

Position Statement on Climate Change by the Canadian Meteorological and Oceanographic Society (CMOS)

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The Canadian Meteorological and Oceanographic Society (CMOS) is a national society of individuals and organizations dedicated to advancing atmospheric and oceanic sciences, as well as related environmental disciplines. CMOS has more than 700 members from Canada's major research centres, universities, private corporations, and government institutes. CMOS is uniquely positioned to provide scientific information to Canadians on the science of climate change. Many of its members are internationally recognized scientists who are extensively involved in comprehensive assessments of the current state of knowledge with respect to this complex issue. Such assessments require atmospheric and ocean scientists working together with scientists in related environmental, social, and economic disciplines to advise policymakers and the public on climate change.

This statement on the science and implications of climate change draws on national and international assessment reports, such as Canada's Changing Climate Report (2019, <https://changingclimate.ca/CCCR2019/>), the World Meteorological Organization Statement on the state of the global climate in 2018 (2019, <https://public.wmo.int/en/our-mandate/climate/wmo-statement-state-of-global-climate>), the United Nations Intergovernmental Panel on Climate Change Special Report Global Warming of 1.5° C (2018, <https://www.ipcc.ch/sr15/>), and the United Nations Intergovernmental Panel on Climate Change Fifth Assessment Report (2013, <https://www.ipcc.ch/assessment-report/ar5/>). These reports include references to underlying peer-reviewed scientific literature upon which this statement is based.

- * Earth's climate---arising from the interaction of the atmosphere, ocean, ice, land surface, and living things---undergoes changes from both human activity and natural causes.
- * Knowledge of climate change is based on observations of the climate and scientific understanding of physical, chemical, and biological processes.
- * Humans influence the climate through changing the atmosphere's composition, primarily through emissions of greenhouse gases as a result of combustion of fossil fuels and deforestation. Carbon dioxide (CO₂) is the dominant human-emitted greenhouse gas. The current CO₂ concentration is approximately 50% above the pre-industrial levels.
- * Human activity has been the main cause of the observed increase in temperature since the middle of the 20th century. The four recent years (2015-2018) have been the warmest years on record for global surface temperature. A long-term warming will continue in the 21st century, although individual months or years will also be affected by natural climate variations.

* Changes in climate result in responses in average and extreme temperature and precipitation, as well as in wind, sea level, snow and ice cover. There are also numerous other responses, such as ocean acidification and deoxygenation. Many of these responses, including those attributed to human activity, have already been observed and are predicted to continue in the future.

* Change has both global (e.g., increasing surface temperature) and regional (e.g., reduction of Arctic sea ice) effects. Important effects specific to Canada, drawing on Canada's Changing Climate Report 2019 include the following.

- * Warming in Canada is, on average, about double the magnitude of global warming. Northern Canada has warmed and will continue to warm at more than double the global rate.

- * The effects of warming in Canada include more extreme heat, less extreme cold, longer growing seasons, increased precipitation in most areas, increased wildfire risk, shorter snow and ice cover seasons, earlier spring peak streamflow, thinning glaciers, thawing permafrost, increased coastal erosion, rising sea level, and more frequent coastal flooding.

- * Canadian areas of the Arctic and Atlantic Oceans have experienced longer and more widespread sea ice-free conditions. Canadian Arctic marine areas, including the Beaufort Sea and Baffin Bay, are projected to have extensive ice-free periods during summer by mid-century. The last area in the entire Arctic with summer sea ice is projected to be north of the Canadian Arctic Archipelago.

- * Because some further warming is unavoidable as a result of past and present emissions, these trends will continue over the next century.

* Future climate projections are based on scientific understanding of physical, chemical, and biological processes that affect climate and estimates of future human activity. There is uncertainty in projections that results from both incomplete scientific understanding and uncertain future human activity. Reducing the uncertainty that arises from incomplete scientific understanding of climate change and quantitatively assessing natural climate variations are core professional goals of many CMOS members.

* A range of future human greenhouse gas emission scenarios are used to inform climate change impact assessment, climate risk management, and policy development. Important climate change effects associated with various emission scenarios are summarized below.

- * With current emission reduction plans and commitments, the future temperature and sea level changes are likely to result in averaged surface temperature increases of 4-6 °C for Canada (even higher for northern regions) and coastal sea level rises approaching 1 metre for some populated parts of Canada by the end of the century.

- * High emissions scenarios, which closely mirror today's business as usual emissions, will have substantially more future climate change effects than this.

* Scenarios with limited warming will only occur if Canada and the rest of the world reduce net carbon dioxide emissions to near zero early in the second half of the century and reduce emissions of other greenhouse gases substantially. To limit global warming to 1.5°C by 2100, projections indicate we must achieve net zero emissions globally by approximately 2050.

CMOS strongly endorses the results of the recent Government of Canada's Changing Climate Report, and, in collaboration with researchers, citizens, governments and industry, stands ready to work collectively toward rapid decarbonization of the economy and investment in renewable energy sources. CMOS is also committed to assisting Canadians learn how to adapt to the climate changes to which we are already committed, for both present and future generations.