

Climate Impacts and Adaptation

Town of Essex

November 18, 2019

Niharika Bandaru | Climate Change Analyst



Niharika Bandaru



Climate Change Analyst

Town of Essex Contract Employee, August 2019 – February 2021

Education

B.A.Sc. Environmental Engineering

University of Windsor, 2013

M.Sc. Environmental Science & Policy

Johns Hopkins University, Current

Why We Are Here

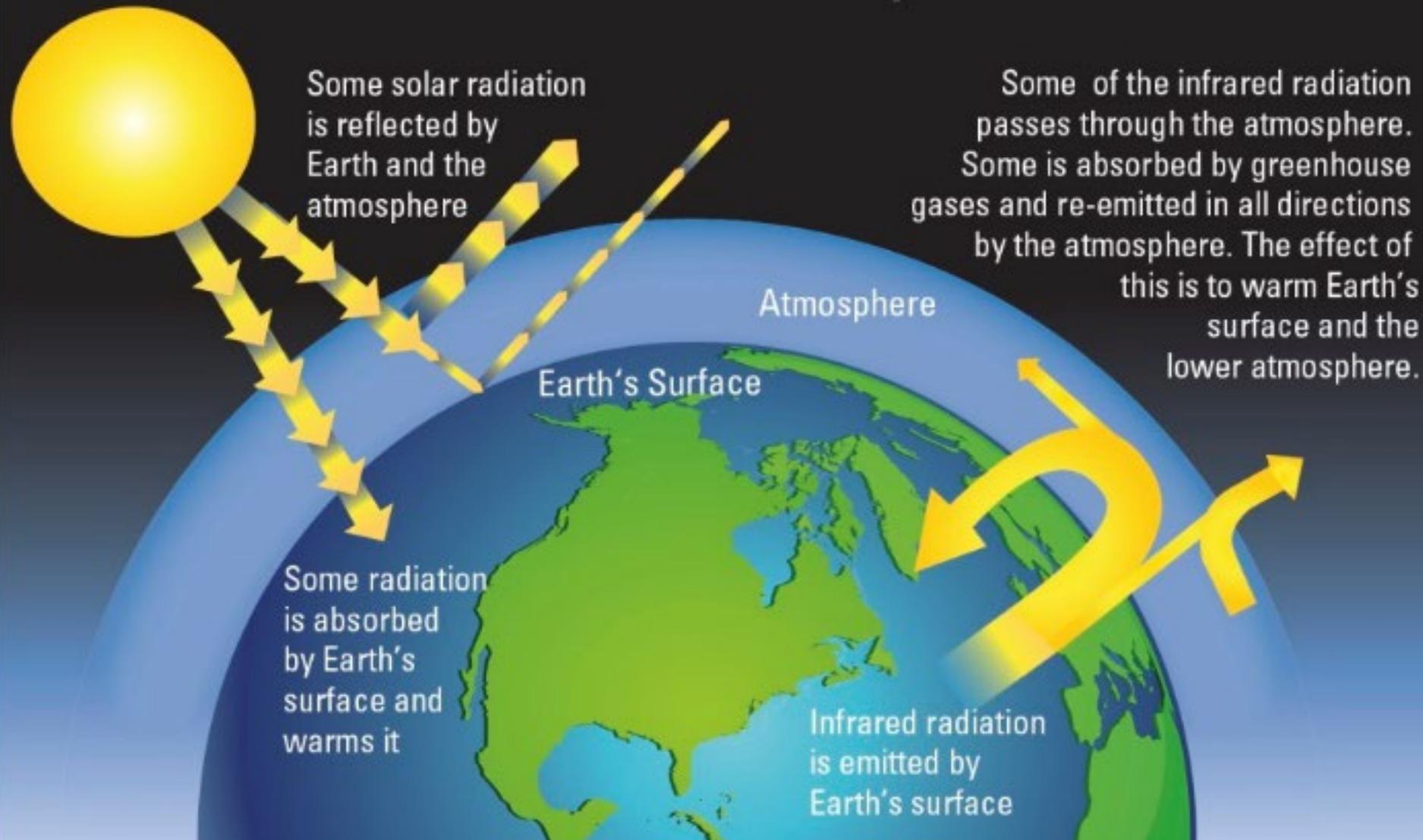
In April 2019, Council received a grant from the **Federation of Canadian Municipalities** to fund the development of a climate change action plan. Niharika was subsequently retained in August to produce such a plan.

This presentation sets out the reasons for the development of a **CLIMATE CHANGE ACTION STRATEGY**, the timetable for its development implementation, and for its ultimate adoption.

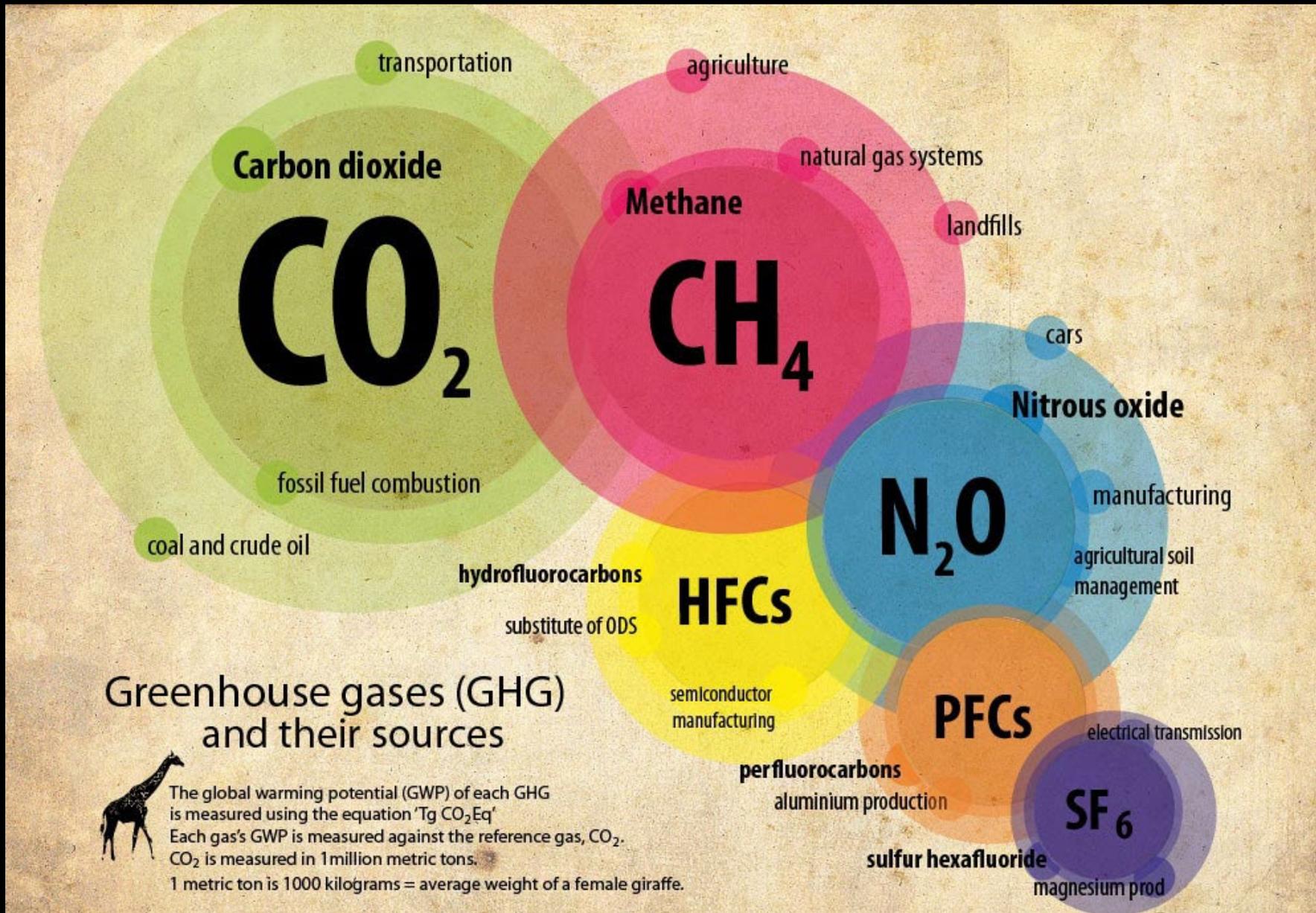
Climate Impacts and Adaptation

1. State of the Science
2. Climate Impacts on the Town of Essex
3. Infrastructure
4. Health
5. Agriculture
6. Recreation
7. Public Momentum
8. Adaptation Measures
9. Action Planning
10. Questions

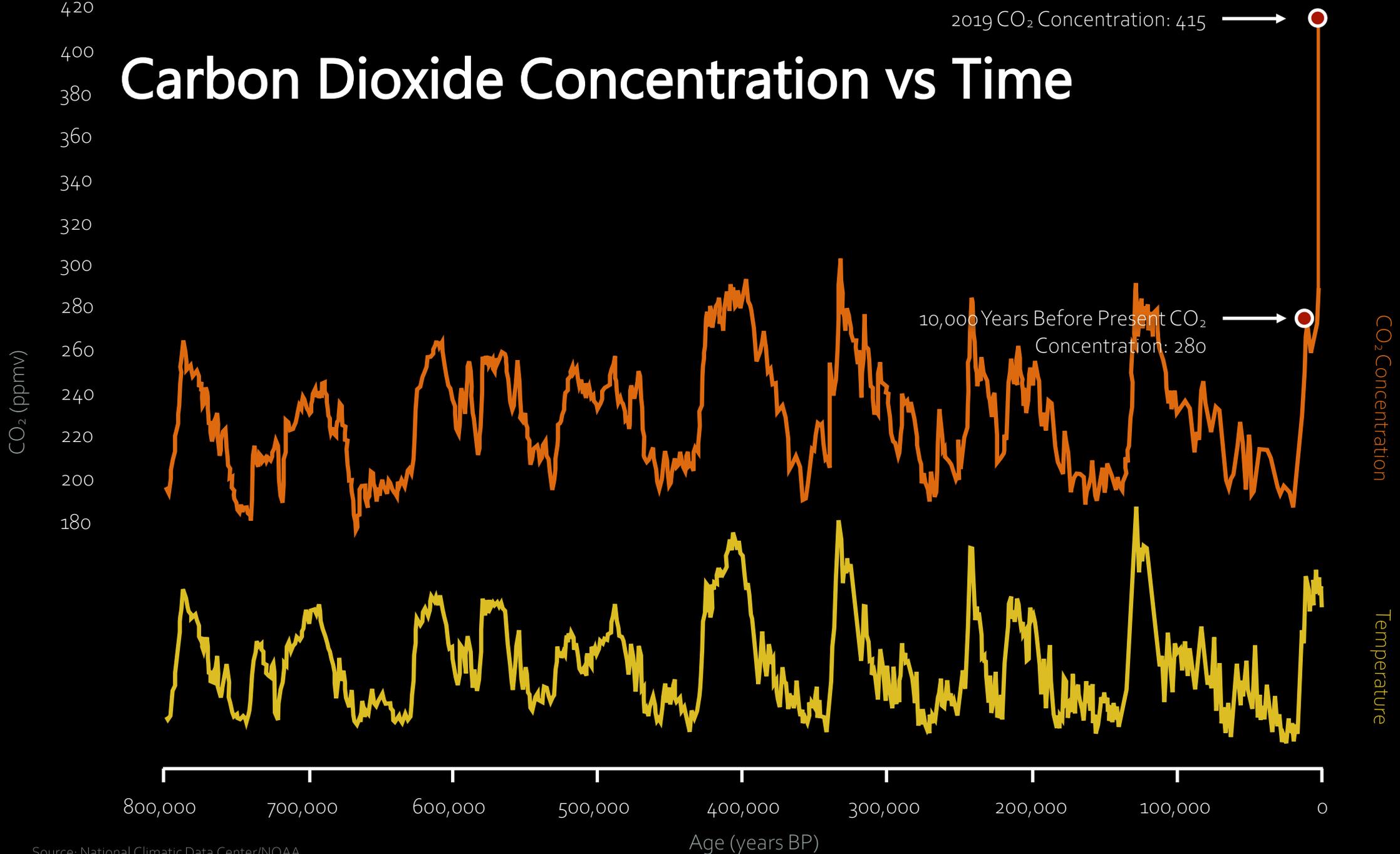
THE GREENHOUSE EFFECT



Greenhouse Gases and Sources



Carbon Dioxide Concentration vs Time



Source: National Climatic Data Center/NOAA

Age (years BP)

