

Climate Change The Challenges and Opportunities for Green Energy



Institute for Catastrophic
Loss Reduction

Institut de Prévention des
Sinistres Catastrophiques



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Key Messages

- **The climate has warmed, will continue to warm, and humans are the cause**
- **Mitigation (emission reductions) will not substantially affect the climate over the next few decades – **so we have to adapt.****
- **Choices made now will have a big impact on the second-half of the 21st century climate and beyond.**
- **Agriculture and Energy have opportunities and challenges.**
- ***“We have options, but the past is not one of them.”*** (Sauchyn and Kulshreshtha, National Assessment)

Key Messages

Opportunities and Challenges:

- **Adapting our agricultural production, including the sources for green energy, to an evolving climate with increased uncertainty.**
- **Governments are now developing strategies to reduce human impact on the climate.**
 - **These policies may or may not be fully supportive of green energy.**
 - **Need comprehensive analyses to avoid making the “wrong” choices on green energy.**

Key Message – Broader Context

UK National Security Strategy - Security in an interdependent world - Prime Minister to Parliament, March 2008

- ... driven by a diverse and interconnected set of underlying factors, including **climate change**, competition for energy, poverty and poor governance, demographic changes and globalisation.
- *Climate change is potentially the greatest challenge to global stability and security, and therefore to national security. Tackling its causes, mitigating its risks and preparing for and dealing with its consequences are critical to our future security, as well as protecting global prosperity and avoiding humanitarian disaster.*

Is the climate changing?



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.

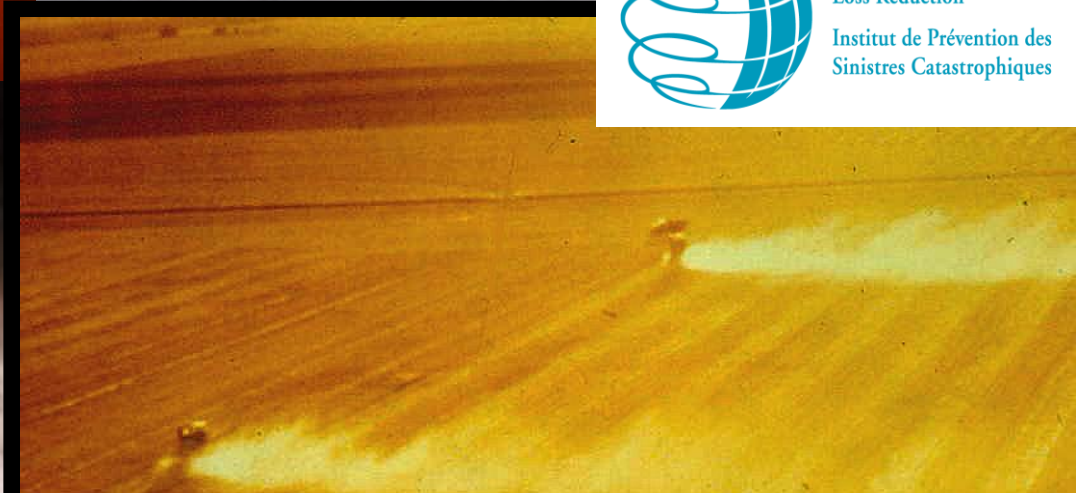
Eleven of the last twelve years (1995 -2006) rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850).

Why is the climate changing?

