



FROM **IMPACTS**
to **ADAPTATION**
Canada in a Changing Climate 2007

VIVRE AVEC
LES **CHANGEMENTS**
climatiques au Canada : édition 2007



Highlights from the Ontario Chapter

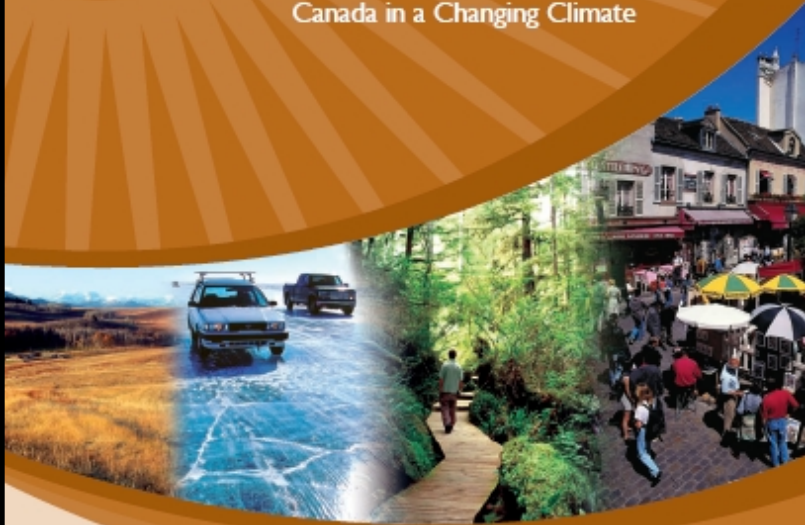


Government
of Canada

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du Canada

Canada

2007
FROM IMPACTS
TO ADAPTATION
Canada in a Changing Climate



Goals

- Assess current and future risks and opportunities (human and managed systems)
- Based on published and grey literature
- 6 regional chapters, 1 international

Chapter 6: Ontario

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Chapter Structure

Regional context

Sub-regions (current observations, projections, adaptations)

- Ecosystems
- Forestry
- Water Resources Management
- Human Health
- Agriculture
- Energy
- Mining
- Transportation
- Tourism and Recreation

Synthesis

Challenges, Opportunities and ways forward...

Challenges

- Many **natural, physical and socio-economic systems will be affected**, including disruptions to critical infrastructure; water shortages; increased health risks; remote and resource-based communities; unmanaged and managed ecosystems
- Adaptation involves a **wide range of players**: individuals, community groups, NGOs, businesses / industry and all orders of government
- **Adaptive capacity** is generally high, but is **unevenly distributed**

Opportunities

- A **solid knowledge foundation** has been established over the past 20 years
- **Governments have roles** as adapters and also as facilitators of adaptation
- **Adaptive capacity is generally high**, but is unevenly distributed

Possible ways forward

- A **solid knowledge foundation** has been established over the past 20 years
- **Integrating** into existing programs and policies is an effective approach



Sub-regions

based on ecozone boundaries and roughly similar socio-economic circumstance

Regional context

- **Economic Growth**
 - Annual growth 3%, expected to slow to 2.3%
 - Transportation sector dominates
 - Largest tourism industry in Canada, 3.3% of provinces employment

- **Population and health status**
 - 12.5 million, projected to grow by 31% by 2031, 60% of growth in GTA
 - Remote and resource-based communities shrinking, central and north sub-regions projected decline by 7.4%
 - 85% urban, aging
 - 1.7% aboriginal

Communities in Ontario

258 communities (population > 1,000)

Range in size from 1,005 to 1.56M

13 communities	>100,000
7 communities	50,000 – 99,000
37 communities	10,000 – 49,900
201 communities	1,000 – 9,999

Stats Canada, 2001 census

North sub-region

Ecosystems

- Observed changes in fish species
- Decline in polar bear population
- Shortening of sea ice season

Water

- Spring and ice-jam flooding: Attawapiskat evacuated 4 times between 1998 and 2004; Kashechewan evacuated in 2005 and 2006 (in addition to water quality evacuation)
- Decreased flows documented for Severn, Winisk, Ekwan, Attawapiskat, Albany and Moose rivers
- Further reductions projected

