




A Changing Climate: Implications for the Carolinian Canada Eco-Region






Carolinian Canada Coalition
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• Is the climate changing?

Climate Science Assessment

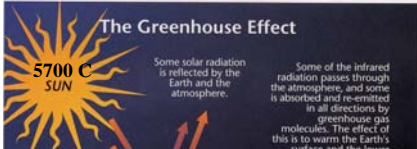
- The Intergovernmental Panel on Climate Change
 - Established in 1988 by the World Meteorological Organization and the United Nations Environmental Programme
- Three Working Groups
 - I. Science
 - II. Impacts, Adaptation and Vulnerability
 - III. Mitigation (Emission Reductions)
- Science Assessments – 1990, 1995, 2001, 2007
 - Summaries for Policy Makers – www.ipcc.ch
- IPCC Awarded Nobel Peace Prize for 2007

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GREENHOUSE EFFECT –

gases in atmosphere trap energy and warm the surface and lower atmosphere

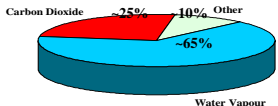
Warming:
 Venus +500C
 >90% CO₂
 90 atmos.
 Earth +30C
 0.04% CO₂
 1% H₂O
 1 atmos.
 Mars +10C
 >80% CO₂
 0.007 atmos.



The Greenhouse Effect

Some solar radiation is reflected by the Earth and the atmosphere.

Some of the infrared radiation passes through the atmosphere, and some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.



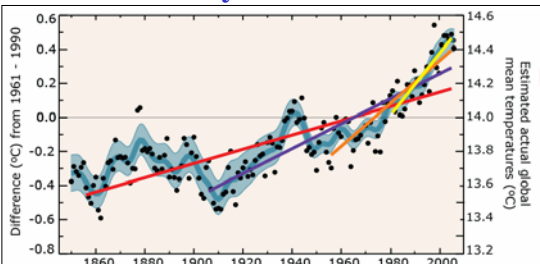
Carbon Dioxide 25%
 Water Vapour 65%
 Other 10%

Time Scales for Climate System

- Water cycle 10 days
- Atmospheric Energy 1 month
- Ocean energy years to centuries
- Emissions to globe years
- Methane gas 10 years
- Carbon dioxide 100 years
- End-use technologies years
- Supply technologies decades
- Social standards decades

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WGI The Physical Science Basis



Difference (°C) from 1961 - 1990

Estimated actual global mean temperatures (°C)

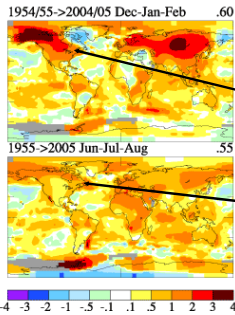
1860 1880 1900 1920 1940 1960 1980 2000

0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8

14.6
14.4
14.2
14.0
13.8
13.6
13.4
13.2

Warming of the climate system is unequivocal,
 as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.
 Eleven of the last twelve years (1995 -2006) rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850).

The Last 50 Years

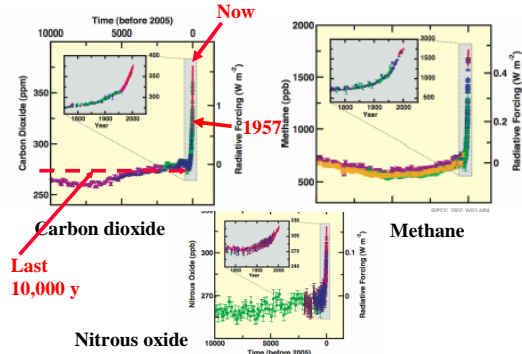


The Arctic is warming most.

And winters are warming more than summers.

