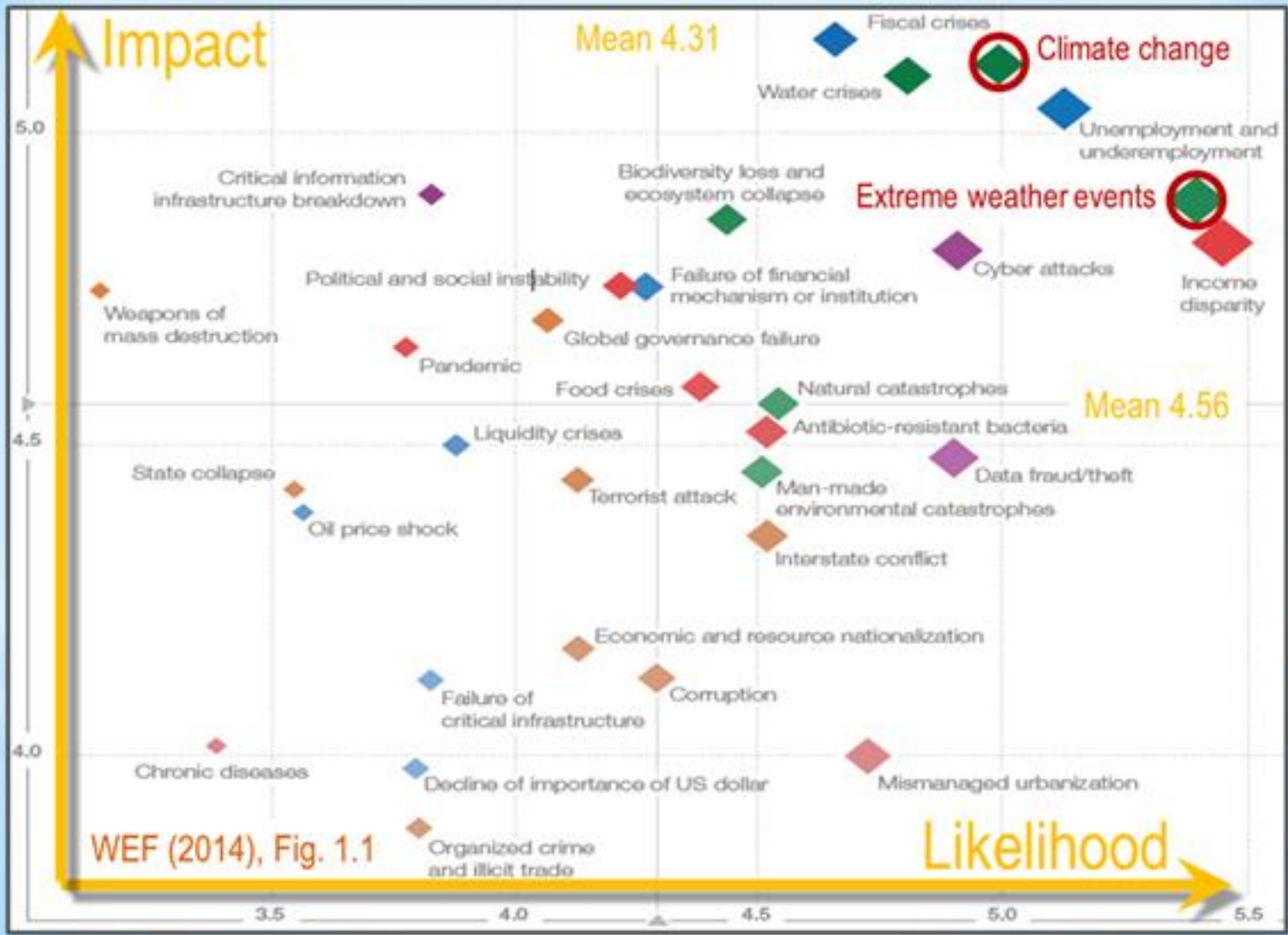
	VANCOUVER		CALGARY		TORONTO		MONTRÉAL	
	LOW CLIMATE CHANGE	HIGH CLIMATE CHANGE	LOW CLIMATE CHANGE	HIGH CLIMATE CHANGE	LOW CLIMATE CHANGE	HIGH CLIMATE CHANGE	LOW CLIMATE CHANGE	HIGH CLIMATE CHANGE
2020s	0.7%	0.7%	0.6%	0.6%	0.5%	0.6%	0.5%	0.6%
2050s	0.9%	1.2%	0.9%	1.3%	0.9%	1.2%	0.9%	1.2%
2080s	1.1%	1.9%	1.1%	2.0%	1.1%	2.1%	1.1%	2.1%