North sub-region

Health

- Changes to traditional ways of life and access to country foods
- Likely increase in potential for vector and waterborne disease outbreaks

Transportation

- 3000 km winter road network depends on frozen ground and waterways
- Reductions in road season length of 10 days observed in 2005 and 2006



Central sub-region

Ecosystems/Forests

- Distribution of species will shift north
limited by soil capability, migratory pathways and presence of pollinator species
- Productivity expected to increase
because of changes in frost-free period, length and temperature of growing season and CO₂ concentrations
- Natural disturbances (fire, insects, disease and wind) expected to increase

Resource dependent communities



Forestry
Agriculture
Mining
Energy

Central sub-region

Flooding

- Shift in timing from spring run-off to heavy rainfall, or rain on snow events
- 2002 flood: \$31M damage, lengthy road and rail disruption



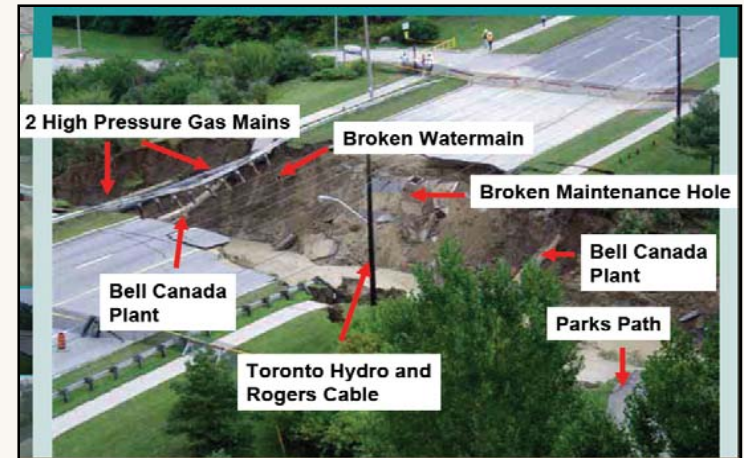
Tourism and Recreation

- Decrease in ski season by 17% by 2020s; 36% by 2050s – can increase snow making
- Decrease on snow-mobiling season between 30 and 50% by 2020s and 50 –90% by 2050s ... adaptation options limited

South sub-region

Water

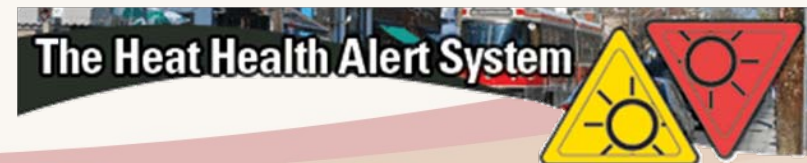
- Reduced summer flows, seasonal shortages
- Warmer temperatures reduce water quality
- Increases in frequency and intensity of heavy rainfalls



City of Toronto

Health

- More than double # of hot days by 2050 (Ottawa average 8)
- Reduction in cold-related mortality by 45%



South sub-region

Energy

- Peak energy demand now in summer
- Increasing water temperatures reduced efficiency of nuclear and coal-fired cooling systems
- Transmission grid sensitive to extreme events and higher temperatures

Severe storm dates	Customers affected (loss of service)
September 29, 2005	93 000
November 6, 2005	120 000
November 16, 2005	50 000
February 4, 2006	100 000
July 17, 2006	170 000
August 2, 2006	150 000
September 24 and 27, 2006	93 000

TABLE 4: Storm damage to electricity transmission and distribution grid in the south subregion of Ontario, September 2005 to September 2006 (*from* McMillan and Monroe, 2006).

