

CLIMATE CHANGE SCIENCE AND IMPACTS

FACT SHEET

Sizing up the Climate Challenge

Photo: Rahims

Scientific assessments paint an increasingly dire picture. It's time to act.

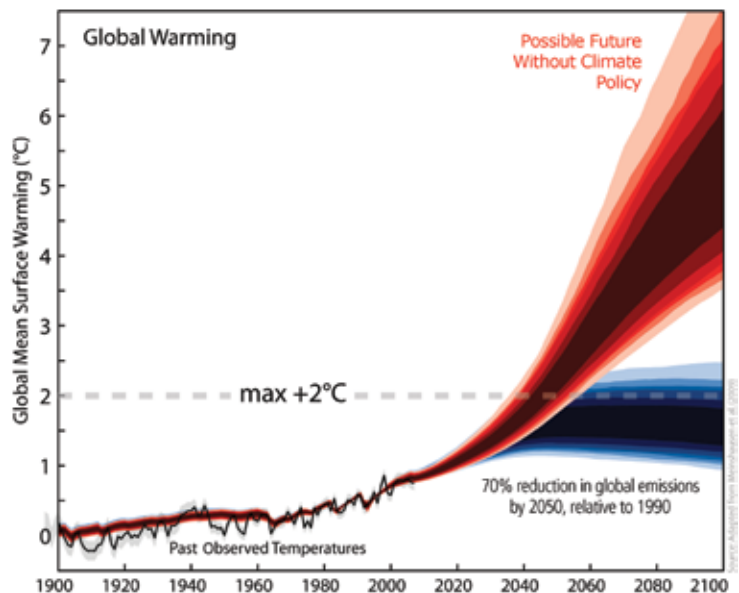
“Climate change is happening even faster than previously estimated; global CO₂ emissions since 2000 have been higher than even the highest predictions, Arctic sea ice has been melting at rates much faster than predicted, and the rise in the sea level has become more rapid. Feedbacks in the climate system might lead to much more rapid climate changes. The need for urgent action to address climate change is now indisputable.”

With that statement, the National Science Academies of the G8+5 nations issued a call to action in May 2009. Without action on emissions, global average temperature could rise as much as 6°C this century and permanently alter the conditions in which human civilization has emerged and thrived. This does not have to be the case. We still have time to limit global warming to a relatively manageable level, 2°C above pre-industrial levels. But only just.

Scientists now describe the warming of the climate system as “unequivocal” and evident in rises in air and ocean temperatures, widespread melting of snow and ice, and rising sea levels. Already, average global surface temperature has risen more than 0.7°C above pre-industrial levels, and this has been shown to be due mainly to the buildup in the atmosphere of greenhouse gases (GHGs) from human activities. Even if all emissions ceased today, this amount of warming would roughly double as a result of the delayed effect of emissions already in the atmosphere.

(continued on page 2)

Temperature Change by 2100



The magnitude of future climate change depends critically on our greenhouse gas emissions path, and thus on the decisions that we make today to shape that path. Without a sharp reduction in global emissions beginning within the next 10 years, humanity will be committed to extraordinary levels of warming and sea-level rise for the next millennium. If decisive action is taken now, average warming can be kept below 2°C.

Source: Malte Meinshausen, Potsdam Institute.

Why 2°C?

Average warming of 2°C above pre-industrial levels is widely regarded as the threshold of “dangerous” climate change. According to the UN Development Programme, 2°C “broadly defines the point at which rapid reversals in human development and a drift towards irreversible ecological damage would become very difficult to avoid.” The governments of all the world’s major GHG-emitting countries, including Canada, agreed in July 2009 to “recognize the scientific view that the increase in global average temperature above pre-industrial levels ought not to exceed 2°C.”

Hitting Close to Home

Canada in a Changing Climate

The most complete assessment to date of climate change in Canada found that “the impacts of changing climate are already evident in every region of Canada.” The 2008 report, published by Natural Resources Canada and including the work of 145 authors and 110 expert reviewers, warns that even a relatively modest level of warming will seriously affect Canadians. It also underlines that global impacts of climate change (see “Key Global Impacts” sidebar) will have a significant impact on Canada, even if they occur outside our borders.

The report projects significant changes in all regions of Canada both to the natural environment and human communities. In a world with 2°C of global warming, Canada will face:

- **Average temperature increases** for Canadian provinces from 2–6°C, with the largest increases in the Arctic.
- **Heat-related deaths.** In Ontario, the number of days at or above 30°C is projected to double, with a consequent doubling of heat-related deaths, and an increase in deaths due to air pollution.
- **More droughts.** Although total precipitation is expected to increase in most provinces, its timing — coupled with less snow accumulation, earlier thawing, greater evaporation, and receding glaciers — is projected to contribute to more frequent and severe drought conditions.
- **Stress on wildlife.** Declining sea ice, more severe winter storms, shifting ecosystems and loss of wetlands will negatively affect many iconic and culturally important Canadian species, such as polar bears, ringed seals, caribou and ducks.
- **Sea level** is predicted to rise more in some places than the global average, increasing the risks of coastal flooding, more frequent and severe storm surges, and rapid erosion. Regions most at risk include much of Atlantic Canada, the Beaufort Sea coast and the Fraser River Delta.

