The climate in many parts of Canada appears to be changing. Although these changes are still in their early stages, the indicators make it clear that some impacts are already being felt by individuals, communities, businesses, and ecosystems. The severity and extent of these impacts varies quite a bit from one part of the country to another. Some are of relatively minor importance, some are quite serious. Some are harmful, while others are beneficial.

CLIMATE

The greatest changes have occurred in the western Arctic, the Mackenzie River Basin, and the Prairies, where rates of warming over the past century have equalled or exceeded 1.5°C – nearly triple the global average of about 0.6°C. The B.C. coast and the Great Lakes–St. Lawrence region have warmed at approximately the same rate as the planet as a whole, while northeastern Ontario, central Quebec, and the Atlantic Provinces have warmed the least, at about half the global rate. The eastern Arctic, northern Quebec, and Labrador, in contrast, have cooled, in some areas by as much as 1.5°C over the past 50 years.

Seasonally, most of Canada has experienced warmer and earlier springs, hotter summer nights (but little change in the number of hot summer days), and shorter, milder winters with less frequent cold spells. Falls, however, have shown a slight cooling trend, although most of the cooling has happened late in the season.

Canada has also become wetter almost everywhere and at every time of the year. Precipitation has increased by anywhere from 5% to 35% in most of the country since 1950. Only the southern Prairies have seen little or no increase. Over the same period, the proportion of yearly precipitation falling as snow has also been changing. The southern half of the country, for the most part, has become less snowy but rainier. The North, on the other hand, has become somewhat snowier.

Unfortunately, the picture for sea surface temperatures is less complete. Good data are available for the west coast and show surface temperatures increasing at rates between 0.9°C and 1.8°C per century. Information for eastern regions is more difficult to assess but tends to show little change, while data for the Arctic are either unavailable or need further analysis. The trends that have been detected are generally consistent with scientific expectations of climate change. They are also mirrored fairly closely by the indicators, which tend to show more change in the West and Northwest than in the East.

NATURE

As the indicators make clear, many aspects of Canada's physical environment are responding to changes in climate. Receding glaciers, thinner and less extensive sea ice, and earlier breakup dates for ice on rivers and lakes can all be connected to a warming atmosphere. Atmospheric warming is also a partial contributor to sea level rise along the Atlantic and Pacific coasts and in the Mackenzie Delta. As a result, these areas are becoming more vulnerable to shoreline erosion and flooding from heavy storms and high tides. In addition, the 1990s witnessed

some of the most costly weather disasters in Canadian history. There was no strong evidence over the long term, however, that the extreme weather events that were examined were becoming more common.

The indicators also showed a number of impacts on living things. Populations of some species, such as the polar bears of western Hudson Bay, are finding survival more difficult as a result of changes in climate. For others, such as the mountain pine beetle, Canada has become a more hospitable place. Key stages in plant development, such as budding, leafing, and flowering, are also occurring earlier, due mainly to earlier and warmer spring weather. At the same time, plants and animals from warmer areas have advanced northwards and species adapted to colder conditions have retreated.

Most of these responses provide further evidence that climate is changing, but they also offer important insights into how these changes are altering and reshaping the natural world.

PEOPLE

For Canadians living in the southern half of the country, winters are becoming less hazardous as they become shorter and less extreme, and consumers are saving energy as a result of reduced heating needs. A longer frost-free season is also increasing the potential for growing new varieties of crops. On the negative side, cooling needs are increasing in much of the country, and more frequent thaw-freeze cycles are reducing the durability of some building materials.

For Canadians in the North, however, the impacts of a changing climate have been more pronounced. A shorter, less reliable ice season has made winter hunting and fishing more difficult and dangerous. The traditional knowledge that aboriginal people relied on in the past to live off the land is also becoming harder to apply as a result of more variable weather and changes in the timing of seasonal phenomena. In addition, winter roads that provide supply links to many northern communities are becoming less reliable and cannot be used for as long.

Some indicators, however, have not shown any significant trends. Although recent years have been marked by severe drought on the Prairies and low water levels on the Great Lakes, the corresponding indicators showed no significant change over the long term. There could be several reasons why trends did not appear. One is that these phenomena are not as responsive to climate change as thought. Another is that more time and further warming will be needed before the changes become significant. Only time – and continued tracking of the indicators – will tell.

A CLIMATE CHANGE LIBRARY

The climate change assessments published every five years by the Intergovernmental Panel on Climate Change (IPCC) are the most comprehensive and authoritative source of information available on the subject. These reports are highly technical, but plain language summaries are available on the IPCC web site, which is listed in the international section below. The latest volumes are:

IPCC, 2001. *Climate change 2001: The scientific basis.* Cambridge, Cambridge University Press.