Tourism and Recreation

- Reduced ski season (able to compensate with snow-making)
- Ice fishing season 52% shorter in 1997/1998
- Winterlude season decrease to 20-49 days by 2050s (current average 50)



Great Lakes

Transportation

- 2.5 cm decline = 100 to 270 tonnes of lost ship capacity

Energy generation

- Projections range from small increase to 50% decline in hydro output

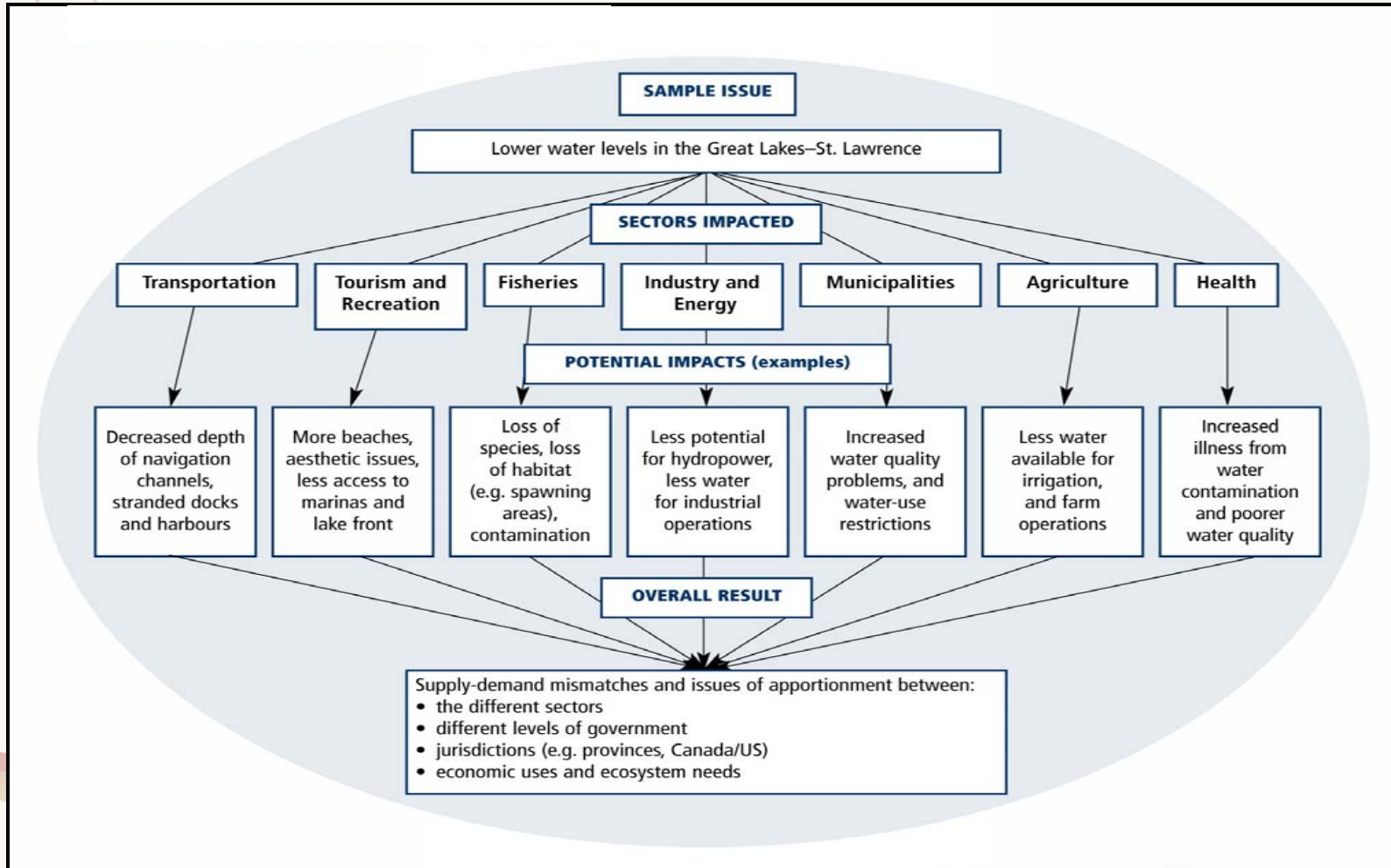
Tourism and recreation

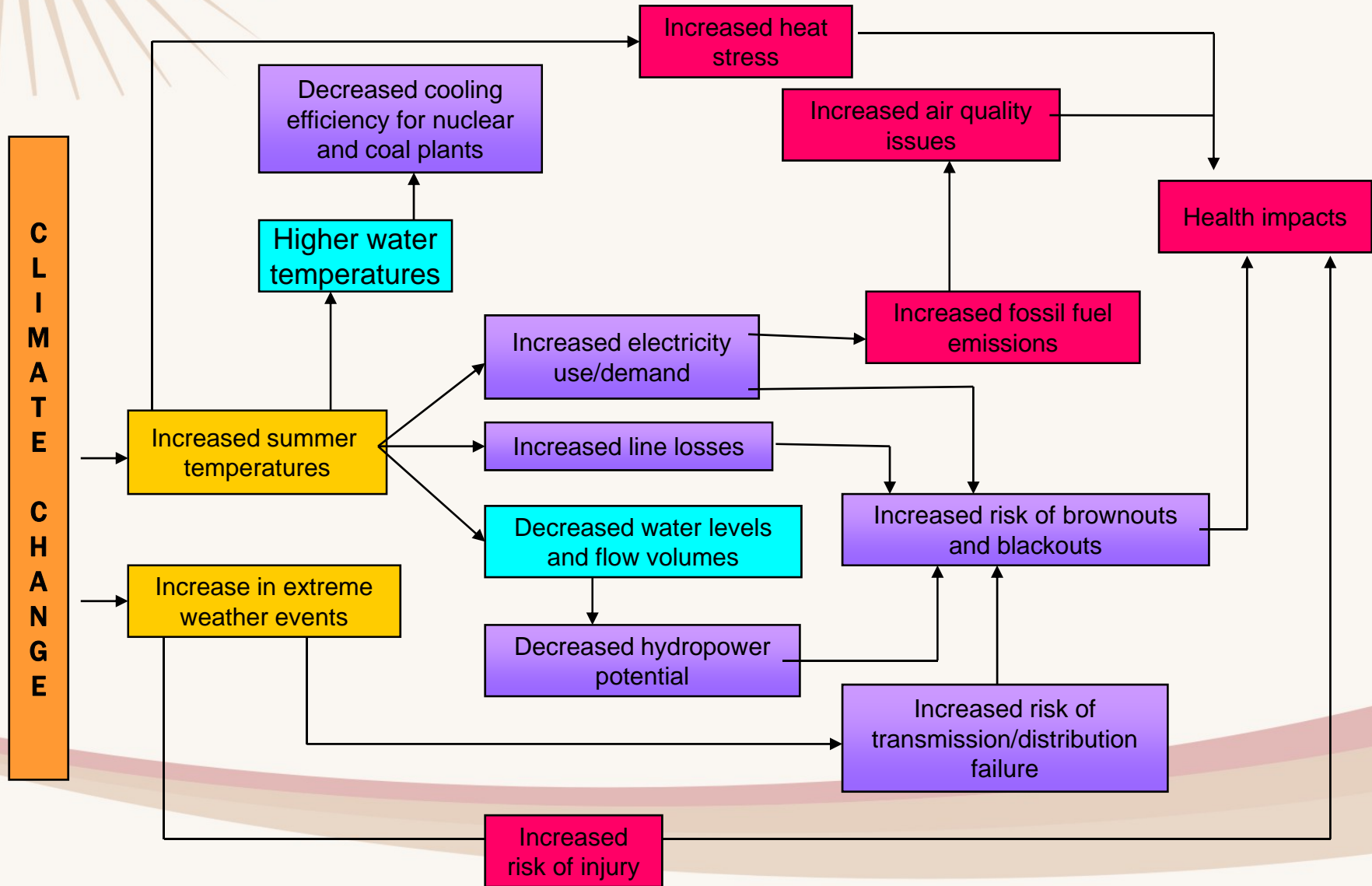
- Lower levels have “major” or “devastating” impact on marinas

Water supply

- Water supply pipelines may require relocation

Other challenges





Adaptive Capacity

Determinants of adaptive capacity

- economic resources (diversity)
- technology (access to it)
- information and skills
- infrastructure
- institutions
- equity

Adaptive Capacity

Urban centres	Rural communities
Strengths	
Greater access to financial resources	Strong social capital
Diversified economies	Strong social networks
Greater access to services (e.g. health care, social services, education)	Strong attachments to community
Higher education levels	Strong traditional and local knowledge
Well-developed emergency response capacity	High rates of volunteerism
Highly developed institutions	
Limitations	
Higher costs of living	Limited economic resources
More air quality and heat stress issues	Less diversified economies
Lack of knowledge of climate change impacts and adaptation issues	Higher reliance on natural resource sectors
High dependence on potentially vulnerable electricity grid	Isolation from services and limited access
Aging infrastructure	Lower proportion of population with technical training
Issues of overlapping jurisdictions can hinder decision-making ability	



Same issue,
different
impacts and
adaptation
response

TABLE 5: Major negative impacts of climate change and onset of 'problems' by subregion in Ontario.