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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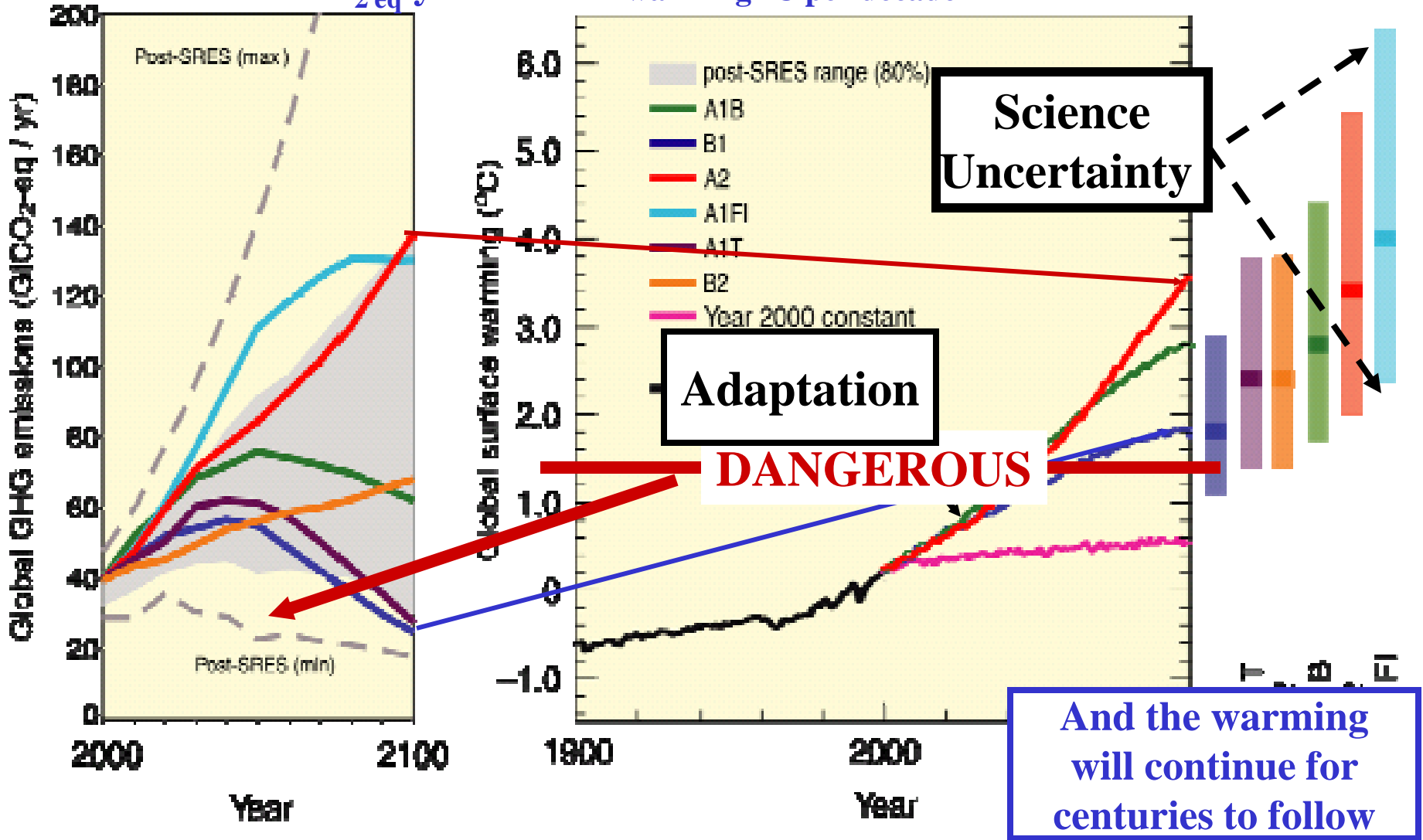
Projecting the Future

Projecting the Future

$$\Delta\text{CO}_2 = \Delta(\text{pop}) * (\Delta(\text{GDP/pop}) * \Delta(\text{energy/pop}) * \Delta(\text{CO}_2/\text{energy}))$$