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RESOURCES ON THE WEB

The sites listed below were active at the time this report was prepared. Since publication, however, the contents or addresses of some sites may have changed, and some sites may have been discontinued. If one of the links provided here no longer works, you may be able to find a replacement site by searching under the name of the organization responsible for the original site.

International

http://www.ipcc.ch. The Intergovernmental Panel on Climate Change is the most authoritative source of scientific information on the causes and impacts of climate change and responses to it.

http://www.unfccc.int. This United Nations site contains the texts and other information relating to the United Nations Framework Convention on Climate Change and the Kyoto Protocol.

http://www.iisd.org/climatechange.htm. Based in Winnipeg, the International Institute of Sustainable Development promotes the development of regional, national, and international responses to climate change. It is a good source of information on climate change in the Arctic.

http://www.climatehotmap.org. This map-based web site documents observations of climate change and its impacts from around the world.

http://www.usgcrp.gov/usgcrp/nacc. A number of regional and sectoral reports on the consequences of climate change for the United States are available from this site. Many will be of interest to Canadians, especially those in regions near the U.S.

http://yosemite.epa.gov/OAR/globalwarming.nsf. The U.S. Environmental Protection Agency's climate change site contains material on how regions in the U.S. and other parts of the world may be affected by climate change.

National

http://www.climatechange.gc.ca. The Government of Canada's climate change web site has an abundance of information on the science of climate change, impacts on Canada, and Canadian responses. It also contains a large selection of links to other sites and resources for teachers and students.

http://www.ec.gc.ca/climate. Environment Canada's climate change site provides fact sheets on climate change science, impacts, and adaptation and control measures.

http://www.msc-smc.ec.gc.ca/ccrm/bulletin. Environment Canada's Climate Trends and Variations Bulletin relates the average temperature and total precipitation of the most recent season and year to longer-term regional and national changes.

http://www.ec.gc.ca/soer-ree. Canada's state of the environment InfoBase features *Environmental Signals: Canada's National Environmental Indicator Series,* a frequently updated series of indicators on climate change and other environmental issues.

http://adaptation.nrcan.gc.ca. From this site you can download *Climate Change Impacts and Adaptation: A Canadian Perspective,* for information on the implications of climate change for water resources, forestry, agriculture, and the coastal zone. The site also offers an excellent series of posters depicting the impacts of climate change on health and safety, communities, land resources, water, and coastal regions in different parts of Canada.

http://www.c-ciarn.ca. The Canadian Climate Impacts and Adaptation Research Network site is useful for people who already have some knowledge of climate change. The site's

database has references to hundreds of papers on climate change impacts in Canada.

http://www.nccp.ca. The National Climate Change Policy Process site contains information on federal, provincial, and territorial climate change policy activities, as well as links to the sites of provincial and territorial governments, international agencies, and non-government agencies. Click on the link to the Climate Change Hub Gateway for access to the national climate change public education and outreach hub system, where you will find an extensive list of resources for the general public as well as for those working in public education.

Provincial and Territorial Government Sites

To find out more about how individual provinces and territories are responding to climate change, go to the following provincial and territorial web sites and follow the links to climate change.

http://www3.gov.ab.ca/env. Alberta Environment.

http://www.gov.bc.ca/wlap. British Columbia Ministry of Water, Land and Air Protection.

http://www.gov.mb.ca/est. Manitoba Energy, Science, and Technology.

http://www.gnb.ca/0085. New Brunswick Department of Natural Resources and Energy.

http://www.gov.nf.ca/env. Newfoundland and Labrador, Environment.

http://www.gov.nf.ca/mines&en. Newfoundland and Labrador, Mines and Energy.

http://www.gov.nt.ca/RWED/eps. Northwest Territories Resources, Wildlife, and Economic Development, Environmental Protection Service.

http://www.gov.nu.ca. Government of Nunavut.

http://www.ene.gov.on.ca. Ontario Ministry of the Environment.

http://www.gov.pe.ca/infopei/Environment_and_Land. Prince Edward Island, InfoPEI.

http://www.menv.gouv.qc.ca. Ministère de l'environnement du Québec.

http://www.mrn.gouv.qc.ca. Ministère des ressources naturelles du Québec.

http://www.se.gov.sk.ca. Saskatchewan Environment.

http://www.gov.ns.ca/energy. Nova Scotia Department of Energy.

http://www.environmentyukon.gov.yk.ca/epa. Yukon Department of Environment, Environmental Protection and Assessment.

