Conducting Climate Change and Health Vulnerability Assessments to Prepare for Climate Change

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Presentation Overview

• Climate Change Risks to Health
• Vulnerability Assessment Guidance
• Canadian and US Assessment Examples
• Health Canada Support for Partners
CLIMATE CHANGE RISKS TO HEALTH
Evidence of Climate Change - “Warming is unequivocal”

Global Land and Ocean Temperature Anomalies, January - December

(Annual anomalies relative to 20\textsuperscript{th} century)

2016 was the hottest year on record

NOAA, 2017
The current pace of environmental change is largely unprecedented in Earth’s history (Schmidt, 2016)

We are locked into an additional 0.7°C warming in the future

(IPCC, 2013)
Current emissions pathways, assuming countries implement their Paris commitments (pledges), indicate an emissions gap of 7 to 12 Gt CO$_2$e/yr by 2030, and by 2050, it would go up to 20 to 30 Gt CO$_2$e/yr for a well-below 2°C goal. For a 1.5°C goal, the gap would be even larger.

Source: ADVANCE project, Fig. 1.1, From Kriegler et al. 2017
Projected Warming in Northwestern Ontario

2051-2080 Projected Change in Mean Temperature: December

Under the RCP8.5 scenario, relative to a baseline of 1976-2005

Temperature Change (°C) (Relative to 1976-2005)

- ≤ 0
- 0.1 - 1
- 1.1 - 2
- 2.1 - 3
- 3.1 - 4
- 4.1 - 5
- 5.1 - 6
- 6.1 - 7
- 7.1 - 8
- 8.1 - 9
- 9.1 - 10
- 10.1 - 11
- 11.1 - 12
- > 12

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Map Data: Ensemble of 12 CMIP5 models (BCSD Statistically Downscaled Climate Scenarios) provided by the Pacific Climate Impacts Consortium, University of Victoria (pacificclimate.org).

Projected Precipitation in Northwestern Ontario - Spring

2051-2080 Projected Change in Total Precipitation: April

Under the RCP8.5 scenario, relative to a baseline of 1976-2005

Precipitation Change (%)
(Relative to 1976-2005)

-5 to -20
-19.9 to -15
-14.9 to -10
-9.9 to -5
-4.9 to 0
0.1 to 5
5.1 to 10
10.1 to 15
15.1 to 20
20.1 to 25
25.1 to 30
30.1 to 35
35.1 to 40
40.1 to 45
> 45

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Map Data: Ensemble of 12 CMIP5 models (BCSD Statistically Downscaled Climate Scenarios)
provided by the Pacific Climate Impacts Consortium, University of Victoria (pacificclimate.org).

A Call to Action for Health

“The evidence is overwhelming: climate change endangers human health”

Dr. Margaret Chan, Director General, WHO, 2014
Climate Change – Top Threat to Security

Greatest threats around the world

Top threat to (survey country)

- Climate change
- U.S. power and influence
- China’s power and influence
- Condition of the global economy
- Large number of refugees leaving countries like Iraq and Syria

Note: U.S. power and influence not asked in the U.S., Russia’s power and influence not asked in Russia, ISIS not asked in Turkey.
Source: Spring 2017 Global Attitudes Survey, Q17a-h.

PEW RESEARCH CENTER

<table>
<thead>
<tr>
<th>Health Impact</th>
<th>Confidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat waves and forest fires</td>
<td>Very high confidence</td>
</tr>
<tr>
<td>Reduced labour productivity</td>
<td>High confidence</td>
</tr>
<tr>
<td>Increased under-nutrition</td>
<td>Very high confidence</td>
</tr>
<tr>
<td>Foodborne diseases</td>
<td>Very high confidence</td>
</tr>
<tr>
<td>Water-borne diseases</td>
<td>Very high confidence</td>
</tr>
<tr>
<td>Vector-borne diseases</td>
<td>Medium confidence</td>
</tr>
</tbody>
</table>