Emissions GtCO₂eq/yr

warming °C per decade



Science
Uncertainty

Adaptation

DANGEROUS

And the warming
will continue for
centuries to follow

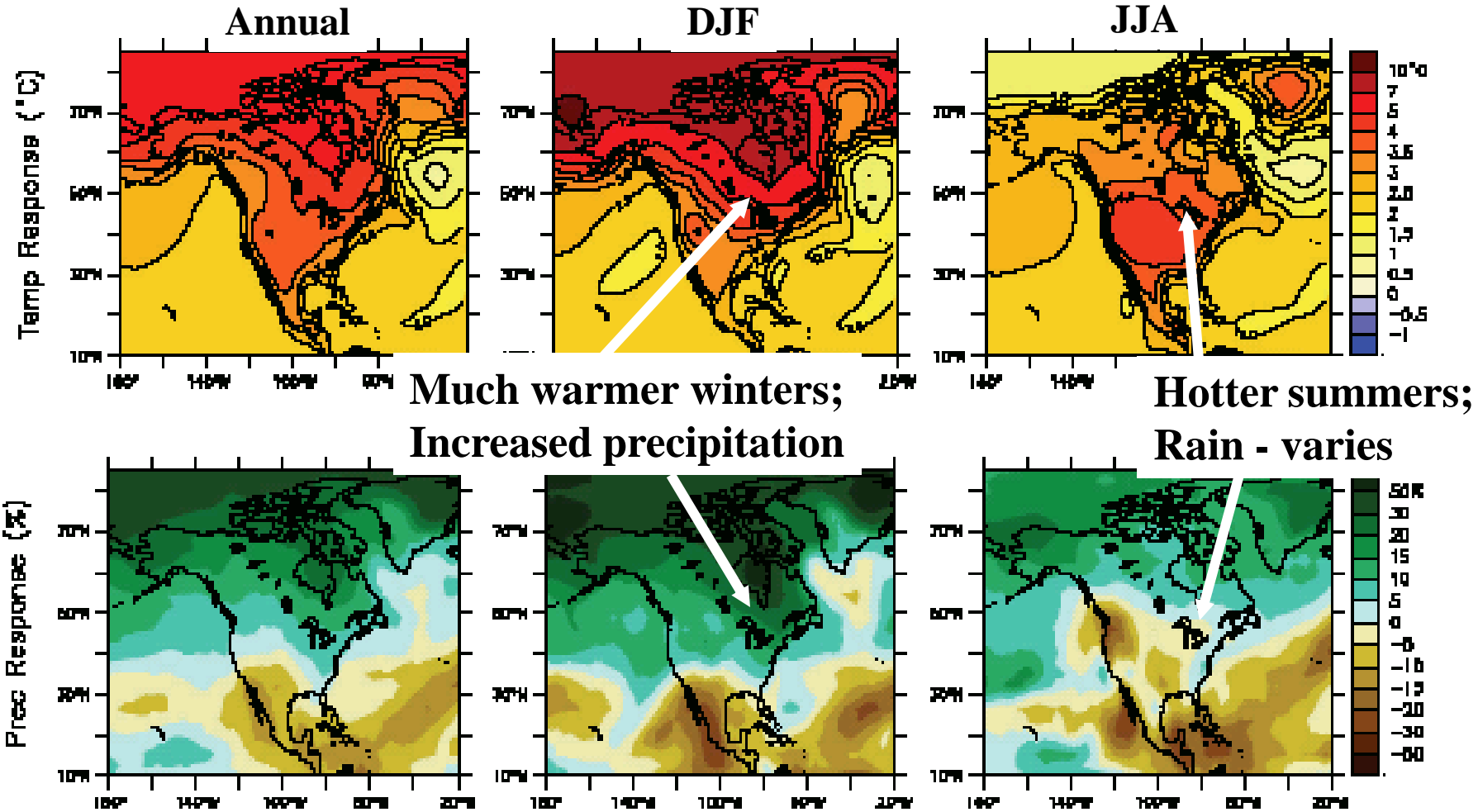


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**Responding – to changes in
Canada - Adaptation**