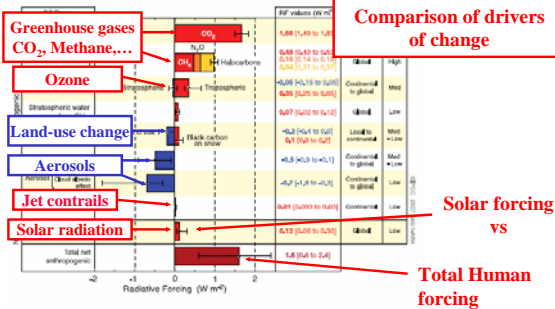
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Changing Greenhouse Gas Concentrations from ice cores and modern data



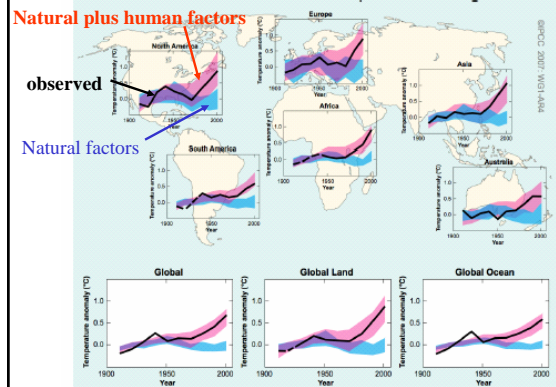
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Most of the observed increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations.



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Global and Continental Temperature Change



Climate Change 2007:

Impacts, Adaptation and Vulnerability

Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases.

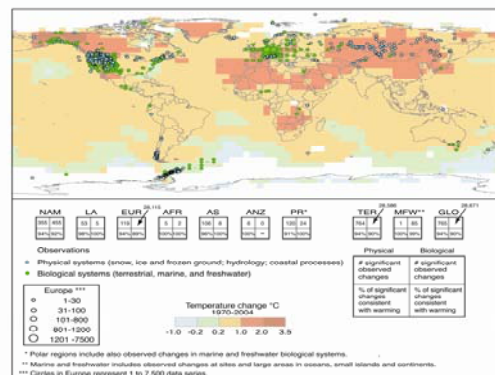
Based on growing evidence, there is high confidence that the following types of hydrological systems are being affected around the world:

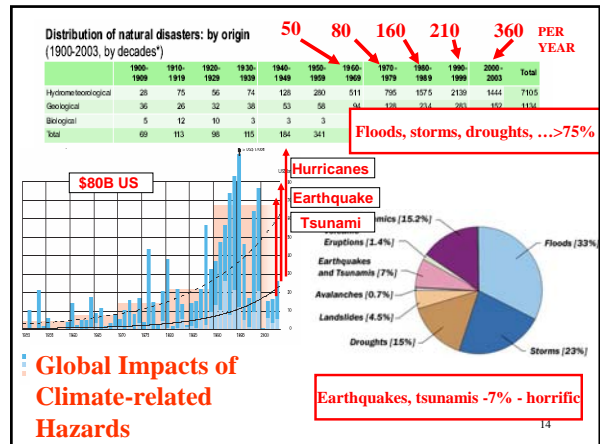
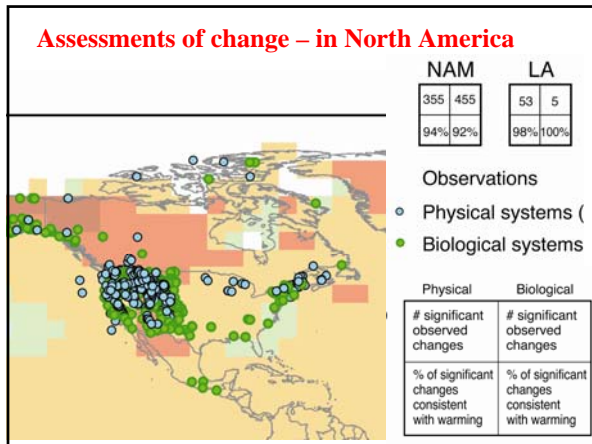
- increased run-off and earlier spring peak discharge in many glacier- and snow-fed rivers;
- warming of lakes and rivers in many regions, with effects on thermal structure and water quality

A global assessment of data since 1970 has shown it is likely that anthropogenic warming has had a discernible influence on many physical and biological systems.