Sources for Essex

Burning for Fuel & Electricity

Electricity & heat for public
Shops, schools
Public buildings
Households

Transportation

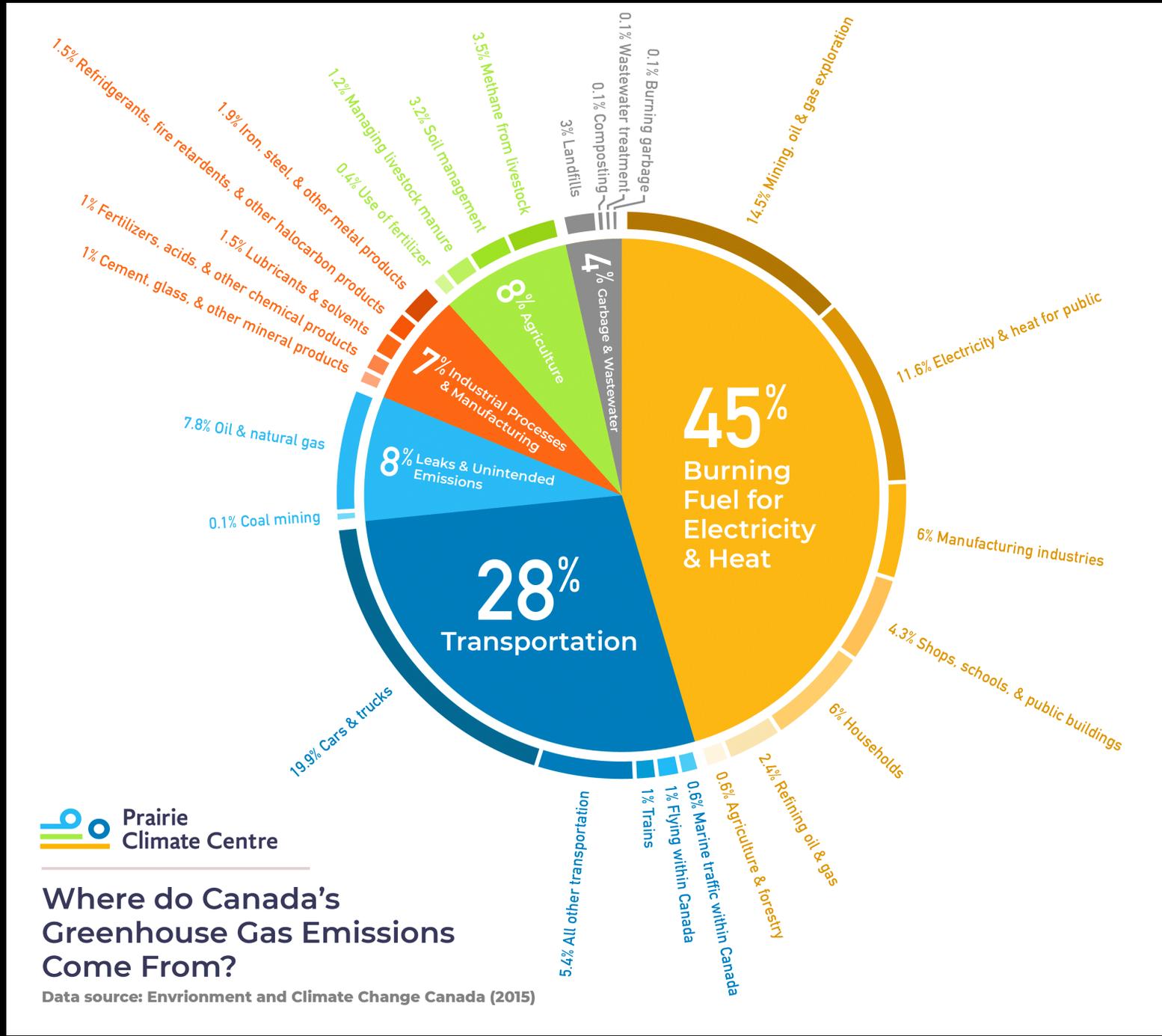
Flying within Canada
Cars & trucks

Leaks & Unintended Emissions

Oil & natural gas

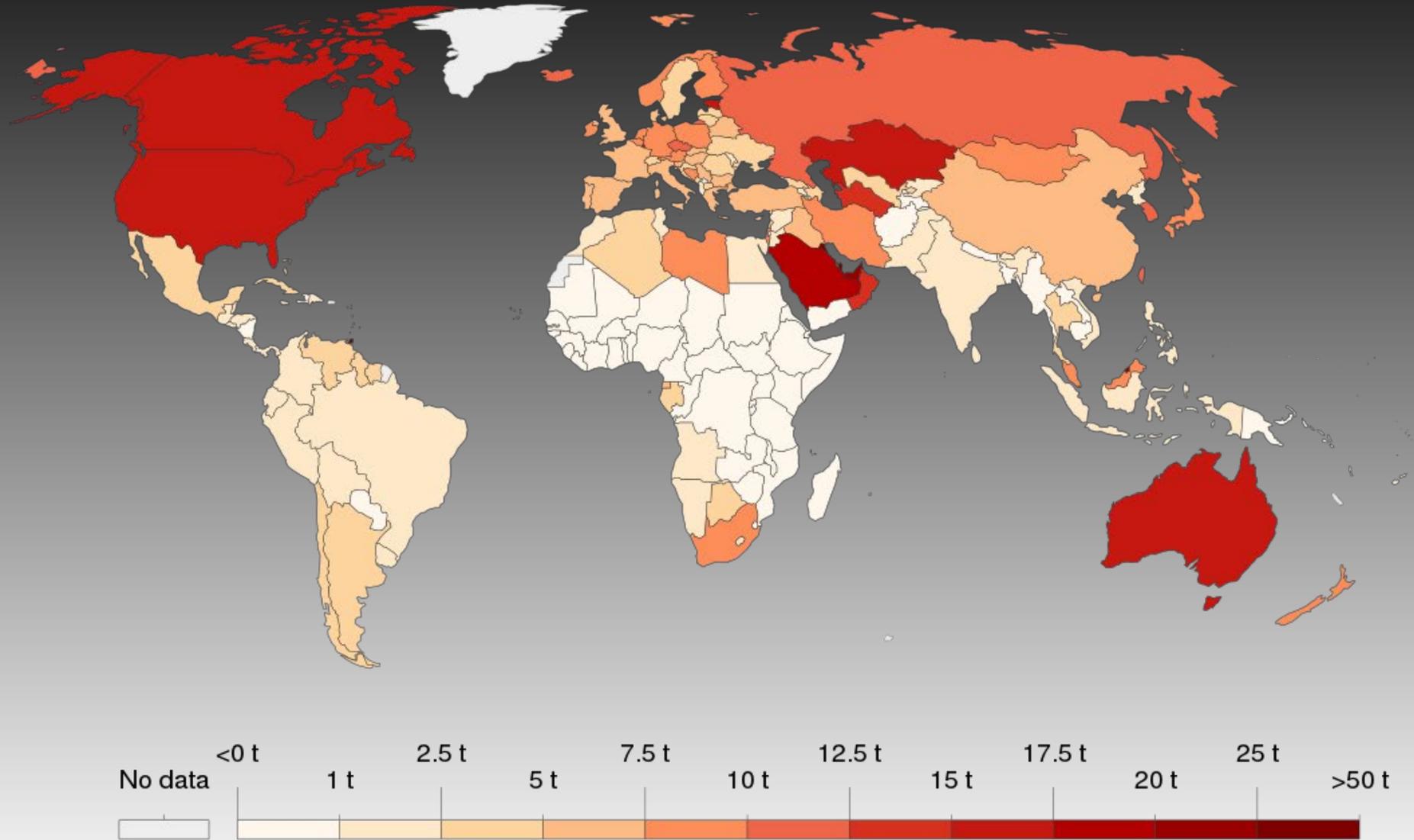
Agriculture

Garbage & Wastewater



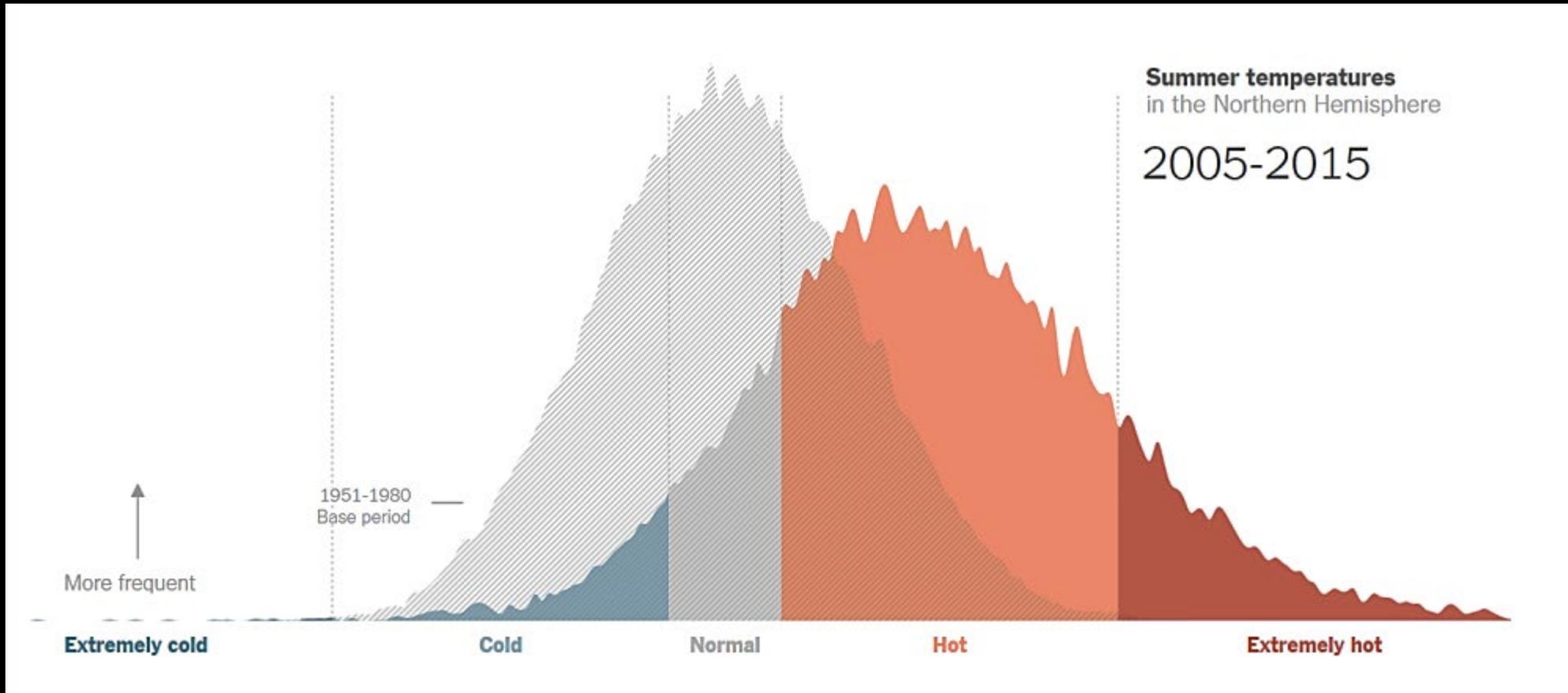
CO₂ emissions per capita, 2017

Average carbon dioxide (CO₂) emissions per capita measured in tonnes per year.