Nature

http://adaptation.nrcan.gc.ca/posters. Natural Resources Canada's climate change posters cover every region of the country and explain how climate change is affecting sea level, sea ice, glaciers, water resources, and other aspects of the natural environment as well as human activities.

http://www.crysys.uwaterloo.ca/education/crysys_education.cfm. Go to this site for information from Canadian ice researchers on sea ice, glaciers and ice caps, river and lake ice, and snow.

http://ice-glaces.ec.gc.ca. The web site of the Canadian Ice Service provides information on current ice conditions along Canada's coasts and in the Great Lakes.

http://pbsg.npolar.no. The home page of the Polar Bear Specialist Group provides up-to-date information on the status of the world's polar bear populations as well as information on conservation issues, a polar bear FAQ, and links to other polar bear sites.

http://www.taiga.net/coop/indics. This site, maintained by the Arctic Borderlands Ecological Knowledge Cooperative, contains an extensive set of indicators that document changes in the physical environment and wildlife of northern Yukon.

http://www.thousandeyes.ca. Check the home page of Nova Scotia's Thousand Eyes project for background on the project and the latest update on results.

http://www.naturewatch.ca. NatureWatch gives amateur scientists a chance to contribute to the scientific monitoring of changes in the natural environment. Current programs include IceWatch, PlantWatch, FrogWatch, and WormWatch, and others are under development.

People

http://www.msc-smc.ec.gc.ca/media/top10. Go here for David Phillips's stories of headline-making weather events and impacts from the past year, the past decade, and the past century.

http://www.taiga.net/nce. The Northern Climate Exchange site is a good place to start for information on climate change in the North and its impacts on northern life.

http://www.agr.gc.ca/pfra/drought. The Prairie Farm Rehabilitation Agency posts regular updates on drought risks in western Canada, along with information on coping with drought.

http://www.on.ec.gc.ca/water/level-news. The latest information on Great Lakes water levels can be found at this site. For more information about Great Lakes water levels, go to the Canadian Hydrographic Service web site, **http://chswww.bur.dfo.ca/danp/tidal_e.html** and the web site of the Great Lakes Information Network, **http://www.great-lakes.net**.

http://www.msc-smc.ec.gc.ca/saib/climate/climat_e.cfm. Follow the links to the climate change pages of the Meteorological Service of Canada's Science Assessment and Integration Branch site and download fact sheets on extreme weather and reports and updates on recent climate events and advances in climate science.

Responding to Climate Change

http://www.climatechangesolutions.com. This site, run by the Pembina Institute in partnership with Environment Canada, Natural Resources Canada, and the Climate Change Action Fund, offers an extensive assortment of tools and resources to help families, municipalities, schools, farms, industries, and businesses reduce their greenhouse gas emissions.

http://energysolutionsalta.com. This Alberta-based site has energy-saving tips and case studies that all Canadians will find useful for reducing greenhouse gas emissions in the home, at work, in the community, and on the road.

www.climcalc.net. Use the climate change calculator to estimate your own contribution to climate change and determine the best way of reducing it.

http://oee.nrcan.gc.ca. Check this site to compare the energy efficiency of appliances, cars, and other products and to get official statistics and publications on energy use in Canada.

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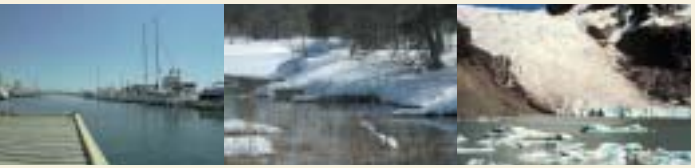

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Joanne Havelock, Saskatchewan Women's Secretariat

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Ash Kumar, Environment Canada

Rolande Laveau, Ministère de l'environnement du Québec

Alison MacGregor, Ontario Ministry of the Environment

Linda Mortsch, Environment Canada[1]

Krista Nakrieko, Canadian Council of Ministers of the Environment (formerly representing Manitoba Conservation)

Dennis O'Farrell, Environment Canada

Aynslie Ogden, Northern Climate Exchange

Monique Plamondon, Ministère de l'environnement du Québec

Elizabeth Sherlock, Nunavut Department of Sustainable Development

Risa Smith, Environment Canada (formerly representing B.C. Ministry of Water, Land and Air Protection)

Jim Sparling, Northwest Territories Department of Resources, Wildlife and Economic Development

Roger Street, Environment Canada[2]

Jeff Turner, Manitoba Department of Energy, Science and Technology

Paul Vanderlaan, New Brunswick Department of Environment and Local Government

Raymond Wong, Alberta Environment

Ron Zukowsky, Saskatchewan Environment[3]

[1] Federal co-chair [2] Former federal co-chair [3] Provincial and territorial co-chair

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