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Assessments of change - globally

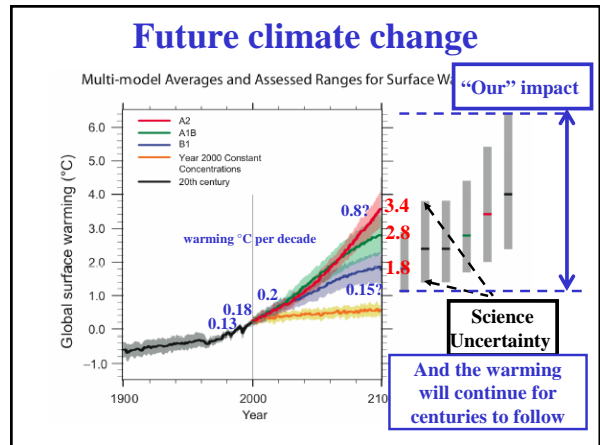




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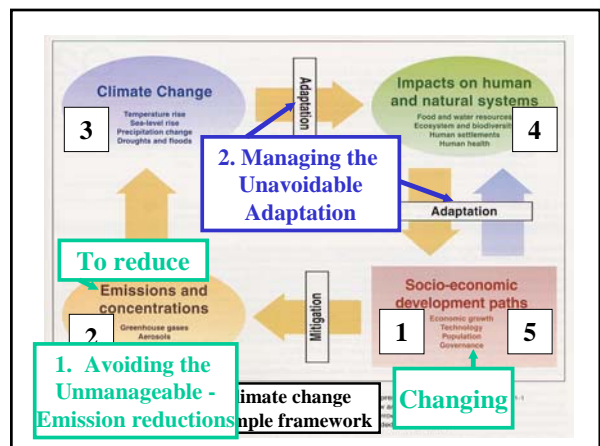
- Projecting the future




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- Responding





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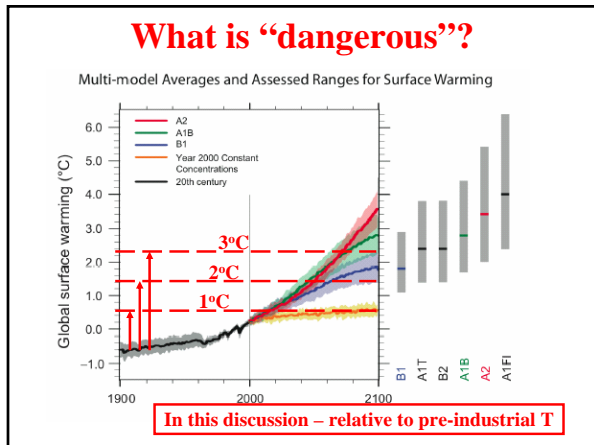
- Avoiding the Unmanageable - Emission reductions

UN Framework Convention on Climate Change

- signed by 155 nations in 1992 – came into force in 1994
- developed countries aim to reduce emissions to 1990 levels by year 2000

Article 2

“... **stabilization** of greenhouse gas concentrations in the atmosphere at a level that would **prevent dangerous anthropogenic interference** with the climate system. Such a level should be achieved within a time-frame sufficient to allow **ecosystems to adapt naturally** to climate change, to ensure **food production is not threatened** and to enable **economic development to proceed in a sustainable manner.**” 20