(Cover Story, continued from page 1)

Warnings on climate change from prestigious scientific bodies are increasingly becoming sharper and more urgent. Current emissions trends are above the worst-case scenario used by the climate science community up to now. Many climate impacts are appearing sooner and more strongly than expected, suggesting the climate is more sensitive to warming than anticipated. Improved scientific understanding of projected major risks is consistently bringing them closer to the present.

A very brief window of opportunity exists to avoid the worst impacts of global warming and preserve a livable climate for generations to come. The science leaves little doubt that the climate challenge is here and now.



Photo: Paul Jerry

Mountain glacier retreat will dramatically reduce water availability in the Western Prairies.

- **Stress on forests.** Increased drought and more favorable conditions for pests are projected to greatly increase the mortality of susceptible tree species, including jack pine, whitebark pine, and white and black spruce.
- **Thawing or thinning of frozen soils.** Over 50% of Canada’s permafrost is at risk of thawing in the near future, threatening critical infrastructure and potentially releasing significant amounts of carbon dioxide.
- **Loss of sea ice.** The summer extent of sea ice is projected to decline by 50–60% this century in the North, with some models predicting a possible complete loss of summer sea ice.

Key Global Impacts

Unchecked, climate change will have grave consequences for global stability, development and human security. Beyond 2°C of global warming the risks are significantly heightened:

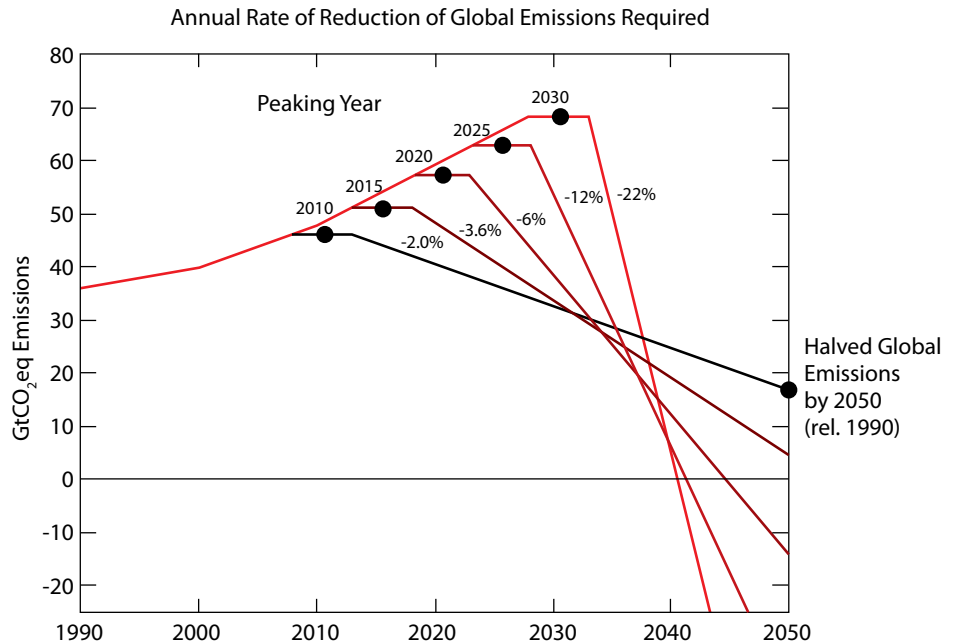
- Many assessments now predict sea level rise of one metre or more this century if nothing is done to curb emissions. This would permanently displace tens of millions of people and have disastrous economic and social impacts worldwide.
- Water shortages from mountain glacier loss will “alter the socio-economic and cultural lives of perhaps 20–25 per cent of the human population,” according to the UN Environment Programme.
- Climate change will be “the biggest global health threat of the 21st century,” particularly through its effects on water, food security and extreme events, according to a major review by the leading medical journal *The Lancet*.
- Extreme seasonal heat, along with other factors such as flooding, drought and changing precipitation patterns, will challenge agricultural yields and food security. In Africa, yields from rain-fed agriculture could be reduced by up to 50% in some countries as early as 2020.
- Up to 30% of species worldwide are at increasing risk of extinction with relatively modest warming, rising to above 40% for business-as-usual scenarios.

Staying Below Two Degrees

Controlling climate change requires a strong global agreement

Canada, along with the world's other major emitters, now recognizes that global warming "ought not to exceed 2°C" relative to pre-industrial levels. To live up to this goal, the next global climate agreement will need to reflect the science, which shows that the door on 2°C will close quickly without immediate action. Analyses by the UN's Intergovernmental Panel on Climate Change and others show that limiting warming to 2°C requires the following:

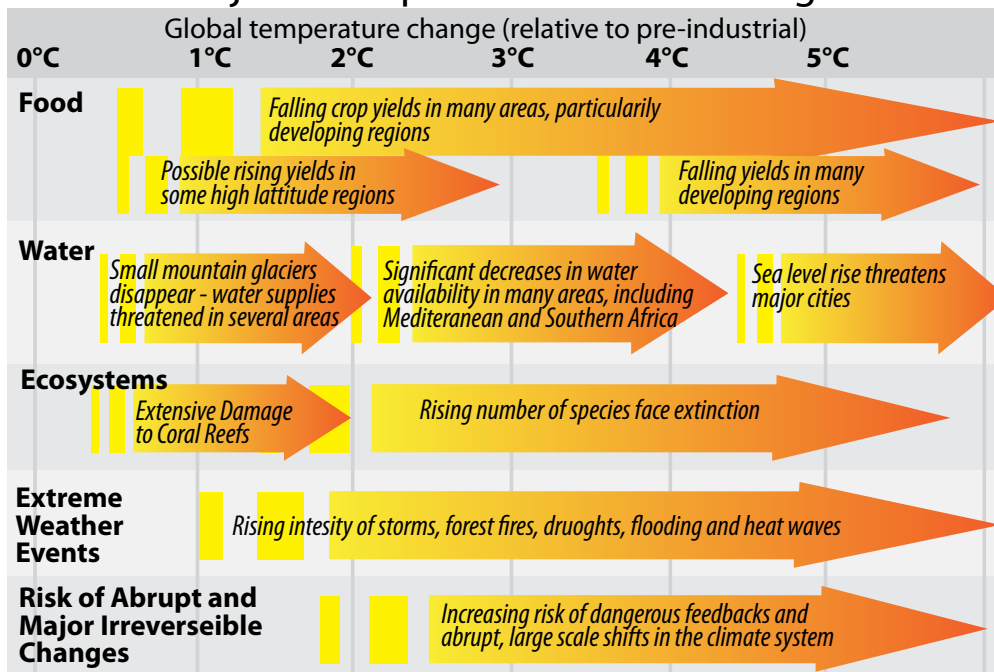
- Global emissions must peak within the next decade and fall to half of their 1990 level (or lower) by 2050.
- Industrialized countries' combined GHG emissions must fall to 25–40% below the 1990 level by 2020, if they are to make a fair contribution to the necessary cuts in global emissions.
- The rate of growth of emissions from major developing countries must be slowed so that those emissions fall 15–30% below business-as-usual levels by 2020.



Reaching global emission reduction goals requires urgent action. Even a short delay will require much steeper reductions later, to have the same probability (45–80% in this case) of staying within the 2°C limit.

Source: Malte Meinshausen, Potsdam Institute

Projected Impacts of Climate Change



Source: Stern Review, 2006

Is 2°C Safe?

A 2°C rise in global temperature, while avoiding the worst impacts of climate change, would still cause significant damage. The World Bank now estimates the cost of adapting to 2°C in the developing world alone will be US\$75–100 billion per year between 2010 and 2050 — the same magnitude as all current Official Development Assistance. As summarized on the previous page, 2°C would also have significant impacts on Canada.



Renewable energy is a core climate solution and a potentially major source of new jobs.

Pembina's Perspective

If Canada is going to live up to its commitments and assume its fair share of responsibility for preventing dangerous climate change, our position must be fully aligned with the science. We need to lead by example and support action by others in a strong global framework. This means committing to the following two essential elements as part of a new global climate agreement:

- **A "2°C Target" for Canada:** Canada must join other industrialized countries by adopting a 2020 target for GHG emissions of at least 25% below the 1990 level. This is the minimum acceptable level of ambition when the science is combined with analyses of Canada's fair share of the international effort. The federal government's current target for 2020 is equivalent to a 3% reduction below the 1990 level.
- **Financing Climate Solutions:** Canada must also commit to provide our fair share of financial assistance to help developing countries adapt to a problem they did little to create. Financial support is also critical to enabling action to curb emissions in emerging economies. Pembina's analysis estimates Canada's fair share to be between \$2—\$6 billion per year.



Photo: P.J. Partington, The Pembina Institute

A recent UNICEF UK report found that children in poor communities are the most vulnerable to climate change. "They are already seeing the impacts of climate change through malnutrition, disease, poverty, inequality and increasing risk of conflict — and ultimately an increase in child mortality rates," noted Lord Stern in a foreword to the report. Adequate support for adaptation is critical to reducing their vulnerability.

Time for Leadership

The world still has a chance to act effectively on climate change, but time is quickly running out. As the international community forges a new global climate agreement, Canada's position must be based on staying within the 2°C limit and safeguarding the world's most vulnerable people and places. The challenge is significant, but ignoring it is not an option. The world desperately needs leaders on climate change, and Canada — with all its wealth and ingenuity — is well equipped to be one.

More Information

To review the latest climate change science findings, refer to:

- The Intergovernmental Panel on Climate Change (IPCC), the world's most authoritative climate science body: www.ipcc.ch
- The synthesis report from the March 2009 Copenhagen Scientific Congress, summarizing science completed since the most recent IPCC report: <http://climatecongress.ku.dk/>
- The UN Environment Program's Climate Change Science Compendium 2009: <http://www.unep.org/compendium2009/>

For in-depth reports, backgrounders and updates on the latest climate news and negotiations, go to climate.pembina.org.

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