Source: OWID based on CDIAC; Global Carbon Project; Gapminder & UN

Summer Temperatures Have Shifted

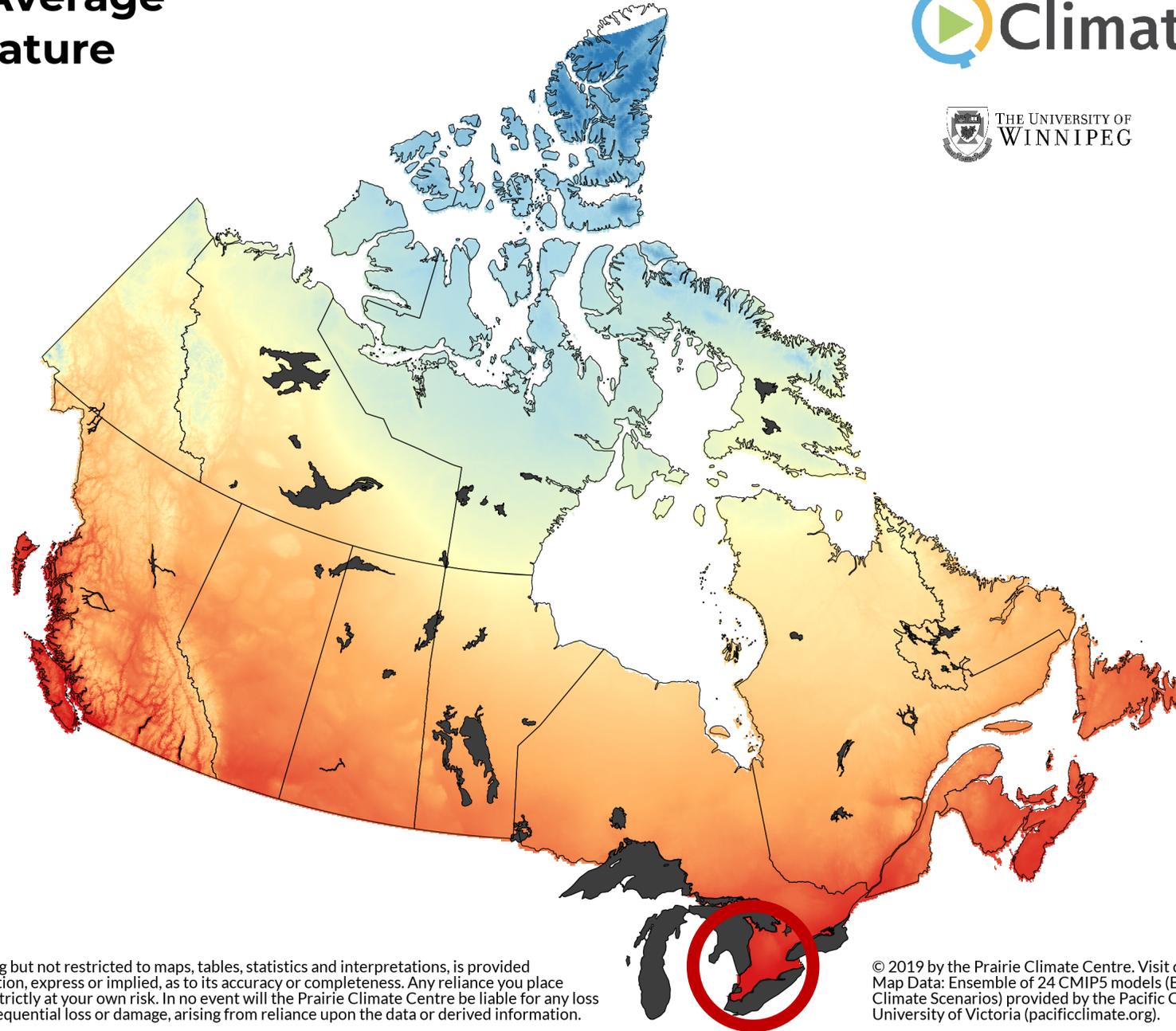
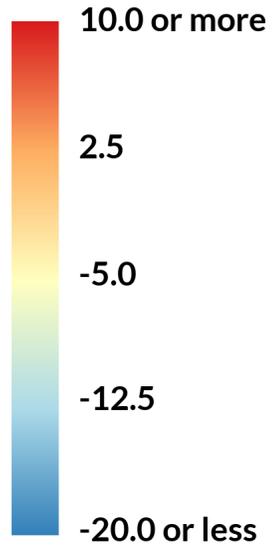


Source: Columbia University Earth Institute. Data via Makiko Sato and James Hansen. Based on: Hansen et al., 2012 (and discussion); 2016 update.
Photo: The New York Times, 2017

2021-2050 Projected Average Annual Mean Temperature

Under the *RCP8.5* scenario

Temperature (°C)



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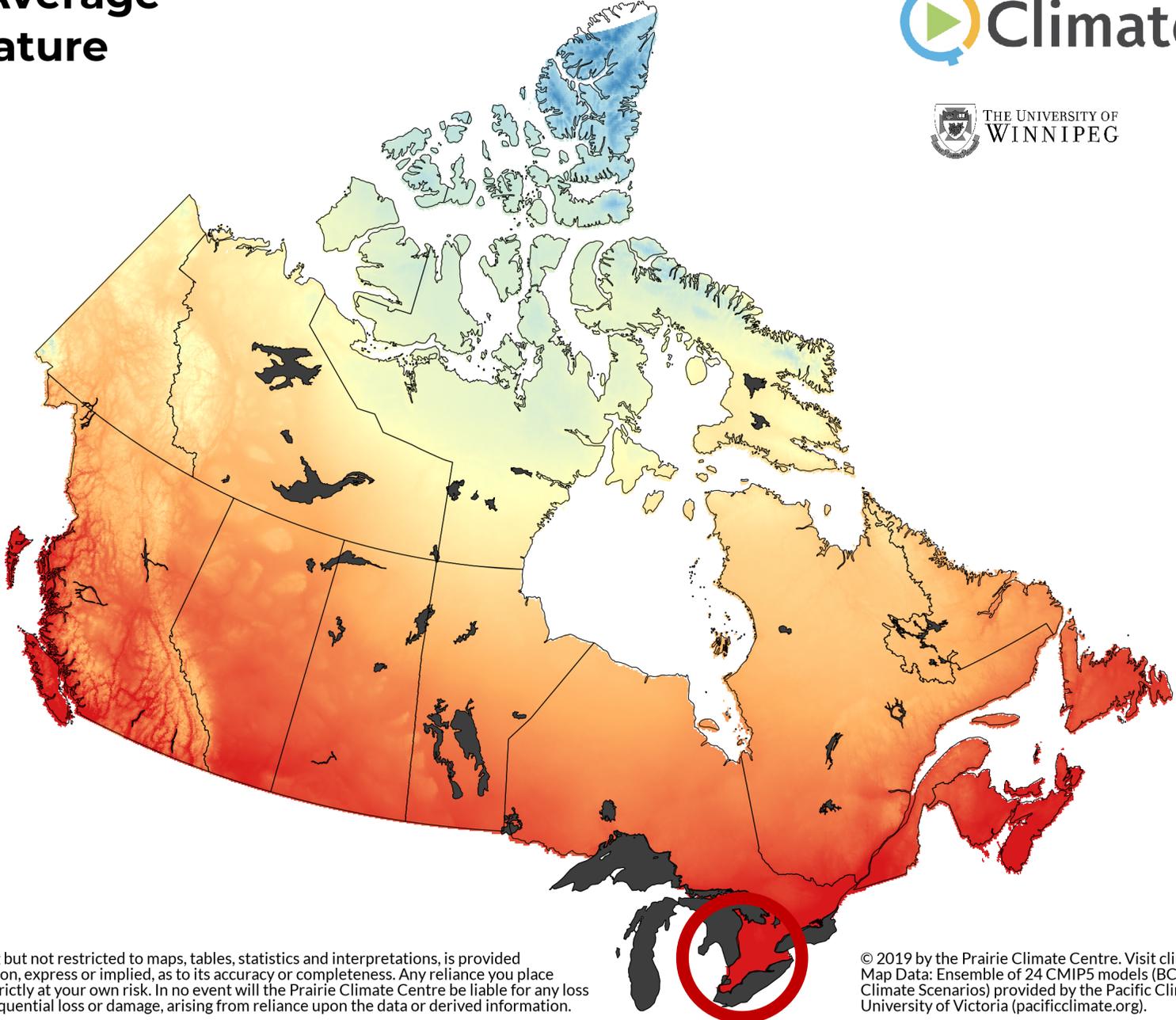
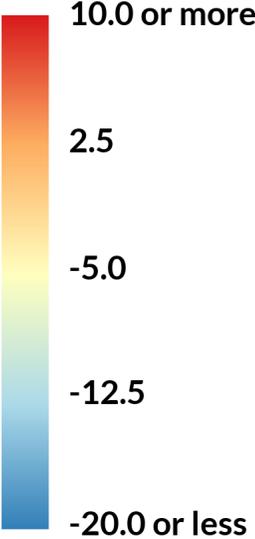
© 2019 by the Prairie Climate Centre. Visit climateatlas.ca for more information.
Map Data: Ensemble of 24 CMIP5 models (BCCAQv2 Statistically Downscaled Climate Scenarios) provided by the Pacific Climate Impacts Consortium, University of Victoria (pacificclimate.org).