Cumulative stresses/region	Subregion		
	North	Central	South
Ecosystems			
Fish	Present to 20 years	Present to 20 years	Present to 20 years
Fauna	Present to 20 years	No information on timing	Present to 20 years
Fora	Present to 20 years	No information on timing	Present to 20 years
Water			
Quality	50 to 80 years	20 to 50 years	Present to 20 years
Quantity (shortages)	No significant impact expected	No significant impact expected	Present to 20 years
Flooding	Present to 20 years	Present to 20 years	Present to 20 years
Health			
Heat	No significant impact expected	20 to 50 years	Present to 20 years
Insect/vector disease	50 to 80 years	20 to 50 years	Present to 20 years
Water quality	50 to 80 years	20 to 50 years	Present to 20 years
Air quality	No significant impact expected	20 to 50 years	Present to 20 years
Agriculture			
Drought	No significant impact expected	No significant impact expected	Present to 20 years
Energy			
Increased demand	No significant impact expected	No significant impact expected	Present to 20 years
Lower production	No significant impact expected	No significant impact expected	20 to 50 years
Forestry			
Fire	Present to 20 years	Present to 20 years	No significant impact expected
Pests and disease	20 to 50 years	20 to 50 years	No significant impact expected
Transportation			
Winter roads	Present to 20 years	No significant impact expected	No significant impact expected
Paved surfaces	No significant impact expected	No significant impact expected	20 to 50 years
Navigation	No significant impact expected	20 to 50 years	20 to 50 years
Tourism and Recreation			
Cold season	No significant impact expected	Present to 20 years	Present to 20 years

■ Present to 20 years ■ No information on timing
■ 20 to 50 years ■ No significant impact expected
■ 50 to 80 years

TIMING IS EVERYTHING

...

TABLE 6: Infrastructure life cycle timeframes (adapted from Auld et al., 2006).

Structure	Phase	Typical expected life cycle timeframe (years)
Commercial buildings	Retrofit	20
	Demolition	50-100
Roads	Maintenance	Annually
	Resurface	5-10
	Reconstruction or major upgrade	20-30
Bridges	Maintenance	Annually
	Resurface	20-25
	Reconstruction or major upgrade	60-100
Rail	Major refurbishment	10-20
	Reconstruction or major upgrade	50-100
Airports	Major refurbishment	10-20
	Reconstruction or major upgrade	50
Dams and water supplies	Major refurbishment	20-30
	Reconstruction or major upgrade	50
Sewers	Reconstruction or major upgrade	50
Waste management	Upgrade	5-10
	Major refurbishment	20-30



Ways forward/opportunities

Mainstreaming

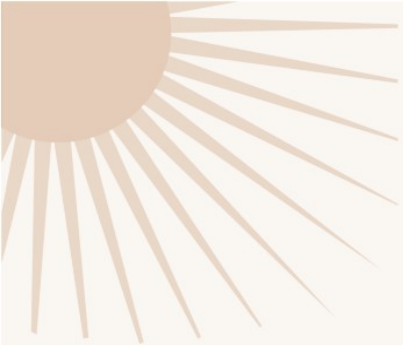
- Integrating climate change considerations into existing decision-making frameworks

AND

- In conjunction with other issues affecting the same decisions

Examples of Adaptation in Ontario

- Urban areas: smog advisories and heat-health alert systems
- Conservation authorities: Source water protection plans
- Farmers
- Foresters
- Tourism



Thank you

From Impacts to Adaptation: Canada is a Changing Climate
www.adaptation2007.nrcan.gc.ca