IPCC, 2014
Health Risks in Canada from Climate Change

- Permafrost melt damaging infrastructures
- Heat-related illnesses and deaths
- Psychosocial impacts from droughts
- Water-borne diseases from floods
- Respiratory illnesses from forest fires
- Dangerous travelling conditions
- Changes in drinking water quality and quantity
- Food security - changing animal distributions
- Health impacts from more severe storms
- Expansion of Lyme Disease vector

Projected Risks from Lyme Disease to Canadians

Ogden et al., 2008
Extreme Heat

“As the climate changes, the frequency, intensity and duration of these events are expected to increase, as are their related adverse health effects” – Health Canada, 2011

At-risk groups include:

- Older Adults
- Infants and young children
- People with chronic illness
- The physically active
- Low socio-economic status
- Newcomers to Canada and transient populations
Climate Change Impacts on Food Insecurity

Schnittter, 2017
Mental Health Impacts of Climate Change

• 1 in 300 year flood
• 1932 people remained evacuated 2 years after the flood

Psychosocial impacts included:

• Increases in alcohol and drug use
• Increases in family violence
• Depression
• Anxiety
• Sleep disruption

Manitoba Flood 2011
Pathways Through Which Drought Impacts Health in the Context of Climate Change

Yusa et al., 2015
Canadian Health Care Facility Impacts from Climate Hazards

Impacts on the Health System
Catastrophic Climate Events – Hurricane Maria

100,000 people have left the island – roughly 1800 per day


VULNERABILITY ASSESSMENT GUIDANCE
Increasing Resiliency of Health Systems

• Climate-informed health planning

• Health and climate capacity development

• Emergency preparedness and management

• Vulnerability, capacity and adaptation assessment

• Integrated risk monitoring and early warning

WHO, 2015
Health Risks in Canada from Climate Change

**WHO will be affected?**
- Permafrost melt damaging infrastructures
- Heat-related illnesses and deaths
- Psychosocial impacts from droughts
- Water-borne diseases from floods
- Respiratory illnesses from forest fires

**WHAT climate hazards will endanger health?**
- Dangerous travelling conditions
- Changes in drinking water quality and quantity
- Food security - changing animal distributions
- Health impacts from more severe storms
- Expansion of Lyme Disease vector

**WHEN will health be impacted?**
- Climate change factors leading to health issues

**WHERE will health risks be the greatest?**
- Map of Canada showing areas of greatest risk

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Climate change is transforming environmental health decision making due to:

- Dynamic and complex disease risks (e.g., vector-borne diseases)
- Multiple uncertainties – particularly around management of indirect health effects (e.g., food insecurity)
- Increase probability of “surprises” that can severely impact health (e.g., cascading or complex emergencies)
- Risks of “involuntary” adaptation

Source: National Institute of Environmental Health Sciences
Linear vs Non-linear Climate Change Impacts and Adaptation?

Ontario Climate Change and Health Toolkit

### STEP 2D: VULNERABILITY INDICATORS TEMPLATE

Use the template below to document information on the sensitivity and adaptive capacity of individuals and the community to climate-related health hazards. Many sensitivity and adaptive capacity indicators are relevant for all climate-related health hazards (i.e., provide an indication of vulnerability for all), while others are specific to one or more. Examples of vulnerability indicators are provided in the template to help guide data collection. Data from these indicators will also be useful for monitoring adaptation success. See Step 5b: Monitoring Indicators Template.

#### Health Hazards

**EXTREME TEMPERATURE (heat, cold) EVENTS**

#### Vulnerability Category

- Exposure

#### Examples of Vulnerability Indicators

- Maximum and minimum temperatures, heat index
- Increase in heat alerts/warnings
- Projected hot days and warm nights
- Projected cold days
- Projected air temperature seasonal changes and extremes
- Proportion of the population living in an urban heat island