2051-2080 Projected Average Annual Mean Temperature

Under the RCP8.5 scenario



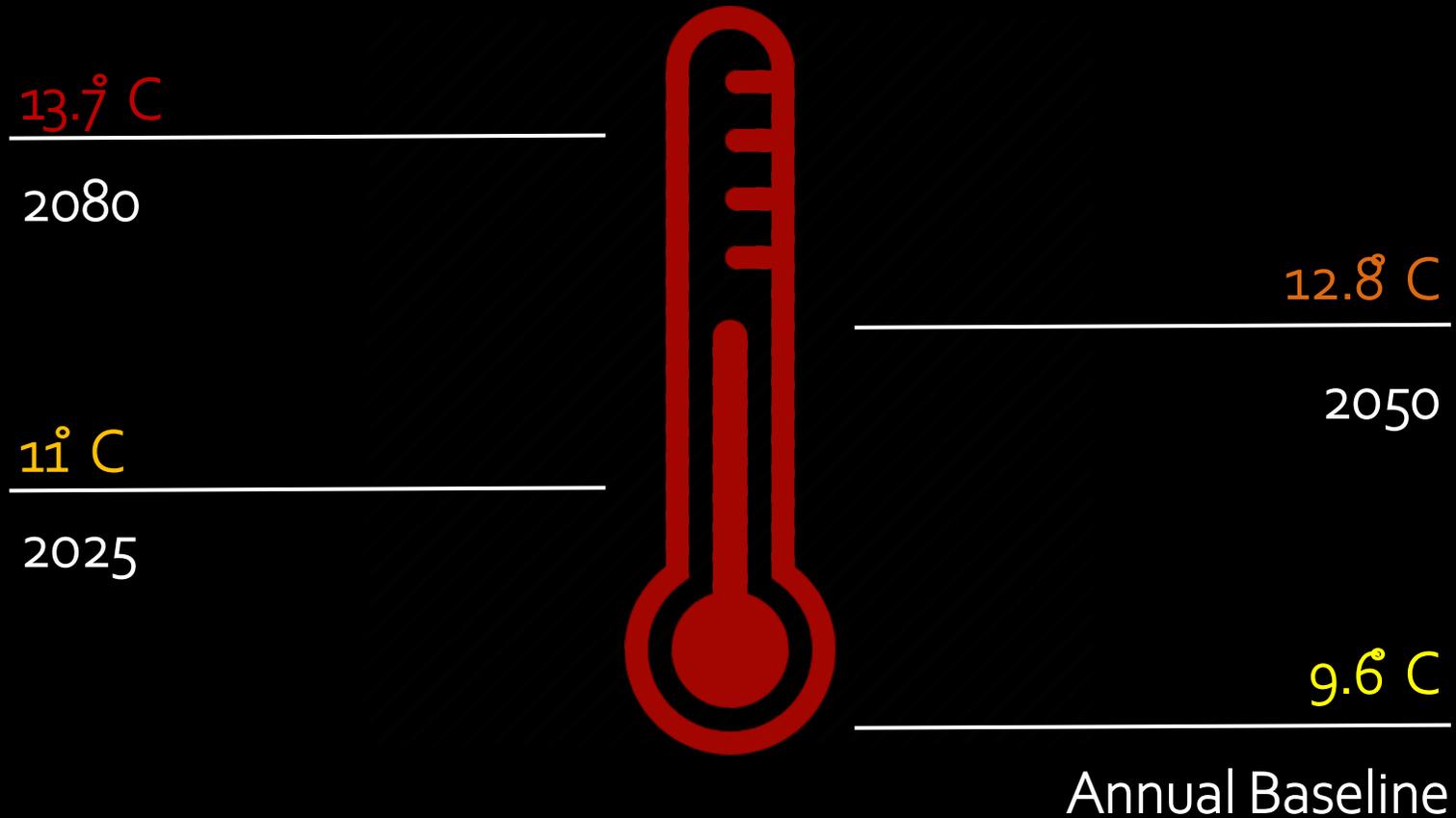
Temperature (°C)



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Mean Annual Temperature Projections for Essex



Mean Seasonal Temperature Projections for Essex



Winter

December - February

2.8°C

2080

0.5°C

2050

-0.7°C

2025

-2.7°C

Baseline



Spring

March - May

12.6°C

2080

10.9°C

2050

9°C

2025

8.1°C

Baseline



Summer

June - August

26.7°C

2080

24.4°C

2050

22.5°C

2025

21.4°C

Baseline



Fall

September - November

16.4°C

2080

14.7°C

2050

13.1°C

2025

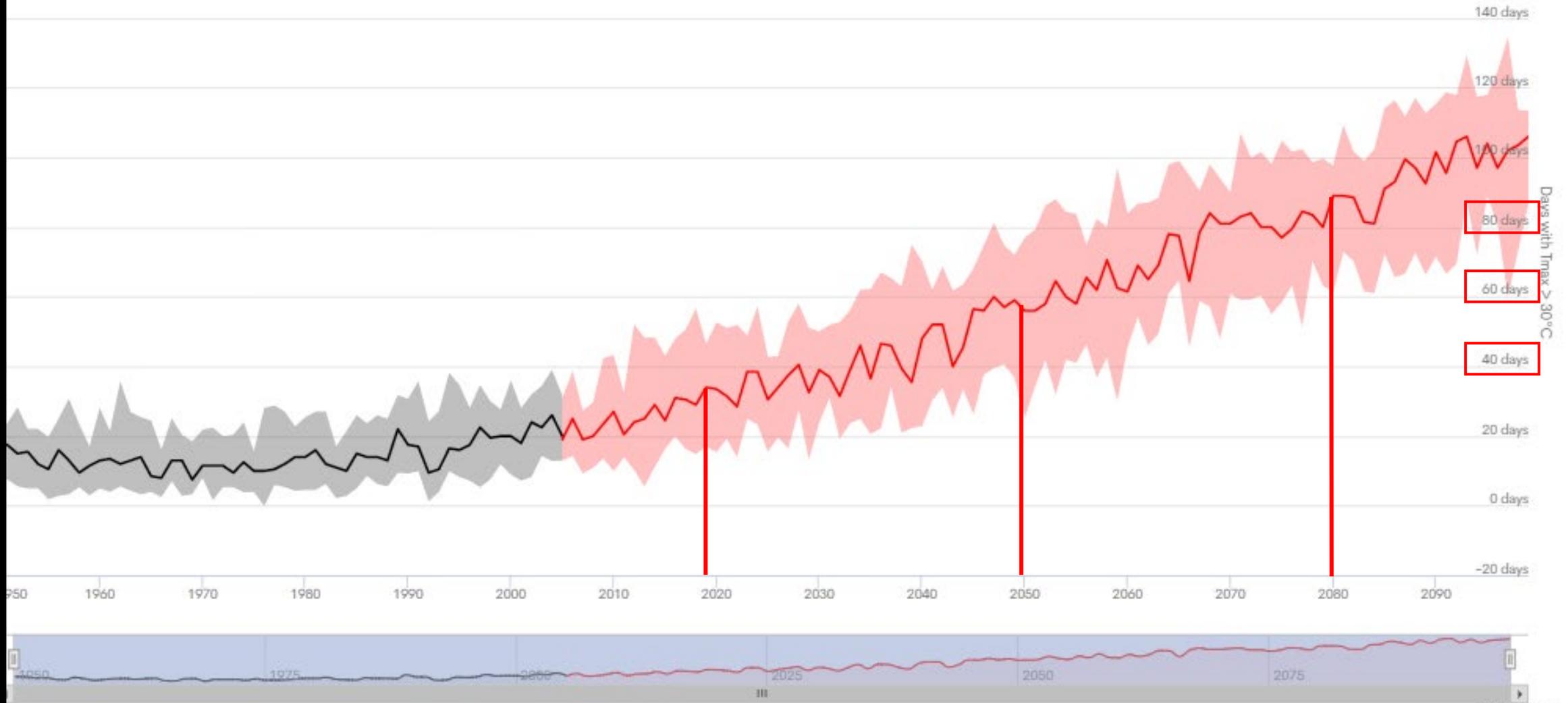
11.5°C

Baseline

Number of Days > 30° C

Climate Atlas

— HISTORICAL — RCP 2.6 MEDIAN — RCP 4.5 MEDIAN — RCP 8.5 MEDIAN



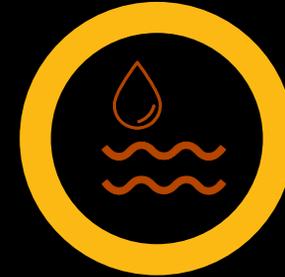
Warmer, Wetter, Wilder



Higher
Winter and
Early Spring
Flows



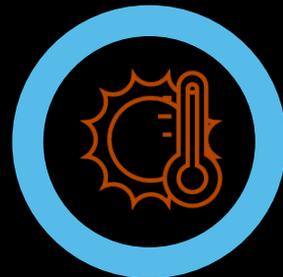
More Winter
Precipitation
↑ 13% by
2050



More
Shoreline
Flooding



Warmer
Winters
↑ 2.3°C by
2050



More Heat
Waves
↑ 165% by
2050



More Intense
Storms
↑ 40% in 100
year storms



More
Extreme
Winds

Warmer air can
hold
a lot more water vapour

With each additional 1° (C) of temperature, the atmosphere's capacity to hold water vapour increases by 7%



Precipitation will
occur at a faster rate
(mm/h)

INTENSITY



Shorter storms will
have an increasingly
high intensity

DURATION

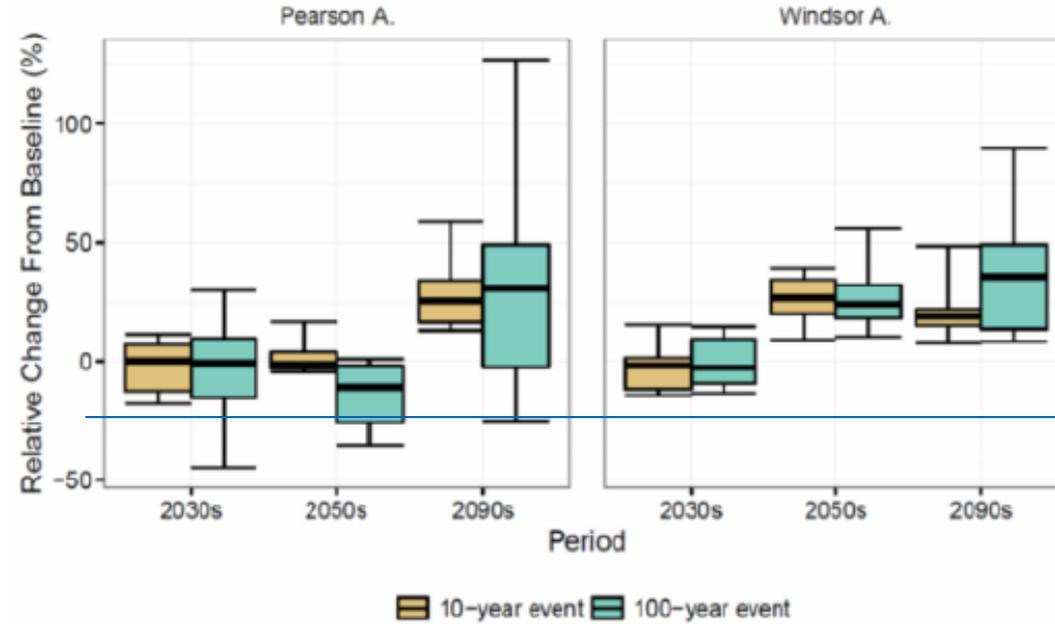


Return periods of heavy
storms will shorten,
meaning increased
frequency

FREQUENCY

Extreme Weather

COMPARING FUTURE IDF CURVES FOR SOUTHERN ONTARIO



25%
increase*

10-year
storms

40%
increase*

100-year
storms

A vintage color photograph of a street in Essex, Ontario, Canada. The street is lined with brick and concrete buildings. On the left, a vertical sign reads "Take Out RESTAURANT". Further down, a large sign for "IGA" is visible. The street is filled with cars from the 1960s, including a white van and a white station wagon. A person is walking on the sidewalk on the left. The sky is clear and blue. The text "CLIMATE IMPACTS ON THE TOWN OF ESSEX" is overlaid in white, sans-serif font across the middle of the image.