WEF Priorities

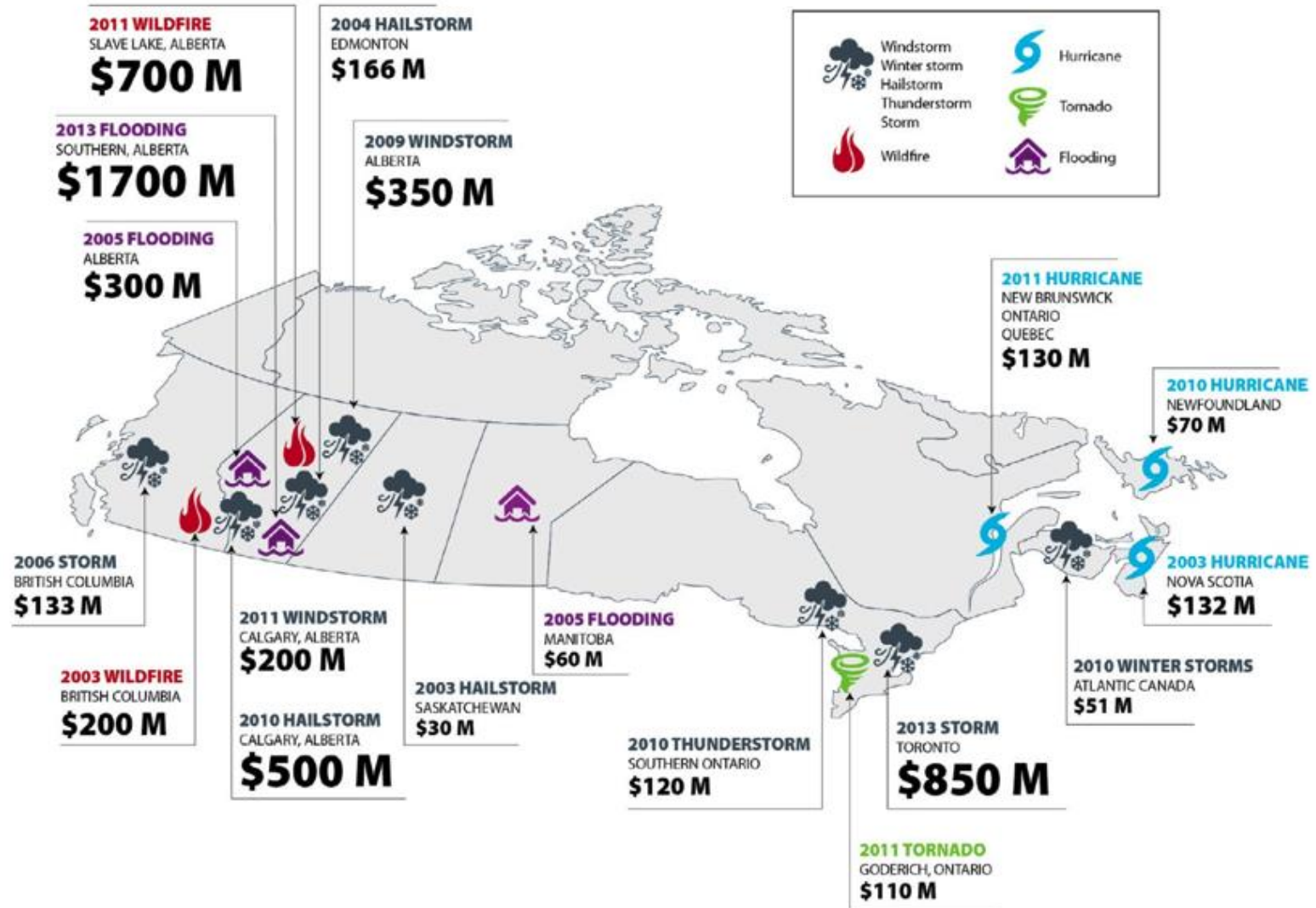
Impact

Breakdown of critical information infrastructure	Asset price collapse	Asset price collapse	Asset price collapse	Storms and cyclones	Severe income disparity	Severe income disparity	Income disparity
Chronic disease in developed countries	Middle East instability	Slowing Chinese economy (<6%)	Slowing Chinese economy (<6%)	Flooding	Chronic fiscal imbalances	Chronic fiscal imbalances	Extreme weather events
Oil price shock	Failed and failing states	Chronic disease	Chronic disease	Corruption	Rising greenhouse gas emissions	Rising greenhouse gas emissions	Unemployment and underemployment
China economic hard landing	Oil and gas price spike	Global governance gaps	Fiscal crises	Biodiversity loss	Cyber attacks	Water supply crises	Climate change
Asset price collapse	Chronic disease, developed world	Retrenchment from globalization (emerging)	Global governance gaps	Climate change	Water supply crises	Mismanagement of population ageing	Cyber attacks
2007	2008	2009	2010	2011	2012	2013	2014
Asset price collapse	Asset price collapse	Asset price collapse	Asset price collapse	Fiscal crises	Major systemic financial failure	Major systemic financial failure	Fiscal crises
Retrenchment from globalization	Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Climate change	Water supply crises	Water supply crises	Climate change
Interstate and civil wars	Slowing Chinese economy (<6%)	Oil and gas price spike	Oil price spikes	Geopolitical conflict	Food shortage crises	Chronic fiscal imbalances	Water crises
Pandemics	Oil and gas price spike	Chronic disease	Chronic disease	Asset price collapse	Chronic fiscal imbalances	Diffusion of weapons of mass destruction	Unemployment and underemployment
Oil price shock	Pandemics	Fiscal crises	Fiscal crises	Extreme energy price volatility	Extreme volatility in energy and agriculture prices	Failure of climate change adaptation	Critical information infrastructure breakdown