No one lives at the global average

Medium (A1B) scenario (2090-2099): Global mean warming 2.8°C



Much warmer winters;
Increased precipitation

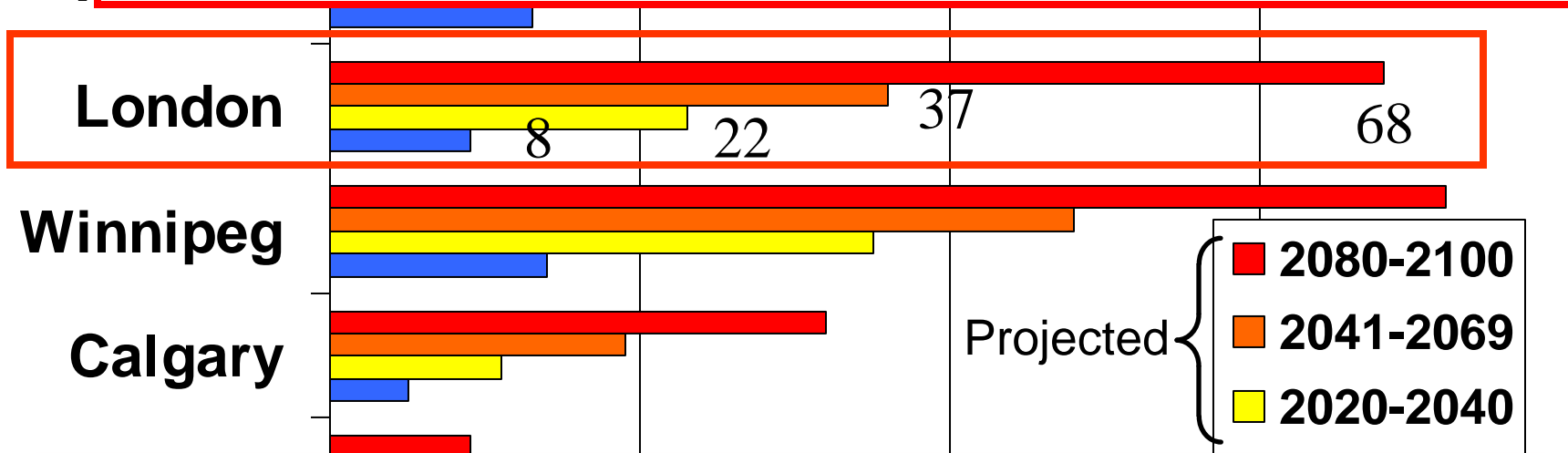
Hotter summers;
Rain - varies

Changing Precipitation

**Water, agriculture
floods, droughts**

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

No Breathing Room

National Illness Costs of Air Pollution

Canadian Medical Association (CMA) August 2008

1. In 2008, **21,000 Canadians will die from the effects of air pollution.** While most of these deaths will be due to chronic exposure over a number of years, 2,682 will be the result of acute short term exposure.
2. **By 2031, almost 90,000 people will have died from the acute effects of air pollution. The number of deaths due to long-term exposure to air pollution will be 710,000. ...**
11. In 2008, economic costs of air pollution will top \$8 billion. By 2031, these costs will have accumulated to over \$250 billion.

The processes that result in air pollution are much the same as those that produce greenhouse gases.

Make Green Energy part of the Solution

Human Health in a Changing Climate – Health Canada (2008)

- “Climate change is expected to increase risk to the health of Canadians through many pathways: the food they eat, the air they breathe, the water they drink, and their exposure to extreme weather events and infectious diseases found in nature.”