CLIMATE IMPACTS ON THE TOWN OF ESSEX

Photo: 1960 South Western Ontario Digital Archive/Barry Schneider

Infrastructure



Cotterie Park Road, Leamington

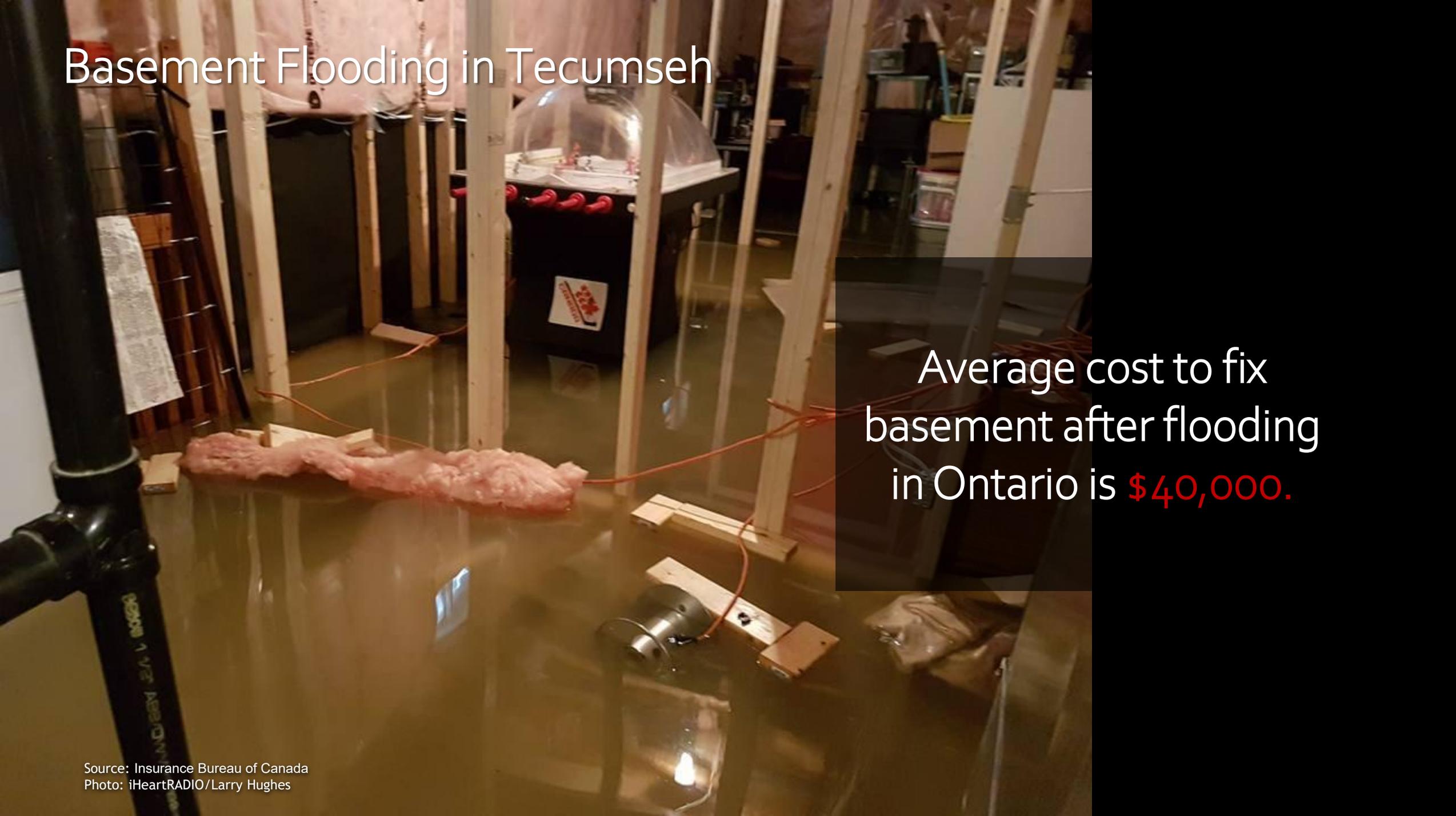
April 16, 2018

“The most damage I have seen from a storm in **two decades**”.

Tim Byrne, ERCA Water Resources Director



Basement Flooding in Tecumseh



Average cost to fix
basement after flooding
in Ontario is **\$40,000.**

Windsor, Ontario

IBC reported the insured losses from the 2016 and 2017 storms in this region totaled **\$232 million.**

Colchester Shore

July, 2019

A photograph showing a significant bluff failure on a private property. The scene is dominated by a steep, exposed soil bank that has eroded, revealing dark, saturated earth. The top of the bluff is covered with dense green trees and shrubs. In the foreground, a concrete walkway made of large, irregular slabs is visible, with some slabs appearing cracked and displaced. To the right, the side of a house with light-colored horizontal siding is partially visible. A semi-transparent dark grey box with white text is overlaid on the right side of the image, providing context for the scene. The background shows a glimpse of a body of water through the trees.

Bluff failure on a private property in Colchester from erosion and saturated soil.

Wheatley
October, 2019

Photo: Keith John Hawkins, 2019

Colchester Shore

April, 2018



Beach closures as a result of high water levels and frequent storms.

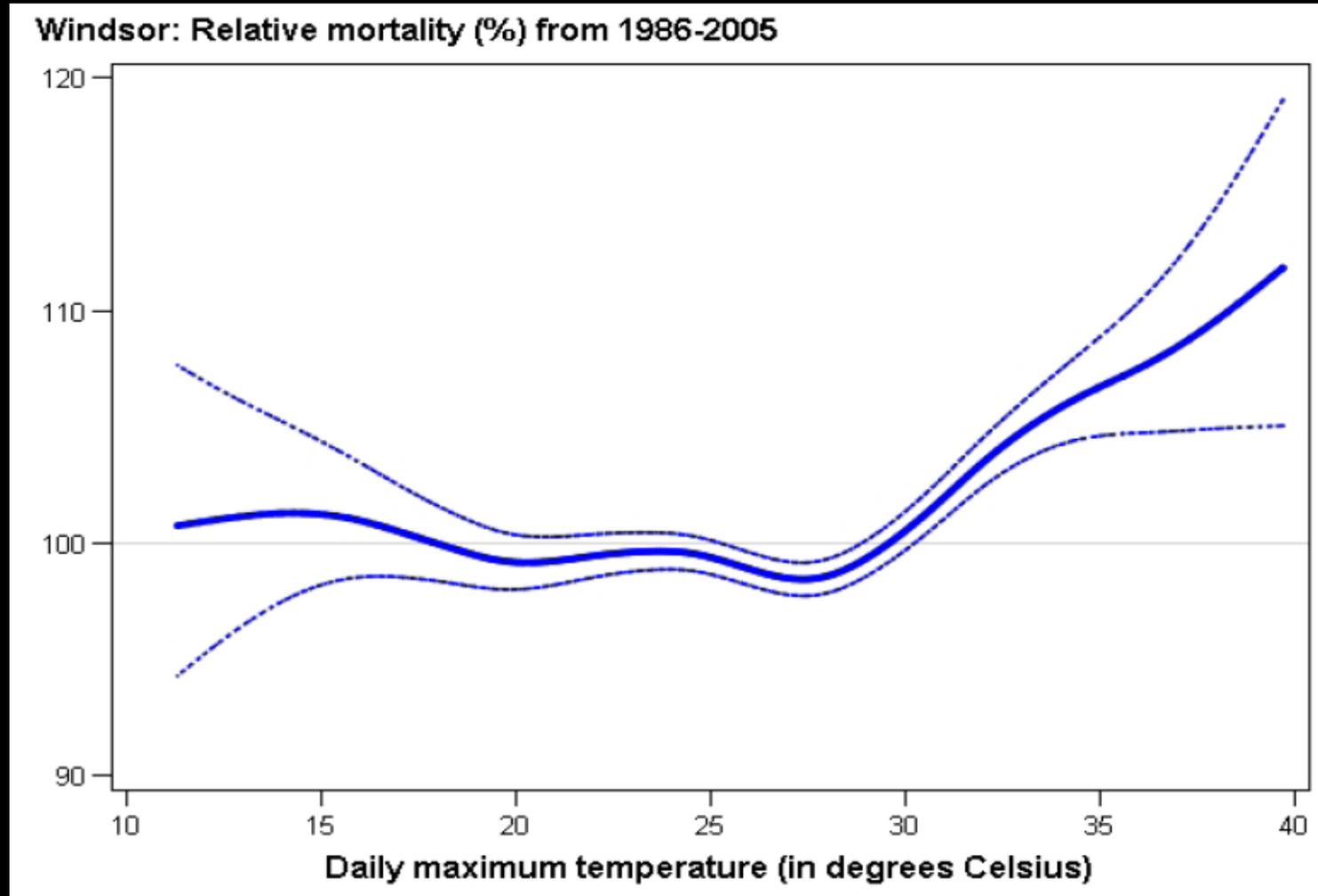
Colchester Harbour

April, 2018

COLCHESTER
HARBOUR
GAS
VHF-CH-68



Windsor's Vulnerability to Extreme Heat



Who Is Most

Vulnerable to Heat?

- Economically disadvantaged
- People experiencing homelessness
- The elderly
- Infants and children
- Those with pre-existing medical conditions
 - Particularly cardiac and respiratory respiratory conditions
- People with mental illnesses
- Agricultural workers and those with outdoor jobs



Highway 3, Essex

July 1, 2018

Buckling on Highway 3
due to extreme heat.

Temperatures were >
30° C for 6 continuous
days.



"Normal" Jet Stream

December 5, 2017





Colchester Ridge Estate Winery, Essex

January 30, 2019



Daytime temperatures hit a record low of **-21.8°C**, causing significant damage to local Colchester wineries.

Talbot St, looking North, Essex, Ont.

Health

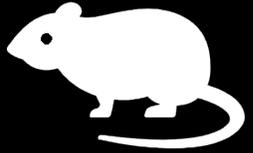


Photo: 1917 South Western Ontario Digital Archive/ Pugh Specialty Co. Ltd.

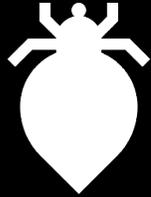
Increase in temperatures, rainfall and humidity can lead to increase in the presence and number of vectors that carry diseases like **West Nile virus** and **Lyme disease** in our area.