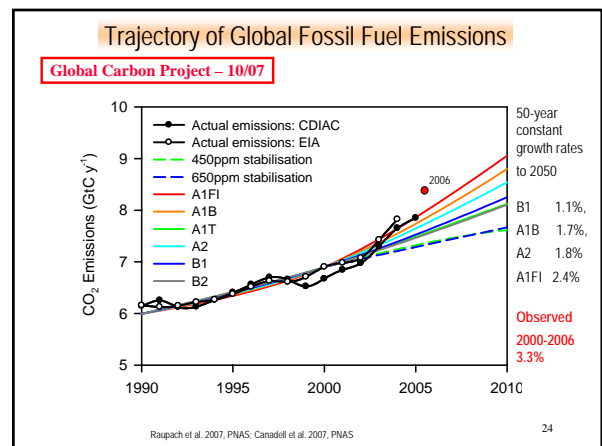
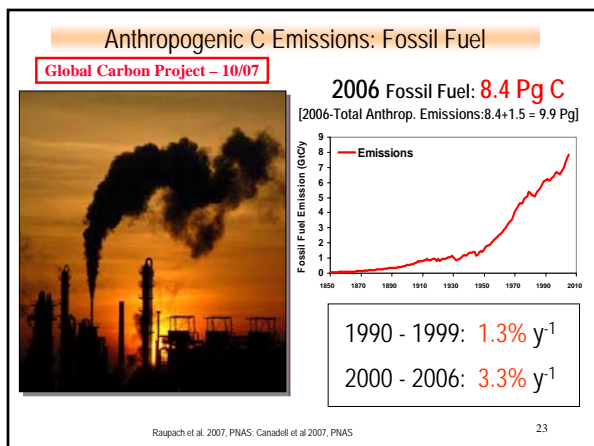


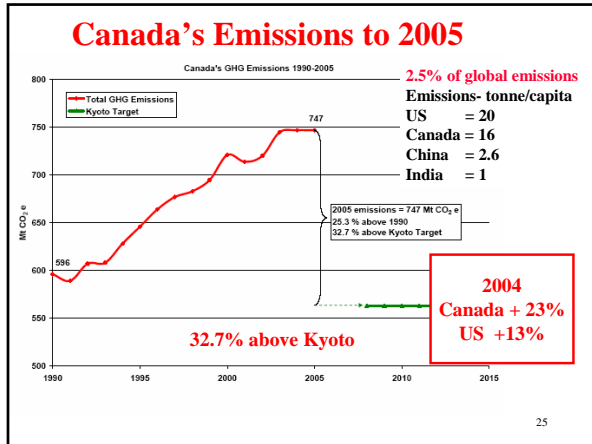
prevent **dangerous anthropogenic interference**

“People are actually questioning if the 2 °C benchmark that has been set is safe enough.” “Rising temperatures this century could bring risks for the extinction of up to 30 percent of the world’s species. A creeping rise in sea levels could threaten Pacific islands and many coastlines.” Pachauri (IPCC).

What is dangerous for Canada?

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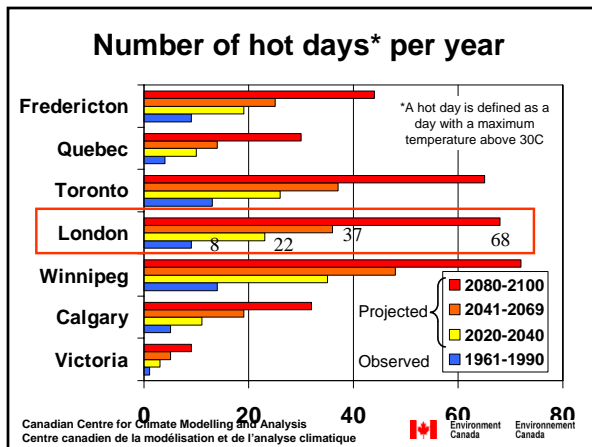
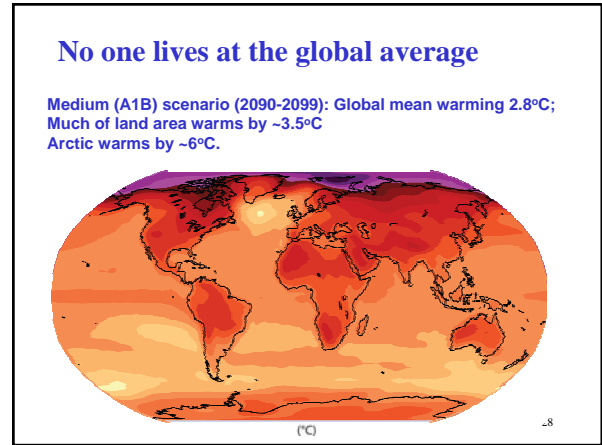
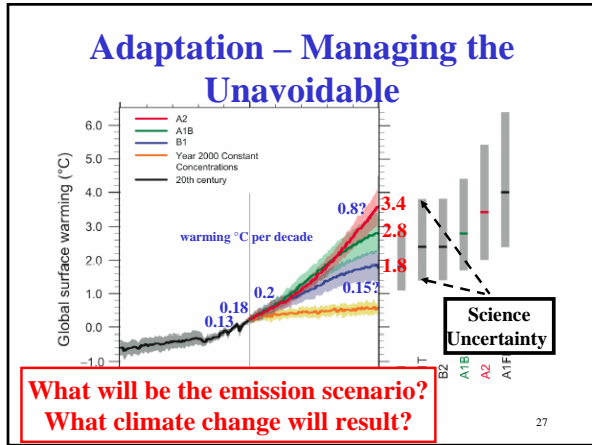