•Heat-related mortality could more than double in southern and central Ontario by the 2050s, while air pollution mortality could increase about 15 to 25% during the same interval.

•Extreme heavy precipitation events, such as the one in May 2000 that contributed to the E. coli outbreak in Walkerton, Ontario, which killed 7 people and made 2300 ill, are projected to increase

CHAPTER 6 Ontario

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ONTARIO



From Impacts to
Adaptation: Canada in a
Changing Climate (NRCan,
2007)

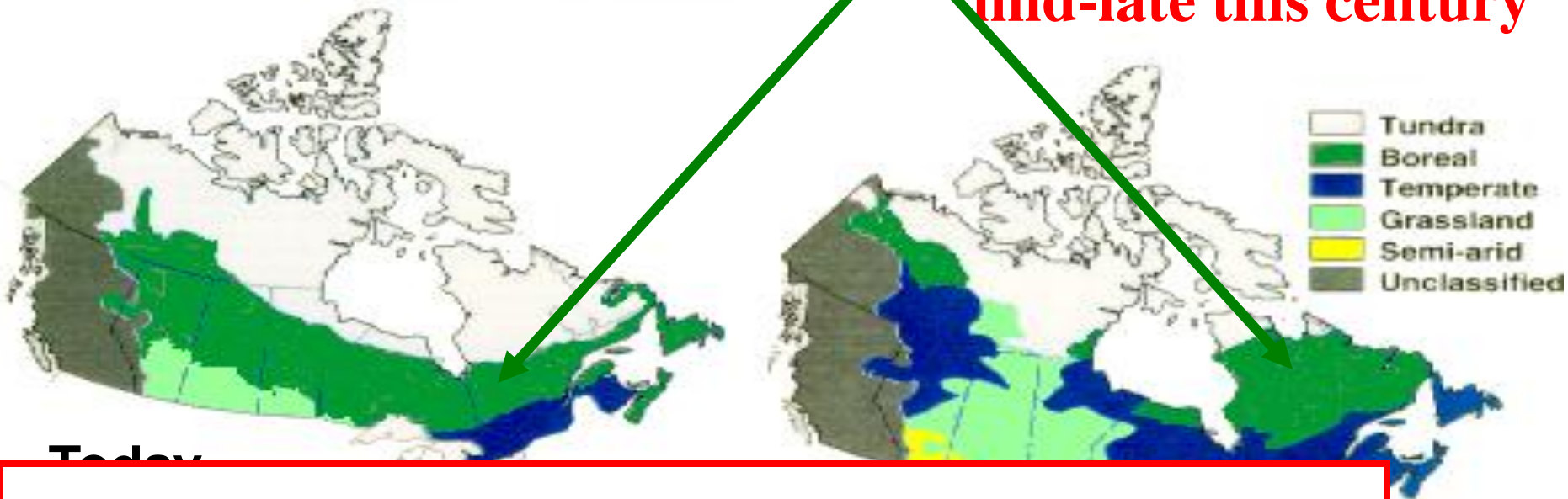
- **Impacts include water shortages**, lower Great Lakes water levels, **flooding**, forest fires, **reduced agricultural production**, damages to infrastructure and property, power outages and outbreaks of water-borne diseases.
- Physical infrastructure, water quality and supply, human health and well-being, remote and resource-based communities, and ecosystems are highly sensitive to climate.
- Disruptions to **critical infrastructure**, including water treatment and distribution systems, **energy generation and transmission**, and of forest pests will adversely impact the **health and** transportation are likely to become increasingly frequent in the future.
- Increased frequency of **forest fires** and outbreaks economic base of communities dependent on the forest industry, particularly in the far northern parts of Ontario's boreal forest