-Windsor Essex County Health Unit

Vectors For Emerging Infectious Diseases



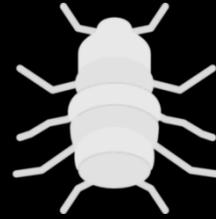
Rodents



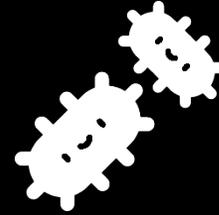
Lice



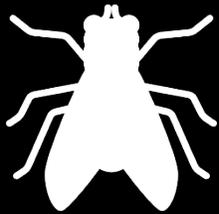
Mosquitoes



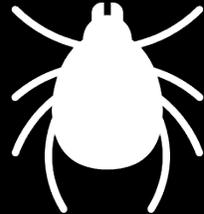
Fleas



Algae



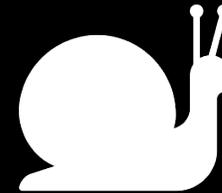
Tsetse Flies



Ticks

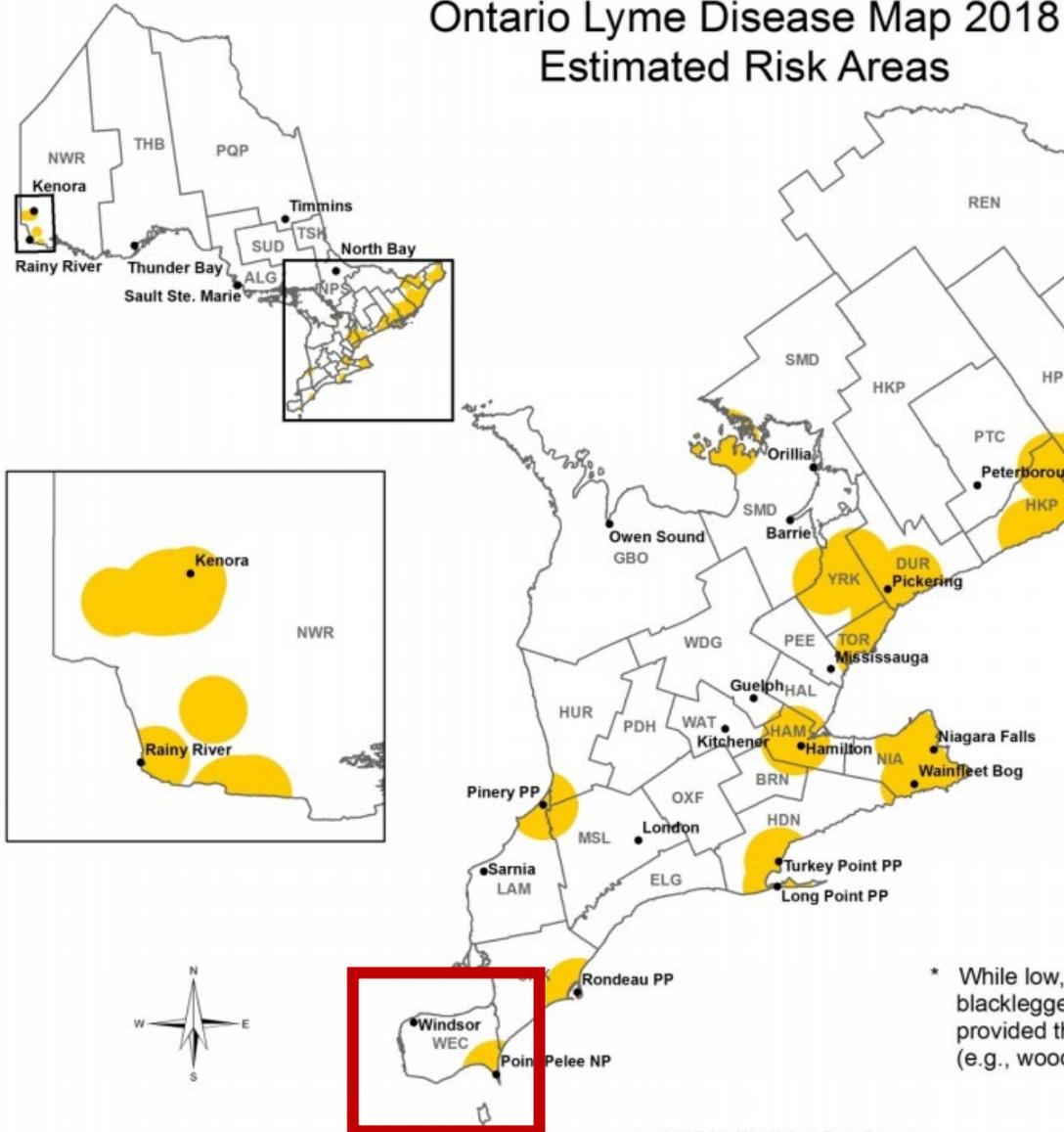


Bats



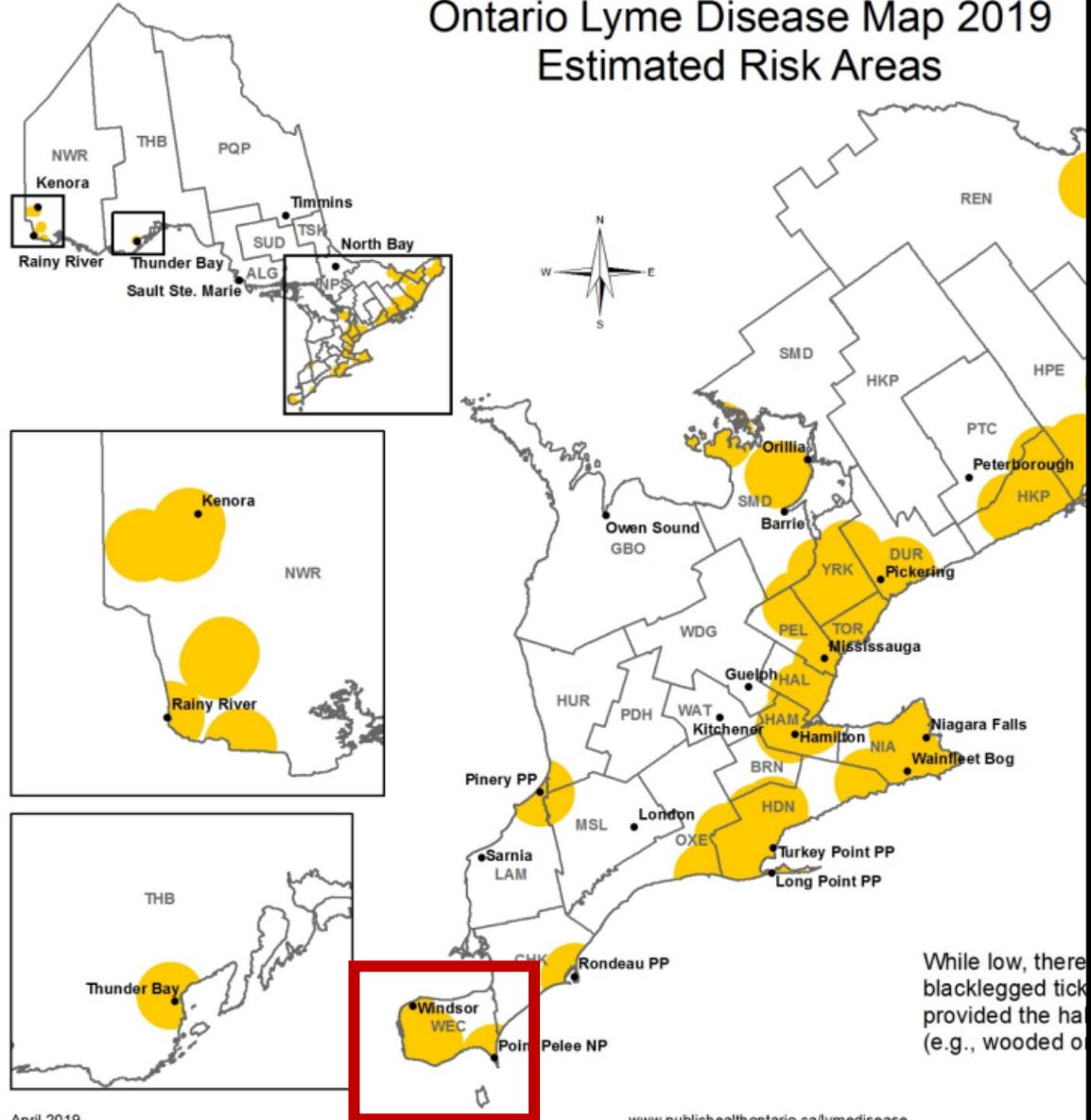
Snails

Ontario Lyme Disease Map 2018 Estimated Risk Areas



* While low, blacklegged tick provided the habitat (e.g., wooded areas)

Ontario Lyme Disease Map 2019 Estimated Risk Areas



While low, there is a blacklegged tick provided the habitat (e.g., wooded areas)

Poor air quality can make it harder to breathe, cause throat or lung irritation, or produce new or worsening episodes of your **current heart** or **lung conditions**.

- Windsor Essex County Health Unit

Allergies Will Be Much Worse by 2040

2000

Grains of pollen
per cubic meter:

8,455

2040

Grains of pollen
per cubic meter:

21,735

Average pollen counts are specific to North America

Source: Dr. Leonard Bielory, Visiting Professor, Center for Environmental Prediction, SEBS, Rutgers University.

Image: Photo by Lukasz Szmigiel on Unsplash



Pollution exposure during pregnancy has been linked to high blood pressure in children.



Agriculture



Agriculture accounts for about **80%** of Essex's economy.

Projected Yield Declines For Each 1° C of Warming



?

These crops make up the majority of crops grown in the Town of Essex.

Current research indicates that...



For every day during the growing season that temperatures go above 29° C (84° F), corn yields decline by 0.7%

Farm on South Malden Road

June, 2019

“The worst year for
corn and soybeans as
far as anybody can
remember”.

