Canadian Foundation for Climate
and Atmospheric Sciences (CFCAS)

Fondation canadienne pour les sciences
du climat et de l'atmosphère (FCSCA)

November 25, 2005

The Right Honourable Paul Martin, P.C., M.P.
Prime Minister of Canada
Langevin Block
80 Wellington Street
Ottawa, ON K1A 0A3

Dear Prime Minister:

In response to your request to the Canadian Foundation for Climate and Atmospheric Sciences (CFCAS) to report to Canadians on the science of climate change and, given that Canada will host the CoP/MoP meeting in Montreal starting November 28, we felt it timely to share with you our assessment of climate science which we believe strengthens the need for action on climate change and reinforces the need to enhance investments in climate science research and monitoring to support decision making.

We, the members of the Board of Trustees of CFCAS and Canadian climate science leaders from the public and academic sectors in Canada, concur with The Joint Science Academies statement that "*climate change is real*" and note that the 2004 Arctic Climate Impact Assessment concluded that Arctic temperatures have risen at almost twice the rate of the rest of the world over the past few decades. Furthermore, we endorse the assessment of climate science undertaken by the Intergovernmental Panel on Climate Change (IPCC) and its conclusion that "*There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.*"

There is now increasing unambiguous evidence of a changing climate in Canada and around the world. Over the past century, the globally-averaged annual temperature increased by 0.6°C and is now warmer than at any time in at least the last 1000 years. During this same period, Canadian temperatures south of the 60th parallel warmed by about 0.9°C. Over the past 50 years, during which human influences on the climate have become more apparent, Canada has warmed faster than most other regions on the globe, with the greatest warming, of more than 2°C, occurring in the Mackenzie Basin. With the exception of the southern Prairies, Canada has also become noticeably wetter. The southern half of the country now receives about 5–30% more precipitation than it did in the early 1900s. In the Arctic, precipitation has increased by as much as 35% since 1950. The changes in precipitation are complex, however, because the increase in average precipitation has also been accompanied by increases in both extreme precipitation and dryness in some regions.

Summer Arctic sea ice has decreased in extent by 30% over the past 30 years and is projected to largely disappear before the end of this century. Global sea level has risen 10-20 cm in the past 100 years and is projected to continue to rise over the next 100 years. Future sea level rise could be much greater if there are massive ice sheet discharges from the Antarctic or Greenland. With rising sea levels, some small island states and low-lying areas are in danger and the threats of storm surges are enhanced.

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Climate scientists now project that global mean temperatures will increase between 1.4 to 5.8°C from 1990 to 2100. The warming over most of Canada is projected to be substantially above that of the global average, especially during winter.

As the climate changes, **there will be increasing impacts on Canada's natural ecosystems and on our socio-economic activities.** Some impacts are:

- Inadequate water for Prairie agriculture due to loss of melt water from mountain snow pack and shrinking glaciers;
- Threats to the sustainability of Canada's natural resources due to changes in ecosystems.
    - Warming allowing the spread of insects through our forests and prolonged drought making forests more susceptible to fires;
    - Warming of ocean and river waters, threatening survival of Pacific salmon, a cold water fish;
- Increasing severity and frequency of extreme weather events: floods, storms, tornadoes and droughts, some of which are already exceeding 100 year records and requiring more robust design specifications for infrastructure;
- Melting of permafrost and associated effects on the human environment (infrastructure, roads, pipelines, buildings), sea ice, northern ecosystems and species, all leading to dramatic changes in the lives of northern people;
- Increased marine traffic through the northern sea routes, increasing the likelihood of environmental impacts and testing Canada's sovereignty claims in the Arctic.

Some of these impacts are already detectable.

Since the completion of the 2001 IPCC Assessment, further advances have been made in climate science including:

- Analyses showing that climate may be more sensitive to additional greenhouse gases than previously determined;
- Improved understanding of the interactions between the climate system and the global carbon and sulphur cycle with the possibility that some terrestrial carbon reserves may become sources;
- Confirmation that warming of the atmosphere near the surface is consistent with the projections of climate models;
- Linking of climate change and ozone recovery (affecting UV levels in the Arctic), and the attribution of recent surface temperature change over the Antarctic to the ozone hole;
- Demonstration that the number of higher-intensity hurricanes has increased in recent decades;
- Identification of ocean warming to depths in excess of 700 m. and its attribution to anthropogenic (human-induced) causes;
- Identification of possible 'tipping points' in the carbon cycle, the North Atlantic Ocean circulation and the Greenland ice sheet, that may trigger irreversible trends with major global climatic consequences;
- Evidence that warm Atlantic water now moves further into the Arctic Basin and may increase the rate of sea ice melt due to warming from below.

There is an increasing urgency to act on the threat of climate change. Significant steps are needed to stop the growth in atmospheric greenhouse gas concentrations by reducing emissions. Since mitigation measures will become effective only after many years, adaptive strategies as well are of great importance and need to begin now. Our climate system is complex and further knowledge of the relationships among its components is needed to inform our decisions on

reducing our own emissions of greenhouse gases and adapting to the inevitable impacts that we will experience.

There are several key research questions whose resolution will lead to better understanding as to how the climate will warm. The natural cycles of greenhouse gases in the oceans, forests and peat bogs need clarification, as do the influences of permafrost and frozen methane hydrates. The roles of clouds, stratospheric interactions and atmospheric chemistry, snow and ice, the oceans and ecosystems in amplifying and/or delaying climate change need further attention. Tipping points that trigger irreversible change need to be identified and incorporated in risk assessments. Canadians will need specific advice on how climate and weather will change, including the occurrences of extreme events, heat waves, winter and summer storms, hurricanes, storm surges and droughts, on a regional scale that relates to the security, sovereignty and livelihoods of Canadians.

The IPCC and the science community have assessed the state of knowledge. Canadian scientists have contributed to this science and its assessment. For the sake of all Canadians and the global community, **continued investments in research and monitoring of the climate system are required** and an integration of sustained scientific activities across government and academic research organizations is essential for the optimal use of resources. Good policy requires good science.

We would be pleased to provide further clarification and information at any time.

Yours sincerely,

Dr. Gordon McBean, FRSC
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Cc: Hon. Stéphane Dion, Minister of the Environment

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