Ontario, Quebec clean up after severe storms
The Canadian Press, April 26, 2009

Natural ecosystems depend on
Precipitation

Boreal forest under stress
Climate moves north faster
than the trees

mid-late this century



Climate zone shifts

– impacts on agriculture, forests, ...
and resource-based communities

Adaptation – Managing the Unavoidable

- **ADAPTATION** = “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which **moderates harm or exploits beneficial opportunities.**”
- **Need to Reduce VULNERABILITY and Enhance RESILIENCE to expected changes in climate and associated extreme weather events. -**
- **Green Energy could be part of solution**

**Communities in Ontario
more than 30% reliant
on resource-based
industry (NRCan, 2007).**

**Adapting to climate change
Ont. MoE
Expert Panel on Climate
Change Adaptation**





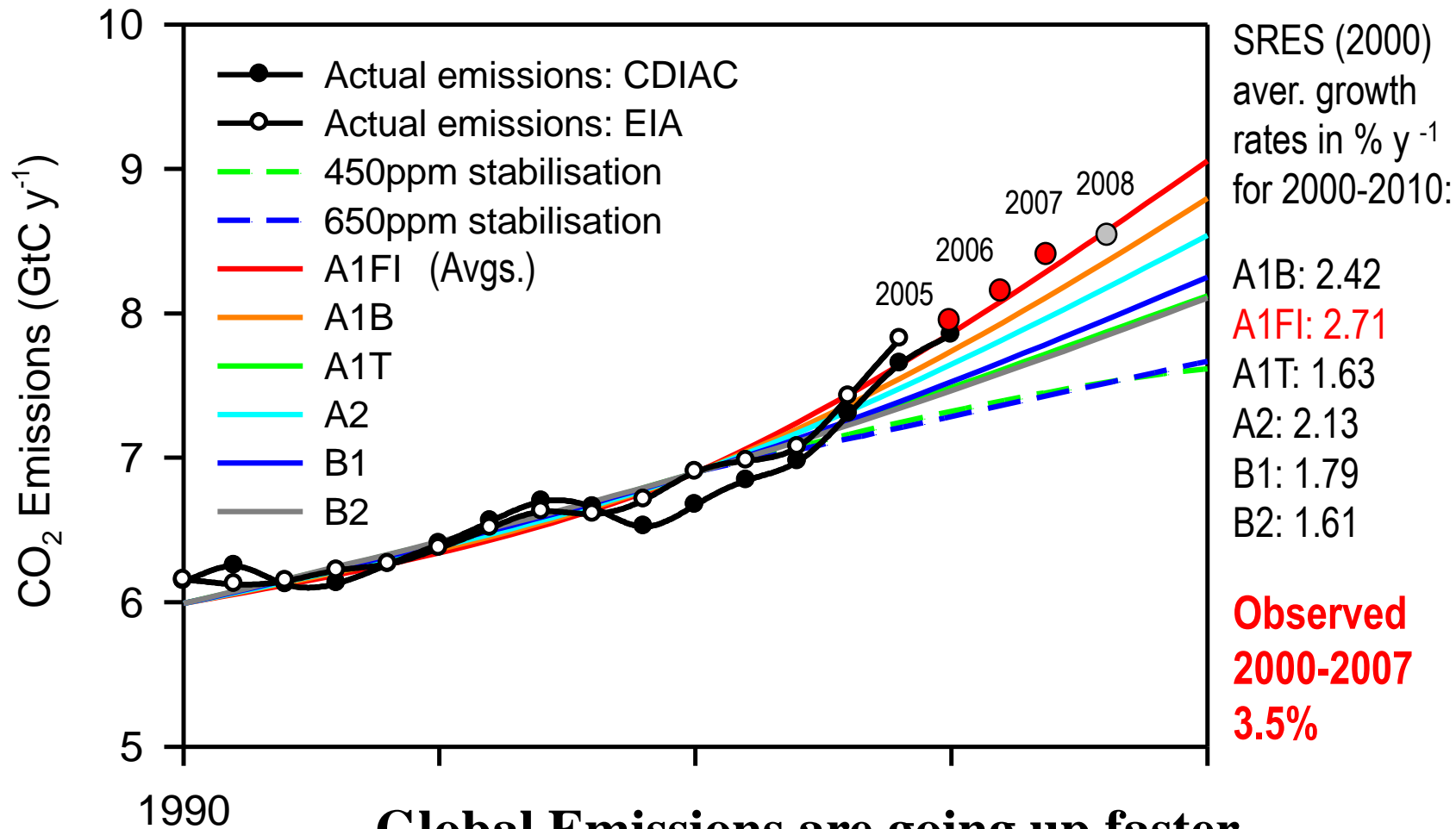
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**Responding
– emission reductions**

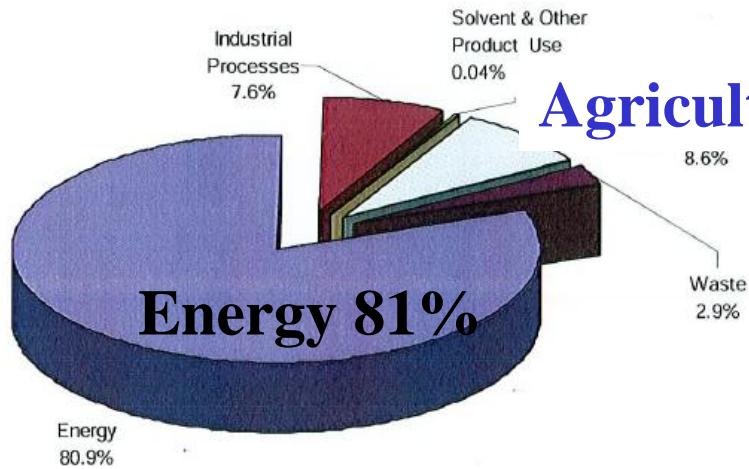
Trajectory of Global Fossil Fuel Emissions