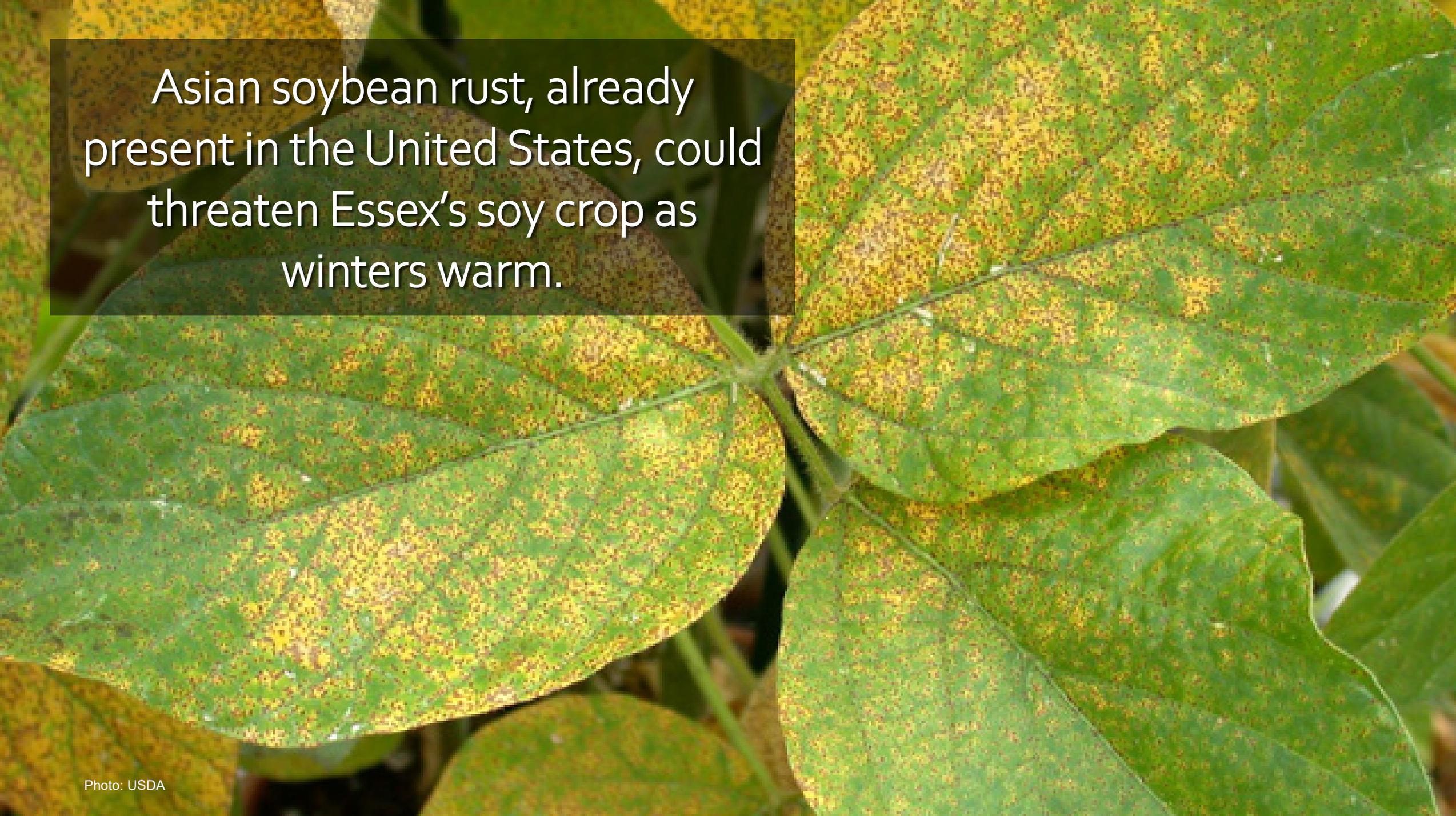
Maurice Chauvin,
Essex County Farmer





Higher temperatures and droughts can cause **toxin accumulation in plants and livestock**, threatening the health of humans and animals.

Wheat leaf rust, which thrives in higher temperatures and humidity, can lead to crop losses of 20% – 30% or more.

A close-up photograph of several soybean leaves. The leaves are green but heavily covered with small, yellowish-brown spots, which are characteristic of Asian soybean rust. The spots are scattered across the leaf surfaces, particularly along the veins. The background is slightly blurred, showing more of the plant's foliage.

Asian soybean rust, already present in the United States, could threaten Essex's soy crop as winters warm.



Tick-borne diseases affect up to 80% of the world's livestock, with a cost of up to \$19 billion per year.



Recreation

Photo: 1945 South Western Ontario Digital Archive/ Tony Techko Collection

What's Canada without backyard hockey rinks?

BY CLAIRE BRASSARD

POSTED MAY 14, 2019 6:08 AM EDT LAST UPDATED MAY 21, 2019 AT 12:38 PM EDT



LOCAL LOCAL SPORTS NATIONAL SPORTS



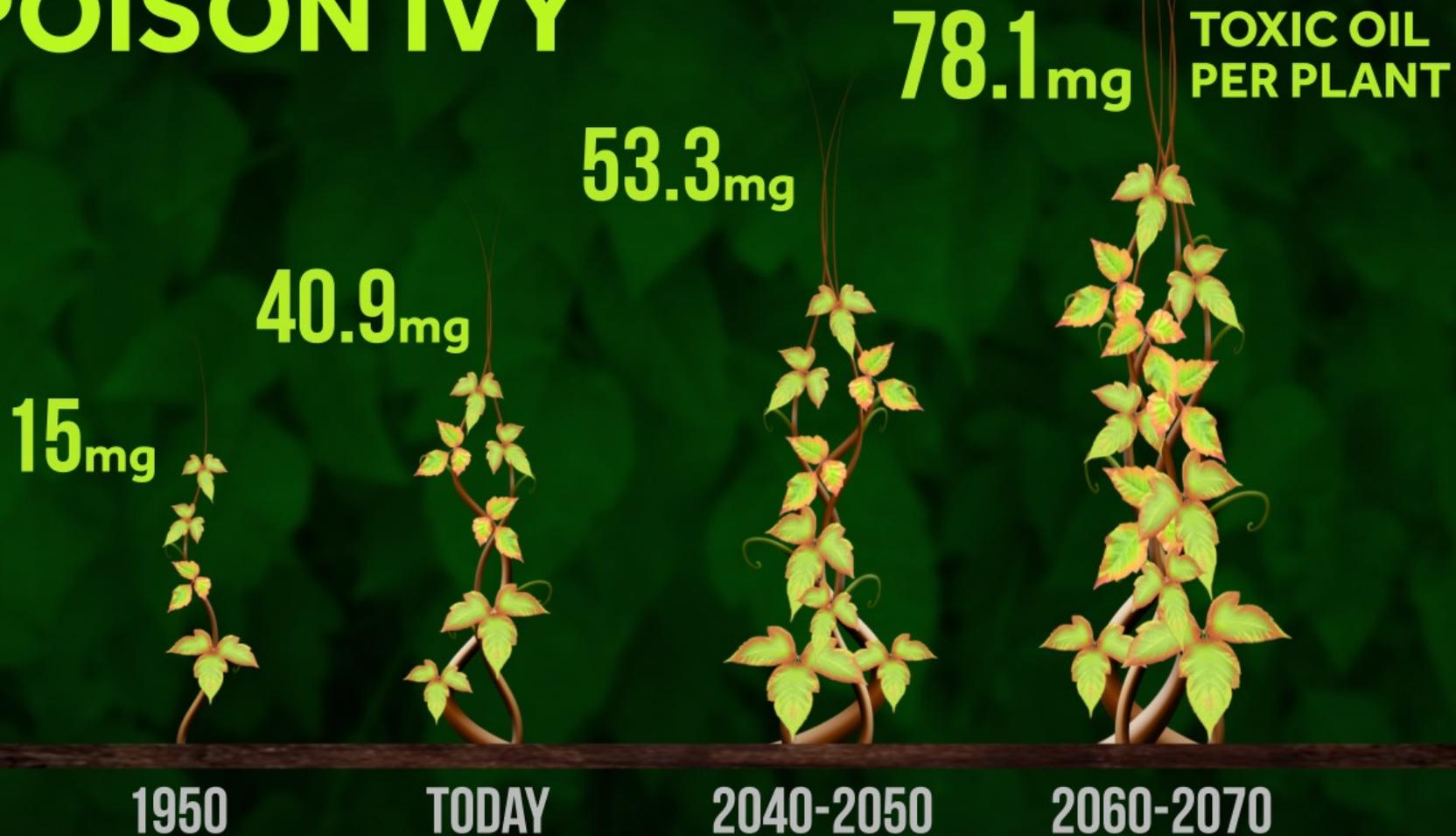
In order to make a good outdoor hockey rink, temperatures should be $< 0^{\circ}\text{C}$ and stay consistent for a while.

Holiday Beach Conservation Area

July, 2019



MORE CO₂ MEANS BIGGER, MORE AGGRESSIVE POISON IVY



Average per plant in Ziska (2007) lab study

The Great Lakes

October, 2011

**Lake
Michigan**

**Lake
Huron**

**Lake
Erie**



Colchester Beach

September, 2017

HABs will result in annual costs of \$272 million in over a 30-year period if we do nothing and continue with business as usual.

Cedar Creek Conservation Area



Fishing in Lake Erie and Cedar Creek affected by algal blooms,
higher toxin levels.

We now risk losing
up to
50% of all
land-based
species
in this century



Talbot Street, Essex, Ont., Canada

Public Interest





Climate Emergency Declarations

- Canadian House of Commons
- 470 Canadian Governmental Agencies
 - Quebec
 - Municipalities
 - Incl. Chatham-Kent County County
- Recommendation in Windsor City Council – Nov 18
- Recommendation in County of Essex Council – Nov 20
 - May include delegation down to down to lower tier municipalities municipalities

Adaptation Measures

Climate Mitigation vs. Adaptation

Mitigation



Adaptation





“For all decisions that you and I make in our lives...climate change is irreversible. What we can hope for is to stabilize the climate at the new level and adapt to it”.

- **Dr. Michael Tjernström**

Professor of Meteorology, Stockholm University

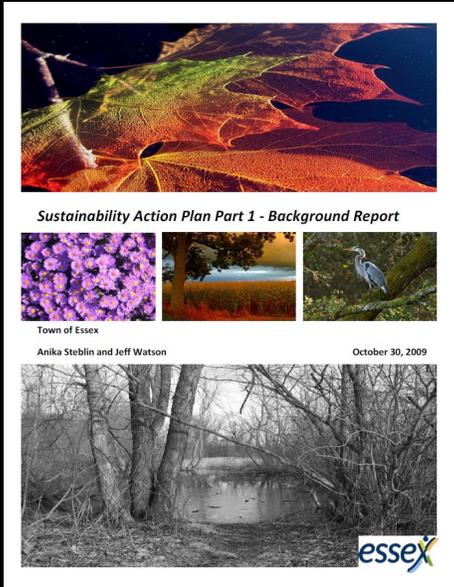


Secured grant in 2019 to develop and implement a Climate Adaptation Plan for the Town of Essex

[HOME](#) > [PROGRAMS](#) > MUNICIPALITIES FOR CLIMATE INNOVATION PROGRAM

Municipalities for Climate Innovation Program

Town of Essex Efforts



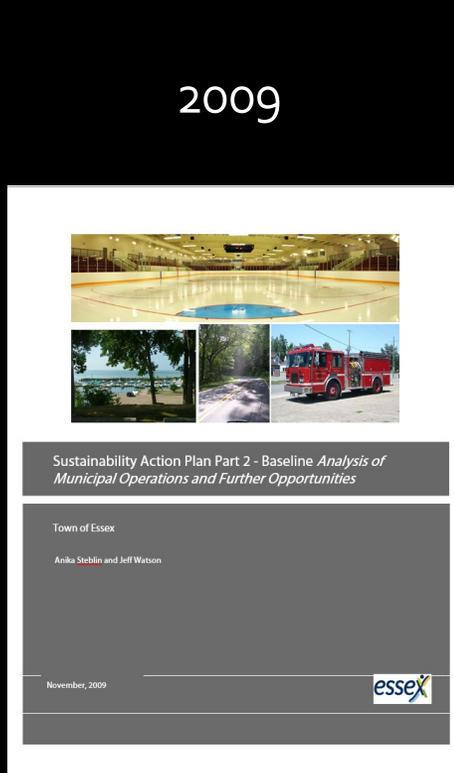
Sustainability Action Plan Part 1 - Background Report

Town of Essex
Anika Steblin and Jeff Watson
October 30, 2009

The cover features a large, vibrant image of autumn leaves in shades of orange, red, and green. Below the main title, there are three smaller images: purple flowers, a landscape with a body of water, and a blue heron. The Essex logo is in the bottom right corner.