Likelihood



Extreme Weather Costs



The Climate Mitigation Spectrum

*Ecological
Activists*

*Smart Growth
Reformers*

*Eco-
Modernists*

Planetary
Limits

Market
Failure

Resilience
& Innovation

*N. Klein
D. Suzuki*

*N. Stern
A. Gore
T. Friedman*

*R. Pielke
T. Nordhaus*



NDP

Liberal



The Climate Adaptation Spectrum

Reducing Vulnerability

Building Resilience

Planetary
Risks

Planetary
Vulnerabilities

Planetary
Impacts

*International / National
Financial / Social /
Scientific*

IPCC
UNFCCC
National / sub-national
governments

*Local / Regional
Applied*

Business
Government
Cities

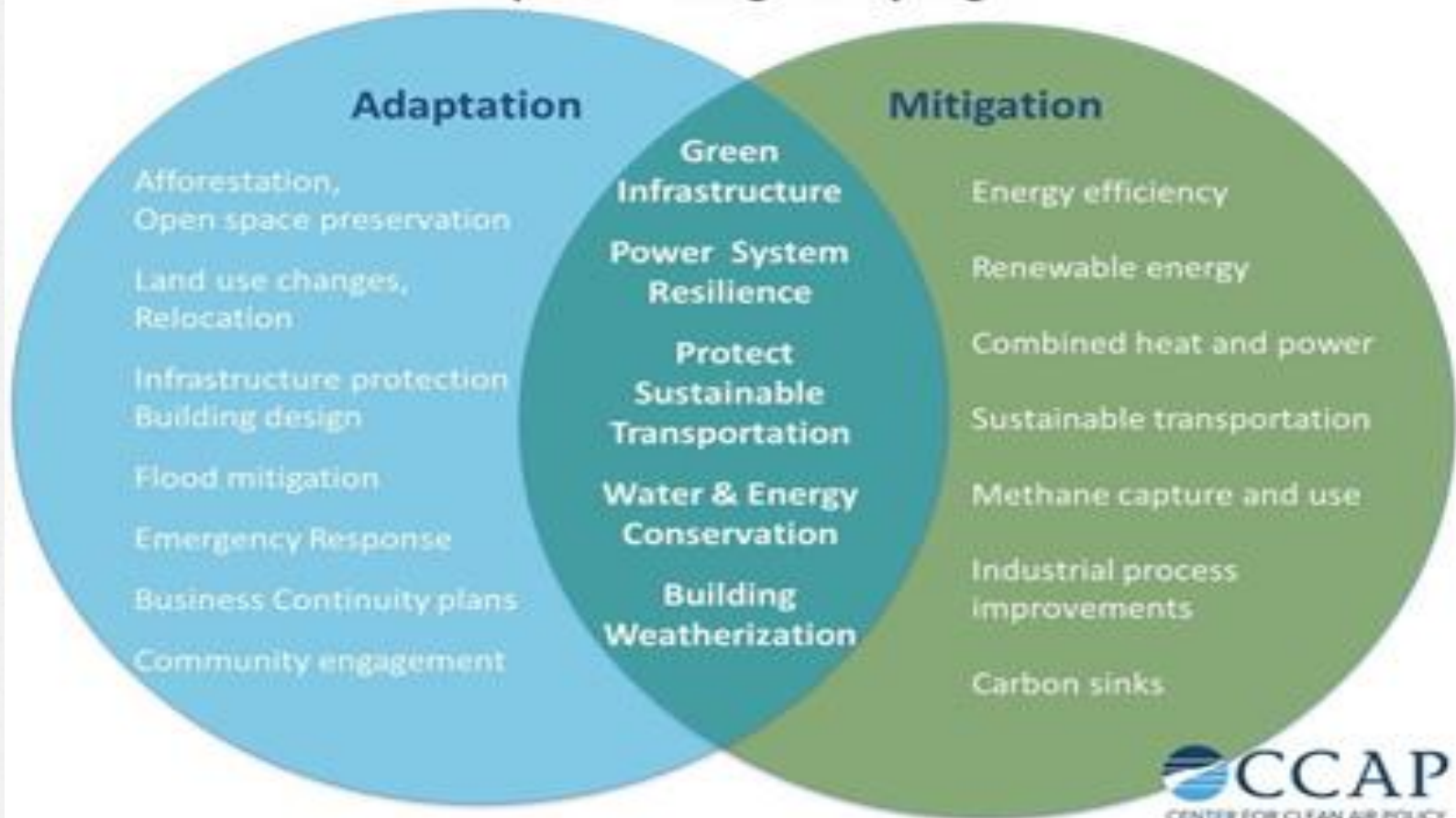
Mitigation vs. Adaptation

- ◆ Transformational
- ◆ Act despite uncertainty
- ◆ Avoid impacts
- ◆ Energy systems focus
- ◆ Partisan
- ◆ Vocal champions
- ◆ Incremental
- ◆ Act factoring in uncertainty
- ◆ Manage impacts
- ◆ Social / ecological / infrastructure systems focus
- ◆ Non-partisan
- ◆ Knowledgeable Experts