#### Data Source

#### Method(s) of Verifying Efficacy and Appropriateness of Indicators

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<table>
<thead>
<tr>
<th>Health Hazards</th>
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<tr>
<td><strong>EXTREME TEMPERATURE (heat, cold) EVENTS</strong></td>
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</tr>
<tr>
<td>Vulnerability Category</td>
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<td>Vulnerability Category</td>
</tr>
<tr>
<td>Exposure</td>
<td>Sensitivity</td>
<td>Adaptive Capacity</td>
</tr>
<tr>
<td>Examples of Vulnerability Indicators</td>
<td>Examples of Vulnerability Indicators</td>
<td>Examples of Vulnerability Indicators</td>
</tr>
<tr>
<td>- Social and economically disadvantaged populations</td>
<td>- Number of people with conditions that inhibit temperature regulation</td>
<td>- Health and social services</td>
</tr>
<tr>
<td>- Number of people with conditions that inhibit temperature regulation</td>
<td>- Number of seniors</td>
<td>- Proportion of the population without air conditioning</td>
</tr>
<tr>
<td>- Number of children</td>
<td>- Heat-related morbidity and mortality</td>
<td>- Access to cooling centers</td>
</tr>
<tr>
<td>- Cold-related morbidity and mortality</td>
<td></td>
<td>- No. of heat wave early warning systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- No. of municipal heat island mitigation plans</td>
</tr>
</tbody>
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Useful Resources for Conducting Assessments

Useful Resources

**Ontario Ministry of the Environment and Climate Change** — [https://www.ontario.ca/ministry-environment](https://www.ontario.ca/ministry-environment)


**Ontario Centre for Climate Impacts and Adaptation Resources** [http://www.climateontario.ca/](http://www.climateontario.ca/)

**Consortium on Regional Climatology and Adaptation to Climate Change** [http://www.ouranos.ca/en/](http://www.ouranos.ca/en/)

**Pacific Climate Impacts Consortium** [http://www.pacificclimate.org/](http://www.pacificclimate.org/)

See also Box 4

Case Studies

Box 12: Air Quality and Climate Change Management Plan, City of Ottawa

The City of Ottawa’s Air Quality and Climate Change Management Plan (2014) outlines goals, objectives, and recommendations to address climate change over the next 5 years. Included in the Plan are specific goals and activities underway or planned to reduce climate-related health risks. One goal is to adapt to climate change and protect people and property by reducing the risks to public health (e.g. through West Nile and Lyme disease monitoring and prevention programs).

This will be achieved through the identification and communication of health risks to Ottawa residents and businesses, continued disease surveillance, education and prevention programs for vectorborne diseases such as West Nile virus and Lyme disease, and increasing the ratio of vegetated to impermeable surfaces to reduce the urban heat island effect. Ottawa Public Health identified a need to continue to invest resources to combat illnesses associated with extreme weather in Ottawa and conduct research and evaluation studies to keep improving the Heat and Smog Action Plan to protect health.

Source: City of Ottawa 2014

Source: Shutterstock image

EXAMPLES OF CANADIAN AND US ASSESSMENTS
Canadian Health Vulnerability Assessments

**National**

- 1995 (Royal Society)
- 1998 (GOC)
- 2008 (Health Canada)
- 2014 (GOC)
- 2021 (planned)

**Sub-National**

- Peel Region (2014)
- Surrey, BC (2014)
- Simcoe Muskoka (2017)
- Northwestern Health Unit (ongoing)
- York (ongoing)
- Hamilton (ongoing)
- Wellington-Dufferin-Guelph (ongoing)
Middlesex-London Vulnerability Assessment

- Collected data on current risks and adaptations
- Modeled future risks with climate change
- Engaged stakeholders on results and recommendations

https://www.healthunit.com/climate-change
Middlesex-London Vulnerability Assessment

Key Recommendations

- Develop a climate change and health adaptation action plan
- Increase understanding of urban and rural vulnerabilities
- Enhance surveillance and monitoring
- Evaluate existing adaptations and programs
- Educate public health officials, and the public about growing risks

https://www.healthunit.com/climate-change
US Assessments

https://www.cdc.gov/climateandhealth/crsci_grantees.htm
### Completed U.S. climate health assessments*