Global Carbon Project – 10/07



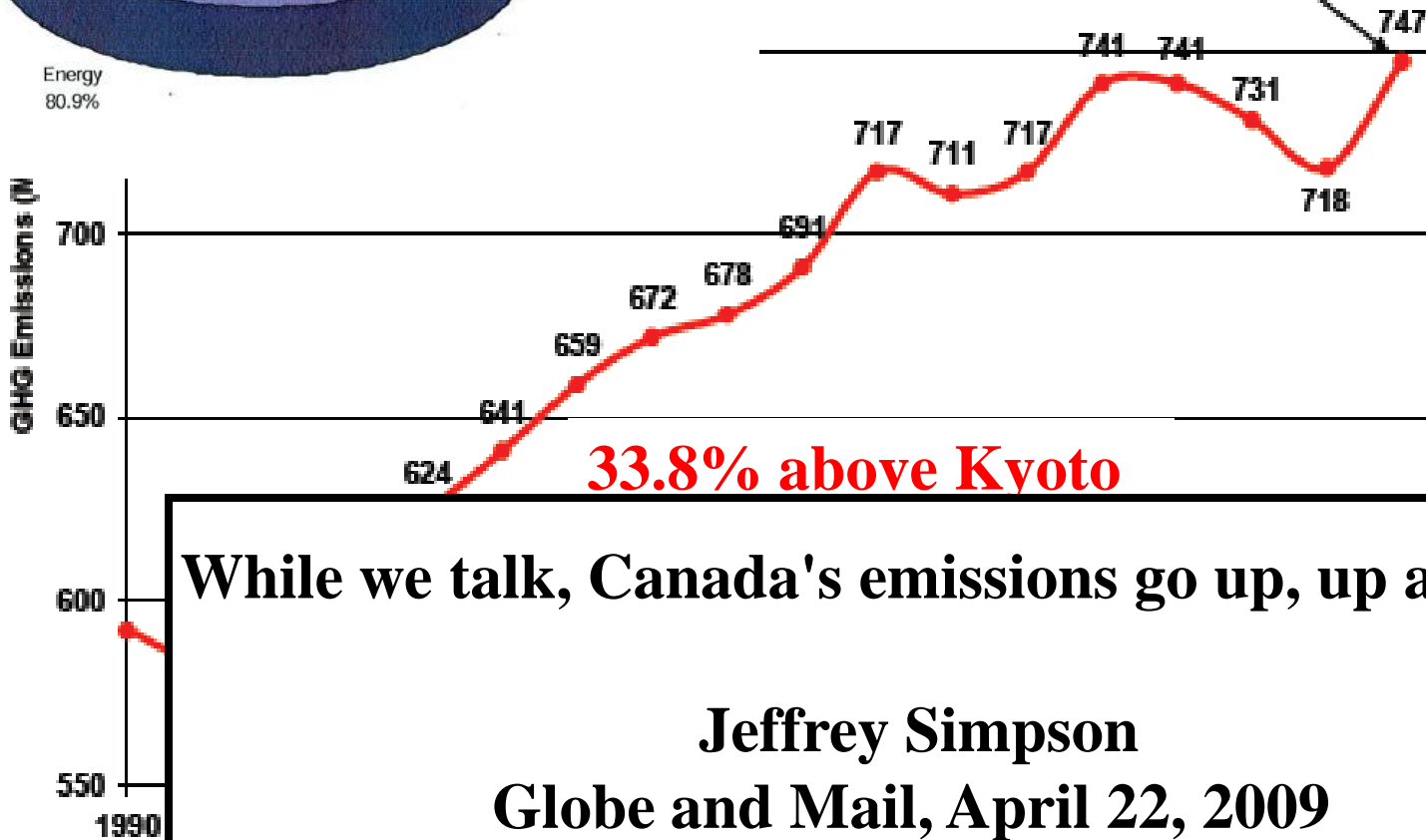
**Global Emissions are going up faster
than the MOST pessimistic forecast!**

Canada's Emissions to 2007



Agriculture – 8.6%

2007 Emissions 747 Mt
 26.2% above 1990
 33.8% above Kyoto Target



33.8% above Kyoto

While we talk, Canada's emissions go up, up and up ...

**Jeffrey Simpson
 Globe and Mail, April 22, 2009**

Target

2012

Energy from and within Agriculture

Can we reduce our dependence on America?

Jeffrey Simpson, April 25, 2009

On climate change, the Harper government has essentially downed tools, waiting for the U.S. political system to come to conclusions about trading emissions and new vehicle emission standards, after which Canada could have taken the lead in climate change within North America years ago but chose not to do so. As a result, it has nothing positive to offer the Obama administration, and so is waiting on events. That "clean energy dialogue" touted at the Obama-Harper summit was, and remains, eyewash.

- **Energy With Agriculture – The Vision**
 - **Green Energy Act – PCCAP, MoE EPCCA**
 - **Ag Energy Co-operative**
 - **Lawrence Centre – UWO Ivey Business School**
 - **Put a Price on Carbon – Tax + Cap-in-Trade**

Key Messages

Opportunities and Challenges:

- **Agricultural and Energy Production - in an evolving climate – reducing use and producing green energy**
- **Governments are now developing strategies to reduce human impact on the climate.**
 - **Make the right choices through comprehensive analysis**
 - **Set framework that is clear, stable and makes a difference.**

The End



Thank you for your attention