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- Impacts of a changing climate and managing the unavoidable - adaptation

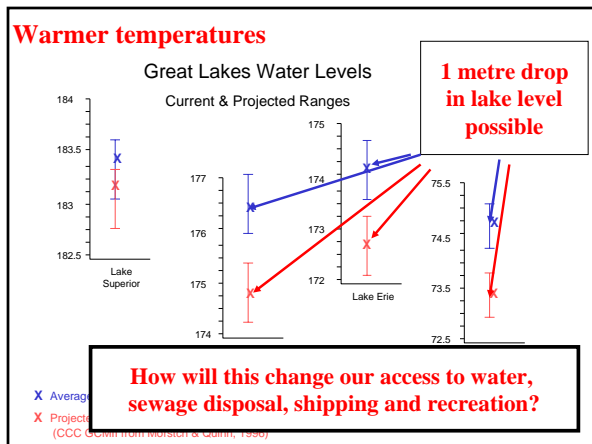
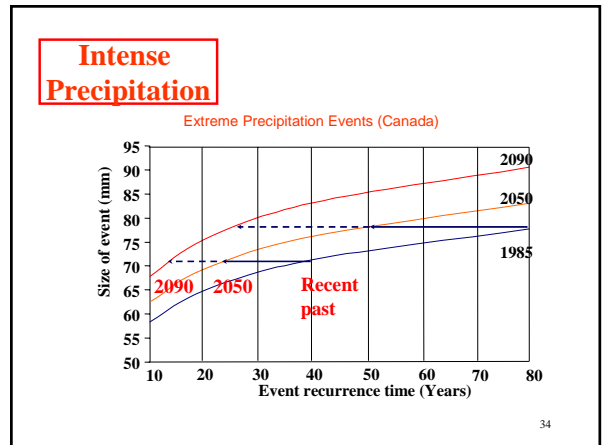
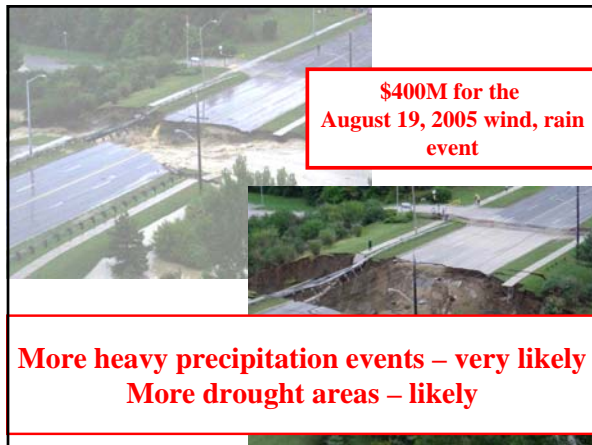
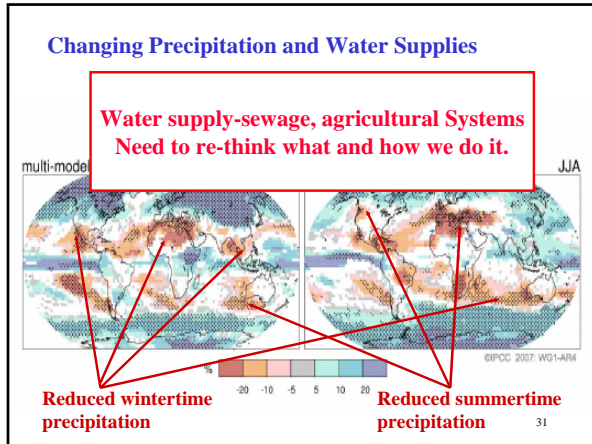


