GLOBAL CLIMATE CHANGE:
What’s Happening, and What Can We Expect

Irene Hanuta
Climate Change Branch, Manitoba Energy, Science and Technology
What is ‘climate’?

• Climate is ‘average weather’
  - and its variability
  - for a particular region
  - over a period of time

• Includes many different elements
  - temperature
  - rain/snow
  - sunshine hours
  - wind, etc.
However, the climate system is also influenced by many other complex interactions and feedbacks.
The earth is getting warmer

THE TOP 10

1: 1998
2: 2002
3: 2001
4: 1997
5: 1995
6: 1990
7: 1999
8: 2000
9: 1991
10: 1987

- 20th century the warmest globally in past 1000 years
- 1980s and 1990s warmest decades on record
Global surface temperatures are rising

1860-2002

Relative to 1961-90 average temperature
Canadian temperatures have also increased substantially during the past century.
The warming will continue

- Scientists predict average temperature **increase between 1.4 - 5.8°C** in next 100 years

- Small changes in average temperatures make a big difference:
  
  - Average temperatures today are only about 5°C warmer than they were during the last Ice Age
Temperature changes will vary

- Temperature changes in Canada won’t be uniform
- Polar regions will warm more than mid-latitude regions
- The Atlantic will cool slightly
How do we know this is happening?

- Instrumental records - to 1860

- Ice cores, sediment cores, tree rings, historical records, traditional knowledge - evidence dating back several thousand years

- Satellite mapping & computer modelling for future predictions: Canadian model one of the best
Climate Change Modeling: Possible Future

CGCM1, Mean Winter Temperature Change 2050
2050 Monthly Precipitation Scenarios

% Change
Possible Changes in Canada’s Ecozones with 2x CO₂ Levels

Why is this happening?
The greenhouse effect

Earth’s surface is heated by the sun and radiates the heat back out towards space.

Greenhouse gases in the atmosphere trap some of the heat.

Some energy is reflected back out to space.

Solar energy from the sun passes through the atmosphere.
What are the greenhouse gases?

**Water vapour:**
The most common gas

**Carbon dioxide:**
Released through burning Fossil fuels

**Methane:**
From wetlands, rice paddies, animal digestive processes, landfills and sewage treatments

**Nitrous oxide:**
From soils and the ocean Agriculture fertilizers

**Ozone:**
Exists naturally in the upper atmosphere

**Halocarbons:**
Human-made chemicals
“There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.”

Intergovernmental Panel on Climate Change
2001
Human activities are intensifying the greenhouse effect

- Electricity
- Deforestation
- Industry
- Transportation
Global trends in fossil fuel CO$_2$ emissions

What’s wrong with warmer temperatures?
Potential benefits to Canadians include:

- Lower snow removal costs
- Less ice cover on Great Lakes, along east coast, and Arctic
- Longer, warmer growing seasons
- Lower heating costs
Potential impacts of climate change on Canada

The North

The Prairies

British Columbia

Ontario and Quebec

Atlantic Canada
Lower lake/stream levels have important impacts:

- Inaccessible docks
- Navigation hazard
- Degraded water quality
- Reduced hydropower
- Reduced cargo loads
Arctic Ocean sea ice is less extensive

“We used to go on the sea ice with dog sleds to hunt seals – now we have to use boats... We used to go a long way out – now we hunt close to shore.”
Many regions of Canada’s coastline are sensitive to sea level rise.
The frequency and severity of droughts are also likely to increase in southern Canada:

- SOUTHWEST MANITOBA, 2003
- CENTRAL AND NORTHERN MANITOBA, 2003
- SOUTHERN ALBERTA AND SASKATCHEWAN
- SOUTHERN B.C.
...but very wet seasons may also become more frequent or more frequent intense rainfalls - local floods

Southeast Manitoba

June 12-16, 2002

- 240 mm in 1 hour near border
- 133 mm in Steinbach

Vanguard, SK July 3, 2000

- eight-hour: 334-387 mm
Longer, more intense heat waves

HEAT STRESS

Europe 2003

• 100°F for weeks

• 35,000 deaths
There are also risks of the spread of diseases

West Nile Virus

Lyme Disease
The North: Much of Canada’s permafrost is highly sensitive to changes in climate
Increase in land instability may have large impacts on human structures such as buildings, roads, and pipelines.
Manitoba Impacts

- Millions $ in costs already due to unreliability of **winter ice roads** for northern community access
- Millions $ more in costs now to develop land based winter road system with river crossings
Manitoba Impacts

- Increased risk of **forest fires** (1148 fires in 2003 and largest area burned in Canada)
Manitoba Impacts

- Increased risk of drought
- Risk of decreased soil moisture

Current Precipitation Compared to Historical Distribution

April 1, 2003 to August 31, 2003 (A.M.)

Percentile Classes
- Red: Record Drought
- Orange: Severe Drought (0-10)
- Yellow: Moderate Drought (10-25)
- Green: Below Mid-Range (20-40)
- Blue: Mid-Range (40-60)
- Purple: Above Mid-Range (60-80)
- Black: Moderately Wet (80-90)
- Pink: Excessively Wet (90-100)
- Gray: Record Wet

ExxonMobil

Prepared by PPRA (Prairie Farm Rehabilitation Administration) using data from the Timely Climate Monitoring Network and the many federal and provincial agencies and volunteers that support it.
Manitoba Impacts

Lake Winnipeg

- Water levels
- Water temperature
- Algae blooms
- Fish species change

"...saw reefs I never saw before"

"I never seen such algae fields before. My family has been going to this camp for 200 years"
Manitoba Impacts

Increased risk of more frequent and large magnitude severe storms and related damage

Lightning damage

Structural damage – wind, ice storm

Ecological disaster

Flooding
The international response

- In 1992, Canada and 154 others signed the UN Framework Convention on Climate Change
- Canada one of 160 signatories of 1997 Kyoto Protocol to UNFCCC
- Target: reduce GHG emissions to 6% below 1990 levels during 2008-2012 (240 MT reduction target annually)
- Manitoba target: 23% below 1990 levels
How does Canada compare?

- Canada is responsible for **2.5%** of international GHGs.
- **3rd-largest emitters per capita**, after U.S. & Australia
What Manitoba is doing...

- Ethanol and biofuels
- Low-impact hydroelectric generation (Wuskwatim, Gull, Conawapa)
- Clean power exports to Ontario
- Hydrogen Fuel
- Wind Power
Personal GHG Emissions

Actions by individuals account for 28% of GHG emissions each year (6 tonnes)
Taking action to reduce emissions will slow the rate of climate change, save money and produce other environmental and health benefits.

**What can I do?**

- Do not idle your vehicle
- Recycle or compost
- Turn off lights and electrical appliances
- Make your home more energy-efficient
- Plant trees
Thank you

Questions?
Current NH temperatures are very unusual within at least the past 1000 years *optional slide*