2009

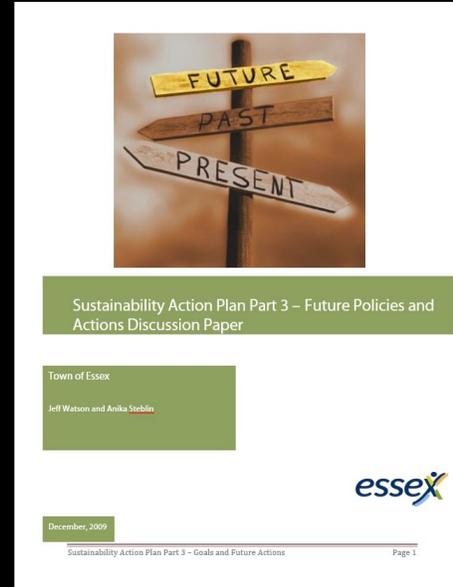
2009



Sustainability Action Plan Part 2 - Baseline Analysis of Municipal Operations and Further Opportunities

Town of Essex
Anika Steblin and Jeff Watson
November, 2009

The cover features a collage of images: an indoor ice skating rink, a park with trees and a lake, and a red fire truck. The Essex logo is in the bottom right corner.



Sustainability Action Plan Part 3 - Future Policies and Actions Discussion Paper

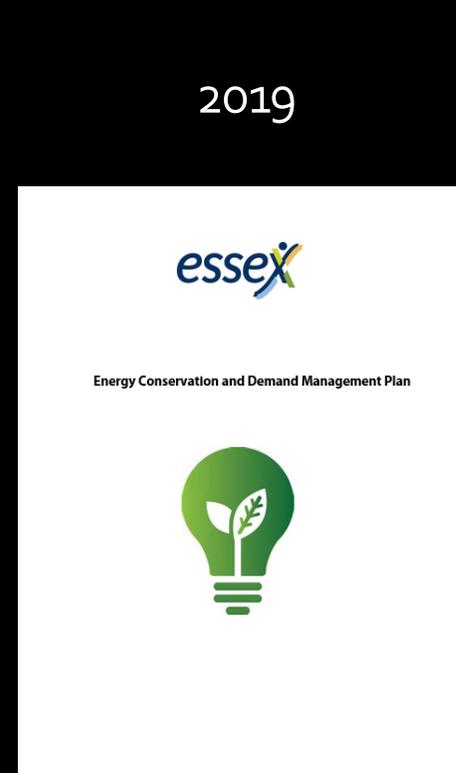
Town of Essex
Jeff Watson and Anika Steblin
December, 2009

Sustainability Action Plan Part 3 - Goals and Future Actions Page 1

The cover features a central image of a wooden signpost with three arrows pointing in different directions, labeled 'FUTURE', 'PAST', and 'PRESENT'. The Essex logo is in the bottom right corner.

2009

2019



essex

Energy Conservation and Demand Management Plan



The cover features the Essex logo at the top and a green lightbulb icon with a leaf inside at the bottom.

Establishing a Climate Collaborative for Essex Region: Post-Workshop Summary Report

Prepared for:



Essex Region Conservation Authority
Sustaining the place for life

Prepared by:



ONTARIO CLIMATE CONSORTIUM
Supported by Towns and Region Conservation Authority

January 2019

2019

Town of Essex Efforts



Draft Adaptation Action Plan for the Town of Essex

ICLEI
Local
Governments
for Sustainability



1

2012

PROGRESSIVE AND SUSTAINABLE INFRASTRUCTURE

PROGRESSIVE | HEALTHY | STEWARDSHIP | VIBRANT | EXPERIENCE | RESILIENCY

Manage, invest, and plan for sustainable municipal infrastructure which meets the current and future needs of the municipality and its citizens.

Ensure financial stability of current and new infrastructure

- Incorporate the Asset Management Plan into budget and forecasting process.
- Review reserve financing for annual infrastructure replacement.

Invest in new infrastructure to meet the needs of all residents

- Develop a sustainable priority plan for roads.
- Implement a rural drainage and sewage strategy.
- Review funding models and long-term planning to meet sustainability objectives for roads, bridges, and other assets.

Identify and work with stakeholders and partners to meet infrastructure goals

- Expand access to broadband internet service.
- Improve the road assumption process.
- Develop formal partnerships to help achieve infrastructure goals.

Mitigate the impact of climate change and reduce environmental footprint

- Invest in new technology and process improvements for operations and new construction projects.
- Identify energy efficiencies in Town facilities.
- Continue to invest in flood mitigation and work with partners to reduce the impact of shoreline flooding.
- Complete a storm water and sanitary master plan for urban centres.



Over **\$5 million** has been spent to date on enhancements to our storm water system infrastructure.



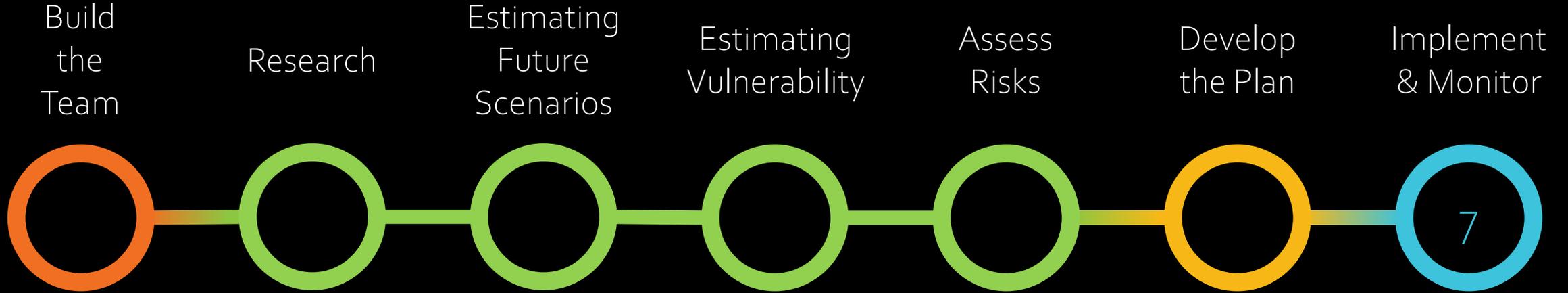
CWATS, Oxley



CWATS is developing 800 km of bikeways and pathways throughout Essex County connecting seven local municipalities.

Action Planning

Developing The Strategy



Recommended Actions

Incorporate climate change adaptation into **town policies** and high level plans.

Create internal mechanisms to '**ask the climate question**' for all new major infrastructure projects.

Recommended Actions

Monitor climate change, **evaluate** the effectiveness of adaptation strategies and **adjust** as needed (adaptive management).

Recommended Actions

Use **best available science** to analyze how the climate is changing locally and how this may impact the community.

Routinely **review the Town of Essex's vulnerability** to climate impacts.

Recommended Actions

Continuously conduct **risk assessments** to identify priority impacts requiring adaptation actions.

Engage the public, business and other stakeholder groups.

Develop an Action Plan



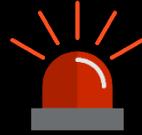
Agriculture



Communications



Economic Development



Emergency Management



Energy



Engineering



Environment



Coastal Zone Management



Fire Services



Legal Services



Parks and Recreation



Planning and Zoning



Police



Waste Management



Finance and Administration



Housing



Harbour Management



Public Health



Transportation



Water

Regulations & Plans

Standards & Codes

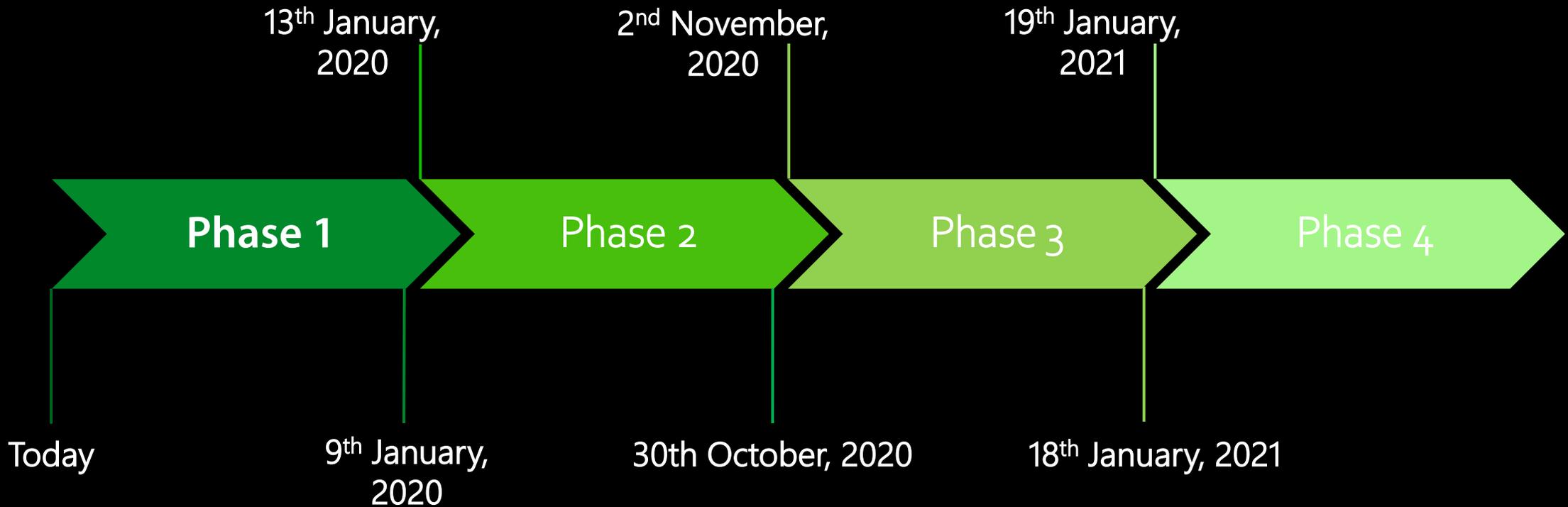
Operational Changes

Capital Projects

EDUCATION and AWARENESS

Proposed Plan

High Level Overview of Work Plan (approval from Council)



Phase 1: Assessing Climate Impacts

Today

9th January,
2020

Action Plan



Council Approval



Stakeholder Education/Engagement



Vulnerability and Risk Assessments

Phase 2: Adaptation Planning

13th January,
2020

30th October, 2020

Risk Prioritization



Establish Vision and Objectives



Set Goals



Assign Tools and Programs



Develop Reporting System



Gap Analysis and Prioritization
Workshop



Amend Draft Adaptation Plan

Phase 3: Approval and Funding

2nd November,
2020

18th January, 2021

Acquire Council Approval



Inform Stakeholders



Further Program Development

Phase 4: Implementation

19th January,
2021

Final Adaptation Plan



Council Adoption



Implementation



Updates Through Reporting System

Benefits and Challenges of Adaptation Planning

Benefits

Insurance against future risk

Reducing vulnerability

Creating opportunities

Lower long-term costs

Reduced risk

Challenges

Degree of uncertainty

Benefits of advance planning may only appear upon impact

Limited resources and/or political support

Duty of care



“To make real, long-lasting change,
everyone needs to act. All three levels
of Canadian government need to act,
too”.

- **Franny Ladell Yakelashek**
12YO Canadian Climate Activist

RECOMMENDATION

That Council direct Administration to implement the Climate Change Action Plan in accordance with the Municipalities for Climate Innovation Program of the Federation of Canadian Municipalities (FCM) and as set out in this presentation.

Questions?

essex