In Europe - Record setting August 2003 (more than 35,000 deaths) will be every second summer – by mid-century

Actions:



- Better design our structures and cities
- more green space-shade-use of passive cooling
- Heat alerts and responses – medical advice
- Cleaner air

More frequent hot days – virtually certain
Warm spells – very likely




Tornadoes are one of the most devastating weather events.

A Major Disaster - Barrie 1985


Barrie, Ontario

- Multiple Outbreak
- 12 deaths \$200M
- Total area with significant damage less than 100 square km

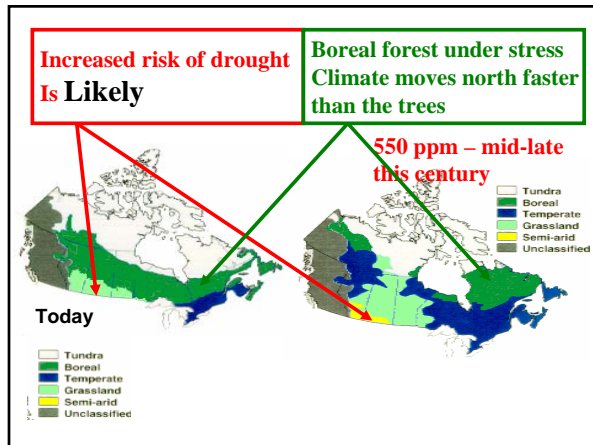


Wind Damage to Infrastructure

Severe Storm	Loss of Service
Sept. 29, 2005	93,000
Nov. 6, 2005	120,000
Nov. 16, 2005	50,000
Feb. 4, 2006	100,000
July 17, 2006	170,000
Aug. 2, 2006	150,000
Sept. 24+27, 2006	93,000




The Insurance Research Lab for Better Homes



Current knowledge about future impacts

- Fresh water resources and their management
 - By mid-century, annual average river runoff and water availability are projected to increase by 10-40% at high latitudes and in some wet tropical areas, and decrease by 10-30% over some dry regions at mid-latitudes and in the dry tropics, some of which are presently water stressed areas.
- Ecosystems
 - The resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g., flooding, drought, wildfire, insects, ocean acidification), and other global change drivers (e.g., land use change, pollution, over-exploitation of resources).
 - Disturbances from pests, diseases, and fire are projected to have increasing impacts on forests, with an extended period of high fire risk and large increases in area burned.

- Moderate climate change in the early decades of the century is projected to increase aggregate yields of rainfed agriculture by 5-20%, but with important variability among regions. Major challenges are projected for crops that are near the warm end of their suitable range or depend on highly utilised water resources.

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The Bottom Line

- The climate is changing –
- It will change more in the next 100 years
- Due to the long lifetime of greenhouse gases, change is inevitable
- But we can make a difference
 - In terms of GHG emission reductions
 - In terms of reducing the impacts of a changing climate.

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Climate change is a long-term issue
Issues of intergenerational and international equity



Thank you for your attention