Synergy

CONNECT THE DOTS

Adaptation + Mitigation Synergies



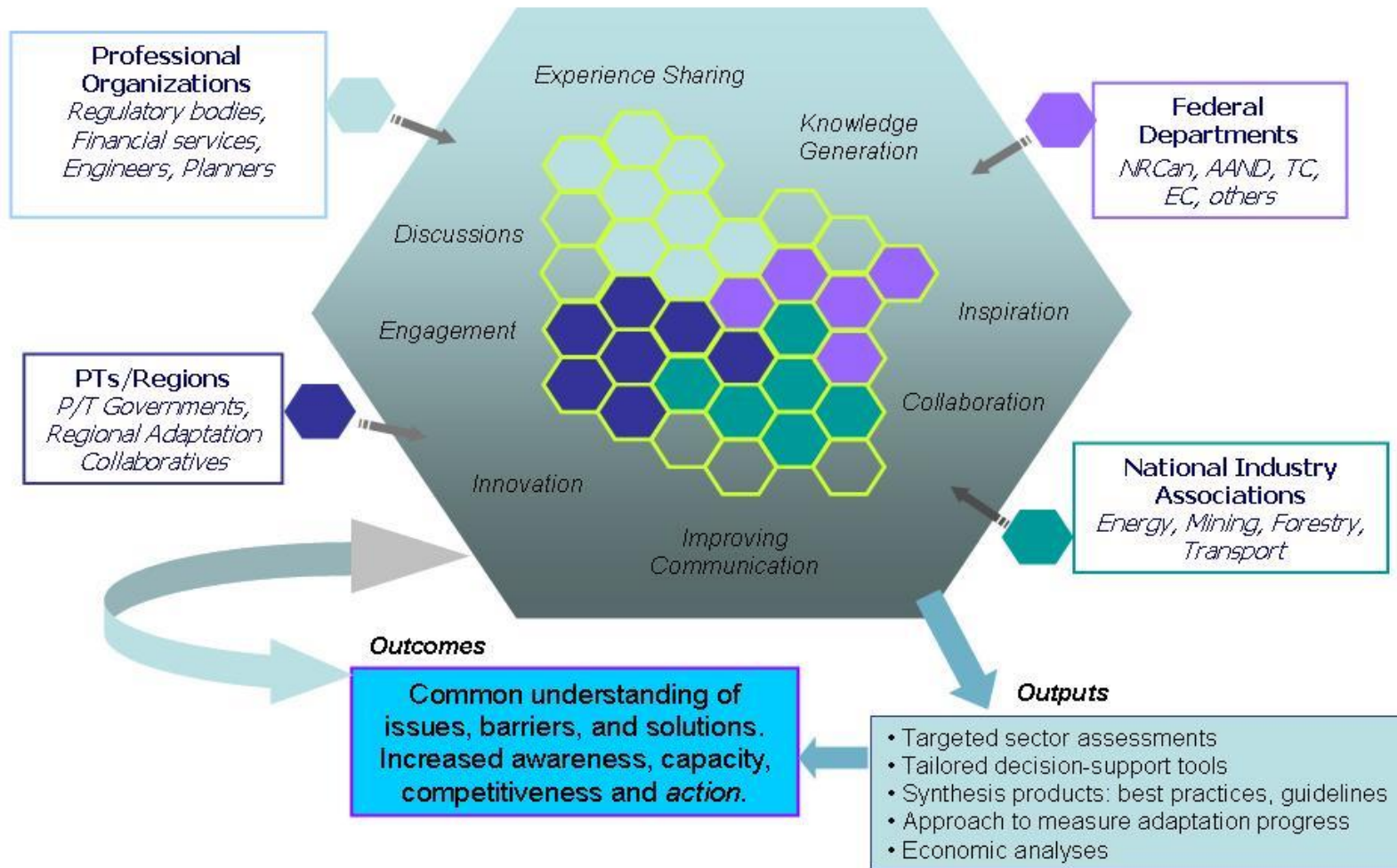
Co-benefits.



Canada & Adaptation

- ◆ Remains by-product of other decisions – policy, budgets, programs
- ◆ Not yet mainstreamed
- ◆ Climate impacts cycle not part of business cycle or political cycle
- ◆ Expert-focused not public-driven
- ◆ Drought, flood, storm resilience main focus
- ◆ Uneven, inadequate information for decision-makers
- ◆ *There is no adaptation agenda for or in Canada.*

The Adaptation Platform



Adaptation for Experts



Adaptation for People