<table>
<thead>
<tr>
<th>Climate Change Adaptation Plan/Framework Developed and Online</th>
<th>Other Adaptation Actions or Next Steps Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona New York State</td>
<td>Florida (priority hazard profiles and cases; county adaptation plans coming soon) Maryland (outreach)</td>
</tr>
<tr>
<td>California North Carolina</td>
<td>Illinois (public health training, heat toolkit) Massachusetts (climate change preparedness assessment - local boards of public health)</td>
</tr>
<tr>
<td>Michigan Oregon</td>
<td>Maine (Syndromic surveillance system for heat, enhanced vector-borne disease monitoring) New York City (local hazard mitigation plans – extreme heat, resiliency guideline for infrastructure) Vermont (public health training)</td>
</tr>
<tr>
<td>Minnesota Rhode Island</td>
<td>New Hampshire – <em>Northeastern U.S. Climate Impacts Assessment separate from BRACE</em> San Francisco Wisconsin</td>
</tr>
</tbody>
</table>

*Based on online scan of US CDC BRACE Climate-Ready States and Cities Initiative grantees*
Arizona
Oregon Climate and Health
Profile Report

Oregon Climate and Health
Resilience Plan
North Carolina

The Profile Report prioritizes the health impacts. The top priorities for North Carolina are:

1. Air quality and respiratory disease – focus on wildfire smoke health impacts

2. Heat related deaths and illnesses – focus on emergency department visits
Outreach

Health Effects of Summer Heat in Florida

Health Effects of Tropical Storms and Hurricanes in Florida

Health Effects of Precipitation Abundance and Deficits in Florida

THINGS YOU CAN DO
Individual and Family Actions

DURING EXTREME HEAT EVENTS:

- Air conditioning is the number one protective factor against heat-related illness and death. During conditions of extreme heat, spend time in locations with air conditioning such as shopping malls, public libraries, or public health sponsored heat relief shelters in your area.

- Get informed. Listen to local news and weather channels or contact your local public health department during extreme heat conditions for health and safety updates.

- Drink cool, non-alcoholic beverages and increase your fluid intake, regardless of your activity level.

- Older adults (65 years and older), infants, and children and people with chronic medical conditions are more prone to heat stress.

DURING EXTREME PRECIPITATION EVENTS:

- Plan ahead - be prepared for extreme precipitation events and floods before they happen:
  - Make an emergency plan.
  - Make a disaster supply kit.
  - Identify your evacuation routes.
  - Make a plan for your pets.

- For more information, visit: Florida’s Emergency Management Agency’s information on floods.

- Do not drive through flood waters.

- During a flood:
  - Listen to radio or local news for information.
  - Use water that you know is safe for drinking, bathing, and other purposes.

- For more information, visit: Maryland’s Emergency Management Agency’s information on floods.

- After a flood:
  - Avoid floodwaters.
  - Listen for news about safe water use.
  - Use caution entering buildings and be careful about hidden damage, chemicals, and sewage and electric power lines.

- For more information, visit: Maryland’s Emergency Management Agency’s information on floods.
Pan-Canadian Framework on Clean Growth and Climate Change

Protecting and improving human health and well-being

1. Addressing climate change-related health risks

   - Extreme heat events
   - Infectious diseases
   - Adaptation investments - surveillance and monitoring, risk assessments, modelling, laboratory diagnostics, health professional education and public awareness activities.

2. Supporting healthy Indigenous communities

Canada in a Changing Climate: Advancing Our Knowledge for Action

The impacts of climate change are already being felt across Canada. Ongoing climate change poses significant risks to communities, health and well-being, our economy and the natural environment. Meeting the challenges posed by climate change means both reducing emissions to limit the amount of change, as well as adapting to the observed and anticipated impacts, in order to build resilience.

Canada in a Changing Climate: Advancing our Knowledge for Action is a series of authoritative science and information products about how Canada’s climate is changing, the impacts of these changes and how we are adapting to reduce risk.

Assessment products will serve as a resource for Canadians, raising awareness of the key issues facing our country and providing information to support sound adaptation decisions and actions.

Learn more about the assessment process

Look ahead at what products you can expect to see

Share Your Views on Canada's Assessment

https://www.nrcan.gc.ca/environment/impacts-adaptation/19918
THANK YOU

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